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An Assessment of Federal Outlay on Pivotal Growth Induced Sectors in Nigeria

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ABSTRACT
This study analyses government capital and recurrent spending outlays on sectors (education, health, defense agriculture and transport and communication) believed to be critical to the growth of the economy, for the period 1980 to 2014. The Error Correction Method was adopted to analyze the short-run impact of each spending division on the prosperity of the economy. The disaggregation into capital and recurrent expenditure was done to gauge the impact each has on economic growth. Empirical findings of the study reveal that though capital outlays on the sectors concerned have been more significant than recurrent spending towards achieving the goal of economic growth, more priority should still be given to capital spending. At the same time, the continuous growth in recurrent spending over capital spending should be checked. This study therefore recommends an increase capital spending in the various sectors considered, relative to recurrent spending, in accordance with our conclusions drawn from the period under study. We believe the main critical inducing outlay of government on growth is capital spending. Also, because of the interrelationship existing between the sectors considered, proper harnessing of the potentials of the various sectors is crucial towards attaining the goal of Nigeria becoming one of the twenty most industrialized nations by 2020.

Keywords: Education, Health, Transport and Communication, Defense, Agriculture.

1 INTRODUCTION

It is believed that today’s government provides a wide range of services through the budget. Such services can be said to include the provision of economic and social infrastructure, defense, maintenance of law and order, establishment of pension schemes, etc. The level of government’s participation in providing goods and services is subject to space and time variations. The scope
of government functions depends, among other things, on the political and economic orientation of the members of a particular society at a given point in time, as well as their needs and aspirations (Adesola 1995). The performance or discharge of these functions engenders governmental fiscal operations.

In 2006, President Obasanjo made an assertion when delivering his budget speech to a joint session of the national assembly, in which he stated that the building blocks for the diversification of the Nigerian economy and the primary sources of growth are agriculture, manufacturing, solid minerals, and construction: an assertion which is believed to be true. In other words, accelerating the pace of growth and development of the agricultural, manufacturing, mining (solid minerals), education, healthcare, and other non-oil sectors will lead to faster integration and improvement in the welfare of the vast majority of the population of Nigeria.

The size and role of the government in a country have been explored from different perspectives in the economic literature. The existence of an optimal government share in the economy has been subject to considerable theoretical debate and sustained empirical assessment. In particular, the literature has provided possible determinants for the different size of government across countries. These kind of studies, in general, focus on different single aspects, which are supposed to be the driving force of the overall government size with respect to GDP.

2 EMPIRICAL REVIEW

Over time, various studies have been carried out to examine the relationship between government spending and economic growth, some of which include the following.

Nitoy, et al. (2003), employed a disaggregated approach in examining the growth effects of government expenditure for a panel of thirty developing countries (including Nigeria) in the 1970s and 1980s, with special interest placed on sectoral expenditures. Their resulting findings revealed that the share of government capital expenditure in GDP is positively and significantly correlated with economic prosperity, but the coefficient for recurrent outlay was found to be insignificant. The result of the analysis at the sectoral level shows that government investment and total expenditures on education are the only outlays that remain significantly associated with growth. Although public investments and expenditures in sectors such as transport, communication, and defense were found to be significantly correlated with growth initially, they rarely survive when government budget constraint and other sectoral expenditures were built into the analysis. In addition, private investment share of GDP was found to be associated with economic growth in a significant and positive manner.

Josaphat, et al. (2000), examined the impact of government spending has on economic growth in Tanzania for the time frame of 1965 to 1996, using time series data from the 32-year period. They developed a simple growth accounting model, developed after the Ram (1986) model in which total government expenditure is disaggregated into expenditure on (physical) investment, consumption spending, and human capital investment. It was found that increased productive expenditure (physical investment) has an inverse effect on growth; while consumption expenditure correlate positively to growth, and which in particular appears to be associated with
increased private consumption. Their empirical findings show an insignificant outlay on human capital investment, and affirm the view that public investment in Tanzania has not been productive.

Nigerian public expenditures can broadly be categorized into capital and recurrent expenditure. Recurrent expenditure is government expenses on administration which include wages, salaries, interest on loans, maintenance, etc., while expenses on capital projects like roads, airports, education, telecommunication, electricity generation, etc., are referred to as capital expenditure. One of the main goals of government spending is to ensure availability of infrastructural facilities for development purpose. Over the past decades, there has been an exponential increase in public sector spending through different government responsibilities and interactions with its Ministries, Departments and Agencies (MDA’s), (Niloy et al. 2003). Although, the widely perceived opinion is that public expenditure, either recurrent or capital, and especially on social and economic infrastructure, can be growth-enhancing, in reality, the financing of such expenditure to provide essential infrastructural facilities, including transport, electricity, telecommunications, water and sanitation, waste disposal, education and health can be growth-retarding (for example, the negative effect associated with taxation and excessive debt). The size and structure of public expenditure will determine the pattern and form of growth in output of the economy.

Robinson, et al. (2014), examined the relationship between government expenditures and economic growth in Nigeria from 1980 to 2010. The study disaggregated Government Expenditure into total expenditure, public debt expenditure, expenditure on health, and government expenditure on Education. The ordinary least square (OLS) method was applied to ascertain the short run relationship between variables. Meanwhile, the Augmented Dickey Fuller (ADF) test was used to gauge the long-run relationship between the variables. Results of the test reveal that there is a negative relationship between economic growth and government expenditures on health, while government expenditures in the education sector were found to be insufficient for the expending sector in Nigeria. It was also discovered that government expenditures in Nigeria could increase foreign and local investments. Their study recommends that government should spend more on key macro-variables, such as health, infrastructure, power, etc. They believe that judicious expenditure by the government will power the transformation agenda of the government, as well as engender growth in the Nigerian economy.

Maku (2014) studied the link between government spending and economic growth in Nigeria over the period 1977 to 2006, using time series data to analyze the Ram (1986) model. Three variants of the Ram model were developed, regressing Real GDP versus Private investment, Human capital investment, Government investment, and Consumption spending at absolute levels. The regression took real GDP as a share of real output, as well as the growth rate of real output to the explanatory variable as a share of real GDP, in order to capture the precise link between public investment spending and economic growth in Nigeria, based on different levels. Empirical results of the study showed that private and public investments have insignificant effect on economic growth. With the use of an error-correction model to detect short run behavior of the variables, the result shows that for any distortion in the short run, the error term restores the relationship back to its original equilibrium by a unit. The paper’s main policy recommendation was that government spending should be channelled in order to influence
economic growth significantly and positively in Nigeria, especially on education and infrastructural facilities.

3 STUDY METHODOLOGY

The study methodology adopted is the Error Correction Method (ECM), which was first adopted by Sargan and later emphasized by Engle and Granger to control for equilibrium. An essential theorem known as the Granger representation theorem states that if two variables Y and X are cointegrated, then the relationship between the two can be expressed as ECM.

The variables of interest used in this study are: per capita gross domestic product (PCGDP) used as proxy to measure the growth rate of the economy, defense spending (DEFN), education outlay (EDUCA), health spending (HELTH), agricultural spending (AGRIC), transportation and communication (TRACOMM), and total federally collected revenue (TFCR) which is used as a control variable. Data were sourced from Central Bank of Nigeria’s statistical bulletin for various years; as well as from the concerned federal ministries’ online databases.

Two ECM models were estimated for the study as shown below. The first model captures the short run behavior of capital outlays for growth-inducing sectors on the GDP per capita variable. The second equation captures the effect of recurrent outlays for growth inducing sectors also on the GDP per capita variable.

Model 1:

\[
\begin{align*}
d\log(\text{PCGDP}) = \\
\beta_0 + d\beta_1 \log(\text{DEFN}) + d\beta_2 \log(\text{EDUCA}) + d\beta_3 \log(\text{HELTH}) + d\beta_4 \log(\text{AGRIC}) + \\
d\beta_5 \log(\text{TRACOMM}) + d\beta_6 \log(\text{TFCR}) + d\beta_7 \log(\text{PCGDP}_{t-1}) + d\beta_8 \log(\text{DEFN}_{t-1}) + \\
d\beta_9 \log(\text{EDUCA}_{t-1}) + d\beta_{10} \log(\text{HELTH}_{t-1}) + d\beta_{11} \log(\text{AGRIC}_{t-1}) + \\
d\beta_{12} \log(\text{TRACOMM}_{t-1}) + d\beta_{13} \log(\text{TFCR}_{t-1}) + \varphi_1 \text{ECM}_{t-1} + \varepsilon_1
\end{align*}
\]

Where:
- \(d\) = indicates first difference or short run factor
- \(\varepsilon\) = white noise error term
- \(\beta_0\) to \(\beta_{13}\) = are parameter estimates
- \(\varphi_1\) = error correction speed of adjustment parameter
- \(\log\) = logarithm transformation
- \(t-1\) = lagged by one variable.

Model 2:
\[
d \log (PCGD\text{P}) = \alpha_0 + d\alpha_1 \log (DEFN) + d\alpha_2 \log (EDUCA) + d\alpha_3 \log (HELTH) \\
+ d\alpha_4 \log (AGR\text{I}C) + d\alpha_5 \log (TRACOMM) + d\alpha_6 \log (TF\text{C}R) \\
+ d\alpha_7 \log (PCGD\text{P}_{t-1}) + d\alpha_8 \log (DEFN_{t-1}) + d\alpha_9 \log (EDUCA_{t-1}) \\
+ d\alpha_{10} \log (HELTH_{t-1}) + d\alpha_{11} \log (AGR\text{I}C_{t-1}) + d\alpha_{12} \log (TRACOMM_{t-1}) \\
+ d\alpha_{13} \log (TF\text{C}R_{t-1}) + \varphi_2 ECM_{t-1} + \varepsilon_2
\]

Where:
\[d\] = indicates first difference or short run factor
\[\varepsilon\] = white noise error term
\[\alpha_0 \text{ to } \alpha_{13}\] = are parameter estimates
\[\varphi_1\] = error correction speed of adjustment parameter
\[\text{Log}\] = logarithm transformation
\[t-1\] = lagged by one variable.

The methodology employed in deriving the preferred short run dynamic model is the general to specific approach. We start with a general error correction model, which includes lags up to the fourth order. This general model is then tested by using \textit{a priori} expectations and statistical significance tests in order to arrive at a parsimonious preferred short run dynamic specification. The parsimonious result for the model is presented in table 3 below.

3.1 UNIT ROOT TEST

Due to the nature of most time series data, it is imperative to conduct a unit root test on the series in the ECM model. This study made use of the Augmented Dickey Fuller (ADF) test, and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root testing procedure to ascertain the level of stationarity of the series.

3.2 Model One Result Analyses

3.2.1 Unit Root Analysis for Model One

\begin{table}[h]
\centering
\begin{tabular}{|l|l|l|l|l|}
\hline
\textbf{Variables} & \textbf{ADF-Test} & \textbf{KPSS-Test} & \textbf{Conclusion} \\
\hline
Log(PCGD\text{P}) & -4.262946** & -4.946335** & 0.506478*** & 0.083809** & NO \\
Log(DEFN) & -9.535907** & -6.449704** & 0.026781** & 0.027552** & NO \\
Log(EDUCA) & -6.705189** & -6.637319** & 0.152125** & 0.076376** & NO \\
Log(HELTH) & -8.856112** & -8.707406** & 0.096045** & 0.096371** & NO \\
Log(TRACOMM) & -7.340729** & -7.139828** & 0.088610** & 0.076589** & NO \\
Log(TFCR) & -6.276573** & -3.475030** & 0.194436** & 0.134190** & NO \\
\hline
\end{tabular}
\end{table}

\textbf{Source:} Computed by Authors from Eviews Output.

\textbf{NOTE:} * , ** , *** represents significance levels at 10%, 5% and 1% respectively.

YES- Indicates the presence of unit root in the series.
NO - Indicates the absence of unit root in the series.

The ADF and KPSS unit root test result for model one in table 2 reveals that the series are stationary at their first difference. Thus, the null hypothesis of unit root presence is being rejected at the 5 percent level of significance.
3.2.2 Cointegration Test Result for Model One.

The cointegration test result for the models are presented below

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>0.981188</td>
<td>301.2984</td>
<td>125.6154</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.941782</td>
<td>186.0736</td>
<td>95.75366</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.786416</td>
<td>103.6101</td>
<td>69.81889</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.743600</td>
<td>58.84205</td>
<td>47.85613</td>
<td>0.0033</td>
</tr>
</tbody>
</table>

Trace test indicates 4 cointegrating equation at the 0.05 level of significance.
*, Denotes rejection of the hypothesis at the 0.05 level of significance

Source: Computed by Authors from Eviews Output

The Trace test and maximum Eigenvalue values in table 3 and 4, respectively, show that four cointegrating equations exist in the model. This test shows that the fiscal capital variables of interest do have a long run relationship.

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Max-Eigen Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>0.981188</td>
<td>115.2248</td>
<td>46.23142</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.941782</td>
<td>82.46351</td>
<td>40.07757</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.786416</td>
<td>44.76801</td>
<td>33.87687</td>
<td>0.0017</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.743600</td>
<td>39.46950</td>
<td>27.58434</td>
<td>0.0010</td>
</tr>
</tbody>
</table>

Max-eigenvalue test indicates 4 cointegrating equations at the 0.05 level.
*, Denotes rejection of the hypothesis at the 0.05 level of significance

Source: Computed by Authors from Eviews Output

3.2.3 ECM Result Analysis for Model One

Table 5: ECM for Model One.

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>T-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>dlog(PCGDP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dlog(Pgd(-1))</td>
<td>0.546638</td>
<td>0.189599</td>
<td>2.883128</td>
<td>0.0095</td>
</tr>
<tr>
<td>dlog(Agric)</td>
<td>0.029827</td>
<td>0.015496</td>
<td>1.924771</td>
<td>0.0694</td>
</tr>
<tr>
<td>dlog(Defn)</td>
<td>-0.035495</td>
<td>0.018573</td>
<td>-1.911084</td>
<td>0.0712</td>
</tr>
<tr>
<td>dlog(Educa)</td>
<td>0.018680</td>
<td>0.022181</td>
<td>0.842162</td>
<td>0.4102</td>
</tr>
<tr>
<td>dlog(Tfcr)</td>
<td>-0.058480</td>
<td>0.046422</td>
<td>-1.259744</td>
<td>0.2230</td>
</tr>
<tr>
<td>dlog(Agric(-1))</td>
<td>-0.037681</td>
<td>0.019394</td>
<td>-1.942892</td>
<td>0.0670</td>
</tr>
<tr>
<td>dlog(Educa(-1))</td>
<td>-0.041029</td>
<td>0.023492</td>
<td>-1.746508</td>
<td>0.0969</td>
</tr>
<tr>
<td>dlog(Health(-1))</td>
<td>-0.011755</td>
<td>0.017154</td>
<td>-0.685286</td>
<td>0.5014</td>
</tr>
<tr>
<td>dlog(Tracomm(-1))</td>
<td>0.024241</td>
<td>0.015967</td>
<td>1.518171</td>
<td>0.1454</td>
</tr>
<tr>
<td>C</td>
<td>0.026432</td>
<td>0.014946</td>
<td>1.768554</td>
<td>0.0930</td>
</tr>
<tr>
<td>ECM (-1)</td>
<td>-0.149335</td>
<td>0.103664</td>
<td>-1.440563</td>
<td>0.1660</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.547705</td>
<td>Adj R-squared</td>
<td>0.309655</td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>2.300801</td>
<td>Prob(F-statistic)</td>
<td>0.056651</td>
<td></td>
</tr>
</tbody>
</table>
The short run model results contained in table 5 for model one support, to a large extent, earlier assertions that fiscal outlays by government are actually the main drivers of growth in any economy. From the result, current growth in the economy is significantly impacted upon by previous year recorded improvements in economic growth. This behavior likely occurs because as the economy records growth; policy makers would ensure that such economic achievements are sustained in the future.

Similarly, capital spending in the agricultural sector positively stimulates economic growth in the same period. This can be attributed to government’s yearly effort at making fertilizers available, as well as providing credit to farmers, building grain storage facilities, etc. However, previous year capital investment in the sector have a significantly negative impact on the economy. A factor responsible for this is the use of capital investment to import agricultural products instead of improving exports.

Capital spending in the defense sector has a significant, negative impact on the growth of the economy. This shows that the allocation of funds to purchase military hardware and military construction crowds out funds for development of other sectors in the short run.

Capital spending on education in the current period positively impacts economic growth, but its contribution is not found to be significant. Conversely, previous investment in the sector significantly and negatively impacts the economy. The cases of strikes and high rates of abandoned projects in the sector can be pointed to as responsible factors for these results. This therefor means that more funding of the sector, smooth running of the sector, and commitments at fulfilling all abandoned projects are actually needed by policy makers. In a similar response, capital funding in the health sector in the previous period does not have positive influence on economic growth. This can also be linked to the poor funding of the sector as well as short fall in manpower in the sector. Investment in transport and communication by the government, though, shows a positive impact on the economy, but the influence is insignificant. An improved funding of the sector to finance roads, network provisions, and the availability of modern transportation for the citizens is capable of turning the tide.

The ECM coefficient of -0.15 shows that an annual correction of about 15 percent takes place in the economy in the presence of distortion to long run equilibrium. This means for long run equilibrium to be restored in the system as a result of policy and political distortions; it would take about six years and seven months for the effect of the distortion to be neutralized or erased.

3.2.4 Model One Residual Hypothesis Test

Model One Normality Test
The residual normality test above accepts the null hypothesis that the residuals for model one are normally distributed.

**Model One Serial Correlation Test**

**Table 6:** Breusch-Godfrey Serial Correlation LM Test:

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Prob. F(2,17)</th>
<th>Prob. Chi-Square(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.398804</td>
<td>0.6772</td>
<td></td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>1.344463</td>
<td>0.5106</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Computed by Authors from Eviews Output

Likewise, the serial correlation test for model one also accepts the null hypothesis of no serial correlation in the residuals.

**Model One Heteroscedasticity Test**

**Table 7:** Heteroskedasticity Test: Breusch-Pagan-Godfrey

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Prob. F(10,19)</th>
<th>Prob. Chi-Square(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>1.254243</td>
<td>0.3211</td>
<td></td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>11.92910</td>
<td>0.2898</td>
<td></td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>3.748912</td>
<td>0.9580</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Computed by Authors from Eviews Output
In line with the above tests (accepting the null hypothesis) and judging by the probability value of the observed R-squared, the residuals for model one show that they are homoscedastic in nature.

**Model One Stability Test**

![Figure 2: Residual Stability Test](image)

Source: Computed by Authors from Eviews Output

The residual stability test for cumulative sum and cumulative sum squared shows that the residuals are stable at the five percent significance level.

### 3.3 Model Two Result Analyses

#### 3.3.1 Unit Root Test Analysis

**Table 8: Unit Root Test for model 2 at first difference.**

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF-Test</th>
<th>KPSS-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(PCGDP)</td>
<td>-4.262946**</td>
<td>-4.946335</td>
</tr>
<tr>
<td>Log(DEFN)</td>
<td>-7.305213**</td>
<td>-7.193043**</td>
</tr>
<tr>
<td>Log(EDUCA)</td>
<td>-5.103092**</td>
<td>-5.355479</td>
</tr>
<tr>
<td>Log(HEALTH)</td>
<td>-5.165153**</td>
<td>-5.118281**</td>
</tr>
<tr>
<td>Log(TRACOMM)</td>
<td>-7.369832**</td>
<td>-7.355713**</td>
</tr>
<tr>
<td>Log(TFCR)</td>
<td>-6.276573**</td>
<td>-3.475030*</td>
</tr>
</tbody>
</table>

Source: Computed by Authors from Eviews Output.

**NOTE:** *, **, *** represents significance levels at 10%, 5% and 1% respectively.

YES- Indicates the presence of unit root in the series.

NO - Indicates the absence of unit root in the series.

Table 8 unit root test shows that all of the variables for model 2 are also found to be stationary at their first difference form, confirming that all the variables are integrated of order one; i.e I(1).
3.3.2 Cointegration Test Result for Model Two.
The cointegration test result for the models are presented below.

**Table 9: Unrestricted Cointegration Rank Test (Trace)**

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>0.835088</td>
<td>169.3850</td>
<td>125.6154</td>
<td>0.0000**</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.696960</td>
<td>111.7099</td>
<td>95.7536</td>
<td>0.0026</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.534560</td>
<td>73.50546</td>
<td>69.8189</td>
<td>0.0246</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.498228</td>
<td>49.03272</td>
<td>47.85613</td>
<td>0.0386</td>
</tr>
</tbody>
</table>

Trace test indicates 4 cointegrating equation at the 0.05 level of significance.
* Denotes rejection of the hypothesis at the 0.05 level of significance

**Source:** Computed by Authors from Eviews Output

**Table 10: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)**

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Max-Eigen Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None*</td>
<td>0.835088</td>
<td>57.67502</td>
<td>46.23142</td>
<td>0.0021</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.696960</td>
<td>38.20448</td>
<td>40.07757</td>
<td>0.0801</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.534560</td>
<td>24.47274</td>
<td>33.87689</td>
<td>0.4215</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.498228</td>
<td>22.06749</td>
<td>27.58434</td>
<td>0.2169</td>
</tr>
</tbody>
</table>

Max- eigenvalue test indicates 1 cointegrating equation at the 0.05 level of significance.
* Denotes rejection of the hypothesis at the 0.05 level of significance

**Source:** Computed by Authors from Eviews Output

Similarly, the Trace and Max-Eigenvalues for the recurrent fiscal variables in table 11 and 12 reveal the presence of four and one cointegrating equations, respectively, at the five percent significant level. This also shows that the fiscal series do have a long run relationship.

3.3.3 ECM Result Analysis for Model Two

**Table 16: ECM for Model Two**

<table>
<thead>
<tr>
<th>Dependent Variable: dlog(PCGDP)</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>T-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dlog(Pcgpdp(-1))</td>
<td>0.216838</td>
<td>0.215231</td>
<td>1.007465</td>
<td>0.3264</td>
</tr>
<tr>
<td>Dlog(Educa)</td>
<td>-0.013943</td>
<td>0.045300</td>
<td>-0.307784</td>
<td>0.7616</td>
</tr>
<tr>
<td>Dlog(Agric)</td>
<td>-0.012599</td>
<td>0.023769</td>
<td>-0.53044</td>
<td>0.6022</td>
</tr>
<tr>
<td>Dlog(Tfcr)</td>
<td>0.061112</td>
<td>0.042148</td>
<td>1.449944</td>
<td>0.1634</td>
</tr>
<tr>
<td>Dlog(Health)</td>
<td>0.026123</td>
<td>0.048392</td>
<td>0.539815</td>
<td>0.5956</td>
</tr>
<tr>
<td>Dlog(Tracomm)</td>
<td>-0.036592</td>
<td>0.018910</td>
<td>-1.935088</td>
<td>0.0680</td>
</tr>
<tr>
<td>Dlog(Defn(-1))</td>
<td>-0.089611</td>
<td>0.039534</td>
<td>-2.266702</td>
<td>0.0353</td>
</tr>
<tr>
<td>Dlog(Educa(-1))</td>
<td>-0.016790</td>
<td>0.042048</td>
<td>0.399315</td>
<td>0.6941</td>
</tr>
<tr>
<td>Dlog(Health(-1))</td>
<td>-0.019534</td>
<td>0.045315</td>
<td>-0.431081</td>
<td>0.6713</td>
</tr>
<tr>
<td>Dlog(Tfcr(-1))</td>
<td>0.058858</td>
<td>0.047431</td>
<td>1.240915</td>
<td>0.2297</td>
</tr>
<tr>
<td>Dlog(Tracomm(-1))</td>
<td>0.004935</td>
<td>0.018178</td>
<td>0.271468</td>
<td>0.7890</td>
</tr>
<tr>
<td>C</td>
<td>0.009602</td>
<td>0.018852</td>
<td>0.509323</td>
<td>0.6164</td>
</tr>
<tr>
<td>ECM (-1)</td>
<td>-0.153782</td>
<td>0.102406</td>
<td>-1.501688</td>
<td>0.1496</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.446577</td>
<td>Adj R-squared</td>
<td>0.097047</td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>1.277649</td>
<td>Prob (F-statistic)</td>
<td>0.306601</td>
<td></td>
</tr>
</tbody>
</table>
The ECM result for model two which shows the relationship between recurrent outlays and economic growth is presented in the above table. The results show that same-period recurrent spending in the education and agriculture sectors negatively affect growth, though the impact is not significant. While same-period recurrent outlays on health have a positive impact on growth, the impact is also insignificant.

However, in the case of recurrent spending on transportation and communication, as well as previous defense spending, both appear to be the only significant contributions to the economy. Previous spending on defense, education, health and transport and communication all have an insignificant impact the growth of the economy.

Interestingly, the ECM coefficient of -0.15 for model two is the same with that of model one. The difference is the significant nature of the coefficient in model two. The coefficient value shows that an annual correction of about 15 percent takes place in the economy in the presence of distortion to long run equilibrium. This means for long run equilibrium to be restored in the economy as a result of policy and political distortions, it would take about six years and seven months for the effect of the distortion to be neutralized or erased.

### 3.3.4 Model Two Residual Hypothesis Test
#### Model Two Normality Test

![Normality Test](image)

**Figure 8: Normality Test**

**Source:** Computed by Authors from Eviews Output

The residual normality test for model two above accepts the null hypothesis that the residuals for model one are normally distributed.

### Model Two Serial Correlation Test

**Table 17:** Breusch-Godfrey Serial Correlation LM Test:
Likewise, the serial correlation test for model one also accepts the null hypothesis of no serial correlation in the residuals.

**Model Two Heteroscedasticity Test**

**Table 18:** Heteroskedasticity Test: Breusch-Pagan-Godfrey

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Prob. F(2,17)</th>
<th>0.6371</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.922180</td>
<td>Prob. F(12,19)</td>
<td>0.5449</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>11.77793</td>
<td>Prob. Chi-Square(12)</td>
<td>0.4637</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>4.008598</td>
<td>Prob. Chi-Square(12)</td>
<td>0.9833</td>
</tr>
</tbody>
</table>

**Source:** Computed by Authors from Eviews Output

In line with the above tests (accepting the null hypotheses) and judging by the probability value of the observed R-squared; the residuals for model one show that they are homoscedastic in nature.

**Model Two Stability Test**

![Figure 9: Residual stability Test](chart)

**Source:** Computed by Authors from Eviews Output

The residual stability test for cumulative sum and cumulative sum squared shows that the residuals are stable at the five percent significance level.
4 CONCLUSION

This study concentrated on analyzing the short run impact of government capital and recurrent outlays on key growth driving sectors for the period 1981 to 2014 in Nigeria. The study found that current government capital spending in the education sector has been a positive contributor to growth, compared to its recurrent spending. The same scenario was observed in the agricultural sector, as well as past capital outlays on the transport and communication sector.

However, an inverse effect on the economy was found for current capital outlays on defense and previous spending on agriculture, education and health sectors. These trends can be attributed to the rates of abandoned projects which are common in these sectors due to poor funding of capital projects, coupled with the problem of sustainability of previous governments’ projects by incumbent governments. We believe these trends are undesirable if the country aims to attain its vision 2020:20. That is, the goal of being one of the twenty most industrialized countries in the world.

The recurrent outlays in the five sectors being examined show inverse impact on economic growth, with exception to previous spending on defense, and transport and communication. Aside from these two sectors, though the regression output shows that the impacts are not significant, growth in recurrent outlays should be controlled by the government, because they crowd out of funds for capital spending.

The five sectors being considered in this study, if properly harnessed, are endowed with the potential of creating much needed jobs in the economy, capable of stimulating its path into prosperity. They also have the ability to raise the productivity level of the economy, and to improve the standard of living of the citizens.

5 RECOMMENDATIONS

Based on the above conclusions, we propose the following recommendations:

The educational sector plays an important role in the provision of quality manpower for the other sectors of the economy. For a nation to actually grow, the possession of qualified human resources is quite essential. That said, the government’s increased recurrent spending in the sector will not yield this required labor force. Rather, increased capital spending in the form of building and equipping existing laboratories in various institutions of learning, as well as construction and rehabilitation of existing schools (primary, secondary and tertiary institutions) is required. Capital spending aimed at encouraging Research and Development in the tertiary institutions should be increased and disbursed adequately for such a purpose.

The health sector is also critically linked to the continuous general well-being of the work force. The observed scenario of increased recurrent outlay over capital spending is also undesirable. Improved investment in capital projects should be given more emphasis, because a better health sector would help reduce the rather large amount of foreign exchange being lost by the economy.
due to increasing demand for quality health care abroad. If proper capital investment in the sector is being done, the country stands to benefit from foreign capital flow realizable from the sector.

The transport and communication sector is very much important to the growth process of the Nigerian economy. Obviously, if the government is to achieve its vision of becoming one of the most industrialized nations, then capital investment in this sector would play a major factor at realizing this goal. This is because a good transport and communication system not only directly adds value to the GDP, but also helps in the supply chain of goods and services from the manufacturing sector to the end users. Poor transportation and communication also contribute to the high cost of production responsible for the weak competitiveness of goods produced within the country, in the form of high prices. The recent attempt by the government at improving the output of this sector in recent years through special intervention schemes, et cetera, is commendable.

Investment in the defense sector today has been considered by most nations to also be necessary, just as in the electrical and agricultural sectors. This is owing to the rising security threat to life and investments in most countries. Thus, the government’s improved capital investment in the sector is strongly recommended to ensure investors’ confidence in the safety of their investments throughout the country. Increased capital spending in acquisition of modern military hardware, as well as the training and retraining of military personnel with the most recent anti-terrorism techniques are all required. Additionally, the Defense Industries Corporation should be revitalized because of its potential of creating additional jobs in the economy, and of saving the economy of foreign currencies used in the purchase of military hardware, which creates jobs in those countries where such hardware is being imported from, at the expense of the local economy.

The agricultural sector is one which can conveniently rival the oil sector, which is currently acting as the main “life line” of the Nigerian economy. Increase in capital spending in the agricultural sector over recurrent spending should be sustained. This would enable the sector function efficiently as a producer of industrial raw material to the manufacturing sector, reduce unemployment among youths, guarantee food security for the nation, serve as source of reliable foreign earnings for the country, and so on.

Finally, the interdependence of these sectors could help ensure the speedy economic and social transformation essential in attaining sustainable growth and development of the Nigerian economy. This is because in each sector abounds with huge growth potentials; thus, the need for sustainable investment to ensure they help realize the growing needs of the economy.

REFERENCES


Motivations for Luxury Consumption: Insights from Tunisia’s Emerging Market

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ABSTRACT
Luxury consumption and the desire for luxury are well-accepted phenomena. Myriad studies have documented the pervasiveness of the luxury market in the West and the high growth and strong potential of Asian luxury markets. It is also evident that as resources have grown in a region, luxury consumption and the desire for luxury products have followed. Nevertheless, the need for more far-reaching studies that explore emerging markets are important to understand the differences in how luxury may penetrate these markets, given variations in resources and culture. This paper investigates a number of factors that may contribute to the emergence of new luxury markets. Specifically, the authors focus on the psychology of luxury consumption in the post-revolution Tunisian market. In particular, this research attempts to understand the psychology behind the consumption of luxury items in Tunisia and provide managerial insights into strategies for entry into such emerging markets. The empirical data was collected using online surveys of participants from French-speaking Tunisia. Overall, this analysis of the Tunisian market for branded products and services informs international luxury managers in developing their strategies to penetrate emerging markets. Besides the managerial insights that the results provide, the hypotheses tested in this paper relating luxury consumption to the variables of age, income, and education within the framework of national culture are important contributions from the theoretical standpoint.

Keywords: Tunisia, Luxury Goods, Consumption and Luxury, Emerging Markets, Culture and Consumption, Demographics and Luxury Consumption.

1 INTRODUCTION

Throughout history, Tunisia has been a civilization of different people. Multiple successive dynasties and civilizations settled in Tunisia in the past included Carthaginian, Roman, Andalusian, Ottoman, Vandal, Jewish, Christian, Arab, Islamic, Turkish, French and native Berbers. This intermingling of people occurred in a geographical location nestled between the Mediterranean, African and Arab worlds. This mosaic of cultures and myriad influences gave
birth to an educated, open-minded, Europeanized, fashion-driven and relatively well-to-do society willing to give up large amounts of money to acquire luxury products.

It is not altogether surprising for such a nation to be the one that triggered one of the most important turning points in world history: the Arab Spring. The Arab Spring refers to the democratic uprisings that started in Tunisia in December 2010 and spread all over the Arab world. Several studies (Al-Momani 2011; Bishku 2013; Dadush & Dunne 2011; Dziri 2013; Maddy-Weitzman 2011; Martin 2011; Sanchez 2009) have been conducted to assess the post-revolution economic and political health of Tunisia and to evaluate new investment opportunities. However, relatively little research has focused on the luxury goods industry, and even fewer studies have examined luxury consumption behavior of the Tunisian population from a cultural or psychological standpoint. Therefore, the overall objective of this study is to explore and test theory pertaining to luxury consumption in the emerging market that Tunisia represents. Given the diverse cultural heritage and interaction that Tunisia has had with Europe, Africa and the Middle East, the luxury consumption behaviors found here will likely be similar in educated, emerging economies that are exposed to and interact with developed economies through television, social media and the Internet.

2 THEORY AND HYPOTHESES

The following literature review briefly outlines the political and socio-economic conditions of Tunisia to understand the viability of the luxury market under such conditions. Further, theory pertaining to understanding key determinants of luxury product desire and consumption, from the psychological and cultural perspectives, will be discussed.

3 THE SOCIO-ECONOMIC CONTEXT OF TUNISIA

Tunisia has been known throughout history as an open Mediterranean trading country. Prior to the revolution, the Tunisian economy was healthy on a macroeconomic level: low inflation rate, sufficient currency reserves, acceptable budget deficits, and annual rates of growth of 5 percent or higher. However, Tunisia still suffers from problems such as overreliance on agriculture, weakness in the private sector, and high rates of unemployment, especially among the young (Maddy-Weitzman 2011). Despite these challenges, the modernization that was put into place after independence from being a French protectorate in 1956 has generated significant positives that have led to stronger economic potential. For example, unlike other Arab countries, Tunisia has banned polygamy. As a result, the majority of women enjoy higher social status and better economic conditions. Furthermore, Tunisia has had a lower rate of population growth compared to the rest of the Arab world, has an active civil society backed by labor unions, a non-politicized military (Maddy-Weitzman 2011) and an educated workforce (Sanchez 2009). Tunisia is designated as a lower middle income country with a gross national income per capita of about $4,000 (The World Bank, n.d.). However, the middle 60% of the population enjoys about 50% share of all income, suggesting a growing middle income group (The World Bank, n.d.). All
these factors play a pivotal role in the shaping consumption of luxury products in post-revolutionary Tunisia.

4 POST-REVOLUTION TUNISIA

Even prior to the Revolution, Tunisia’s geographic location and openness had attracted six and a half million tourists annually (Sanchez 2009). Tunisia has always maintained good diplomatic, political, and economic relations with the Western developed world. Free exchange of goods, services, and human capital between the United States, other western countries, and the region, create investments and subsequently job opportunities (Martin 2012). Examples of large American corporations investing in Tunisia are Fidelity Investments and IBM, which opened new regional headquarters in the capital city of Tunis very recently (Martin 2012).

From the socio-political perspective, the first elected government, despite being led by an Islamist party, opposed the institution of shari’a Islamic Law in the constitution and the bans of alcohol and payment of interest. Such a stance reassured Tunisian secularists, potential foreign investors, and tourists of Tunisia’s openness to foreign economic participation (Bishku 2013). Despite the numerous threats to stability, the Arab world, in general, is embracing a new era of economic, political, and social development (Al-Momani 2011). Tunisia, in particular, seems to be the most promising country among all the post-revolutionary countries. The World Economic Forum in its Global Competitiveness Report of 2006-2007 described the Tunisian economy as the most competitive in Africa and in the Arab world (Sanchez 2009). Furthermore, the Tunisian population is more literate and less impoverished than other Arab countries, has a stronger middle class than most other nations, and possesses government that has spurred private foreign investment in industry (Bishku 2013). Thus, despite Africa commanding only about 2% of the worldwide luxury products market (Statista, n.d.), Tunisia serves as an excellent market to study how the luxury industry may penetrate emerging and opening markets.

Against this backdrop, this research aims to explore and test theory associated with luxury consumption in the Tunisian market. Given the relative openness of the government to foreign economic participation, and a stronger middle class with more exposure to foreign ideas, products, and brands, studying Tunisian consumer behavior with regards to luxury products is timely and pertinent. The insights from Tunisian consumers are likely to reflect the desires for luxury products in other emerging markets.

5 THEORY AND HYPOTHESES

In recent years, the world market for luxury goods has experienced significant growth, from being valued at $60 billion in 1990 to about $240 billion in 2015 (Le Monkhouse, Barnes & Stephan 2012). Although the desire amongst the well-heeled to enjoy high quality products from the functional or the social conspicuousness perspectives has been known for a long time, recent
evidence suggests that increasing number of markets with limited financial resources are demanding luxury goods much more than before (Souiden, M’Saad, & Pons 2011). It seems reasonable to attribute some of this phenomenal growth in the luxury product market to consumer desire created by significantly enhanced awareness and information sharing about luxury products across the world. The proliferation of the Internet has likely had a significant role in creating rapid awareness of luxury products and services. Today, observing celebrities, brand advertising, and lay people consuming luxury products in different societies across the world has become restricted not by location, but by Internet connectivity. It is not surprising, therefore, that consumers in the developing world now show very similar interests in branded fashion accessories compared to their counterparts in the developed world (Souden, M’Saad and Pons 2011). This trend is observed particularly in emerging countries like Brazil, India, and China, where the luxury market growth rates range from 20% to 35%, boosted by both affluent customers and less affluent social status seekers who purchase luxury brands (Souiden, M’Saad, & Pons 2011). Mass marketing of luxury goods (Souiden, M’Saad, & Pons 2011) is now part of the luxury product landscape. It is, in fact, not surprising that an increasing number of luxury manufacturers are trying to make their products affordable to a wider range of people by adding lower-priced items to their product lines. On the same line of reasoning, Soyoun and Jongeun (2011) introduced the “masstige” concept, which refers to “mass” prestige. Masstige products are defined as “premium but attainable,” and are considered luxury or premium products that have been priced to be attainable to the middle classes. In fact, with the growing number of middle class consumers who are willing to spend large percentages of their income on luxury products, luxury producers are expanding their narrow circle of ultra-affluent consumers to include the willing middle class.

An important factor that has strongly supported the remarkable luxury product penetration in Asia is their culture (Soyoun & Jongeun 2011). In particular, most Asian nations tend to be high on power distance and collectivism (Hofstede 2001). Maintenance of power distances usually leads to a choice of products that accentuate those differences. For instance, a manager attaining a certain post may feel compelled or be urged to consume certain types of products to conform. Furthermore, collectivism is likely to lead consumers to choose products that help them fit into a variety of social groups, or to achieve conformity in their aspirant groups (Soyoun & Jongeun 2011). Interestingly, country comparisons between Middle Eastern and Asian countries reveal a striking similarity in terms of these two key dimensions (Hofstede 2001). Thus, it is very likely that consumers in emerging markets like Tunisia will exhibit attitudes towards luxury products very similar to the attitudes of their Asian counterparts. Thus, from the cultural perspective, over time Tunisian consumers are likely to seek and consume luxury products in a manner similar to Asian consumers.

However, it is imperative to explore the boundary conditions of such a generalized propensity towards luxury product consumption and desire. Certainly, the lure of luxury products from the quality and enhanced functionality perspectives is very reasonable. However, conspicuous consumption of products is often done to display wealth and social status or to seek social acceptance. Purchasing luxury products often has customers perceiving themselves as being in
higher status positions in society, which elicits feelings of pleasure, excitement and confidence (Lim, Ting, Khoo & Wong 2012). Although conspicuous consumption is a fairly universal phenomenon it is likely more pervasive in more collectivist and high power distance countries, including those in Asia and the Middle East. Very often, conspicuous consumption has a role to play in fostering materialism (Hanzaee & Rouhani 2013), which is the importance a consumer attaches to worldly possessions (Hudders & Pandelaere 2011). Materialism values publicly consumed goods more than privately consumed ones. Susceptibility to the need for conformity, a hallmark of collectivist and high power distance societies, has been considered one of the most significant factors influencing the need for publicly consumed products. Conformity has been shown to significantly impact the purchasing of foreign luxury brands (Park, Rabolt & Jeon 2008). Therefore, one likely motivation of materialism is the use of possessions and consumer goods to communicate an individual’s personal identity, social class, or status.

Therefore, from the cultural perspective, we would expect that Tunisian consumers will exhibit a significant desire for luxury products to enable expression of social position. However, to the extent younger consumers are more exposed to media and information, and have a stronger need to conform to social groups, it is very likely that this desire for luxury products will be stronger for younger consumers in the Tunisian market. Thus, we hypothesize:

H1a: The desire for luxury products is stronger for younger compared to older consumers.

Next, younger consumers are likely to be less prudent compared to older consumers. Also, with relatively less income, they are more likely to spend somewhat more recklessly on luxury products. Therefore,

H1b: The proportion of income spent on luxury is higher for younger compared to older consumers.

Next, as consumers grow in age, they are likely to gain in prudence and are less likely to be subject to norm based pressures than their younger counterparts. The ability to make self-determined choices, albeit for luxury products, is likely to be stronger for older consumers. In other words, public consumption, and therefore the approval of others, will be stronger for younger consumers compared to older buyers.

H1c: Opinions of others in relation to product purchases is more important for younger compared to older consumers.

Lastly, younger consumers, who are more susceptible to social pressure to engage in conspicuous consumption to fulfill social expectations, are more likely to hold the views that materialism and socially inspired consumption are prevalent in their society. Thus,

H1d: The belief about the prevalence of materialism in society is stronger for younger
compared to older consumers.

H1e: The belief that other consumers purchase luxury products largely to display to others is stronger for younger compared to older consumers.

Another important variable explored in this study is the formal education levels of consumers. The fundamental premise is that as education increases, the sense of independence and self-determination is likely to rise as well. It is therefore likely that the felt social impositions and cultural norms to conform will be less intensely felt for more educated consumers. Thus, it is reasonable to expect that when engaging in luxury consumption that is more determined by social or cultural pressures, consumers would probably also have less control over choices and, therefore, prices. On average, we expect that less educated consumers will spend what is required to acquire the product and be less price sensitive. On the other hand, more educated consumers will buy what they choose themselves based on personal criteria and will correspondingly spend with some restraint. Therefore, we propose,

H2a: The proportion of income spent on luxury is higher for less educated compared to more educated consumers.

H2b: The willingness to purchase luxury even if their existing debt level was higher than usual is higher for less educated compared to higher educated consumers

As discussed, education is likely to create a dichotomy whereby the desire for luxury products will stem from different reasons. A framework that is particularly useful to explore the differences in luxury product desire based on educational levels is one proposed by Le Monkhouse, Barnes & Stephan (2012). Broadly, they propose that the key reasons for the desire for luxury are either conformity based consumption behaviors or self-indulgent, hedonistic forms of behavior. That is, besides purchasing luxury products for social conformity or public status display purposes, consumers may seek to purchase luxury products due predominantly to the high quality of the products. The quality they seek may include materials, design, technology, sophistication, utility and craftsmanship. Further, besides quality, another private reason for luxury product desire may be purely hedonism, or self-indulgence. Consumers may seek such products to enjoy or reward themselves with the sensory pleasures of well-performing and aesthetically pleasing luxury products. These would represent the “private” reasons for consumption. On the other hand, as discussed above, consumers may desire luxury to signal wealth, power, or social presentation (Demirbag, Sahadev & Mellahi 2010). As an extension of the conspicuous value of luxury products, unique or exclusive products may also be used to portray dominant status and create distance with other consumers (Lim, Ting, Khoo & Wong (2012), Melika Husic and Muris Cicic (2009)). These reasons form a subset of “public” reasons for luxury product consumption. It is likely that less educated consumers will be more susceptible to the “public” reasons for consumption of luxury products. On the other hand, educated consumers are correspondingly more likely to seek products more for “private” reasons, given their interest and ability to critically evaluate social and cultural norms and perhaps defy them. Therefore,
H2c: Luxury products with enduring, rather than temporary, style are chosen more by higher educated compared to lower educated consumers.

H2d: Luxury product purchases for the purpose of appearance enhancement will be made more by lower educated compared to higher educated consumers.

The next few hypotheses pertain to the impact of income on luxury consumption. To the extent income is a limiting factor, it is reasonable to expect that,

H3a: The proportion of consumers in possession of luxury products will be higher for high income compared to low income consumers.

H3b: Amongst those without luxury products, the proportion of consumers willing purchase luxury products will be higher for high income compared to low income consumers.

However, to the extent luxury products costs are significant, lower income consumers are more likely to be willing to spend proportionally more to acquire such products, we expect that,

H3c: The willingness to spend a higher proportion of income on luxury products will be higher for low income compared to high income consumers.

Further, with very relatively few other markers of success in their lives, luxury products will represent success more to lower income consumers. On the other hand, higher income consumers are likely to be less inclined to see luxury products as mere expressions of success, particularly for conspicuous display. On the contrary, higher income consumers are more likely to seek luxury for “private” reasons such as hedonistic, or self-indulgent, reasons. Hence, we propose,

H3d: The tendency to view luxury products as an expression of accomplishment will be higher for low income compared to high income consumers.

H3e: The desire for luxury products to seek the best available products for themselves is stronger for higher income compared to lower income consumers.

H3f: The desire for luxury products to seek the best quality products for themselves is stronger for higher income compared to lower income consumers.

6 METHODOLOGY

The sample respondents were drawn exclusively from Tunisian Facebook users. One of the authors used her personal friends and family members as “seed” respondents and requested that
each of them further forward the survey to at least five more friends or family members. The survey was conducted through Survey Monkey. Records were identified by name and date of birth to ensure no duplication of respondents in the database. The questionnaire was administered in both French and English. A Tunisian certified translator was asked to translate the questionnaire in order to ensure the accuracy and the correctness of the translation. Table 1 provides a summary of the demographics of the collected sample that used to test the hypotheses.

**Table 1**

<table>
<thead>
<tr>
<th>Sample Size</th>
<th>Gender</th>
<th>Age</th>
<th>Annual Income in US Dollars*</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td></td>
<td>18-25 (82, 41%)</td>
<td>$0-2275 (61, 30.5%)</td>
<td>High School (23, 11.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26-35 (75, 37.5%)</td>
<td>$2275-4550 (37, 18.5%)</td>
<td>Bachelors (48, 24%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>36-45 (21, 10.5%)</td>
<td>$4550-11375 (69, 34.5%)</td>
<td>Masters (76, 38%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>46-55 (15, 7.5%)</td>
<td>&gt;$11375 (33, 16.5%)</td>
<td>Doctorate (39, 19.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;55 (7, 3.5%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the survey, income was reported in Tunisian Dinars (TND), 0-5000, 5000-10000, 10000-30000 and 30000 and above.

We corroborated the sample demographics with the population demographics. In terms of gender, the sample data is somewhat imbalanced towards women, perhaps because of the restriction to Facebook users (as a method of initial contact). In terms of age, the population demographics report about 38% to be less than 24 years of age, about 52% being in the age range 25-64 and 8% over 65 years of age (The World Factbook, n.d.). The sample age statistics of 41% below 25 years of age, 55% between 26-55 and about 4% over 55 seem reasonably matched with the population statistics. With a national literacy rate of about 82% (The World Factbook, n.d.), the sample’s educational levels, where more than 62% have bachelors or masters degrees, seems appropriate. However, since Facebook was used to invite study participants, the sample certainly has more educated consumers than the national population. The distribution between the other categories was well balanced. In terms of income levels, four categories of income were used, measured in annual income. The median income of Tunisians was included as one of the middle categories. Here as well, the sample was well distributed with at least 30 respondents in each of the 4 categories of income measured. However, although reasonably representative, the sample has limitations, which are discussed in the Conclusions, Limitations and Future Directions section.

In the first section of the questionnaire, respondents answered questions related to demographic variables such as age, gender, marital status, education, occupation, country, and city of
residence and annual income. Next, the questionnaire started with an introduction and examples of luxury brands (e.g., Louis Vuitton, Burberry, Dior, Chanel), and a yes or no screener question asking (Y/N) if the respondent owned at least one luxury brand. This determined eligibility to participate in the survey. Those that answered “No” were asked about their willingness to purchase luxury in the future. Next, respondents were asked to indicate at least two types of luxury products or services they prefer, and their brand names (e.g., Louis Vuitton purse, Louboutin shoes). The main purpose of this was to help respondents recall certain brands, as well as to ensure that they referred to luxury brands as defined in the survey and not to other fashion products such as Forever 21 or H&M. Then, respondents were asked to indicate their degree of agreement and disagreement on a battery of items that were measured on a 10-point Likert scale, ranging from (1) strongly disagree to (10) strongly agree. All questions were single item questions developed by the authors and written very closely to match each hypothesis. For example, H2d hypothesizes that luxury is more often used to enhance appearance by less educated consumers than by more educated consumers. The question used to test this hypothesis simply asked respondents their level of agreement with the statement “Luxury products improve my appearance.” All other questions are presented in Table 2. Finally, participants had to answer a number of open-ended questions concerning their consumption behavior. In order to ensure the anonymity of the participants and confidentiality of the data they provided, the questionnaire did not ask for information that could readily identify the participants, such as name or national identification number. The next section details the hypotheses testing, the measures used, and the results.

7 RESULTS

This section explores the results of the hypotheses testing. A summary of the hypotheses testing is provided in Table 2. Hypothesis 1 explores the relationships between age and consumption of luxury products in Tunisia. Broadly, theory suggests that the desire for and consumption of luxury products is a pervasive phenomenon across ages in virtually all cultures. Not surprisingly, even in the Tunisian market, the results are the same. More than 70% of our respondents reported owning at least one luxury item. The older age groups reported even higher penetration rates of luxury product ownership. Despite widespread ownership of luxury products across age categories, Hypothesis 1 explores the nuanced behaviors and attitudes towards luxury consumptions across different age groups.

Hypothesis H1a purports that younger consumers who did not own luxury products would be more likely to aspire to own one than older consumers who similarly lacked luxury items. Results suggest that this hypothesis is partially supported ($\chi^2 = 4.67, p < 0.03$), whereby the proportion of the youngest consumers willing to buy a luxury product is higher than the proportion of slightly older consumers (86% vs 55%). Given the nature of the question, which asks for willingness to buy a luxury product if one does not own one already, the sample size for older consumers who do not already own a luxury product is naturally small. Hence, the comparison for this hypothesis is only between consumers 18-25 years of age and 25-35 years of
age. Next, H1b hypothesizes that younger consumers are more likely to spend a larger proportion of their income on luxury products. For ease of exposition, we collapsed the data such that there were two categories of ages (less than 35 and over 35) and two categories of expense proportions (less than 20% of income and more than 20% of income). This is hypothesis is supported ($\chi^2 = 7.01, p < 0.00$) with the data suggesting that nearly 25% of younger consumers spend more than 20% of their income on luxury products compared to only about 3% of older consumers. As expected, there seems be a larger appetite for luxury products amongst younger consumers, and recklessness with regards to how much they are willing to spend. Next, H1c suggests that the opinions of other people are more important for younger consumers than for older consumers. That is, younger consumers will be more concerned about the approval of others in the context of luxury products. The results support this hypothesis ($F(4,132) = 2.27, p < 0.07$), where younger consumers believe more in the importance of opinions of other people for luxury products, compared to older consumers. Thus, the evidence suggests that susceptibility to conformity-based consumption is stronger for younger consumers. Next, H1d tests the theory that younger consumers, perhaps due to their stronger desire to consume luxury to conform, are more likely to perceive materialism in their society as more prevalent than older consumers would. The results support this hypothesis as well ($F(1,81) = 3.80, p < 0.06$), where younger consumers (under 35) reported a higher mean response to the question of whether they felt Tunisians are materialistic compared to older consumers over 35 (7.58 versus 6.36). The final hypothesis pertaining to age and luxury consumption, H1e, purports that younger consumers, compared to older consumers, will be more likely to perceive that Tunisian consumers are driven primarily by conspicuous display when purchase luxury products. The results do not provide statistical support for this hypothesis. However, the means do suggest that younger consumers’ perceptions that Tunisian consumers buy luxury products more for display purposes is stronger compared to the perceptions of older consumers (8.10 vs. 7.45).

The next set of hypotheses use the lens of education on luxury consumption behavior and aspirations. The foundational rationale for this set of hypotheses is that the more formal education consumers have, the more likely they will be to choose luxury products for their comfort and quality, rather than merely for display purposes. It is reasonable to expect that the more formal education an individual has, the more independent their thinking is likely to become. Hence, it is likely that formal education will make consumers resist conformity-based consumption more than less educated consumers. Therefore, with a stronger desire for display and social acceptance, H2a hypothesizes that less educated consumers are likely to spend a higher proportion of their income on luxury products. The data supports this hypothesis ($\chi^2 = 15.42, p < 0.08$), whereby we found a notably larger proportion of consumers with lower educational qualifications report spending in excess of 20% of their income on luxury products, compared to consumers with higher educational qualifications (15.4% vs 7.1%). However, a caveat is necessary for H2a. It is possible that this finding is actually the result of lower income. With the expectation that lower educational levels are correlated with lower incomes, this result, although statistically significant, is possibly confounded. The next hypothesis, H2b, suggests that less educated consumers will have a stronger willingness to purchase luxury even if their prior
levels of debt were higher than usual. The dependent variable used to test this hypothesis was derived from a question in which we asked respondents about their level of willingness to buy luxury products if their existing debt levels were too high. The data support this hypothesis ($F(4,128) = 2.91, p < 0.02$), where the less educated consumers report a higher willingness to buy luxury when they had higher levels of existing debt. This question, compared to H2a, is less likely to be picking up the effects of income levels and to truly measure the results of education, since it tests a willingness to spend when existing debt levels are high, rather than actual expenses. Hence, H2b is a stronger test that less educated consumers have perhaps more rigid beliefs about the need for conformity and socially motivated luxury consumption, and thereby, a more reckless willingness to obtain luxury, despite having higher existing debt levels. Perhaps higher levels of education create a pragmatic, rather than reckless, approach to managing the desire for luxury products. Incidentally, post-hoc tests reveal that the differences were significant between respondents with bachelor’s degrees and respondents with master’s degrees or above.

The next hypotheses pertain to the relationship between educational levels and the motivations and expected outcomes of luxury consumption. The “birds eye” perspective is that higher levels of education likely lead to more independent thinking with stronger abilities to resist conformity. In turn, such independence in thinking may foster more private and functional reasons for luxury consumption amongst more educated consumers. Less educated consumers are more likely to seek peer approval, buy things more for display and acceptance with peer and aspirant groups, and find a sense of personal achievement with luxury products. In this regard, hypothesis 2c purports that the higher the level of education, the higher the likelihood that chosen luxury purchases will have enduring, rather than temporary, style and will be akin to an investment. Results provide support for this hypothesis ($F(4,123) = 3.90, p < 0.00$), in which the more highly educated consumers report buying luxury products that are enduring in value and are seen as investments, compared to less educated consumers. Similarly, H2d hypothesize that less educated consumers will be more likely to see luxury products as a means to enhance their appearance than do more educated consumers. This hypothesis is supported with the means in the expected direction ($F(1,123) = 4.02, p < 0.05$).

The next set of hypotheses study luxury consumption from the viewpoint of income. In a manner similar to the theory discussed earlier, the rationale for luxury consumption for lower income consumers compared to higher income buyers is likely to be different. It is interesting to note that across income groups, there is no difference in the proportion of people who are in possession of luxury brands ($\chi^2 = 3.36, p < 0.33$), rejecting H3a. This is very likely because the price ranges and qualities of luxury items vary widely enough to capture a variety of income groups. Such strategies make luxury brands available to large swathes of people. Furthermore, for those who did not currently own a luxury product, the willingness to purchase one is the same across income groups ($\chi^2 = 5.43, p < 0.14$). In other words, nearly everybody in the population either has at least one luxury product or is willing to purchase one, regardless of income, rejecting H3b. These results are noteworthy. From a pragmatic viewpoint, one would expect that
higher income would be a driver of the desire for luxury products that provide quality. That is, as income rises, it would be reasonable to expect that people may reward themselves with better quality and better functioning products. However, the results seem to contradict such a pragmatic approach to luxury. Since lower income consumers own and desire luxury, there seems to be a stronger likelihood that the reasons for that desire are beyond mere desire for higher quality. To corroborate the theory that lower income consumers are likely more susceptible to conformity or social display motivations we explore H3c-H3f.

H3c hypothesizes that consumers with lower incomes are more likely to spend a larger proportion of their income on luxury products. With the need for such products for display and social acceptence, and thus less control on which luxury products need to be purchased, it is reasonable to expect that the proportional expenditure on luxury at lower income levels is likely to be very high. That is, lower income groups probably feel a stronger need to display socially and may thus exhibit a propensity to spend proportionally more than their higher income counterparts. The self-reported data largely support this hypothesis, where lower income consumers spend a significantly larger proportion of their income on luxury products compared to higher income consumers ($\chi^2 = 11.18, p < 0.01$). In terms of the reasons for consumption, H3d hypothesized that lower income consumers may be more inclined to use luxury products to express accomplishment and success. The relationship between income and the question that measured luxury apparel conveying accomplishment and success was statistically significant ($F(1,123) = 6.00, p < 0.02$). However, counter to what was expected in H3d, the mean responses suggest that the higher the income, the more the tendency to use apparel to convey accomplishment and success. However, this question may be flawed in that it is possible that higher income people, as part of their professional work, are required to use certain apparel to function effectively. In other words, the validity of the question to test H3d is questionable. Next, the expectation in H3e, that higher income consumers would seek the best for themselves, including luxury, was tested. This hypothesis tests the expectation that as income resources grow, the desire for the better things in life, for personal reward, will be higher as well. The hypothesis was supported ($F(1,123) = 3.42, p < 0.02$). Next, H3f tests the theory that at higher levels of income, the tendency is more to buy luxury products because they are very high in quality. This hypothesis is supported as well ($F(3,123) = 6.00, p < 0.02$) where the highest income group seemed to desire very high quality and believed more strongly that luxury products had that level of quality. Perhaps at lower levels of income, other considerations, such as status value and peer approval play a stronger role in luxury consumption.

8 CONCLUSIONS, LIMITATIONS AND FUTURE DIRECTIONS

The overarching purpose of this research was to explore the luxury product market in Tunisia. It was of particular interest to us that we understand the underlying motivations of luxury in this newly emerging market from the perspective of age, income and educational levels. To the extent such variables are relatively easy to measure, any insights into the differences luxury
product consumption and motivation from these perspectives provide insights for marketing managers on product positioning, promotional decisions and pricing and for public policy makers to manage such motivations.

First, it was noteworthy to find that in every age category, more that 70% of consumers reported possessing at least one luxury product. Amongst those who did not yet own a luxury brand, all age categories admit a willingness to purchase a luxury product in the near future. Thus, in a survey done in post-revolution Tunisia, it is staggering to observe the penetration of luxury products in society and the irrefutable willingness to own luxury products. It is clear to see that this is a large market. To the extent that Tunisia is representative of many other emerging economies, the results here suggest that luxury penetration in such populations is likely to be very rapid.

Additionally, the results also provide material for some nuanced insights. Particularly, younger consumers tend to be much more driven by their peers and seek their approval, which the results suggest is a strong reason for desire for luxury products. For younger consumers, such products are a mechanism for social acceptance and social admiration that they seek. From the seller’s perspective, creating popularity and supporting larger “mass” luxury markets is likely to generate significant value for businesses marketing to younger consumers. For older consumers, who seek luxury more for the functional and quality perspective, marketing products with a quality and functionality positioning is likely to be a more successful strategy. The implications of the results exploring age and luxury consumption are far reaching. From the promotional perspective, it may be advantageous for managers to create popularity for certain mass marketed luxury products to foster conformity and social acceptance value for certain products. Such themes in advertising luxury products are likely to help in appealing to younger consumers. For older consumers, promotions and pricing based on creating a belief about quality, self-indulgence and longevity of the luxury product in question may be more valuable.

From the perspective of education, this research provides some very interesting insights as well. In particular, less educated consumers tend to spend a larger proportion of their income on luxury products. Such recklessness may allow marketers extraordinary margins for a variety of products, with less regard to quality. The more educated consumer may also yield high margins to the marketer, but is only likely to do so with a requisite return in terms of durability, functionality and investment value. There are significant implications for advertising and pricing. As an example, marketing to the less educated consumer could involve credit provision, given the propensity to spend more to acquire certain socially desirable products. From the advertising perspective, creating a sense of social acceptance and social approval with the product or service would likely make such products more attractive to younger consumers. Distribution in visible, popular locations may be desirable to capture this larger group. On the other hand, focusing on key functionality and investment value would likely succeed for products targeted to the well-educated, with more value-based pricing and restricted distribution.

Last, from the income perspective, a similar pattern emerges. We find a higher tendency to spend a larger proportion of income on luxury for lower income consumers. Furthermore, as incomes rise, pragmatic reasons like quality, or self-reward reasons to own luxury products seem to
dominate. As an extension, it is then likely that lower income consumer may be purchasing more for public display or social acceptance reasons. That is, when income is low, spending on luxury becomes one way to maintain an ability achieve social acceptance and position. Although somewhat counter-intuitive, our results show that the less income one has, the stronger the desire for luxury products as a means to social display.

However, the results provide a cautionary note as well, suggesting less desirable potential outcomes. Despite the very useful prescriptions for marketers, there are significant insights in these results for public policy and society in general. To the extent younger people seek to cloak their desire for social acceptance and social position with expensive luxury products, such tendencies may lead to unsustainable habits of over spending, anxiety and family conflict. Such problems are not alien in developed economies where younger consumers have a tendency to spend disproportionately on luxury products. Excessive spending and unbridled desire for luxury for social acceptance can lead to myriad of problems in society. From the public policy perspective, perhaps prescriptive education on financial management, which occurs in many parts of the world, needs to include discussion and education on the perils of excessive luxury spending to achieve conformity or social position. Perhaps some instruction, discussion, and case education may help alleviate the effects of such felt peer pressure and desire for expensive luxury products. The results in this paper are a very timely reminder to public policy makers in emerging markets. Although variables such as culture may mitigate such tendencies, freedom of communication and Internet connectively act to counter such mitigation. Although we purport that avoiding the tendency toward conformity and social display through luxury in the younger, less educated or somewhat lower income groups is not entirely possible, we believe that intervention at the right venues may be of value to maintain such desire at healthy levels.

In terms of limitations of the research, we acknowledge that we were somewhat restricted by the sample that we had. Since we used Facebook users, we were somewhat limited by the profile of individuals willing to be on Facebook. There were fewer respondents in the oldest age categories, in the least educated categories and in the very highest income categories. As a result, our cells did not have perfectly balanced sizes, as one might be able to achieve with experiments and controlled samples. In future work in this area, more representative samples would be important to establish internal and external validity. Furthermore, given that this research was a broad first look at luxury consumption in Tunisia, and that we explored it from a variety of perspectives, we were limited by the length of the survey. In future work, it would be very important to use more psychometrically valid measures and perhaps probe deeper into each relationship studied.

In terms of future directions, an interesting avenue for future research may be to replicate this research using controlled experiments. Doing so will alleviate the problems due to unequal cell sizes. Furthermore, with a better sample, more nuanced interaction hypotheses can be explored. Although studying age, income, and education as independent variables impacting motivations for luxury consumption is insightful, it is important to understand that these variables also interact in their effects on luxury consumption and motivation. Further work, perhaps experimental, could develop theory in this area and take this work another step forward. Lastly,
there are certainly other variables that will impact luxury product desire. Developing and testing theory in relation to such variables represents another interesting future research opportunity.

REFERENCES


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<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Relationship Tested</th>
<th>Measures</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>Age è + Luxury Desire</td>
<td>IV: Age Categories, *DV: Are you willing to buy a luxury product? (FOR THOSE WHO DID NOT ALREADY HAVE LUXURY PRODUCTS)</td>
<td>Yes; p &lt; 0.03</td>
</tr>
<tr>
<td>1(b)</td>
<td>Age è + Percentage Income Spent on Luxury</td>
<td>IV: Age Categories, *DV: What percentage of your annual income do you spend on luxury products?</td>
<td>Yes; p &lt; 0.00</td>
</tr>
<tr>
<td>1(c)</td>
<td>Age è + Importance of Others’ Opinions</td>
<td>IV: Age Categories, ^DV: When buying a luxury product, other peoples’ opinions are important to me.</td>
<td>Yes; p &lt; 0.07</td>
</tr>
<tr>
<td>1(d)</td>
<td>Age è + Belief about societal materialism</td>
<td>IV: Age Categories, ^DV: Tunisians are materialistic.</td>
<td>Yes; p &lt; 0.06</td>
</tr>
<tr>
<td>1(e)</td>
<td>Age è + Belief that luxury is purchased for display to others.</td>
<td>IV: Age Categories, ^DV: Tunisians purchase luxury products and services to show off.</td>
<td>No</td>
</tr>
<tr>
<td>2(a)</td>
<td>Education è + Proportion of Income Spent on Luxury</td>
<td>IV: Education Categories, ^DV: What percentage of your annual income do you spend on luxury products?</td>
<td>Yes, p &lt; 0.08</td>
</tr>
<tr>
<td>2(b)</td>
<td>Education è + Willingness to accept higher than usual debt level for luxury</td>
<td>IV: Education Categories, ^DV: I would not buy a luxury item if I felt that my debt level is higher than usual.</td>
<td>Yes, p &lt; 0.02</td>
</tr>
<tr>
<td>2(c)</td>
<td>Education è + Purchased luxury will have enduring style and value</td>
<td>IV: Education Categories, ^DV: I select luxury items that will have enduring style and are therefore worth the investment</td>
<td>Yes, p &lt; 0.00</td>
</tr>
<tr>
<td>3(a)</td>
<td>Income è + Proportion of persons with luxury products</td>
<td>IV: Income Categories, *DV: Are you in possession of at least one luxury brand?</td>
<td>No</td>
</tr>
<tr>
<td>3(b)</td>
<td>Income è + Proportion of persons without luxury willing to buy luxury</td>
<td>IV: Income Categories, *DV: Are you willing to buy a luxury product in the future?</td>
<td>No</td>
</tr>
<tr>
<td>3(c)</td>
<td>Income è + Proportion of income spent on luxury products</td>
<td>IV: Income Categories, *DV: What percentage of your annual income do you spend on luxury products?</td>
<td>Yes, p &lt; 0.01</td>
</tr>
</tbody>
</table>
Table 2: Results of Hypotheses Testing

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>IV: Income Categories, ^DV: Wearing luxury apparel conveys that I am accomplished and successful.</th>
<th>No</th>
<th>0.02</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Income è + Tendency to view luxury products as accomplishment</td>
<td>IV: Income Categories, ^DV: I want the best of everything and for me that means luxury brands.</td>
<td>Yes</td>
<td>0.02</td>
</tr>
<tr>
<td>+Income è + Desire to seek the best available luxury products</td>
<td>IV: Income Categories, ^DV: I want to own items of top quality and I think luxury items are better quality.</td>
<td>Yes</td>
<td>0.02</td>
</tr>
</tbody>
</table>

~ “-Age” should be read “…lower the age…” and “+Luxury Desire” should be read, “…higher the luxury desire…”

*Categorical Variable

^Continuous Variable
Exploring the budget deficit-economic growth nexus: new evidence from Ghana

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ABSTRACT
In this paper, we combine Autoregressive Distributed Lag (ARDL) approach with trend analysis to assess the relationship between Ghana’s budget deficit and economic growth from 2000 to 2015 using quarterly data. The trend analysis reveals that since 2000, years of high budget deficit were usually followed by years of low economic growth and vice versa. This phenomenon was pronounced in 2009, when the Gross Domestic Product (GDP) growth rate fell from 7.3 percent in 2008 to 4 percent in 2009, following an increase in the budget deficit from 8 percent in 2007 to 11.5 percent in 2008. The same phenomenon was observed between 2012 and 2015. The econometric results show a significantly negative effect of budget deficits on economic growth. Thus, a 100 percent increase in budget deficit in the long run would lead to a 3 percent decrease in real GDP, holding all other factors constant. The results confirm the Neoclassical proposition that high budget deficit does not necessarily translate into economic growth. The paper recommends that government must ensure strong fiscal discipline without compromising the wellbeing of the citizenry by allocating budget spending to sectors that can translate the deficit into high economic growth both in the short and long runs.

Jel classification: O1, O2, O4

Keywords: Budget deficit, ARDL, error correction model, long and short run, economic growth.

9 INTRODUCTION

The implications of budget deficits for economic growth have remained one of the focal macroeconomic debates among policy makers and researchers (Georgantopoulos & Tsamis, 2011). This debates is deeply rooted in the theoretical controversy between the Neoclassical Economists and the Keynesian Economists. While the former assert that
budget deficit impact economic growth negatively, the latter hypothesize that budget deficits have a positive relationship with economic growth (Rahman, 2012). Several empirical studies suggest that although budget deficits are not a true representative of fiscal policy, and that it is not easy to estimate the impact of fiscal policy, fiscal deficits are the most reliable and measurable indicator for economic growth and development (Fischer, 1993). It is also important to stress that there is a bidirectional relationship between budget deficits and other macroeconomic indicators. However, budget deficits have been found to impact economic growth either positively or negatively depending on the sources of the deficit (Kneller et al., 1999). According to Eminer (2015), an increase in a budget deficit will impact economic growth positively if the deficit is geared towards productive spending and negatively if it is geared towards non-productive spending. In any case, the term “productive spending” is relative, and dependent on the discretion of the policy maker. Also, the full realization of the impact of budget deficits is dependent on the duration (short or long run) of the policy.

In the Ghanaian context, the debate between the positive versus negative impact of budget deficits on economic growth has been long-standing, particularly among politicians and policy makers. Since the first republic where the socialist agenda was adopted, budget deficits have been a common feature of Ghana’s economic management (Larbi, 2012). Recently, this debate has been intensified, following the phenomenal increase in the government’s budget deficit since 2012. The country’s deficit has consistently increased from 4.3 percent in 2011 (Bank of Ghana, 2012) to 11.8 percent in 2012 (Bank of Ghana, 2013) before being reduced to 6.3 percent in 2015, which is still considered high compared to previous figures. The rise in the deficit has contributed to an increase in the country’s gross public debt as a ratio of GDP, from 40 percent in 2011 to 72.6 percent at the end of November, 2015 (African Development Bank, Organization for Economic Cooperation and Development & United Nations Development Programme, 2015). Given the implications of the budget deficit for the economy, this study combines trend and econometric analyses to examine the relationship between budget deficit and economic growth in Ghana from the year 2000 to 2015.

Although a similar study has been conducted by earlier researchers (see Larbi, 2012, Akosah, 2013; Nkalu, Richardson & Nwosu, 2016), the scope of years covered in these studies is up to 2013. This study extends the scope further to 2015. Also, methodologically, this study uses the Autoregressive Distributed Lag (ARDL) approach which has not yet been used in the literature to analyze the relationship between budget deficit and economic growth in the Ghanaian context. The essence of using this approach is to attempt to validate the existing studies (see Nkalu, 2015), using a different approach from frameworks such as the Vector Error Correction Model (VECM), Seemingly Unrelated Regression (SUR) model, and Two-Stage Least Squares (2SLS), as well as Johansen cointegration procedure which have already been applied in the literature. The results of the econometric analysis, conducted to supplement the trend analysis, support the neoclassical proposition that high budget deficits do not necessarily translate into long term economic growth. Similarly, the trend analysis depicts elements of negative lag effects of high deficits on economic growth.

The rest of the paper is structured as follows: Section 1 presents a brief review of Ghana’s economy from 2000 to 2015. It also reviews the theoretical and empirical literature on budget
deficit-economic growth nexus both in Ghana and other parts of the world with a focus on developing countries that have the same features as Ghana. Section 2 presents the methodology used in the study, while sections 3 and 4 present the results, conclusion, and policy recommendation, respectively.

1.1 Overview of Ghana’s economy (2000-2015)
Extant literature suggests that the Ghanaian economy has grown steadily, especially from 2001 to 2011. This is in part due to sound macroeconomic policies aided by high prices in primary commodities such as cocoa, timber, gold, and oil in 2011. In this paper, we juxtapose the performance of the economy from 2000 to 2008 with the period 2008 to 2012 and further place the current economic performance in context giving due cognizance to global developments. Retrospective analysis of the trend of some of the macroeconomic indicators (presented in Figure 1) reveal that prior to 2001, Ghana’s economic performance was quite unimpressive. In 2000, the year-on-year inflation rate was as high as 40.5 percent, Real Gross Domestic Product (Real GDP) growth was creeping at a rate of 3.7 percent coupled with a high budget deficit of 9.7 percent, and external debt of $6,062.0 (Bank of Ghana, 2004).

One of the major challenges that the economy faced, especially from 2002 to 2007, was the difficulty in controlling the money supply growth and the country’s vulnerability to severe supply shocks from weather and commodity price developments. However, the economy stabilized between 2000 and 2007 as inflation averaged 13.5 percent per annum (Centre for Policy Analysis, nd.). The government’s decision to take advantage of the debt relief and debt cancellation provided by the IMF, World Bank, and bilateral donors under the Enhanced HIPC Initiative and Multilateral Debt Relief Initiative (MDRI), helped reduce Ghana’s debt stock from 198.3 percent of national income in 2000, to 118.8 percent of national income at the end of December 2003, and further down to 41.9 percent of national income by the end of 2005 (Centre for Policy Analysis, nd.). As of the end of 2008, the estimated debt was 52 percent of national income (Bank of Ghana, 2008). As presented in Figure 1, the gross external debt as ratio of GDP stood at 16 percent while the growth in public debt was 35.6 percent.
A stabilized currency resulted in significant improvement in the country’s Gross Domestic Product (GDP) growth, from an overall growth rate of 3.7 percent in 2000 to higher growth rates of 5.8 percent in 2004. This growth was mainly driven by an increase in Agricultural output by 7.5 percent, reflecting an upswing in cocoa production of over 700,000 tons during the 2003/04 crop season, the highest since the 580,000 tons recorded in 1964/65 crop season (Bank of Ghana, 2004). This was reflected in a reduction in poverty from 40 percent in 2000 to 31.9 in 2005 (Ghana Statistical Service, 2007). When oil prices hit their all-time high of 101 dollars per barrel in 2008, the Real GDP growth stood at 7.3 percent, inflation at 18 percent, and the deficit was 11.5 percent of GDP. Despite an increase in debt stock in 2008, the debt service burden remained within sustainable levels. The Debt-to-GDP ratio was 28.1 percent, the stock of gross international reserves was US$2,036.22 million, which was equivalent to 2.1 months of import cover at the end of 2008 (Bank of Ghana, 2008).

In 2009, there was a fall in GDP growth rate from 8.4 percent in 2008 to 4 percent, despite the effort of the government to ensure fiscal discipline (Bank of Ghana, 2009). The economy bounced back in 2010, and continued to experience impressive growth up to 2011. This impressive performance was due to multifaceted factors, including fiscal discipline of the government, especially from 2009 to 2011, which resulted in a decrease in the deficit from 11.5 percent of GDP in 2008 to 4.3 percent in 2011. Other factors included a consistent fall in oil prices together with the oil find and increase in commodity prices. The economy was considered the fastest growing economy in sub-Saharan Africa, with a GDP growth rate reaching an all-time high of 15 percent, with a stable inflation rate of 8.6 percent at the end of 2011 (African Development Bank, Organization for Economic Cooperation and Development & United Nations Development Programme, 2015). Gross international reserves at the end of 2011 were equivalent to 3.2 months of import cover.

The expectation of the Bank of Ghana and the government was that over the medium term to 2015, the economy would register robust growth of about 8 percent, bolstered by improved oil and gas production, increased private-sector investment, improved public infrastructure development, and sustained political stability. However, this expectation proved to be quite different from actual results, as the pace of growth moderated in 2012, reaching 8.8 percent, and further down to 7.1 percent (Bank of Ghana, 2012) in 2013 compared to the 15 percent growth seen in 2011. The downward trend was observed in 2014, as the country’s growth rate of 4.2 percent was below the Sub-Saharan African (SSA) average of 5.0 percent (International Monetary Fund, 2015). In 2015, the economy grew at a rate of 4.1 percent while the single digit inflation rate achieved from 2010 to 2011 began to increase persistently, up to a rate of 19.0 percent in January 2016. The consistently low growth has been ascribed to factors such as the fall in supply of power for economic activities, increasing trend of government budget deficits, and external debt accumulation.

### 1.2 Review of literature

Generally, there are three schools of thought concerning the economic effects of budget deficits: Neoclassical, Keynesian and Ricardian. Among the mainstream analytical perspectives, the Neoclassical economists consider fiscal deficits to be detrimental to investment and growth,
while in the Keynesian paradigm, it constitutes a key policy prescription (Rahman, 2012). Theorists persuaded by Ricardian equivalence assert that fiscal deficits do not really matter except for smoothening the adjustment to expenditure or revenue shocks. While the Neoclassical and Ricardian schools focus on the long run, the Keynesian view emphasizes the short-run effects (Van & Sudhipongpracha, 2015). Existing empirical studies on the relationship between deficits and economic growth are mixed, with one strand of the literature suggesting that high budget deficits have a positive relationship with economic growth, while the other strand asserts otherwise. Mohanty (2012) employed the Johansen Cointegration test, Granger Causality test, and Vector Error correction Model to examine the short-run and long-run relationship between fiscal deficit and economic growth in India from 1970 to 2012. The study found a negative and significant relationship between fiscal deficits and economic growth in the long run. The short-run results, on the other hand, found the relationship between fiscal deficits and economic growth to be insignificant. However, the results reveal that the negative impact of the post-reform fiscal deficit on economic growth is more than the impact pre-reform fiscal deficit.

Rahman (2012) investigated the relationship between budget deficits and economic growth from Malaysia’s perspective using quarterly time series data form 2000 to 2011 and the ARDL approach. The authors found no evidence of a long-run relationship between budget deficits and economic growth which confirmed the Ricardian equivalence hypothesis. According to the author, a productive expenditure rather had a positive and significant relation with economic growth. Cinar, Eroglu and Demirel (2014) also employed the panel ARDL model to analyze the European Debt Crisis stemming from the 2008 Global Crisis within Keynesian budget deficit policies using data from 2000Q1-2011Q4. The study revealed that conjunctural deficit policy (functional fiscal policy) had a positive effect on economic growth in the short run. The estimated long-run results showed that budget deficit policies had no effect on economic growth.

Using quarterly data from 2000-2012 and Vector Error Correction Model (VECM), Akosah (2013) investigated the threshold effect of budget deficits on economic growth in the Ghanaian case. The results indicated an inverse long-run relationship between deficits and economic growth, suggesting that high deficits slow down economic growth. In the short run, however, the author found the budget deficit promoted economic growth, but a deficit beyond the threshold level of 4 percent of GDP was found to be detrimental to economic growth. The same negative long-run relationship was obtained by Nkalu (2015), who applied the Vector Error Correction Model (VECM), Seemingly Unrelated Regression (SUR) model, and Two-Stage Least Squares (2SLS) approach in Ghana and Nigeria. Larbi (2012) conducted similar study covering the period of 1980 to 2010, using the Johansen cointegration procedure and Granger Causality test, and concluded that budget deficits exert no significant long-run impact on economic growth. However, further evidence from the Granger Causality test suggested statistically significant and positive long-run relationships between deficit and economic growth. This brief review shows that the direction and extent of relationship remain inconclusive in the literature, hence the need for further validations using different approaches and expansion on the scope of years.

10 METHODOLOGY AND DATA

In assessing the causal relationship between government budget deficit and economic growth, most authors employ rigorous econometric processes and methods, such as the Vector
Autoregressive (VAR) and the Vector Error Correction Model (VECM) framework. In this study, we move further and employ both Autoregressive Distributed Lag (ARDL) and trend analysis to understand the factors underlying the relationship between government budget deficits and economic growth in Ghana. One of the major reasons for complementing the econometric analysis with trend analysis is that trend analysis offers a measurable and verifiable method for predicting the outcomes of the econometric analysis. It provides adequate information on the potential direction of the relationship between economic growth as the response variable and budget deficit as the explanatory variable of interest using the ARDL approach. The trend analysis also has the advantage of being based on verifiable data that can be subjected to thorough scrutiny for validation. It can be replicated, checked, updated, and refined using the accompanying data. However, the simple trend analysis is not sufficient for one to draw valid inference. In essence, the trend analysis was used as a method for validating the econometric results. As a result, the study uses econometric techniques following Mohanty (2012). The mathematical model used to evaluate the relationship between government budget deficit and economic growth is specified as:

\[ RGDP = f(DEF, CPI, GOV, OP, REER, K, L) \] (1)

Where \( RGDP \) is real gross domestic product, \( DEF \) is government budget deficit, \( CPI \) is consumer price index (inflation), \( GOV \) is government expenditure, \( OP \) is oil price, \( REER \) is real effective exchange rate, \( K \) is capital stock and \( L \) is labour force.

\[ RGDP = \beta_0 + \beta_1 DEF_t + \beta_2 CPI_t + \beta_3 GOV_t + \beta_4 OP_t + \beta_5 REER_t + \beta_6 K_t + \beta_7 L_t + \epsilon_t \] (2)

Taking natural logs of equation (2) for linearity gives equation (3)

\[ \ln RGDP = \beta_0 + \beta_1 \ln DEF_t + \beta_2 \ln CPI_t + \beta_3 \ln GOV_t + \beta_4 \ln OP_t + \beta_5 (REER_t) + \beta_6 \ln K_t + \beta_7 \ln L_t + \epsilon_t \] (3)

Differencing equation (3), the growth equation is finally given as;

\[ \ln \Delta RGDP = \beta_0 + \beta_1 \Delta \ln DEF_t + \beta_2 \Delta \ln CPI_t + \beta_3 \Delta \ln GOV_t + \beta_4 \Delta \ln OP_t + \beta_5 \Delta (REER_t) + \beta_6 \Delta \ln K_t + \beta_7 \Delta \ln L_t + \nu_t \] (4)

Where \( \ln \) is the natural logarithmic operator and \( \Delta \) is the difference operator. The coefficients \( \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6 \) and \( \beta_7 \) are the elasticities of the respective variables, \( \beta_0 \) is the drift component, \( t \) denotes time and \( \nu_t \) is the error term.

The study employed the Autoregressive Distributed Lag (ARDL) model by Pesaran and Shin (1999); Pesaran, Shin, and Smith (2001) and Pesaran and Pesaran (2009) to determine the long and short-run relationship between budget deficit and economic growth. This is as a result of the advantages that the ARDL approach to cointegration has over the Johansen approach to cointegration. In the first instance, the ARDL model is the more statistically significant approach to determine the cointegration relation in small samples (Ghatak & Siddiki, 2001), while the Johansen cointegration techniques require large data samples for validity. Whereas the Johansen cointegration techniques require all the regressors to be integrated of the same order, the ARDL approach can be applied whether the regressors...
are I(1) or I(0). This means that the ARDL approach avoids the pre-testing problems associated with standard cointegration, which requires that the variables be already classified into I(1) or I(0) (Pesaran et al., 2001). Tang (2006) also stated that the ARDL procedure is also applicable when the explanatory variables are endogenous and it is sufficient to simultaneously correct for residual serial correlation. The ARDL approach to cointegration involves estimating the short run and long-run elasticities by employing the Unrestricted Error Correction Model (UECM) that has unrestricted intercepts and no trends based on the assumption made by Pesaran et al. (2001). From the analysis, equation (3) can be expressed in ARDL representation as:

\[
\Delta \ln RGDP = \beta_0 + \alpha \ln RGDP_{t-1} + \beta_1 \ln DEF_t + \beta_2 \ln CPI_t + \beta_3 \ln GOV_t + \beta_4 \ln OP_t + \beta_5 REER_t
\]

\[+ \beta_6 \ln K_t + \beta_7 \ln L_t + \sum_{i=1}^{P} \Phi \Delta \ln RGDP_{t-i} + \sum_{i=1}^{P} \varphi_{1i} \Delta \ln DEF_{t-i} + \sum_{i=1}^{P} \varphi_{2i} \Delta \ln CPI_{t-i}
\]

\[+ \sum_{i=1}^{P} \varphi_{3i} \Delta \ln GOV_{t-i} + \sum_{i=1}^{P} \varphi_{4i} \Delta \ln OP_{t-i} + \sum_{i=1}^{P} \varphi_{5i} \Delta (REER)_{t-i} + \sum_{i=1}^{P} \varphi_{6i} \Delta \ln K_{t-i}
\]

\[+ \sum_{i=1}^{P} \varphi_{7i} \Delta \ln L_{t-i} + \nu_t \tag{4}\]

Where \(\Delta\) is the first difference operator, \(P\) is the lag order selected by the Schwarz Bayesian Criterion (SBC), \(\beta_0\) is the drift parameter and \(\nu_t\) is the error term which is \(N(0, \delta^2)\). The parameters \(\alpha\) and \(\beta_{ij}\) represent the long-run multipliers whereas \(\Phi\) and \(\varphi_{ij}\) are short-run parameters. The first step in the ARDL approach is to estimate equations (4) by applying OLS. The computed F-test (Wald test) is then used to test the existence of long-run relationships among the variables. This is done by restricting the coefficients of the lagged level variables to zero. The null hypothesis of no long-run relationship among the variables in equation (4) is tested against the alternative hypothesis. This is specified as:

\[H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = 0\]

\[H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq 0\]

Given that cointegration is established, the following ARDL model is estimated in order to obtain the long run and short run coefficients.

\[
\ln RGDP_t = \omega_0 + \sum_{i=1}^{P} \lambda \ln RGDP_{t-i} + \sum_{i=1}^{P} \beta_1 \ln DEF_{t-i} + \sum_{i=1}^{P} \beta_2 \ln CPI_{t-i} + \sum_{i=1}^{P} \beta_3 \ln GOV_{t-i}
\]

\[+ \sum_{i=1}^{P} \beta_4 \ln OP_{t-i} + \sum_{i=1}^{P} \beta_5 \Delta (REER)_{t-i} + \sum_{i=1}^{P} \beta_6 \ln K_{t-i} + \sum_{i=1}^{P} \beta_7 \ln L_{t-i} + \nu_t \tag{5}\]

The error correction representation of the ARDL model is specified as
\[ \Delta \ln RGDP_t = \lambda_0 + \sum_{i=1}^{P} \phi_i \Delta \ln RGDP_{t-i} + \sum_{i=1}^{P} \varphi_{1i} \Delta \ln DEF_{t-i} + \sum_{i=1}^{P} \varphi_{2i} \Delta \ln CPI_{t-i} + \sum_{i=1}^{P} \phi_{3i} \Delta \ln GOV_{t-i} + \sum_{i=1}^{P} \phi_{4i} \Delta \ln OP_{t-i} + \sum_{i=1}^{P} \phi_{5i} \Delta (REER)_{t-i} + \sum_{i=1}^{P} \phi_{6i} \Delta \ln K_{t-i} + \sum_{i=1}^{P} \psi_i \Delta \ln L_{t-i} + \psiECT_{t-1} + \epsilon_t \] (6)

Where \( \psi \) represents the speed of adjustment to long-run equilibrium following a shock to the system and \( ECT_{t-1} \) is the error-correction term, the residuals from the cointegration equation lagged one (1) period. The coefficient of the lagged error correction term \( \psi \) is expected to be negative and statistically significant to further confirm the existence of a cointegrating relationship among the variables in the model. The data used for this analysis were obtained from the annual reports of the Bank of Ghana from 2000 to 2015 and World Development Indicators (World Bank, 2016).

11 RESULTS AND DISCUSSION

In order to understand the relationship between real gross domestic product and budget deficits over the years, we present in Figure 1 the growth trend of real GDP, budget deficit, and other selected variables from the year 2000 to 2015. The analysis reveals that since 2000, years of high deficits were usually followed by years of low economic growth, and vice versa. This phenomenon was pronounced in 2009, where the GDP growth rate reduced from 7.3 percent in 2008 to 4 percent in 2009, following an increase in budget deficit from 8 percent in 2007 to 11.5 percent in 2008. The same phenomenon was observed between 2012 and 2015. The Figure also shows that periods of high inflation were associated with low growth of real GDP, and vice versa.
3.1 Unit root and cointegration tests

Before carrying out the ARDL or Bounds test to cointegration, and the Granger-causality test, a unit root test was first conducted in order to examine the stationarity properties of the variables in the study. While the ARDL approach to cointegration does not necessitate the pretesting of the variable for unit roots, it is imperative to perform unit roots test to verify whether the variables are not integrated of an order higher than one, to avoid spurious results. This is necessary, because the computed F-statistics provided by Pesaran et al. (2001) are not valid in the presences of I (2) variables. The results from the unit roots test indicates that all the variables of interest are integrated of order one (I(1)) variables. The study conducted a cointegration test to examine the long run relationships among the variables. The F-statistic that is computed within the framework of the Unrestricted Error Correction Model was compared with the lower and upper critical values in Pesaran and Pesaran (2009). Table 3 reports the bounds test results for Real GDP (RGDP). From Table 3, the F-statistic for the model with Real GDP (LRGDP) as the dependent variable is F(LRGDP) = 4.332. It exceeds the upper critical bound at one percent significance level. This means that the null hypothesis of no cointegration among the variables is rejected. This suggests the existence of a long-run relationship between economic growth and its explanatory variables.

Table 3: Bounds test for the existence of cointegration

<table>
<thead>
<tr>
<th>Critical Value Bounds</th>
<th>90% Level</th>
<th>95% Level</th>
<th>99% Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept with no trend</td>
<td>I(0)</td>
<td>I(1)</td>
<td>I(0)</td>
</tr>
<tr>
<td>K=7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent Variable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F(LRGDP) = F(LRGDP</td>
<td>LBD, LCPI, LGOV, LOP, REER, LK, LL)</td>
<td>2.035</td>
<td>3.153</td>
</tr>
</tbody>
</table>

**Note:** K is the number of regressors.

Source: Authors’ estimated using WDI (2012) data and Microfit 4.1 package
3.2 Long and short-run analysis

Given that the results of the cointegration analysis indicate the existence of a long-run relationship between economic growth and the explanatory variables, the study proceeded to estimate the long-run impact of the explanatory variables on economic growth using the ARDL framework. The a priori expectation is that government budget deficit should translate into high economic growth, especially in the long run. Intuitively, one expects that if government budget deficits were invested in productive sectors of the economy and in diversified manner, they should propel economic growth, at least in the long run. However, the results (presented in Table 4) show a significantly negative relationship between budget deficit and economic growth. This shows that a 100 percent increase in budget deficit in the long run would lead to a 3 percent decrease in real GDP, holding all other factors constant. The implication is that government budget deficits over the past decade have been counterproductive to the growth of Ghana’s economy. This result is consistent with that of Fisher (1993) who found a negative effect of budget deficit on economic growth. It also corroborates a similar study conducted by Mohanty (2012), which found a negative and significant relationship between fiscal deficit and economic growth in India.

In the Ghanaian context, the result supports the earlier study by Akosah (2013) and Nkalu (2015), who found an inverse long-run relationship between budget deficit and economic growth, especially as the deficits have often been used to finance recurrent expenditures, suggesting that high budget deficit, driven by recurrent expenditures, slows down economic growth. However, the result is in contrast with findings of Larbi (2012) who concluded that budget deficit has a positive significant relationship with economic growth in Ghana. Again, whereas capital stock and growth of labor force have a positive and significant impact on economic growth, the consumer price index and oil price were found to have a significant and negative impact on economic growth. Nonetheless, the long-run estimate of real exchange rate and government expenditure were insignificant.

Table 4: Long Run Model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBD</td>
<td>-0.0334</td>
<td>0.0107</td>
<td>-3.1194</td>
<td>[0.004]***</td>
</tr>
<tr>
<td>LCPI</td>
<td>-0.2680</td>
<td>0.0763</td>
<td>-3.5139</td>
<td>[0.001]***</td>
</tr>
<tr>
<td>LGOV</td>
<td>0.4498</td>
<td>0.0293</td>
<td>1.5331</td>
<td>[0.134]</td>
</tr>
<tr>
<td>LOP</td>
<td>-0.0060</td>
<td>0.0019</td>
<td>-3.1271</td>
<td>[0.004]***</td>
</tr>
<tr>
<td>REER</td>
<td>-0.8041</td>
<td>0.0040</td>
<td>-1.995</td>
<td>[0.843]</td>
</tr>
<tr>
<td>LK</td>
<td>0.1541</td>
<td>0.0422</td>
<td>3.6484</td>
<td>[0.001]***</td>
</tr>
<tr>
<td>LL</td>
<td>0.6809</td>
<td>0.1257</td>
<td>5.4168</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>C</td>
<td>-26.9877</td>
<td>6.1004</td>
<td>-4.4239</td>
<td>[0.000]***</td>
</tr>
</tbody>
</table>

Source: Estimated from WDI (2012) and BP Statistical Review data using Microfit 4.1 package
Note: *** and ** denotes significance at 1%, 5% and 10% respectively

Table 5 presents the short-run results of the growth model. The results show that the coefficient of the error correction term (ECT) is negative and highly significant at one percent level. This confirms the existence of a cointegrating relationship among the variables in the model. The ECT represents the rate of adjustment to restore equilibrium in the dynamic model following a disturbance. The coefficient of the error correction term (ECT) is -0.32. This suggests that the speed of adjustment to long-run equilibrium is approximately 32 percent per quarter. The size of
the coefficient of the error correction term (ECT) indicates that about 32 percent of the disequilibrium in the product market that has been caused by previous quarters’ shocks converges back to the long-run equilibrium in the current quarter. However, the magnitude of the coefficient in this study suggests that the speed of adjusting to long-run changes is slow. The short-run results again shows that budget deficit is positive but insignificant. This implies that changes in budget deficit do not have any immediate effect on the growth of the economy. This can be partly due to the fact that government spends mostly on long-term projects such as education, construction of roads, and other infrastructural projects whose impacts are not observed in the short term; neither are there sufficient complementary projects to propel the short-run positive impact in to long-run positive impact. The results of the error correction model confirms the findings of Mohanty (2012) who discards the short-run relationship between fiscal deficit and economic growth.

Table 5: Error Correction Model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>T-Ratio</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>dLRGDP(-1)</td>
<td>0.7264</td>
<td>0.1619</td>
<td>6.9573</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>dLRGDP(-2)</td>
<td>0.6332</td>
<td>0.0897</td>
<td>7.0591</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>dLRGDP(-3)</td>
<td>0.6823</td>
<td>0.0937</td>
<td>7.2818</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>dLBD</td>
<td>0.0016</td>
<td>0.0095</td>
<td>0.1684</td>
<td>[0.863]</td>
</tr>
<tr>
<td>dLCPI</td>
<td>0.1259</td>
<td>0.0647</td>
<td>1.9459</td>
<td>[0.059]*</td>
</tr>
<tr>
<td>dLGOV</td>
<td>-0.2387</td>
<td>0.0411</td>
<td>-5.8084</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>dLGOV(-1)</td>
<td>0.1988</td>
<td>0.0456</td>
<td>4.3543</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>dLOP</td>
<td>-0.2291</td>
<td>0.0015</td>
<td>0.1444</td>
<td>[0.886]</td>
</tr>
<tr>
<td>dREER</td>
<td>-0.0386</td>
<td>0.0022</td>
<td>-17.1600</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>dREER(-1)</td>
<td>0.0235</td>
<td>0.0054</td>
<td>4.2974</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>dLK</td>
<td>0.1691</td>
<td>0.0386</td>
<td>4.3786</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>dLK(-1)</td>
<td>-0.1672</td>
<td>0.0363</td>
<td>-4.6064</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>dLL</td>
<td>0.4939</td>
<td>0.1543</td>
<td>3.2009</td>
<td>[0.002]***</td>
</tr>
<tr>
<td>dLL(-1)</td>
<td>-0.5610</td>
<td>0.2024</td>
<td>-2.7717</td>
<td>[0.015]**</td>
</tr>
<tr>
<td>dLL(-2)</td>
<td>-0.6610</td>
<td>0.1827</td>
<td>-3.6179</td>
<td>[0.002]***</td>
</tr>
<tr>
<td>C</td>
<td>17.5542</td>
<td>4.2573</td>
<td>4.1233</td>
<td>[0.000]***</td>
</tr>
<tr>
<td>ECT(-1)</td>
<td>-0.3252</td>
<td>0.0688</td>
<td>-4.7219</td>
<td>[0.000]***</td>
</tr>
</tbody>
</table>

Source: Estimated from WDI (2016) data using Microfit 4.1 package
Note: ***, ** and * denotes significance at 1%, 5% and 10% respectively

3.3 Granger causality test results
In some instance, there is a bidirectional relationship between the dependent variable (which is economic growth in the case of this study) and the explanatory variable of interest (budget deficit). Since this is not known from the data used, the Granger Causality test (presented in Table 6) was conducted. The results suggest that the null hypothesis, that budget deficit (LBD) does not Granger cause real GDP (LRGDP), is rejected, indicating that budget deficit Granger cause real GDP. The implication is that budget deficit predicts future values of real GDP. However, the null hypothesis that real GDP does not Granger cause budget deficit is not rejected. This means that, there is a unidirectional causality running from budget deficit to real GDP.

Table 6: Pairwise granger causality tests

<table>
<thead>
<tr>
<th>Null Hypotheses</th>
<th>F-Stat</th>
<th>Prob</th>
<th>Remarks</th>
</tr>
</thead>
</table>

### CONCLUSION AND POLICY IMPLICATION

Since 2012, there have been growing concerns over Ghana’s high budget deficits, and their implication for the country’s debt sustainability and economic growth. This paper analyses the relationship between government budget deficit and economic growth using data from Bank of Ghana and the World Bank. The trend analysis used to validate the econometric results reveals that, since 2000, years of high budget deficit were usually followed by years of low economic growth, and vice versa. This phenomenon was pronounced in 2009 where the GDP growth rate reduced from 7.3 percent in 2008 to 4 percent in 2009, following an increase in the deficit from 8 percent in 2007 to 11.5 percent in 2008. The same phenomenon was observed between 2012 and 2015. The econometric result shows that there is a negative long run relationship between budget deficit and economic growth. This finding is in conformity with the prediction of the Neoclassical Economists that high budget deficits do not necessarily translate into economic growth in the long run. Instead, they lead to crowding in effect only in the short run, and shift tax burdens into the future. Budget deficits result in an increase in current private consumption, and a decline in personal savings. Higher interest rates caused by declining personal savings decrease private investments (the crowding out effects) and hence affect economic growth negatively.

Following the observed negative effect of budget deficits on economic growth, this paper recommends that government must ensure strong fiscal discipline without compromising the wellbeing of the citizenry by allocating budget spending to sectors that can translate the deficit into high economic growth, both in the short and long runs. The government could consider spending in sectors that could boost aggregate demand, private savings, investment, and economic growth. There is the need for government to maintain a strong fiscal consolidation that will contribute to minimizing the country’s growing debt (partly due to borrowing), by keeping with its policy of strict expenditure controls. While ensuring strong fiscal discipline, it must also improve its revenue collection performance to offset the fiscal imbalance. The paper further recommends that government should use its monetary policy rate to moderate the real effective exchange rate and inflation, since their increase were found to have negative implications for the growth of the economy.

### REFERENCES


| LBD does no Granger Cause LRGDP | 8.8442 | 0.000*** | H₀ is rejected |
| LRGDP does no Granger Cause LBD | 2.3767 | 0.102   | H₀ is not rejected |

Source: Computed using Eviews 9.0 package.

Note: *** denote rejection of null hypothesis at 1% level of significance.


### Appendix 1

<table>
<thead>
<tr>
<th><strong>Variable</strong></th>
<th><strong>ADF Statistic</strong></th>
<th><strong>P-Value</strong></th>
<th><strong>Lag Length</strong></th>
<th><strong>PP Statistic</strong></th>
<th><strong>P-Value</strong></th>
<th><strong>BW</strong></th>
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</thead>
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<tr>
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<td>1.9700</td>
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</table>
Notes: Null hypothesis: there is unit root. Alternative Hypothesis: there is no unit root. If the p-values for the ADF and PP tests are not significant then we cannot reject the null hypothesis and vice versa.

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<tr>
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<th>Lag Length</th>
<th>PP Statistics</th>
<th>P-Value</th>
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Notes: Null hypothesis: there is unit root. Alternative Hypothesis: there is no unit root. If the p-values for the ADF and PP tests are not significant then we cannot reject the null hypothesis and vice versa. *** represents significance at 1% level.
Challenges Of Respecting Riparian Rights Around Hydroelectric Dams In Cameroon Since 1949

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ABSTRACT
The impact of electric energy on socio-economic development has attracted the attention of all categories of people in society. This is because of the role power plays in the economic and industrial sectors of any country. Public authorities seem to be more concerned with protecting capitalist interests at the detriment of the riparian population. Despite regulations and legal provisions, authorities are still not able to implement a rigorous policy in this sector in Cameroon due to administrative bottle necks, among other factors. Furthermore, the existence of multiple regulatory and management bodies creates confusion. Legislation related to this issue is usually not taken seriously; hence implementation in many cases does not follow an ordinary and normal procedure. In fact, it is clear that the Cameroonian consumer, and especially riparian populations around power generation sources, are not protected.

Keywords: Law, Hydroelectric dams, Riparian Populations, Development, Environment.

1 INTRODUCTION
Several power sources are known and exploited across the world in order to meet the energy needs of the population. These include thermal, wind, solar, nuclear, and hydroelectric energy. Hydroelectric energy is the energy generated by converting the pressure of falling or running water to electricity by means of a turbine coupled to a generator.1 It is created by dams which are barriers of concrete or earth that are built across rivers, and which control the flow of water.2 The term “riparian” refers to an owner of land along a river, or a population situated along a riverbank or near a river.3 However, the first three forms (thermal, wind, and solar), are known as pollution-free energy due to their low percentage in environment destruction, according to the Objectives of Millennium (OM) on nature management and protection. But these power sources are limited in terms of capacity and production costs, which are exorbitant. Therefore, the use of nuclear energy is inevitable. Nuclear power is a subject of controversy between underdeveloped and developed countries because the latter always assume that nuclear energy is used by underdeveloped countries as a means of acquiring nuclear weapons, even if it is used for civilian purposes. Countries like Pakistan, Iran, and North Korea have been highly criticized in the manufacturing and development of nuclear plants. Consequently, the most reliable means of getting energy supply for poor countries remains hydroelectricity. This is in spite of the

1 Encarta Dictionaries, Electronic version.
2 Ibid.
3 Ibid.
requirement of a watercourse with a significant flow rate to construct hydroelectric dams without too much risk as far as profit is concerned. However, taking into account both the population and industrial growth, as well as climate change observed over the past few decades, water itself has become a more and more valuable and scarce asset which needs to be preserved. Thus, the construction of hydroelectric dams has become an expensive and elusive venture. Is it really possible to invest in this sector without damaging immediate and distant biodiversity? Taking into consideration the aforementioned factors, are investors and public authorities perhaps taking too much risk by sacrificing residents to selfish capitalist and egocentric interests? Are they really preserving riparian rights around the hydroelectric dams? Are these rights well identified and known by all stakeholders? To answer to all these questions, this study addresses the duties and rights of the riparian population around the hydroelectric dams in Cameroon since the construction of the first one in Edea, in 1949. The purpose of this research is to identify, define, clarify and understand the rights of all stakeholders in riparian areas. These, and other questions are addressed in detail in this paper which analyses existing documents on this subject.

1) Various Stakeholders in the Construction and Exploitation Process of Hydroelectric Dams in Cameroon

a) Literature Review

Since the 1970s, the international community has gradually started to be aware of the dangers threatening the environment. This explains why the World Heritage Centre has undertaken to regulate some activities related to wildlife through the Washington Convention (1973), and through Tenets 11 of the World Charter for Nature (1982). In the same vein, a conference was organized in Rio de Janeiro, Brazil, on 05 June, 1992, leading to the signing of a convention on biological diversity. This convention aimed at, among other things, preserving biodiversity, sustainable exploitation of biologically diverse resource areas, as well as a fair and equitable sharing of benefits from the exploitation of natural resources.

In Africa, from the Bamako Convention in Mali in 1991, through the Maputo Convention in Mozambique in 2003, to the African Convention on Nature Conservation and Natural Resources Management, focus has been on environmental protection, conservation and sustainability. These conventions also highlighted the sovereign right of states on issues related to the sustainable management of their natural resources for their own development.

In Cameroon, issues related to environmental preservation and protection have been given special attention by development actors and the three institutional powers of public life since 1996. Therefore, Law No 96/12 of 5 August, 1996, on the management of the environment was adopted by the National Assembly of Cameroon. This Law is accompanied by several decrees and orders of implementations, the first being Decree No 2005/0577/PM of 23 February, 2005, laying down modalities for realizing environmental impact assessments. Within the framework of the environmental impact study on underwater landscape, there is also Law No 98-005 of 14 April, 1998 to lay down conditions, in respect to environmental management and public health protection principles, within the general legal framework of water regimes. Government institutions in charge of monitoring compliance with regulation pertaining to underwater natural
resources preservation and protection in Cameroon include the Ministry of Water Sources and Energy (MINEE) and Ministry of Environment and Wild Species Protection (MINEPED).

There is no need to demonstrate the social and economic significance of a power generation project, considering that many more people in the rural and urban areas need electricity. In spite of this, environmental impact studies are expected to limit the major adverse effects of this activity on the environment.4

Is it true that some investments always go with many risks and damages to the immediate environment, and sometimes distant ones? The construction and exploitation of hydroelectric dams affect both aquatic and terrestrial ecosystems, upstream as well as downstream, making previous residents victims of the development.5 One is therefore tempted to talk of, "development against its own promoter," that is, humans.6 As a matter of fact, Amin, Faire and Malkin (1977) are trying to answer the question concerning the future possibilities and future roles of various types of African industries. They are analyzing various feasible industrialization hypotheses, according to the evolution of the international division of labor, the creation of a new labor divisions, and the planned adoption of self-oriented national strategies requiring external relations reorganization.

But they are not the only scholars taking interest in this issue. Abdelmalki and Mundler (1995), have discussed theories of development, taking into account their own contributions and limitations.7 The originality of the approach is featured in the structure of the book, which is divided into three parts. The first part, "Development in question" assesses the current body of work, and introduces the second part which deals with "Development in action"; which enlightens us on the authors’ former experiences and opens the reader’s mind on the third and last part "Development in the future." This last part deals with the analysis of the current problem of developing riparian communities and infrastructure on the basis of short, medium or long term plans and promises. After presenting traditional theories which come along with the birth of developed economics, these authors presented motives of developmental economics. New problems with institutions, democracy, and environment were also highlighted, which gave a new definition to the concept of development. These three parts of development which seem to be deeply linked up are in fact not really cohesive, creating uncertainty in Africa’s future as far as this development is concerned.

Mbonji Edjenguélé (1988) talks of the development process and defines it as: "a simple dynamism, a spring that drives something and makes it move from stage A to stage B."8 To this effect, development will be considered as a process of climbing stairs from the base which would

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be point A to the summit which is represented by point B. Abdelmaki and Mundler (1995), for their part, are of the opinion that "to develop, major risks must always be taken, making victims who are most of the time riparian populations near the project to be carried out, for the interest of the majority." This style of decision making follows a two-step path as mentioned above; namely, debate on this issue, and taking action in line with progress.

The artificial barriers known as hydroelectric dams will not only constitute an obstacle to water ways, but will also significantly obstruct the continuity of riparian’s daily activities. There is therefore conflict between the riparian populations, who are always against being separated from what belongs to them (the land of their ancestors and the site of their activities), and the capitalist investors who most often seek at all costs to gain a return from their investment. This tense atmosphere often partly affects the regulatory bureaucracy, which generally prefers not take any decision in an attempt to please all stakeholders involved, but usually ends up displeasing one of the partners, usually the riparian population. In many cases, the State, in taking into consideration national or majority interests, sacrifices riparian populations in favor of development. Therefore, what was regarded yesterday as charity, and as a source of endogenous development, suddenly turns into a nightmare of a frustrated group, and victims of a project carried out in the guise of national interests, which are usually a façade for private interests. In this case, the project pushes the people away, and further restricts any activities that can contribute to the sustainable livelihood of the population so displaced because of the project.

Such a situation often leads to serious ill-will, terror, rejection, confusion, and resentment between the victims and beneficiaries of a project. To prevent all of this from happening, it is absolutely necessary to identify various rights and duties of each party involved in the construction or management and exploitation of hydroelectric dams and have them make firm commitments under threat of penalty in the event of non-fulfilment by the arbitrator-State. There are always stakeholders playing different roles in projects of this nature.

b) Various Stakeholders

In an investment policy, different stakeholders are comprised of capital investors, riparian communities, and/or landowners of the project site and affected areas along the river. The State is usually the arbitrator to ensure compliance by everyone in terms of standards and commitments. Even when the investor is the State, it still keeps its position as arbitrator. With the world becoming increasingly capitalist, the first stakeholders (investors) usually consist of individual and collective businessmen who take the risk of investing their capital to make a profit. The benefit so derived is regarded as the reward of the risk taken by investing their money in businesses.
Generally, the motivation here remains the profit to be generated as a result of the project, regardless of the consequences on the environment and riparian populations. Financial capital alone is insufficient for realizing investors’ projects, because the capital should be invested in a safe place which is suitable for the defined project, but generally, this site is not their land; it therefore becomes imperative to acquire the land by involving a second stakeholder, generally made up of landowners and/or riparian communities of the site. In principle, the latter should be partial shareholders after estimating the relative value of their capital in the project site. Unfortunately, this heritage is often acquired at a lower cost, either by being bought cheaply, or granted free of charge on behalf of the population, with the expectation of future community development. Given the complexity of land ownership, specifically in sub-Saharan Africa, land is a matter of community and not individuals, as once explained by a patriarch: "In Black Africa in general, and within Bantu people specifically, land is and remains the community property. It is recognized by the customary law. This community is often defined by blood ties or lineage. So, a plot can belong to a single person or family. But it is under the tutelage of the whole clan that decisions to grant or not to grant to a third party are taken. (...) Thus, the land can be granted to the third party for many reasons: war damages, adoption, co-optation, etc."¹²

In the light of the above, it is obvious that land in Africa is an asset with a priceless value. That is why it has always been a source of conflict; preventing a community from owning it is often considered as subjecting it to slavery, because there is deep bond between the community and their land in unimaginable ways.

Taking all of this into account, it is obvious that granting a plot of land in Africa would never be done without valid reasons. If that is the case, to which purposes would land be granted to a third person or party for the construction and exploitation of long term work like the dam? This grant is usually made through the ignorance of consequences which would occur and taxation of State authorities which promotes the national or majority’s well-being, regardless of that of the riparian communities affected. This is because the project is most often cloaked in secrecy, to the extent that neither public authorities, nor investors generally dare to present the hidden side of the iceberg. Having been sold on the project based on a fictitious motive of charity which promotes development, the residents become aware of the reality from the moment the project begins.¹³ From the start, they notice that even the so-called associated measures to their benefit, a result of the waiver of customary rights on the granted land, were undervalued. From that moment, the negative impact made up of risks and damages on the safety perimeter, prohibits public access (concessionaries) during and after the completion of the project. This is how the issue of riparian rights around hydroelectric dams in Cameroon arises.

2) Rights and Duties of Riparian Populations Around Hydroelectric Dams in Cameroon

¹² Bata Mbem, P., (2012, May 17), 74 years old, Mbombog (Patriarch) and former bank employee, Bikoukound.
a) **Riparian’s Duties**

In a game of interest, the rights of one side are always the duties of the other side. To this effect, the only way for stakeholders to claim their interests and their rights is to recognize their duty and fulfil their commitments. Therefore, riparian populations should:

- Take into consideration all the lessons learned about nature protection.
- Protect absolutely the investment of the third party as a public heritage and observe bans on safety perimeter violation.
- Comply with the concession agreement or waiver of customary rights on the granted site until its termination.
- Be conscious of damage caused by the violations of the respect for safety perimeters, and of the risks taken by practicing prohibited activities within this safety perimeter.
- Ban residents from using generators under electrical transmission and distribution lines without prior approval of the operator.

However, riparian populations do not only have duties. They also have rights which must be respected and should represent sometimes the duties of others.

b) **Citizens’ Rights to Compensation**

General rights in this process are those which concern riparian populations and any person who suffers damage within a specified area. These rights are not affected by social status. They include:

- Being connected to the electrical distribution network.
- Promoting endogenous development through reduction of exports of our raw materials which, because of the lack of means to process them in the local community, would take another destination, not as finished goods or semi-finished products as required.
- Protecting consumer rights. That is, preserving citizens from damage which can be caused by supply of poor quality electrical energy.
- Damage due to untimely power cuts made without at least 24 hours’ notice ahead of time, or accidents due to lack of safety around hydroelectric facilities, transformer stations, and power lines.

However, consumers are not the only people who can benefit from State consideration. They can also be forced to pay the same damages if they spoil construction or expropriate material of hydroelectric dams. Examples include theft of electrical transmission and distribution cables, electricity poles, and so on. If facts are established when authorities concerned have reported it, people concerned are required to pay, not only for the damages to the operator, but also the evaluated material. Moreover, if unauthorized people succeed in entering a production plant or transformer station, interrupt power transmission, or cut distribution cables, they must not only

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pay the damages to the operator, but they will also be sued. In addition to general laws affecting all consumers, there are individual rights restricted to the residents.

c) **Particular or Especial Rights to Riparian defined by WDC**

In relation to the proximity of hydroelectric works, riparian populations should benefit from a number of advantages equal to the risks taken in the event of damage. Unfortunately, that is not usually the case in Cameroon. This is because even the compensation related to their exclusion from the occupied sites are often treated as a favor, added to their under-evaluation. A witness emphasized that: "In Edea and Song Loulou for instance, these so-called damages were mainly made up of direct consumption goods (bags of rice and cod, whisky, red wine, cans, tomato boxes, tobacco, pipes, boxes of matches, some makeshift loincloths, etc.) and the large part was used to be sacrificed for the marine spirits who had to bless and protect them during and after the works."\(^{16}\) If the landowner becomes a stakeholder in the project, it is thanks to the granted site under arbitration of the public authorities in several forms: direct purchase, hire purchase, renting, direct actions, indirect and non-evaluated actions, etc.\(^{17}\)

Furthermore, these damages, due to the grant of the land by landowners are not the only rights; there are also damages reserved for riparian landowners resulting from the loss of connection with their living environment, their investment, or their displacement from that site to another one. Therefore, as the safety perimeter is identified, they are banned to come back for any reason to the site for any activity either individually or collectively.

The evaluation and payment of compensation to riparian must always be accompanied by the putting in place of some structures for the social and economic reintegration of the underprivileged and damaged social sections of the population. For instance, structures\(^{18}\) such as communication, health, education, sports, social production, and Common Initiatives Group (CIG) buildings can be constructed. This will also involve public education and partnership for nature preservation with Non-Governmental Organizations (NGOs) working in that domain in order to meet the OM on environment. This is the focus of organizations such as Plan Cameroon, Worldwide Fund for Nature (WWF), International Union for the Conservation of the Nature (IUCN), and “Deutsche Gesellschaft für Technische Zusammenarbeit” (GTZ). The establishment of these structures will contribute to the fight against deforestation and poaching, preservation of biodiversity and ecosystem balance, climate change prevention, protection of rare species, and especially endangered species, among others.

Added to individual rights recognized by national laws, the World Dams Commission (WDC) presents seven strategic priorities which come directly from the WDC report. No change has

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\(^{16}\) Loga, S., (2011, October 22), 86 years old, retired clerk in ALUCAM, Edea.


been done to date. Each strategic priority has a key message and a basis for action which underlies it. Each of these bases for action is described in detail in the WDC report as follows:

1. Get public acceptance: to guarantee a fair and sustainable development of hydraulic and energy resources, it is essential that the public accepts the key decisions. This acceptance comes from rights recognition, taking into account risks and protection of interests of all groups involved, namely the indigenous and tribal populations, women, and other vulnerable groups. The decision-making process and mechanisms must allow the participation of any group, and result in a demonstrable adherence to key decisions.

2. Complete evaluation of options: alternative solutions to dams often do exist. In order to study them, the need for water, food, and energy must be evaluated and goals clearly defined. The appropriate development action is defined from the range of the conceivable options. The choice is based on a complete and participative evaluation of all the political, institutional and technical options. During the process, social and environmental aspects have the same importance as the economic and financial factors.

3. Existing dams: it is possible to optimize advantages provided by several existing dams, talk about pending social problems and reinforce protective measures and re-establish the environment. Dams and the context in which they are exploited are not static over time. Advantages and impacts can be modified by changes in priorities concerning the use of water, physical changes, and new land exploitation in the watershed, technological processes and evolution in the government policy through laws on environment, safety as well as economic and technical aspects.

4. Preservation of watercourses and means of subsistence: watercourses, watersheds and aquatic ecosystems are the biological driving force of the planet. They are sources of life and subsistence base of local communities. Dams transform the landscape and can have irreversible impacts. Understanding, protecting, and re-establishing watershed ecosystems is vital in promoting fair human development and guaranteeing the well-being of all species. The evaluation of the options and the decision-making related to improvement of watercourses must prioritize impact prevention, reduction, and the attenuation of adverse effects on the health and integrity of river systems.

5. Recognition of the rights and sharing of advantages: negotiations with affected people lead to mitigated measures of consequences and development, mutually agreed and legally enforceable. These recognize to the affected people the rights which improve their means of subsistence and their living conditions. Mitigation measures, re-establishment, and development are the responsibility of the State and the project promoter. They should prove to the people involved that abandoning their resources and current environment will improve their living conditions.

6. Guarantee standards implementation: This is to benefit the confidence of the public, governments, promoters, arbitration bodies, and operators shall respect all commitments related to planning, construction, and exploitation of dams. The respect of applicable regulations, criteria, and code of conduct, as well as negotiated agreement are guaranteed at any important level of the project planning and completion. A set of mutually reinforcing motivations and mechanisms must be put in place concerning social, environmental, and technical measures. A balanced association of regulatory and non-regulatory measures, comprising motivations and penalties is critical.

7. Sharing of watercourse for peace, development and safety: storage and deviating cross-border rivers' water lead to intense tensions between countries and inside the country.
Dams which aimed at deviating water require a constructive cooperation. That is why the use and exploitation of resources are more and more subjected to agreements between States which are concerned with the promotion of regional cooperation and peaceful collaboration. Consequently, the close approach of providing a limited resource is replaced by watercourses sharing, and their related advantages, a process in which States use innovative method to define task scale and range.\textsuperscript{19}

2 PROCEDURES AND INFRINGEMENTS

The recognition of riparian rights are sometimes presented as a magnanimous act, in addition to the under-evaluation of compensations paid to riparian communities by investors and public authorities. Sometimes, it is also noticed that if all this happens, it is because there is not a real and clear set of specifications which shall be used by the various stakeholders.\textsuperscript{20} Therefore, we are facing a double standard situation in which there are rights on one side, and duties on the other. That it is what one sadly notices, up to now, in the case of hydroelectric dams which are already in existence (i.e. Edea, Song Loulou and Lagdo). Strangely, in the first two cases, damages were paid to other ethnic groups, rather than to real beneficiaries. Furthermore, when redressing the damage suffered, the Bokok area, situated along the Sanaga River, was once more forgotten and disadvantaged, as in the Song Loulou case.

It was necessary to initiate a judicial procedure to start receiving tax benefits from incomes generated by the hydroelectric power plant of Song Loulou. The worst problem is that single-parent families headed by a woman (widow or unmarried), were not taken into account, given that women and minors did not take part in the debate. This illustrates that even from inside the group of beneficiaries, some restrictions created a kind of exclusion among the affected population. In Edea, these negotiations were also more selective because only investors were allowed to be part of negotiations, the colonial master and traditional authorities representing the different social stratum without knowing the ins-and-outs of negotiations, for which they were only dupes, seeking only the signature from local people in order to justify the legality of documents if they were needed. Knowing that the land had a social and non-commercial value, they considered traditional chiefs as the hierarchy of that society, as a way to achieve their goals, which consisted of acquiring or granting the solicited site. But if this level of disagreement was reached, it was because of three factors that were not considered but which represented the interests of the various stakeholders:

- Reckless pursuit of material interests by investors.
- Search of the local developmental baseline in colonies by the colonial masters.

• Ignorance of the populations and traditional authorities who were already convinced by colonial masters.\textsuperscript{21}

In the developing countries generally and in Cameroon specifically, investment procedures are constantly infringed upon. It may easily be concluded that these procedures are done in reverse of the normal standard. Instead of first compensating the dispossessed upon the granting of the site and before their expulsion, and then breaking ground, they expel the civilians first, and begin construction, which is supposed to be the last step. These damages are usually paid back as if they were donations, without taking into consideration the social and economic situation. As the construction site ends, commitments made to disposed riparian populations are reneged upon, and the people’s rights are trampled. Unfortunately, this has been the case in Edea, Song Loulou or Lagdo.

Fortunately, now, with the new hydroelectric dams of Lom Pangar, Memve’ele and Mekin which are under construction, we have seen that the procedure for damages paid to beneficiaries have been going on smoothly. But, we are also aware that there is under-evaluation of what should actually be given to the affected population. There is, for instance, exclusion of people from the construction site of the hydroelectric dams of Mekin. As one victim reports "the evaluation of our goods was done on the basis of amortization, mainly as far as real estate is concerned, by taking into account spending done sometimes before the economic crisis of the 1990s. This was with the complicity of traditional and administrative authorities who were simply guessing when investments were made to deduce the amortization. They just considered the net value to be paid that day and this was not based on any rational criteria."\textsuperscript{22}

Although there has been a noticeable improvement in the area, there are still many infringements on the rights of the riparian populations of Cameroon.

3 CONCLUSION

In a nutshell, the issue of riparian rights and duties around hydroelectric dams in Cameroon since the construction of the first hydroelectric power plant of Edea (Edea I) between 1949 and 1953 has remained a problem. The riparian populations were not adequately compensated, neither were their real interests taken into consideration by the colonial master, France. Today this problem has continued because of infringement from several parties. There is usually an abandonment of responsibilities promised to the riparian settlements by the public authorities. They are neither able to determine real specifications, nor are they able to respect the so-called existing provisions. Furthermore, they are also unable to clarify the role of many managerial, developmental, or regulatory bodies that were created to handle any problems that emerge from the construction of hydro-electric dams. This carelessness leads today to the debate on riparian rights around the hydroelectric dams in Cameroon. Poor residents have been abandoned to look after themselves. There has also been a violation of their rights and their extreme poverty. At

\textsuperscript{22}Eloundou, S., (2012, June 12), 54 years old, Peasant and beneficiary of PASEM, Nyabizan.
best, they have been given assistance as if it is charity, even when many of the inhabitants suffer from illnesses such as river blindness and onchocerciasis, caused by the heavy investment in energy. Finally, they are prevented from doing their work because of the production of energy which they do not benefit from.

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Mobile Facial Recognition System for Patient Identification in Medical Emergencies for Developing Economies

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ABSTRACT
Medical emergencies are part of the common daily lives of people in developing and underdeveloped economies. Frequently, some of these medical emergencies end up tragically for many people in these countries due to many reasons, among which is the delivery of medical treatment when the patient is uncommunicative or unresponsive. The ability of the attending medical personnel to access a patient’s medical history is critical for the quality of the treatment rendered. Unfortunately, today many lives are lost in low income economies during medical emergencies due to lack or inaccessibility of a patient’s medical information. One of the major contributing factors of this paucity in records is attributable to the absence of reliable and cost-efficient healthcare delivery systems that support patient identification and verification. Due to the current ubiquity of mobile devices with their concomitant digital cameras, this paper explores the feasibility and practicability of using mobile platform and facial recognition technology as a means to deploying a cost-efficient system for reliable patient identification and verification.

Keywords: medical emergencies, developing economies, patient identification, facial recognition.

1 INTRODUCTION
In spite of the global efforts by healthcare providers to focus on preventive healthcare systems, medical emergencies continue to claim many lives in low income economies due to many reasons, including, but not limited to, insufficiencies of qualified medical personnel, unavailability of appropriate medical equipment, cultural barriers, cost, and unreliable delivery systems. Lack of stable, supportive computer networks makes it impossible for data sharing, and helps to compound the problem. Other contributing factors, as identified by Robertson, et al. (2009), include economic and geopolitical constraints, transportation, and geographic barriers. Medical emergencies are usually handled in three phases – at point of occurrence, during transportation, and at a health facility. Razum & Kelly (2005), in their works in Zimbabwe, concluded the fate of an emergency patient depends greatly on what happens during the first phase of the treatment. The issues and problems surrounding the insufficiencies of medical personnel and unavailability of equipment have been amply discussed in Roudsariemail (2005); Conrad & Gallagher (2015); Razzak et al. (2008); Chandran & Lyn (2008); Scott et al. (2008); Kinfu et al. (2009); and Naicker et al. (2009). The focus of this paper is on the issues contributing to the unreliability of the emergency healthcare delivery process.
Under normal healthcare delivery process, the quality of the services rendered is greatly impacted by the knowledge and/or accessibility of a patient’s medical information. Many healthcare delivery accidents have happened, in part, due to the absence or inaccessibility of a patient’s medical history, as evidenced in the works by Castrejón, McCollum, Tanriover, & Pincus, (2012; Tsukamoto (2012); and Grif (2011). This situation is complicated in a medical emergency when a patient is uncommunicative or unresponsive, and therefore unable to provide some medical information. What is needed to effectively address this problem is a system that can securely and reliably capture, store, and retrieve a patient’s relevant medical information. The reliability depends greatly on how to verify or identify a patient during a medical emergency described earlier. Low income economies are notorious for the absence of healthcare infrastructure that facilities storage and access of patients’ necessary medical information.

This system is an attempt to design and develop a cost-efficient and reliable system and platform to facilitate the capture, storage, access, and retrieval of patients’ critical medical information for medical emergencies in developing and under-developed economies.

2 GENERAL SYSTEM DESCRIPTION

This system comprises a front-end for patient registration or enrollment; mobile application for patient identification, and a back-end for data storage and retrieval. The patient registration or enrollment can be done either by the patient’s Primary Care Physician (PCP) with the authorization of the patient, or by the patient using a desktop or mobile application. Only critical medical information necessary for emergency medical care is captured during the enrollment, including the patient’s passport-sized digital image. All textual information is stored in the back-end in encrypted form. Only authorized persons, who have successfully authenticated biometrically, are allowed access via the front-end mobile application.
3 THE FRONT-END APPLICATIONS

The system’s front-end comprises two mobile applications: (1) Patient Enrollment and (2) Patient Identification.

Patient Enrollment Application (PEA).

The PEA is used to enroll a patient in the system. The enrollment process involves the capture of necessary, critical emergency medical information, including the patient’s passport-sized digital photograph. One component of this critical emergency medical information is the patient’s list of allergies. There are different types of allergies which include, but are not limited to: Cockroach Allergy, Drug Allergies, Dust Allergy, Eye Allergies, Food Allergies, Insect Sting Allergies, Latex Allergy, Mold Allergy, Pet Allergies, Rhinitis, Sinusitis, and Skin Allergies. In addition to the allergies, the enrollment process captures some personal information about the patient such as the name, age, and gender, which are vital during the identification process. Furthermore, other optional pieces of information can be captured, such as the patient’s past medical history, past surgical history, social history, family history, and medications. The patient enrollment can be done either by the patient’s Primary Care Physician (PCP), with the authorization of the patient, or done directly by the patient. When using a mobile phone for registration, some of the enroller’s personal information are automatically retrieved from the associated mobile phone, and stored for security purposes and post enrollment validation. Distinction is made between information obtained via enrollment from a patient and the PCP. For the purposes of quality and reliability of patient information, a distinction is made about the sources of the information both at storage and retrieval when applicable information is accessed. This helps to convey a degree of confidence about patient information based on the sources of the information. For security and privacy purposes, all original textual data, without privacy implications, and that will never be part of the identification criteria, are stored in encrypted form.

![Patient Enrollment Flow Diagram](image)

Fig. 2: Patient enrollment flow diagram.

Patient Identification Application (PIA).
The other component of the front-end is the Patient Identification Application which is used to identify a patient during an emergency. In the best-case scenario during a medical emergency, the patient’s name, age, and gender are known. In that case, a verification operation is performed with the age, name, and gender to retrieve the associated information, if available. In the worst-case scenario, neither the name nor age is known. In this case, an identification operation is required as described below, (see “System’s Facial Recognition Technique”) using the patient’s gender and estimated age. Depending on the result of each matching request, the user can repeatedly modify or tune the patient’s age and perform another matching request, as detailed in the matching technique below.

![Patient identification flow diagram.](image)

Fig. 3: Patient identification flow diagram.

As detailed below, facial recognition technique is a similarity-based algorithm that determines the degree of similarity between two facial templates. The higher the degree of similarity, the more equal the two objects. As a result, the number of matches between one face and many faces depends on the similarity threshold specified. The similarity threshold is usually a number between 0.01 and 1.0 where a value of 1 indicates absolute similarity. Usually, a similarity threshold of $S$ is expressed as $0 < S \leq 1.0$.

The task of identifying a patient from a database of patients is similar to the classical problem of searching in computing. How quickly one can find or identify an element from among many elements is a function of the size and nature of the elements. Over the years in the field of data structures and algorithms, many techniques and strategies have been designed and developed to optimize the search process. For multifarious or multi-component or structured elements, one of the effective strategies is determining the target set of elements from the complete set. By
reducing the target set of elements, one is effectively reducing the effective search time. As a result, this system utilizes tunable parameters in the form of the patient’s age and gender to reduce the effective search set.

4 THE BACK-END
The system’s back-end is responsible for performing the facial matching, encryption, decryption, storage, and retrieval. The back-end accepts the enrollment data from the front-end application, formats the data as required, performs encryption and facial template extraction, and stores the information in the database. The enrollment fails if the facial template extraction was unsuccessful. During patient identification, the back-end performs the facial matching activity and returns the matching patients’ facial images and subsequent medical information. Whenever a backend request failed, it’s the responsibility of the front-end applications to determine the next course of action - whether to modify the request and repeat it, or terminate the process.

Fig. 4: Backend flow diagram

The Facial Recognition Engine
Biometrics verification and identification are the processes of using an individual’s measurable physiological or behavioral attributes to either confirm or deny the stated identity of the individual, or determine the identity of the individual. The physiological or behavioral attributes of an individual have to do with the measurable characteristics of the individual and related to the functioning of the body, such as fingerprints, face, DNA, Iris, Palm, voice, signature,
 keystroke dynamics, etc. Basically, physiological data has to do with data derived from the measurement of a part of a person’s anatomy. Behavioral data has to do with data derived from measurement of an action performed by a person. Verification is the process of determining whether someone or something is, in fact, who or what it is declared to be. Identification is the process of establishing the identity of an individual. Verifying or confirming a person’s identity can be accomplished by using something the person knows (password), something the person has (token), or something that’s part of the person (biometrics). Collectively, they provide the highest degree of security; however, individually, biometrics has the highest degree of security and reliability. The use of password, token, biometrics, or combination thereof depends on the target objective of the system. Each mode of verification has its inherent problems and issues, such as recollection, management, and intrusion.

Why Facial Recognition?
As a biometric technique, facial recognition is the least intrusive of all the biometric technologies. Facial recognition systems can surreptitiously take a picture of a person's face when he/she is present within a defined area. The target object for facial identification may not consciously participate in the process, that is, he/she does not need to take any particular posture for the facial image to be captured. The camera can determine the presence of a face and capture the image.

The facial recognition software operates by detecting a face and then measuring the various features of the face. Everyone's face has several, distinguishable characteristics that constitute the facial features. These features include, but are not limited to: distance between the eyes, width of the nose, depth of the eye sockets, the shape of the cheekbones, and the length of the jaw line. These features are then measured and aggregated to produce a quantifiable numerical code that is used in facial recognition process. The entire process involves the following steps:

- **Detection/Capturing** – An image can be obtained by scanning an existing photograph or using a manually controlled video camera or by a camera automatically detecting a face.

- **Extraction/Representation** - Unique data (code) is extracted from the sample and a template is created. This may involve using and comparing serial samples.

- **Matching** - The system then decides if the features extracted from the new sample are matching or not.
The System’s Facial Recognition Technique

The facial matching (recognition) approach used in this system uses a patient’s gender, estimated age, and photo image (live or stored) to retrieve a set of patients’ facial templates that meet a given similarity threshold in comparison with the target patient. The age and similarity parameters can be adjusted during successive iterations of an identification session, in order to obtain an optimal result. A similarity value measures the degree of similarity between two facial objects. Therefore, a value of 1.0 indicates a 100% match between two facial objects. The lower the similarity value, the higher the probability that more facial objects will match the target object.

To describe the facial matching technique utilized in here, we let:

- \(a\) represent the estimated age of a patient and \(a_z\) represent the estimated age during the \(z^{th}\) iteration of a given identification session.
- \(g\) represent the gender of the patient.
- \(S\) represent a set of similarity threshold values 0.1 to 1.0 with 0.1 differential, where \(S = \{0.1, 0.2, 0.3, ..., 1.0\}\) and \(S_i\) represents the \(i^{th}\) element of \(S\); and \(S_{sys}\) represents the system default threshold value.
- \(F(a, g, j)\) represent the face matching function that compares two face objects and returns a value \(y\) where \(0 \leq y \leq 1.0\); \(j\) represents any face object from the target database that meets the \(a\) and \(g\) selection criteria.
- \(H\) represent the face matching process that uses \(F(a, g, j)\) and yields a set of facial objects, \(\Omega\).
- \(H^{(z)}\) represent the \(z^{th}\) iteration within a given identification session where \(z \geq 0\).
- \(H^{(all, S_i)}\) represent the result of applying \(S_i\) threshold value, that is, \(F(a, g, j) \geq S_i\).
- \(H^{(max, S_i)}\) represent the result of applying \(S_i\) threshold value such that there exists \(F(a, g, j) = \max\) and for all \(m \neq j\), \(F(a, g, m) \leq \max\).

Therefore, for a given \(t^{th}\) iteration within an identification session,

\[
\Omega = H^{(all, S_{sys})} \cup H^{(max, S_{sys})} \quad \text{if } t = 0 \tag{1}
\]
\[
\Omega = H^{(all, S_{i})} \quad \text{if } t > 0 \tag{2}
\]

Consequently, the associated pseudo code for the \(z^{th}\) iteration for an identification session is thus:

5 PROCEDURE

\(G(a, g, S_i)\)

Initialize \(H^{(max, S_i)}\) to empty

Obtain \(\Omega\) for \(F(a, g, j)\)
For each face template in $\Omega$
  Compute the similarity value
  If similarity value $\geq S_i$ then
    Add face template ID to $\mathcal{H}(all,S_i)$
  End if
  If similarity value $> \text{similarity value of } \mathcal{H}(\text{max},S_i)$ then
    Set $\mathcal{H}(\text{max},S_i)$ to current face ID
  End if
End For each
If $z == 0$ then
  Add $\mathcal{H}(\text{max},S_i)$ to $\mathcal{H}(all,S_i)$
End if
Return $\mathcal{H}(all,S_i)$
End PROCEDURE

Integration with google glass
Google glass is a network-enabled, eyeglass-like headset that displays information like a smartphone. It was developed by Google X, a division of Google. It responds to user’s voice recognition, manual commands, and eye movements. It consists of a touchpad for manual control of the device; a high-definition camera for taking pictures and videos; and a liquid crystal-based display.

There have been documented uses of Google glass in the healthcare delivery such as (Greenfield, 2015) to access patient records, check live patient vitals, and physicians’ collaboration; (Farr, 2014) a cloud-based patient/physician medical record sharing environment; and (Metz, 2015) that enables live-streaming of patients’ visit thereby eliminating the need for Electronic Health Records. Google glass will be integrated with this system in order to leverage the ease-of-use
that it provides for patient facial recognition. This integration is seamless given that Google glass is also an Android-based device.

**Limitations and challenges**

One of the major assumptions of this system is the availability of patient registration, that is, the willingness and cooperation of the patients and their healthcare professionals to register with the system and provide the necessary medical information. Due to lack of evidential benefits from documentation exercises, many people in low income economies are usually not motivated with the idea of either participating with such endeavors, and/or providing reliable information. As such, necessary advocacy and enlightenment may be necessary to educate and inform the target population about the benefits of the system.

**System status and testing results**

The front-end of this system has been designed and partially implemented. The PEA and PIE have been prototyped as Java applications for testing and demonstration purposes. The back-end has been fully implemented. The test database was populated with one to three thousand facial templates with 1:1 male/female ratio.

Due to the fact that an identification process may be time-intensive because of its \(O(N)^{23}\) execution time when matching \(N\) facial templates, it’s always a concern in any facial matching system to determine the performance efficiency of the system. Our evaluation environment used a LINUX 32-bit machine with Apache Web Server, MySQL 5.x Database Server, two 2.4 GHz Processors and 4 GB RAM. The CPU matching time for 1,000 to 3,000 facial templates in the database with a percentage hit of 30%-50% ranged from 7.5 milliseconds to 38.3 milliseconds. The total CPU time to retrieve all the applicable facial templates and IDs from the database ranged from 32.0 milliseconds to 163.0 milliseconds.

This system is still in-progress and we are planning to complete the application development, system integration, and system testing using our Computer Technology Excellence Laboratory (CTEL) which is currently under development.

**6 CONCLUSIONS**

This paper attempts to address the issue of patient identification during a medical emergency when a patient’s medical information may become inaccessible as a result of the patient’s inability to communicate effectively in order to provide the needed medical information. The system comprises two front-end mobile applications that are used to enroll and identify a patient based on the patient’s facial recognition, in conjunction with the gender and tunable age parameters. This system utilizes efficient and effective facial template management and matching technique to determine whether a given patient already exists in the database, and to retrieve the associated medical information. The ability to quickly identify a patient, even when the patient is unresponsive, enables healthcare providers to access a patient’s medical history which is invaluable for quality of care.

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23 Big O notation is used to describe the performance or complexity of an algorithm. It’s mostly used to describe the worst-case scenario of an algorithm either in the execution time or space used.
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ABSTRACT

The main aim of this study was to find out the barriers in dengue prevention in the Swat District of Khyber Pakhtunkhwa Province, Pakistan. A sample size of 354 respondents were proportionally allocated to each Mahallah or street (Tahir Abad, Angaro Dheri, Usman Abad and Banr) and then randomly selected. The association of the independent variable (barriers to prevention) and dependent variables (practices for control) were tested by using a Chi Square test. The perception about barriers in dengue prevention shows that a highly significant association was found between practices for control and access to medical facilities (p=0.034), government agencies to eradicate dengue breeding sites (p=0.005), dengue insecticides available in market (p= 0.028), use of bed nets (p=0.000), government/NGO instruction (p=0.008) and inconvenient sleep in bed nets (p=0.000). The barriers which enhanced the susceptibility of dengue epidemic were high population density, sufficient breeding sites in residential areas, and lack of coordination of government agencies with citizens to give instruction and advices about dengue prevention and treatment. Rather than the government, most of the infected persons were advised and treated by private health clinics. The study recommends controlling dengue fever and its vectors in the most vulnerable areas by providing emergency facilities, medicines, preventive chemicals and mosquito nets free of cost or with price controls.

Keywords: Advices, Bed Nets, Dengue, Fever, Government, People Organization.

1 INTRODUCTION

Dengue fever is also known as break bone fever, which appears with symptoms of headaches, high temperature, muscular/bone pains and decrease of platelets (Gubler, 2010). Dengue fever is caused by a virus which has four stereotypes (DENV-1 to DENV-4) and is transmitted through female mosquitos known as Aedes Aegypti. It is mostly found in urban and semi urban regions,
between latitudes of 35°N and 35°S. The severe conditions of dengue fever are Dengue hemorrhagic fever and Dengue Shock Syndrome (Guzman, 2002). The Dengue hemorrhagic fever has symptoms of high temperature, bleeding, low platelet counts, and plasma leakage due to low concentration of proteins and albumins in blood (Pan American Health Organization, 1994). Dengue shock syndrome occurs after 2-7 days of dengue hemorrhagic fever along with symptoms of low blood pressure and pulse, belly pain, and patients restlessness (World Health Organization, 1997).

The Swat District, in the northern area of Khyber Pakhtunkhwa Province, was struck by dengue fever in August, 2013. A total of 8,963 dengue cases and 36 deaths were registered during the epidemic. The DNV-1, DNV-2 and DNV-3 viruses were confirmed in patients. The blood samples of these patients were tested in Islamabad and Lahore. Besides the Swat District, the other regions of KP (Mardan, Shangla and Dir Lower) were also hit by dengue virus. The total number of dengue cases in four provinces of Pakistan as recorded in Nov, 2013 were; Khyber Pakhtunkhwa, 9,321, Punjab, 1,103, Baluchistan, 15 and Sindh, 3,889 (National Institute of Health & World Health Organization, 2013).

The dengue hemorrhagic fever may affect the human life directly and indirectly. The direct impacts include periods of illness, treatment, and monetary expenditure of patients and their parents. The indirect factors are life disturbances and psychological disorders. The measurement of indirect impact is difficult. The dengue hemorrhagic fever disturbs the daily activities of people and their family income. They also affect the economic condition of immediate family members, as well as other relatives (Sornmani et al, 1994). Dengue fever considerably affects the population of the plagued area socially and economically (Cattand, 2006). From 1996 to 2005, the World Health Organization reported the numbers of dengue cases increased from 0.4 to 1.3 million. The main factor preventing the understanding of dengue fever is misdiagnoses, which are significantly increasing dengue vectors annually (Suaya et al, 2007).

The negative perceptions of people were considered a major constraint in controlling dengue fever. These behaviors included lack of inclination to keep water clean and covered and keep old tires or other discard things away from home. The health department noticed that the lack of adoption of these behaviors has been a basic barrier in dengue control (Smith, 2012). People were fully aware about mosquito breeding places yet their behavior was not consistent. They left water containers uncovered, which provides suitable environment to dengue population. The positive control over dengue mosquitoes depended on each member of the community. According to much research, control activities on household have shown poor performance. During dengue outbreak, the community participation became difficult to control (Winch et al, 2002). There were many challenges to community participation in the form of social, financial, political, and other obstacles which affected the skill and capacity of community members in dengue control (Manderson, 1992).

Outstandingly, although there have been large numbers of dengue victims, there has been hardly any economic or social impact of dengue. Although the impacts of dengue have been low, it is essential for policy makers to allocate resources to the research and control of dengue. The incidence rate of dengue fever was 12% in 1995 and 35% in 1997(Kouri, 1998 & Guzmán et al, 1999). There are various factors which increase the breeding of dengue, including lack of diagnostics, ineffective prevention programs, and poor surveillance systems. In Latin America,
contributing factors include population growth, which promote global warming and also facilitates vector borne diseases. Insufficient urban planning in Latin America increased the chances of dengue vectors because of garbage and poor cleaning practices (Pan American Health Organization, 2005). Another cause of dengue epidemics is air travel, which transmits dengue mosquitoes from infected areas to other regions (Schneider & Droll, 2001). Other causes significantly influencing the degree to which dengue spreads are socio-economic status and poor sanitation systems. Currently, negative human activities and social inequalities favor the emergence of dengue. The decline of public health departments also increases the chance of dengue epidemics. Latin American countries and their health departments have prioritized the identification of preventive measures to control dengue outbreak because of economic constraints (Pan American Health Organization, 2005 and Kouri et al, 1986).

The economic impact of dengue is difficult to calculate due to the unpredictability of the number of dengue cases in a given year. For example, by applying the human capital method and non-age-dependent indicative rate, the cost of the 2000 epidemic was US $64 million, and the 2005 epidemic cost $160 million. The distribution cost was $415 million from 2000-2009 without control costs. By using the friction cost method, the means of 5th and 95th percentiles of $236 and $504 million was $351 million. The control cost was $500 million. Therefore, from 2000 to 2009 the total economic costs by using human capital method and friction cost method were $0.91 billion and $0.85 billion respectively. Those estimates increased to $1.06 billion for the human capital method and $1.15 billion for the friction cost method when age-dependent symptomatic rates are used. Ambulatory cases had higher cost by age dependent symptomatic rates. By using constant symptomatic rates, the largest share of cost recorded was for hospitalized cases (Lum, 2008).

**Dengue Prevention and Health Belief Model**

The control of dengue fever is possible through health behavior theory. The significance of this theory is to develop a theoretical framework, and to design health education and behavior intervention change. It calls for supplying education, equipment, and communication to control dengue mosquitoes (Glanz et al, 1997). Therefore, the prevention of dengue fever may make use of health behavior theory. Another approach which establishes the back bone and theoretical approach to dengue prevention is HBM (health belief model) (Strecher and Rosentock, 1997).

The most important components of HBM are perceived severity, susceptibility, cues-to-action, perceived benefits, perceived barriers, and self-efficacy. The perceived severity is the association of contracting the disease with negative health consequences, while perceived susceptibility is a belief of a person regarding the possibility of contracting a disease. These two principles form the perceived risk to health. The cues-to-action construct refers to anything that may improve awareness or increase interest in performing the activities necessary to control, prevent, treat, or improve health related issues. The cues-to-action could be a promotion in the form of a message on a poster or pamphlet, placard or radio campaign. Mass and print media play a vital role in awareness regarding health education. The beliefs of the masses in the value of adhering to health-related procedures to control the disease are known as perceived benefits. Self-efficacy refers to the confidence of people in taking health-related action. Bandura developed the social learning or cognitive theory but it was also quickly added to HBM. HBM is a step-by-step approach to control dengue vectors, and also promote conviction among people to
clean up dengue breeding sites on a weekly basis. Similarly, perceived barriers refer to mental blocks and perceived costs which prevent people from taking action to control disease. If the perceived benefits are outweighed by the perceived costs, the suggested activity will not be enacted (Strecher and Rosentock, 1997).

2 MATERIALS AND METHODS

This research study was carried out in the Swat District, Khyber Pakhtunkhwa Province, Pakistan. Persons affected from dengue fever in Tahir Abad, Angaro Dheri, Usman Abad and Banr were the potential respondents for this study because urban and semi-urban areas in these regions were badly affected by dengue outbreak. Therefore, a pilot study was conducted by the researcher to determine the number of dengue cases in the study area, according to which a total of 4440 persons were affected from dengue fever. For a population size of 4440, a sample size of 354 respondents was selected through criterion devised by Sekaran (2003). Cronbach’s alpha test was applied to determine the inside consistency of the rudiments/instrument that represent the index. Alpha measures the degree of elements comprising the scale “hang together.” The range of alpha value is from zero to one. So the value of alpha coefficient is 0.7 which indicates the reliability and validity of the instrument (Nachmias, 1992).

A conceptual framework was devised as shown in the Table 1 and the interview schedule and face to face interview were used as tools for data collection. The dependent variable (practices for control) was indexed and cross tabulated with the independent variable (barriers to prevention) to measure the association. To test the relationship between the two variables the Chi Square Test was used. The mathematical form of Chi Square test is as under (Taj, 1978).

\[ \chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(O_{ij} - e_{ij})^2}{e_{ij}} \]

Table 1: Conceptual framework

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barriers to prevention</td>
<td>Practices for control</td>
</tr>
</tbody>
</table>

The basic principles for Chi- Square Test are given below
1. The subjects for each group are randomly and independently selected.
2. Selection of respondents without replacement.
3. Sample size must fairly be large (at least 10) and no expected frequency is less than five in cells of the contingency table.

If the last principle has been violated in data then the Fisher Exact Test was used instead of simple Chi- Square Test. The mathematical form of the Fisher Exact Test as,

\[ \text{Fisher Exact Test} = \frac{(a + b)! (c + d)! (a + c)! (b + d)!}{N! a! b! c! d!} \]

Where a, b, c, d and “n” represented the observed numbers in four cells of the contingency table and the total number of observations, respectively.

3 RESULTS AND DISCUSSION
3.1. Frequency and Percentage Distributions Regarding Barriers to Dengue prevention

The perception of respondents about barriers and constrains in dengue prevention in the study area is given in Table-2. The study shows that a majority (92.4%) of respondents identified their residential area as a breeding place for dengue mosquitoes. The masses were not participating at Mahallah level to clean and remove standing water, discard broken items, or other breeding sites, and never checked/examined water containers. Similarly high population density also provides suitable environment for dengue population in the studied area. Moreover, a high proportion (73%) of respondents had access to medical facilities and treatment. The result makes it evident that the people had no problem regarding treatment and medical facilities. However, they got treatment from private health units through self-support, due to low attention of government agencies. Most (78.2%) of the respondents stated that government was not active in eradication of dengue vectors. Moreover, 79.7 percent of respondents pointed out that they had not followed the advice of government agencies and NGOs for prevention or control of dengue. Therefore, the masses faced many barriers in dengue prevention in the form of political rigidity, misunderstanding, and lack of coordination among various agencies. The government agencies were passive in giving proper attention in dengue eradication, and had extended insufficient advice to people regarding dengue prevention and treatment. These results were supported by Claro et al. (2006), who found that lack of coordination between government agencies, such as municipal health departments, and local community, increased the population of dengue mosquitoes. Likewise, 50.8% of respondents reported that insecticides for controlling dengue mosquitoes were available in the market, but due to high treatment cost they were unable to use them. In addition, 58.8% of respondents identified that it was not easy to remove and fill standing water because of high rainfall. This result was supported by Lennon (2004), who found that prices of insecticides and unavailability of masses to eradicate dengue vector were causing dengue spread. A high proportion (76.6%) of respondents used bed nets for protecting themselves against mosquitoes while 60.2 percent did not use mosquito repellents to protect themselves from dengue attack. Moreover, high proportion (61.6%) of respondents identified that they felt it inconvenient to sleep in bed nets during dengue fever. Although, most of the masses used mosquitoes nets as protective measure, they felt uncomfortable due to sever muscular pain and high temperature.

Table -2: Frequencies and percentage allocation of respondents about their perception of barriers in dengue prevention (N=354)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Yes</th>
<th>No</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your residential area has sufficient areas where mosquitoes can breed.</td>
<td>327(92.4)</td>
<td>27(7.6)</td>
<td>00</td>
</tr>
<tr>
<td>You have access to medical facilities in case of dengue.</td>
<td>261(73.7)</td>
<td>93(26.3)</td>
<td>00</td>
</tr>
<tr>
<td>Government agencies are active in eradication of mosquitoes.</td>
<td>74(20.9)</td>
<td>277(78.2)</td>
<td>3(.8)</td>
</tr>
<tr>
<td>Insecticides for controlling dengue mosquitoes are available in market.</td>
<td>180(50.8)</td>
<td>86(24.3)</td>
<td>88(24.9)</td>
</tr>
<tr>
<td>You use bed net for protecting yourself against mosquitoes.</td>
<td>271(76.6)</td>
<td>83(23.4)</td>
<td>00</td>
</tr>
<tr>
<td>You use mosquito repellent for preventing dengue</td>
<td>140(39.5)</td>
<td>213(60.2)</td>
<td>1(.3)</td>
</tr>
</tbody>
</table>
3.2 Association between barriers to prevention and practices for control

Dengue fever is a universal problem, especially in developing countries like Pakistan. The prevention of dengue vectors is a difficult task because there are many barriers in dengue control, such as breeding sites in living areas, poor attention of government agencies, and lack of knowledge about protective measures. To ascertain the relationship between barriers to prevention and practices for control, the perception of barriers to prevention was limited to a few statements as mentioned in Table-3 and discusses below.

The results show that a significant (p=0.034) association was found between access to medical facilities and practices for control. Therefore, those people who had good access to medical facilities and treatment during dengue epidemic were safer from dengue fever. Similarly, a significant relationship was found between efforts from government agencies to eradicate dengue mosquito breeding sites, and practices for control (p=0.005). Similarly, following instructions from the government and NGOs, and practices for control also had a significant correlation (p=0.008). It is evident from these findings that dengue can be controlled through mutual coordination of government agencies and citizens. If the government agencies are active and give advice and instruction to people about dengue fever, then the masses can follow good practices for dengue control. These results are supported by Claro et al. (2006); they found that lack of coordination between government agencies like health and sanitation departments and local communities accelerated dengue outbreak. Moreover, a significant (p= 0.028) association was found between use of insecticides and practices for control. Similarly, use of bed nets against dengue mosquitoes and practices for dengue control were also significant (p=0.000) in association. Therefore, the results make it evident that those having knowledge about use of bed net and insecticides followed good practices for dengue control. Furthermore, a highly significant (p=0.000) negative correlation was found between inconvenient sleep in bed nets and practices for control. The result shows that if people felt it inconvenient to sleep in bed net, they may eventually have low practices for control. Abvia et al (2012) supported the conclusion that those people who had knowledge about the use of bed nets against dengue mosquitoes followed good practices for dengue control. On the other hand, a non-significant association (p=0.234) was found between residential area, where dengue mosquitoes could breed, and practices for control. Similarly, the relationship between use of mosquito repellent and practices for control were found to be non-significant (p=0.492). Likewise, a non-significant (p=0.059) association was established between filled stagnant water and practices for control.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
<th>Group 1 Frequency</th>
<th>Group 2 Percentage</th>
<th>Group 3 Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>You follow the advices/ instructions given by Government agencies/ NGO for prevention of control.</td>
<td>71(20.1)</td>
<td>282(79.7)</td>
<td>1(.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is not easy to fill in all stagnant water places.</td>
<td>208(58.8)</td>
<td>145(41.0)</td>
<td>1(.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is inconvenient sleep in bed nets.</td>
<td>218(61.6)</td>
<td>92(26.0)</td>
<td>44(12.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Data in table show frequencies & parenthesis show the percentages.

Table -3: Association between barriers to prevention in dengue fever and practices for control (N= 354)
<table>
<thead>
<tr>
<th>Barriers in controlling Dengue Fever</th>
<th>Perception</th>
<th>Practices for control</th>
<th>Total</th>
<th>Chi-Square (P=Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Your residential area has sufficient areas where mosquitoes can breed.</td>
<td>Yes</td>
<td>279(78.8)</td>
<td>48(13.6)</td>
<td>327(92.4)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>25(7.1)</td>
<td>2(0.6)</td>
<td>27(7.6)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>0(0)</td>
<td>0(0)</td>
<td>0(0)</td>
</tr>
<tr>
<td>You have access to medical facilities in case of dengue.</td>
<td>Yes</td>
<td>230(65.0)</td>
<td>31(8.8)</td>
<td>261(73.7)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>74(20.9)</td>
<td>19(5.4)</td>
<td>93(26.3)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>0(0)</td>
<td>0(0)</td>
<td>0(0)</td>
</tr>
<tr>
<td>Government agencies are active in eradication of mosquitoes.</td>
<td>Yes</td>
<td>72(20.0)</td>
<td>2(0.6)</td>
<td>74(20.6)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>230(65.0)</td>
<td>47(13.3)</td>
<td>277(78.2)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>2(0.6)</td>
<td>1(0.3)</td>
<td>3(0.8)</td>
</tr>
<tr>
<td>Insecticides for controlling dengue mosquitoes are available in market.</td>
<td>Yes</td>
<td>160(45.2)</td>
<td>20(5.6)</td>
<td>180(50.8)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>76(21.5)</td>
<td>10(2.8)</td>
<td>86(24.3)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>68(19.2)</td>
<td>20(5.6)</td>
<td>88(24.9)</td>
</tr>
<tr>
<td>You use bed net for protecting yourself against mosquitoes.</td>
<td>Yes</td>
<td>248(70.1)</td>
<td>23(6.5)</td>
<td>271(76.6)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>56(15.8)</td>
<td>27(7.6)</td>
<td>83(23.4)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>0(0)</td>
<td>0(0)</td>
<td>0(0)</td>
</tr>
<tr>
<td>You use mosquito repellent for preventing dengue attack.</td>
<td>Yes</td>
<td>122(34.5)</td>
<td>18(5.1)</td>
<td>140(39.5)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>181(51.1)</td>
<td>32(9.0)</td>
<td>213(60.2)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>1(0.3)</td>
<td>0(0.0)</td>
<td>1(0.3)</td>
</tr>
<tr>
<td>You follow the advices/instructions given by Government agencies/ NGO for prevention of control.</td>
<td>Yes</td>
<td>69(19.5)</td>
<td>2(0.6)</td>
<td>71(20.1)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>234(66.1)</td>
<td>48(13.8)</td>
<td>282(79.7)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>1(0.3)</td>
<td>0(0.0)</td>
<td>1(0.3)</td>
</tr>
<tr>
<td>It is not easy to fill in all stagnate water places.</td>
<td>Yes</td>
<td>171(48.3)</td>
<td>37(10.5)</td>
<td>208(58.8)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>132(37.3)</td>
<td>13(3.7)</td>
<td>145(41.0)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>1(0.3)</td>
<td>0(0.0)</td>
<td>1(0.3)</td>
</tr>
<tr>
<td>It is inconvenient sleep in bed nets.</td>
<td>Yes</td>
<td>183(51.7)</td>
<td>35(9.9)</td>
<td>218(61.6)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>90(25.4)</td>
<td>2(0.6)</td>
<td>92(26.0)</td>
</tr>
<tr>
<td></td>
<td>Don’t know</td>
<td>31(8.8)</td>
<td>13(3.7)</td>
<td>44(12.4)</td>
</tr>
</tbody>
</table>

*Number in table represent frequencies and number in parenthesis represent percentage proportion of respondents and in the last columns number in the parenthesis represent P=Value

### 4 CONCLUSION AND RECOMMENDATIONS

The root causes and barriers regarding dengue control were congested streets and houses, population, adequate mosquito breeding sites, and a passive role of government to inform or mobilize the citizens. A large number of patients got treatment and guidelines from local medical practitioners because of low attention of the health department and also limited isolated wards for dengue infected persons. There was a political interference among government workers in communities, due to which government showed passive role in dengue prevention. Similarly,
due to rainy/monsoon seasons, a lack of unity was observed among citizens to remove the dengue breeding sites and standing water. However, the people were fully aware about the use of bed nets, although they were found to be inconvenient to sleep in during the times in which dengue fever was spreading, due to high temperature, and bone and muscular pains. Mosquito repellents and insecticides were not commonly used, due to high market price during dengue epidemic. It is also acknowledged that those people who had access to treatment, followed advice and instruction, and used insecticides and mosquito nets were safer from dengue than those who did not. The study suggested that government should play a neutral role, and also pay special attention to controlling mosquito breeding and larva in the most vulnerable areas by providing urgent care services, medicines, chemicals, mosquito repellants, and bed nets free of cost or at a controlled price.

REFERENCES


