ANALYSIS OF SECTORAL BUDGETARY ALLOCATION AND ECONOMIC DEVELOPMENT IN NIGERIA

A.E. Uwubanmwen and Osagie Osifo
Department of Banking and Finance

ABSTRACT

The study examines empirically the short-run and long-run relationships between sectoral allocations to long sectors of the economy and economic development of Nigeria. The study adopted multivariate OLS analysis for the estimation process, cointegration analysis for long-run relationship and the associated error correction model to determine the short-run impact of the variables. The Granger causality test was used to determine the direction of causality among the variables. The findings of the study were that budgetary allocations to education, health and agricultural sectors positively and significantly affects economic growth in Nigeria and allocation to defence sector is negative. We therefore recommend that increase, articulate and judicious spending on these sectors of the economy as well as institutional mechanism to properly monitor the resources spent on them, so that the allocated funds are properly channeled for rapid economic growth and development.

Keywords: Sectoral allocations, economic growth, budgetary allocations, cointegration analysis, granger causality

INTRODUCTION

Budgetary allocation to critical sectors of the economy has been recognised by development planners and economists as an essential pre-condition for a country's rapid economic development. No country in the world has achieved sustained economic growth without substantial budgetary allocation to key sectors of the economy known to have high multiplier effect (Nurudeem & Usman, 2010). According to Cooray (2009), budgetary allocations to central sectors of the economy such as education, health, agriculture, industry through their positive effect can enhance equity and reduce poverty significantly to minimal levels. It is a known fact in the literature of government expenditure that the productivity of budgetary allocation depends on the ability of a given sector/sectors to enhance output (growth), create employment, reduce poverty and consequently accelerate economic development (Gupta, 2001; UNDP, 2009).

Given the critical role of government expenditure in the growth process, scholars have argued that increased budgetary allocation and efficiency of resource allocation within key sectors of the economy fosters economic growth and development: for example expenditure on education and health raises the level of national output through improved quality of labour and productivity (Alutu and Izilein, 2012). The structure and size of budgetary allocation to different sectors of the economy and the efficiency of the resource allocation is therefore an important issue to development planners, government, economists and all stakeholders in the economy (World Bank, 2011).

In Nigeria, government places a high premium on sectors such as agriculture, industry, education, health, and

communications because of the catalytic roles of these sectors in the development process. The overriding objective of giving prime budgetary attention to these sectors is that they have the potential to grow other sectors, given the enabling environment and consequently fastrack economic development (Loto, 2011). It is based on this that aggressive efforts are being made by the current administration to give critical focus to development – enhancing sectors in terms of budgetary allocations.

Given the fact that increased and efficient budgetary allocations to key sectors of the economy have the potential to accelerate economic development and that their insufficient funding culminates in economic retardation, thus the need for this study. In the same vein, budgetary allocations to key sectors of the economy like agriculture, health, education, industry, communication have been insufficient and sometimes erratic. This huge policy mistake according to the World Bank (2010) has contributed to the failure of development programmes in Nigeria more than any other factor.

This study specifically seeks to empirically examine the impact of sectoral budgetary allocations to economic development in Nigeria. To this end, the rest of the paper is organized as follows; section 2 briefly surveys the literature on sectoral budgetary allocation. Section 3 describes the methods and data sources. The results are presented in section 4 and section 5 concludes the paper.

EMPIRICAL LITERATURE REVIEW

Empirical studies are replete with the relationship between government expenditure and economic development Omojimite,(2010) in his study examined the relationship between budgetary expenditure on education and economic growth in Nigeria. He employed granger causality analysis and cointegration. The result show that there is cointegration between public expenditures on education; primary school enrolment and economic growth. Olugbenga and Owoye (2007) examine the association between government spending on some sectors and economic growth in OECD. They employed the Granger causality test and cointegration. The results revealed the existence of a long-run relationship between government expenditure and economic growth. In addition, the authors observed a unidirectional causality from government expenditure to growth for sixteen (16) out of the thirty countries studied, thus supporting the Keynesian hypothesis. However, causality runs from economic growth to government expenditure in ten (10) out of the countries, confirming the Wagner's law. Finally, the authors found the existence of feedback relationship between government expenditure and economic growth for a group of four countries. Lus Chuh – Hl, HSU and Younis (2008) examine the causal relationship between GDP and government expenditure for the United States (US) data during the period 1947 – 2002. The causality results revealed that total government expenditure causes growth of GDP, without a reverse causation. Moreover, the estimation results indicated that public expenditure raises the US economic growth. The authors concluded that judging from the causality test, Keynesian hypothesis exerts more influence than the Wagner's law in US. Abdullahi,(2008), x-ray budgetary allocation and selected sectors contribution to economic development in Nigeria using vector Auto-regression estimation model, the study found that the selected sectors contributed to the development of the Nigerian economy but there is need for improvement to suit international standard.

Lorzides and Vainvoukas (2005) employ the trivariate causality test to examine the relationship between government expenditure and economic growth using data set of

Greece, United Kingdom and Ireland. The authors found that government spending granger causes economic growth in all the countries they studied. Gregarious and Ghosh (2007) use the heterogenous panel to investigate the impact of government expenditure on critical sectors of the economy. The authors employed the GMM technique, and discovered that countries with large government expenditure tend to experience higher growth, but the effect varies from one country to another. Abdullahi (2000) analysed the relationship between government expenditure and economic growth, he found that government spending on infrastructure, social and economic activities increased growth. Donald and Shuanglin (2003) investigate the differential effects of various forms of expenditure on economic growth for a sample of 58 countries. Their findings indicated that government expenditures on education and defense have positive influence on economic growth, while expenditure on welfare has insignificant negative impact on economic growth.

Niloy, Emranul, and Denise (2003), used a disaggregated approach to investigate the impact of public expenditure on economic growth for 30 (thirty) developing countries in 1970's and 1980's. The authors confirmed that government capital expenditure in GDP has a significant positive association with economic growth, but the share of government current expenditure in GDP was insignificant in explaining growth. At the sectoral level, government investment and expenditure on education are the only variables that had significant effect on economic growth, especially when budget constraint and omitted variables are included. Oyinlola (1993) examine the relationship between the Nigeria's defence sector and economic development, and reported a positive impact of defence expenditure on economic growth.

Nurudeen and Usman (2010) investigated the impact of government expenditure on economic growth in Nigeria, using a disaggregated sectoral analysis. The results revealed that government total capital expenditure, total recurrent expenditures and government expenditure on education have negative effect on economic growth. On the contrary, rising government expenditure on transport and communication and health results to an increase in economic growth. The authors recommend that government should increase its expenditure on education, transport and communication and health in order to enhance economic growth. Adesoye, Olukayode, and Akinwande, (2010) examine the link between government spending and economic growth in Nigeria using a disaggregated Ram (1986) model, the results show a long run relationship between government expenditure and economic growth. Udegbunam and Oaikhenan (2003) use a descriptive approach to argue that government expenditure on infrastructure such as education, health, transport and communication drives national development in Nigeria. Alutu and Izilein (2012) use trend analysis to examine the budgetary allocations to the education and health sector on human capital development in Nigeria. The findings reveal that the budgetary allocation to the education and health sectors is poor and insufficient to make human capital development propel rapid economic development. The authors recommends increase budgetary allocation to these two key sectors of the economy in order to enhance growth. Loto (2011) examined the impact of government sectoral expenditure on growth in Nigeria over the period of 1980 to 2008. He used an error correction mechanism, and the results showed that the impact of education on economic growth though negative was not significant. The impact of expenditure on health was found to be positively related to

growth. He suggests the possibility of positive expenditure on education in the long run brain drain could be checked. Daudu (2011) investigate the long run relationship between education and economic growth in Nigeria through the application of Johensen co-integration technique and Vector Error Correction methodology. The findings reveal the existence of a positive and statistically significant relationship between investment in education and economic growth and a long run relationship between both variables.

Oyakhilomen, Abdulsalam and Grace (2013) in their study investigated Agricultural budgetary allocation and economic growth in Nigeria and it was found that the relationship between agricultural budgetary allocation and economic growth in Nigeria is positive but not significant only for two year lagged value of agricultural budgetary allocation. Ejiogu, Okezie and Chinedu (2013) examined causal relationship between Nigeria government allocation to the education sector and economic growth and the result reveal that expenditure on education is positively related to GDP.

METHODOLOGY

Data Description and Source

The study employed annual data for the period 1980 to 2012. The data for this study were obtained from secondary sources. The data include; Real gross domestic product per capita and is the dependent variable – while annual budgetary allocation to educational sector, health sector, Agricultural sector, transport and communication sector and defence are collected as independent variables for the time frame of the study. The data are sourced from Central Bank of Nigeria (CBN) statistical bulletin.

Specification of Model

The objective of the study is to investigate the impact of sectoral budgetary allocation on economic development of Nigeria.

RGDPPC = f(EDU, HLTH, AGRIC, TC, DEF) …….. (1)

The empirical specification is given as;

$RGDPPC = \beta_0 + \beta_1 EDU + \beta_2 HLTH + \beta_3 AGRIC + \beta_4 TC + \beta_5 DEF + \sum_t$ …… (2)

Where:

RGDPPC = Real gross domestic product per capita
EDU = Sectoral allocation to Education
HLTH = Sectoral allocation to Health
AGRIC = Sectoral allocation to Agriculture
TC = Sectoral allocation to Transport and communication
DEF = Sectoral allocation to Defence

β_0 denotes the constant term, β_1 β_2 β_0 β_4 and β_5 are slope coefficients representing parameters to be estimated and $\sum_t$ is the disturbance term.

Estimation Technique

The study uses both descriptive and inferential statistics to analyze and evaluate the results. Descriptive statistics have been used to know the structural properties of data. Inferential analysis covers correlation analysis, regression analysis, unit root analysis, cointegration analysis, error correction model (ECM) and granger causality test. Pearson correlation is used for correlation analysis to know the direction of relationship between variables. Ordinary least square method is used for regression analysis to measure the strength and significance of relationship. Augumented

Dickey- Fuller (ADF) unit root test is used to test the data stationarity. Johensen cointegration test was employed to select the vectors of cointegrated series for the regression to check the long run relationship between dependent variable and independent variables. The Error-correction model (ECM) was employed to check the speed of adjustment of the independent variables towards the dependent variable. Lastly, Granger causality test was used to determine the direction of causality among the variables. E-views 7.0 statistical software package is used for data analysis.

EMPIRICAL ANALYSIS

The empirical analysis that is performed in this chapter involves the estimation and succinct analysis of the model that was specified in the previous section. However, in order to examine the characterization as well as correlation among the variables used in the regression analysis, we carry out the descriptive and correlation analysis, before conducting the unit root test, cointegration and error correction model. The Granger Causality test is also employed to determine the direction of causality among the variables.

Descriptive Statistics

Table1, in the next page presents summary statistics on the variables used for the analysis. The descriptive statistics shows that the mean value of RGDPPC is for the firms are 19.42 while its median value is7.22. The mean values of education, health, agriculture, transport and communication and defence are 5.11, 8.52, 15.33, 11.7 and 9.41 respectively. The relative higher mean value of Agriculture over all other sectoral budgetary allocation underscores the critical and more pronounce role of agricultural sector in economic development, particularly poverty reduction. Further buttressing this fact is that the sector has the lowest standard deviation, an indication of low variability from its mean value. Apparently, the agricultural sector has a multiplier effect on economic development. In terms of the kurtosis, agricultural sector has the highest value of 3.11, while the health sector has the lowest value of 1.30. These values indicate normality in distribution over the period of budgetary allocation.

Table.1. Descriptive Statistics

	Mean	*Median*	*Max.*	*Min.*	*Std. Dev.*	*Skew*	*Kurt.*	*J-B*
RGDPPC	19.42	7.22	21.26	4.61	3.54	2.77	3.05	4.88
EDU	5.11	2.27	13.24	3.51	4.17	1.15	2.55	2.96
HLTH	8.52	6.64	26.73	1.00	4.35	5.01	1.30	3.1
AGRIC	15.33	5.53	14.00	3.11	2.19	2.28	3.11	4.23
TC	11.7	9.5	18.00	3.4	3.16	2.03	3.7	3.5
DEF	9.41	8.2	14.27	3.18	4.24	1.03	1.5	3.2

Source: Authors' compilation, 2015 with E-views 7.0

Correlation Analysis

In econometric analysis, it is important to ensure that the independent variables in the models do not have excessive correlation patterns. Moreover, it is essential to examine, in a preliminary manner, the relationships among the variables in the study. The correlation analysis is used to conduct these investigations. The result of the correlation tests are reported in table 2 below. In the correlation matrix, a positive relationship is observed between RGDPPC and all the sectors of the economy; an indication that increases in budgetary allocation to these sectors will invariably enhance economic development in Nigeria. The correlations between agricultural sector and RGDPPC (a proxy for economic development) also has the highest value of 0.74; a buttressing in fact to the already pronounced role of agricultural sector in economic development over all other sectors. Those of education and transport and communication are 0.61 and 0.62 respectively.

Table 2: Correlation Results

	RGDPPC	*EDU*	*HLTH*	*AGR*	*TC*	*DEF*
RGDPPC						
EDU	0.611					
HLTH	0.52	0.60				
AGR	0.74	0.17	0.33			
TC	0.62	0.62	0.36	0.15	0.40	
DEF	0.54	0.29	0.47	0.55	0.17	

Source: Authors' compilation, 2015 with E-views 7.0

Unit Root Analysis

A time series is stated as non-stationary if its mean and variance is dependent overtime. On the other hand, a time series is regarded as stationary if the mean and variance is time-invariant and constant over time. Using the Augmented Dickey Fuller (ADF) test, the results of the unit root is presented in table 3 below:

Table: 3: Unit Root Test for Variables in First Difference

Variables	First Difference	Order	Remarks
RGDPPC	-5.1124**	I(1)	Stationary
EDU	-3.5778*	I(1)	Stationary
HLTH	-3.7217*	I(1)	Stationary
AGR	-4.4120*	I(1)	Stationary
TC	-3.5014*	I(1)	Stationary
DEF	-3.9669*	I(1)	Stationary

* (**) significant at the 5% (1%) Source: Authors' compilation, 2015 with E-views 7.0

A cursory examination of the unit root test results indicate for all the variables, the null hypothesis of no unit root could not be rejected, implying that the variables were non-stationary at levels. However, after first differences, the variables became stationary. This implies that the variables are difference-stationary. They are thus integrated of order one (i.e. I [1].

Test of Cointegration

Having established that the series in the analysis are not stationary in their levels, we move on to determine if they are cointegrated. The Johansen Cointegration method was used for this analysis because the study involves the use of multivariate estimations. The results from the multivariate cointegration test are presented in Table 4 below. As can be observe from the table, the λ-max test statistic indicates that there are at least five cointegrating vectors in the relationship. This implies that a long run equilibrium relationship exists between the RGDPPC and the various sectoral budgetary allocations in Nigeria.

Table 4: Johansen Multivariate Cointegration Tests Results

Maximum Eigenvalue Test			
Null Hypothesis	Test Statistic	Critical Value at 5%	Hypothesized No of CE(s)
r = 0*	142.22	83.17	None**
r ≤ 1*	122.12	62.10	At most 1**
r ≤ 2*	87.12	40.05	At most 2**
r ≤ 3*	49.51	31.19	At most 3**
r ≤ 4*	29.60	20.42	At most 4**
r ≤ 5*	10.31	10.62	At most 5

(**) denotes rejection of the hypothesis at 5% (1%) significance level Eviews 7.0

Source: Authors' compilation, 2015

Granger Causality Testing

The relationship between the dependent variable (RGDPPC) and independent variables as well as the direction of causality is very important in this study. Hence, we employ the Granger causality test to determine the direction of causality between the dependent and independent variables. The results of the Granger causality tests are reported in table 5 below. As it is generally the case, the F-test is conducted on the null hypotheses in order to determine the direction of causality between each pair of variables. The rejection of each of the null hypothesis is based on the significance of the F-value for the particular relationship. We focus on the relationship that is of importance to the study. From the results, education, agriculture, transport and communication and defence all granger cause RGDP per capita without a feed-back effect, implying that increase budgetary allocation to these sectors will invariably stimulate economic development in Nigeria. In the case of health, a bi-directional causality is found. This implies that increase sectoral budgetary allocation to the health sector will propel economic development while increase economic development will on the other hand enhance budgetary health allocation which of course will lead to better health facilities in the economy. This feed-back relationship between the health sector and economic development underscores the popular maxim that'' health is wealth''

Table 5: **Granger Causality Test results**

Null Hypothesis:	F-Statistic	Probability
EDU does not Granger Cause RGDPPC	2.67055	0.0973
RGDPPC does not Granger Cause EDU	0.89569	0.42336
HLTH does not Granger Cause RGDPPC	2.66910	0.09300
RGDPPC does not Granger CauseHLTH	2.78231	0.08403
AGR does not Granger Cause RGDPPC	5.02073	0.01639
RGDPPC does not Granger Cause AGR	0.14655	0.88053
TC does not Granger Cause RGDPPC	2.41520	0.11120
RGDPPC does not Granger Cause TC	1.50332	0.25443
DEF does not Granger Cause RGDPPC	2.37882	0.11415
RGDPPC does not Granger Cause DEF	0.14618	0.86476

Source: *Authors' compilation, 2015*

Error Correction Model

The short-run dynamics of the behaviour of the economy with respect to changes in the various sectoral budgetary allocation variables can be analyzed in the context of an error correction model (ECM) presented in table 6 below. Given and its adjusted R^2 of 0.81, it can be concluded over 81 percent of the net systematic variations in economic development (proxied by RGD per capita) is explained by the combined explanatory variables and the ECM. The F-Value of 150.2 is highly significant at the 1 percent level. Thus, we cannot reject the hypothesis of a significant linear relationship between economic development and all the independent variables combined in the short run. The DW statistic of 1.74 indicates the absence of serial correlation in the model making the estimated model reliably fit for policy perspectives. The error correction term is appropriately negative and significant at the 5 percent level. Thus, any short term-

disequilibrium in the system will be restored back to the system. Its coefficient of -0.72 indicates that 72 percent of the contemporaneous adjustment in economic development is covered in the next period.

A close examination of the estimated coefficients for each of the explanatory variables reveal that all the explanatory variables possess the required expected signs except that of defence. In terms of the statistical significance of the respective individual coefficients of the explanatory variables, it is observed that education passes the significance test at the 1 percent level. This high level of significance underscores the critical role of education in propelling rapid economic development through the channel of human capital accumulation. Thus, increased budgetary allocation to the education sector will in no doubt spur rapid economic development in Nigeria. The coefficient of agriculture is positive and significant at the 5percent level, while that of health is positive and significant at the 10 percent level. This implies that agriculture and health sectors positively and significantly contributes to economic development in Nigeria. The coefficient of defence is negative and also insignificant at the 5 percent level. This rather negative and insignificant coefficient of defence could be attributed to the chaotic security situation in the country in recent times where resources meant for development were deployed to arrest the precarious near-life taking situation in the country. This deteriorating impact of defence on the economy could be reverse through increase budgetary allocation to the sector, as well as judicious use of resources in the purchase of sophisticated military equipment and coordinated strategic planning on the part of the military in Nigeria. This will enhance its relevance for rapid national development.

Table 6: Error Correction Model (ECM): Dependent Variable is ΔRGDPPC

Variable	Coefficient	T-ratio
C	0.1572	0.8299
ΔEDU	0.1314	4.8470
ΔHLTH	0.1564	1.9772
ΔAGR	0.3942	2.4258
ΔTC	0.1511	1.3529
ΔDEF	-0.2294	-1.3108
ECM (-1)	-0.7210	-3.5760
R^2=0.84; R-Bar squared=0.81	F= 150.15	DW Statistic=1.76

Eviews 7.0 Source: Authors' Compilation, 2015

CONCLUSION

This paper has established that budgetary allocations to some key sectors of the economy between the periods of 1980-2012 has impacted positively and significantly on the economic growth in Nigeria. From this study, more funds should be earmarked to these sectors that have the capacity to drive the economic growth of the country under review. The study reveals that meaningful economic development can be attained via prompt, prioritized and increased budgetary allocations to education, health and agricultural sectors of the economy.

We recommend increase, articulate and judicious spending on these sectors of the economy as well as institutional mechanism to properly monitor the resources spent on them, so that the allocated funds are properly channelled to desire ends for rapid economic growth and development in Nigeria.

REFERENCES

Abdullah, H.A. (2000). The relationship between government expenditure and economic growth in saudi arabia. *Journal of Administrative Science*, 12(2), 173 – 191.

Abdullahi, I.B. (2008). Budgetary allocations and selected sectors' contribution to economic development in Nigeria. *Pakistan Journal of Social Sciences*, 5(9), 894 – 898.

Adesoye, A.B., Olukayode, M.E. & Akinwande, A.A. (2010). Dynamic analysis of government spending and economic growth in Nigeria. available online at http://www.lautechtransporting.com/journals.html.

Alutu, U.U. & Izilein, E (2012). Juxtaposing the trends in Nigeria's capital and recurrent expenditures on human capital development (1981-2010). Finance & banking review [FBR], 6 (1&2).

Cooray, A. (2009). Government expenditure, Governance and economic growth. Comparative economic studies, 51(3), 401-418. [http://www.ingentaconnectaCom/content/pgl/ces; Jsessionid=E1g81gkzfums.alile.

Dauda, R.O.S. (2010). Investment in education and economic growth in Nigeria: An empirical evidence. *International Research Journal of Finance and Economics*, ISSN 1450 – 2887, Issue, 55.

Donald, N.B. & Shuanglin, L. (2003). The differentials effects on economic growth: A disaggregated analysis for developing countries. (www.socialsciences.manchester.ac.uk/cgbcr/dpcgbr.30.pdf).

Ejiogu, U., Okezie, A.I. & Nwosu, C. (2013). Causal relationship between Nigeria government budget allocation to the education sector and economic growth. Discourse journal of Education Research. 1(8), 54 – 64.

Gregoriou, A. & Gosh, S. (2007). The impact of government expenditure on growth: empirical evidence from heterogenous panel. (http://www.brunel.ac.uk/9379/efwps/0701.pdf).

Gupta, M.R. (2001). Government sectoral expenditure and economic growth, *Journal of Economics*, Bengal, India.

Liu Chih-HL, Itsu, C. & Younis, M. Z. (2008). The association between government expenditure and economic growth: The granger causality test of the US data, 1974 – 2002. *Journal of Public Budgeting Accounting and Financial Management*, 20(4), 439 – 52.

Loizides, J. & Varnvoukas, G. (2005). Government expenditure and economic growth: evidence from trivariate causality testing. *Journal of Applied Economics*, 8(1), 125 – 152.

Loto, M.A. (2011). Impact of government sectoral expenditure on economic growth. *Journal of Economics and International Finance*. ISSN 2006 – 9812, (2(11), 646 – 652.

Niloy, B., Emranul, M.H.& Denise, R.O. (2003). Public expenditure and economic growth: A disaggregated analysis for developing countries, Jel, publication.

Nurudeen, A. & Usman, A. (2010). Government expenditure and economic growth in Nigeria, 1970-2008: A disaggregated analysis. *Business and economics Journal*, BEJ-4.

Olugbenga, A.O. & Owoye, O. (2007). Public expenditure and economic growth. New evidence from DECD countries. (http://iges.confex.com/iase/Rome-67/techprogram/s1888.htm).

Omojimite, B.U. (2010). Education and economic growth in Nigeria. A granger causality analyse. *African Research Review*. 4(3), 90 – 168.

Oyakhilomen, O., Abdulsalami, Z. & Grace, Z.R. (2013). Agricultural budgetary allocation and economic growth in Nigeria: Implications for agricultural transformation in Nigeria, *The Journal of Sustainable Development*. 10(1), 16 – 27.

Oyinlola, O. (1993). Nigeria's national defence and economic development. An impact analysis. *Scandinavian Journal of Development Alternatives*, 12(3).

Ram, R. (1986). Government size and economic growth. A new framework and some evidence from cross-section and time-series data. *America Economic Review*. 76, 191 – 203.

Udegbunam, R.I. & Oaikhenan, H.E. (2003). An examination of the role of public infrastructure in national development. The Nigerian economic and financial review, 8(2), 35 – 46.

World Bank (2011). Development report, Washington D.C; world bank.

APPENDIX 1

	RGDPPC	EDU	HLTH	AGR	TC	DEF
Mean	19.42116	5.1102.8	8.521.3	15.332.14	11.70000	9.4152
Median	13.220000	2.265.0	6.64200	5.52599	9.50000	8.20000
Maximum	21.26000	13.2408.	26.733.	14.01165	18.00000	148.2700
Minimum	4.610000	3.51000	1.00000	3.11.640	3.400000	3.178100
Std. Dev.	3.54230	4.1740.7	4.35603	2.18944	3.160806	4.24423
Skewness	2.77116	1.149093	5.016511	2.27936	2.03277	0.032121
Kurtosis	3.05410	2.554380	11.01070	3.11315	3.70104	1.53312
Jarque-Bera	4.88214	0.96531	3.1.6809	4.231519	3.568850	3.21525
Probability	0.799605	0.050648	0.000000	0.032324	0.092166	0.162541
Sum	1301.3300	1211.159.	1050.2161.	1290.95.	709.6000	1033.018
Sum Sq. Dev.	199.12226	6.69E+12	5.10E+12	5.18E+10	1110.280	35201.17
Observations	33	33	33	33	33	33

Covariance Analysis: Ordinary
Date: 02/16/15 Time: 09:13
Sample: 1980 2012
Included observations: 33

Correlation

Probability	RGDPPC	EDU	HLTH	AGR	TC	DEF
RGDPPC	1.000000					

EDU	0.61105	1.000000				
	0.0006	-----				
HLTH	0.215284	0.600431	1.000000			
	0.2856	0.0011	-----			
AGR	0.738850	0.171875	0.329866	1.000000		
	0.00010	0.2300	0.045	-----		
TC	0.619445	0.364214	0.150955	0.399319	1.000000	
	0.0010	0.430	0.2419	0.2900	-----	
DEF	0.535621	0.291207	0.46814	0.547475	0.168671	1.000000
	0.0040	0.3100	0.0162	0.0031	0.4000	-----

APPENDIX 2

Unit root tests for variable DLRGDPPC
The Dickey-Fuller regressions include an intercept but not a trend

****

31 observations used in the estimation of all ADF regressions.
Sample period from 1982 to 2012

****

Test Statistic	LL	AIC	SBC	HQC
DF -5.1124	-5.3345	-6.6935	-7.4230	-7.9791
ADF(1) -5.0251	-5.4506	-8.2906	-8.5538	-8.7190
ADF(2) -3.7718	-3.1779	-7.8840	-10.7710	-8.4551

****

95% critical value for the augmented Dickey-Fuller statistic = -2.9970
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DLRGDPPC
The Dickey-Fuller regressions include an intercept and a linear trend

****

31 observations used in the estimation of all ADF regressions.
Sample period from 1982 to 2012

****

Test Statistic	LL	AIC	SBC	HQC
DF -4.1421	-2.3146	-5.3196	-6.119	-6.1260
ADF(1) -4.9772	-1.3329	-4.5599	-4.5798	-5.1310
ADF(2) -3.2219	-1.1350	-2.0652	-4.1819	-6.1004

****

95% critical value for the augmented Dickey-Fuller statistic = -3.1658
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DLEDU
The Dickey-Fuller regressions include an intercept but not a trend

****

31 observations used in the estimation of all ADF regressions.
Sample period from 1982 to 2012

****

Test Statistic	LL	AIC	SBC	HQC
DF -3.5779	-.31076	-2.3108	-3.4463	-2.1009
ADF(1) -4.1334	. 77185	-2.2282	-3.9216	-2.5281
ADF(2) -4.0170	. 34765	-2.6524	-4.9535	-3.7184

****

95% critical value for the augmented Dickey-Fuller statistic = -2.9970
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DLEDU

The Dickey-Fuller regressions include an intercept and a linear trend

****

31 observations used in the estimation of all ADF regressions.

Sample period from 1981 to 2012

****

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.0231	.32784	-2.6425	-4.2153	-3.1005
ADF(1)	-4.1297	2.8351	-1.1249	-3.5984	-1.7360
ADF(2)	-3.0058	2.8462	-2.3530	-4.6526	-2.8678

****

95% critical value for the augmented Dickey-Fuller statistic = -3.1658

LL = Maximized log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DHLTH

The Dickey-Fuller regressions include an intercept but not a trend

****

31 observations used in the estimation of all ADF regressions.

Sample period from 1982 to 2012

****

	Test Statistic	LL	AIC	SBC	HQC
DF	-3.7217	9.8847	.8247	5.6892	4.5091
ADF(1)	-3.1948	8.1719	17.9117	6.2084	5.7813
ADF(2)	-3.0311	8.7102	18.3402	4.0692	6.4596

****

95% critical value for the augmented Dickey-Fuller statistic = -2.9970

LL = Maximized log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DHLTH

The Dickey-Fuller regressions include an intercept and a linear trend

****

31 observations used in the estimation of all ADF regressions.

Sample period from 1982 to 2012

****

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.4730	9.0179	7.0476	6.1845	3.1702
ADF(1)	-3.6191	9.2253	6.1153	5.2932	3.1592
ADF(2)	-2.0436	9.2530	5.3760	7.3571	4.8754

****

95% critical value for the augmented Dickey-Fuller statistic = -3.1658

LL = Maximized log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DLAGR

The Dickey-Fuller regressions include an intercept but not a trend

****

31 observations used in the estimation of all ADF regressions.
Sample period from 1982 to 2012

****

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.4120	11.5063	9.9423	10.2288	6.174
ADF(1)	-3.1770	10.1719	7.2037	8.1301	7.8253
ADF(2)	-2.1621	10.1256	8.7456	10.1924	9.2245

****

95% critical value for the augmented Dickey-Fuller statistic = -2.9970
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DLAGR

The Dickey-Fuller regressions include an intercept and a linear trend

****

31 observations used in the estimation of all ADF regressions.
Sample period from 1982 to 2012

****

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.3123	10.1819	13.2017	9.1426	7.8124
ADF(1)	-4.1202	9.2332	12.1829	9.1442	8.2711
ADF(2)	-3.03348	11.1717	14.1881	10.3198	9.4313

****

95% critical value for the augmented Dickey-Fuller statistic = -3.1658
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DLTC

The Dickey-Fuller regressions include an intercept but not a trend

****

31 observations used in the estimation of all ADF regressions.
Sample period from 1982 to 2012

****

	Test Statistic	LL	AIC	SBC	HQC
DF	-3.5014	-7.0479	-6.7704	-8.7129	-9.0837
ADF(1)	-4.1274	-8.7354	-8.2856	-9.7988	-8.8247
ADF(2)	-3.4119	-9.1674	-9.6674	-10.3363	-9.1955

****

95% critical value for the augmented Dickey-Fuller statistic = -2.9970
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DLTC

The Dickey-Fuller regressions include an intercept and a linear trend

****

31 observations used in the estimation of all ADF regressions.
Sample period from 1982 to 2012

****

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.6914	-3.0143	-7.2142	-9.7628	-8.2810
ADF(1)	-4.5552	-4.9660	-8.3330	-10.1874	-8.4772
ADF(2)	-3.9148	-4.7022	-9.8622	-11.2913	-9.1760

****

95% critical value for the augmented Dickey-Fuller statistic = -3.1658
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DLDEF

The Dickey-Fuller regressions include an intercept but not a trend

****

31 observations used in the estimation of all ADF regressions.
Sample period from 1982 to 2012

****

	Test Statistic	LL	AIC	SBC	HQC
DF	-3.9669	9.2871	11.3777	9.3282	- 6.8794
ADF(1)	-3.2317	9.2162	11.4398	11.7501	-7.1819
ADF(2)	-2.1909	9.3190	11.4265	12.1947	-5.1342

****

95% critical value for the augmented Dickey-Fuller statistic = -2.9970
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable DLDEF

The Dickey-Fuller regressions include an intercept and a linear trend

****

31 observations used in the estimation of all ADF regressions.
Sample period from 1982 to 2012

****

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.1725	7.2225	7.1175	8.5743	-5.7554
ADF(1)	-5.2535	9.7823	6.7623	9.5701	-5.5402
ADF(2)	-4.0952	10.1335	9.1435	11.3127	-6.4390

****

95% critical value for the augmented Dickey-Fuller statistic = -3.1658
LL = Maximized log-likelihood AIC = Akaike Information Criterion
SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

APPENDIX 3

Date: 02/16/15 Time: 11:48
Sample: 1981 2012
Included observations: 30
Test assumption: Linear deterministic trend in the data
Series: RGDPPC EDU HLTH AGR TC DEF
Lags interval: 1 to 2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value
0.782801	142.2202	83.17	111.10
0.692201	122.205	62.10	85.25
0.582985	87.1228	40.05	71.35
0.41271	49.50717	31.19	36.32
0.235406	29.6025	20.42	24.15
0.127745	10.3194	10 .62	11.92

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 4 cointegrating equation(s) at 5% significance level

APPENDIX 4

Pairwise Granger Causality Tests
Date: 02/16/15 Time: 11:55
Sample: 1980 2012
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
EDU does not Granger Cause RGDPPC	30	2.67055	0.0973
RGDPPC does not Granger Cause EDU		0.89569	0.42336
HLTH does not Granger Cause RGDPPC	30	2.66910	0.09300
RGDPPC does not Granger Cause HLTH		2.78231	0.08403
AGR does not Granger Cause RGDPPC	30	5.02073	0.01639
RGDPPC does not Granger Cause AGR		0.14655	0.88053
TC does not Granger Cause RGDPPC	30	2.41520	0.11120
RGDPPC does not Granger Cause TC		1.50332	0.25443
DEF does not Granger Cause RGDPPC	30	2.37882	0.11415
RGDPPC does not Granger Cause DEF		0.14618	0.86476

APPENDIX 5

Error Correction Representation for the Selected ARDL Model

ARDL (3,0,0,3,1) selected based on Schwarz Bayesian Criterion

****

Dependent variable is dLRGDPPC
32 observations used for estimation from 1981 to 2012

****

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
DLEDU	.1314	.0271	4.8470[.000]
dLHLTH	.1564	.0791	1.9772[.092]
dLAGR	.3942	.1625	2.4258[.014]
dLTC	.1511	.1116	1.3529[.182]
dLDEF	-.2294	.1750	-1.3108[.191]
dCONSTANT	.1572	.1894	.82998 [.427}
ecm(-1)	-.7210	.2019	-3.5760[.001]

****

List of additional temporary variables created:
dLRGDPPC = LRGDP-LRGDPPC(-1)
DLEDU = LEDU -LEDU (-1)
DLHLTH= LHLTH-LHLTH (-1)
dLAGR =LAGR-LAGR(-1)
dLTC = LTC-LTC(-1)
dLDEF = LDEF-LDEF(-1)
dCONSTANT = CONSTANT-CONSTANT(-1)
ecm = LRGDPPC + 1.503*EDU +0.4219*HLTH +0.8830*LAGR+ 0.1793*TC -0.1695DEF-.943*CONSTANT

****

R-Squared .84311 R-Bar-Squared .8019
S.E. of Regression 8.4521 F-stat. F (5, 26) 150.16[.00000]
Mean of Dependent Variable 52.015 S.D. of Dependent Variable 39.1601

Residual Sum of Squares 9.2520 Equation Log-likelihood 9.7712
Akaike Info. Criterion 5.2232 Schwarz Bayesian Criterion 7.2244
DW-statistic 1.7603
****

R-Squared and R-Bar-Squared measures refer to the dependent variable
dLRGDPPC and in cases where the error correction model is highly
Restricted, these measures could become negative.