Long Run Relationship and Causality between Education and Economic Growth in Bangladesh

Kazi Mostafa Arif¹, Munshi Murtoza Ali², Md. Alamgir Hossain Bhuiya³

Abstract
This paper focuses on the long-run relationship and causality between government expenditure in education and economic growth in Bangladesh for the period 1973 to 2009 through the application of Johansen Cointegration technique and Vector Error Correction Methodology and causality is tested through Granger Causality approach. The Johansen Cointegration result establishes a long run relationship between education and economic growth. With regard to the Granger causality relationship, the result confirms the unidirectional causality running from GDP to education expenditure. On the basis of the findings of the study, it is recommended that, if government policy is going to substantially increase growth, then investing in education is one of the pro-growth policies for promoting economic growth.

Keywords: Government Expenditure, Economic growth, Johansen Cointegration, Vector Error Correction Methodology, Granger Causality.

1. Introduction
Overall economic development of an economy substantially hinges on human resource development. Human resource development is, therefore, considered as an integral part of world development agenda (Bangladesh Economic Review, 2011). It is generally considered that health and education sector as foundation for human development. Education is the imperative part of human competency and sovereignty (Sen, 1999). The relationship between education and economic growth is contentious issue in developing economies. The development theorists argue that education has indeed promoted economic growth and structural transformation in many LDCs. But critics argue that it can also perpetuate inequalities in societies and impart values, attitudes and aspirations which are inimical to development; for example, the adoption of practices and institutional structures inappropriate to the environment of the country (Thirlwall, 1994). The development of education sector is critical for meeting the twin goals of economic growth and poverty reduction. First, education is a crucial input into production, raising worker productivity in any given activity. Thus, higher levels of education should make it easier for an economy to engage in new activities. Second, it can act as a catalyst to change—empowering entrepreneurs to develop or adopt new technologies, or to introduce new economic activities. The theoretical basis of education on economic growth is rooted in the endogenous growth theory. Endogenous growth economists believe that improvements in productivity can be linked to a faster pace of innovation and extra investment in human capital. Endogenous growth theorists argue the need for government and private sector institutions and markets which nurture innovation, and provide incentives for individuals to be inventive. There is also a central role for knowledge as a determinant of economic growth. Endogenous growth theory predicts positive externalities and spillover effects from development of a high valued-added knowledge economy which is able to develop and maintain a competitive advantage in growth industries in the global economy.

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By using a Cobb-Douglas specification of the aggregate production function with two factors of production, labor and physical capital, Debraj Ray (1998) in his book “Development Economics” build up a model where we can see how human capital plays a crucial role to promote economic growth. The modified version of cobb-douglas function is

\[ y = k^\alpha h^{1-\alpha} \]  

Where \( h \) stands for human capital and unskilled labor has been omitted for now, \( k \) for physical capital and \( y \) is output. Now part of the output is consumed, but the remaining part of the output can be used in two ways. First, a fraction \( s \) of it is saved, permitting the accumulation of capital:

\[ k(t + 1) - k(t) = sy(t) \]  

Another fraction \( q \) is saved in the different way: it is used to augment the quality of human capital, so that

\[ h(t + 1) - h(t) = qy(t) \]  

It can be shown that starting from any initial configuration at date 0, call it \{\( h(0), k(0) \}\), the equation (1), (2), and (3) cause the economy to ultimately have all its variables – \( y \), \( k \), and \( h \) – growing at some common rate, and this rate is determined by the savings rate \( s \) as well as the propensity to invest in human capital, as measured by \( q \).

It is easy to figure out what the rate is. Let \( r \) denote the ration of human capital to physical capital in the long run. Divide both sides of (2) by \( k(t) \) and use (1) to note that

\[ \frac{k(t + 1) - k(t)}{k(t)} = sr^{r - \alpha}, \]

this gives us the growth rate of physical capital. Likewise, divide both sides of (3) by \( h(t) \) and use (1) once again we see that

\[ \frac{h(t + 1) - h(t)}{h(t)} = qr^{-\alpha}, \]

this gives us the growth rate of human capital. Because these two growth rates are the same in the long run (so that the ratio of human capital to physical capital also stays constant), we must have \( sr^{r - \alpha} = qr^{-\alpha} \), or simply

\[ r = q/s. \]  

This equation makes perfect sense. The larger is the ratio of saving in human capital relative to that of physical capital, the larger is the long-run ratio of the former to the latter.

The Bangladesh economy could be said to have enjoyed some form of macroeconomic stability in the recent period as the rate of economic growth averaged 6 percent within the last few years. However, as a result of rapid population growth rate, per capita growth has remained low level. (World Bank, 2009) With its large reserves of human and moderate level of natural resources, Bangladesh has the potential to build a prosperous economy, reduce poverty significantly, and provide the health, education, and infrastructure services that its population needs. Nevertheless, despite the country's relative wealth, poverty is widespread, and almost forty percent of the total populations live under poverty level (World Bank, 2008). Poverty, which has no geographical boundary, is seen in all part of the country, rural and urban areas inclusive. An educated, trained and healthy population can play an important role in improving the quality of life, reducing poverty and attaining sustainable economic growth. The development agenda should be directed for improving the living standards of the underprivileged and the poor.
Educational expenditures in Bangladesh have been increasing since the independence. According to the declaration made in the World Summit on Social Development held in Copenhagen in 1995, the Government of Bangladesh has been spending more than 20 percent of the budgetary allocation in socio-economic sectors. Education expenditures increased significantly from 1.6 percent of total GDP in 1990 to over 2.4 percent in 1995-96. Since 1999, the share of education in GDP remained stable at 2.2 percent. Public education expenditure as a share of total government spending has increased from about 12 percent in 1990-91 to 16 percent in 1999-2000 and has remained around 15 percent. The share of GDP devoted to education in Bangladesh is currently at 2.2 percent, while the average share of GDP devoted to education was 4.5 percent for developing countries and 3.8 percent for countries in South and West Asia in 2002 (Al Samarrai, 2007). Therefore, it is worthwhile to assess the long-run relationship between education and GDP in Bangladesh.

The study specifically deals with the following issues:
- Is there any relationship between education and Gross Domestic Product (GDP)?
- Is there any co-integration between education and economic growth in Bangladesh?
- Is there any Granger causality between education and economic growth in Bangladesh?

The remainder of this study is structured as follows; objectives are set in section two, thereafter, relevant literature is reviewed, section four provides data description, section five presents methods of analysis, section six gives the empirical findings; and section seven deals with conclusion and recommendations.

Objective of the Study

The specific objectives of the study are as follows.
- To conduct the empirical analysis of education by investigating the link between education and economic growth.
- To examine the long-run (LR) linkages between education and economic growth in case of Bangladesh economy.
- To determine the causal nexus between education and economic growth in Bangladesh.

2. Review of Literature

Education is the key to socio-economic development of a nation. It is also considered as one of the principal strategies of poverty alleviation and human resources development (Six Five Year Plan). There is a vast body of literature that identifies the expansion of formal education as a key component of successful development strategies (Schultz 1988; Psacharopoulos 1994; Barro and Sala-i-Martin 1995). Literature review of some related studies is presented below.

Afzal et al. (2010) analyzed the short-run and long-run relationship between school education and economic growth in case of Pakistan by using ARDL approach to cointegration. Their study used annual time series data on real GDP, physical capital in real terms, poverty, inflation and general school enrollment ratio for the period of 1970-71 to 2008-09. The results of the study by Afzal et al. (2010) confirm the cointegration among real GDP, poverty, inflation and school enrollment ratio when both the real GDP and school enrollment ratio serves as the dependent variables. The results of their study also confirmed that in SR, school education and economic growth were inversely related, while in the LR, two way direct relationships found between school education and economic growth. Daniela and Lucian (2010) investigated the causal relationship between higher education and economic growth in Romania and found the evidence of unidirectional causality between economic growth and higher education. Pradhan (2009) examined the causality between education and economic growth in case of India and found the uni-directional causality between these two variables. Katircioglu (2009) employed the bounds test and granger causality test to investigate the relationship between higher education and economic growth in case of Northern Cyprus and found the unidirectional causality between these two variables. Islam, T. S., Wadud M.A. and Qamarullah,
B. T. I., (2007) examined the causal relationship between education and income (GDP) growth for Bangladesh over the period 1976-2003 using a multivariate approach. Their results show that there is bidirectional causality running from GDP to education and vice versa. However, this study faces serious drawback as in this study, Johansen & Juelius (1990, 1995) technique on 27 observations have been used with four optimal lag lengths. Due to short span of sample period there is still some debate about result. Kakar K. Z., Khilji B.A. and Khan M. J. (2011) studied the impact of government expenditure on education on economic growth on Pakistan for the period 1980-2009 by using co-integration and vector error correction techniques. The results confirm that education has a long run relationship of economic growth. Rahman M.M., and Peng. Liu (2012) examined the long-run effect of different level of educations on GDP in case of two BCIM countries (Bangladesh and China) from the year 1980-2009. From the Block Exogeneity Wald Tests they found the only evidence of unidirectional causality from GDP to tertiary education and from secondary to primary education in case of Bangladesh and confirmed that the existence of unidirectional causality from primary education to GDP and also from secondary education to GDP and bidirectional causality between primary education and secondary education in case of China. Babatunde & Adefabi (2005) investigated the long run relationship between education and economic growth in Nigeria between 1970 and 2003 through the application of Johansen Cointegration technique and Vector Error Correction Methodology. The result establishes a long run relationship between education and economic growth. They also argued that education is triggering economic growth through many factors like enhancing the employment opportunities, improving health facilities, reducing fertility and poverty level, improving technological development and source of political stability. Danacica, Belascu & Llie (2010) used time series data for the span of 1980-2008 to explore the causal nexus between higher education and economic growth in case of Romania. The results of their study have confirmed that there is LR relationship between higher education and economic growth and one-way causality i.e. running from economic growth to higher education has been observed. However due to small sample, this technique may mislead the results and also may loss of the degree of freedom.

Albeit there is no doubt the positive relationship of education and economic growth, however, several studies conversely demonstrated a different finding. According to Blaug (1970) and Sheehan (1971), investment in education is just merely consumption. This is due to the fact that investment in acquiring knowledge or skills is for the individual interests only and does not contribute into the economic growth. To support this argument, empirical study by Devarajan et al., (1996) on 43 developing countries showed that excessive government expenditure in education negatively correlated with the countries’ economic growth. Moreover, from another study we see that high literacy rate was not the guarantee of peace, justice and prosperity in a society (Raja, 2010). The analysis of Lucas (1988), Rebelo (1991) and Romer (1990) revealed that investment in human capital led to growth in physical capital which in turn leads to economic growth. Bose, Niloy., Haque, M. E and Osborn, D. R (2007) examined the growth effects of government expenditure for a panel of thirty developing countries over the decades of the 1970s and 1980s, with a particular focus on sectoral expenditures. Their primary results are twofold. Firstly, the share of government capital expenditure in GDP is positively and significantly correlated with economic growth, but current expenditure is insignificant. Secondly, at the sectoral level, government investment and total expenditures in education are the only outlays that are significantly associated with growth once the budget constraint and omitted variables are taken into consideration.

In conclusion, based on the previous discussion, the effect of education on economic growth is arguable. Some might said it has positive effect and vice versa, despite the general believe that individual educational achievement will lead to job opportunities and job creations and at the same time improve people’s life. Therefore, in this study, we seek to investigate long term relationship and causal relations between expenditure in education and economic growth in Bangladesh.

3. Data Description and Variable Definitions

In this study, we use annual time series data of real GDP for the period from 1973 to 2009 and these data are collected from Bangladesh Economic Review (2011) and Six Five Year Plan (FY2011-FY2015). We
use GDP as proxy of economic growth. Here, real GDP is calculated at current market prices while public expenditure on education as % of GDP is the total public expenditure (current and capital) on education expressed as a percentage of the Gross Domestic Product (GDP) in a given year. Public expenditure on education includes government spending on educational institutions (both public and private), education administration, and transfers/subsidies for private entities (students/households and other privates’ entities).

Before empirical analysis, we will show the chart for each variable in level.

From the figures above we can see that both GDP and education expenditure have upward trends with some fluctuations. This means that the series suffer from non-stationary problem.
Methods of Analysis

- **Econometric Model**

This study considers time series analysis and single equation regression model. Study will determine the long-run (LR) relation between education expenditure and economic growth then determine how they evolve over time.

\[ GDP_t = a + bEEXP_t + \mu_t \]  

...(5)

Where

- \( GDP = \) Gross Domestic Product
- \( a = \) Intercept term
- \( b = \) Slope term
- \( EEXP = \) Education Expenditure
- \( \mu = \) Error Term

Empirical methodology of this study consists of unit root tests, cointegration technique, and error correction modeling approach. These are discussed below.

- **Unit Root Test**

While dealings with time series, it is necessary to analyze whether the series are stationary or not. Since regression of non-stationary series on other non-stationary series leads to what is known is spurious regression causing inconsistency of parameter estimate (Engle and Yoo, 1987). The hypothesis behind is that random shocks in economy have long lasting effects (Engle & Granger, 1987). The most popular of these tests are the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) tests (Raza, 2015; Raza et al., 2015). ADF test will be considered for this study because ADF tests use a parametric autoregressive structure to capture serial correlation.

The testing procedure for the ADF test involves the regression of the following model:

\[ \Delta y_t = \alpha + \beta_t + \gamma y_{t-1} + \sum_{i=0}^{p} \delta_i \Delta y_{t-p} + \epsilon_t \]  

...(6)

where \( \Delta \) is the first difference operator, \( y_t \) is the variable of interest and \( \epsilon_t \) is white noise error term, \( \alpha \) is the intercept (constant), \( t \) denotes a linear time trend , \( \beta \) the coefficient on a time trend and \( p \) the lag order of auto regressive process. By including lags of the order \( p \) the ADF formulation allows for higher-order autoregressive processes. This means that the lag length \( p \) has to be determined when applying the test. One possible approach is to test down from high orders and examine the \( t \)-values on coefficients. An alternative approach is to examine information criteria such as the Akaike information criterion, Bayesian information criterion or the Hannan-Quinn information criterion. The unit root test is then carried out under the null hypothesis \( \gamma = 0 \) against the alternative hypothesis of \( \gamma < 0 \). Once value for the test statistic is computed it can be compared to the critical value for the Dickey-Fuller Test (MacKinnon, 1991). If the test statistic is less than the critical value, then the null hypothesis of \( \gamma = 0 \) is rejected and no unit root is present. Otherwise, the alternative hypothesis is accepted, that is unit root is present. If the variable is differenced once and the differenced series is stationary, then it is integrated of order one [i.e., I (1)]. Similarly, if it is differenced twice and the differenced is stationary, then it is integrated of order two [i.e., I (2)] and so on.

- **Co-integration Test**

Many macro time series may contain a unit root has spurred the development of the theory of non-stationary time series analysis. Engle and Granger (1987) pointed out that a linear combination of two or
more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be co-integrated. The stationary linear combination is called the co-integrating equation and may be interpreted as a long-run equilibrium relationship among the variables. The purpose of the co-integration test is to determine whether a group of non-stationary series is co-integrated or not. In this study, we use Johansen maximum likelihood (ML) approach to test for cointegration.

Johansen’s method follows VAR-based cointegration test. Consider a VAR of order $p$:

$$ y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + Bx_t + \varepsilon_t $$

where $y_t$ is a $k$-vector of non-stationary I(1) variables, $x_t$ is a $d$-vector of deterministic variables (such as a constant, or a constant and time trend etc.) and $\varepsilon_t$ is a vector of errors (innovations).

We can rewrite this VAR as (after taking first difference):

$$ \Delta y_t = \prod_{i=1}^{p-1} y_{t-i} + \sum_{i=1}^{p-1} \Gamma \Delta y_{t-i} + Bx_t + \varepsilon_t $$

$$ \prod = \sum_{i=1}^{p} A_i - I, \quad r_i = - \sum_{i=1}^{p} A_i $$

Granger’s representation theorem asserts that if the coefficient matrix $\Pi$ has reduced rank $r<k$, then there exist $k\times r$ matrices $\alpha$ and $\beta$ each with rank $r$ such that $\Pi = \alpha \beta'$ and $\beta' y_i$ is I (0); $r$ is the number of cointegrating relations (the cointegrating rank) and each column of $\beta$ is the cointegrating vector. The elements of $\alpha$ are known as the adjustment parameters in the VEC model. Johansen’s method is to estimate the matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of $\Pi$. The null hypothesis of no cointegration is tested against the alternative hypothesis of cointegration using the maximum eigenvalue and trace tests. The null hypothesis of the trace test is the number of cointegrating vectors $r \leq \text{sequence number}$, and the null hypothesis of the eigenvalue test is $r = \text{sequence number}$. Johansen have given the critical value at 5% level. We can compare the trace value with critical value; if trace value is greater than critical value then we reject the null hypothesis for trace test. In the same way, we can also compare eigenvalue value with probability value, if eigenvalue value is greater than probability value then we reject null hypothesis for eigenvalue test.

- Granger Causality between Economic Growth and Education Expenditure

Measuring the correlation (similarities in strength and direction between two graphs) between variables such as GDP and EDEXP would according to Granger (1969) not be enough to construct a complete understanding about the relationship between two-time series. The reason is that some correlations may be spurious and not useful, as there might be a third variable that cannot be accounted for.

By using the Granger causality approach with the question if variable X (in a time series), causes variable Y (in another time series), a researcher wants to see how the value of the existing Y can be explained by past values of Y. And then by adding lagged values of X add to explanation of the relationship (Alam et al., 2015).

Granger Representation Theorem states that if variables are cointegrated then an error correction model (ECM) exists that combines the long-run relationships with the short-run dynamics of the model. Since our objective is to examine the causal relationship between economic growth (GDP) and inflation (INF), we specify the error correction model as follows:

$$ \Delta \text{GDP} = \alpha_1 + \sum_{i=1}^{p} \gamma_i \Delta \text{GDP}_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta \text{EDEXP}_{t-i} + \rho_1 \text{ECT}_{t-i} + \varepsilon_t $$

$$ \Delta \text{EDEXP} = \alpha_2 + \sum_{i=1}^{p} \beta_i \Delta \text{EDEXP}_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta \text{GDP}_{t-i} + \rho_2 \text{ECT}_{t-i} + \xi_t $$
where $ECT_{t-1}$ is the lagged stationary residuals from the cointegration equation. Ordinary Least Squares (OLS) method are applied for the estimation and the standard $t$-statistics for testing the significance of each term since all the variables are stationary $[I(0)]$. We estimate the pair of equations for education expenditure on GDP and GDP on education expenditure separately, if at least one of these coefficients must be significant in order that ECM holds. In order to determine the causality, we use F-statistic. This F-statistic depends upon the restricted residual sum squares ($RSS_1$) and unrestricted residual sum squares ($RSS_2$).

$$F = \frac{(RSS_1 - RSS_2)/m}{(RSS_2)/(n-k)}$$  \hspace{1cm} (11)

where, m denotes number of lags; k number of parameters involved in the model; and n is the sample size. If the estimated F-statistic is significant the null hypothesis of the non-causality is rejected leaving the alternative hypothesis of causality accepted and hence we conclude that GDP causes EDEXP and vice versa. The non-causality hypothesis is accepted if the statistic is not significant leaving that GDP does not cause EDEXP and vice versa.

4. Empirical Analysis Findings

Stationary Test Result

In regression model, in order to prevent spurious regression happening, we have to test the stationary of each variable. In this study, we use ADF test to check the stationary of time series. The results are:

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF</th>
<th>Test Critical values</th>
<th>Stationary</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>2.647617</td>
<td>-3.632900 -2.948404 (-2.612874)</td>
<td>No</td>
</tr>
<tr>
<td>EDEXP</td>
<td>1.518726</td>
<td>-3.661661 -2.960411 (-2.619160)</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF</th>
<th>Test Critical values</th>
<th>Stationary</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>14.67716</td>
<td>-4.234972 -3.540328 (-3.202445)</td>
<td>No</td>
</tr>
<tr>
<td>EDEXP</td>
<td>2.446386</td>
<td>-4.309824 -3.574244 (-3.221728)</td>
<td>No</td>
</tr>
</tbody>
</table>

The results show that each variable’s ADF value is bigger than test critical value in three levels. So, all of the four variables are non-stationary in regression model. For the purpose of getting stationary variables, we make first order difference of each variable.

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF</th>
<th>Test Critical values</th>
<th>Stationary</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>2.467372</td>
<td>-3.632900 -2.948404 (-2.612874)</td>
<td>Yes</td>
</tr>
<tr>
<td>EDEXP</td>
<td>2.592209</td>
<td>-3.661661 -2.960411 (-2.619160)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>ADF</th>
<th>Test Critical values</th>
<th>Stationary</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>0.406483</td>
<td>-4.243644 -3.544284 (-3.204699)</td>
<td>Yes</td>
</tr>
<tr>
<td>EDEXP</td>
<td>0.314656</td>
<td>-4.284580 -3.562882 (-3.215267)</td>
<td>Yes</td>
</tr>
</tbody>
</table>
We can see that ADF values of both variables (after first order difference) are more negative than critical level. This means that they are integrated of order one.

**Co-integration Test Result**

As we mentioned above, we have tested the stationary time series and proved that both variables are stationary after first difference. Table 5 presents the results of Johansen cointegration procedure. The lag lengths are selected using AIC and SBC criteria.

<table>
<thead>
<tr>
<th>Hypothesized</th>
<th>Trace Eigenvale</th>
<th>Trace Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None *</td>
<td>0.430452</td>
<td>26.01227</td>
<td>15.49471</td>
<td>0.0009</td>
</tr>
<tr>
<td>At most 1 *</td>
<td>0.164977</td>
<td>6.310365</td>
<td>3.841466</td>
<td>0.0120</td>
</tr>
</tbody>
</table>

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Based on Trace test and Maximum eigenvalue test statistics, in particular, the computed trace, the maximum eigen value statistics and their corresponding critical values indicate that the null hypothesis of no co-integration (r = 0) can be rejected under both of these tests at both 5-percent and 1-percent levels of significance. Both maximum eigen value and trace tests indicate two co-integrating equations at both 5-percent and 1-percent levels of significance. This again implies a long-run relationship between education expenditure and economic growth in Bangladesh.

Since, GDP and EDEXP are found to be cointegrated, we proceed to test the vector error correction mechanism which also represents the short run relationship among the variables under study. The error correction Mechanism (ECM) term represents the speed of adjustment back to the long run relationship among the variables.
The empirical results show the existence of short-run and long-run relationships between education expenditure and GDP in Bangladesh. This also implies short-run and long-run relationships between education expenditure and economic growth in the country. The estimated coefficients of the error correction terms are significant at 5-percent level from education expenditure to real GDP and vice versa with appropriate (i.e., negative) signs. That means that in the long-run if the two series are out of equilibrium, GDP will adjust to reduce the equilibrium error and vice versa. In other words, it shows that 21 percent (error correction term -0.21) of the deviation of GDP from its long run equilibrium level is corrected each year. On the other hand, just one percent (error correction term -0.001) of the deviation of the education expenditure from its long-run equilibrium level is corrected each year.

**Granger Causality Test Result**

In order to test the causal relationship between education expenditure and GDP, we implement Granger Causality Test on them and the sample interval is from 1973 to 2009. Granger (1988) has mentioned that the Granger test is available only when the involved variables are stationary or non-stationary but co-integrated. In our study, we showed that all of variables (before first order difference) are non-stationary but stationary.
after first differences and have co-integration relationship in long-term. Therefore, we can take the Granger Test and the result is in table 7:

<table>
<thead>
<tr>
<th>Null-Hypothesis</th>
<th>F-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(GDP) does not Granger Cause D(EDEXP)</td>
<td>8.68402</td>
<td>0.0011</td>
</tr>
<tr>
<td>D(EDEXP) does not Granger Cause D(GDP)</td>
<td>0.79125</td>
<td>0.4628</td>
</tr>
</tbody>
</table>

The conclusions from Granger Causality Test are that: firstly, for the null hypothesis “D (GDP) does not Granger Cause D (EDEXP)”, the probability value of F-statistic is 0.0011<0.05 (in the 5% level of significance). Thus, we reject this hypothesis and believe that GDP is granger cause of education expenditure; Secondly, for the null hypothesis, “D (EDEXP) does not Granger Cause D (GDP)” the probability of F-statistic is 0.4628>0.05. Therefore, the null hypothesis is accepted and the education expenditure is not Granger cause of GDP.

5. Conclusion and Recommendations

The present research work explores the long-run (LR) linkage and causal nexus between education expenditure and economic growth. The LR relationship has been examined through Johanson Co-integration approach and Vector Error Correction methodology and causality is tested through Granger Causality approach. The co-integration results confirm that there exist long-run relationship between education expenditure and economic growth. The result of Granger Causality confirms the unidirectional causality running from GDP to education expenditure. This result supports the previous work of Daniela and Lucian (2010), Pradhan (2009), Katircioglu (2009).

On the basis of the findings of the study, it is recommended that a good performance of an economy in terms of economic growth may therefore be attributed to a well-developed human capital base through education. If government policy is going to substantially increase growth, then investing in education is one of the pro-growth policies for promoting economic growth.

Reference


