
The Impact of Human Capital on Economic Growth in Ethiopia: Evidence from Time Series Analysis

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Abstract: The general objective of the study was to analyze the impact of human capital development on economic growth in Ethiopia over the period 1974/5 -2018/9. The econometric models of Johanesan cointegration, VECM and causality tests were applied to analysis short-run and long-run impact of Human capital on Economic growth. The result of the error correction model shows that the model is adjusting at a relatively stable rate of 74.3% towards the long-run equilibrium. The result shows that human capital proxied of (primary and secondary school enrolments) and active labour force have a positive statistical significant long run and short-run effect on economic growth in Ethiopia. Results reveal that education expenditure and life expectancy at birth have a positive and statistically significant long-run effect on economic growth. However, the expenditure on health, secondary school enrolment and official development assistance are statically significant and have an unexpected negative impact on long-run economic growth. Furthermore, the short-run causality tests results reveal that public expenditure on education, primary school enrolment, secondary school enrolment and RGDP have unidirectional causal effects. Hence policymakers and/or the government give prioritize to create institutional capacity that increase school enrolment and strengthening the infrastructure or investment of educational and health institutions that produce quality of manpower to increase productivity.

KEYWORDS: *Economic growth, Education, Health, Ethiopia and Human capital development.*

1. INTRODUCTION

Human capital consists of the knowledge, skills, and health's that people accumulate over their lives, enabling them to realize their potential as productive members of

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society. The concept that investment in human capital promotes economic growth actually dates back to the time of the Scottish economist Adam Smith (1776) and the early classical economists who emphasized the importance of investing in human capital. Investments in human capital have become more important as the nature of work has evolved in response to rapid technological change, increase productivity and efficiency as the world development report (World Bank, 2019). It has large payoffs for individuals, societies, and countries' economies as a whole. Hence Human capital development is one of the necessary conditions for all kinds of growth- social, political, cultural, and economic aspects (Chitescu and Lixandru, 2016).

Most schools of thought believe health and economic growth are intertwined. Health can strongly affect economic growth and economic growth can strongly affect health. Higher incomes promote better health through improved nutrition, better access to safe water and sanitation, and increased ability to purchase more and better quality health care (Bloom and Canning, 2008). Investments in health and education have direct effects on productivity and economic growth by producing healthy and educated Human Capital. Health and education are two closely related proxy of human capital components that work together to make the individual more effective in production (Acemoglu, 2012). Improvement in the health of workers increases productivity. In turn increase in productivity results in economic growth either through reducing work off days or through increasing production in workplace (Yousefi and Movaghar, 2013). In general, if done in compliance with efficiency, investments in education and health affect income of the individual.

However, sustained improvement in Sub-Saharan Africa human development is found to be the lowest level in the world as the assessment made by UNDP (2013). In Ethiopia is one of the developing African countries and exhibited low government spending and low private sector participation in healthcare financing and education sector comparing to other developing countries. HDI's value for 2019 was 0.463 of one, which put the country in the low human development category positioning it at 173 out of 189 countries and territories according to the UNDP's Human Development Index Report (World Bank, 2019). This indicates Ethiopia has lower human capital investment and stocks than another country.

Investment of health services and education are Weak and limited coverage, especially in a large portion of Ethiopian people in rural areas have inadequate health facility, and standardized education; it leaves insufficient financing available for investments in the other essential inputs for academic success. These challenges manifested in low education and health outcomes hurt the future productivity of workers and future competitiveness of economies. Hence, the gaps in this study the inadequate Expenditure on education and health to develop human capital and increase productivity. Therefore, this study will look at the impact of human capital formation on economic growth in Ethiopia considering both education and health aspects of human capital components into consideration. Government Expenditure in education and health, school enrollment and life expectancy are taken as proxy variables for human capital developments. Applying the method of Johansen Co-integration approach, VECM and causality test.

1.1. Objectives of the Study

The general objective of this study is to analyze the impact of human capital development on economic growth in Ethiopia using time series data over the period of 1974/15 to 2018/19. The specific objectives of this study are:-

- ✓ To examine the short run as well as long-run effects of human capital stocks such as school enrolment and life expectancy on economic growth in Ethiopia
- ✓ To determine the relationship between total Government expenditure on health and education and net official development assistance with economic growth in Ethiopia
- ✓ To identify the existence of causal relationships between human capital with economic growth in Ethiopia. If any, to investigate the direction of causality.
- ✓ To provide empirical evidence and guidance for future spending on the inadequacies in the Ethiopian health and education sectors

2. METHODOLOGY OF STUDY

2.1. Econometric Model Specification

To analysis, the impact of human capital development on economic growth in Ethiopia the endogenous growth (augmented Solow growth) model would be applied in this study. The augmented Solow production function specifies that output is a function of labor, human capital, capital stock and productivity (Mankiw et al., 1992). It is represented in a Cobb-Douglas production function with constant

returns to scale. Hence, human capital augmented Solow model using the standard Cobb-Douglas production function specified as follows:

$$Y_t = AK_t^\alpha H_t^\beta L_t^{1-\alpha-\beta} \text{-----}$$

---- (3.1)

Where, Y_t : Represents Output level or economic growth at time t, A is the level of technology which is not accounted for by the growth in factors of production. K_t, H_t and L_t are physical Stock Capital at time t, Level of Human Capital at time t and Labor force measured by number total population of active workers age at time t respectively; α, β and $(1-\alpha-\beta)$ are the elasticity of physical capital concerning output, the elasticity of human capital concerning output and elasticity labor force respectively. Theoretically, a positive correlation is expected between growths in output on the one hand and increases in capital stock, human capital and labor force on the other.

Based on theoretical framework developed by Mankiw et al., (1992) the following Econometrical model is specified:

$$Y_t = AK_t^\alpha H_t^\beta L_t^{1-\alpha-\beta} e^{U_t} \text{-----}$$

----- (3.2)

When transformed into a log-linear to linearized and to show elasticity of the variables form (Gujarati, 2009); the growth function of the equation becomes,

$$\text{Ln}Y_t = \alpha_0 + \alpha \text{Ln}K_t + \beta \text{Ln}H_t + \Theta \text{Ln}L_t + U_t \text{-----}$$

----- (3.3)

Where, $\Theta = 1 - \alpha - \beta$ and $\alpha_0 = \text{Ln}A, e = \text{Base of natural logarithm}$

The augmented Solow human capital growth model is modified to take an additional (external) variable in addition to gross variable and labor force. These external variables are proxy of human capital such as gov'n't expenditure on education, gov'n't expenditure on health, official development assistance, life expectancy at birth, primary school enrollment, secondary school enrollment and dummy of policy change.

The new expanded model is stated as follows:

$$\text{LnRGDP}_t = (\text{LnGCF}_t, \text{LnLbF}_t, \text{LnGovn'tEduExpt}, \text{LnGovn'tHealExpt}, \text{PSCEROLR}_t, \text{SESCEROL}_t, \text{LnLifeExpt}, \text{LnODAt}, D) \text{-----} \text{ (3.4)}$$

$$\text{LnRGDP}_t = \alpha_0 + \beta_1 \text{LnGCF}_t + \beta_2 \text{LnLbF}_t + \beta_3 \text{LnGovn'tEduEXP}_t + \beta_4 \text{LnGovn'tHealExpt} + \beta_5 \text{LnP}$$

$$SCEROL_t + \beta_6 LnSESCEROL_t + \beta_7 LnLifeExpt. + \beta_8 LnODAt + \beta_9 D + Ut \text{ -----}$$

(3.5)

Where: $LnRGDP_t$ = Natural logarithm of real GDP at time t.

$LnLbf_t$ = Natural logarithm of Labor force measured the total number of the population age 15-64 to total population workers at time t.

$LnGCF_t$ = Natural logarithm of gross capital formation at time t.

$LnGovn'tEducExp_t$ = Natural logarithm of gov'n't education expenditure at time t.

$LnGovn'tHealExp_t$ = Natural logarithm of gov'n't health expenditure at time t.

$PSCEROL_t$ = Primary school enrollment proxy of human capital stock at time t.

$SESCEROL_t$ = Secondary school enrollment proxy of human capital stock at time t

$LnLifeExp_t$ = natural logarithm of life expectancy with birth at time t.

$LnNODA_t$ = Natural logarithm of net official development assistance at time t.

D = are dummy variables for policy change and Ut = Stochastic random error term at time t

β 's ($\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_8$ and β_9) are the output parameters with reference to a particular input.

2.2. Estimation Procedure

This study engages in a series of six-step procedure to determine the long run and short-run relationship between human capital development and economic growth in Ethiopia. These procedures are the stationarity test for variables, Johansen co-integration rank of estimation, the VECM for short-run adjustment to the long run, short-run causality test for the sum of the differences of the explanatory variables, Diagnostic Tests such as autocorrelation, residual normality tests and model stability would be analyzed. Finally, causality could be tested by employing the Granger causality tests.

4. RESULTS AND DISCUSSION

4.1. Unit Root Tests

Table 4.1: ADF Unit Root Test Results at Levels and first difference

at Level			at 1 st difference		
Variabl es	Specification	Test statistic	Variables	Specification	Test statistic
LnRGDP	Intercepts	1.36324	ΔLnRGDP	Intercept	-
DP		6			5.845017**

					*
	Trend and intercept	- 1.77248 7		Trend and intercept	- 6.275791** *
LnGCF	Intercept	1.06536 0	ΔLnGCF	Intercept	- 7.677932** *
	Trend and intercept	- 1.59088 5		Trend and intercept	- 8.168274** *
LNLbF	Intercept	1.00730 9	ΔLNLBF	Intercept	- 7.596097** *
	Trend and intercept	2.37687 2		Trend and intercept	- 7.626964** *
LnHelExp	Intercept	2.89426 3	ΔLnHelExp	Intercept	- 4.245197** *
	Trend and intercept	0.22271 1		Trend and intercept	- 5.343270** *
LnEduExp	Intercept	2.83394 4	ΔLnEduExp	Intercept	- 3.969683** *
	Trend and intercept	1.58675 6		Trend and intercept	- 5.863532** *
PscErol	Intercept	- 0.35239 8	ΔLnPrmScEnr	Intercept	- 3.729414** *
	Trend and intercept	- 1.80997 2		Trend and intercept	-3.698359**
LnSeScErol	Intercept	- 1.78569 7	ΔLnSecScEnr	Intercept	-2.986476**
	Trend and intercept	- 3.50770		Trend and intercept	- 5.587804**

		1			*
LnLife ExP	Intercept	- 1.45717 2	ΔLnLifexp e	Intercept	- 4.532095** *
	Trend and intercept	- 2.05037 5		Trend and intercept	- 4.332360** *
LnNO DA	Intercept	0.46462 1	ΔLnNODA	Intercept	- 4.199583** *
	Trend and intercept	- 2.34533 1		Trend and intercept	- 4.277089** *
Testcrit ical values:	Intercept	Trend and intercep t		Intercept	Trend and intercept
1% level	-3.588509	- 4.18091 1		-3.592462	-4.186481
5% level	-2.929734	- 3.51552 3		-2.931404	-3.518090

Source: own estimation using Eviews version 10.

The *** and ** sign indicates the rejection of the null hypothesis of non-stationary at 1%, and 5% significant level respectively.

The null hypothesis in these tests claims that the series under investigation has unit root. On the other hand, the alternative hypothesis claims that the series is stationary. The ADF test statistics as depicted in Table 4.1 illustrates that all variables are non-stationary or unit root problem in their levels for both types of specifications at 1% and 5% level of significance. That is, it is not possible to reject the null hypothesis of a unit root. On the other hand, in their first differences, all of the variables are stationary at the conventional 1% and 5% level of significance. These results indicate that, with intercept and trend, the variables are integrated of order one I (1). This shows that the mean value and variances are constant. Such results of stationarity test would allow us to apply the Johansen approach of co-integration. This is one of the main justifications for using the VEC Model.

4.2. Optimal Lag Length Selection Results

Stationarity of the results confirmed that all variables were integrated I(1), before identifying the number of cointegrating vectors, we first applied the VAR test in order to determine the optimal lag length. As shown in table 4.2 the optimal lag order is determined with the sequential modified Likelihood Ratio test statistics (LR), the Final Prediction Error (FPE), the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SIC), and the Hannan-Quinn Information Criterion (HQ). The table 4.3 shows that most of criteria suggest a lag length of three at 5% level of significance and three lag lengths are used in this study.

Exogenous variables: C, Sample: 1974 2018, Included observations: 42

Table 4.2: Optimal Lag order Selection Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	60.6542	NA	4.24e-14	-2.412108	-1.998377	-2.260459
1	425.569	538.684	1.60e-19	-15.02711	-10.47607*	-13.35897
2	529.199	103.630	3.18e-19	-15.19999	-6.511643	-12.01537
3	777.217	129.91	6.62e-21*	-	-9.422810	-17.54736*

Source: own estimation using Eviews version 10; *indicates lag order selected by the criterion at 5%

4.3. Johansen Co-integration Test and Analysis

In the presence of co integration, the valuable long-run relationship can be preserved since estimation would not be spurious, so long as the variables are integrated by the same order and are co-integrated. The study tests for the existence of a long-run relationship among the variables. The Johansen cointegration test for the variables indicates the presence of co-integration and also the presence of one co-integration as the variables are integrated of order one. The null hypothesis that there is no co-integrating vector in the system is rejected, but the null that there exists at most one co-integrating vector of order one is not rejected at 5% level of significance. These findings establish the existence of an underlying long-run equilibrium relationship between the dependent variable, LnRGDP and the independent variables.

Table 4.3: Johansen Co-integration Test Result

Null hypothesis	Alternative	Eigen	Co-integration	5% Critical	Prob.*	Hypothesized
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s	hypothesis	value	n trace Statistic	value	*	No. of CE(s)
<i>Trace test (λ trace)</i>						
$r \leq 0$	$r > 0$	0.81100 1	227.8888	197.370 9	0.0006	None ***
$r \leq 1$	$r > 1$	0.69024 3	156.2504	159.529 7	0.0743	At most 1*
$r \leq 2$	$r > 2$	0.52167 3	105.8557	125.615 4	0.4172	At most 2
$r \leq 3$	$r > 3$	0.39267 9	74.14493	95.7536 6	0.5752	At most 3
$r \leq 4$	$r > 4$	0.34889 6	69.81889	71.2283 1	0.5806	At most 4
$r \leq 5$	$r > 5$	0.34889 6	47.85613	52.7009 4	0.5184	At most 5
$r \leq 6$	$r > 6$	0.27106 7	29.79707	34.2502 3	0.4882	At most 6
$r \leq 7$	$r > 7$	0.25956 8	15.49471	20.6547 8	0.3795	At most 7
$r \leq 8$	$r > 8$	0.16057 7	3.841466	7.73237 2	0.4945	At most 8
<i>Max eigen test (λ max)</i>						
$r = 0$	$r = 1$	0.81100 1	71.63849	58.4335 4	0.0016	None **
$r = 1$	$r = 2$	0.69024 3	50.39465	52.3626 1	0.0785	At most 1*
$r = 2$	$r = 3$	0.52167 3	31.71078	46.2314 2	0.6761	At most 2

r = 3	r = 4	0.39267 9	21.44399	40.0775 7	0.9353	At most 3
r = 4	r = 5	0.34889 6	18.45071	33.8768 7	0.8539	At most 4
r = 5	r = 6	0.27106 7	13.59545	27.5843 4	0.8495	At most 5
r = 6	r = 7	0.25956 8	12.92241	21.1316 2	0.4594	At most 6
r = 7	r = 8	0.16057 7	7.526729	14.2646 0	0.4288	At most 7

Source: own estimation using Eviews version 10; Note: ** and * denotes rejection of null hypothesis at 5% level and 10% level of significance respectively.

The Johansen's co-integration Eigenvalue is presented in table 4.3, and determine the number of co-integrating vectors. The null hypothesis is that there is no co-integrating vector: $H_0: r \leq 0$; against its alternative hypothesis, $r > 0$, H_0 is rejected by both the λ max and the λ trace statistics at 5% level of significance. From the maximum Eigenvalue test results, for $H_0: r = 0$, the reported trace statistic is 227.8888 which is greater than the 5% critical value of 197.3709, thus suggesting that the null hypothesis is rejected. But, for $H_0: r \leq 1, \leq 2, \dots, \leq 8$, the reported trace statistics are less than the critical value at 5% significance level. Thus both λ trace and maximum Eigen value (λ max) conclude that there is one co integrating vector among the variables. These findings establish the existence of an underlying one long-run equilibrium relationship between the dependent variable and the independent variable.

4.4. Long-Run Analysis

The main objective of this paper is to analyze the impact of human capital development on economic growth in Ethiopia for the period 1974 - 2018. To this end, data on variables that are believed to be more relevant in explaining economic growth in Ethiopia have been employed. These include gross capital formation, active labor force age of the population, government health expenditure, government education expenditure, primary school enrollment, secondary school enrolment, life

expectance and net official development assistance. The regression result for the long-run model is given below.

Equation needs to come bellow the results table:

Table 4.4: Results showing Long - Run estimation of LnGDP
Dependent Variable: LNGDP

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LNGCF	-0.345897***	0.053586	-6.454962	0.0000
LNLAFL	3.930827***	0.963579	4.079403	0.0003
LNGOVTHEALTHEXP	-0.290677***	0.046404	-6.264025	0.0000
LNGOVTEUEXP	0.446044***	0.064662	6.898075	0.0000
PRSCERL	0.016622***	0.001625	10.22996	0.0000
SECSCERL	-0.017101***	0.004246	-4.027833	0.0003
LNLIFEEXPE	5.741163***	0.642945	8.929473	0.0000
LNNODA	-0.124166***	0.045863	-2.707320	0.0105
dummy change Policy	0.070347	0.064582	1.089272	0.2837
C	-22.83259***	3.500609	-6.522463	0.0000
R-squared	0.982775	Mean dependent var		12.57136
Adjusted R-squared	0.978216	S.D. dependent var		1.006176
S.E. of regression	0.148507	Sum squared resid		0.749845
Long-run variance	0.003247			

Source: own estimation using Eviews version 10; *** and ** show significance at 1% and 5%

level of significance respectively.

As table 4.4 Indicates R-squared (R^2) is 0.982775signifying that 98.3% of the variation in ln real GDP in the long run is explained by explanatory variables such as Ln of Gross Capital Formation, Ln of Labor Force, Ln of Gov't Health Expenditure, Ln of Gov't Education Expenditure, Primary School Enrolment, Secondary School Enrolment, Ln of Life Expectancy and Ln of Net Official Development Assistance. As it is shown in long run results, the some of the variables coefficients have as expected hypothesized signs while gross capital formation, government expenditure on health, secondary school enrolment and net official development assistance have unexpected signs. In addition, all the variables are statistically significant at 1% and 5% level of significance in long run.

Total government expenditure on Education

Human capital is approximated using total government expenditure on Education has a long-run impact on the Ethiopian economy growth and statistically significant

at 1 per cent significance level. The findings of this study concerning the long-run positive impact of the education expenditure on Ethiopian economic growth are consistent with the endogenous growth theories developed by Lucas (1988), Romer (1990). The result as it can be seen from table 4.4 is both significant and robust. One percent increase in education expenditure is expected to raise the level of real GDP by 44.67%. According to theoretical literature, education is basic objective of development. Education is essential for a satisfying and rewarding life; it is fundamental to the broader notion of expanded human capabilities that lie at the heart of the meaning of development. At the same time, education plays a key role in the ability of a developing country to absorb modern technology and to develop the capacity for self-sustaining growth and development. Moreover, health is a prerequisite for increasing productivity, and achieving successful education which relies on adequate health as well. Thus education can also be seen as vital components of growth and development as inputs to the aggregate production function. Their dual role as inputs and outputs gives education their central importance in economic development (Todaro, 2012). This is in line with the results found by (Teshome 2006; Borojo and Yushi, 2015; Tewodros, 2014; Hadir and Lahrech, 2015; Biruk, 2017; Kazmi et al., 2017; Fadila et al., 2019; Chijioke and Amadi, 2019). On the other hand this result is in contradiction with previous findings of negative or insignificant effects of education expenditure on economic growth like (Eggoh, Houeninob and Sossoub, 2015 and Gisore et al., 2014) who found that education expenditure and human development indicator have an insignificant effect on economic growth in Africa. Thus, government investment in the education sector in Ethiopia helps in economic growth in the long-run.

Public expenditure on health

The result of the long-run model shows public expenditure on health has a negative statistically significant effect on long-run economic growth. It indicates, real Gross Domestic Product declines by 29,06 percent as health expenditure decline by 1% at 5% level of significance, keeping other variables constant. The Significant result is consistent with the output of studies conducted by Gisore et al. (2014); Eggoh, Houeninob and Sossoub (2015), Kidanemariam (2014), Dinkene (2015) and Fadila et al. (2019). This consistency results may indicate it is most important and significant to support the country economy when adequately allocate and follow applying the usage of budget by any concerning body. But, it is uneven with the

output of the study is negative; it may be allocation, availability and/or problem of budget use and corruption.

Primary school enrollment

In addition, the coefficients of primary school enrollment have positive relationships and statistically significant at 1% percent of level significance in long run. This variable is one of proxy human capitals. From the above long-run equation economic growth with respect to primary school enrollment is highly elastic with a one unit increase of primary school enrollment leading to a by 1.7 percent increase in economic growth or real GDP when the other things considers at constant. This supports the government investments on education human capital formation means of producing educated and skilled labor force. On the other hand the argument of endogenous growth theories of additional effects of human capital over the static effect on the level of output that explains sustainable economic growth. This result supported or in the line of positive and significant effect of primary school enrolment on economic growth as study of Hadir and Lahrech, 2015 and Dinkneh and Yushi, 2015. But this findings contradiction with previous study like Jaiyeoba,2015 who found negative and insignificant effect of primary school enrolment on economic growth. So, as result of study government investment on primary school is crucial to post our economy in a long run. Because can produce/create skill full and educated man power to increase productivity.

Secondary school enrolment

Furthermore, Secondary school enrolment of human capital stock has also a negative statistical significant effect on economic growth at one percent level of significance in long run. The investment in secondary education in developing countries provides not much support for economic development because a coefficient study result is negative. Unexpected negative effects may be Ethiopia is a less industrialized country and this level education is no supported with laboratory, practical and limitation in education quality. For more industrialized countries, secondary and above education enrollment can play a key role in economic growth (International Institute for Applied Systems Analysis, 2008). Furthermore, the fast increase in enrolment in school in Ethiopia is important but may not be sufficient to ensure that students have harvested sufficient knowledge and skills that will enable them to create productive job and employment because the secondary school in the country is claimed less quality education. This significant results in a line as study

results of (Kidanemariam, 2014; Dinkneh, 2015; Jaiyeoba, 2015; Hadir and Lahrech, 2015; Tassew and Nandeeswar, 2016 and Fadila et al., 2019). Furthermore, other factors such as countries' macroeconomic structure, the given function of education in national poverty reduction strategy giving education calculam independence and their responsiveness to local needs can also have influence and limit education benefits (Montanini, 2013).

Life expectancy at Birth

Life expectancy has positive statistical significant impact on economic growth at 1% level of significance within the long run. One percent increase of life expectancy of people, the real gross domestic product increased by 5.74 percent. Healthy people live long and numbers of the population are increased and the death rate would be decreased. Within many populations, may have much active working-age grouped labor force increased. Then the productivity would be increased. This result supported by previous study findings like Kazmi et al., 2017 who found a positive and significant effect of Life expectancy at birth on economic growth.

Gross Capital Formation

The gross capital formation is an unexpected negative sign and significant effect on the real GDP in the long run. Output of study shows that, one percent increase of gross capital formation decrease 34.6 percent of real gross domestic product. The result is unexpected or inconsistent with the neoclassical growth model of the Solow - Swan (1956) and endogenous growth model. In their model, they assumed higher investments and saving rates leads to more accumulated capital per worker. However, this finding is inconsistent with prior expectation and contradicts with economic growth theories. In my opinion, it may be the problem of corruption; the probability of omission of the quality of physical capital; inefficient and under investment; but it is difficult to justify the exact reason behind such unexpected result using this research. Even the result is negative it was significant effects on economic growth. Hence, further detailed research should be done to identify the reason behind such a result. This result finding in line with (wube, 2008).

Active Labor Force

The population of the active labor force aged and is positive statistical significant effects on economic growth at 1% level of significance in long run. This is in line with expectation. As we observed from the above table model results other things remains constant as labor force increases by one percent real GDP has increased by

39.3 percent other things at remaining constant. This implies that labor force has an important role in the growth of Ethiopian economy. Like that of human capital, the result shows that the population active labor force strongly affects economic. This shows how high population of labor force growth in Ethiopia activates economic advancement in the long run. So, skill full and healthy labor force can easily adopt technology to increase product and largely contribute to the country economy in any work places. The findings of this research are consistent with the endogenous growth theories (mainly advocated and developed by Lucas (1988); Romer (1990); Mankiw, Romer and Weil (1992) which argue that improvement in human capital (skilled and healthy workers) leads to productivity enhancement that boost output. Also the results in line with the other studies like Barro (1997), Anyanwu et al. (2015) while this result finding is also inconsistent results to Wube (2008); Kidanemariam (2015); Dinkeneh (2015); Altiner and Toktas (2017).

Net Official Development Assistant

The study expected the long-run effect of net official development assistance to be positive considering the effects of investing on human capital and other investments. But the result shows that its effect is an unexpected negative sign. But as attempted to explain the findings concerning the relationship between Net official development assistant and economic growth was a negative and significant effect on economic growth at 1% of the level of significance with in long run. One reason behind the negative effect of development assistant on the Ethiopian economy might be that the period covered is too short to experience the negative effect of debt servicing on economic growth. Official development assistant in this paper includes grants, external debt and aid. From this finding, a one percent increases of official development assistant real gross domestic product decreased by 12.4% when other things remain constant. This shows that even if the effect of development assistant on the long-run growth negative, it has a very weak effect on economic growth. The result is also in line with Tewodros (2015), kidanemariam(2014) and Mulugeta (2017) had investigated that external debt had a negative significant impact in the long run on economic growth in Ethiopia due to debt overhang and crowding effect.

4.5. The Vector Error Correction Model Estimation Results

The coefficients of the difference of the variables represent the coefficients of short-run dynamics whereas the coefficient of lagged error correction term ECM (-1) captures the speed of adjustment towards the long-run equilibrium relationship. i.e.,

ECM is used to tie short-run behaviour to its long-run dynamics. Table 4.6 indicates that human capital proxy variables such as primary school enrollments and secondary school enrolments at its difference are statistically significant in determining real GDP in the short run at 5% level of significance. Also, active labor force and a dummy of policy changes have positive significant effects on economic growth in the short run. But, gross capital formation, public education expenditure, public health expenditure, life expectancy at birth and official development assistants have an insignificant impact on economic growth in the short run. The result shows that the coefficient of the error term for the estimated growth equation is statistically significant and negative as expected. Thus, it will rightly act to correct any deviations from long-run equilibrium. Specifically, if the actual equilibrium value is too high, the error correction term will reduce it while if it is too low, the error correction term will raise it. In other words it shows the convergence of the model toward the long-run equilibrium in case of any disturbance occurs in the short run. The coefficient (-0.7434387) shows that 74.3 percentage points adjustments take place each year towards long-run equilibrium, or about 74.3% of the disequilibrium is adjusted in the first period, hence, a full adjustment would require a period of about three years.

Table 4.5: Results Showing the Short-run dynamics Estimation:

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	0.0117699	0.0633148	0.19	0.853
DlnRGDPt-1	0.4606638	0.2898744	1.59	0.112
DlnGCFt-1	0.0838671	0.1456302	0.58	0.565
DlnLF t-1	26.76997 **	11.82638	2.26	0.024
DlnHealthEXPt-1	0.0014309	0.2305709	0.01	0.995
DlnGOVTEDUEXPt-1	-0.1902941	0.3425092	-0.56	0.578
DPRSCHERLt-1	1.142645 **	0.4879458	2.34	0.019
DSECSCERLt-1	0.8547845**	0.3867671	2.21	0.027
DlnLifeexpet-1	38.02518	26.49113	1.44	0.151
DlnNODAt-1	0.0337698	0.1091353	0.31	0.757
Policy change dammy(D)	0.5808233*	0.3330441	1.74	0.081
ECTt-1	-0.7434387	0.3709864	-2.00	0.045

	**			
R-squared 0.449227	Mean dependent var 0.069881			
Adjusted R-squared 0.026441	S.D. dependent var 0.116191			
S.E. of regression 0.117717	Akaike info criterion - 1.135307			
Sum squared resid 0.304862	Schwarz criterion - 0.307846			
Log likelihood 43.84145	Hannan-Quinn criteria. - 0.832010			
F-statistic 0.944412	Durbin-Watson stat 1.972035			
Prob(F-statistic) 0.546406				

Source: own estimation using Eviews version 10; Note: ** and * shows significance level at 5% level of significance respectively.

4.6. Short Run Analysis

The model estimates that the short-run dynamics which is mainly driven by lagged real GDP, total government expenditure on education and health, primary and secondary school enrollment, life expectancy, Gross capital formation, net official development assistant, and active labor force age population. The short-run coefficient of individual variables should be examined to determine the relative contribution of each component of explanatory variables to economic growth in Ethiopia.

After the acceptance of long-run coefficients of the growth equation the short run Error correction Model is estimated. The coefficient of one-period lagged error-correction term (lagECM) measures the speed of adjustment to the co-integration relationship. It is as expected to be negative, statistically significant, and has an absolute value smaller than one, indicating the gradual convergence of the system toward long run equilibrium values (Engle and Granger,1987). Based on the result, the R^2 for the ECM is 44.9% which means that 44.9% the variation in the first lagged value of the real gross domestic product in the short run is explained by the difference of logarithm of all explanatory variables. The magnitude of the error correction coefficient, estimated at -0.743 is significant and has the correct negative

sign. This shows that there is a very high speed of adjustment to equilibrium. The significant error correction term (i.e. 74.3%) further confirms the existence of stable long-run relationships. Moreover the Durbin-Watson statistics (1.972035) is greater than that of R^2 (0.449227). The implication is that the rate at which adjustment is made towards long-run equilibrium annually 44.9%.

As shown in table 4.5 the estimated short-run model reveals that human capital proxy variables such as primary and secondary school enrollments have a positive statistically significant effect on economic growth in the short run. The estimated short-run model reveals that human capital variable the coefficient of first lagged of primary school enrolment that proxies of human capital was positive and significant impact on economic growth in short run. As result reveals that one unit of primary school enrolment increased, the real gross product is raised by 1.143 amounts when other things constant. This result findings similar to previous or earlier study like Dinkneh and Yushi (2015).

➤ Similarly, the coefficient of first lagged of secondary school enrolment was a positive statistical significant effect on economic growth. That implies one present increase in secondary school enrolment leading to a rise in economic growth on average by 85.5 percent in the short run when other things remain constant. School enrolments have support to adopt new technology for manufacturing and service sector and benefit for education among people to produce more quality production in short run. This may be due to the fact that Ethiopia economic growth based on school enrolment by producing educated man power. And the sign is expected but different growth theories emphasize that the impact of such human capital is observed in long run rather than in short run. Also, the result was similar consistent with the finding of Dinkneh and Yushi (2015) who found positive impact of human capital development on economic growth in Ethiopia increasing school enrolment for education.

➤ In addition, the co-efficient of the first lagged value of labor force was positive significant effects on economic growth at 5% level of significant in short run. This indicates, in the short run, active labor force in the current period is sensitive to what it was in the previous period to support continuous economic growth.

- However, the coefficient of first lagged value of human capital proxy variables of health expenditure and life expectancy have positive insignificant impact on economic growth in short run. But, human capital measured by education expenditure is negative insignificant to economic growth in short run. Because this all are investment for future productivity, but for current it is economic cost.
- Whereas official development assistant are negative and statically insignificance impact on economic growth which is opposite result to long run result at 5% level of significance. However, the long run contribution of the development assistant to the overall economic growth is turned to be negative and significant. Similarly, the results of short term dynamics reveals that gross capital formation has positive insignificant effect on economic growth in the short run economic growth in Ethiopia.
- Policy change in Ethiopia has positive significant effect on real Gross Domestic Product in the short run. Probably a change of policy can affect or change our economy by 58.08 percent in short run. This indicates government structural change can produce proper policy develop to increase or post the country economy.
- Finally, the study result shows that human capital proxy variables primary and secondary school enrolment are positive significant impact on economic growth in short run. And active labor force is positive significant effect on economic growth in short run. On the other hand in short run, government education expenditure, government health expenditure and life expectancy have insignificant impact on economic growth in Ethiopia.

4.7. Granger Causality Test Results

A granger causality test is made to identify the direction of causality between the dependent variable (real GDP) and independent variables such as human capital (proxy by education expenditure, health expenditure, primary and secondary school enrolment). In order to test the causality pair wise granger causality test was employed. The concept of causality involves the effect of past values of one or more of the variables on the current value of the other. In a causality test as first proposed by Granger (1969), we consider the null hypothesis that Ln of real Gross Domestic Product does not granger cause Ln of Gov't Health Expectancy, Ln of Gov't Education Expenditure, Ln of Primary and secondary School Enrolment, Ln and vice versa. These tests confirm the application of a single dynamic model rather than a simultaneous equation model. It helps to test whether economic growth has got an

impact on the human capital level in the country and vice versa. Our result shows that human capital which is proxy by Ln of Primary School Enrolment and Ln of Secondary School Enrolment are causal relation with LnRGDP that is at 1% and 5% level of significances respectively. But, Ln of RGDP is the cause only for Ln of Gov't Education Expenditure at 10% level of significances. This shows that human capital is the cause for economic growth and there is feedback effect of economic growth on the level of human capital formation means of government education expenditure. Causality may be positive or negative cause. From the above result, education expenditure and primary school enrollments are the cause for the improvement of economic growth, while Secondary school enrolment is the cause for reduction of economic growth.

Table 4.6: Pair wise Granger Causality F-Statistics

Null Hypothesis:	F-statistic	Prob.
LnHEALTHEXP does not Granger Cause LNRGDP	2.35306	0.1088
LnRGDP does not Granger Cause LNHEALTHEXP	1.17316	0.3203
LnGOVTEDUEXP does not Granger Cause LNRGDP	2.58857	0.0883*
LnRGDP does not Granger Cause LNGOVTEDUEXP	1.07644	0.3510
LnPRSCHERL does not Granger Cause LNRGDP	1.43408	0.2509
LnRGDP does not Granger Cause LNPRSCHERL	6.67230	0.0033***
LnSECSCERL does not Granger Cause LNRGDP	0.05689	0.9448
LnRGDP does not Granger Cause LNSECSCERL	3.71993	0.0335**

Source: our calculation using eview version 10.

Note: ***significant at 1 percent level, **significant at 5 percent level, and *significant at 10 percent level are probabilities of accepting the null hypotheses of no causality.

There is a universal consensus that the Granger causality test does not indicate real causality among variables. However, it suggests a preliminary approach to the possible relationships among the Variables. Table 4.6 presents the Granger causality test results for each pair of variables of the model. According to the result, government expenditure on education and economic growth shows unidirectional causality at 10percent level of significance. Also, economic growth and primary and secondary school enrollment show unidirectional causality at 0.5 percent level of significance. Therefore, the evidence coming from the Granger-causality test

demonstrates the idea that human capital had an impact on economic growth in Ethiopia.

4.8. Diagnostic Tests and Model Stability

Tests of serial autocorrelation, heteroskedasticity and normality tests on the residuals of the vector error correction models are conducted with the help of Lagrange-multiplier test, Breusch-Pagan test, RMSE tests and Jarque Bera test respectively. Finally, the model stability test is conducted using CUSUM test and CUSUM of squares test. These tests are used to confirm the basic assumptions regarding the residual and the validity of the results in this study.

4.8.1. Serial Autocorrelation Test

The serial correlation test can be done using the Lagrange multiplier (LM) test for autocorrelation presented in appendix 1(A) shows that our lag selection criteria dictated us to choose lag 3. At each lags, the p-value is greater than 5% level of significant. The decision in this case is to not reject H_0 (there is no autocorrelation). Hence we accept the null hypothesis. Again in all the lags above the p-value is insignificant. As such we no autocorrelation problem and we can judge that the model is free from autocorrelation problem.

4.8.2. Heteroskedasticity Test

The estimated residuals did not provide significant heteroskedasticity effect in the error term (see appendix 1(B) for Breush-pagan heteroskedasticity test).

4.8.3. Normality Test

H_0 : the residuals are normally distributed; Alternative H_1 : the residuals are not normally distributed

The result presented in appendix 1(C) shows that the normality distribution of the residuals, the Jarque Bera test is used. As can be seen from the test result, residual distribution of all variables for all models shows that the distribution is normal. Results for the variables shows that the p-value for over all variables is not greater than 5% and hence we can say that the model is free from the problem of normality distribution of the residual (error) terms.

4.8.4. Model Stability Test

Finally, the stability of the model test is conducted using CUSUM test and CUSUM of squares test. This option plots the cumulative sum together with the 5% critical

lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines. As with the CUSUM test, CUSUM of squares test shows movement outside the critical lines as suggestive of parameter or variance instability. Accordingly, the results presented in appendix 1(D) show that the model and parameters of the model are stable since the cumulative sum and cumulative sum of square lie between two critical lines.

5. CONCLUSION AND POLICY IMPLICATION

5.1. CONCLUSION

The human capital proxy variables such as government expenditure on education, life expenditure at birth, primary school enrollments are positive long-run effects or relationships on economic growth in Ethiopia. Thus, human capital developments have positive and significant long-run impacts on economic growth in Ethiopia. In this study significant impact of human capital proxy variables are sound and consistent with the theoretical prediction of the neoclassical growth model and the endogenous growth model which argue that improvement in human capital (skilled workers) leads to productivity improvement that enhances output. Furthermore, the finding of this research concerning the long-run positive impact of human capital is consistent with the study of Mankiw, Romer and Weil (1992), Barro and Sala-i-Martin (1995). So, the development of human capital is important accelerator of economic growth in Ethiopia.

However, human capitals proxied by government expenditure on health and secondary school enrollment have negative significant impact on the economy growth in long run. In Ethiopia, public health expenditure may not have sufficient health facility materials or investment on health to sustainable and improve human health. Also secondary education has limitation on necessary education materials, quality and laboratory to produce skilled human capital. For this reason coefficient of public health expenditure and secondary school enrollments have unexpected negative result even statistically significant impact on economic growth. Simply providing more schooling may yield little or nothing in the way of economic growth in the absence of other elements such as the appropriate market, legal and governmental institutions and suitable policy environment in other sectors of the economy to support a functioning modern economy. School enrolment by itself is not a sufficient engine of growth. This may be adjusted by improving quality,

increasing accessibility to all local area, fulfilling necessary materials and follow upping efficiency. Moreover, the results of the study have important implications, particularly for policymakers that for achieving rapid economic growth, it is indispensable to give much emphasis to human capital development.

Human capital proxy of primary school enrollment and secondary school enrolments are unidirectional causal relationship with real GDP. And real GDP is the causes of public expenditure on education. This shows that human capital is the cause of economic growth by producing educated manpower to increase productivity. Qualified education has a support to adopt new technology for manufacturing and service sector and benefit for education among people to produce more quality of production. Hence emphasizing to educate society and improving the quality of any type of education system most important direction to economic growth in Ethiopia.

5.2. Recommendation

- ❖ In order to improve economic growth, public expenditure on education needs to be better prioritized and more resources should be devoted to educate the citizens of the country. So, the Government suggested giving more emphasis on its spending on education especially in rural areas because the majority of the population lives there.
- ❖ We have shown that economic conditions and health status of most developing countries are unfavourable. Our empirical evidence also reveals that improving the existing bad health facilities can smooth economic growth. To this end, concerned bodies suggested increasing the accumulation of health capital stock. This is possible by investing in health. Therefore, policy makers, government and non-governmental organizations who strive to promote growth and development suggested that investing in health and accumulate this form of capital. In addition, government take better action to audit and follow up how governmental expense used in expected sectors; increase accessibility of health care center facility.
- ❖ The results suggest that government and any concerned body should be given greater attention to human capital stocks development by introduce policies innovation promote and supporting education with practical and technology to support economic growth. Besides that, government suggested provide more opportunity job to balance with increasing enrollment rate to achieve high income

economy and productive in order to adjust the negative impact of secondary school enrolment.

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