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**INTERACTION AMONG EDUCATION, EMPLOYMENT, FDI AND GDP GROWTH IN BANGLADESH: AN ECONOMETRIC ANALYSIS**

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**ABSTRACT:** *This paper has addressed a very important policy question of Bangladesh. This examines the causality among education, employment, FDI and GDP growth in Bangladesh by using time series data from 1980 to 2013. Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests show that the time series data is stationary at first difference. Then, the Johansen cointegration analysis indicates that the variables have strong, positive and significant linear relationship between them at .05 level of significance. Granger causality test found the unidirectional causality between employment and literacy rate and also between literacy rate and FDI. Again this empirical Granger causality test found that employment and FDI Granger causes GDP in unidirectional way. Finally, the Vector Error Correction Model (VECM) is also used to check the short and long run equilibrium relationships among the variables and the significant results have been found. This study gives the guideline to the researchers and policy makers.*

**KEYWORDS:** *education, employment, FDI, GDP growth, Bangladesh*

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## **INTRODUCTION**

Education is the largest investment in human resources. It is an age of breakneck change. The advanced countries are developing at exponential rates. In any economy, education is a matter of paramount national importance. One lesson from the past is that economies that committed themselves to education and training made great strides in both human development and economic growth. Although progress on education is sought mainly as an end in itself, there has been firm evidence that education promotes economic growth and thus puts other goals of development within reach. An explicit emphasis on human development for turning the huge population of the country into an asset has been also a major policy objective of the government. Education as

human capital possesses utmost significance from both micro and macro-economic perspectives. But unfortunately, like other developing economies around the globe, the literacy rate of Bangladesh is increasing very slowly. Despite considerable investment of scarce resources in the education sector, the quality of education in Bangladesh has probably deteriorated. By ensuring quality education, it is possible to enhance the efficiency of the workers and thus increase the rates of individual productivity. Consequently, this will create a greater demand for qualified workforces.

The overriding importance of the education sector in the development process is unquestionable. Education can provide individuals with the necessary market skills to gain high employability at a global setting and to be relevant in the economy. In this respect many researchers (Huseyin, 1998; Harvey, 2000; gbsn, 2013) found the strong long run relationships between education and employment. Education contributes to economic growth by improving health, reducing fertility and possibly by contributing to political stability. With the continuity of production, it helps us to adopt new technology for surplus production. Researchers (Babatunde and Adefabi, 2005; Solaki, 2012; Aghion et al., 2009; Brempong, 2010; Hanushek and Wobmann, 2007; Akosy, 2013) mentioned that educational development intensifies productivity which leads to economic growth in an economy.

Datta and Sharkar (2014) mentioned that Bangladesh is a huge labor surplus country and is an important supplier of migrant workers to those countries which are suffering from labor shortages or have the ability to hire cheap labor. A large number of Bangladeshi migrant workers are going to almost all countries of the world, especially to the oil-rich countries and contributing to our GDP growth sending their remittance. Kon (2007) found that the elasticity of labor supply with respect to wage is an important determinant of employment influencing on economic growth. Reversely, GDP growth also has the positive impact on our employment. Yam et al (2002), by using regression analysis, investigated the impact of economic growth on employment in Singapore and found that 1 percent point increase in economic growth would increase employment of 0.61 percent point over a period of two years. Herman (2011) analyzed that positive employment elasticity of economic growth generates employment opportunities under the conditions of the existence of an economic growth process in European Union. Seyfred (2005) also studied US economy over the period of 1990-2003 and found the effects of economic growth on employment. Padalino and Vivarelli (1997) analyzed that the employment intensities of economic growth from 1960 to 1994 for the cross countries vary US to be approximately 0.5; Japan 0.06; Canada 0.56; Germany 0.38; France 0.25; Italy 0.13; and UK 0.36. They concluded that the linkage between growth and employment in the whole economy did not decline in the post-Fordist period for the short-run. Authors Flaig and Rottman, (2007) stated that the effect of the economic growth process on employment depends on the institutions specific to the labour market and labour flexibility, demonstrating that rigidity in the field of employment, taxes on high salaries, the existence of some barriers in negotiating wages led to the reduction of the employment intensity.

On the other hand, different empirical studies emphasize a significant role of inward FDI in economic growth of the developing countries, through its contribution to human resource, capital formation, enhanced organization and administrative skills, transfer of technologies (Barro, 1990;

Zhang, 2001; Aitkin and Harrison, 1999). Balasubramanyam *et al.* (1996) employs cross sectional data for 46 countries for the period 1970-85 for analyzing the relationship between FDI and economic growth. Their results demonstrate that FDI has positive impact on economic growth of those countries which have followed inward looking development strategies. Li and Lue (2005) examine the association between FDI and economic growth for eighty four countries over the period 1970-1999. Their findings conclude that FDI and human capital both have positive impact on the economic growth of developing countries. Chowdhury and Mavrotas (2005) examine the causal link between FDI and economic growth over the period 1969-2000 from Chile, Malaysia and Thailand. They have also found bidirectional causality between FDI and economic growth in Malaysia and Thailand and one-way causality running from economic growth to FDI in Chile. Campos and Kinoshita (2002) examined the effects of FDI on economic growth for the period 1990-1998, for 25 Central and Eastern European and former Soviet Union transition economies. Their results indicate that FDI has a significant positive effect on the economic growth of each selected country. These results are consistent with the theory that associates FDI with technology transfers which brings benefit to the host country. Perhaps this is the first time to make an attempt to find out the causal relationships among the variables to explore their significance and contribution to GDP growth. The paper proceeds as follows: Section 2 presents the methodological issues, the data is used in the empirical analysis and its justification of stationarity properties; Section 3 reports all the empirical results and section 4 contains concluding remarks and policy implications.

## DATA AND METHODOLOGY

### Data

This paper exploits annual time series data of Literacy rate (total % of adult people aged 15 and above), Employment (% of total population aged 15 and above, modeled by ILO estimate), Foreign Direct Investment (FDI) (% of GDP net inflows) and GDP per capita in current US dollar covering the period from 1980 to 2013 of Bangladesh. The data obtained from online version of World Development Indicators (WDI), the World Bank and Bangladesh Economic Review. As this study examines the contribution of Education, Employment and FDI to economic growth in Bangladesh, secondary data is appropriate for the study.

### Methodology

Assessment of Granger causality between the variables and the direction of their causality in a vector error correction framework requires three steps. The first step is to test the non-stationarity property and determine order of integration of the variables, the second step is to detect the existence of long run relationship and the third step is to check the direction of causality between the variables.

### Model Specification

This study investigates the contribution of education, employment and FDI to economic growth in Bangladesh from 1980 to 2013. Correlation analysis and multiple regression analysis are used to examine the relationship between the dependent variable and the independent variables in the study. The following model represents the relationship between per capita real Gross Domestic

Product (GDP) and the three variables, namely education i. e. literacy rate, employment, FDI for Bangladesh. The equation for the multiple regression analysis is:

$$GDP = \beta_0 + \beta_1 LIT + \beta_2 EMP + \beta_3 FDI + \mu \tag{1}$$

Where, GDP = Real Gross Domestic Product per capita, LIT = Literacy rate of total % of people aged 15 and above, EMP = Employment of total % of population aged 15 and above modeled by ILO estimate, FDI = Foreign Direct Investment, net inflows (% of GDP),  $\beta_0$  = Intercept,  $\beta_1, \beta_2, \beta_3$  = Co-efficient and  $\mu$  = Error Term.

**Stationarity Test**

The annual time series data covering a period of 34 years from 1980 to 2013 is used to determine the relationship among Education, Employment, Foreign Direct Investment (FDI) and Gross Domestic Product (GDP) per capita in Bangladesh. In the first step of the estimation process, this study examines the stationarity properties of the data series.

According to Nelson and Plooser (1982), most of the time series that appear in the economy will have to be differenced in order to become stationary. In fact, most economic variables show a trend and therefore in most cases they are non-stationary. Thus, before moving to further analysis of the variables, it is needed to ensure the stationary properties of the variables.

This study uses Augmented Dickey Fuller (ADF) test (Dickey and Fuller, 1979, 1981) to perform the unit root tests. The ADF test includes extra lagged terms of the dependent and independent variables, which are real GDP per capita, education i. e. literacy rate, statistics of employment and foreign direct investment in order to eliminate autocorrelation. This study uses a regression model that includes an intercept and a time trend:

$$Y_t = \beta_0 + \beta_1 t + \beta_2 Y_{t-1} + \sum_{i=1}^k \alpha_i \Delta Y_{t-i} + \mu_t \tag{2}$$

The ADF regression tests for the existence of unit roots of  $Y_t$ , namely all model variables at time  $t$ . The variable  $Y_{t-i}$  represents the first differences with  $k$  lags while  $\mu_t$  is a variable that adjusts the errors of autocorrelation.  $\beta_0, \beta_1$  and  $\alpha_i$  are the coefficients values.

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests use intercept and trend with intercept for test stationarity features of the variables’ at levels and first differences form.

*Table 1: Augmented Dickey-Fuller and Phillips-Perron unit root test results*

Results of Augmented Dickey-Fuller (ADF) Unit Root Test								
Variables	Statistics	Critical value			Statistics	Critical value		
		1%	5%	10%		With trend and intercept	1%	5%
<b>Level Form</b>								
LIT	-	-3.653730	-2.957110	-	-	-4.262735	-3.552973	-

EMP	-	-3.752946	-2.998064*	-	-	-4.416345	-3.622033	-
FDI	-	-3.646342	-2.954021	-	-	-4.262735	-3.552973	-
GDP	5.56584	-3.646342*	-2.954021*	2.02349	-	-4.262735	-3.552973	-
Difference Form								
LIT	-	-3.653730*	-2.957110*	-	-	-4.273277*	-3.557759*	-
EMP	-	-3.769597	-3.004861*	-	-	-4.440739*	-3.632896*	-
FDI	-	-3.653730*	-2.957110*	-	-	-4.273277*	-3.557759*	-
GDP	-	-3.653730	-2.957110	-	-	-4.273277	-3.557759*	-
Results of Phillips-Perron (P.P.) Unit Root Test								
Variables	Statistic	Critical value			Statistics	Critical value		
		With intercept	1%	5%		10%	With trend and intercept	1%
Level Form								
LIT	-	-3.646342	-2.954021	-	-	-4.262735	-3.552973	-
EMP	-	-3.752946	-2.998064*	-	-	-4.416345	-3.622033	-
FDI	-	-3.646342	-2.954021	-	-	-4.262735	-3.552973	-
GDP	5.56584	-3.646342*	-2.954021*	1.84346	-	-4.262735	-3.552973	-
Difference Form								
LIT	-	-3.653730*	-2.957110*	-	-	-4.273277*	-3.557759*	-
EMP	-	-3.769597	-3.004861*	-	-	-4.440739*	-3.632896*	-
FDI	-	-3.653730*	-2.957110*	-	-	-4.273277*	-3.557759*	-
GDP	-	-3.653730	-2.957110	-	-	-4.273277	-3.557759*	-

Note: The test is conducted using Eviews 7.0.0.1

Table 1 reports the results of the ADF and PP unit root test for four variables in their level and difference form. Interestingly, some variables are not stationary in their levels but all of them become stationary after first differencing. On the base of critical value, \* denotes that the rejection of null hypothesis of unit root at 1%, 5% and 10% levels of significance. Here we consider the variables with intercept only, and with trend and intercept, both in level and first difference form. Number in the bracket denotes lag length.

**EMPIRICAL RESULTS****Results of Cointegration**

After examining the stationarity of these series we used Johansen's and Juselius (1990) method to test the cointegration between the series of Education, Employment, FDI and GDP growth. Cointegration means that despite being individually non-stationary, a linear combination of two or more time series data can be stationary (Gujarati, 2011). When a linear combination of non stationary variables is stationary, the variables are said to be cointegrated and the vector that is quite possible for a linear combination of integrated variables to be stationary. In this case the variables are said to be cointegrated. The cointegration technique uses two tests-the maximum Eigen value statistics and trace statistics in estimating the number of cointegration vectors. The trace statistic evaluates the null hypothesis that there are at most  $r$  cointegrating vectors whereas the maximum Eigen value test evaluates the null hypothesis that there are exactly  $r$  cointegrating vectors.

*Table 2: Johansen Test for Co-integration*

<b>Trace test</b>						
Null hypothesis	Alternative hypothesis	Without trend		With trend		Conclusion
		Test Statistics	Critical Value	Test Statistics	Critical Value	
$r=0$	$r=1$	65.45269*	47.85613	91.06147*	63.87610	Two
cointegration						
equations at 0.05 level						
$r \leq 1$	$r=2$	29.23455	29.79707	54.22086*	42.91525	
$r \leq 2$	$r=3$	6.516847	15.49471	23.77920	25.87211	
<b>Maximum Eigen value test</b>						
$r=0$	$r=1$	36.21814*	27.58434	36.84061*	32.11832	Two
cointegration						
equations at 0.05 level						
$r \leq 1$	$r=2$	22.71771*	21.13162	30.44166*	25.82321	
$r \leq 2$	$r=3$	5.087757	14.26460	18.84701	19.38704	

Note: The test is conducted using Eviews 7.0.0.1

From Table 2, we found that Maximum Eigen value test and Trace test, the estimated test statistics is not less than the critical value for  $r=0$  for both with and without trend at 5 % level of significance. Moreover, the estimated test statistics is not less than the critical value for  $r \leq 1$  for with trend of Trace test and both with and without trend of Maximum Eigen value test at 5% level of significance. This indicates that there are two cointegration equations and the variables- Education i.e literacy rate, Employment, FDI and GDP per capita have the long run relationships among

them. So, it is clear that there are two linear cointegration equations, long run relationship and linear deterministic trend among the variables.

### Results of Granger Causality Test

Granger Causality (1969) has been analyzed that if the variables are cointegrated then there should be at least one direction of causality between the two variables and this causality has been tested by F-statistics. Table 3 shows the results of Granger causality between the variables. Result shows that Employment and GDP Granger causes Literacy unidirectional way where Literacy rate Granger causes FDI but FDI does not cause Literacy. Employment Granger causes GDP and FDI strongly and FDI also Granger causes GDP.

Table 3: Granger Causality between the Variables (LIT, EMP, FDI and GDP)

Null Hypothesis	Lag	Obs.	F-Statistics	Probability	Decision
EMP does not Granger Cause LIT			3.51805	0.0561	Rejected*
LIT does not Granger Cause EMP	5	19	0.34757	0.8702	Accepted
FDI does not Granger Cause LIT			0.77370	0.5811	Accepted
LIT does not Granger Cause FDI	5	29	2.68420	0.0555	Rejected*
GDP does not Granger Cause LIT			2.18346	0.1499	Rejected*
LIT does not Granger Cause GDP	1	33	0.10169	0.7520	Accepted
FDI does not Granger Cause EMP	1	23	1.83356 4.29586	0.1908 0.0513	Accepted Rejected*
GDP does not Granger Cause EMP	5	19	0.78841 2.90251	0.5861 0.0873	Accepted Rejected*
GDP does not Granger Cause FDI			0.69590	0.6333	Accepted
FDI does not Granger Cause GDP	5	29	2.43412	0.0748	Rejected*

Note: The tests are performed using the software Eviews 7.0.0.1. \* denotes significance of the results and rejection of hypothesis.

These relationships indicate that FDI, Employment and GDP growth are closely dependent on each other in this study. It can also be seen that if the employment opportunities and GDP growth boost then literacy rate i.e educational facilities also increases in this process.

### Error Correction Modeling (ECM)

Granger and Engle (1983) analyzed that if the variables are integrated of order one and cointegrated, there exists the Error Correction Term (ECT) and these variables bear the steady state situation or in equilibrium situation.

The following equation is considered where mutual relationship as exists:

$$\Delta Y_t = \beta_0 + \beta_1 t + \beta_2 Y_{t-1} + \sum_{i=1}^k \alpha_i \Delta Y_{t-i} + \alpha_i ECT_{t-i} + \varepsilon_t \quad (3)$$

Where  $Y_t$  denotes the variables,  $ECT_{t-i}$  is the error correction term which is the lagged residual series of the cointegrating vector, '  $\Delta$  ' denotes the first difference and '  $\varepsilon_t$  ' denotes the white noise term. Here the error correction term is capturing the disequilibrium situation. The negative and

significant coefficient of error term suggests that there is a short run adjustment process working behind the long run equilibrium relationship among the variables. Coefficient parameters of error correction term are the speed of adjustment for the short run imbalances. In fact, in the vector error correction model all the variables are endogenously determined within the model. When the variables are cointegrated, there is a systematic and general tendency of the series to return to their equilibrium situation. This means that the dynamics of adjustment is intrinsically embodied in the theory of cointegration. Moreover, Granger Representation Theorem indicates how to model a cointegrated series in a Vector Auto Regressive (VAR) format. VAR can be constructed either in terms of level data or in terms of their first differences with the addition of an error correction to capture the short run dynamics.

Table 4: Results of Vector Error Correction Test

	Coefficient	t	F		Coefficient	t	F
$GDP = \int(LIT)$	0.60523	[	76.034	$LIT = \int(GDP)$	1.2244	[	578.64
	8	3.27747	81		26	6.34338	77
$GDP = \int(EMP)$	0.88828	[	166.9	$EMP = \int(GDP)$	1.3038	[	344.4
	5	3.81041	668		36	5.38012	327
$GDP = \int(FDI)$	0.81693	[	41.05	$FDI = \int(GDP)$	1.1982	[	656.3
	8	4.12646	230		62	6.52506	196
$EMP = \int(FDI)$	0.69596	[	19.07	$FDI = \int(EMP)$	0.8965	[	169.9
	1	2.88015	116		38	3.81341	763
$LIT = \int(EMP)$	0.87689	[	165.2	$EMP = \int(LIT)$	0.4145	[	10.01
	1	3.72764	210		70	1.64508	040
$LIT = \int(FDI)$	0.85129	[		$FDI = \int(LIT)$	0.5981	[	70.92
	8	4.12646	10.182		66	3.87166	278

Note: The tests are performed using the software Eviews 7.0.0.1. \* denotes the rejection of the hypothesis at 5% level of significance. The (\*) values are statistically significant and shows the estimated coefficient of lagged variables. Values in the third brackets are t-statistics.

Table 3 shows that, the vector error correction results are significant for Literacy and Employment, FDI and GDP growth, Employment and GDP growth and Literacy rate i.e education and GDP growth, indicating the long run and short run causal effects on each other.

In equation (3), the significant lagged ECT coefficient indicates that the current outcomes are affected by the past equilibrium errors. If the two variables are cointegrated, there must exist an error correction mechanism. This implies that error correction model is associated with the cointegration test. The long term effects of the variables can be represented by the estimated cointegration vector. The adjusted coefficient of error correction term (ECT) shows the long term effect and the estimated coefficient of lagged variables shows the short term effect. Causality test among the variables are based on Error Correction Model with first difference.

## FINDINGS AND CONCLUDING REMARKS

This paper has examined the causal relationship among education, employment, FDI and GDP growth for Bangladesh for the year 1980-2013. The study has found the existence of the long run



causal relationship among these variables. By applying Johansen's and Juselius cointegration technique, we have found the Trace test and Max Eigen value is greater than the critical value at 0.05 level of significance which indicates two cointegration equations among the variables. To search for the nature of the relationship between the variables, we have implemented the Granger causality tests and found unidirectional relationship that is employment and GDP Granger causes education i.e. literacy rate. Again, employment Granger causes both FDI and GDP, which means the opportunity of more employment, intensify GDP growth and finally we see that FDI granger causes GDP. It means that Foreign Direct Investment (FDI) boosts GDP growth significantly by adopting new technology. Moreover, the results of Vector Error Correction tests confess that the variables regress on each other significantly in short and in the long run adjustment. Thus the variables are closely linked with each other. While it is possibility that education could be equated with literacy, it is assumed that ensuring quality education and capacity building through proper training will pave the way of transforming the people into invaluable human resource which is a key requisite for the enhancement of production in the form of employment. On the other hand, Foreign Direct Investment (FDI) create ample scopes for employment using new and newer technology which also enhances sustaining GDP growth and development momentum amid perennially arising diverse shocks and crises in the domestic and external scenes. In this respect, the policy formulators should devise strategies for ensuring quality education and appropriate guidance for the people and for attracting more foreign investments into the development sectors in order to contribute to GDP growth. The government and the policy makers should marshal arguments for taking decisions with updated and significant results of the research. It is evident that this research will play a statutory role in the revitalization of development policy of Bangladesh.

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