MILITARY EXPENDITURE AND ECONOMIC GROWTH NEXUS: THE CASE OF ECONOMIC COMMUNITY OF WEST AFRICAN STATES (ECOWAS)

Adeleke Gabriel AREMO¹
amoleke@gmail.com

Olabode Eric OLABISI²
Olabode.olabisi@elizadeuniversity.edu.ng

Oluwaseun Isaac, FASANMI¹

Abstract
Economic growth of most countries in Africa has been the major concern of most experts researching on growth and development of nations, particularly in the Africa continent. Although, attention has been given by scholars to examining the related growth determinants but only few authors have satisfactorily dealt with the issue of endogeneity in the case of military expenditure and the economic growth nexus equation. The current study takes into cognizance this problem by adopting descriptive and Generalised Method of Moments (GMM) techniques for 15 Economic Community of West African States (ECOWAS) between 2000 and 2012. The results of the descriptive analysis reveal that, on the average, the trends of military expenditures and economic growth increased over the years. Also, the military expenditure exerted significant positive impact on economic growth in the ECOWAS sub-region, implying that military expenditure enhanced economic growth in the ECOWAS sub-region. The causality test shows the existence of bidirectional causality between military expenditure and economic growth. In conclusion, military expenditure should be encouraged in the Economic Community of West African States sub-region as it is growth-enhancing with the attendant multiplier effects.

Keywords: Military expenditure, Economic growth, ECOWA, Development

Introduction
The world military expenditures have increased significantly over time. Stockholm International Peace Research Institute (SIPRI) (2008) reports that the world military expenditure in 2007 was $1.34 trillion representing 2.5% of world GDP and an increase of 6% in real terms over 2006 estimate. SIPRI (2011) reports also show that the trend in the growth rate of defence expenditure has continued to rise yearly as the world military expenditure in 2011 reached $1.7 trillion representing 2.6% of global GDP. Sub-Saharan African countries spent on average of $8.8 billion

¹ Department of Economics, Obafemi Awolowo University, Ile-Ife, Nigeria.
² Department of Economics, Elizade University, Ilara-Mokin, Nigeria.
annually on the military between 1990 and 1999 while her military spending increased by 8.3% in 2013 to $44.9 billion (Brempong, 2002; SIPRI, 2014).

Ever since the emergence of the Economic Community of West African States, the countries in the sub-region have faced daunting political, economic and security challenges. The major security problems that have been threatening West African countries are internal squabbles among ethnic groups; militia activities of factional groups arising from obvious marginalisation of minority tribes; and religious fanaticism resulting in religious crises in the region (SIPRI, 2014). The need to quell civil conflict and security challenges facing countries in the sub-region through peace keeping missions led to the formation of ECOWAS cease-fire Monitoring Group (ECOMOG) in the 1990s. The peace keeping activities of ECOMOG in member countries in no doubt increased military spending in the region. It is reported that ECOWAS member countries spent about $1.8 million every month on military troops to maintain peace in Cote d’Ivoire civil war in the 1990s (Bamfo, 2013).

There has also been a noticeable increase in the trend of military expenditure in West African countries with a damning effect on economic growth. For instance, Nigeria’s military spending rose from $1.9 billion to $2.39 billion between 2010 and 2011 which accounted for a rise in her military burden from 1% to 1.1% while her annual growth rate declined from 7.9% to 7% within the same period. In the case of Mali, military spending rose from $110 million to $161 million between 2007 and 2011. Cote d’Ivoire’s military spending rose from $388 million to $407 million which accounted for a rise in her military burden from 1.6% to 1.8% between 2006 and 2012 with a decline in her average growth rate to -4.7% within the same period while Equatorial Guinea’s military spending leapt from $196 million to $372 million while her military burden rose from 1.8% to 3.7% between 2007 and 2009, her economic growth rate however plummeted to -0.28% (SIPRI, 2012; WDI, 2012; ECOWAS, 2012).

Several factors have been identified to have triggered the increase in the military expenditure in SSA countries and West African countries; a major factor identified is the demand-side factor. The demand-side factors include increased participation in peace keeping operations; Demobilization, Disarmament and Reintegration (DDR) processes, military reform and modernization programmes and internal security problems (Stalenheim, 2008). The demand factors however translated into increased military spending due to a growth in nominal GDP reinforced by increased oil revenues in countries like Nigeria, Angola and Algeria. For instance, the combination of Nigeria’s role in regional peace keeping missions and rising internal security demands like the Niger Delta militancy, Boko Haram insurgence in the Northern part of Nigeria contributed to the growth of Nigeria’s military spending while the Malian government is spending a lot of money to fight Tuareg insurgent in their country while other West African countries like Ivory Coast and Guinea had been confronted with political unrest which were curtailed by deploying
the military. All these invariably contributed to increase in military expenditure in the ECOWAS sub region.

The increase in military expenditure in West African countries has been complemented by economic stagnation, declining standard of living, high poverty level and low human development index ranking. This implies that countries in the West African sub-region have continued to be disadvantaged in terms of macroeconomic performance. For instance, Human Development Index report (2012) reveals that Nigeria ranks 153rd despite her high military spending in recent years.

In the defence economics literature, there is plethora of studies that examined the effect of military expenditure on economic performance of developing countries (Benoit, 1973, 1978; Abu-Bader & Abu-Qarn, 2003; Dakurah et al, 2000; Chang et al, 2012; Dunne and Tian, 2013). In these studies, it was discovered that there was no consensus among researchers on the effect of military spending on economic growth.

Studies by Benoit (1973;1978) Knight et al 1996; Alptekin and Levine (2012) showed a positive relationship between military expenditure and economic growth. However, in a study of 38 sub Saharan African countries, a negative relationship was found between defence burden and economic growth (Kefyalew, 2007) while Biswas and Ram (1986) concluded that there is no relationship between military expenditure and economic growth. This however makes it clear that the relationship between military expenditure and economic growth is still an issue of debate among economists and policy makers in both developed and developing countries.

A lot of studies have examined the effect of military expenditure on economic growth in the middle east, Asia and Europe with little focus on sub Saharan African countries; (Abu-Bader and Abu-Qarn, 2003; Kollias et al, 2004; Reitschuller and Loening, 2005; Chang et. al., 2011; Alptekin and Levine, 2012; Ageli and Zaidan, 2012); However, there is a paucity of studies on military expenditure-growth nexus in the West African sub-region despite the prominence of the region in Sub-Saharan Africa. This however makes this study pertinent. Evidences have also shown from various works in the literature both at the country specific and cross country level that there is no consensus in the direction of causality between defence expenditure and economic growth. Dakurah et al (2001), Abu-Bader and Abu-Qarn (2003), Karagol and Palaz (2004) observed a unidirectional causality running from military expenditure to economic growth. However, some studies observed a unidirectional causality running from economic growth to military expenditure in some developed economies like United States of America and Oil rich countries like Saudi Arabia and Kuwait in that the countries’ economic performance increased the military spending to sustain a conducive macroeconomic environment for Investment.(Chowdbury, 1991; Lacivita & Frederiksen, 1991).
Studies by Al-Yousif and kollias et al (2007) showed bidirectional causality between military expenditure and economic growth while studies by Yildirim and Ochal (2006) and Dakurah et al. (2001) revealed no causality between the military expenditure and economic growth. An empirical gap in the literature however shows that the right channel of causality between military expenditure and economic growth in countries of the world and especially in the ECOWAS sub region has not been identified. This study is however aimed at filling this gap in the literature.

Furthermore, defence literature shows that most of the panel studies on military expenditure-growth relationship are characterised by the pooling of countries from different macroeconomic environment together. A study like Chang, Huang and Yang (2011) employed data from high income countries like United Arab Emirates, Germany, United Kingdom and Saudi Arabia; from semi industrialised countries such as Argentina and Brazil and from low income countries like Chad and Niger. Due to the heterogeneous nature of these countries, it may be inappropriate to lump countries with such a diverse macroeconomic environment together in a study. In view of this, this study focuses on Economic Community of West African States mainly due to their less heterogeneous economic structure and income status.

The need to carry out this research work cannot be overemphasised in view of the increasing rate of threat to national security in form of militia insurgence, political unrest, communal clashes and terrorist attack (such as the Tuareg militants in Mali, Boko Haram in Nigeria, Niger & Chad ) prevalent in the West African sub region which invariably lead to increase in military expenditure (military burden) and also the effect on Foreign Direct Investment inflow into the region. In view of the magnitude of military burden among the members of the Economic Community of West African States (ECOWAS) in recent times, this study is valuable in providing information to policy makers during budget planning on what to allocate to defence/military sector and other activities such as investment and public expenditure on human capital development.

Following from the issues raised above, this paper examines the issue of endogeneity in the relationship between military expenditure and economic growth within the framework of endogeneity growth model, in particular, in the case of ECOWAS countries between 2000 and 2012.

**Literature Review**

The relationship between defence spending and economic growth has been debated in the development literature since the seminal work of Benoit (1973, 1978) who found a positive relationship between the two variables. Benoit’s work however inaugurated a vast array of studies directed at identifying a definite pattern between the two variables. Such studies include; Biswas 1993 and Chang *et al.*, (2011).

In a study by Chang *et al* (2011), Generalised Method of Moment (GMM) by Arellano and Bond, 1991 was applied to panel data of 90 countries spanning
between 1992 and 2006. The result of the study indicates that military spending leads to a negative economic growth for the panels of low income countries. The findings is similar to that of Yildirim et al (2005) also carried out a related study using a dynamic panel data approach to analyse the relationship between military expenditure and economic growth for 13 Middle East countries from 1989 to 1999. Using the Generalised Method of Moments they found a positive relationship between military spending and economic growth. A contrary finding was found by Hou and Bo Chen (2013) which applied the Augmented Solow Growth model to examine the influence of military expenditure on economic growth for 35 developing countries spanning 1975 to 2009. System Generalised Method of Moments (GMM) estimators was employed in the study and the result showed that defence has a negative and significant effect on economic growth in the sample countries. , Heo and Eger (2005), who examined the direct and indirect effects of defence spending on economic growth in US from 1951 to 2000 also found similar result.

Joerding, (1986) investigated the effect of defence expenditure on economic growth in selected 57 developing countries. Using data spanning 1962-1977, the study indicated that causality runs from defence expenditure to economic growth and that defence expenditure has a positive effect on economic growth. In a similar study by Chowdhury (1991) which examined the impact of defence expenditure on economic growth in 55 developing countries between the period 1961-1987, the result from the hypothesis tested indicated that a negative causality runs from defence expenditure to economic growth in 15 countries, negative causality runs from economic growth to defence expenditure in 7 countries, no causality in 30 countries and a bi-directional causality in 3 countries.

Loening (2004) investigated the military expenditure-growth nexus empirically using longitudinal data for Guatamela and allowing the effect of defence spending on growth to be non linear. Using threshold regressions, Loening found out that a positive and a significant externality effect of defence spending prevails for relatively low level of defence spending and becomes negative and insignificant for higher levels. He further observed that military spending can affect the economy in a number of ways with both positive and negative effects on growth. The defence sector could take skilled labour away from civilian production but it could also provide training for workers particularly in developing economies.

Pradhan (2010) examined the relationship between military spending and economic growth in selected countries of China, India, Nepal, and Pakistan between 1988 and 2007. Using Johansens multivariate cointegration and Pedroni’s panel cointegration test, the result confirmed that there is a long run relationship between defence spending and economic growth in the Asian countries at the individual and panel level. Similarly, in assessing the impact of defence expenditure on economic growth in 14 developing countries for the period 1981-2006, he employed Larsens (2001) panel cointegration testing procedure and exogeneity tests were employed and the
results showed that defence expenditure is an exogenous variable and the variable has a positive effect on economic growth in these countries.

In a related study, Rashid and Arif (2012) examined the causal ordering between military spending and economic growth in 14 developing countries from 1981 to 2006. They also employed Larsen (2001) panel cointegration testing procedure to test for cointegration and exogeneity between the two variables. The result of the study however showed that military expenditure is an exogenous variable and that it influences economic growth in the countries under study.

Similarly, Anwar, Rafique and Joiya (2012) observed that long run relationship exist between defence spending and economic growth in a study carried out to examine the relationship between defence spending and economic growth in Pakistan from 1980 to 2010 of which Johnsen Cointegration test was used. He further observed that Growth granger causes defense spending. In a related study conducted in Pakistan by Shahbaz, Afza and Shabbir (2011), the study examined the relationship between military spending and economic growth in Pakistan from 1972 to 2009 by adopting ARDL bounds testing approach. The result of the study showed a negative effect of military spending on economic growth for Pakistan’s economy.

Al-Yousif (2002) explored the relationship between economic growth and defence expenditure in six Gulf countries from 1975 to 1997. He employed a multivariate error correction model with granger causality test in the test. The result of the study showed that the relationship between growth and defence spending is a function of the socio-economic condition of an economy which cannot be generalised for all the countries he studied.

In different studies by Deger and Sen (1983), Deger (1986), Gyimah-Brempong (1989), Dunne and Mohammed (1995), simultaneous equation models were employed in examining the effect of military expenditure on economic growth and the result showed a negative effect of military expenditures on economic growth. In a related study, Lebovic and Ishag (1987) estimated a three-equation model by employing panel data analysis for 20 countries in the Middle East for a period spanning 1973-1982 and the result indicates that defence expenditure has negative impact on economic growth.

Similarly, Galvin (2003) applied two-stage and three-stage least square methods to the cross-sectional data of 64 countries for 1999. He however found a negative relationship between the military expenditure and economic growth. Galvin took a step further by regrouping the 64 countries into low-income and middle-income countries. He found greater negative impact for the lower income group and the spin off effect from its military spending was negligible. Heo (1998) also applied a non-linear regression model to a data of 80 countries from 1961 to 1990. The result of the study showed a negative relationship between military spending and
Military Expenditure and Economic Growth Nexus: The Case of ECOWAS

Economic growth in two thirds of the countries based on a three equation model (growth, savings and military spending).

Kalyoncu and Yucel (2005) examined the direction of causality between growth of Gross National Product in Turkey and Greece and the impact of military expenditure in both countries from 1956 to 2003. They employed a logarithmic form unit root test and Engel-Granger cointegration test for the study. The result of the study however showed that there exists a unidirectional causality from growth to military spending for Turkey and that there is a long run equilibrium between military spending of Turkey and Greece. In a related study, Dritsakis (2004) investigated the nexus between military expenditure and economic growth in Greece and Turkey. He applied Johasen cointegration test using Vector Error Correction method in other to examine the relationship between the two variables. The result of the study however showed that there is no cointegrated relationship between the two variables, while the Granger causality test indicates a unidirectional causal relationship between economic growth and military spending for both countries. Moreover, the study indicates a bilateral causal relationship between military spending of the two countries.

Habibulah, Siong-Hook and Afizzah (2008) examined the military expenditure-economic growth nexus in selected Asian countries from 1989 to 2002. Larson et al (2001) panel cointegration test and Pesaran (2009) panel error correction test was carried out in the study. The result of the study showed a long run relationship between military expenditure and economic growth while the Panel correction test showed that military spending and economic growth are not related in Asian countries.

In a study carried out in 15 European Union countries between 1961 and 2007, Dunne and Nikolaidu (2011) employed an augmented solow-swan model using both panel and time series data to provide empirical evidence on the economic effect of defence spending. The result of his study showed that both panel and time series is consistent and that military burden does not promote economic growth among the European Union countries. The study is however consistent with the findings of Mylonidis (2008), though weaker. Similarly, the result of a survey of 102 studies on the economic effects of defence spending carried out by Dunne and Uye showed that there is negative relationship between military expenditure and economic growth in 39% of the cross country studies and 35% of the case studies.

Laopodis (2001) examined the relationship between defence spending and economic growth in four selected European countries of Portugal, Greece, Spain, and Ireland between 1960 and 1997. Using Granger causality tests, the study finds no significant relationship either positive or negative between defence spending and gross private domestic investment. In a related study, Laopodis tested for cointegration of some variables to gross private domestic investment and estimated the associated Error Correction Model (ECM). The result of the study shows that defence spending had no significant effect on investment since investment is one of
the indicators of growth rate of any economy. It could be inferred from the study of Laopodis (2011) that defence spending has no significant effect on economic growth of the countries under study.

Kung and Min (2013) investigated the causal linkage between military and economic growth in 16 Latin and South American countries by focusing on country-specific analysis for the period 1988-2010. The result of the Granger causality test in the study revealed that causality runs from economic growth to military spending for Bolivia and Ecuador. In a related study, Farzanegan (2011) analyzed the response of the Iranian economy to shocks in its military budget from 1959-2007, using Impulse Response Function (IRF) and Variance Decomposition Analysis techniques. The result of the study however showed that the response of economic growth to increasing shocks in the military budget is positive and statistically significant while the Granger causality test showed that there is unidirectional causality from military spending to economic growth.

Brasoveanu (2010) analysed the relationship between defense expenditure and economic growth in Romania. She tried to find out the existence, direction and intensity of the connection between the two variables. The methods employed in the study are cluster analysis, regression technique and Granger causality. She however found a negative correlation between defense expenditure and economic growth. In a related study, Brasoveanu employed a pooled least squares regression for 32 countries using data from 1990-2007 and found a negative correlation between defense expenditure and economic growth for the 32 countries.

Mintz and Huang (1990, 1991) reported that increase in US defence expenditure stifles private investment although it takes five years for the effect to appear. Heo and Eger (2005) also find that defence spending has a dampening effect on private investment but with only a one-year delay. Lindgren (1984) in his review of studies on the relationship between military spending and economic growth observed that increase in defence expenditures resulted in the decrease of private investment. Similarly, Dunne and Uye (2009) in a survey of 102 studies on the economic effects of defence spending showed that almost 39% of the cross country studies and 35% of the case studies found a negative effect of military spending on growth, with only 20% finding is positive for both types of studies.

Taking a different perspective, Smyth and Narayan (2009) examined the impact of military expenditure and income on external debt for Panel of Six Middle Eastern countries from 1988 to 2000. The study employed panel unit root and panel cointegration framework to test whether there is a long run relationship between military expenditure, income and external debt in the six countries. The result of the study however showed that a 1% increase in military expenditure result in between a 1.1% and 1.6% increase in external debt in the long run while a 1% increase in income reduces external debt by between 0.6% and 0.8% depending on the estimator employed and that a 1% increase in military expenditure increases external debt by 0.2% in the short run. Wijeweera and Web (2009) employed a
Vector Autoregression Analysis to examine the link between military expenditure and economic growth and found that military expenditure has only a minimal positive impact on economic growth when compared with non-military expenditure.

Empirical evidence on the nexus between military expenditure and economic growth in Sub ECOWAS countries has also been documented in the literature. Anfofum (2013) analysed the macroeconomic determinants of defence spending in Nigeria from 1970 to 2011. The result of the estimated VAR model employed in the study showed that oil revenue, foreign exchange rate, real Gross Domestic Product and non-oil revenue has a long term influence on defence spending. The granger causality test also showed a unidirectional causality from oil and non-oil revenue to defence expenditure. He further carried out a cointegration test to show that there is a long run relationship between defence spending and its determinants in Nigeria. In a similar study, Tambudzi (2007) examined the determinants of defense spending in 12 Southern African countries from 1997 to 2004. The result of the panel study showed that Gross Domestic Product (GDP) per capita is a significant determinant of the military burden of any economy.

Kefyalew (2007) analysed the sectoral effects of defence burden in 38 Sub-Saharan African countries from 1983 to 2002. The result of his study revealed that though defence burden affects growth of output in manufacturing and agriculture sector negatively, he further observed that the effect is more pronounced in the agricultural sector because agriculture is the most dominant economic base in the Sub-Saharan African countries. Thus, the effect of defence burden in the service sector and industry is insignificant.

Nabe (1983) empirically assessed the relationship between defense expenditure and economic growth in a sample of African countries. The study was verified using a recursive model and he found that defense spending is negatively related to economic growth rate. In a related study, Lim (1983) and Faini et al., (1984) also showed that defense spending has a negative effect on economic growth and the effect is more pronounced in the poorer African countries.

Looney (1990) examined the effect of defense spending on the economic performance of 33 African countries between 1970 and 1980. In his study, he grouped the countries under study into conflict and non conflict countries. The finding of this study showed a negative relationship between military expenditure and economic indicators in the conflict ravaged countries while a positive relationship was found between the two variables in the non-conflict countries. Also, in a country-specific study by Oriavwote and Eshenake (2013), the impact of security spending on economic growth in Nigeria was examined between 1980 and 2010. The result of the Johasen co-integration test showed that a long run relationship exist among the variables used in the study while the Error Correction Model showed that expenditure on defence has a negative impact on the level of economic growth.
McMillan (1992) also examined the relationship between defense expenditure and economic growth in South Africa between 1950 and 1985. The result of his study showed that defense expenditure has both positive and negative relationship on economic growth. In a related study on South Africa, Roux (1996) examined the effect of defense expenditure on South African economic growth for the period of 1960-1990. He used a four equation model to analyse the relationship and he also found a mixed result, but overall the military burden affects economic growth negatively.

Olaniyi (1993) analysed the impact of defense sector on Nigeria’s economic performance. The result of his study revealed that the defense sector in Nigeria contributed to the growth of the real GDP and it has a dampening effect on inflation rate though the effect was statistically low. Odusola (1996) also examined the effect of military expenditure on economic growth in Nigeria using a simultaneous equation model. The result of his study showed that military expenditure was negatively related to economic growth. Odusola (1996) further disaggregated military expenditure into recurrent and capital military expenditure and found that recurrent military expenditure was more growth retarding than capital military expenditure.

Dunne and Mohammed (1995) examined the effect of defense expenditure on economic growth in 13 relatively homogenous Sub-Saharan African countries between 1967 and 1985. They employed different statistical techniques for both aggregate and individual country analysis and the result of the study revealed that military expenditure has a negative effect on growth and investment. In a related study, Dunne and Watson (2000) carried out a study on military spending-growth nexus using firm level employment data from South Africa. The result of the study showed that military spending decreases employment and efficiency in the South African industrial sector. They also observed that military spending had negative impact on economic growth in African countries not because the amount spent on military is too much but because military resources are not allocated efficiently.

Aiyedogbon (2011) examined the relationship between military expenditure and capital formation in Nigeria between 1980 and 2010. He employed the econometric methodology of Vector Error Correction Model and tested the result using stationary test, co-integration and variance decomposition. The study revealed that military expenditure and lending rate have negative impact on Gross Capital Formation in Nigeria both in the short run and long run.

An evaluation of the literature from both Sub Saharan African /ECOWAS Countries and outside the region show that there is no consensus on the direction of causality between military expenditure and economic growth. Overall, empirical evidence reveals that military expenditure could be growth retarding especially in developing countries whose economies are characterised by poor macroeconomic indicators. The gap in the literature depicts that there is no known panel study on the relationship between military expenditure and economic growth for the West African sub region which our study fills.
Methodology

Theoretical Framework

The standard neoclassical growth model emphasises that labour and capital inputs are the key factors that explain the bulk of economic growth patterns in an economy, although there is still room to account for the significance of other explanatory variables in deriving output changes. Such factors may be considered on the basis of further theoretical foundations as well as country-specific characteristics. In view of this, studies in the recent time have stressed the implication of military spending on economic growth of an economy (Knight et al., 1996; Dunne et al., 2005; Chang et al., 2011; Kung and Min, 2013). As the stylized facts show, countries across the globe have continued to incur military spending which can be growth enhancing or retarding. In view of this, this study adopts endogenous growth theory based on the fact that it can explain other sources of growth which are embedded in total factor productivity (technical progress). The endogenous growth model is preferred because Solow Growth model does not provide information on other sources of economic growth which might be responsible for improvement or changes in total factor productivity as often proxy by index of technological progress. Hence, the starting point of an empirical study of growth determinants in any given country is the growth model based on aggregate production function as follows:

\[ Y_t = f(A_t, L_t, K_t) \]

Where:
- \( Y_t \) = Aggregate real income in period t
- \( K_t \) = Real capita stock in period t
- \( L_t \) = Labour input in period t
- \( A_t \) = Index of technological progress in period t

In equation (1) above, "\( A_t \)" represents the total factor productivity (TFP) or growth in output not accounted for by changes in labour and capital. Following the new endogenous growth theory, "\( A_t \)" is endogenously determined by other economic factors aside from capital (\( K_t \)) and labour (\( L_t \)) in equation (1) above [Adu, 2011]. In line with this assertion, several studies such as Laopodis (2001), Loening (2004), Yildrim (2005), Dune et al (2005), Pradhan (2010), Brasoveanu (2010), Chang et al (2011) and, Kung and Min (2013) have linked military expenditure to economic growth, they all emphasized military expenditure as one of the economic factors which can influence economic growth. Following this trend in the economic literatures, this study assumes the index of technological progress in equation (1) above to be military expenditure as follows:

\[ A_t = f(M_t) \]

Where: \( (M_t) \) is the military expenditure which is proxied by military spending per capita (Chang et al., 2011).

Substitute equation (2) into equation (1) as follows:

\[ Y_t = f(M_t, L_t, K_t) \]

From equation (3), the specific operational model for aggregate real income for ECOWAS countries is expressed in a linear form as follows:

\[ Y_{it} = \alpha_0 + \alpha_1 M_{it} + \alpha_2 L_{it} + \alpha_3 K_{it} + \varepsilon_{it} \]
All the variables in equation (4) are proxied as follows:

- $Y_{lt} = RGDP_{lt}$ is the real GDP growth rate per capita which is the proxy for economic growth;
- $M_{lt} = MILEX_{lt}$ is military spending per capita;
- $K_{lt} = INV_{lt}$ is the Gross Investment as a ratio of GDP;
- $L_{lt} = POP_{lt}$ is the Population growth rate;
- $\varepsilon_{lt}$ is the error term.

**Model Specification**

In an attempt to examine the effect of military expenditure on economic growth in ECOWAS sub region, this study follows Dunne *et al.*, (2004), Chang *et al.*, (2011) that examined the impact of military expenditure and economic growth. Since defense sector of an economy is an integral sector that the government allocates resources in her budget every fiscal year, hence, its impact on economic growth are examined along with other variables such as investment and population as control variables guided by empirical literatures.

In line with the theoretical framework stated above, the effect of military expenditure on economic growth is captured by the operational model expressed in equation (4). Following Chang *et al* (2004), the estimated equation is as follows:

$$RGDP_{lt} = \alpha_0 + \alpha_1.MILEX_{lt} + \alpha_2.INV_{lt} + \alpha_3.POP_{lt} + \mu_t + \varepsilon_{lt} \ldots \ldots$$

Where: $RGDP$ is the Real GDP growth rate per capita which is the proxy for economic growth; $MILEX$ is military spending per capita; $INV$ is the Gross Investment per GDP ratio of the country which is proxy for capital good; $POP$ is the population growth; $\mu_t$ represents the unobservable country-specific effects (non-time series); $\varepsilon_{lt}$ is the error term; $i$ represents each country under study i.e. $i = 1, 2 \ldots \ldots N$; $t$ stands for the time period of the scope i.e. $t = 1, 2 \ldots \ldots T$. While $\alpha_1$ to $\alpha_4$ are coefficients of the respective variables.

Also, $\alpha_0$ is the intercept term. Meanwhile, Dakurah *et al.*, (2000) in an attempt to analyze the relationship between military expenditure and economic growth discovered that "Military expenditure may be caused by economic growth and economic growth can in turn be caused by military expenditure" which might further result in potential endogeneity problem. Also, Kollias *et al.*, (2007) established bi-directional relationship between military expenditure and economic growth. Based on the circumstances in the literature, it is obvious that estimating equation (5) above via ordinary least square (OLS) or widely used fixed or random effects estimator could result into the problem of simultaneity bias which is another source of endogeneity problem (Chang *et al.*, 2011), because military expenditure (MILEX) may not be truly exogenous in nature (Wintoki *et al.*, 2009).

With respect to the problem identified above, this study follows (Wintoki *et al.*, 2009) by adopting a dynamic generalized method of moment (GMM) panel estimator. This estimator was put forward by Holtz-Eakin *et al*. (1988) and Arellano and Bond (1991), and further developed by Arellano and Bover (1995). This
estimation technique is well suited to handle the endogeneity problem and capable of providing consistent and unbiased estimates (Wooldridge, 2001; Buck et al., 2008; Wintoki et al., 2009; Chang et al., 2011). Hence, equation (6) above is re-specified in a dynamic form as thus:

$$\text{RGDP}_{it} = \alpha_0 + \alpha_1 \text{RGDP}_{it-1} + \alpha_2 \text{MILEX}_{it} + \alpha_3 \text{INV}_{it} + \alpha_4 \text{POP}_{it} + \mu_i + \varepsilon_{it} \ldots \ldots (6)$$

However, the presence of lagged dependent variable in equation (6) above renders pool OLS, fixed or random effect inappropriate because there may be linear correlation between lagged dependent variable ($\text{RGDP}_{it-1}$) and country-specific effect ($\mu_i$) [$E(\text{RGDP}_{it-1}, \mu_i) \neq 0$]. In attempt to overcome this problem, this study takes after Arellano and Bover (1995) to remove country-specific effect from the dynamic panel data model in equation (6). That is to get rid of $E(\text{RGDP}_{it-1}, \mu_i) \neq 0$ problem by forward demeaning transformation processes. In view of this, equation (6) is re-specified for each cross-sectional unit by averaging this equation over time periods (t) as follows:

$$\bar{\text{RGDP}}_i = \alpha_0 + \alpha_1 \bar{\text{RGDP}}_{i-1} + \alpha_2 \bar{\text{MILEX}}_i + \alpha_3 \bar{\text{INV}}_i + \alpha_4 \bar{\text{POP}}_i + \mu_i + \bar{\varepsilon}_{it} \ldots \ldots (7)$$

Where:

$$\bar{\text{RGDP}}_i = \frac{1}{T} \sum_{t=1}^{T} \text{RGDP}_{it}; \ ar{\text{RGDP}}_{i-1} = \frac{1}{T} \sum_{t=1}^{T} \text{RGDP}_{it-1}; \ \bar{\text{MILEX}}_i = \frac{1}{T} \sum_{t=1}^{T} \text{MILEX}_{it}; \ \bar{\text{INV}}_i = \frac{1}{T} \sum_{t=1}^{T} \text{INV}_{it}; \ \bar{\text{POP}}_i = \frac{1}{T} \sum_{t=1}^{T} \text{POP}_{it} \text{ and }$$

$$\bar{\varepsilon}_{it} = T^{-1} \sum_{t=1}^{T} \varepsilon_{it}$$

To complete the forward demeaning transformation processes, the equation (7) is subtracted from equation (6) and this process leads to equation (8) below:

$$\tilde{\text{RGDP}}_{it} = \alpha_1 \bar{\text{RGDP}}_{i-1} + \alpha_2 \bar{\text{MILEX}}_i + \alpha_3 \bar{\text{INV}}_i + \alpha_4 \bar{\text{POP}}_i + \tilde{\varepsilon}_{it} \ldots \ldots (8)$$

The variables in equation (8) are defined as follows:

$$\tilde{\text{RGDP}}_{it} = (\text{RGDP}_{it} - \bar{\text{RGDP}}_i); \ \tilde{\text{RGDP}}_{i-1} = (\text{RGDP}_{i-1} - \bar{\text{RGDP}}_{i-1}); \ \bar{\text{MILEX}}_i = (\text{MILEX}_{it} - \bar{\text{MILEX}}_i); \ \bar{\text{INV}}_i = \bar{\text{INV}}_i; \ \bar{\text{POP}}_i = (\text{POP}_{it} - \bar{\text{POP}}_i) \text{ while } \tilde{\varepsilon}_{it} = (\varepsilon_{it} - \bar{\varepsilon}_i)$$

The process that led to equation (8) which yielded time-demeaned data make use of all information unlike differencing transformation by Arellano and Bond (1991). This within transformation is more efficient than differencing (Blundell, 2005). It is to be noted that the correlation problem between country-specific effect and lagged dependent variable has been dealt within equation (8) but it creates another problem of correlation between lagged dependent variable and error term or $E(\text{RGDP}_{it-1}, \tilde{\varepsilon}_{it}) \neq 0$. As noted earlier, the estimation technique to overcome this endogeneity problem [$E(\text{RGDP}_{it-1}, \tilde{\varepsilon}_{it}) \neq 0$] is Generalised Method of Moment (GMM), as suggested by Arellano and Bover (1995). Studies like Arellano and Bond, 1991; Arellano and Bover, 1995; Ozkan, 2007; Wooldridge, 2001; Chang et
have suggested using a lag of 2 or higher as good choice for the instrument variables.

The specification in equation (8) is justified because it eliminates unobserved, time-invariant, individual-specific effects and provides consistent estimation results (Ozkan, 2007; Buck, Liu and Skovoroda (2008); Docougliagos, Graham and Janto-Haman (2012)). Aside from this, natural logarithms of respective variables are already in growth forms to serve as necessary precaution against problem of heteroskedasticity and address non-normality concerns (Sigler, 2011). In addition, this study also applies other diagnostic measures such as test for multicollinearity using correlation matrix coefficients and the variance inflation factors (VIF) of the explanatory variable.

In line with the work of Buck et al. (2008), this study adopts a two-stage modelling strategy to test the presence of causality between military expenditure and economic growth in ECOWAS countries with a view to identifying and testing whether there are two-way causal links between military expenditure and economic growth in ECOWAS sub region by conducting Granger causality tests employing the following equations:

$$RGDP_{it} = \alpha_0 + \sum_{j=1}^{n} \alpha_{1j} RGDP_{it-j} + \sum_{k=1}^{n} \alpha_{2k} MILEX_{it-k} + \sum_{l=1}^{n} \alpha_{3l} INV_{it-l}$$

$$+ \sum_{p=1}^{n} \alpha_{4p} POP_{it-l}u_{it} \ldots \ldots (9)$$

$$MILEX_{it} = \beta_0 + \sum_{j=1}^{p} \beta_{ij} MILEX_{it-j} + \sum_{k=1}^{p} \beta_{2k} RGDP_{it-k} + \sum_{l=1}^{p} INV_{it-l}$$

$$+ \sum_{i=1}^{n} \alpha_{3i} POP_{it-l}u_{it} \ldots \ldots (10)$$

Where: RGDP and MILEX, in equations (9) and (10), are the two variables, Economic growth and military expenditure, proposed to have interacting relationships, given investment (INV) which is incorporated as intervening variables. All the same, it is to be noted that there are no separate equations for investment (INV) and population growth rate (POP), because they are only serving as intervening variable in equations (9) and (10). Lastly, $n$ and $p$ are the maximum lag lengths. The decision rule goes thus:

i. The null hypothesis "MILEX (military expenditure) does not Granger-cause RGDP (economic growth)"", given INV and POP, is tested through a standard Wald test or F tests value on the joint significance of $\alpha_{2k}$ in equation (9)

ii. MILEX is said to granger-cause RGDP if $\alpha_{2k}$ are jointly significant. In the same vein, if the $\beta_{2k}$ in equation (10) is jointly significantly different from zero, the null hypothesis that RGDP does not granger-cause MILEX is rejected.

Studies have confirmed that Generalized Method of Moment (GMM) estimator provides a consistent estimation outcome, most especially in causality tests (Buck et
Military Expenditure and Economic Growth Nexus: The Case of ECOWAS

al, 2008; Chang et al, 2011). In view of the foregoing, this present study makes use of Arellano and Bover (1995) transformation process to Real Gross Domestic Product (RGDP), military expenditure (MILEX) and investment (INV) variables to test causality in equation (9) and (10) with the aid of GMM estimation technique.

Data Description and Measurement of Variables
The data on military expenditure per capita for the countries studied was obtained from Stockholm International for Peace Research Institute (SIPRI), (2012) while data on Real GDP, Investment and population Growth was obtained from World Bank Development Indicator (2012).

Real Gross Domestic Product (RGDP) is the Per capita GDP growth rate proxy for economic growth. It is measured by dividing the Gross Domestic Product by the population of a country’s annual growth rate. Military Expenditure per capita (MILEX) on the other hand, is the total amount spent on military formations, and peace keeping operations divided by the population of a country. While population Growth Rate (POP) captures the population growth of the countries studied. It serves as the proxy for labour input in the model. Investment/GDP ratio (INV) is the Gross Fixed Capital formation that is the level of investment which serves as proxy for capital good. All these variables are incorporated into the study by Chang et al., (2011) and Dunne et al. (2004)

RESULTS AND DISCUSSIONS
This sub-section reports the descriptive statistics of all the variables under study.

<table>
<thead>
<tr>
<th>Table 1: Descriptive Statistics of the Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Median</td>
</tr>
<tr>
<td>Maximum</td>
</tr>
<tr>
<td>Minimum</td>
</tr>
<tr>
<td>Std. Dev.</td>
</tr>
<tr>
<td>Skewness</td>
</tr>
<tr>
<td>Kurtosis</td>
</tr>
<tr>
<td>Jarque Bera Probability</td>
</tr>
<tr>
<td>Sum</td>
</tr>
<tr>
<td>Sum Sq. Dev.</td>
</tr>
<tr>
<td>Observations</td>
</tr>
</tbody>
</table>

Source: Author’s Computations, 2015
The result from Table 1 above indicates that the average of growth rate of real per capita income (RGDP) is $1.3445 while the median stands at $1.3900. The maximum and minimum values are reported as $91.67 and -$50.24 respectively. Similarly, the military expenditure per capita (MILEX) yields the average value $1.2602 with median value of $1.2. The maximum and minimum amounts spent per head on military in ECOWAS sub-region are reported as $4.4 and $0.1 respectively. Also, the average value of investment as a ratio of GDP (INV) is approximately 17.15 while the median value is 17.69. The minimum and maximum values are calculated as -1.83 and 7.84 respectively. Lastly, the mean value of population growth rate (POP) over the study period in ECOWAS sub-region is 2.6426 with the median value of 2.66. The maximum and minimum values of the population growth rate are accounted as 7.84 and -1.83. In addition, results of Jarque-Bera statistic of variables reported in Table 1 above showed that the variables are normally distributed. The coefficients of skewness show that MILEX, RGDP and INV are positively skewed while only POP is negatively skewed.

**Correlation Tests**

The results of Pearson correlation matrix between variables are presented in Table 2. The results of pairwise correlation coefficients between explanatory variables in this study for all the models show that all the pairs give coefficients that are less than 0.5 (50%). The pair with highest coefficients are growth rate of real per capita income (RGDP) and investment as a ratio of GDP (INV) which gives coefficient of 0.3178 (31.78%). This gives evidence that problem of multicollinearity is not an issue to worry about in this study. In the same vein, in order to serve as robustness check, Variance Inflation Factors (VIF) was also used and the results indicated that multicollinearity is not a concern for this study by giving coefficients that are far less than 10. This was done by using the conventional formula $\frac{1}{1 - r_{ij}}$, where $r_{ij}$ is pair of each correlation coefficient (see Gujarati and Porter, 2009). In view of this, correlation coefficients among control variables do not suggest any threat of multicollinearity.

<table>
<thead>
<tr>
<th></th>
<th>RGDP</th>
<th>MILEX</th>
<th>INV</th>
<th>POP</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGDP</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MILEX</td>
<td>-0.2176</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INV</td>
<td>0.3178</td>
<td>-0.2885</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>POP</td>
<td>0.1127</td>
<td>-0.1625</td>
<td>0.0297</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Source: Author’s Computations, 2015

**Panel Unit Root Tests**

One of the fundamental requirements for using a dynamic penal data model is to ensure that the variables maintain stationarity properties (Chang et al., 2011). In order to ensure the robustness of results, this study adopts panel unit root test by Levin, Lin and Chu or LLC (2002) and Maddala and Wu (1999, Fisher-ADF). The
main difference between the two is that the LLC assumes a common unit root test process while ADF allows for individual unit root process. The results of these unit root tests are presented in Table 3 below.

<table>
<thead>
<tr>
<th>Variables (Level)</th>
<th>Levin, Lin and Chu's t-test [LLC] (Assume common unit root process)</th>
<th>Augmented Dickey Fuller's test [ADF] (Assume individual unit root process)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Effects Only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MILEX</td>
<td>-4.4991***</td>
<td>-2.6684***</td>
</tr>
<tr>
<td>RGDP</td>
<td>-8.5262***</td>
<td>-7.7631***</td>
</tr>
<tr>
<td>INV</td>
<td>-2.4210***</td>
<td>-1.63***</td>
</tr>
<tr>
<td>POP</td>
<td>-2.0769**</td>
<td>-4.0103***</td>
</tr>
<tr>
<td>Individual Effects and Linear trends</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MILEX</td>
<td>-4.6418***</td>
<td>1.9469**</td>
</tr>
<tr>
<td>RGDP</td>
<td>-9.5286***</td>
<td>7.1564***</td>
</tr>
<tr>
<td>INV</td>
<td>-2.4210***</td>
<td>-1.6323**</td>
</tr>
<tr>
<td>POP</td>
<td>2.0495</td>
<td>73.1918***</td>
</tr>
<tr>
<td>POP</td>
<td>-10.6855***</td>
<td>-5.7636***</td>
</tr>
</tbody>
</table>

Note that *** and ** represent 1% and 5% significant levels respectively, given the null hypothesis:

Source: Authors' Computations, 2015 MILEX, RDGP, INV and POP contain panel unit root.

The results show that the variables contain neither individual unit root nor common unit root based on the principles of the two tests mentioned above when examined with individual effect only. Similarly, when the variables were examined with individual effect and linear trends; the results of ADF indicate that all variables maintain stationarity process. The POP was not when LLC was adopted but ADF confirmed its stationarity. Hence, the results of the ADF test establish that all variables portray the stationarity processes [that is, they are all integrated of order zero I(0)] while LLC test with individual effect only confirmed stationarity of all variables. However, it is to be noted that LLC test with individual effect and linear trends showed that only POP was not stationary at level. Since, ADF supports the stationarity of all the variables while LLC show only one variable (POP) was not stationarity at level but its first difference confirmed its stationarity. Hence, the issue of testing for cointegration among the variables is not applicable in this present study. Having examined the stationarity properties of the variables in this study, the next is to discuss the results from effect of military expenditure on economic growth in ECOWAS sub-region.

**Effect of Military Expenditure on Economic Growth in ECOWAS Countries**

This section presents the results of the effect of military expenditure on economic growth in the ECOWAS countries using fixed effect, random effect and System generalised method of moments (GMM) approaches.

To ascertain the extent of the reliability of GMM estimates, we carried out the Sargan- and J-tests of instrument validity. The results show that the null hypotheses of over-identifying restrictions are valid suggesting the validity of the instruments used. Also, the using the Wald test to ascertain the joint significance of the
parameters estimated, the significance of F-statistic further confirms the reliability of the overall model.

<table>
<thead>
<tr>
<th></th>
<th>Fixed Effect</th>
<th>Random Effect</th>
<th>Sys-GMM (2-Step)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-5.9019***</td>
<td>-2.0997</td>
<td>-0.2386***</td>
</tr>
<tr>
<td></td>
<td>(0.0042)</td>
<td>(0.1697)</td>
<td>(0.0000)</td>
</tr>
<tr>
<td>RGDP(-1)</td>
<td>0.1252***</td>
<td>-0.9121**</td>
<td>1.5121**</td>
</tr>
<tr>
<td></td>
<td>(0.0425)</td>
<td>(0.0381)</td>
<td>(0.0102)</td>
</tr>
<tr>
<td>INV</td>
<td>0.2701***</td>
<td>0.1822***</td>
<td>0.3659***</td>
</tr>
<tr>
<td></td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
</tr>
<tr>
<td>POP</td>
<td>0.9406**</td>
<td>0.4709</td>
<td>1.7798****</td>
</tr>
<tr>
<td></td>
<td>(0.0315)</td>
<td>(0.1748)</td>
<td>(0.0001)</td>
</tr>
<tr>
<td>R-Square</td>
<td>0.1891</td>
<td>0.1252</td>
<td>32.9608</td>
</tr>
<tr>
<td>F-statistic</td>
<td>2.9759</td>
<td>11.0237</td>
<td>(0.0000)</td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>(0.0001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrument Rank</td>
<td></td>
<td></td>
<td>139</td>
</tr>
<tr>
<td>J-statistic</td>
<td>98.8897</td>
<td></td>
<td>(0.0000)</td>
</tr>
<tr>
<td>Sargan Test</td>
<td>0.5916</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*** and ** denote 1% and 5% significance levels respectively
The probability values are reported in ()

Source: Author’s Computations, 2015

The results of the GMM in the Table 4 show that previous growth rate of GDP real per capita (RGDP(-1)) has significant but negative impact on the current growth rate of GDP real per capita at p-value < 0.01. The result proved that 1 percentage point increase in growth rate of GDP real per capita in the previous period would induce a 23.86 percentage point decrease in growth rate of GDP real per capita in the current period. It is evident that previous growth rate of GDP real per capita is a major factor that determines current growth rate of GDP real per capita in ECOWAS sub-region. The significance of coefficient of previous growth rate of per capita invalidates the appropriateness of ordinary least square (OLS), and fixed or random effects for this study. This result is consistent with the study of Chang et al., (2011). Though the results of fixed and random effect are reported in Table 4.4 above but the significance of the coefficient of lagged dependent variable in the dynamic GMM estimate shows that using them for this study will make the results biased. So, the results of GMM estimates appear to be more reliable. On the other hand, the results indicate that the coefficient of military expenditure exerts significant and positive influence on economic growth in the ECOWAS sub-region at the p-value of 0.0102. Statistically, the result shows that 1 percent increase in military expenditure will increase the growth rate by 151.21 percentage point.
This finding proves that military expenditure in ECOWAS sub-region is a growth-enhancing factor as it contributes positively to the growth rate of the region on average. This observation points to the fact that military expenditures of the countries in the sub-region have not been growth-retarding. In view of this, it is worthy of emphasizing that government spending internal security as well as wading off external threats and aggression is worthwhile in the sub-region. This study is in line with Yildirim et al., (2005), Benoit (1973), Mintz and Stevenson (1995), Alptekin and Levine (2012) whose studies showed that military expenditures exert a positive influence on economic growth; thus establishing the fact that military expenditure is growth-enhancing in ECOWAS countries within the study period.

Similarly, the results from Table 4.4 indicate that the coefficient of investment per capita (INV) exerts positive and significant effect on the economic growth in West African sub-region. Statistically, the results show that one percentage point increase in investment per capita in the sub-region leads to 36.59 percentage point rise in growth rate of GDP. This finding depicts that investment is an important and positive factor that influences economic growth of ECOWAS countries. Also, the result shows that coefficient of population growth rate (POP) has significant and positive influence on economic growth in ECOWAS countries. On the average, the result reveals that a unit percentage point increase in population growth rate leads to 177.98 percentage points in economic growth of the ECOWAS sub-region. This indicates that population is a blessing rather than a curse in ECOWAS sub-region in that there is manpower to get involved in the production process which is labour intensive in the sub-region.

In a nutshell, evidences from the analysis above have shown the effect of military expenditure on economic growth of ECOWAS sub-region and the results have revealed that the government spending on defense in the sub-region is worthwhile as it shows that it is growth-enhancing in nature. This gives a clue that military expenditure in the sub-region has not been a waste but it is rather a growth-enhancing phenomenon. In view of this, it is highly necessary that governments of the sub-region need to encourage more spending on defense as security is a key factor that creates a favorable and conducive macroeconomic environment and promotes growth in the region.

Causality between Military Expenditure and Economic Growth in ECOWAS Countries
This section examines the direction of causality between military expenditure and economic growth in ECOWAS sub-region. In order to achieve this objective, it has been established in the literatures that stationarity properties of the variables are prerequisites for the examination of causality (see Buck et al., 2008; Gujarati and Porter, 2009; Chang et al., 2011). So, the results of the panel unit root tests performed earlier proved that the variables meet the stationarity properties. Having met these conditions, the results of the two-stage modelling strategy specified earlier to test and examine the presence of two-way causal links between military
expenditure and economic growth in ECOWAS sub-region are presented in Table 4.5 below. While Panel A shows the results of whether lagged values of military expenditure [MILEX (-1), MILEX (-2)] predicts the present economic growth [RGDP] in ECOWAS; the results of Panel B, on the other hand, present the results of how lagged values of economic growth [RGDP (-1), RGDP (-2)] predicts the present military expenditure [MILEX]. These show how the causality runs between military expenditure and economic growth in ECOWAS sub-region. Prior to that, estimates of dynamic generalized method of moments (GMM) depend on the genuineness and validity of the instrumental variables adopted.

Furthermore, the validity of the GMM estimates are examined using Sargan test of over-identifying restrictions under the null hypothesis that instruments are not correlated with the error terms. After critically observed that the instrument ranks (95 and 89) are greater than the numbers of parameters estimated (7 and 7) as indicated in Panel A and Panel B of Table 5. The fulfilment of this requirement gives hint that the Sargan test of over-identifying restriction can be computed using “scalar pval = @chisq (J-statistic, k-p)” [see Gujarati and Porter, 2009; Ajisafe and Akinlo, 2013 and 2014].

| Table 5: Results of Two-Way Causality Modelling between Military expenditure and Economic Growth in ECOWAS Countries in Dynamic Panel (GMM) |
|-------------------------------------------------------------|-------------------------------------------------------------|
| Coefficient | Coefficient |  t-Statistic |  t-Statistic |
|-------------------------------------------------------------|-------------------------------------------------------------|
| RGDP(-1) | -0.0806*** | MILEX(-1) | 0.3649*** | 7.0164 |
| MILEX(-1) | -1.2974*** | RGDP(-1) | -0.0079*** | -2.5212 |
| MILEX(-2) | 0.8314** | RGDP(-2) | -0.0088*** | -2.4158 |
| INV(-1) | 0.1728** | INV(-1) | -0.0113*** | -7.6597 |
| INV(-2) | -0.0971*** | INV(-2) | 0.0023 | 0.7711 |
| POP(-1) | -1.3839*** | POP(-1) | 0.2736*** | 2.8130 |
| POP(-2) | 1.3010*** | POP(-2) | -0.3046*** | -3.2916 |
| Instrument Rank = 95 | Instrumental Rank = 89 |
| J-statistic = 65.0983 | J-statistic = 69.5630 |
| Scalar pval = 0.4318 | Scalar pval = 0.8346 |
| F-statistic (Wald Test) = 34.6969 | F-statistic (Wald Test) = 353.7401 |
| Prob (F-statistic) = 0.0000 | Prob (F-statistic) = 0.0000 |

*Note that *** and ** represent 1% and 5% significant levels respectively
Source: Authors’ Computations, 2015

The results of Sargan test from Panel A and Panel B report the probability of values of 0.4318 and 0.8346 respectively. From these results, it shows that the null hypotheses are to be accepted which means that the instruments are not correlated with error terms. Having met these conditions, it can be deduced that the instrumental variables adopted in this study are valid and the estimates are reliable. In the same vein, to ascertain overall reliability of the models, the results in Panel A and Panel B show F-statistics of 34.6969 and 353.7401 respectively while the
In line with the null hypothesis (1) that "MILEX (military expenditure) does not Granger cause RGDP)”, given INV and POP. The joint significance of $\alpha_{2k}$ in equation (10) was tested through a standard Wald test and the results of the joint significance of the coefficients of the military expenditure (MILEX) lagged by one and two showed F-statistic of 3.8845 with p-value of 0.0226 (see Table 4.6 below). These results show that the two parameters are jointly significant and this establishes that the military expenditure Granger causes Real GDP ($\Delta$MILEX→$\Delta$RGDP) in ECOWAS sub-region. This finding is consistent with the studies of Farzanegan, (2011), Hirnissa (2009) and Dunne et al (1999) that military expenditure granger-causes economic growth. This shows that expenditure on defence by countries in ECOWAS sub-region has a predictive power to explain the economic growth of the region on the average. It is obvious from the analysis above that government spending on military to ensure internal and external security is one of the factors that cause economic growth in ECOWAS countries. This study shows that defense spending is a sine qua non for economic growth of the ECOWAS sub-region as the importance of security of lives and property is evidently fundamental to a meaningful economic growth of the region.

Table 4.6: Summary of Results from the Panel Causality Tests

<table>
<thead>
<tr>
<th>Direction of Causality</th>
<th>Wald Test</th>
<th>Inferences of causality</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta$MILEX (Military expenditure) → $\Delta$RGDP (Economic growth)</td>
<td>3.8845**</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>(0.0226)</td>
<td></td>
</tr>
<tr>
<td>$\Delta$RGDP (Economic growth) → $\Delta$MILEX (Military expenditure)</td>
<td>5.6035***</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>(0.0044)</td>
<td></td>
</tr>
<tr>
<td>$\Delta$MILEX (Military expenditure) ↔ $\Delta$RGDP (Economic growth)</td>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note that *** and ** represent 1% and 5% respectively. Probability values are in parentheses.

Source: Authors' Computations, 2015

Also, in order to verify the evidence of causality from economic growth to military expenditure in ECOWAS sub-region, the null hypothesis that "Economic growth (RGDP) does not Granger cause military expenditure (MILEX), given INV and POP" was put to test by examining the joint significance of $\beta_{2k}$ in equation (9) through Wald test and the results of the joint significance test of the coefficients of economic growth (proxy by growth rate of real per capita income) lagged by one and two generated F-statistic of 5.6035 with p-value of less than 0.01 (see Table 4.6 above). This evidence of joint significance of the parameters shows that economic growth Granger-causes military expenditure ($\Delta$RGDP→$\Delta$MILEX). This result gives hint that change in economic growth in ECOWAS sub-region has tendency to cause change in military expenditure. Since the result shows a positive causation from economic growth to military expenditure, this establishes that both military expenditure and economic growth are bound to be moving together in the same direction.
In a nutshell, the result from Table 4.6 shows that there is evidence of mutual interplay between military expenditure and economic growth in ECOWAS sub-region. This suggests and confirms bidirectional relationship between military expenditure and economic growth in ECOWAS sub-region ($\Delta MILEX \leftrightarrow \Delta RGDP$). This two-way causal links is consistent with the findings of Kollias et al., (2007) and Chowdbury (1991).

**Conclusion and Policy Prescriptions**
The findings of this study have shown that the effect of military expenditure on economic growth in West African sub-region is positive. The study suggests that military expenditure exerts significant and positive influence on economic growth in the region as the military expenditure is growth-enhancing and not growth-retarding. Military expenditure enhances growth in the region because government spending on national security helps to provide favourable macroeconomic environment for investment which translates into a strong economy.

Based on the findings that emerged in this study, the following recommendations are offered. Government should allocate more resources to the military sector in order to ensure national security which provides a favourable macroeconomic environment that is conducive for investment. Since the result from the analyses showed that military expenditure is growth-enhancing, government of West African sub-region should be more committed to providing a safe and secure economy that will avoid civil unrest and militia insurgence. Thus, creates a better environment that is suitable for both the local and foreign investors.

Government should invest in defence/military projects that could have spill-over and multiplier effects on the economy and thereby promoting long term growth. Such projects include development of technologies that have direct or indirect military applications, research and development, military institutions and infrastructures among others that add potential value in different sectors of the economy like education, health, manufacturing, industrial sectors.

Government of countries in the West African sub-region should also set up an institutional framework that will block leakages in the defence/military sector of their economy. The leakages can be in form of corruption. Government should put measures in place to fight corruption in order to ensure that budgetary allocation to the defence/ military sector every fiscal year is judiciously spent in order to achieve the goal of providing favourable environment for investment and other economic activities that could stimulate economic growth.

**References**
Military Expenditure and Economic Growth Nexus: The Case of ECOWAS


ECOWAS (2012).“Integration and Political Stability in West Africa”.2012 ECOWAS annual report.102-105

Farzanegan M. (2011) “Military spending and Economic growth: The case of Iran” ZEW Mannheim and Dresden University of Technology, Germany.


Military Expenditure and Economic Growth Nexus: The Case of ECOWAS


