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Research Paper

Ethiopian Higher Education and Economic Growth Nexus

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Abstract

Ethiopian government has paid great attention to higher education expansion and hence, it has been a national policy issue of the country. The study investigated the dynamic relationship between higher education and economic growth in Ethiopia using annual data collected from 1981-2014. Autoregressive Distributive Lag framework was used along with Error Correction Term so as to investigate long run relationship between real GDP, enrollment in higher education, gross capital formation and labor. The result from bounds test confirmed the existence of strong long run relationship between variables. Enrollment in higher education and gross capital formation has positive long run effect on real GDP. But, only enrollment in higher education has negative effect in the short run. The study utilized granger causality test in order to examine causal relationship between higher education and economic growth. According to the test result, a unidirectional causality running from higher education to economic growth was observed. The necessary diagnostic tests were applied in order to check reliability and acceptability of model outputs and they were found satisfactory. Drawing on the finding it is recommended that government should continue expanding provision of higher education and in the meantime endeavor to improve quality of the provision.

1. Introduction

Attainment of higher rate of economic growth is one of the prime aims of nations. The argument held over a long period of time was that physical capital matters more for economic growth. However, contemporary researches on the subject matter indicate the existence of other dimensions of capital like social capital and human capital as source of economic growth. According to Rusli and Hamid (2014) and Devadas (2015), human capital is the key factor in economic growth attempt of a nation. It is the skills, knowledge and experience possessed by an individual (Bergheim, 2005) and (Pettinger, 2017). One of sources from which an individual obtains these important resources is educational institutions. Therefore, educational institutions can play a significant role in economic progress of nations. This assertion is reflected in 2006 by the former United Nations secretary general, Kofi Annan. He argued that the primary driver of Africa's development in 21st century will inevitably be universities.

According to Berhane (2000), skills and knowledge can be developed through attainment of formal educational system in response to which developing countries are expanding educational opportunities. Ethiopia is not the exception where expansion (especially tertiary education) and reforms are at the heart of national policies. These re, education training policy (ETP) in 1994, successive five year, Education Sector Development Programs (ESDP) since 1998 and Higher Education Proclamation in 2003 to feed demand of growing economy and in order to realize the vision of

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joining medium income group by 2030 (Teshome, 2004); (Saint, 2004) and (Yusuf and Pilay, 2014).

Even though higher education in the country is not even a century old, as it was started in1950 (Teshome, 1990), enrollment has increased at a higher rate (Rayner and Ashcroft, 2011). According to report from Ministry of Education (2003), from 1997/98 to 2002/03, it has increased by more than threefold (43,843 in 1997/98 to 147,954 in 2002/03). Seven years latter (2009/10), enrollment in tertiary education has increased to 434,659, which is virtually three times higher. The figure further rose to 860,378 in 2016/17 which is about to double (MoE, 2017). Over the period elapsing between 2009 and 2013, nearly half of general government expenditure on education went on to finance tertiary education (UNESCO Institute of Statistics, 2019). In the same way, there is also observed expansion in tertiary education institution. Looking at government universities alone, there are 44 universities in the country and direction was put forward to increase it to 50 in near feature. According to Yirdaw (2016), there was no single private higher education in the country prior to 1991. But, about 76 private institutions emerged between 1992 and 2016. In nutshell, all these facts indicate that tertiary education has been given a due attention in the country.

There are literatures that stress the different ways through which tertiary education can contribute to economic growth of a country. According to Oketch et al (2014), these are increased productivity and income, increased capability and institutional improvements. According to the source, even though researches done during post-independence era advocating importance of higher education both for private and public faced fierce criticism by latter studies. Endogenous growth theories since 1990's have emerged with theoretical explanation for contribution of higher education to economic growth. They argued that highly skilled personnel are required for technology adaptation and transfer and at the same time increase efficiency and productivity of the economy (Lucas, 1988). Endogenous growth theories also stress non market private benefits like improved health and reduced family size as a components of capability approach to growth resulted from higher education (Oketch et al., 2014). Moreover, higher education results also in non-market social benefits like democratic institutions and political stability Mugizi (2018) and Wambua and Mugendi (2019). According to World Bank group (2017), higher education can reduce poverty and encourage shared property within the society.

However, it is impossible to blindly recommend a certain country engage in expansion of higher education in order to bring about economic growth in light of the above arguments because there are empirical evidences that show absence of significant relationship or negative relationship between education and economic growth Temple (1999); Bils and Klenow (2000); Pritchett 2000; Hadushek and Wobmann, (2007); Horii et al (2008); Chaudhary et al. (2009); Behrooznia et al (2016). The most frequently cited reason for such result to happen by studies including those given above is that poor quality sidelined with expansion of higher education. For that matter, researches conducted on higher education in Ethiopia testify the existence of poor quality in Ethiopian higher education system (Saint, 2004); Ayenachew (2015); (Arega, 2016); Shibru et al (2016); Alemayehu and Solomon (2017) and Mulu (2017).

There is a plethora of growth literatures in Ethiopia, of which a great account and detailed study was done by Weeks et al (2004). The study was aimed at figuring out source of growth in the country and found a pretty much importance of labor to growth. The physical capital (not human capital) included in the growth model employed by the study was found to be insignificant. The same topic was researched by Ahmed and Kenji (2016) where human capital was considered as an independent variable. In the study too, human capital (labor productivity) has no impact on GDP of the country. Absence of relationship between GDP and human capital was also found in study by Woubet (2006). Another worth mentioning study on the subject is that conducted by Engidaw and Federici (2019). In this study, however, human capital is positive significant variable affecting economic growth both in the short run and long run. Similar result was also obtained in the study by Kidanemariam (2016). As to another different result, the negative relationship between human capital and economic growth was obtained by Tefera (2017). The study included education expenditure and education enrollment as independent variables in the study which inevitably result in multicolliniarity problem.

In spite of the need to investigate whether endogenous growth theory fits or the case of empirical results indicated above holds in the country, to the best

of knowledge we have, there are no prior studies undertaken in the country with particular focus on causal relationship between higher education and economic growth of Ethiopia. Moreover, owing to domestic literatures reviewed above, the relationship between human capital in general and economic growth is inconclusive. Therefore, the objective of the current study is to find out whether there is a causal relationship between economic growth and higher education in Ethiopia and also whether they move together in the long run. Thus, the study tests two hypotheses. (1) There is long run relationship between higher education and economic growth of Ethiopia. (2) There is no dynamic causality running from higher education to economic growth of Ethiopia.

2. Materials and Methods

To serve the purpose of current study, a time series data spanning from 1981 to 2014 was collected from available sources on four variables such as real GDP, enrollment in higher education, working age population and gross capital formation. Real GDP is used to measure economic growth of the country. Enrollment in higher education (number) is used to proxy higher education. Enrollment instead of number of graduates is used because of data availability. Over the period considered, few data values were missing but they are filled with multiple imputation technique. Working age population is used to proxy labor and gross capital formation is used to proxy physical capital. The choice of the variables and the corresponding proxies used are supported by available literatures. Real GDP, labor and enrollment in higher education were accessed from World Bank indicator while gross capital formation was obtained from Ethiopian ministry of financial development (MoFED). Both of these data sources are reliable from which many scholars utilize data. For the purpose of estimation and tests EViews version 9 was used.

2.1. Model specification

The theoretical model employed by this study is a neoclassical growth model developed by Solow (1956) and extended by endogenous growth models Romer (1989) and Lucas (1988). According to the model, relying on Coup Douglas production function, the national income is the function of factors of productions like physical capital and labor as originally introduced and human capital as latter incorporated. Keeping the former two inputs in place, in this study I use higher education enrollment instead of human capital variable.

$$Y = AH^{\gamma}K^{\alpha}L^{\beta} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where, A is technological progress, K physical capital, L is labor and H is human capital variable and γ, α and β are parameters. Following proxies for the variables indicated above, the above equation can be written as;

$$Y = AEHE^{\gamma}GCF^{\alpha}LR^{\beta} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where, Y is real GDP, EHE is enrollment in higher education, GCF is gross capital formation, LR is labor force and the other symbols are defined above. Taking natural log to both sides of the equation we get the following equation.

$$nY = lnA + \gamma lnEHE + \alpha lnGCF + \beta lnLR \ldots \quad (3)$$

Then the time series econometric model representation of the above equation is given below where, in addition to symbol defined above, t is time period and ε_i is the disturbance term.

$$lnY_t = lnA + \gamma lnEHE_t + \alpha lnGCF_t + \beta lnLR_t + \varepsilon_i \quad (4)$$

In case variables considered are integrated of different order but not integrated of order two (I(2)) and more, there are no best models than ARDL (Pesaran and Shin, 1998). The model was originally developed by Pesaran et al. (1996) and got popularity over other alternative models because of the following. Firstly, it can be applied even though variables are integrated of different order, that is some are integrated of order zero and some are integrated of order one. Secondly, it can be used for small sample size. Thirdly, the use of it overcomes the problem of serial correlation (Nkoro and Uko, 2016). Estimation of ARDL usually involves three steps. Firstly, unit root test should be applied in order to ascertain that none of the variables is I(2) or more. Then co-integration test drawing on bound test should be applied to check for long run relationship. Finally, causality should be analyzed.

2.2. Unit Root

Care should be taken when dealing with time series data in order to avoid a problem called spurious regression. Spurious regression is a regression that leads to fallacious result as dependent variable is regressed over a set of explanatory variables lacking constant means and variance (Guarati, 2003). When that happens, we say the variable has got unit root. In order to overcome this problem, we need to test data on the variables for unit root and once detected, take

appropriate measures and the most often used remedy is differencing. There are alternative techniques for testing unit root of which Augmented Dicky Fuller test is the most common. For the purpose of current study, Augmented Dicky Fuller (ADF), which was developed by Dichey and Fuller (1979) and Phillips Perron test (PP) which was developed by Phillips and Perron (1988) are used. The novelty in these tests of unit root is that they take care of possible serial correlation among the residuals. While ADF test takes care of serial correlation by adding lagged difference terms of the dependent variable, PP test do so by using nonparametric statistical methods (Gujarati, 2002). The following equation gives ADF test method.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_i \ldots\ldots (5)$$

Where, Δ is difference operator, m is the appropriate lag length and ε_i is a white noise disturbance term, Y, is a variable that is to be tested for unit root and t is the time index.

2.3. Co-integration

Once order of integration is tested, the next step in ARDL estimation framework is test of co-integration. The current study employs bound test approach developed by Pesaran et al. (2001) to examine the existence of long run association between the variables. To this end, the Unrestricted Vector Error Correction Model (UVECM) up on which the test technique depends is specified below (Equation 6, 7, 8 and 9).

2.4. Granger Causality

Granger causality test is the third step in ARDL estimation framework. The test is applied when we have the evidence that all of our variables are co-integrated. Furthermore, we should go for this test because co-integration test provide information about whether there is log run relationship but not direction of causality. The foundation for granger causality is the assumption that past values of certain variable can influence the future value of the other(s). As it is given in the following vector of equation if coefficients of lagged values of independent variables separately are significant, then we say our independent variable of interest granger causes the dependent variable; and we should proceed the test if we are about to argue vise-versa (Granger, 1988).

$$\Delta lnEHE_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta lnEHE_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnY_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnGCF_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnLR_{t-i} + \alpha_1 lnEHE_{t-1} + \alpha_1 lnY_{t-1} + \alpha_1 lnGCF_{t-1} + \alpha_1 lnLR_{t-1} + \varepsilon_{1t} \ldots (6)$$

$$\Delta lnGCF_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta lnGCF_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnEHE_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnY_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnLR_{t-i} + \alpha_1 lnGCF_{t-1} + \alpha_1 lnEHE_{t-1} + \alpha_1 lnY_{t-1} + \alpha_1 lnLR_{t-1} + \varepsilon_{1t} \ldots (7)$$

$$\Delta lnLR_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta lnLR_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnEHE_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnGCF_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnY_{t-i} + \alpha_1 lnLR_{t-1} + \alpha_1 lnEHE_{t-1} + \alpha_1 lnGCF_{t-1} + \alpha_1 lnY_{t-1} + \varepsilon_{1t} \ldots (8)$$

$$\Delta lnY_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta lnY_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnEHE_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnGCF_{t-i} + \sum_{i=1}^{p} \alpha_i \Delta lnLR_{t-i} + \alpha_1 lnY_{t-1} + \alpha_1 lnEHE_{t-1} + \alpha_1 lnGCF_{t-1} + \alpha_1 lnLR_{t-1} + \varepsilon_{1t} \ldots (9)$$

Where, p is the maximum lag length suggested by information criteria and they are not necessarily the same for all of the variables and other symbols are as defined before.

$$\begin{bmatrix} \Delta lnEHE_t \\ \Delta lnGCF_t \\ \Delta lnLR_t \\ \Delta lnY_t \end{bmatrix} = \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \\ \theta_4 \end{bmatrix} + \sum_{i=1}^{p} \begin{bmatrix} \varphi_{11}\varphi_{12}\varphi_{13}\varphi_{14} \\ \varphi_{21}\varphi_{22}\varphi_{23}\varphi_{24} \\ \varphi_{31}\varphi_{32}\varphi_{33}\varphi_{34} \\ \varphi_{41}\varphi_{42}\varphi_{43}\varphi_{44} \end{bmatrix} \begin{bmatrix} \Delta lnEHE_{t-i} \\ \Delta lnGCF_{t-i} \\ \Delta lnLR_{t-i} \\ \Delta lnY_{-it} \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \end{bmatrix} [ECT_{t-1}] + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \end{bmatrix} \ldots (10)$$

Where, ECT_{t-1} is the lagged error correction term derived from the long run relationship, $\mu_{1t}, \mu_{2t}, \mu_{3t}$, and μ_{4t} are serially uncorrelated disturbance terms.

3. Results and Discussion

3.1. Unit Root Test

As it can be seen from Table 1, the two unit root test techniques shows that all variables are not stationary at level but when converted in to first difference, all of them are stationary. So, our variables are integrated of order one (I(1)). Thus the ARDL model is estimated with I(1). The first deference of higher education and labor are checked at intercept and also, for the former, lag length 3 is used in ADF case.

3.2. Co-integration Test

Because the result of unit root test given in Table 1 shows none of variables included in the model are not integrated of order 2. It is possible to run ARDL model because of its aforementioned merits. However, it needs to select optimal lag length before running the model. For that matter, there are five selection criteria that can guide us to select optimal lag length. As it is provided in Table 2, three of such selection criteria suggest lag length three. With any maximum lag length imputed, EViews automatically selects appropriate lag order for each variable. Accordingly, as the result is given in Figure 1, the stated statistical software has selected an ARDL model with specification (2, 3, 1, 0) based on Akakai Information Criteria (AIC). This information criterion is used because it is widely used criteria in ARDL estimation.

Using the lag selection criteria, co-integration test result is given in Table 3. The name of the test is known as bounds test in ARDL framework. The test provides F-statistics along with upper bound and lower bound critical values at 1%, 2.5%, 5% and 10%. According to the test, three cases should be considered so as to accept or reject the null hypothesis which estates 'no long run relationship exists'. The first case is where F-statistic is less than lower bound critical value and if this result happens the null hypothesis should be accepted. The second case is where the F-statistics is above the upper critical bounds and in this situation the null hypothesis should be rejected. As to another possibility, if the F-statistics found in between the lower and upper bound

Table 1: unit root test

	Augmented Dicky Fuller Test				Phillip Perron Test			
Variable	Level		First Difference		Level		First Difference	
	Test statistics	Critical value	Test statistics	critical value	Test statistics	critical value	Test statistics	critical value
LnRGDP	-0.442	-3.552	-3.796	-3.754	0.1005	-4.262	-5.824	-4.103
LnEHE	-1.588	-3.557	-3.439	-2.957	-1.317	-3.552	-3.460	-2.957
lnGCF	-2.045	-3.552	-7.736	-3.557	-1.940	-3.552	-14.12	-3.557
lnLR	-2.206	-3.587	-3.007	-2.957	-1.910	-3.552	-3.021	-2.957

Source: Borld Bank Indicator and MoFED

Table 2: lags selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	19.52589	NA	4.32e-06	-1.00167	-0.81664	-0.941355
1	248.6317	384.3066	4.67e-12	-14.7504	-13.82528*	-14.44886
2	273.2729	34.97461*	2.83e-12	-15.3079	-13.6427	-14.76509
3	293.3795	23.34954	2.53e-12*	-15.57287*	-13.1675	-14.78877*

Source: Borld Bank Indicator and MoFED.* indicates lag order selected by information criteria

Table 3: Co-integration test (Pesaran et al., 2001))

Test Statistic	Value	k
F-statistic	11.79662	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.37	3.2
5%	2.79	3.67
2.50%	3.15	4.08
1%	3.65	4.66

Source: Borld Bank Indicator and MoFED

critical values, the test result is inconclusive. In this study, as it is given in Table 3, the null hypothesis should be rejected meaning that the variables included in the model move together in the long run. On the other hand, variables included in the model are co-integrated which indicates the variables are necessary for one another.

3.3. The Long Run ARDL Model

As it is given in Table 4, higher education (also similarly obtained by Gyimah-Brempong (2006), Becherair (2014) and Nohak and Dahal (2016)) and gross capital formation have positive significant effect on economic growth at 1%. From the regression result, coefficient of log of enrollment in higher education indicates as the number of enrollment in higher education increased by 10%, GDP increases by 2.45%, all relevant explanatory variables being unchanged. The result further indicates that a 10% increase in gross capital formation has an effect of increasing GDP by about 4.39%, other things remaining constant. Implication of this result is that the sustained increased enrollment of higher education in the country is contributing to economic growth positively which might be due to the higher education in the country is boosting human capital and this result is supported by existing theory (endogenous growth theory).

Table 4: Estimated Long Run Coefficients using the ARDL (2,3,1,0)

Long Run Model				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEHE	0.245***	0.053	4.55	0.0002
LNGCF	0.429***	0.082	5.23	0.0000
LNLF	-0.210	0.169	-1.24	0.2271
C	13.759	2.670	5.15	0.0000

Source: World Bank indicator and MoFED

3.4. The Short Run Model

As the result is depicted in Table 5, only higher education significantly affect economic growth over the period considered for this study. However, the sign of the variable is in this model is opposite to its sign in the long run model. In other words, enrollment in higher education affects economic growth positively in the long run and negatively in the short run. As the result clearly indicates, a 10% increase in the number of students enrolled in higher education in the short run decreases the real gross domestic income by about 2%. This could be engagement in illegal activities as argued by Prichett (2001) or labor market problem (mismatch between skill and job) as argued by Tefera (2017).

Table 5: vector error correction model and the short run dynamic equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNRGDP(-1))	0.175	0.138	1.26	0.2201
D(LNEHE)	0.046	0.072	0.63	0.5341
D(LNEHE(-1))	0.210	0.115	1.82	0.082
D(LNEHE(-2))	-0.208**	0.074	-2.81	0.0104
D(LNGCF)	0.048	0.040	1.20	0.2406
D(LNLF)	-0.112	0.093	-1.20	0.2435
CointEq(-1)	-0.534***	0.095	-5.58	0.0000

Source: World Bank Indicator and MoFED

Concerning by the error correction model it should be negative in sign, between zero and one in absolute term and statistically significant. Accordingly, all these requirements are met in the model and the error correction term is -0.5344 which is statistically significant at 1% significance level. The implication is that about 53% of disequilibrium occurred in previous year is corrected in current year. Or simply, the speed of adjustment towards the long run equilibrium is about 53%.

3.5. Diagnostic Checking

As test result is depicted in Table 6, the model estimated is free from serial correlation of residuals and also are homoscedastic and have normal distribution. In addition, the model is well specified as guaranteed by Ramsey RESET Test. The fitted model is also stable as it is confirmed by CUSUM and CUSUMQ (result is given in Figure 1). In CUSUM and CUSUMQ test, so long as the fitted line lies within 5% critical values, the fitted model is said to be stable.

Table 6: diagnostic checking

Diagnostic test	Test technique applied	F- statistics	P-value
Normality of residuals	Jarque-Bera	0.71	0.7
Serial cirrelation	Breusch-Godfrey Serial Correlation LM Test:	0.56	0.57
Heteroscedasticity	Breusch-Pagan-Godfrey	0.82	0.6
Functional form	Ramsey RESET Test	0.007	0.92

Source: World Bank indicator and MoFED

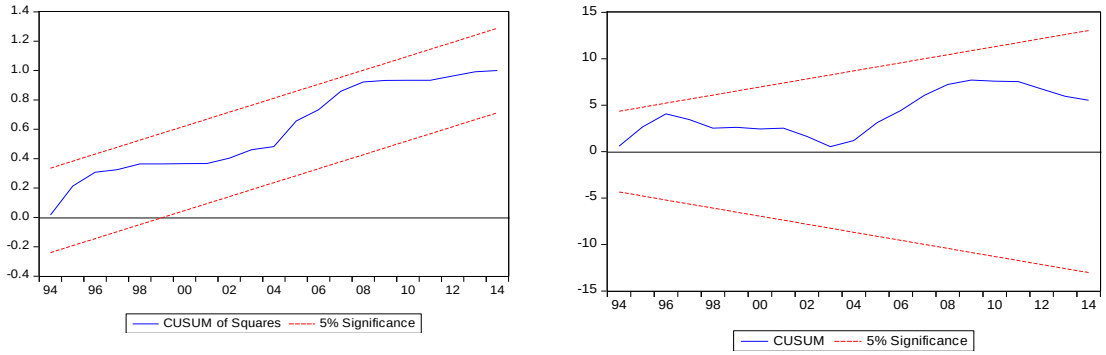

Figure 1: Test for model fit

Table 7: Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
LNEHE does not Granger Cause LNRGDP	31	3.50358	0.0308
LNRGDP does not Granger Cause LNEHE		1.14430	0.3513
LNGCF does not Granger Cause LNRGDP	31	9.51563	0.0003
LNRGDP does not Granger Cause LNGCF		5.52528	0.0050
LNLF does not Granger Cause LNRGDP	31	1.25629	0.3116
LNRGDP does not Granger Cause LNLF		1.56488	0.2238
LNGCF does not Granger Cause LNEHE	31	1.77094	0.1796
LNEHE does not Granger Cause LNGCF		2.72766	0.0663
LNLF does not Granger Cause LNEHE	31	1.95497	0.1477
LNEHE does not Granger Cause LNLF		4.95731	0.0081
LNLF does not Granger Cause LNGCF	31	2.73733	0.0657
LNGCF does not Granger Cause LNLF		0.74105	0.5380

3.6. Granger Causality Test

The result of granger causality test is reported in Table 7 above. The null hypothesis of the test is that lagged values of the dependent variable do not explain variation in the dependent variable. Therefore, if probability value is greater than 0.05, we cannot reject the null hypothesis and conclude that there is no causality between variables considered. On the other hand if the probability value is less than 0.05, we cannot accept the null hypothesis and conclude that there is causality (Granger, 1988).

As it is indicated in Table 6, there is a unidirectional causality running from higher education to economic growth (not vice versa). Stated in other words, Ethiopian economy is, in part, higher education driven and not growth stimulated higher education and both variables not feeding each other. This result rejects our prior hypothesis which estates there is no dynamic causality between higher education and economic growth. This result is in line with that of Mariana (2015) and Dudzevičiūtė and Šimelytė (2018), but contradict with findings by Chaudhary et al. (2009) and Wambua and Mugendi (2019). Granger causality test also shows the existence of bidirectional causality between gross capital formation and real GDP. This implies that the two variables feed each other. To put it in other words, any measure taken with regards to capital formation in the country has bearings on economic growth of the country and vice versa. Therefore, neither bidirectional causality nor is the direction of causality from economic growth to higher education.

4. Conclusion and Recommendations

4.1. Conclusion

Ethiopian government has paid great attention to higher education expansion and hence, it has been a national policy issue of the country. While doing this, expectation from the sector on the part of the government is that it will help achievement of development dream of the country. However, some empirical evidences from across the world assert nonexistence of causal relationship between higher education and economic growth. If the same holds for

Ethiopia, it means that government's investment on higher education expansion is simply wastage and it ought to be diverted to other productive investments instead. Thus, the aim of the current study was to investigate causal relationship between higher education and economic growth. To this end, time series data from 1981 to 2014 was collected on four variables such as real GDP, enrollment in higher education, gross capital formation, and labor. Appropriate methodological procedures in light of available literatures were applied to analysis of the data.

Accordingly, estimation of ARDL model was justified based on unit root test results and superiority of the model over other competing models. A bounds test approach associated with ARDL was run to investigate long run relationship between Real GDP, enrollment in higher education, gross capital formation and labor force; and from the test result, the followings were deduced:

- It was observed that there is a long run association ship between real GDP, enrollment in higher education, gross capital formation, and labor in Ethiopia
- Enrollment in higher education and gross capital formation positively affected economic growth of Ethiopia in the long run
- Enrollment in higher education negatively affected economic growth of Ethiopia in the short run
- Higher education causes economic growth, but not the reverse, in Ethiopia
- Gross capital formation and economic growth in Ethiopia reinforce each other.

4.2. Recommendations

Based on the output of the study, therefore, the author recommends the followings:

- Government should continue energetic effort of providing higher education. While expanding higher education, however, emphasis should be given to quality because the negative effect of higher education in the short run could be attributed by poor quality of its provision.
- Considerable investment in physical capital should be undertaken by the government and all necessary incentives should be given to private firms in order to induce them to engage in investment activities

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