An Econometric Analysis of Human Capital Development and Economic Growth in Bangladesh

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Abstract

The paper has explored empirically the relationship between human capital development and economic growth in Bangladesh. Human capital is a significant factor employed in transferring all resources to mankind's use and advantage. Economists studied that the development and employment of human capital is essential in a nation's economic growth. However, the illiteracy rate in Bangladesh is 29% still high compared to others SAARC country and many workers are unskilled, leading to their low productivity; consequently, this study gives an idea about the significance of human capital development to the growth of the economy. To investigate the relationship between human capital development and economic growth in Bangladesh, this study uses the gross domestic product (GDP) as proxy for economic growth, total government expenditure on education and health, and the enrolment pattern of tertiary education, secondary and primary schools as proxy for human capital. Since the data of the variables are based on annual time series data covering the periods 1981-2014, this study is an attempt to investigate the long run, short run and casual relationship among the variables by applying recent advantages in econometric methods such as cointegration and error correction mechanism. Unit root test results show that the variables are integrated of order one and positive long run relationship between human capital development and economic growth is confirmed by cointegration test result. The short run adjustment of the variables identified from the error correction mechanism. The entire result suggest that human capital development makes a significant contribution to economic growth. Thus stakeholders need to go forward a more realistic means of developing the human capabilities, since it is seen as a vital apparatus for economic growth in Bangladesh.

Keywords: Human Capital Development, Economic Growth, Cointegration, Error Correction Mechanism (ECM), Bangladesh.

1. Introduction

The history of human capital modelling and measurement helps to explain the development of empirical growth analysis. Consideration of the importance of the workforce has a long history in economics helps to explain a number of issues that are pertinent to today's analysis of economic growth Eric A. Hanushek (2013). Petty (1676 [1899]) assessed the economics of war and of immigrants in terms of skill (and wage) of individuals. Smith (1979[1776]) incorporated the ideas in the Wealth of Nations, although ideas of specialization of labor dominated ideas about human capital. Human capital as defined by Schutz (1993) is the important component in improving firms' asset and employees in order to expand productivity as well as sustain competitive advantage. Human capital becomes an instrument for competitive advantage since it consists of the process of training, knowledge acquisition (education), initiatives and so on, all these are geared towards skill acquisition. According to Cote et al (2001), human capital is concerned with knowledge, skills competitiveness and attributes embedded in an individual that facilitates the creation of personal, social and economic wellbeing. In order to achieve positive economic growth in Bangladesh, human capital development should be considered as an integral and important factor for economic growth. A major challenge facing the global community and Bangladesh at large is how to achieve sustainable development. The three pillars of sustainable development cannot be achieved if human capital development doesn't come to play as an integral part.

The main basis of per capital output in any country; whether developing or developed, with a market economy or centrally planned is an upturn in productivity. Per capita output growth is still a significant factor of economic welfare, (Abramowitz, 1981). From experience, it has been shown that human beings are the most significant and encouraging source of growth in productivity and economic growth. Equipment and technology are products of human minds and can only be made productive by individuals. The achievement of any productive program depends on human advanced ideas and creativeness. The effect of human capital development and economic growth emphasized the growth theory (Romer, 1986; Lucas, 1988). A motivating idea in their work was that in the long run, output per unit of input could increase even when inputs were exhaustively accounted for. In principle innovative human capital and a growing knowledge base give the idea to be part of this origin of growth. A suggestion of Lucas' hypothesis on human capital is therefore associated with investment in man and his development as innovative and productive resources (Harbison, 1962).

Wobst et al (2005) examine the long term effects of increased school enrollment (and effective attendance) on economic growth in Tanzania using a dynamic computable general equilibrium (DCGE) model found that an increase in human capital formation in the long run leads only to a moderate increase of economic growth rates but to a substantial improvement of factor incomes to low education households, while overall income effects are

Pareto efficient.

As the global economy shifts on the way to more knowledge-based sectors (e.g. the manufacture of ICT devices, pharmaceuticals, telecommunications and other ICT based services, R&D, skills and human capital development turn out to be a central issue for policy makers and practitioners engaged in economic development both at the national and regional level(OECD,1996); yet the impact education and vocational training activities employ upon changing national and regional economies remain less than thoroughly explained and analyzed. In the meantime, the introduction of human capital theory in the 1960s, a number of studies have tried to address this and allied issues. Today, the global economy is divided into four parts comprising of (1) Low Income ($1035 or less), (2) Lower Middle Income ($1036 to $4085), (3) Upper Middle Income ($4086 to $12,615) and (4) High Income ($12,615 or more) based on per capita GNI (World Bank 2013). Bangladesh is classified under the lower middle income countries. Bangladesh as a country is vastly endowed both in natural and human resources. The pool of resources from one end to the other is immeasurable to such extent that, given a dynamic leadership, economic prosperity would have been achieved in first decade of 21th century. The primary focus of Bangladesh has been finding a way to speed up the growth rate of national income and to take part in structural transformation of her subsistence and resource based economy to a production and consumption based economy in order to achieve the upper middle income economies status.

Human capital talks about the abilities and skills of human resources and human capital development states the process of acquiring and increasing the number of persons who have the skills, education and experience which are critical for the economic growth of the country (Harbison, 1964). Therefore, what really matters in Bangladesh is the empowerment of people and the mobilization of economic surplus into productive investment channels. There is also the need for the Bangladesh economy to eliminate or minimize those constraints towards human capital development so as to enhance rapid economic growth.

The World Development Report (1997) studies how knowledge influences development. The report emphasizes some well – known lessons, such as the value of knowledge gained over and done with trade and foreign investment. It also highlights others that have sometimes been passed over, such as how imperfect information leads to failure in all markets and the importance of institution to facilitate the flow of information. In addition, the report looks at the role of knowledge in development, examining difference in knowledge across and within the countries, the impact of knowledge gaps and information failures on development, and the way in which governments in developing countries and international institutions can foster development by addressing these issues.

Studies have shown the handsome returns to various forms of human capital accumulation: basic education, research, training, and learning – by doing and capacity building. Education enriches peoples understanding of themselves and the world. It improves the quality of their lives and leads to broad social benefit to individual and society. Education raises people's productivity and creativity and promotes entrepreneurship and technological advances, demonstrated in several countries such as Malaysia, Bolivia, China (World Bank, 1999).

Pritchett (2001) shown that cross-national data shows no association between increase in human capital attributable to the rising educational attainments of the labor force and the rate of growth of output per worker. Specifically, he reports that the estimates of the effect of growth in education capital on growth per workers are insignificant.

The effects of health on economic performance are usually discussed at both the micro and macro levels in the literature. Evidence of this link at the micro level has been discussed extensively elsewhere (see Schultz, 2002). Good health is a necessary condition for school attendance since a child has to be healthy to endure the rigours of schooling. Also, healthier students, in contrast to their less healthy counterparts, have lower malingering and higher cognitive functioning, and thus receive a better education for a given level of schooling which in turn guarantees higher earning over a longer period of time. Sound health enhances worker's productivity through the spill-over effects on their physical and mental abilities. All other things being equal, it is presumed that healthy workers work harder and longer and reason more plainly than those who are less gifted with good health. Good health can also minimize the incidence of poverty through higher labor participation and reduction in cost of medical services, thus releasing income for other welfare improving consumption. This condition holds irrespective of whether the worker is skilled or unskilled.

Dauda (2010), in his study on human capital formation and economic growth in Nigeria used the endogenous growth model in his investigation into their relationship, he employed enrolment in the different levels of education, primary, secondary and tertiary as proxies for human capital and found long-run positive relationship between human capital formation and economic growth in Nigeria with a feedback mechanism.

Arora (2001) in his study discovered that there is a cointegrated relationship between health and income; innovations in health according to him lead to economic growth and not vice versa. Bloom and Sachs (1998) have obtained empirical evidence that health and demographic variables play an important role in determining economic growth rates. Taniguchi (2003) in his works showed that both education and health cause each other and thus contribute to economic growth. Agiomirgianakis et al (2002) conducted panel study consisting of 93 countries on impact of education on economic growth, their results showed a significant positive long run impact of education (primary, secondary and tertiary) on economic growth.

Bloom et al (2004) tried to investigate the impact of human capital on economic growth by utilizing 2 stage least square approach, it was discovered that schooling and life expectancy both positively contribute to economic growth.

Khan (2005) tries to analyze the relationship between human capital and economic growth in 72 developing countries for the period 1980-2002. The study concludes that which invested significantly in human capital have achieved higher returns in terms of economic growth. Khan and Rehman (2012) used analytical techniques, which are OLS and Johansen cointegration to investigate the impact of human capital in economic growth of Pakistan. The result support significant positive association between secondary education and economic growth.

2 Objectives of the Study

The effect of human capital development on economic growth holds a lot of benefits to our overall economic progress. The government and its agencies will find this work resourceful in formatting policy, directives and regulations for human capital development to aid economic growth. The broad objective of this research is to evaluate the impact of human capital development on economic growth in Bangladesh. The specific objectives are as:

a) To examine the structure of human capital development in Bangladesh; the various means of human capital development in Bangladesh.

b) To analysis the relative size and trends of human capital development and its possible prospects in the emerging global economic growth.

c) To investigate the empirical relationship between human capital and economic growth in Bangladesh.

3 Theoretical Framework

Human capital theory shows how education leads to increase in productivity and efficiency of workers by increasing the level of their cognitive skills. Theodore, Schultz, Gory Bucker and Jacob Mincer introduced the notion that people invest in education or as to increase their stock of human capabilities which can be formed by combining innate abilities with investment in human beings (Babalola, 2000). Examples of such investments include expenditure on education, on the job training, health, and nutrition. However, the stock of human capital increases in a period only when gross investment exceeds depreciation with the passage of time, with intense use or lack of use. The provision of education is seen as a productive investment in human capital, an investment which the proponents of human capital theory considers to be equally or even more equally worthwhile than that in physical capital. Human capital theorists have established that basic literacy enhances the productivity of worker's low skill occupations. They further state instruction that demands logical and analytical reasoning that provides technical and specialized knowledge increases the marginal productivity of workers in high skill or profession and positions. Moreover, the greater the provision of schooling society and consequently, the greater the increase in national productivity and economic growth.

3.1 The Modernization Theory

This theory focuses on how education transforms an individual's value, belief and behaviour, exposure to modernization institutions such as schools, factories, and mass media inculcate modern values and attitudes. The attitude includes openness to new idea, independences from traditional authorities, willingness to plan and calculate further exigencies and growing sense of personal and social efficacy. According to the modernization theorists, these normative and attitudinal changes continue throughout the life cycle, permanently altering the individual's relationship with the social structure. The greater the number of people exposed to modernization institutions, the greater the level of individual modernity attained by the society. Once a critical segment of a population changes in this way, the pace of society's modernization and economic development quickens. Thus, educational expansion through its effects on individual values and benefits sets in motion the necessary building blocks for a more productive workforce and a more sustained economic growth.

3.2 The Dependence Theory

This theory arose from Marxist conceptualizations based on the dynamic world system that structures conditions for economic transformation in both the core and periphery of the world economy. Certain features of the world polity such as state fiscal strength, degrees and regime centralization and external political integration may contribute to economic growth in the developing world.

4 Human Capital Strategy in Bangladesh

The experience of the East Asian NIEs suggests that these economies succeeded in achieving higher growth rates than the world averages due to the large base of human capital mainly as a result of investments on education, health, R&D, etc. At the outset, a large fraction of unskilled workforce and a minuscule physical capital were the core resources for their industrial development. With the accumulation of human capital stock, these countries eventually attracted high value-added MNCs and caused faster economic growth (Khan, 2007).

Table 1: Government Expenditure on Education (% of GDP), 2006-2014.

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bangladesh	1.90	2.23	2.15	1.94	1.94	1.95	1.94	1.94	1.94
Japan	3.28	3.29	3.29	3.27	3.29	3.28	3.30	3.29	3.29
Hong Kong	3.80	3.60	3.20	3.80	3.40	3.40	3.50	3.80	3.80
Malaysia	4.49	4.37	3.96	5.97	5.12	5.94	6.13	5.80	5.87
India	3.10	3.10	3.10	3.10	3.20	3.20	3.30	3.30	3.40
Pakistan	2.60	2.80	2.90	2.80	2.70	2.70	2.40	2.40	2.40
Sri Lanka	2.10	2.10	2.10	2.10	2.00	2.00	2.00	2.00	2.00

Source: Human Development Reports, 2015

Although lagging behind the East Asian counterparts, Table 1 shows that Bangladesh has performed really well in comparison to Japan and the South Asian neighbors. In light of the current level of investment on HRD in the South Asian countries and Japan, it would not be difficult for Bangladesh to develop the skills required for attracting investment in hi-tech industry, e.g., engineering, chemicals, etc.

Table 2: Average Yearly R&D Spending in Selected Countries (% of GDP), 2006-2014.

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bangladesh	.03	.03	.03	.03	.03	.03	.03	.03	.03
Japan	3.4	3.5	3.5	3.4	3.3	3.4	3.4	3.4	3.4
Korea	3.0	3.2	3.4	3.6	3.7	3.4	3.5	3.4	3.5
Hong Kong	.80	.80	.70	.80	.70	.70	.80	.80	.80
Malaysia	.60	.80	1.0	1.1	1.1	1.1	1.1	1.1	1.1
India	.80	.80	.80	.80	.80	.80	.80	.80	.80
Pakistan	.40	.40	.60	.60	.40	.30	.30	.30	.30
Sri Lanka	.20	NA	.10	NA	.20	NA	NA	NA	NA

Source: Organisation for Economic Co-operation and Development Reports, 2015.

Note: NA stands for not available.

Virmani and Rao (1999) highlighted that global industrial R&D per head nearly trebled in 13 years, from $23 in 1985 to $72 in 1997. In the industrial countries, the figures were $122 and $402, and in the developing world, they were $0.7 and $4.6. East Asia (excluding China) spends $31 per capita on R&D, compared to only $0.3 for South Asia and $6.3 for Latin America (Lall, 2002). A picture of the R&D expenditure in Bangladesh is compared with respect to the Japan, East Asian Tigers economies (South Korea, Taiwan and Singapore) and South-East Asian emerging economies (Indonesia, Malaysia and Thailand) in Table 2.

Behrman and Fischer (1980), in their case studies on R&D in developing countries (DCs), indicate that R&D activity in the developing world is only able to adapt imported product and process technologies to local conditions. But there is evidence which suggests that the DCs also perform R&D activities oriented towards a search for and developing new products and processes (new from the point of view of the Third World) as well as basic research (Brundenius and Goransson, 1993; Parthasarathi, 1987). Some of the trends observed in technology transfer (TT) in the DCs indicate that R&D has not been playing a leading role in those countries. Due to lack of recognition of the role of research in innovation, DCs usually spend a negligible amount on R&D (Virmani and Rao, 1999). Bangladesh, being a DC, is no exception in this regard. As Table 2 shows, R&D expenditure in Bangladesh has been very insufficient as compared to the leading Asian NIEs during 1994-2008. Empirical validation of this observation by checking R&D's contribution in Bangladesh' growth is, therefore, of interest in this study. Table 3 shows the health expenditure as percent of GDP from the year 2006-2014. The expenditure on health of Japan is more than two folds of Bangladesh.

Table 3: Health Expenditure (as % of GDP), 2006-2014.

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014
Bangladesh	3.2	3.33	3.3	3.3	3.5	3.6	3.5	3.7	3.7
Japan	8.2	8.2	8.6	9.5	9.6	10.1	10.13	10.3	10.40
Korea	6.1	6.4	6.6	7.2	7.3	7.4	7.6	7.2	7.3
Malaysia	3.7	3.6	3.5	4.0	4.0	3.9	4.0	4.0	4.0
India	4.1	3.9	4.0	4.1	3.8	3.8	3.8	4.0	4.0
Pakistan	3.7	3.6	3.4	2.9	3.0	3.0	2.8	2.8	2.8
Sri Lanka	4.0	3.7	3.4	3.3	3.4	3.3	3.1	3.2	3.2

Source: Human Development Reports, 2015

5. EMPIRICAL METHODOLOGY

The present study uses time series data of GDP as proxy for economic growth; total government expenditure on education and health, and the enrolment pattern of higher education, secondary and primary schools as proxy for human capital during the period 1981-2014 to investigate the relationship between human capital development and economic growth. Data on expenditure on education, expenditure on health, school enrolment in primary level, school enrolment in secondary level, school enrolment in tertiary level and gross domestic product have collected from World Development indicator data base, World Bank 2015, Human Development Report 2015, Organisation for Economic Co-operation and Development Reports 2015 and Economic Review 2015, Ministry of Finance, Bangladesh. Almost most of the econometric time series data shows trends and are non-stationary (Phillips, Perron, 1988). Any time series has a unit root where its first difference is stationary. Consequently, as firstly in empirical analysis with any time series is to test for the existence of unit roots in order to remove the problem of spurious regression. In this stage, it is needed to explore the order of each variable to found whether it contains unit roots and how many times it needs to be differenced to draw a stationary series.

The error correction mechanism first introduced by Sargan (1984) and later popularized by Engel and Granger (1987). Since variables in the growth model are cointegrated, an error correction representation would be a more appropriate modelling strategy to capture short-run and long-run dynamics in the model. When variables are cointegrated that is, there is a general and systematic tendency for the series to return to their equilibrium value. The Granger representation theorem states that if a set of variables is cointegrated, then their exists an ECM describing that relationship. This theorem is a vital result as implies that cointegration and ECMs can be used as a unified empirical and theoretical framework for the analysis of both short-run and long-run behaviour.

6. RESULT ANALYSIS

6.1 Descriptive Statistics

Table 4 shows the basic characteristics of the collected data, which is in general called as the descriptive statistics of the data.

Table 4: Descriptive Statistics of the Data on Variables

Variables	Mean	Max.	Min.	SD	Variance
GDP	4.95	6.70	2.15	1.25	0.46
Education Expenditure (%)	1.40	2.23	0.70	0.38	0.14
Health Expenditure (% GDP)	2.65	3.84	1.52	0.68	0.46
School Enrolment in Primary	87.84	119.80	65.89	15.66	245.51
School Enrolment in Secondary	36.38	57.32	16.53	13.50	182.36
Enrolment in Tertiary	6.52	14.90	2.99	3.28	1.57

Source: Authors own calculation

6.2 Testing for Stationary

We used Augmented Dickey Fuller (ADF) unit root test to check whether our variables Gross Domestic Product (GDP), Expenditure on Education (EXE), Expenditure on Health (EXH), School Enrolment in Primary Level (SEP), School Enrolment in Secondary Level (SES), and School Enrolment in Tertiary Level (SET) are stationary. All of the variables are used in logarithmic form. The result is also further justified by Phillips–Perron (PP) Test. The results of these tests are presented in the Table 5.

Table 5: Result of Unit Root Test

Variable	ADF			PP		
	Level	First Difference	Critical Values	Level	First Difference	Critical Values
$\ln GDP$	6.48	-3.28**		8.01	-3.31**	
			-3.65(1%)			-3.65(1%)
$\ln EXE$	0.49	-6.96***		0.98	-7.03***	
$\ln EXH$	-1.34	-6.04***		-1.36	-14.57***	
			-2.95(5%)			-2.95(5%)
$\ln SEP$	0.06	-6.09***		1.12	-7.00***	
$\ln SES$	-1.12	-4.59***		-1.20	-4.61***	
			-2.61(10%)			-2.61(10%)
$\ln SET$	0.36	-3.67***		0.08	-3.59**	

Note: Superscripts***, ** and * indicate rejection of null hypothesis at 1%, 5% and 10% level of significance respectively.

Table 5 reveals that the time series ln*GDP*, $\ln EXE$, *lnEXH*, *lnSEP*, ln*SES*, and *lnSET* are non-stationary at their levels, while first difference make them stationary. Thus, we conclude that the variables are stationary and it is integrated of order one. Both the ADF and the PP test provide the same result.

6.3 Testing for Cointegration

6.3.1 Result of Engle-Granger Residual Based ADF Method

According to Engle- Granger residual based ADF method as proposed by Engle and Granger (1987), the test method and process is as follows:

First step, equation estimating using Ordinary Least Square (OLS) method:

$$\ln GDP = \beta_1 + \beta_2 \ln EXE + \beta_3 EXH + \beta_4 SEP + \beta_5 SES + \beta_6 SET + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

If β_i are the estimation values of regression coefficients, the estimated value of model residual may be expressed as:

$$\hat{u}_t = \ln GDP - \beta_1 - \beta_2 \ln EXE - \beta_3 EXH - \beta_4 SEP - \beta_5 SES - \beta_6 SET \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Second step, cointegration test of error series $\left(\hat{u}_t \right)$. $\left(\hat{u}_t \right)$ is n-order integrated series if $\hat{u}_t$ is stationary series after n-difference, and it may be regarded that there is cointegration relation between time series of $\ln GDP$ and $\ln EXE$, $\ln EXH$, $\ln SEP$, $\ln SES$, and $\ln SET$. The following regression results can be obtained after analyzing the actual annual data of gross domestic product (GDP) and *EXE*, *EXH*, *SEP*, *SES*, and *SET* from 1981 to 2014 with E-views software according to the above method. After regressed $\ln GDP$ on $\ln EXE$, $\ln SEP$, $\ln SES$, and $\ln SET$, we obtain the following outputs:

Table 6: Ordinary Least Square (OLS) Regression

Dependent Variable: $\ln GDP$

Method: Least Squares

Sample: 1981 2014

Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.87	0.55	10.67	0.0000
$\ln EXE$	0.29	0.03	9.66	0.0000
$\ln EXH$	-0.07	0.08	-0.87	0.3989
$\ln SEP$	0.38	0.14	2.71	0.0110
$\ln SES$	0.21	0.03	7.00	0.0000
$\ln SET$	0.15	0.04	3.75	0.0001
R-squared	0.99	Mean dependent variable		24.63
Adjusted R-squared	0.99	S.D. dependent variable		0.47
Durbin Watson stat	1.42			

Source: Authors own calculation

So, our estimated regression model is

$$\ln GDP = 5.87 + 0.29\ln EXE - 0.07 EXH + 0.38 SEP + 0.21 SES + 0.15 SET \ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Where
GDP = Gross Domestic Product
EXE = Government Expenditure on Education
EXH = Government Expenditure on Health
SEP = School Enrollment in Primary Level
SES = School Enrollment in Secondary Level
SET = School Enrollment in Tertiary Level
In stands for logarithm transformation

Since $\ln GDP$ on $\ln EXE$, $\ln EXH$, $\ln SEP$, $\ln SES$, and $\ln SET$ are individually non stationary, there is the possibility that this regression is spurious. But when we performed a unit root test on the residuals obtained from equation (2), we obtained the following results.

Table 7: ADF Unit Root Test of OLS Residual

Null Hypothesis: RES1 has a unit root

Lag Length: 0 (Automatic based on SIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic (Constant and Trend)		-6.87	0.0000
Test critical values:	1% level	-3.65	
	5% level	-2.95	
	10% level	-2.61	

*MacKinnon (1996) one-sided p-values.

Source: Authors own calculation

Since the computed Augmented Dickey-Fuller test statistic (-6.87) at constant and trend is much more negative than the critical values [1% level (-3.65), 5% level (-2.95) and 10% level (-2.61)] and our conclusion is that the residuals from the

regression of $\ln GDP$ on $\ln EXE$, $\ln EXH$, $\ln SEP$, $\ln SES$, and $\ln SET$ are integrated of order zero. Hence, the equation (2) is a conintegrating regression and this regression is not spurious, even though individually the variables are non-stationary.

To sum up, our conclusion based on the result of Engle-Granger residual based ADF method, is that $\ln GDP$ and $\ln EXE$, $\ln EXH$, $\ln SEP$, $\ln SES$, and $\ln SET$ are cointegrated. Although they individually exhibit random walks, there seems to be a stable long-run relationship between them; OLS regression results states that there is positive relationship among expenditure on education, school enrolment in primary level, school enrolment in secondary level, school enrolment in tertiary level and gross domestic product. There is a negative relationship between expenditure on health and gross domestic product and it is statistically insignificant.

6.3.2 Error Correction Mechanism

From the cointegration test we found that $\ln GDP$ and $\ln EXE$, $\ln EXH$, $\ln SEP$, $\ln SES$, and $\ln SET$ are cointegrated; that is, there is a long run relationship among the variables. Of course, in the short run there may be disequilibrium. There for we can treat the error term $\hat{u}_t$ in equation (2) as the "equilibrium error". And we can use this error term to tie the short run behaviour of $\ln GDP$ to its long run value.

Table 8: Differential Coefficient of Error Correction Term in ECM-Regression Results

Dependent Variable: $\Delta(\ln GDP)$

Method: Least Squares

Sample: 1981 2014

Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.041	0.0040	10.28	0.0000
$\Delta(\ln EXE)$	0.044	0.021	2.090	0.0040
$\Delta(\ln EXH)$	-0.006	0.023	-0.260	0.7887
$\Delta(\ln SEP)$	0.013	0.057	0.228	0.8258
$\Delta(\ln SES)$	-0.040	0.033	1.210	0.2385
$\Delta(\ln SET)$	0.058	0.025	2.320	0.0200
RESID(-1)	-0.1179	0.050	2.360	0.0100
R-squared	0.64			
Durbin Watson stat	1.71			

Source: Authors own calculation

For our study the error correction model can be estimated as follows:

$$\Delta \ln GDP_t = 0.041 + 0.044\Delta \ln EXE_t - 0.006\Delta \ln EXH_t + 0.012\Delta \ln SEP_t - 0.040\ln SES_t +$$

$$0.058\Delta \ln SET - .117u_{t-1} ....(4)$$

There is a positive relationship between short run adjustment of expenditure on education and short run adjustment of gross domestic product, since the sign of the elastic coefficient is positive. The adjustment of expenditure on health and the adjustment of gross domestic product have a negative relationship. The adjustment of school enrolment in primary level, adjustment of tertiary level enrolment have a positive relationship with adjustment of gross domestic product. The adjustment of school enrolment in secondary level and the adjustment of gross domestic product have a negative relationship. In the table 8, the coefficient on error correction term is negatively significant. This provides an information on the short run relationship among Gross Domestic Product and expenditure on education, expenditure on health, school enrolment in primary level, school enrolment in secondary level, and school enrolment in tertiary level. The estimate of coefficient of error correction term, known as constant elasticity, specifies that the changes in expenditure on education, expenditure on health, school enrolment in primary level, school enrolment in secondary level, school enrolment in tertiary level respond to a deviation

from the long run equilibrium. This shows that 11.70 percent of disequilibrium in t-1 period is corrected in t period. Thus, though there is disequilibrium between short run and long run, about 11.70 percent of the disequilibrium in t-1 period is adjusted every year by the changes in expenditure on education, expenditure on health, school enrolment in primary level, school enrolment in secondary level, school enrolment in tertiary level.

7. Conclusions and Policy Recommendations

The study found out the impact of human capital development on economic growth in Bangladesh. It shows logical methods understanding the significance of human capital development on economic growth. In this study it is proved that human capital development has a statistically significant impact on economic growth, a statistical analysis was embarked upon where cointegration and error correction model (ECM) was used to evaluate the relationship between human capital development and economic growth for the period 1981-2014. High level of human capital development holds the key to the nation's socio-economic development as proved by this research. The study shows that human capital development is beneficial and remains an essential tool of economic growth in Bangladesh. The government expenditure on education, and health were significantly related to economic growth in Bangladesh. The primary, the secondary, and the tertiary school enrolments were also statistically significant for economic growth in Bangladesh. From the findings of this study, it is recommended that government expenditure on education should be increased in budgetary allocation for Bangladesh. It is also recommended that the government should keen on improving the standard of education in Bangladesh.

This study opens up a new ground for further research. Further research can address the issue on how can we make our human capital encouraging for economic growth in Bangladesh. It may also study that in which levels (Primary, Secondary and tertiary) government should increase its expenditure for its economic development.

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