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Investment In Human Capital And Growth In Nigeria (1980-2012)

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Abstract: *This study attempts to examine the relationship between real gross domestic product and government expenditure in human capital investment (which includes expenditure on education, health and other social and community services) between 1980 and 2012. The study further disaggregated total government expenditure into capital and recurrent expenditure. A vector autoregressive (VAR) approach was adopted as the methodology. Johansen cointegration test suggests that RGDP, CEHCI and REHCI are cointegrated in Nigeria. Granger causality test reveals that there is causality running from CEHCI and REHCI to RGDP in the long run. Moreover, there is a bi-directional causality between CEHCI and RGDP in the long run but a single directional running from CEHCI to REHCI. The variance decomposition generated suggests that CEHCI is relatively more important than REHCI in explaining the variations in economic growth (RGDP) as CEHCI also proved to explain the variations in REHCI than economic growth. The impulse response function confirmed that a shock to CEHCI and REHCI has a positive effect on economic growth in Nigeria. Government should therefore increase capital expenditure to human capital investment.*

Keywords: *Causality; Cointegration; Variance Decomposition; Impulse Response Function; Real Gross Domestic Product; Current Expenditure; Recurrent Expenditure; Human Capital Investment.*

I. Introduction

The new endogenous growth theories in economics have proven to be significant in the introduction of the active role of human capital in the growth of every economy. Human capital is the term often used in economics for "education, health and other human capacities that can raise productivity when increased" (Todaro and Smith, 2003). Health and education are two closely related human capital components that work together to make the individual more productive.

Taking one component as more important than the other is unrealistic as an educated individual, who is ill, is as inefficient as an illiterate. Both components are thus considered as complements. Appleton and Teal (1998) described "health and education as components of human capital that are contributors to human welfare". They (Appleton and Teal) considered these components as "different as different from other types of good products in societies". Health and education are often subsidized by the state and in some countries education is compulsory for certain minimum length of time.

Human capital can be viewed from two perspectives: the narrow sense which deals with just education, or the broader sense which adds health to the education components. It has become conventional to discuss human capital in its narrows sense because "expenditure on education and tanning is capable of measurement as compared to healthcare" (Jhingan, 2005). Healthcare shall however be included in this study. Aigbokhan et al (2007) consider "education to be a basic and obvious process by which skills, knowledge and attitude are acquired for the performance of socio-economic responsibilities, social integration, improving personal competence, and seeking better opportunities". In the words of Leeuwen (2007), "human capital is implicitly referred to as formal and informal education yet it can also contain factors such as the costs of raising children, health costs ahead of health, showing the priority placed on it. Human capital theory thus focuses on health and education as inputs in economic production.

The economic rationale for investing in human capital derives from the belief that human capital plays a key role in economic growth. According to Todro and Smith (2003), "human capital must be given direct attention in its own right, even in economies that are growing rapidly. This point to the important of this key concept not for just developing countries who wish to break free of their vicious cycle, but also developed countries that aspire to achieve sustainable growth and development.

In this paper, following the introduction, an empirical review on the subject will be presented. After a brief reference to the vector Autoregressive model, we will study empirical results and then end with conclusion and recommendation.

II. Empirical Review

Ordinary Least Square (OLS) Methodology was adopted by Arden (2013) in effort to investigate the relationship between investment in human capital and economic growth in Nigeria between 1980 and 2010. His (Arden) study examined education and health as the two different channels through which human capital can influence economic growth in Nigeria. The study found out that government expenditure on education is insignificant at 5 percent significant level and thus recommends that Government should invest more on education and re-structure the curricula of higher education and making it more practical oriented. He further recommended that emphasis should be placed on technical/engineering courses and on-the-job training.

Simon-Oke (2012) investigated the relationship between human capital investment and industrial productivity in Nigeria using secondary data spanned through 1978 to 2008. Co-integration and Error Correction Mechanism (ECM) was employed to examine the nexus between human capital investment and industrial productivity. Granger causality test was also adopted as a supplementary estimation method to explore the nature of causality among the variables established in the model. The study found that government expenditure on education maintained a positive long run relationship with index of industrial production while government expenditure on health and Gross Capital Formation exhibited long run negative relationship with the dependent variable. Consequently it was recommended among others that more stock of physical capital needed to be acquired, to facilitate more investment in human capital and thereby enhance industrial productivity in Nigeria.

In a research conducted by Ditimi and Nwosa (2011), it was discovered that there exist no causality between human capital development and economic growth in Nigeria between 1970 and 2009. Their (Ditimi and Nwosa) study examined the causal nexus between human capital Investment and economic growth in Nigeria for sustainable development in Africa using Vector Error Correction (VEC) and Pairwise granger causality methodologies. The result of the empirical analysis conducted showed that the variables used were stationary at first differencing but not co-integrated. The study recommends the need to increase budgetary allocation to the education and health sector and the establishment of sound and well functioning vocational institute needed to bring about the needed growth in human capital that can stimulate economic growth.

Furthermore, Atoyebi et al (2013) undertook a research that focuses on 'the effect of human capital development in Nigeria' with the general aim of examining the relative effect of human capital development and economic growth and also to evaluate the effect of physical formation on economic output in Nigeria. The findings from the cointegration regression result test show that there is a strong evidence of cointegration between RGDP and HDI. They (the researchers) recommended that government should endeavour to provide enabling environment by ensuring macroeconomic stability and increased investment in human capital by corporate individuals.

Lastly, Oluwatobi and Ogunrinola (2011) investigated the relationship between human capital development efforts of the Government and economic growth in Nigeria. The study was designed to find out the impact of government recurrent and capital expenditures on education and health in Nigeria and their effect on economic growth between 1970 and 2008. The data used for the study are from secondary sources while the augmented Solow model was also adopted. The dependent variable in the model is the level of real output while the explanatory variables are government capital and recurrent expenditures on education and health, gross fixed capital formation and the labour force. The OLS methodology was adopted. The result shows that there exists a positive relationship between government recurrent expenditure on human capital development and the level of real output, while capital expenditure is negatively related to the level of real output. The study recommends appropriate channeling of the nation's capital expenditure on education and health to promote economic growth.

III. Econometric Framework

3.1 Data and Model Specification

The series comprise annual observations from the period of 1980 to 2012 in Nigeria. The study employs data on economic growth and human capital investment for Nigeria. Economic growth is measured by the real gross domestic product (RGDP) while human capital investment variable is measured by capital expenditure on human capital investment (CEHCI) and recurrent expenditure on human capital investment (REHCI). All data is extracted from the Central Bank of Nigeria Statistical Bulletin.

First, all variables are transformed into the natural logarithmic form as the equation:

$$RGDP_t = \beta_0 + \beta_1 CEHCI_t + \beta_2 REHCI_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where $RGDP_t$ is the natural logarithm of real gross domestic product, $CEHCI_t$ is the natural logarithm of capital expenditure on human capital investment, $REHCI_t$ is the natural logarithm of recurrent expenditure on human capital investment, and ε_t is white noise error terms. The β_1 and β_2 are expected to have positive signs.

3.2 Estimation Method

A descriptive statistics for all the variables was first carried out; and then followed by correlation analysis. The study also conducts a stationarity test of each variable by employing the augmented Dickey-Fuller

(ADF) (Dickey and Fuller, 1981) and Phillips-Perron (PP) (Phillips and Perron, 1988) unit root tests. Next, a system-wise Johansen cointegration test (Johansen, 1988; Johansen and Juselius, 1990) is used to analyze the presence of the long-run equilibrium relationship between real gross domestic product (RGDP), capital expenditure on human capital investment (CEHCI) and recurrent expenditure on human capital investment (REHCI). A multi-variate vector autoregressive (VAR) equation was also estimated in this study.

Vector Autoregressive (VAR) Models

VAR models are the best methods for investigating shock transmission among variables because they provide information on impulse responses (Adrangi and Allender, 1998). Zellner and Palm (1974), Zellner (1979), and Palm (1983) showed that any linear structural model can be written as a VAR model. Therefore a VAR model serves as a flexible approximation to the reduced form of any wide variety of simultaneous structural models.

Considering three economic time series RGDP, CEHCI and REHCI which represents the relationship between RGDP and government expenditure on human capital investment variables (i.e CEHCI and REHCI), the VAR model would be as follows:

$$\Delta RGDP = \alpha_1 + \sum_{i=1}^{k} \vartheta_{1i} \Delta RGDP_{t-i} + \sum_{i=0}^{k} k_{1i} \Delta CEHCI_{t-i} + \sum_{i=1}^{k} \delta_{1i} \Delta REHCI_{t-i} + \psi_1 EC_{t-1} + \varepsilon_{1t} \quad \ldots\ldots (2)$$

$$\Delta CEHCI = \alpha_2 + \sum_{i=0}^{k} k_{2i} \Delta CEHCI_{t-i} + \sum_{i=1}^{k} \vartheta_{2i} \Delta RGDP_{t-i} + \sum_{i=1}^{k} \delta_{2i} \Delta REHCI_{t-i} + \psi_2 EC_{t-1} + \varepsilon_{2t} \quad \ldots\ldots\ldots (3)$$

$$\Delta REHCI = \alpha_3 + \sum_{i=1}^{k} \delta_{3i} \Delta REHCI_{t-i} + \sum_{i=0}^{k} k_{3i} \Delta CEHCI_{t-i} + \sum_{i=1}^{k} \vartheta_{3i} \Delta RGDP_{t-i} + \psi_3 EC_{t-1} + \varepsilon_{3t} \quad \ldots\ldots\ldots (4)$$

The equations above consist of the short- and long-run elements, where Δ is the first difference operator and the residuals ε_{it} are assumed to be normally distributed and white noise. From the above equations, EC_{t-1} is the one period lagged error-correction term which derives from the cointegrating equation. However, in the absence of cointegration, this term will be excluded. The significance of the EC_{t-1} term represents the long-run causality.

IV. Empirical Analysis and Findings

4.1 Descriptive Statistics and Correlation Matrix

Descriptive Statistics

Table 1: Descriptive Statistics of Variables

	RGDP	CEHCI	REHCI
Mean	420810.0	36416.34	113542.1
Median	367218.1	8656.200	15989.18
Maximum	888893.0	152174.6	640100.0
Minimum	31546.76	237.6000	270.4500
Std. Dev.	196269.3	49208.49	182765.3
Probability	0.228952	0.009601	0.000001
Observations	33	33	33

Note: RGDP stands for real gross domestic product, CEHCI is capital expenditure on human capital investment, and REHCI stands for recurrent expenditure on human capital investment.

From table 1 above, real gross domestic product has an average of 420810.0 between 1980 and 2012. It ranges from 31546.76 to 888893.0 with a standard deviation of 196269.3. Capital expenditure on human capital investment has a mean of 36416.34 for the period under study. It varies from a minimum of 237.6 to a maximum of 152174.6 with a standard deviation of 49208.49.

Recurrent expenditure on human capital investment has an average of 113542.1. It ranges from 270.4500 to 640100.0 with a standard deviation of 182765.3.

Correlation Matrix

Positive correlation exists among all the variables; with the existence of high correlation between all the variables (see table 2). For example, the correlation between RGDP and CEHCI is 86.9% while that between RGDP and REHCI is 91.5%. Also, the correlation between CEHCI and REHCI is 81.4 per cent.

Table 2: Correlation Matrix between Variables.

	RGDP	CEHCI	REHCI
RGDP	1.000	0.869	0.915
CEHCI	0.869	1.000	0.814
REHCI	0.915	0.814	1.000

4.2 Unit root, cointegration, and Granger causality

As a start to any time series analysis, there is need to ascertain if the time series data are non-stationary and/or non-cointegrated. For this reason, we conduct two unit root tests to scrutinize the order of integration for each of the variable under investigation. ADF and PP unit root tests proposed by Dickey and Fuller (1981) and Phillips and Perron (1988) respectively were employed to perform the test. Table 1 reports the results of the ADF and PP unit root tests.

Table 3: Result of ADF and PP Unit Root Test

Statistics (Level)	**RGDP**	**Lag**	**CEHCI**	**Lag**	**REHCI**	**Lag**
$\tau_{T(ADF)}$	-1.006139	(0)	2.711303	(6)	3.548349	(8)
$\tau_{\mu(ADF)}$	0.242769	(0)	-0.996840	(0)	6.098970	(5)
$\tau_{(ADF)}$	9.066528	(1)	-0.349362	(0)	6.688626	(5)
$\tau_{T(PP)}$	-1.280713	(0)	-2.429743	(0)	0.962928	(0)
$\tau_{\mu(PP)}$	0.242769	(0)	-0.888479	(0)	3.736632	(0)
$\tau_{(PP)}$	3.906838	(0)	-0.208961	(0)	5.013011	(0)
Statistics (First Difference)	**RGDP**	**Lag**	**CEHCI**	**Lag**	**REHCI**	**Lag**
$\tau_{T(ADF)}$	-18.50563*	(0)	-3.938256**	(5)	-6.502175*	(4)
$\tau_{\mu(ADF)}$	-1.942023	(1)	-7.539897*	(0)	2.126017	(8)
$\tau_{(ADF)}$	-0.519084	(1)	-7.448877*	(0)	2.794212	(8)
$\tau_{T(PP)}$	-14.30571*	(0)	-7.455480*	(0)	-6.154051*	(0)
$\tau_{\mu(PP)}$	-7.530127*	(0)	-7.476265*	(0)	-4.835690*	(0)
$\tau_{(PP)}$	-6.004135*	(0)	-7.252404*	(0)	-4.274406*	(0)

Note: RGDP represents real gross domestic product; CEHCI is the capital expenditure on human capital investment; REHCI is the recurrent expenditure on human capital investment. τ_T *stands for the most general model with an intercept and trend;* τ_μ *is with an intercept but without trend;* τ *is the one without intercept and without trend. Numbers in parentheses are optimum lags in the case of ADF test (AIC). In the case of PP test, numbers in parentheses represent Newey-West Bandwith (Bartlett-Kernel). Unit root tests were performed from the most general to the most restricted model as also suggested by Enders (1995). *, ** and *** represent the rejection of the null hypothesis at alpha 1 percent, 5 percent and 10 percent respectively. Tests were carried out in E-VIEWS 7.1.*

The result in tables 3 reveals that none of the variables was stationary at levels. The unit root tests applied to RGDP, CEHCI and REHCI at levels reject the null hypothesis of stationarity. The ADF and PP test applied to the difference of RGDP, CEHCI and REHCI time series accept the null hypothesis of stationarity. RGDP, CEHCI and REHCI are all integrated of order one.

Table 4: Johansen Cointegration Test for RGDP, CEHCI and REHCI

Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: RGDP CEHCI REHCI
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.763749	58.30662	29.79707	0.0000
At most 1	0.289975	13.57790	15.49471	0.0953
At most 2	0.091119	2.961790	3.841466	0.0853

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.763749	44.72872	21.13162	0.0000
At most 1	0.289975	10.61611	14.26460	0.1745
At most 2	0.091119	2.961790	3.841466	0.0853

Notes: VAR includes one lag on each variable and a constant term. The estimation period is 1980-2012. None of the deterministic variables is restricted to the cointegration space; the maximum eigenvalue and trace test statistics are adjusted for degree of freedom.

The result of the cointegration test is presented in table 4 above. The result suggests that the null hypothesis of no cointegration between RGDP, CEHCI and REHCI is rejected. The test for cointegration of RGDP, CEHCI and REHCI show cointegration of real gross domestic product, capital expenditure on human capital investment and recurrent expenditure on human capital investment at 5% level.

Vector Auto-regressive Model including RGDP, CEHCI and REHCI

To provide an empirical insight into the relationship between real gross domestic product, capital expenditure on human capital investment and recurrent expenditure on human capital, the three-variable VAR model is specified using RGDP, CEHCI and REHCI. The unit root and cointegration test show that there is stationarity of variables. The strong evidence of cointegration of the series RGDP, CEHCI and REHCI implies the stability of the relationship among real gross domestic product, capital expenditure on human capital investment and recurrent expenditure on human capital.

Having tested for cointegration, the study estimates unrestricted vector autoregressive model in levels using one lags of each variable including a constant (in table 5). In literature, it has been demonstrated that VAR models can be applied in levels irrespective of whether the variable are I(0) or I(1) (Pesaran and Pesaran, 1997).

Table 5: Vector Auto-Regressive Estimates of RGDP, CEHCI and REHCI

Vector Autoregression Estimates
Included observations: 32 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	RGDP	CEHCI	REHCI
RGDP(-1)	0.640708	0.133683	0.031970
	(0.08238)	(0.05306)	(0.08835)
	[7.77785]	[2.51944]	[0.36186]
CEHCI(-1)	0.645802	0.717682	0.861299
	(0.24705)	(0.15913)	(0.26496)
	[2.61403]	[4.50998]	[3.25067]
REHCI(-1)	0.272771	-0.084466	0.879772
	(0.08166)	(0.05260)	(0.08758)
	[3.34022]	[-1.60580]	[10.0451]
C	123960.5	-33389.03	-11042.25
	(25017.5)	(16114.4)	(26831.1)
	[4.95495]	[-2.07200]	[-0.41155]
R-squared	0.974834	0.852693	0.970484
Adj. R-squared	0.972138	0.836910	0.967322
Akaike AIC	23.64454	22.76482	23.78451
Schwarz SC	23.82776	22.94803	23.96773

Ordering of Variables: RGDP, CEHCI and REHCI

From the estimation results presented in table 5, we shall first concentrate on the VAR equation attempting to explain the GROWTH (i.e RGDP), the left-most column. We discovered that all coefficients were significant and have positive signs. This implies that capital expenditure on human capital investment and recurrent expenditure on human capital investment influenced growth between 1980 and 2012 in Nigeria. All the VAR equations explaining RGDP, CEHCI and REHCI have high Coefficients of Determinations of 0.974834, 0.852693 and 0.970484 respectively. VAR estimation for RGDP reports the highest number of significant coefficients.

In the RGDP equation, all the coefficients were statistically significant at 1 percent. This implies capital expenditure on human capital investment and recurrent expenditure on human capital investment has important effect on growth. Again, the coefficients of RGDP and CEHCI for lagged one period are statistically significant at 1 percent in CEHCI equation. This implies that RGDP and CEHCI have predictive power for capital expenditure on human capital investment in Nigeria.

Between 1980 and 2012, CEHCI and REHCI have predictive power for recurrent expenditure on human capital investment. The result shows that CEHCI and REHCI for lagged one period are statistically significant at 1 percent in the REHCI equation.

Table 6: VAR-Granger Causality Test

VAR Granger Causality/Block Exogeneity Wald Tests

Sample: 1980 2012

Dependent variable: RGDP			
Excluded	Chi-sq	df	Prob.
CEHCI	6.833176	1	0.0089
REHCI	11.15706	1	0.0008
All	23.42349	2	0.0000

Dependent variable: CEHCI			
Excluded	Chi-sq	df	Prob.
RGDP	6.347599	1	0.0118
REHCI	2.578588	1	0.1083
All	6.352530	2	0.0417

Dependent variable: REHCI			
Excluded	Chi-sq	df	Prob.
RGDP	0.130946	1	0.7175
CEHCI	10.56684	1	0.0012
All	16.54392	2	0.0003

From table 6, the result shows that we may not reject the null hypothesis for some of dependent variable. We can reject the null hypothesis for the granger causality between real gross domestic product (RGDP) and capital expenditure on human capital investment (CEHCI) at all conventional levels of statistical significance (i.e at 10%, 5% and 1%). This implies that capital expenditure on human capital investment (CEHCI) causes gross domestic product (RGDP) since the coefficient on capital expenditure on human capital (CEHCI) is statistically different from zero. Again, we can reject the null hypothesis for the granger causality between real gross domestic product (RGDP) and recurrent expenditure on human capital investment (REHCI) at all conventional levels of statistical significance (i.e at 10%, 5% and 1%). This implies that recurrent expenditure on human capital investment (REHCI) causes real gross domestic product (RGDP) since the coefficient on recurrent expenditure on human capital investment (REHCI) is statistically different from zero. We can reject the null hypothesis for the combined granger causality of real gross domestic product (RGDP) by capital expenditure on human capital investment (CEHCI) and recurrent expenditure on human capital investment (REHCI) at conventional levels of statistical significance (i.e at 10%, 5% and 1%). This implies that capital expenditure on human capital investment (CEHCI) and recurrent expenditure on human capital investment (REHCI) combined to cause real gross domestic product (RGDP) since the coefficients are statistically different from zero.

Table 6 also shows the causal relationship between capital expenditure on human capital investment (dependent variable), real gross domestic product (RGDP) and recurrent expenditure on human capital investment (REHCI). We may reject the null hypothesis for the granger causality between capital expenditure on human capital investment (dependent variable) and real gross domestic product (RGDP) at 5% level of statistical significance. This implies that real gross domestic product (RGDP) causes capital expenditure on human capital investment since the coefficient is statistically different from zero at 5% level of statistical significance. Again, we may not reject the null hypothesis for the granger causality between capital expenditure on human capital investment (CEHCI) and recurrent expenditure on human capital investment (REHCI) at all conventional levels of statistical significance (i.e at 10%, 5% and 1%). This implies that recurrent expenditure

on human capital investment (REHCI) does not cause capital expenditure on human capital investment (CEHCI) since the coefficient on recurrent expenditure on human capital investment (REHCI) is not statistically different from zero. We can reject the null hypothesis for the combined granger causality on capital expenditure on human capital investment (CEHCI) by real gross domestic product (RGDP) and recurrent expenditure on human capital investment (REHCI) at all 5 per cent level of statistical significance. This implies that real gross domestic product (RGDP) and recurrent expenditure on human capital investment (REHCI) jointly causes capital expenditure on human capital investment (CEHCI). As such, RGDP and REHCI jointly precede CEHCI. Lastly, table 6 shows the causal relationship recurrent expenditure on human capital investment (dependent variable), real gross domestic product (RGDP) and capital expenditure on human capital investment (CEHCI). We may not reject the null hypothesis for the granger causality between recurrent expenditure on human capital investment and real gross domestic product at all conventional levels of statistical significance (i.e at 10%, 5% and 1%). This implies that real gross domestic product (RGDP) do not cause recurrent expenditure on human capital investment since the coefficient on real gross domestic product (RGDP) is not statistically different from zero at all level of statistical significance. Again, we may reject the null hypothesis for the granger causality between recurrent expenditure on human capital investment and current expenditure on human capital investment at all conventional levels of statistical significance (i.e at 10%, 5% and 1%). This implies that capital expenditure on human capital investment causes recurrent expenditure on human capital investment since the coefficient on the capital expenditure on human capital investment is statistically different from zero. We may reject the null hypothesis for the combined granger causality between real gross domestic product and capital expenditure on human capital investment and recurrent expenditure on human capital investment (dependent variable) at all conventional levels of statistical significance (i.e at 10%, 5% and 1%). This implies that real gross domestic product and capital expenditure on human capital investment jointly causes recurrent expenditure on human capital investment since the coefficients are all statistically different from zero.

4.2 Variance decomposition and impulse response functions

In effort to provide further insight into the dynamic relationship between capital expenditure on human capital investment, recurrent expenditure on human capital investment, and economic growth in Nigeria, variance decomposition and the impulse response functions analysis was carried out. Variance decomposition indicates the information about the percentage of the movements in a variable due to its own shocks versus shocks to the other variables in the system, while the impulse response functions show the directions of response to a random shock of a variable in the system. Both are out-of-sample tests which are useful in discerning the degree of exogeneity of the variables and the dynamic responses of the variables beyond the sample period. The results for variance decomposition are reported in Table 7. Among three variables under consideration, GDP is relatively the most exogenous variable both in the short and the long run. At the end of 10 years, the forecast error variance for RGDP, CEHCI and REHCI are 54.06496 per cent, 53.32321 per cent and 13.69202 per cent, respectively. Nevertheless, over the first two years, on average, 93.7 per cent of the variation in the forecast error for RGDP is explained by its own shocks, while 95.9 per cent and 90.52 per cent of the variation in the forecast error for CEHCI and REHCI, respectively are explained by their own shocks. On an average 10-year period, 28.75 per cent of the forecast error variance in RGDP can be explained by CEHCI and 37.098751 per cent of the forecast error variance in CEHCI can be explained by RGDP. Also, 5.13 per cent of the forecast error variance in RGDP can be explained by REHCI as RGDP explains 23.83 per cent of the forecast error variance in REHCI. While, the contribution of CEHCI to explaining the forecast error variance in REHCI is 33.65 per cent, REHCI explains 2 per cent (the lowest) of the forecast error variance in CEHCI.

Table 5: Variance Decomposition for the VAR RGDP, CEHCI and REHCI

Variance Decomposition of RGDP

Period	S.E.	RGDP	CEHCI	REHCI
1	31104.21	100.0000	0.000000	0.000000
2	43338.65	87.42784	8.204212	4.367943
3	56042.75	73.81327	19.01987	7.166860
8	120745.2	54.65414	40.47635	4.869507
10	144263.3	54.06496	42.06352	3.871524

Variance Decomposition of CEHCI

Period	S.E.	RGDP	CEHCI	REHCI
1	20034.98	19.52921	80.47079	0.000000
2	26031.64	27.56304	71.27605	1.160904
3	29592.42	33.03967	64.84119	2.119143
8	36733.55	43.20718	54.48516	2.307665
10	38486.19	44.54026	53.32321	2.136533

Variance Decomposition of CEHCI

Period	S.E.	RGDP	CEHCI	REHCI
1	33358.96	0.129252	0.786206	99.08454
2	48855.14	3.982277	14.06495	81.95277
3	63384.88	10.70992	26.76942	62.52066
8	133141.7	36.94677	44.33989	18.71334
10	157997.1	41.53814	44.76984	13.69202

Note: Cholesky Ordering: RGDP CEHCI REHCI

The direction of response to random shocks of a variance in the system is also analysed in this study. Figures 1 to 3 depict the results of impulse response function with respect to one-standard deviation shocks over a 10-year period. Beginning with Figure 1, the results show that a shock in CEHCI leads to a continuous increase in RGDP from the first year through to the tenth year and also proved to have positive impact on RGDP. A shock in the REHCI leads to an increase in RGDP from the first to the third year; and started declining from the third year to the tenth year. Figure 2 shows response of CEHCI to shocks in CEHCI, REHCI and RGDP. A shock in REHCI had a negative impact on CEHCI from the first to the eight year, and then positive between the eight and tenth year. A shock in the RGDP had a positive impact on CEHCI for the 10-year period.

Finally, Figure 3 reveals that a shock in RGDP induces the REHCI to an increase from the first year to the tenth year and also has positive impact on REHCI. Meanwhile, a shock in CEHCI has a positive impact on REHCI and also increased consistently from the first year to the tenth year. In summary, shocks in each variable seem to persist over three to four years and dissipate thereafter, implying that the effect of policy intervention on GDP, FAPS and/or PDI in Nigeria is at most three years. This conforms to the 3-year rolling plan adopted by Nigeria for economic planning and management.

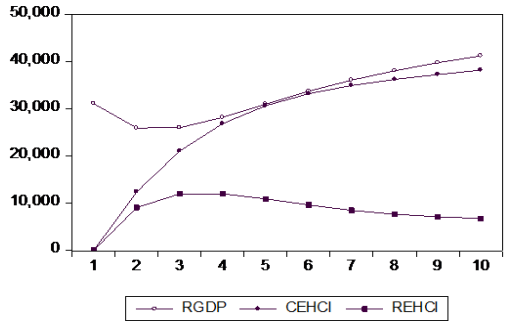

Figure 1: The plots of impulse response of RGDP to one-standard deviation shocks in RGDP, CEHCI, and REHCI

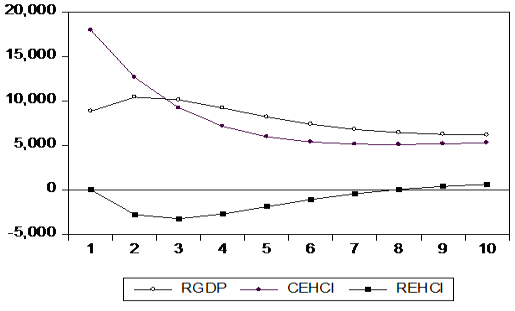

Figure 2: The plots of impulse response of CEHCI to one-standard deviation shock in CEHCI, REHCI and RGDP

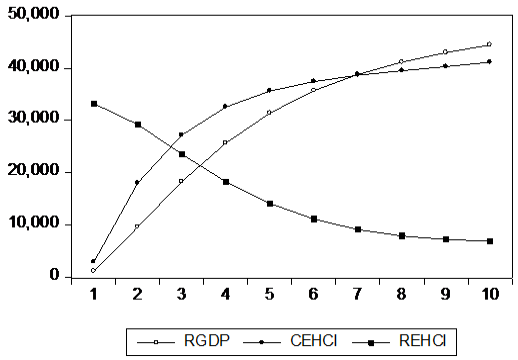

Figure 3: The plots of impulse response of REHCI to one-standard deviation shocks in REHCI, RGDP and CEHCI.

V. Conclusion and Policy Recommendations

This paper assesses the dynamic relationship between human capital investment (disaggregated into capital expenditure on human capital investment and recurrent expenditure on human capital investment) and economic growth in Nigeria from 1980 to 2012. This study used various econometric techniques: cointegration, Granger causality, variance decomposition, and impulse response frameworks to achieve the objectives of this study. The following summarizes the major findings of this study: Firstly, the Johansen cointegration test indicates that economic growth is cointegrated with CEHCI and REHCI. This implies that these variables are moving together in the long run, even though there might be deviations in the short run. The second key finding is that in the long-run, CEHCI and REHCI has a significant relationship with economic growth. Third, the Granger causality results suggest that there causality running from CEHCI and REHCI to economic growth and from RGDP to CEHCI in the long run. In addition, there is a bi-directional causality between RGDP and CEHCI in the long run, but a single causality running from CEHCI to REHCI. Finally, it is noteworthy to point out here that the variance decomposition indicates that on average most of the variations in economic growth are explained by CEHCI compared to the REHCI in Nigeria. But, CEHCI is relatively more important than RGDP in explaining the variations in REHCI as REHCI also proved to explain very low variations in CEHCI when compared with economic growth. Therefore, CEHCI and REHCI are unidirectional causality in nature. In addition, the impulse response functions suggest that the shock to CEHCI and REHCI has a positive effect on economic growth; shock to economic growth has a declining effect on CEHCI. Meanwhile, a shock to REHCI has a negative impact on CEHCI; but a shock to RGDP and CEHCI has a positive and increasing impact on REHCI. In this respect, the expansionary fiscal policy that falls on capital expenditure on human capital investment may effectively encourage recurrent expenditure on human capital investment and then stimulate economic growth in Nigeria.

In terms of policy, the overall results of this research suggest that Nigeria should adopt a strategy that promotes provision of more funds for capital expenditure on human capital by building quality learning environments and providing standard learning facilities like electronic libraries and well-equipped laboratories. Therefore, economic growth in Nigeria can be sustained through increase capital expenditure in human capital investment. Evidently, findings of this paper also suggest that fiscal policy should be complemented with increased participation of the private sector in human capital investments. This is so as the changes in the capital expenditure on human capital investment has the potential of inducing an employable workforce. Hence, learning about the increase in capital expenditure on human capital investment is of utmost important in generating a conducive learning environment and human resource development in Nigeria. In doing so, human resource development could be an effective invigorator for economic growth in Nigeria.

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