



## Defence Expenditure and Human Capital Development Nexus: Empirical Evidence from Nigeria

Omokhagbo Mike Imafidor

*Adams and Moore, Abuja, Nigeria*

Umar Faruq Quadri

*Nigerian Institute of Social and Economic Research (NISER), Ibadan, Nigeria*

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### Abstract

The crux of this paper is the determination of the impact of defence expenditure on human capital development in Nigeria. The study aims to further throw light on the recent debate on the effect of the resource allocation between the defence and the non-defence sectors on the economy –especially through the channel of human capital development. This issue cannot be overlooked especially in developing countries like Nigeria, considering the opportunity cost of spending and the country’s level of development. Applying Yetkiner (2012) framework -that incorporate defence spending into the solovian model-, this study utilized the VAR methodology in examining the relationship between the variables. Findings from the analysis of data revealed that Nigeria’s defence expenditure had a positive impact on human capital development within the period of study, albeit not significant overall. An interesting finding also - although not unexpected - was that changes in human capital was more influenced by changes in education and health expenditure, and it had an increasingly stronger and lasting effect than defence expenditure. Expenditure on defence, was observed to have a weak and waning effect on human capital development. With the security challenges facing the country and given that a fundamental role of the state is the protection of its citizens against external or internal aggression, an increasing share of military spending in total government expenditure is expected. What is useful however is for policy makers and fiscal actors to ensure that these expenditures on defence is structured in such a way and manner that it creates a positive spill over effect to other sectors of the economy like the health and education sectors. For instance, defence expenditure should be targeted mostly on areas that help to improve the technical competence of men of the force and on other aspects of the military, like the civilian components, as this will create a positive spill over effect to the private sector, stimulate aggregate demand and thus investment. It is also recommended that more local armament manufacturing industries should be developed to conserve foreign exchange for the country, combat capital flight and widen the industrial base of the economy. This will further boost the backward and forward linkage effect of the industrial sector.

**Keywords:** Human Capital Development, Defence Expenditure, Health, Education, VAR

**JEL Classification Code:** E62, H51, H53

**Paper Classification:** Research Paper

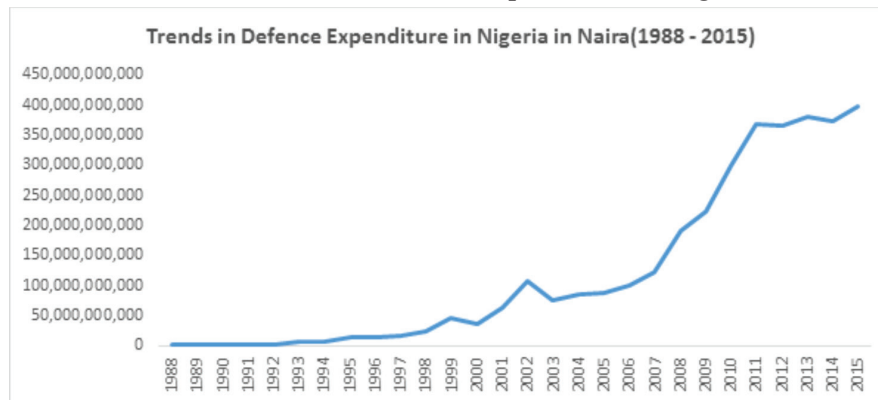


## Introduction

Theories, especially the endogenous growth theory, suggest that government expenditure has a strong impact on the growth rate of an economy in the long run. It is the main weapon in the government's arsenal -from a fiscal perspective- in regulating the pace of growth and direction of travel of the economy. Its influence depends on the size of government intervention on the different components of public spending (Pieroni, 2007). One very vital channel, through which this expenditure impacts on the economy is human capital. There is significant evidence to suggest that human capital has a significant role to play in an economy in terms of its contribution to long run economic growth. Consequently, the definition of the stock of capital in recent times has been widened to accommodate not only natural resources but also human capital as an engine of sustainable economic growth rate.

While there are, various sectors competing for the limited resources of the government, a critical sector that is increasingly gaining share and advantage because of the recent realities and challenges facing most nations of the world, is the defence sector. This is connected to the numerous roles it plays in an economy which includes protection against internal and external aggression amongst others. The effect of the resource allocation between the defence and the non-defence sectors on the economy through various channels such as human capital development has been a subject matter that have attracted intense debate in recent years. This issue cannot be overlooked especially in developing countries, considering the opportunity cost of these spending and these countries level of development.

Since the end of the cold world war, expenditure on defence started moving along the downward trend, although not consistent across all regions. However, this decline has fizzled out in more recent years and the expenditure is on the upward trend now. In Nigeria for instance, the Nigerian Civil war (1967-1970) and the long period of military dictatorship created an environment that sustained defence's increasing claim on the national resources. Defence spending as a proportion of total federal government expenditure after spiralling in the 1970s started on a downward trend, declining from about N1 billion in 1981 to about N803.2 million in 1986. As a proportion of total government expenditure, it fell from more than 14% to 2.7% in 1987. It started to record an upward trend from 1988 and between 1988 and 1998, it rose from N1.2 billion to N25 billion respectively. In 2007, military spending had almost doubled its 2001 figure at N122 billion following the security challenges in the Niger Delta. In 2010, defence spending stood at N292 billion and by 2015, it had risen to N397 billion owing to the terrorist challenges in the North-Eastern part of the country. This upward trend in defence spending reflects the security challenges facing the country. The Table 1 shows the trend of military expenditure in Nigeria from 1988 to 2015.

**Table 1: Trends in Defence Expenditure in Nigeria**

Source: National Bureau of Statistics

Going forward, basic economic mechanism shows that there is a crowding out effect of defence spending on the education sector, health sector and other social service sectors of the economy. However, as posited by Roux (1994), this crowding out effect impact is not that straightforward, as there are a number of routes through which spending on defence may have on the quality and stock of available human capital, some of which may eventually be positive.

The critical role human capital plays in an economy cannot be over-emphasized. Although human capital just carries potentials, these potentials must, however, be harnessed and developed if they must be contributory. Considering the quality of human capital in Nigeria, therefore there is the urgent need to critically look at human capital and what might have impeded on its development. The continued unimpressive performance of these sectors that contribute directly to human capital development dictates the urgent need for a reappraisal of allocations of revenue, policies, and commitment level of both the public and the private actors to these sectors. The need to examine the existing distortion in expenditure on defence and on sectors that contribute directly to human capital development, which can in turn put the economy on the path of sustainable growth, is therefore compelling. This raises the question of how defence expenditure could be structured and implemented to contribute positively, and specifically to human capital and the economy at large. This calls for new thought and initiatives, which is the essence of this study.

The objective of the study is primarily to examine the impact of defence spending on human capital development in Nigeria. Amongst others, this study aims to contribute to the scanty existing literature on the subject matter by providing an expository analysis of the effect of public expenditure in general and defence expenditure, on human capital development.

## Literature Review

Despite the critical role the defence sector plays in an economy, there is a dearth of literatures as regards to establishing these roles, especially in developing countries. Most of the studies done in this sector have not actually in a deliberate manner looked at channels (such as Human Capital development) through which this sector affects the economy. This section will review literature on defence spending as a component of public expenditure and the role it plays in the growth process. Also, literature on human capital development shall be looked at as it serves as a channel for this expenditure in the growth process. However, to serve as a base for the literature review and the study in general, the difficulties encountered by many researchers in earlier studies that have caused a dearth in literature in this sector shall be reviewed.

## Difficulties of Military Studies

There are primarily three key challenges encountered in the analysis of data on defence spending. These challenges include (i) conceptual challenges i.e. defining what amounts to defence spending; (ii) methodological challenges i.e. the appropriate method for analysis; and (iii) practical difficulties i.e. data collection challenges due to the seemingly secret nature of the activities of the military.

### Conceptual Challenge

Various definitions of defence expenditure exist due to the way and manner various countries classify what amounts to defence expenditure, the way budgets are drawn up, as well as the accounting methodology utilised in definition of military expenditures (Herrera, 1998). According to Brzoska (1995), every country has the freedom to define its defence spending the way it benefits them; hence there is no universal definition. Despite this absence of universal definition, three definition stands out, and they are; The International Monetary Fund (IMF) definition, the North Atlantic Treaty Organisation (NATO) definition, and the United Nations (UN) definition.

Specifically, the main variances in the definitions include;

- i. vagueness on the treatment of external defence aid; if it should be included or excluded from defence expenditure;
- ii. funding of pensions of retired military personnel, which NATO included in its classification but absent from the IMF classification;
- iii. lack of clarity in dealing with expenditure relating to para-military agencies such as vigilante groups and border guards, which form part of civilian groups and partly military.

### Methodological Challenge

Methodological problem has to do with the issue of treatment of local currency and inflation. These variables differ from one country to another as time progresses and are more pronounced in panel studies that are cross country with various time series data. The challenge here arises in choosing an appropriate deflator and conversion mechanism to bring the different rates to a common scale for analysis.

### Data Collection Challenges

Practical (data collection) problem derives from the secret nature of military activities which create a significant data confidence problem. Secrecy is preferred over opaqueness because it prevents access to valuable information for existing or potential opponents. There may therefore be some missing military data for some countries for some period.

### Theoretical Literature

The theoretical literature on the social and economic impact of defence spending has proposed several linkages between defence expenditure and socio/economic output. For purpose of analysis however, they can be categorised into demand-side effects, supply-side effects, and security effects.

The supply side effect is explained by considering the opportunity cost of scarce factors of production. In this sense, defence expenditure is seen as a diversion of factors of production

(labour, physical and human capital, and natural resources) and technology from more productive uses, causing a drop-in consumption available for civilians, thus lowering level of welfare due to weak consumption driven by absence of adequate savings and investment (Akinyemi et al, 1986). There is a disagreement in literature as to the composition of total output, i.e if it is composed of intangible military outputs, or just civilian production output. This is because, even though resources used by the military may not be directly available for civilian use, they may however create externalities. For instance, certain types of trainings received by military personnel make them more productive when they return to civilian employment. Research and development work by the military may also command some commercial spin-offs.

The demand-side effects are examined by considering expenditure level and composition. Taking the Keynesian multiplier effect for instance -which is one of the most obvious-, an exogenous surge in defence expenditure increases the level of aggregate demand and in the instance of excess capacity, increases the rate of utilization and reduction in unemployment of resources (Akinyemi et al 1986). Theories of under-consumption reverse this causation and describe defence expenditure as having an opportunity cost element attached to it, and thus crowd out investment and other forms of expenditure. The degree to which the crowding out effect manifest, and the extent to which its impact is felt depends on previous utilisation of increase in defence expenditure, and how such increase was financed. Again, Smith and Smith (1983) posited that if the economy is already at full employment, increased defence expenditure might be inflationary, or could trigger a balance of payment problem.

Governments are mostly constrained in budgeting, and this thus means that increase in defence expenditure will most likely be financed by either increased borrowing, seigniorage, increased taxation, cuts in other public expenditure, or a combination of any of these. The chosen option will have implications such as an increase in deficit, which may raise the interest rates and limit the ability of the private sector to access credit, thus stifling productivity. Again, increase in defence expenditure has the potential to alter the composition of industrial output, with input-output effects. Same argument applies to reductions in defence spending, though the effect might not be symmetric.

On security effect, it is evident that for markets to grow and operate smoothly, the security of lives and properties from both foreign and domestic threats must be assured, to incentivise and allow flow of investment and innovations into the market. According to Benoit (1973) and Deger (1986), an environment that is safe attracts both domestic and foreign investments, thereby supporting higher levels of economic growth. The classical as represented by Adam Smith had severally opined that the fundamental duties of a state are provision of protection from any form of violence and invasion an independent state, and the protection of citizens from any form of oppression or injustice. This they believe is a basic requirement needed for the growth and development of a state. In many low income countries such as Somalia and Syria, a major obstacle to their growth and development is war and lack of security. Also, Heo (1998) considered international relations, and asserted that a strong military provide a stronger negotiating position of a country, when engaging with other countries in economic, trade or security matters.

It is apt to note that most of these effects are dependent on a number of factors such as; source of finance for the military expenditure, the effectiveness of the military in providing adequate security and countering threat, the degree of utilisation of defence expenditure, and the externalities created by the defence expenditure. It is expected that these factors may vary over time and over countries, making the economic effects of defence expenditure also vary. The time horizons of these effects vary too, some are quite short-run, others vary in the long-run.

## Empirical Literature

Several empirical researches have been carried out to examine the nature of relationship that exists between defence expenditure and economic growth. There is however an absence of consensus as to the relationship in terms of its impact on economic growth. For purpose of analysis, the literature on the subject matter has been categorised into three groups. The first those studies that found a positive relationship between defence expenditure and economic growth; the second are those that find a negative relationship, and the third group are those that couldn't reach a conclusive result.

### Positive Relationship

According to Al-Jarrah (2005), defence expenditure boosts economic growth by primarily to means. The first is through the stimulation of aggregate demand level. The second is through the positive externalities - such as human capital development- that results from training of military personnel and the transfer of technology. The third is the improvement in security enforcement that comes with increased defence expenditure, which encourages investment. In his study, Benoit (1973) used several non-measurable contributions of military programmes to national economy and found that defence expenditures in less developed countries had a net positive development effect. This conclusion has since been challenged given the non-measurable data he captured. In a more robust study, Benoit (1978) contradicted the prevalent opinion, that the surge in defence expenditure was primarily the reason for the economic depression suffered by most LDCs. In a sample of 44 developing countries, he found that defence expenditure was positively correlated with economic growth rates. He posited that if there is a decrease in defence expenditure, only a small fraction of that goes to any form of productive investment. A similar conclusion was also reached by Atesoglu (2004). Tiwari and Tiwari (2010) Granger causality analysis reveals that there is directional causality between GDP and defence expenditure which implies that increase in either defence expenditure or GDP will bring momentum, and both will increase over time. Similar conclusions were also reached by Atesoglu (2004).

### Negative Relationship

The empirical studies within this group posit that defence spending starves productive investment of the needed resources with attendant implications on economic growth. They believe that giving more resources to defence spending will starve other critical human capital and economic development sectors - such as education, health, manufacturing and infrastructure- of needed funds. Lim (1983), Deger and Smith (1983) in their respective studies on Latin America countries found a negative relationship between defence expenditure and economic growth. Dunne (2010) specifying a growth model for Sub Sahara Africa which includes military spending and overcoming some of the limitations of earlier models concluded that there were clear negative impacts of defence expenditure on growth for Sub-Sahara Africa. In an earlier study also, Jen Wu and Te Lu (2003), trying to elucidate on the key empirical findings of Abu-Barder and Abu-Qarn (2003) set up an endogenous growth model that attempted to explore the association between the burden of defending a nation and the growth rate of the economy. They incorporated the demand-side effect and supply side effect of defence spending and proved that the relationship was negative.

### Inconclusive

A third group of researchers could not reach a conclusion on the type of relationship that existed between defence expenditure and economic growth rate. They believed it could be

positive or negative, depending on a range of factors. Chuwadhury (1991) for instance analysed data from fifty-five (55) developing countries and concluded that the relationship that exist between defence expenditure and the growth rate of an economy cannot be generalised across all countries. There was clearly an absence of any case that could support the view that defence expenditure stimulates economic growth. Kim (1996) investigated the type of trade-offs between quality of life and defence expenditure for 101 countries. His result showed that defence spending has no effect on economic growth, and that countries with larger defence borders were more likely to suffer lower levels of welfare. Apanisile and Okunlola (2014), in their study examined the short- and long-term impact of defence spending on GDP in Nigeria. They also assessed the economic contributory nature of defence spending using the ARDL bounds testing approach to cointegration. They found that defence expenditure had a significant negative effect on GDP in the short run, but a significant positive impact on GDP.

The observed ambiguousness over the impact of defence expenditure on economic growth has been attributed to a number of factors prevalent in the economy of interest. Some of these include; prevailing structural and policy differences in the respective economies, level of development, classification of military expenditure, variable specification, and technique adopted (Masih and Masih, 1997)

## Defence Expenditure versus Social Expenditure

There has been a demonstrable willingness on the part of governments of developing countries towards expanding defence expenditure at the expense of expenditure on human capital development. While there have been claims of war, insurgency, and increasing polarisation of the relationship between nations of the world in recent times as a reason for the observed trend, there are strong arguments against this. One of such is the greed and quench for these developing countries leaders to hold on to power, and thus expand defence expenditure to buy the loyalty of men of the armed forces, who are a key determining factor in toppling any government. Another argument is that of corruption. Given the covert nature of the operations of the military, defence spending is an avenue for corrupt leaders to loot the public treasury without any form of accountability. This behaviour perpetuates partly because of low institutional resistance from organised labour, trade union associations, and other influential groups and associations within those countries (Deger, 1986). The implication therefore is a deterioration of key human capital development sectors such as education and health of these economies.

In many developing nations, military expenditure, aside expenditure for internal security has represented immense diversions of public resources to socially irrelevant purposes. There appears to be an opposite relationship between income absorbed by the military and the level of human development. For instance, the United Nations Development Programme in 1989 showed that developing countries classified as "high human development" spent an average of 3.1% of their GDP on their military, "medium human development" countries apart from China spent 4.55% of their GDP on their military, while "low human development" countries excluding India spent 4.8 percent (Griffin and Mckinley, 1992). This thus creates a prima facie evidence for examining whether a nation can grow its output better and increase its citizens welfare better if it reduces the resources it allocates to the military and increase those spent on other direct human capital development activities in education and health. This is also in recognition of the fact that defence spending and debt servicing account for a very significant proportion of total expenditure of developing countries, and these two items are very related, as most of the accumulated debt are channelled to military expenditure in the acquisition of military equipment at the expense of other social services like education.

Although the government in Nigeria recognizes the critical role of human capital development through formal education, its funding has become a subject of intense debate. Following the quadrupling of crude petroleum oil prices in the early 1970s, the Federal and State governments embarked on a rapid expansion of educational facilities at primary, secondary and tertiary levels. Government did not only build new schools, they also compulsorily acquired privately owned (including missionary schools) primary and secondary as well as tertiary institutions that were regional in character. These policies placed enormous financial responsibilities on the federal government on the one hand, and regional/state governments on the other. Government spending on education has exhibited tremendous instability in trend. The rise in government revenues in the early 1970s resulted in increase in government spending, including expenditures on education, health and defence. For example, the share of education expenditure in total government expenditure fluctuated from 8.27% in 1980 to 2.97% in 1990. In 2002, expenditure on education as a share of total federal government expenditures declined to 1.91%. There was a significant rise in the share of expenditures on education beginning from 2004 when it stood at 21.18% of total expenditures. During the entire period under study, the share of education was consistently lower than the United Nations benchmark of 26% of Gross Domestic Product.

The health sector also has not been given attention too as a meagre ratio of less than 4.7% of total recurrent expenditure of the government has been expended on it throughout the period in view unless in 2002 when it was 5.83%. This is far below that spent by the developed nations of the world in their respective health sectors.

### **Theoretical Framework and Research Methodology**

Within economic theorizing, there is a clear absence of an explicit role for defence spending as an individual economic activity. Furthermore, given the absence of a generally accepted growth theory among economists also means that there is no standard theoretical framework that defence spending can be fitted into. This might be surprising because defence spending has always been an important issue among economists and has always been perceived as a significant item in total government expenditure. Hence, it is disappointing to find that the link between such a central issue and economic growth has not been sufficiently developed. Also, the (modern) growth literature has a long history since Solow (1956), with a second golden age in 1990s after Romer (1986), Lucas (1988), Barro (1990) and Romer (1990). During this period, although many growth-related issues were thoroughly explored at the theoretical level by growth economists, it is surprising to note that the defence-related aspects of the theory did not develop to a satisfactory level.

However, the argument that there is no solid theory in the neoclassical sense on growth-defence nexus does not mean a total absence of work in that direction. Indeed, Dunne, Smith and Willenbockel (2005), was a historical breakthrough, as it offered a neoclassical framework for empirical research in growth-defence nexus by adopting the convergence framework of the economic growth setup. To this end, Bayraktar-Saglam and Yetkiner (2012) developed a framework that on the one hand allows the introduction of non-constant and non-identical technological growth rates, and on the other, retains the simplicity and appropriateness of the Solovian convergence equation. However, according to Yetkiner (2012) the proposed framework had its own technical problems.

Yetkiner (2012) study expands that particular framework i.e Bayraktar-Saglam and Yetkiner (2012), by adding the defence sector to the model in the sense of Dunne, Smith and Willenbockel (2005). A short summary of the model is as follows: there are three private sectors, namely the

final good sector, the intermediate-good sector, and research and development (R&D) sector, in addition to a government. The role of government is to manage the defence sector, which hires a proportion of skilled labour in the sector, financed through income taxation of the final-good sector. The R&D sector generates new blueprints through skilled labour. The model assumes that the intensity of defence (which is the share of defence expenditure in total GDP), is an externality in the knowledge production function of private sector.

Yetkiner assumed that the military sector is run by the government and financed through proportional income taxation. At each time  $t$ , the government charges a constant tax on the output (=GDP) and uses this revenue to cover the costs of military spending, which is simply the cost of human capital hired in that sector. It is assumed that the government follows a balanced budget, which implies

$$w_M \cdot H_M = M = \tau_M \cdot Y \quad (1)$$

In (1),  $w_M$  is the wage cost of per unit skilled labor hired by the government in the defence sector, and  $\tau_M$  is the fixed proportional tax rate. Note that the alternative interpretation of  $\tau_M$  is the share of military spending in GDP. Also, note that equation (1) can be expressed as intensive form, as  $w_M \cdot \theta_M = \tau_M \cdot y$ , where  $y$  is output per skilled labor.

This study considers this a legitimate assumption, as in practice, the defence sector positively enhances private R&D in many economies, at least in technology producing economies (a good example is the Internet). Blueprints of new knowledge are sold in the market through auctions, and firms purchased them to produce intermediate goods in a monopolistically competitive market. The final good sector exploits all intermediates to produce the final good. As knowledge stock grows, new varieties appear, and hence final output grows. Given that the saving-consumption trade-off and the allocation of human capital among competing sectors are exogenous, the study derived the long run determinants of economic growth and the convergence equation. This resembles the respective conventional equations, but allows for different technological growth rates at different times and for different countries. In addition, it introduced the role of defense spending in long run determinants and convergence equations in a general equilibrium framework. In this set up, the role of the defense sector is not necessarily positive or negative. The externality effect of defense spending on R&D sector is the positive effect. On the other hand, taxation and the allocation of some skilled labor to the defense sector have negative effects in the process of long run development. Therefore, the total (net) effect can be either negative or positive, depending on the nature of country or the period. In this respect, the theoretical model supports the findings of empirical literature that were inconclusive in nature. In the special case where the observations are made from LDCs, it is theoretically correct to expect that defence spending may have a negative effect on the convergence process. This study will therefore be based on the framework developed by Yetkiner (2012) because of the openness of the effect of defence spending on economic growth.

## Methodology

For data analysis, the study adopts time series data due to its suitability for single country analysis and utilization of appropriate statistical procedures to test for the long run relationships and causality between two or more variables in both the long run and the short run. Time series data on Nigeria's defence spending, public health expenditure, public education expenditure, total government expenditure and Real Gross Domestic Product were utilized for this purpose. To protect against spurious result, the study kicked off by testing the unit root properties of the variables and also their level of co-integration. The Augmented Dickey-Fuller (ADF) test

developed by Dickey and Fuller (1981) and the Philip Perron (PP) test were employed in this endeavour. The essence of this was to improve the statistical fitness of the model. This was done also to find out if all the variables in the regression model have identical empirical characteristics and also to find out if the variables of interest are co-integrated i.e. have long run relationship. After this, the Ordinary Least Square technique was employed to ascertain the impact of the explanatory variables on the explained one.

To capture short-run deviations that might have arisen in estimating the long-run co-integrating equation, a dynamic Error-Correction Model (ECM) was formulated. The ECM was estimated based on the dependent variable, education expenditure (public), using the Autoregressive Distributed Lag Model. Due to the fact that the key objective of this study is to investigate the relationship between defence spending and human capital development, the Error Correction Model focused on analysing the coefficients of error correction term and defence spending. Thereafter, a test of the direction of causality between the variables was carried out utilizing the "Pair wise Granger Causality Analysis". In ascertaining further the relationship between the variables in the study and in assessing the dynamic effect of each variable on the others beyond the sample period, the study estimated the proportion of forecast error variance for each variable that is due to its own innovations and those due to innovation from others.

## Sources of Data

The data collected are secondary in nature, obtained from the Central Bank of Nigeria Statistical Bulletin various issues and from the Nigeria Bureau of Statistics.

## Model Specification

In the light of the theoretical framework analysed above, the operational model conceived by the study holds that in addition to other factors, defence spending also has an impact on human capital development.

The model is thus specified as;

$$SSER = (DEX, HEX, GEX, GDPGR, EEX) \text{-----} (1)$$

Expressing Equation (1) more explicit, it is:

$$SSER = C_0 + C_1 DEX + C_2 HEX + C_3 GEX + C_4 GDPGR + C_5 EEX + e_i \text{-----} (2)$$

Where, SSER = secondary school enrolment rate (A Proxy for human capital development)

EEX = Public Education Expenditure as a ratio of Government Expenditure

DEX = Defence Expenditure as a ratio of Government Expenditure

HEX = Public Health Expenditure as a ratio of Government Expenditure

GEX = Government Expenditure as a ratio of GDP

GDPGR = Gross Domestic Product Growth Rate

Where,

$C_0$  = Intercept,

$C_1$ - $C_5$  = Coefficients to be estimated and

$e_i$  = Error term

## Presentation and Discussion of Result

### Unit Root Tests Results

**Table 4.1: Unit Root Result**

Augmented Dickey Fuller (ADF) Test				Phillip-Perron (PP)test		
Variable	At Levels	1st Difference	Status	Level	1ST Difference	Status
SSER	0.559091	-3.443681**	I(1)	-1.020309	-3.642254*	I(1)
DEX	-1.119274	-9.467956*	I(1)	-2.222459	-9.611796*	I(1)
EEX	-1.643770	-11.52225*	I(1)	-3.642254**	-	I(0)
HEX	-1.033506	-8.928093*	I(1)	-1.663723	-9.449014*	I(1)
GEX	-0.850312	-5.869390*	I(1)	-1.390915	-27.48856*	I(1)
GDPGR	-4.895848*	-	I(0)	-4.910140*	-	I(0)

Note: \*\* implies stationarity at 1% and 5% respectively

### Test Critical values

	1%	5%	10%
Augmented Dickey Fuller Test	-3.632900	-2.948404	-2.612874
Phillip Perron Test	-3.6329	-2.9484	-2.612874

Source: Authors' Results from Eviews 7 for Windows

The test for unit roots as shown above was carried out utilizing two approaches, namely; the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Unit Root Test. With respect to the ADF test as shown in Table 4.1, all estimating variables except Gross Domestic Product growth rate was found to be I(1) series, implying that these variables were non stationary at level but became stationary after first difference. Therefore, the null hypothesis of no stationarity was rejected in all the series. The PP test on the other half of Table 4.1 also confirmed the ADF test result except for the ratio of Education expenditure to Total Government Expenditure which was I(0).

## Cointegration Test

**Table 4.2: Johansen Cointegration Test**

Sample (adjusted): 1983 2015

Series: DEX EEX GDPGR GEX HEX SSER

Lags interval (in first differences): 1 to 2

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.667894	115.1140	95.75366	0.0012
At most 1 *	0.647776	78.73813	69.81889	0.0082
At most 2	0.458613	44.30301	47.85613	0.1038
At most 3	0.370592	24.05351	29.79707	0.1982
At most 4	0.151183	8.775296	15.49471	0.3866
At most 5	0.096976	3.366193	3.841466	0.0665

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level  
 \* denotes rejection of the hypothesis at the 0.05 level  
 \*\*MacKinnon-Haug-Michelis (1999) p-values

Source: Authors' Results from Eviews 7 for Windows

Table 4.2 shows the co-integration test. Following the approach of Johnson (1988) and Johansen and Juselius (1990), the long – run co-movement of the variables under this study is examined. Results from the estimation provide evidence of statistical long run relationship among DEX, HEX, EEX, SSER, GEX, and GDPGR. As the table shows, there exists evidence of two long run relationship. Although this evidence by itself does not explicitly show the dynamics or mechanism by which the variables relate. Such dynamics will be explored further in the Vector Autoregressive framework in the following section.

### Vector Error Correction Estimate (VECM)

Results of co-integration test in Table 4.2 above provides enough evidence on the long run relationship between the variables under consideration as there are two co-integration equations. Result of unit root test also provides enough evidence of stationarity of variables. These two conditions have proved that the variables are co-integrated and non-spurious and formed a basis to estimate A VECM. The results of the VECM are given in Table 4.3 below.

**Table 4.3: VECM Result**

Error Correction:	D(SSER)	D(HEX)	D(DEX)	D(EEX)	D(GEX)	D(GDPGR)
CointEq1	-0.136137	-8.29E-05	-0.000162	-0.001261	-0.000116	-0.732890
	[-2.17115]	[-0.24826]	[-0.29969]	[-1.89099]	[-0.25609]	[-3.88734]
D(SSER(-1))	0.015717	-0.000673	0.000178	-0.005127	-0.000549	0.033598
	[ 0.06971]	[-0.56043]	[ 0.09152]	[-2.13856]	[-0.33723]	[ 0.04956]
D(HEX(-1))	20.68204	0.029172	0.337880	0.354973	0.214266	-519.4397
	[ 0.43859]	[ 0.11611]	[ 0.82983]	[ 0.70786]	[ 0.62921]	[-3.66355]
D(DEX(-1))	-16.08079	-0.343680	-0.409608	-0.205967	-0.061179	-176.1105
	[-0.49620]	[-1.99050]	[-1.46379]	[-0.59763]	[-0.26141]	[-1.80733]
D(EEX(-1))	5.154675	-0.056226	-0.245662	-0.563827	0.158282	16.93151
	[ 0.26370]	[-0.53988]	[-1.45545]	[-2.71227]	[ 1.12126]	[ 0.28807]
D(GEX(-1))	-1.543418	-0.116061	0.047389	0.122001	-0.385904	-183.5661
	[-0.05147]	[-0.72652]	[ 0.18304]	[ 0.38261]	[-1.78222]	[-2.03612]
D(GDPGR(-1))	0.042714	-8.75E-05	0.000126	0.000750	-5.82E-05	0.071780
	[ 0.80415]	[-0.30903]	[ 0.27371]	[ 1.32859]	[-0.15162]	[ 0.44944]
C	0.820962	0.001778	0.000606	0.004125	0.002871	1.314129
	[ 2.15620]	[ 0.87661]	[ 0.18445]	[ 1.01885]	[ 1.04400]	[ 1.14790]

Source: Authors' Results from Eviews 7 for Windows

The results from the table above shows that the co-integration equation or the error correction term for SSER is correctly signed and significant at the 5% level. It goes further to show that the speed of adjustment once the system is shocked is 13.6%. This clearly shows that there is no problem of adjustment in the long run in the event short run shocks. Again, none of the variables were seen to be significant.

### Stability Test

Going forward and to strengthen the robustness of the analysis, the level of stability of parameters in the model is investigated. The Hansen and Quandt-Andrews breakpoints test for one or more unknown structural breakpoint(s) is applied. Given that the estimation periods for

the study cover a fairly volatile period that partly saw military rule at some point, truncation of democracy, and then return to democracy in Nigeria, it is important to examine whether the parameters (and by implication the Specified Model) under estimation are really stable over these periods.

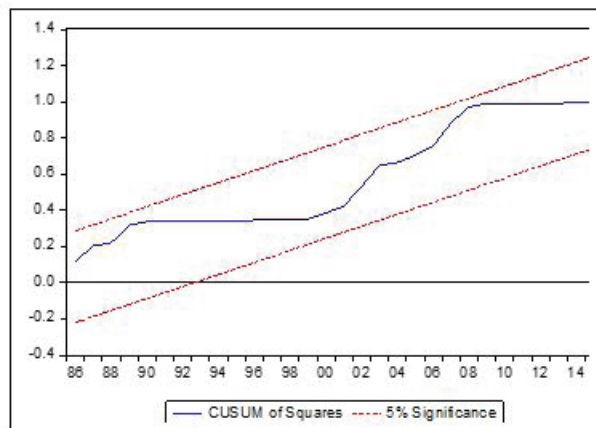
The Quandt–Andrews test is a modified version of Chow test that allows for dominant endogenous breakpoints in the sample for an estimated equation. The maximum (max F), average (ave F) and exponential (exp F) test statistics are used in this test.

The results of the test for parameter instability are presented in the Table 4.4. As evident from the results, these tests show signs of parameter stability. The Figure 4.4 also confirms stability since the plot remains within critical bounds at 5% significance, accepting the null hypothesis that all coefficients and the ECM are stable.

**Table 4.4: Quandt–Andrews Test**

Statistic	Value	Prob.
Maximum LR F-statistic (2001)	1.944202	1.0000
Maximum Wald F-statistic (2001)	1.944202	1.0000
Exp LR F-statistic	0.592084	1.0000
Exp Wald F-statistic	0.592084	1.0000
Ave LR F-statistic	1.139103	1.0000
Ave Wald F-statistic	1.139103	1.0000
Note: Probabilities calculated using Hansen’s (1997) method		

Source: Authors’ Results from Eviews 7 for Windows



**Figure 4.4: Plot of Cumulative Sum of Recursive Residuals**

### Granger Causality Test

To confirm/establish the existence of causal relationship between defence expenditure, health expenditure, education expenditure, and human capital development, and to further confirm the existence of long-run co-integrating relations between the variables, the pair-wise Granger causality test advanced by Granger (1969) was conducted.

**Table 4.5: Summary of Granger Causality Result**

#	Variable	Granger Causes	Granger Caused By
1	Public Education Expenditure as a ratio of Government Expenditure (EEX)	SSER GEX	GEX
2	Defence Expenditure as a ratio of Government Expenditure (DEX)	SSER GEX	SSER GEX
3	Secondary school enrolment rate (SSER)	DEF GEX GDPGR	DEF GEX
4	Public Health Expenditure as a ratio of Government Expenditure (HEX)	SSER GEX	GEX
5	Government Expenditure as a ratio of GDP (GEX)	SSER EEX DEX HEX GDPGR	SSER EEX DEX HEX
6	Gross Domestic Product Growth Rate (GDPGR)	GEX	SSER

Source: Authors' Results from Eviews 7 for Windows

According to the Granger causality test result presented in Table 4.5.1, it is seen that there exists unidirectional causality running from health expenditure, education expenditure, to human capital development as proxied by Secondary School enrolment rate. Also, unidirectional causality was seen to run from defence spending and government expenditure, to human capital development. Again, bi-directional causality ran from government expenditure to both health expenditure, education expenditure and defence expenditure.

## Variance Decomposition

This study further draws on the variance decomposition technique to examine the breakdown of the change in value of the variable in each period arising from its own shocks in addition to the shocks of other variables in previous periods.

From the variance decomposition below, variations in SSER were accounted for mainly by own shocks. It is also observed that the variation in SSER explained by defence expenditure was insignificant in the first period, assumed a peak in the third year and the reflection declined progressively to 0.40 percent in the tenth year. It is evident that the ability of defence spending to influence human capital development is not instantaneous, and also dies out steadily in the long run. Variations to Education and Health expenditure (as a percent of total government expenditure) were however seen to increasingly explain variations to human capital development up to the 10th year.

**Table 4.6: Result of Variance Decomposition**

Period	S.E.	SSER	EEX	DEX	HEX	GEX	GDPGR
1	1.804321	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	3.242488	93.86074	0.213185	0.387691	2.078137	0.165718	3.294530
3	4.604916	89.35417	0.554884	0.654890	3.798908	0.309737	5.327407
4	5.588847	88.03355	0.710124	0.597740	4.732715	0.326405	5.599470
5	6.294797	87.85156	0.753232	0.502767	4.993182	0.296920	5.602339
6	6.901345	87.86788	0.773692	0.460367	5.051875	0.286095	5.560089
7	7.474338	87.84672	0.778392	0.437878	5.099484	0.280746	5.556781
8	8.021500	87.79250	0.789388	0.423283	5.145868	0.277806	5.571156
9	8.535433	87.73630	0.797372	0.411492	5.196331	0.276039	5.582469
10	9.017273	87.69983	0.804613	0.400032	5.232909	0.273434	5.589181

Source: Authors' Results from Eviews 7 for Windows



### Impulse Response Function

The Figure below shows the outcome of the impulse response function result that helps to trace out the responsiveness of the dependent variables to each of the independent variables. It is a response to cholesky one standard deviation innovation. It clearly shows that except for shocks from gross domestic product growth rate, the response of SSER to positive shock from all other variables was positive.

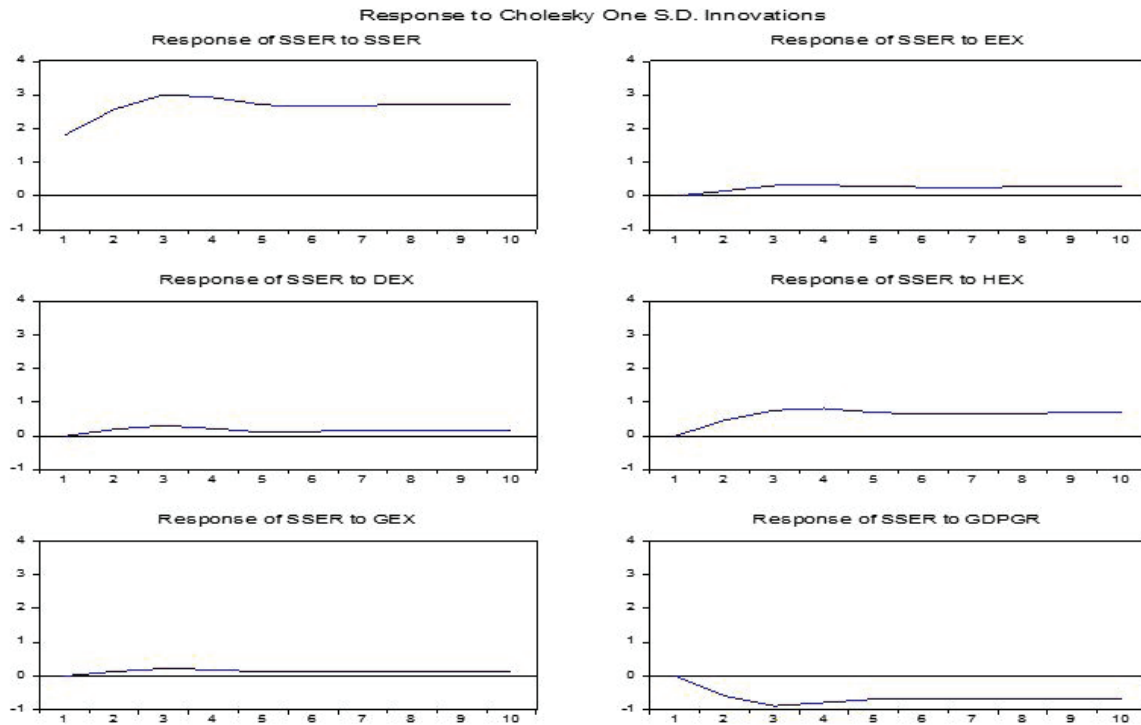


Figure 4.6: Impulse response function

### Conclusions and Policy Recommendations

The primary goal of this paper centred on determining the impact of defence expenditure on human capital development in Nigeria. This was observed to be a very important channel through which such expenditure could affect the economy. Applying Yetkiner (2012) framework, which developed on Dunne, Smith and Willenbockel (2005) and Bayraktar-Saglam and Yetkiner (2012), this study utilized the VAR framework in examining the relationship between the variables.

Findings from the analysis of data revealed that defence expenditure had a positive impact on human capital development, albeit not significant overall. This is in line with findings of Apanisile and Okunlola (2014) who found a long run positive impact of defence spending on output. Similar conclusions were also reached by Adebisi and Oladele (2005) and Omojimite (2012) in their empirical studies. According to Omojimite (2012), the observed relationship is not surprising because after the Nigerian Civil war in 1970, the federal government rapidly increased expenditure on military emoluments, and through the multiplier effect, increased aggregate demand which lead to real growth and corresponding education and health expenditures.

An observed caveat was that changes in human capital development influenced more by changes in education and health expenditure, and it had an increasingly stronger delayed effect. Expenditure on defence, on the other hand was observed to have a weak and waning effect on human capital development.

However, there has been some contention by some that the military has the potential to contribute towards the promotion of the modernisation of developing nations through the improvement of the quality and quantity of human capital, and thus dismantling social rigidities hampering development. What remains is the fact that in developing countries like Nigeria with limited resources being competed for by varied needs of the state, a negative trade-off between defence expenditure and public education expenditure and other human capital enhancing expenditure is generally expected. However, with the security challenges facing the country, and given that a fundamental role of the state is the protection of its citizens against external or internal aggression, an increasing share of military spending in total government expenditure is expected. What is useful however is to ensure that these expenditures on the military is structured in such a way and manner that it creates a positive spill over effect to other sectors of the economy like the health and education sectors. For instance, defence expenditure should be targeted mostly on areas that help to improve the technical competence of men of the force and on other aspects of the military, like the civilian component as this will create a positive spill over effect to the private sector, stimulate aggregate demand and thus investment. More local armament manufacturing industries should be developed to conserve foreign exchange for the country, combat capital flight and widen the industrial base of the economy. This will further boost the backward and forward linkage effect of the industrial sector. And this should be consummated within the framework of a deliberate policy strategy.

Human capital has proved to be a potent source of wealth for nation. The world is fast moving towards a knowledge driven economy, and to succeed and break the ranks into the developed nations, with high level of human development, then developing a strategy to improve human capital development in the country is a must. Developing this core asset should no longer be within the confines of the education sector alone, but every expenditure of the government should be linked at improving human capital.

There should be increased Private participation in educational policy formulation. This is to make education relevant to the current manpower need of the country. In other words, there should be valuable inputs from labour employees in defining the direction and contents of training and education. Formidable links between labour employees and educational institutions should be established.

Finally, proper attention must be given to effective monitoring and evaluation of educational programmes. With the growing wave of the establishment of education centres by both the public and private sector alike, the National University Commissions (NUC) and other relevant commissions at both the primary, secondary, and tertiary education level should conduct periodic accreditation exercise to guarantee that the quality of education being offered is not compromised, is relevant and meets market need.

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### *Authors' Profile*

**Mike Omokhagbo Imafidor** is a Research Economist with Adams & Moore, Abuja, Nigeria a professional advisory service firm that is providing research into public policies for governments across Africa. He is a multi-skilled research expert with 7 years' cross sectoral work experience. He demonstrates critical dexterity in data analysis -with advanced computer tools such as R, EViews, and Microfit. He is experienced in leading research teams & providing technical support & policy advice to senior public and private sector management.

**Umar Faruq Quadri** is at present a Ph.D student of International Trade at the Department of Economics, University of Ibadan, Nigeria. He currently works as a Research Fellow with the Nigeria Institute of Social and Economic Research (NISER), the Federal Government of Nigeria's Think-Tank. Faruq is a seasoned Lecturer and researcher with over 8 years working experience in both academic and research institutions. He is experienced in leading research teams & providing technical support to international organizations such as the UNICEF.

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