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Full Length Research Paper

Measuring the impact of educational expenditures on economic growth: evidence from Pakistan

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Education plays a vital role in human capital formation. It raises the productivity and efficiency of individuals and thus produces skilled manpower that is capable of leading the economy towards the path of sustainable economic development. The objective of this study is to empirically investigate the impact of education expenditures on economic growth of Pakistan over a period of 1972 to 2010, using bonds testing approach. The empirical results show that education expenditures have a positive and significant impact on economic growth in the long run. The elasticities of the model suggest that if there is a one percent increase in education expenditures, it increases up to 0.039 percent in output in the long run.

Keywords: Education expenditures, economic growth, employment, bonds testing approach, Pakistan.

INTRODUCTION

Education plays a vital role in human capital formation. It raises the productivity and efficiency of individuals and thus produces skilled manpower that is capable of leading the economy towards the path of sustainable economic development (Zaman, 2008). Moreover education is expected to act positively towards world economic development and poverty alleviation, both of which are the priorities of the world community. An investment in human capital, especially in education allows each person to contribute to their society in a productive way. It becomes an important factor of an economy's capability to achieve high level of growth with low unemployment, high wages and strong social unity. Therefore, along with elements such as low unemployment and balance of payments equilibrium, education is an important issue that each country's government deals with and strives to improve.

Contribution of education to economic development works in two ways: firstly, through the economy's organization that is its division of tasks and secondly through the economy's performance that how much it produces. The organization of an economy is getting specialized in its division of tasks. These tasks include "schools" that train students for efficient and effective performance. Productivity of the labor force determines the performance of economy. Because the educational level of the labor force is a determinant of its productivity, schools and other educational facilities make an important contribution to economic development. All this could be made possible by a reasonable financing to education sector both by government and education sector itself.

In Pakistan, public expenditure on education lies on the fringes of 2% of GDP. According to Pakistan living and social standard survey (2008-09) report, public expenditure on education as a percentage of GDP was actually reduced in 16 years and maintained for 5 years between 1972–73 and 2008-09. Thus, out of total 37 years since 1972, public expenditure on education as a percentage of GDP either decreased or remained stagnant for 21 years. Governments spending on education in South Asia currently average about 4.1 percent of GDP (GoP, 2011). The government spending increased from 23.0% in 1980 to 26.0% in 1992 while it decreased sharply to 19.9% in 2009. Expenditures for the period of 1980-2009 are demonstrated in Figure 1.

Pakistan's economy has undergone a variety of stages over the 30 year period (1980-2009) which comprised situations of decreased and elevated growth

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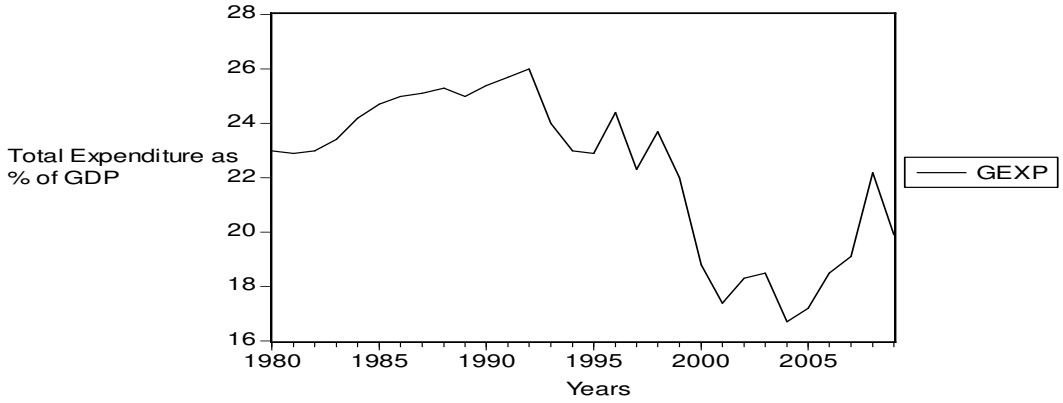

Figure 1. Government Expenditures of Pakistan (1980-2009)
Source: ADB (2009).

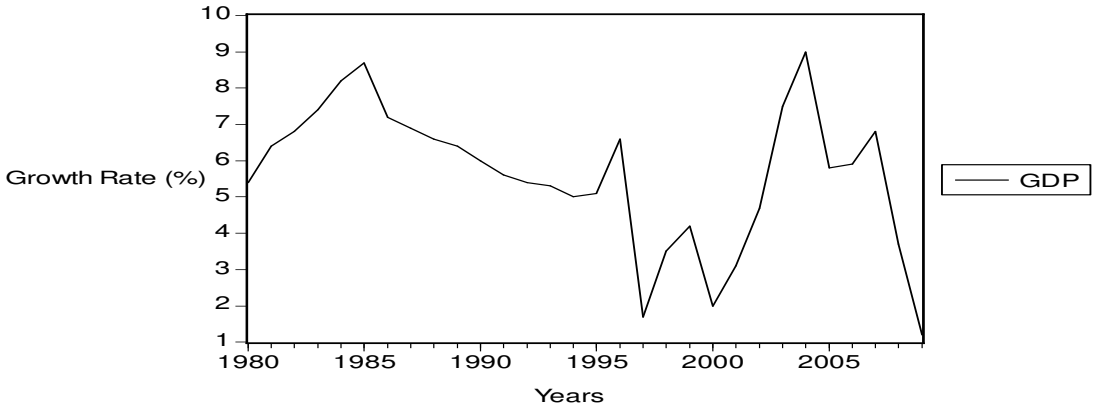

Figure 2. GDP growth Rate of Pakistan (1980-2009)
Source: GoP (2010)

which provides with an interesting case study. The data illustrates that economic growth descended steadily from 5.4% in 1980 to 1.2% in 2009. GDP growth rate of Pakistan from 1980 to 2009 is given in Figure 2.

The above discussion confirms a strong linkage between education expenditures and economic growth. The objective of this paper is to critically examine the impact of education expenditures on economic growth of Pakistan, using time series data from 1972-2010. The more specific objectives are:

i. How much GDP growth change with the change of education expenditures in the long run and short run?

ii. To estimate the dynamic short-run causality effects of education expenditures, gross capital formation and employment towards economic growth in Pakistan.

A cointegration technique is used for analysis. The Auto-Regressive Distributed Lag (ARDL) model is used to calculate short-run and long-run estimates.

The study arrange in the following manners: after introduction, Section 2 describes literature review. Data Source and Methodological Framework are included in Section 3 to share vision with the readers. Results and discussion are carried out in Section 4. Conclusion of the study is presented in the last.

Literature Review

There are number of empirical studies regarding the impact of educational expenditures on economic growth, however, those studies gives contradictory results, for examples, Barro (1991) and Benhabib and Speigel (1994) estimated a positive relationship between education expenditure and economic growth. However, Devarajan et al. (1996) find a negative relationship between education expenses and economic growth. Bose et al. (2003) study the growth effects of government expenditure, particularly focusing on sectoral expendi-

tures for a panel of thirty developing countries by using data from 1970 to 1990. They find that the share of government capital expenditure on gross domestic product is positively and significantly correlated. Moreover, at the sectoral level, government investment and total expenditures in education are significantly associated with growth. Todd and Kenneth (2003) illustrate the linkage between government education expenditures and economic growth. An important aspect of this linkage is that it is extremely hard to demonstrate any effect of increased funding to schools. They find an insignificant relationship between these two variables. Teles and Andrade (2008) studied the relation between government spending on basic education and the human capital accumulation process. They observed the impacts of spending on economic growth and individual investments in higher education and that the significance of the relation between public spending on education and economic growth is altered by changes in the composition of government spending with regard to basic and higher education, and this relation may be insignificant when higher education is not promoted. Blankenau et al (2004) find that there exists a positive relationship between public education expenditures and long run growth for developed countries. By using panel data from 23 countries they concluded that this relationship is sensitive to the imposition of the government budget constraint and there are no significant growth effects of public education expenditures. Angelopoulos et al. (2007) finds that public spending on education brings growth and promotes the welfare. They further argue that if the composition of public spending can be changed so that the share of education spending is more than other components of total government spending then the welfare gains will increase by four percent of consumption.

Akram and Khan (2007) examine the incidence of government spending on education in Pakistan at both urban and rural provincial level by employing the three-step Benefit Incidence Approach methodology on primary data of the Pakistan Social Standard Living Measures Survey 2004-2005. They find that at regional and the provincial levels the overall expenditure on the education sector is progressive in Pakistan. While some disparities exist in the shares of different income groups' benefit from the provision of educational facilities created by public expenditures. Nurudeen and Usman (2010) find that government total capital expenditure, total recurrent expenditures and government expenditure on education have negative effect on economic growth. While rising government expenditure on transport and communication, and health results to an increase in economic growth. Afzal et al. (2010) find the existence of direct relationship between school education and economic growth in Pakistan. Macroeconomic instability due to inflation retards economic growth both in the short-run and the long-run while it retards school education only in the long-run. They observed a statistical significant and inverse relationship between school education and economic growth in the short-run. Faridi et al (2010) find a positive relationship between higher education and earnings of the students per month. They use the Mincerian human capital model. They suggest that government should increase its expenditures on education by giving scholarships to the students and by making proper arrangements for the needy students because it could have ultimate positive effect on economic growth.

Education expenditures and economic growth have been well debated in developing countries, hence there is a pressing need to evaluate and analyze the education-growth nexus and to find out the inter relationship. In the subsequent sections an effort has been made to empirically find out the long-run relationship between education expenditures and economic growth in the context of Pakistan.

METHODOLOGICAL FRAMEWORK

Theoretical Framework

The model used in this paper is based on the following aggregate production function i.e.,

$$Y_t = A.K_t^{\alpha}.L_t^{\beta}.H_t^{\gamma} \quad \text{..... (1)}$$

Where
"Y_t" is real income that is real GDP
"K_t" is physical capital
"L_t" is the number of workers
"H_t" is the total amount of human capital
"A" is the technology parameter
"t" is the observation subscript
and, α, β, and γ are parameters to be estimated.

Human capital can be defined as the product of average level of education per worker ($\mathbf{E_t}$) and number of total workers ($\mathbf{L_t}$).
Mathematically we can write it as;

$$H_t = E_t.L_t \quad \text{..... (2)}$$

It is assumed that the average level of education per worker and average expenditure on education per worker has direct relationship. Substituting equations (2) into (1) obtains;

$$Y_t = A.K_t^{\alpha}.L_t^{\delta}.E_t^{\gamma} \quad \text{..... (3)}$$

Where $\boldsymbol{\delta = \beta + \gamma}$. It is from equation (3) that we develop the econometric equation and uses it to assess empirically the impact of government education expenditures on economic growth. Theoretically, a positive correlation is expected between growth in output

on one hand and increases in capital stock, employment and education of workers on the other hand.
The data used in this study is taken from different sources, i.e., GoP (2011) and ADB (2009).

Empirical Model

Bound Testing Approach

The use of the bounds technique is based on three validations. First, Pesaran et al. (2001) advocated the use of the ARDL model for the estimation of level relationships because the model suggests that once the order of the ARDL has been recognized, the relationship can be estimated by OLS. Second, the bounds test allows a mixture of I(1) and I(0) variables as regressors, that is, the order of integration of appropriate variables may not necessarily be the same. Therefore, the ARDL technique has the advantage of not requiring a specific identification of the order of the underlying data. Third, this technique is suitable for small or finite sample size (Pesaran et al., 2001).

Following Pesaran et al. (2001), we assemble the vector autoregression (VAR) of order *p,* denoted VAR (*p*), for the following growth function:

$$Z_t = \mu + \sum_{i=1}^{p} \beta_i z_{t-i} + \varepsilon_t \qquad (4)$$

where z_t is the vector of both x_t and y_t , where y_t is the dependent variable defined as economic growth (GDP), x_t is the vector matrix which represents a set of explanatory variables i.e., gross fixed capital formation (GFC), employment (E) and education expenditures per worker (EEWE) and *t* is a time or trend variable. According to Pesaran et al. (2001), y_t must be I(1) variable, but the regressor x_t can be either I(0) or I(1). We further developed a vector error correction model (VECM) as follows:

$$\Delta z_t = \mu + \alpha t + \lambda z_{t-1} + \sum_{i=1}^{p-i} \gamma_t \Delta y_{t-i} + \sum_{i=1}^{p-1} \gamma_t \Delta x_{t-i} + \varepsilon_t \qquad (5)$$

where Δ is the first-difference operator. The long-run multiplier matrix λ as:

$$\lambda = \begin{bmatrix} \lambda_{YY} \lambda_{YX} \\ \lambda_{XY} \lambda_{XX} \end{bmatrix}$$

The diagonal elements of the matrix are unrestricted, so the selected series can be either I(0) or I(1). If $\lambda_{YY} = 0$, then *Y* is I(1). In contrast, if $\lambda_{YY} < 0$, then *Y* is I(0).

The VECM procedures described above are imperative in the testing of at most one cointegrating vector between dependent variable y_t and a set of regressors x_t . To derive model, we followed the postulations made by Pesaran et al. (2001) in Case III, that is, unrestricted intercepts and no trends. After imposing the restrictions $\lambda_{YY} = 0, \mu \neq 0$ and $\alpha = 0$, the hypothesis function can be stated as the following unrestricted error correction model (UECM):

$$\Delta(GDP)_t = \beta_0 + \beta_1 (GDP)_{t-1} + \beta_2 (GFC)_{t-1} + \beta_3 (E)_{t-1} + \beta_4 (EEWE)_{t-1} + \sum_{i=1}^{p} \beta_5 \Delta(GDP)_{t-i}$$

$$+ \sum_{i=0}^{q} \beta_6 \Delta(GFC)_{t-i} + \sum_{i=0}^{r} \beta_7 \Delta(E)_{t-i} + \sum_{i=0}^{s} \beta_8 \Delta(EEWE)_{t-i} + u_t \qquad (6)$$

Where Δ is the first-difference operator and u_t is a white-noise disturbance term.
GDP = Gross Domestic Product (GDP) in US $ million;
GFC = Gross Fixed Capital Formation in percentage;
E = Total Employment in percentage;
EEWE = Government education expenditures per worker.

Equation (6) also can be viewed as an ARDL of order (p, *q*, *r, s*). Equation (3) indicates that economic growth tends to be influenced and explained by its past values. The structural lags are established by using minimum Akaike's information criteria (AIC). From the estimation of UECMs, the long-run elasticities are the coefficient of one lagged explanatory variable (multiplied by a negative sign) divided by the coefficient of one lagged dependent variable (Bardsen, 1989). For example, in equation (3), the long-run investment, employment and education expenditures per worker elasticities are (β_2 / β_1), (β_3 / β_1) and β_4 / β_1 respectively. The short-run effects are captured by the coefficients of the first-differenced variables in equation (6).

After regression of Equation (6), the Wald test (*F*-statistic) was computed to differentiate the long-run relationship between the concerned variables. The Wald test can be carry out by imposing restrictions on the estimated long-run coefficients of economic growth, investment, employment and education expenditures per worker. The null and alternative hypotheses are as follows:

$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ (no long-run relationship)

Against the alternative hypothesis

$H_A : \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$ (a long-run relationship exists)

The computed *F*-statistic value will be evaluated with the critical values tabulated in Table CI (iii) of Pesaran et al. (2001). According to these authors, the lower bound critical values assumed that the explanatory variables x_t are integrated of order zero, or I(0), while the upper bound critical values assumed that x_t are integrated of order one, or I(1). Therefore, if the computed *F*-statistic is

Table 1. Augmented Dickey-Fuller (ADF) Test

Level		1st Difference	
Variables	**Constant**	**Constant**	**Order of Integration**
GDP	1.523(0)	-4.669(0) ***	I(1)
E	-1.779(0)	-3.934(0) ***	I(1)
GCF	0.396(0)	-5.486(0) ***	I(1)
EEWE	-2.642*(0)	-4.165(1)	I(0)

Note: The null hypothesis is that the series is non-stationary, or contains a unit root. The rejection of the null hypothesis is based on MacKinnon (1996) critical values. The lag length are selected based on SIC criteria, this ranges from lag zero to lag four. *** represents significant at 1 percent level.

Table 2. Estimated Models based on Equation (6)Dependent Variable: $\Delta \log(GDP)_t$

Variable	Coefficient	t-Statistic	Prob.
β_0	2.767295**	2.336452	0.0274
$\log(GDP)_{t-1}$	0.934138***	22.87779	0.0000
$\log(GCF)_{t-1}$	-0.323729*	1.818408	0.0805
$\log(E)_{t-1}$	-0.694063**	-2.521685	0.0181
$\log(EEWE)_{t-1}$	-0.037124***	2.942557	0.0068
$\Delta \log(GCF)_t$	1.012290***	34.20610	0.0000
$\Delta \log(GCF)_{t-1}$	0.041314	1.514732	0.1419
$\Delta \log(E)_t$	0.333047	-1.666571	0.1076
$\Delta \log(E)_{t-1}$	0.157083	0.664139	0.5124
$\Delta \log(EEWE)_t$	0.019264**	2.233693	0.0343

Model criteria / Goodness of Fit:
R-square = 0.729; Adjusted R-square = 0.699; Wald F-statistic = 8.441 [0.000] ***
*Note: ***, ** and * indicate significance at 0.01, 0.05 and 0.10 level respectively.*

smaller than the lower bound value, then the null hypothesis is not rejected and we conclude that there is no long-run relationship between economic growth and its determinants. Conversely, if the computed *F*-statistic is greater than the upper bound value, then economic growth and education expenditures have a long-run level relationship. On the other hand, if the computed *F*-statistic falls between the lower and upper bound values, then the results are inconclusive.

RESULTS AND DISCUSSION

The standard Augmented Dickey-Fuller (ADF) unit root test was exercised to check the order of integration of these variables. The results obtained are reported in Table 1. Based on the ADF test statistic, it was concluded that the GDP, Gross fixed capital formation (GCF) and employment (E) are non-stationary series at level. Though, when we take the first difference of these variables, then they becomes stationary i.e., I(1). Government education expenditures per worker (EEWE) is stationary at level, therefore, we considered as I(0) variable. Noticeably, the mixture of both I(0) and I(1) variables would not be possible under the Johansen procedure. This gives a good justification for using the bounds test approach, or ARDL model, which was proposed by Pesaran et al. (2001).

The unit root test explains that all variables are stationary at first difference except the education expenditures per workers which is stationary at level. In the next step, we estimate the model in order to analyze the impact of education expenditures on GDP growth both in short-run and long-run. The time series property of econometrics may compel us to employ the autoregressive distributive lag model (ARDL) due to the mixture of I(0) and I(1) variables.

The estimation of Equation (3) using the ARDL model is reported in Table 2. We follow the general to specific rule in order to remove the highly insignificant or less

Table 3. Diagnostic and Stability Test

Tests	F-Statistics	Probability
χ^2_{NORM}	2.7403	0.2540
χ^2_{WHITE}	1.0692	0.4443
χ^2_{RAMSEY}	0.3953	0.3776
χ^2_{ARCH}	1.4819	0.2393
$\chi^2_{Serial\,Corr}$	0.2008	0.5185

Note: For normality test, we report Jarque-Bera statistics. χ^2_{NORM}, χ^2_{WHITE}, χ^2_{RAMSEY}, χ^2_{ARCH}, $\chi^2_{Serial\,Corr}$ are non-normal errors normality test, white heteroskedasticity test, Ramsey Regression Specification Error Test, and Auto regressive Conditional Heteroskedasticity (ARCH Test), Serial correlation Lagrange Multiplier Test (LM-type Breusch-Godfrey-Test). These statistics are distributed as Chi-square values and capture degree of freedom in parenthesis.

significant variables from our regression analysis. This process may help us to follow the important property of autoregressive distributive lag (ARDL) model and make our regression analysis most appropriate or desirable. The above procedure in estimating equation may appear as result of one or none lags with the explanatory variables. Interestingly, it captures all lags that may have desirable significance power in term of statistical inference. Table 2 shows that all the variables are significant in the long run.

The value of R-squared and adjusted R-squared is 0.729 and 0.699 respectively. The results of the bounds co-integration test demonstrate that the null hypothesis of against its alternative is easily rejected at the 1% significance level. The computed *F*-statistic of 8.441, that is greater than the upper bound value of 5.06, thus indicating the existence of a steady-state long-run relationship among GDP, GCF, E and EEWE.

Table 3 show the statistics of different diagnostic and stability test to check overall stability of the model.

The robustness of the model has been definite by several diagnostic tests such as Breusch- Godfrey serial correlation LM test, ARCH test, Jacque-Bera normality test and Ramsey RESET specification test. All the tests disclosed that the model has the aspiration econometric properties, it has a correct functional form and the model's residuals are serially uncorrelated, normally distributed and homoskedastic. Therefore, the outcomes reported are serially uncorrelated, normally distributed and homoskedastic. Hence, the results reported are valid for reliable interpretation.

The plots of CUSUM and CUSUM-square statistics are in critical bounds and they do not diverge from that critical region that indicates the stability of coefficient in the estimated model as shown in Figure 3. It also confirms that the stability of long and short-run estimates of the model from GDP to education expenditures. The absence of divergence and presence of convergence mainly support to the long-run as well as short-run stability of the model particular to the long-run estimates.

The estimated coefficients of the long-run relationship between GDP growth rate, Gross fixed capital formation, employment rate and education expenditures per worker are shown in Table 4.

The results reveal that there is a positive and significant relationship with GCF, E and EEWE on GDP both in the long run and the short-run. The coefficient of 0.04 and 0.34 suggests that if there is one percent change in the capital formation, it increases the GDP to 0.04 percent in the short run and 0.34 percent in the long run. Similarly, if there is one percent increase in employment rate, it increases the GDP by 0.15 percent in short run and 0.74 percent in long run. Education expenditure is statistically insignificant in the short run but in the long run its impact is quite significant. The co-efficient of 0.039 depicts that if there is one percent increase in education expenditures, it increases the GDP by 0.039 percent.

CONCLUSION

The objective of the study is to measuring the impact of education expenditures on economic growth of Pakistan from 1972-2010. The estimated results confirm that education expenditure have a significant impact on long-run economic growth. The results conclude that if there is one percent increase in the capital formation, it increases

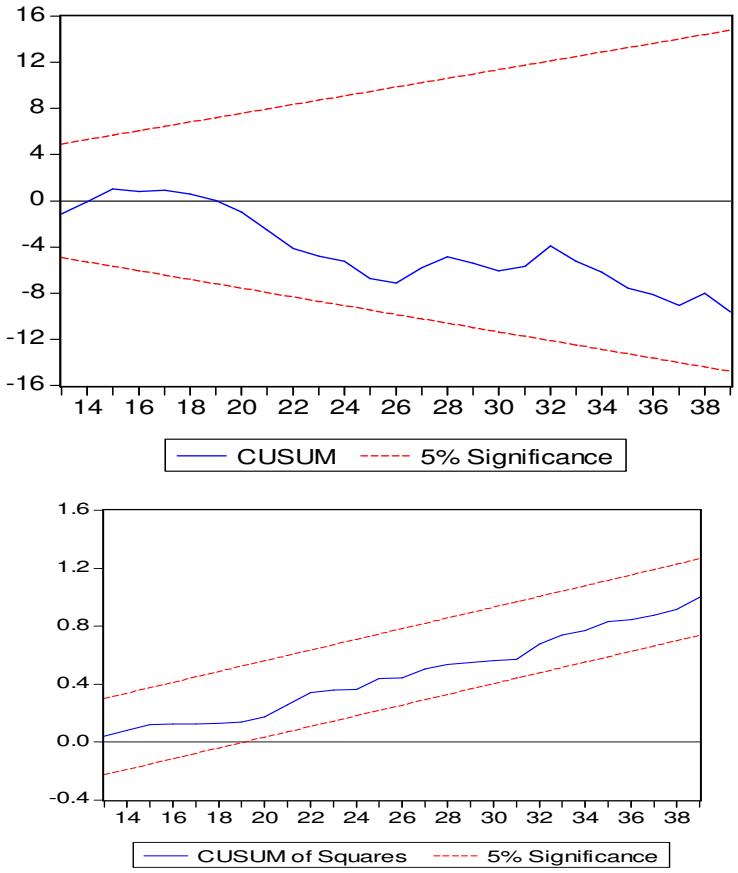

Figure 3. CUSUM Plots

Table 4. Long-run and Short-run Elasticities of GDP Growth Function

Dependent Variable = $\Delta \log(GDP)_t$		
Variables	**Short Run**	**Long Run**
Log(GCF)	0.041314*	0. 344*
Log(E)	0.157083*	0.743***
Log(EEWE)	0.157083	0.0397***

Note: ***, **, * denote the significance level at 1%, 5% and 10% level of significance, respectively.

the GDP up to 0.04 percent in the short run and 0.34 percent in the long run. Similarly, if there is one percent increase in employment rate, it increases the GDP by 0.15 percent in the short run and 0.74 percent in the long run. Education expenditure is statistically insignificant in the short run but in the long run its impact is quite significant as it increases economic growth up to 0.039 percent in the long run. The results have shown that investment matter for economic growth both in short run and long run. Thus, macroeconomic policies aimed at increasing investment through foreign direct investment (FDI) and domestic sources. Security and political stability also plays a part in attracting FID and retaining human capital. Education sector should be treated as a special sector by immunizing budgetary allocations for it from fiscal stresses and political and economic instabilities. Allocations for education should not be affected by squeezed fiscal space or surge in military expenditure or debts.

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