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Government Size and Economic Growth in ECOWAS Sub-Region: A Test of the Non-Monotonic Hypothesis

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Abstract

This study analysed the statistical properties of government size and economic growth as well as testing the non-monotonic hypothesis in the ECOWAS region following panel analytical procedure. Secondary data on population, unemployment, exchange rate, consumer prices, export, and import of goods and services, aggregated government expenditure and gross domestic product were sourced mainly from World Bank Data Base. Following the non-linear approach, the result of panel least square confirms the non-monotonic hypothesis in favour of U-shaped curve as against an inverted U-shaped **(∩)** which is a proof of Armey curve scenario. The result also showed that while exchange rate and money supply were not significant, unemployment and import of goods and services significantly contributed to the low pace of economic growth in this economic sub-region. Export of goods and services was found to have positive and significant impact on growth. The policy implication is that while each of the member countries should adhere strictly to the optimal (min) of about 42% as the starting point for a meaningful economic growth in line with Big-Push theory, each country should equally boost export trade; restrict import; and as well tackling unemployment and exchange rate problems for rapid economic growth. The study concluded that the U-shaped non-monotonic relation existed between government size and economic growth in the ECOWAS sub-region.

Keywords: non-monotonic relation, government size, Armey curve, economic growth, ECOWAS countries

Introduction

The debate on the relationship between government size and economic growth has gained prominent attention among economic scholars particularly in the field of public economics. Several studies including Pevcin (2004), Afonso and Furceri (2008), Herath (2012), Turan (2014), Bozma, Başar and Eren (2019), and Coayla (2021) across the globe have engaged in country-specific, regional, and multi-country studies to investigate, empirically, the nexus between government size and economic growth. The subject of most investigation has been to test whether the relationship is positive, negative, or neutral and whether the relationship is only a mere correlational or it is both correlational as well as causational. The reason for the growing research interest in this subject matter is not

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unconnected with the increasing role of government in the management of the economy (Charlesworth, 2013; Khadan, 2019; Dakhlallah, 2020; Aldama and Creel, 2020). The role of government is, among other functions, to reduce market inefficiency. Market inefficiency tends to slow down economic growth process and the effect of public sector in many countries of the world. Market failure always calls for government intervention and such intervention at times creates some side effects (Ekinci, 2011; Mehdi and Shoorekchali, 2012; Ascari, Florio, and Gobbi, 2017; and Bui, 2020). Government intervention too occasionally fails to achieve the desired goals and yields certain scary or detrimental effects on the socio-economic development of the concerned economy. Based on this, government intervention may be efficient at times. For instance, when it produces positive result by optimally correcting the imbalances in the market system and enhances productivity of the private sector. It may also be bad, especially when it causes distortion and disincentive to productive agents of the economy, crowds out private sector investments and reduces the ability of the private sector to employ. This shows that government intervention could produce either of two effects. It may make or mar the socio-economic development of a nation. The climax of socialism is communism where the government has absolute power to control all means of production and distribution, and thus what to consume by who. On the other hand, is capitalism where all means of production are in the hand of the private sector with nil government control and regulation. Neither of the two scenarios produces optimal results for economic growth. The collapse of the former Soviet Union to give way to 15 different and independent economies attests to this observation (Burke, 2014).

Empirical findings too are mixed and contentious among existing studies with stories differ from one country to another and from one region to another (Ram, 1986; Pevcin, 2004; Chen, and Lee, 2005; Herath, 2012; Turan, 2014; Bozma, Başar and Eren (2019), and Coayla (2021). Countries and regions have had differing experiences in respect of the trend of government size as well as how this trend affects economic growth. There have been significant variations in government size and economic growth experience across countries and regions. For instance, a wide gap has been observed between developed and developing countries. Even within developed or developing countries, the experience also differ. The level of development attained also differ across developing countries, hence, the size of government as well as the response of economic growth to variations in government size might also not be easily generalized. It is likely that as the level of economic development of a country moves a step up, then the response of economic growth to variations in government size might also be sensitive to such a change in the level of development.

Government regulation is desired principally to provide the necessary environment for the private sector to operate optimally without any infringement on the overall goals of the government. Where the private sector attempts to engage in profiteering, the government wades in to check such excessive moves of the private sector that may lead to decrease in the societal welfare. It is in this regard that the size of the government matters. Size and specifically optimal size, in this case, would refer to the capability with which the government is able to regulate and enforce law and order for societal welfare and growth. The capability would also include the extent of provision of necessary socio-economic infrastructure for the optimal performance of the economy (Ekinci, 2011); Mehdi and Shoorekchali, 2012); Baharumshah, Soon, and Lau, 2016; Blot, Ducoudré, and Timbeau, 2016; Ascari, Florio, and Gobbi, 2017; Dada, 2017; and Bui, 2020). Provision of the necessary infrastructure would serve as a boost to industrialisation while maintenance of law and order, among others, would stem the tide of corruption, crimes, and other vices. Therefore, a lower government size relative to the volume of the tasks needed to achieve the set macroeconomic targets may limit economic growth. Expansion in government calls for increase in the size of government. The expansive role of government emanates from factors that include population growth, urbanization, industrialization, provision of socio-economic infrastructure, and the quest to move up to a higher level or an upper stage of economic development.

It is important to note that as civilization progresses, government expenditure will continue to rise since this will increase the demand for public provisions for the population involved in the civilization process. This fact is first highlighted in Wagner (1890). However, economic growth has responded positively to relatively low government size in some economies while in some, it has responded negatively. So, it becomes very difficult to generalize on how economic growth responds to varying degree of government size. The dynamic nature of the variables involved in the analysis and the controversial nature of the findings of prior studies are some of the reasons that usually aroused the interest of scholars to contribute to this important debate. However, most studies exploring relationship between government size and economic growth have mostly focused on the use of linear framework in their analysis. The linear specification views the relationship in a monotonic sense. This implies that government size and economic growth could be either a monotonic increasing function or a monotonic decreasing function. The implication of this is that as government size increases, higher economic growth is always attainable. The reverse is the case of a monotonic decreasing function.

The survey of extant literature reveals that the non-linear framework has been rarely used particularly in the ECOWAS region. Karras (1997), Pevcin (2004), Chen and Lee (2005), Gunalp (2005), Roy (2009), Abounoori and Nademi (2010), Dizaji (2012), Mehrara and Keikha (2012), Altunc and Aydin (2013), Turan (2014), Villena, Gamboni, and Tomaselli (2018), and Asogwa, Okwudili, and Urama (2019) are among studies that directly or indirectly investigated the role of government size on economic growth. Some of these studies confirmed positive relationship between the two variables following a monotonic increasing function. Some other studies established negative relationship between government size and economic growth following a monotonic decreasing function. The use of linear framework is wide and tall. The exploration of non-monotonic relationship requires the use of non-linear framework. Ram (1986), Smeti (1993), Grossman, (1988), Vedder and Gallaway (1998) are among early studies using the non-linear framework. Studies employing a non-linear approach have also come up with mixed findings. While the non-monotonic hypothesis holds in some economies, it does not hold in others. This scenario could be due to variations in country-specific characteristics. It could also be due to inclusion of complementary explanatory variables that could influence the behaviour of the key variables usually involved in such analysis. Among more recent studies using a non-linear framework include Folster and Henrekson (2001), Dar and Amirkhalkhali (2002), Chen and Lee (2005), Gunalp (2005), Bozma, Başar and Eren (2019). Some of these studies used the non-linear framework to test for the existence of Armey Curve or otherwise in some economies and regions. The findings of the studies are also mixed in this regard. While some confirmed the existence of Armey Curve in some economies and regions, others found that Armey Curve does not exist in some other economies.

The hypothesis of non-monotonic relationship with consideration to a number of key macroeconomic variables has been scarcely tested particularly among countries in the ECOWAS region. Due to this lacuna, this study used the non-linear framework to test the hypothesis of non-monotonic relationship between government size and economic growth using panel data for 12 developing countries in the ECOWAS regions. This current study shed more light on the non-linear relationship between government size and economic growth within the ECOWAS region. The study analyzed the statistical properties of government size and economic growth and then tests the hypothesis of non-monotonic relationship in these 12 countries being investigated, namely Benin, Burkina-Faso, Cameroon, Cote d'Ivoire, Ghana, Guinea-Bissau, Mali, Niger, Nigeria, Sierra Leone, The Gambia, and Togo. This is with the view to advancing the frontier of knowledge on the relationship between government size and economic growth. Figure 1 depicts the hypothesized monotonic and non-monotonic relations between two variables X and Y, where X and Y are presumed to be government size and economic growth, respectively. A monotonic relation exists between variables X and Y if (i) the value of variable Y decreases as the value of variable X increases or (ii) the value

of variable Y increases as the value of variable X increases. This is depicted in Figure 1 panels (a) and (b) but panels (c) and (d) depict a situation of non-monotonic relation between government size (GZ) and economic growth (EG). From panel (c), government size starts to increase economic growth as it rises until point X where economic growth is optimum at point M with optimal government size, g^*. Further increase in government size beyond point X, that is, government size greater than g^* leads to a decrease in economic growth as shown in the panel. Conversely, in panel (d), government size starts to decrease economic growth as it rises until point Y with optimal government size g^{**} . At that point, government size produces zero effect on the curve at point N. Point N is a turning point where the slope is zero. Any increase in government size after point Y, that is, government size greater than (g^{**}) starts to raise economic growth and the slope becomes positive.

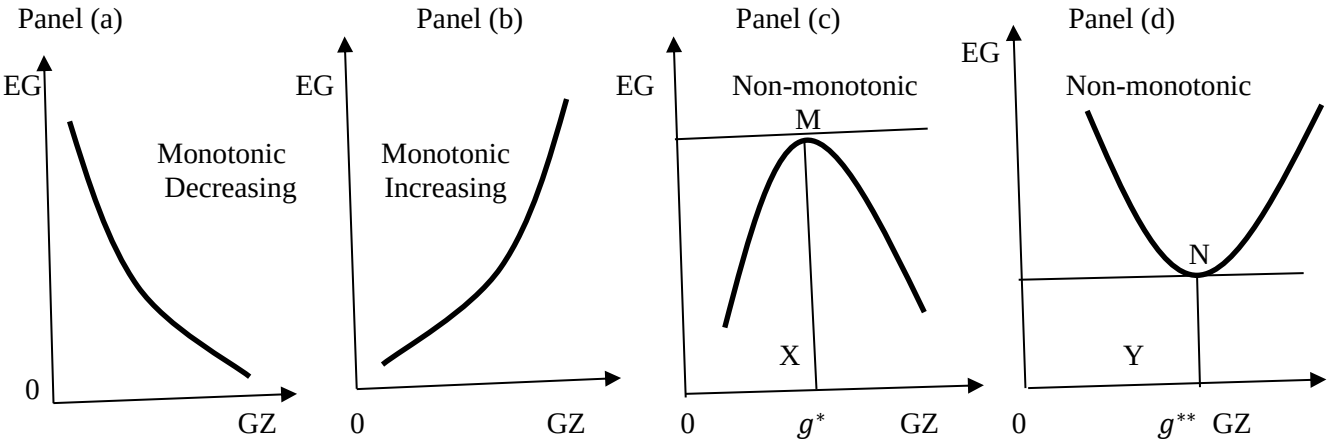

Figure 1: Monotonic and Non-monotonic Relations
Source: Authors' Compilation

The remaining parts of this paper are scheduled as follows: Following this section is Section 2, which presents a brief review of theoretical underpinning and empirical literature. Section 3 embodies the data and econometric methodology adopted to achieve the study objectives. Section 4 presents the empirical findings while section five draws the conclusion.

Theoretical foundation and empirical literature
Several theoretical constructs have emerged over time on the inevitability of government sector in the growth process. Such theories include the linear stages growth theory developed by an American, Walt Whitman Rostow. The theory canvassed for massive injection of capital coupled with government intervention as strategy for achieving speedy economic growth in less developed countries. Similarly, Harrod-Domar growth theory suggests that growth rate of output is determined by saving (s) and capital, (K), output, (Y), ratio (R). Accordingly, the growth model takes the form

$$y = \frac{s}{R} \qquad (1)$$

where

y =ΔY/Y, and

$R = K/Y$

In this simple model, saving rate and capital output ratio are considered as key determinants of growth. It is a common knowledge that an impoverished individual will have little or no saving. The government is expected, then, to spend big in such an economy to improve the

condition of the people to move from impoverished state to state of prosperity. This theory on its own is in line with the fiscal space hypothesis. In addition, the balanced growth theory developed by Ragnar Nurse is of the view that the government of any underdeveloped country needs to make large investments in a number of industries simultaneously in order to enlarge the size of market, increase productivity, and provide an incentive for the private sector investment. This view is absolutely in support for the crowding-in effect of government spending as against the crowding-out effect usually claimed by some economic scholars.

Government can influence the activities of the private sector positively through a lot of super provisions and packages that can step up per capita income of people and thereby give them access to participate in the production activities. This promotes the workings of the market system by enlarging the size of the market. Nurkse was also of the view that the poor size of the market in developing countries perpetuates its underdeveloped state. The proponent clarified the various determinants of the market size and puts primary focus on productivity. If the productivity levels rise in a developing country, its market size will expand and thus it can eventually become a developed country. Nurkse also asserted that developing countries lack adequate purchasing power, which implies that the real income of the people is low, although it may be high nominally in monetary terms. If the money income was low, the problem could easily be overcome by expanding the money supply. However, since it is the real income, raising the supply of money will only generate inflationary pressure. Neither will real output nor real investment rise. It is to be noted that a low purchasing power implies that domestic demand for commodities is low.

The critical minimum efforts otherwise known as the big push theory on its own suggests that, if a low level of equilibrium trap exists, it is argued that a critical minimum effort is required to escape from it. This view hangs on the belief that a vicious circle of poverty exists constraining development and makes it difficult to escape from it. Thus, a modest accumulation of capital may not raise incomes and hence low saving is bound to persist, but if a substantial capital accumulation can be achieved early on, income will be raised and savings generated to make the process of capital accumulation self-sustaining. Also, from the point view of Harvey Leibenstein, developing countries are generally characterized with vicious circle of poverty, which keeps them around a low per capita income equilibrium state. The way out of this logjam is a certain critical minimum effort which is strong enough to raise the per capita income to a level at which sustained development could be maintained.

The critical minimum effort in this context is related to minimum investment required to stimulate sustainable economic growth below which it will fail to raise the per capita income in the developing countries. This investment gap cannot be filled without government being actively involved to play a vital role to generate the minimum investment level required to sustain economic growth. The critical minimum efforts otherwise known as Big-Push theory suggests that developing countries required an injection of a level of investment often referred to as critical such that anything lower than it will yield no effect on economic growth. Unless the developing countries are able to meet up with this investment requirement, they may remain in the state of underdevelopment for a very long time. Governments of the developing countries can therefore engage in massive investment spending to accelerate the process of economic development in the developing countries. Government spending can be raised to generate such a required investment that will stimulate economic growth in these countries.

The popular Keynesian theory also emphasize that government sector is crucial to economic growth especially in an economy where there is low purchasing power. Increased government size will, others things being equal, raise aggregate demand, reduce unemployment and raise income level. John Maynard Keynes and the Keynesians opine that government expenditure is an exogenous factor that determines the growth of an economy. The school believes that an increase in government size will raise economic growth especially in developing countries where output is believed to be generally low. The endogenous growth theory also suggests that government activities are vital in the growth process. However, classical economists hold a pessimistic view of government intervention.

They, therefore, canvassed for limited government participation to avoid dead weight loss and distortionary effect of large government size on the economy. The destructive effects of having too powerful state as well as having too weak state have been widely acknowledged in the literature on public sector economics. Hence, the non-monotonic hypothesis is necessary to be tested due to the existing trade-off between efficiency and equity objective to be able to contain the eroding power of the state.

The tests of hypothesis of non-monotonic relationship are well documented in the empirical literature. For instance, Afonso and Furceri (2008) used the methodology of Afonzo, Schuknecht and Tanzi (2005) to provide evidence of non-monotonic relationship between government size and economic growth. Chen and Lee (2005) established a non-linear relationship between government size and economic growth for Taiwan. Similarly, Chen, Chen, and Kim (2011) also confirmed the existence of a non-linear relationship between government size and economic growth. Other studies have embarked on the use of non-linear approach to explain the non-monotonic relation between government size and economic growth. For instance, Afonso and Furceri (2008), and Anaman (2004) are notable studies. Bergh and Henrekson (2011) also employed similar approach for Organisation for Economic Co-operation and Development (OECD) and European Union (EU) countries. Other studies have used similar approach. For instance, Mankiw, Romer, and Weil, (1992), Anaman (2004), Herath, (2012), Bozma, Başar and Eren (2019), and Coayla (2021) tested the existence of Armey Curve hypothesis using ARDL cointegration technique. The results showed that the Armey Curve Hypothesis was valid for the US, Canada, and France but not valid for other G7 countries. Studies on the nexus between government size and economic growth in the ECOWAS region are mostly country-specific and have focused more on linear framework rather than the non-linear one. For instance, Amoafo (2011), Richard (2009), Loto (2010), Okpara and Nwaoha (2010), among others. Some studies that used the non-linear approach are country-specific, for instance, Nasiru (2012), Asogwa, Okwudili and Urama (2019), are among others. This current study takes up this challenge by providing a unique frontier of knowledge on empirical evidence regarding the existence of non-monotonic relationship between government size and economic growth in the ECOWAS region. This is in simultaneous consideration for import and export of goods and services, stock of money supply, consumer prices, exchange rates, unemployment rates, and population growth rates in the region using a dataset for 1991–2018.

Method

This study employed secondary data covering the period 1991–2018 on panel of countries in the ECOWAS region. The data were sourced from World Development Indicators (WDI) of the World Bank, International Financial Statistics (IFS), and Government Financial Statistics (GFS). The data collected were analyzed based on non-linear models formulated and estimated to achieve the study objectives.

Empirical Models

The study hangs on the simple production function of the type

$$Y = f(l, k) \quad (2)$$

where

Y is the total output

l is the labour force

k is the physical capital

The Solow growth model emphasized technological progress in what the model called exogenous technology as an important growth determinant. On this basis the simple model in (2) was augmented with exogenous technology and now expressed as

$$Y = af(l,k) \quad (3)$$

where a represent the exogenous technology and other variables remained as previously defined

The augmented Solow growth model inspired by Mankiw *et al*, (1992) considered the role of human capital in the growth process and hence factored in human capital as an important variable input. Incorporating human capital into the growth model,

$$Y = af(l,k,h) \quad (4)$$

where h represents human capital input

The endogenous growth model of Barro (1990), and Barro and Sala-i-Martin (1992) emphasized the role of the public sector in the growth process. Hence is the need to include public capital in the model of economic growth. By incorporating public capital input, the model becomes

$$Y = af(l,k,h,G) \quad (5)$$

where G represents the public capital input

It is logically plausible to admit that countries of the world are differently endowed in these factor inputs that determine the rate of economic growth across nations and also that the gap in these variable inputs may altogether or individually account for the gap in economic growth rate among countries of the world. Assuming the gap in labour, physical capital and human capital is bridged such that labour, physical and human grow at a constant rate, variation in economic growth will be accounted for by the growth rate of public capital. Considering a number of strategic macroeconomic variables to use as control, the model becomes

$$Y = af(\bar{l},\bar{k},\bar{h},G,R) \quad (6)$$

where $R = \text{vector of control variables}$

The partial derivative of (6) with respect to each of $l, k, and\ h$ is zero. Hence, (6) now becomes

$$y = af(g,r) \quad (7)$$

where r is a vector of control variables such as import and export of goods and services, exchange rate, money supply, inflation, unemployment, and population growth rate.

Following a simple Cobb-Douglas production function, (7) can be expressed as

$$y_t = ag_t^{\alpha} r_t^{\beta} \quad (8)$$

Linearizing (8) and express it econometrically,

$$\mathbf{y_{it}} = \boldsymbol{\alpha_0} + \alpha g_{it} + \beta r_{it} + \boldsymbol{e_{it}} \quad (9)$$

where $'\boldsymbol{e}'$ is a disturbance error term and $'\boldsymbol{t}'$ is time period

The focus of this study is to test the hypothesis of non-monotonic relation between government size and economic growth in a panel of 12 ECOWAS countries following a non-linear modelling procedure. The non-linear model is thus expressed as a quadratic function in g as

$$\mathbf{y_{it}} = \boldsymbol{\alpha_{0i}} + \lambda_i g_{it} + \phi_i g_{it}^2 + \beta_i r_{it} + \boldsymbol{\varepsilon_{it}} \quad (10)$$

where $\boldsymbol{\varepsilon}$ is said to be a white noise error term and $\boldsymbol{i}$ represents the number of cross-sectional units. y is natural logarithm of GDP which is used to proxy economic growth rate. g is government size variable denoting the level of government expenditure share in GDP, $\boldsymbol{g^2}$ is the quadratic term of government size variable as government spending keeps rising until it squares itself over time, r is a vector of control variables as earlier defined. Similarly, $\boldsymbol{\alpha_{0i}}$, λ_i, ϕ_i and β_i are the parameters to be estimated, $\boldsymbol{\varepsilon_{it}}$ is white noise error term.

The model was based on the proposition that the effect of government spending size on economic growth is not always positive or negative. Lower or higher government size could make or mar economic growth before reaching a certain threshold or stationary point beyond which, it begins to have negative or positive effect on economic growth. Hence, in this model, the focus is on the significance or non-significance as well as the magnitude of λ_i and ϕ_i.

To confirm the nonlinearity relationship between government size and economic growth, the two parameters λ_i and ϕ_i must both be significant and bear opposite signs; otherwise, the relationship would be linear. For instance, if λ_i and ϕ_i are both significance with $\lambda_i < 0$ while $\phi_i > 0$, the relationship is U-shaped or convex. Alternatively, if λ_i and ϕ_i are both significance with $\lambda_i > 0$, while $\phi_i < 0$, the relationship is concave or inverted U-shaped (∩).

The derivation of the optimal size requires solving the first order condition (FOC), from equation (10)

$$\frac{\partial y_{it}}{\partial g_{it}} = \lambda_i + 2\phi_i g_{it} = 0 \quad (11)$$

Solving g_{it} from equation (11), the optimal size is thus obtained as

$$g_{it}^{*} = \frac{-\lambda_i}{2\phi_i} \quad (12)$$

Equation (12) defines the optimal government size that exists at the turning point on the quadratic function.

Unit root test

The stationarity property of the panel data was investigated by conducting the test of unit root on each of the variables. The unit root test is conducted in order to ascertain whether a variable is level or difference stationary. The null hypothesis of unit root was tested against the alternative hypothesis of no unit root. If the variable is stationary at level, then, it is said to be integrated of order zero, I(0). If a variable is stationary at first difference, then, it is said to be integrated of order one, I(1). The unit root test helps to identify the order of integration of each of the variables in the VAR system. The study employed panel unit roots such as Levin, Lin and Chu (LLC), Im, Pesaran and Shin, ADF-Fisher and PP-Fisher. The null hypothesis of unit root is tested against the alternative hypothesis of no unit root.

$\boldsymbol{H_0 : \rho = 0}$ as against $\boldsymbol{H_1 : \rho \neq 0}$. The test was conducted at 1%, 5%, and 10% levels of significance.

Results

The result in Table 1 shows the descriptive summary of the key variables in the study. The average growth rate of GDP was about (9.7%) while population growth rate was about (2.75%) on the average. The government size which is measured as the average share of government expenditure in GDP was about (13.7%), the average inflation rate as well as unemployment rate was about (1.85%) and (4.55%) respectively. The average share of export and import in GDP were found to be about (24.32%) and (32.56%), respectively.

Table 1: Descriptive Summary of some of the key variables in the study

	GDPGRT	GSIZE	INFRT	UEMPRT	EXPSHRGDP	IMPSHRGDP	PGRT
Mean	9.738693	13.31589	1.852834	4.548357	24.31500	32.56040	2.751038
Maximum	11.75473	73.57668	2.406716	11.71000	53.81996	68.31552	4.629681
Minimum	8.314831	0.911235	0.406677	0.273000	4.902490	9.509990	-0.444094
Std. Dev.	0.694509	8.344955	0.292966	2.700048	9.282400	10.67248	0.611573

Source: Authors' Compilation

Distribution of GDP by countries

The average GDP was computed for each country over the period 1991-2018. The outcome is presented both in tabular and graphical form, respectively, in Table 2 and Figure 2. Guinea-Bissau has the least GDP of about US$0.64billion while Nigeria has the highest GDP of about US$221.71billion. Guinea-Bissau contributed the lowest representing about 0.19% while Nigeria contributed the greatest representing about 64.86% of the total group average GDP.

Table 2: Average GDP by countries (1991-2018)

Country	Average GDP (US $'billions)	Group Average GDP Distribution (%)
Benin	5.17	1.51
Burkina-Faso	6.37	1.86
Cameroon	20.28	5.93
Cote D'Ivoire	20.14	5.89
Gambia	1.07	0.31
Ghana	23.66	6.92
Guinea-Bissau	0.64	0.19
Mali	7.50	2.19
Niger	4.23	1.24
Nigeria	221.71	64.86
Sierra-Leone	2.09	0.61
Togo	2.67	0.78
Group Average GDP	**26.29**	
Group Total GDP	**341.82**	

Source: Authors' Compilation

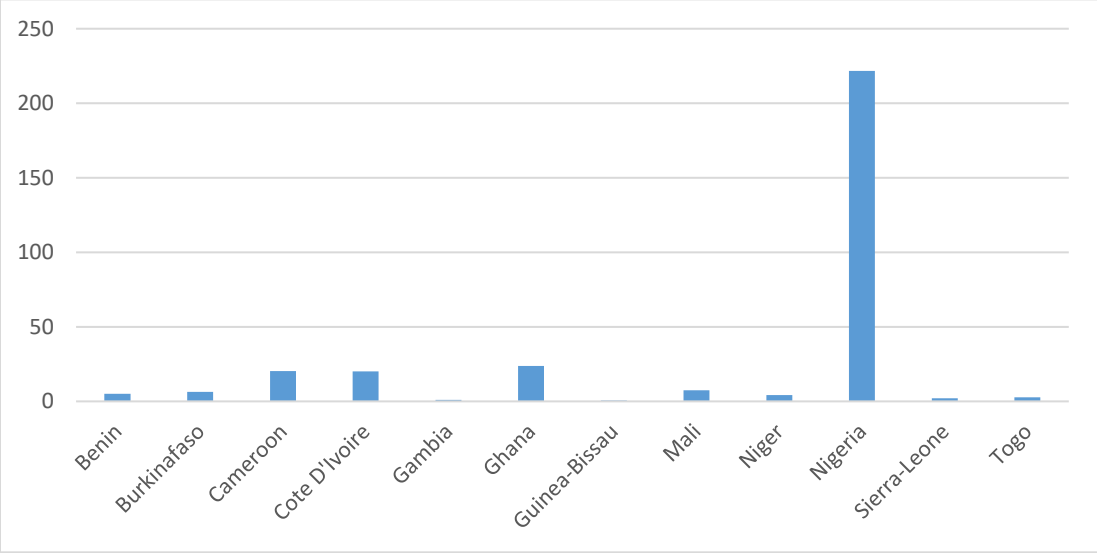

Figure 2: Average GDP in billions of US dollar by Country (1991-2018)
Source: Authors' Compilation

Distribution of Government Size by Countries

The average government size for each of the countries in the study is presented in Table 3 and Figure 3. Burkina-Faso has the highest government size of about 22.40%, followed by Togo with about 21.41%. Surprisingly, Nigeria has the least government size of about 4.38%.

Table 3: Average Government Size in percentage (1991-2018)

Country	Average Government Size (%)
Benin	14.44
Burkina-Faso	22.40
Cameroon	11.62
Cote D'Ivoire	13.41
Gambia	10.59
Ghana	10.72
Guinea-Bissau	10.53
Mali	14.91
Niger	15.06
Nigeria	4.38
Sierra-Leone	10.33
Togo	21.41
Group Average	**13.32**

Source: Authors' Compilation

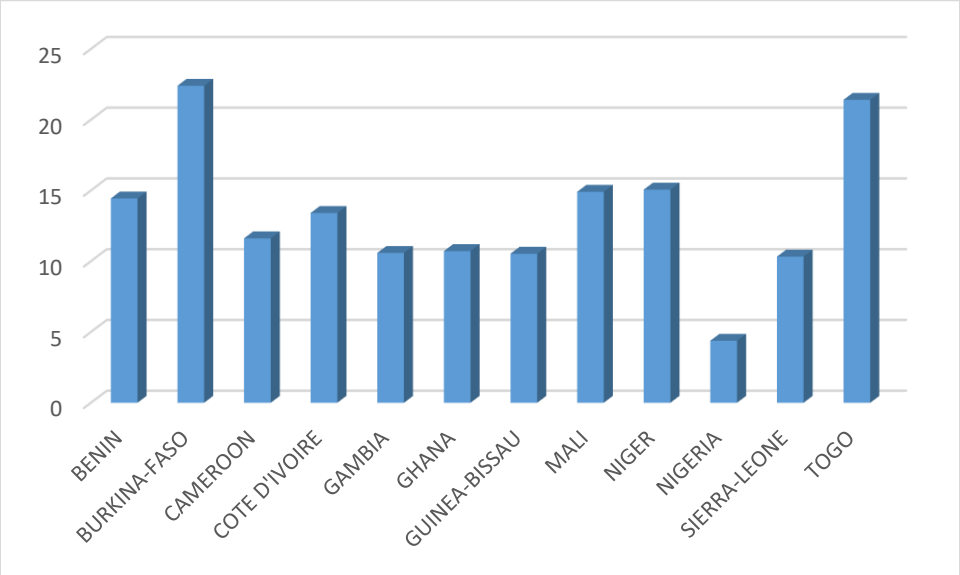

Figure 3: Average Government Size by Countries (1991-2018)
Source: Authors' Compilation

Trend of Government Size and GDP

Figures 4 and 5 show the trend in growth rate of government size and economic growth in the ECOWAS territory. Both variables moves together almost in similar pattern but one variable marginally outgrew the other. From the figure, it is equally observed that both variables are characterized with both downward and upward trends though dominated by upward trend.

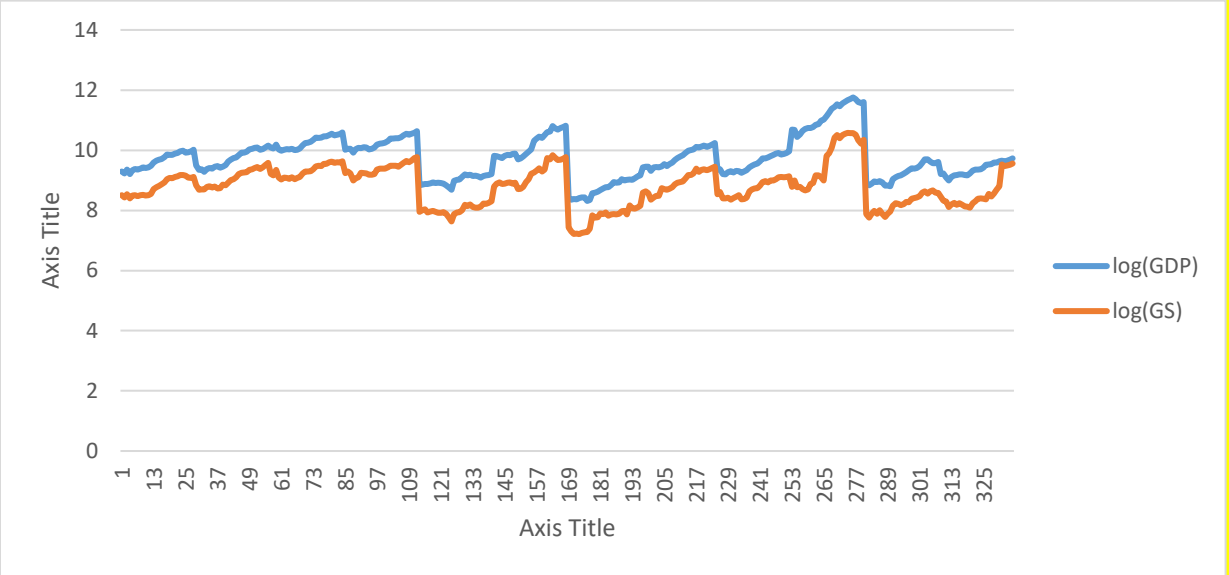

Figure 4: Average GDP-Government Expenditure growth rate by Country (1991-2018)
Source: Authors' Compilation

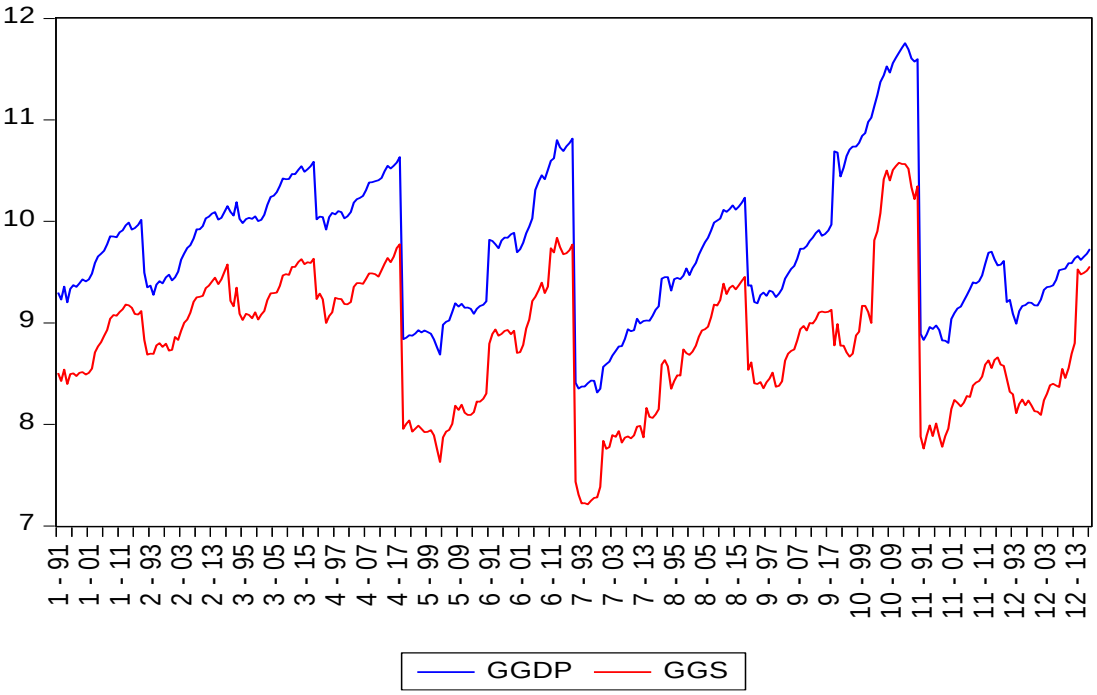

Figure 5: Average GDP-Government Expenditure growth rate by Country (1991-2018)
Source: Authors' Compilation

Unit Root Test

Panel unit root test (PURT) was conducted to account for the stationarity condition of each of the variables in the study**.** The test was conducted with trend and a constant term. The lag length determination is done automatically using SIC.

The result in Table 4 shows that most of the variables especially GDP growth rate as well as government size in the estimated models are stationary at level. The variables are said to be I(0). A variable is said to have a unit root if all or both LLC and IPS fail to reject the hypothesis of

unit root. A rejection of the hypothesis of unit root implies that the series is stationary. The orders of integration, *I*(d), of the other control variables, as displayed in Table 1, are reported in Table 4. Four of the control variables are I(1) while the remaining variables are I(0). As usual, the variables with I(0) result have no unit root and are stationary at level. On the other hand, the variables with I(1) order of integration has unit root and became stationary only after first differencing.

Table 4: Results of Panel Unit Root Tests

Variables	LLC	IPS	ADF-Fisher	PP-Fisher	I(d)
LGDP	-2.09**	-2.28**	43.34*	42.19*	I(0)
GSIZE	-1.37***	-2.81*	48.08*	47.08*	I(0)
GSIZE^2	-1.83**	-3.10*	50.39*	49.84*	I(0)
MSPCGDP	1.63	1.66	12.02	12.4	-
∆MSPCGDP	-7.78*	-4.79*	97.91*	209.69*	I(1)
EXPTPCGDP	-0.43	0.44	19.81	27.76	-
∆EXPTPCGDP	-8.90*	-9.41*	121.39*	635.08*	I(1)
IMPTPCGDP	-1.49***	-2.19*	36.55*	48.21*	I(0)
EXCR	-1.31***	-1.49***	32.86	13.6	I(0)
UEMPRT	-0.99	-1.15	28.84	14.72	-
∆UEMRT	-3.69*	-3.77*	53.81*	74.61*	I(1)
INFRT	-2.11	2.36	23.22	4.81	-
∆INFRT	-7.27*	-7.81*	107.92*	96.73*	I(1)
PGRT	-11.75*	-16.24*	644.58*	26.4	I(0)

, ** and * denotes rejection of the hypothesis of unit root at level at 1%, 5% and 10% significance level respectively*

Source: Authors' Compilation

Test of Cointegration

In order to avoid any deficiency in the outcome of this study over the choice of estimation method, the non-stationary variables were tested for cointegration. Engle-Granger cointegration approach was first used to determine if the group of individually non-stationary variables would converge to a long run equilibrium by being cointegrated. If variables are individually non-stationary while their linear combination is stationary, then they can be modelled together using OLS. The result of KAO cointegration test shows that the variables cointegrate. This means that they converge to a long run equilibrium and the OLS estimation is unbiased, efficient, and consistent. The residual series obtained from the OLS estimation was tested for unit root to know whether it is stationary or non-stationary. The result also shows that residual series are found to be stationary confirming that the variables are of course cointegrated. Table 5 presents the result obtained from Kao's cointegration test. From the table, there is existence of cointegration among the group of individually non-stationary variables. ADF (t-statistic) of -6.08 has p-value of 0.0001. The existence of cointegration is a proof of long run relation and the appropriateness of OLS method of estimation.

Table5: Result of Kao and Engle-Granger Cointegration Test

Kao Cointegration Test		
	t-statistic	**P-value**
ADF	-6.075338*	0.0000
Residual Variance	0.009046	
HAC Variance	0.007151	
Combined Fisher's Cointegration Test		
Engle-Granger Cointegration Test		
Levin, Lin and Chu t	-1.8459**	0.033
Im, Pesaran and Shin W-Stat	-1.2870***	0.099
ADF-Fisher Chi-square	38.2628**	0.033
PP-Fisher Chi-square	37.1176 **	0.043

*, **, *** denote the significance level at 1%, 5% and 10% respectively
Source: Authors' Compilation

Quadratic Model Estimation Result

The result of the estimated quadratic function is shown in Table 6. The null hypothesis on the absence of non-monotonic relationship between government size and economic growth could be comfortably rejected. Taking the behaviour of other variables as given, the result in Table 6 showed that government size has a negative and significant effect on growth while the square of government size has a positive and significant effect on growth. This confirms the non-monotonic hypothesis in the relationship between government size and economic growth. The result also shows that a decrease of about 6% in unemployment rate, 7.8% in import of goods and services and 0.03% in exchange rate respectively, made GDP grew by 10%. Inflation rate, export of goods and services, and population growth rate have positive effect on the growth of GDP in the region. A 10% growth in the GDP of the ECOWAS region was due to 9.1%, 1.6%, and 3.2% increase, in inflation rate, export of goods and services, and population growth rate respectively. The coefficient of government size was negative whiles its quadratic form was positive. This showed convexity where growth of GDP first fell and rose after reaching a threshold.

The coefficient of the linear term is negative and significant while the coefficient of the quadratic term is positive and significant even at 1% level. This confirms the non-linearity case and the existence of non-monotonic relationship between government size and economic growth. It follows a U-shaped rather than an inverted U-shaped ***∩*** pattern**.** Economic growth first starts to respond negatively to increase in government spending until after a point of equilibrium is reached when the increase in government spending is substantial enough to produce the desired positive effect on economic growth. The estimated result is as presented in Equation 13.

$$LGDP = -0.0902114418719 * GSIZE + 0.00106421604513 * GSIZE^2 + 9.26779804779E-06 * MSPCGDP - 0.0594851649564 * UEMRT + 0.091349360588 * (EXPTPCGDP) - 0.0777531788724 * (IMPTPCGDP) - 0.000347485248559 * EXCRT + 0.0160185351334 * INFRT + 0.324593011717 * PGRT + 21.8075048869 \quad (13)$$

On differentiating the estimated function with respect to $GSIZE$,

$$\frac{\partial InGDP}{\partial GSIZE} = -0.0902114418719 + 2 * 0.00106421604513 * GSIZE = 0 \quad (14)$$

Equation 14 is the FOC. On solving for the FOC,

$$0.00212843209026 * GSIZE = 0.0902114418719 \quad (15)$$

The optimal government size ($GSIZE = g^*$) = **-(**-0.0902114418719)/2(0.00106421604513)

= 0.0902114418719/0.000212843209026

= 42.39

≈ 42%

Although this result confirms the existence of non-monotonic hypothesis between government size and economic growth, it does not verify the popular Armey Curve. Rather, it moves in the opposite direction. The Armey Curve is inverted U-shaped. The finding in this study is U-shaped non-monotonic relation. The coefficient of government size is negative while that of government size squared is positive with both coefficients being significant at 1%. The optimal value in this case is not maximum but minimum. The result also shows that while population growth rate is not significant, high inflation rate, unemployment rate, exchange rate, and import of goods and services significantly slow down economic growth process in this economic sub-region. Export of goods and services has positive and significant effect on economic growth.

Table 6: Results of Panel Model Estimate

Dependent Variable =InGDP			
Variables	**Coefficient**	**t-Stat**	**P-value**
GSIZE	-0.0902	-3.853*	0.0001
GSIZE^2	0.0011	3.291*	0.0011
MSPCGDP	9.27E-06	0.696	0.4867
UEMRT	-0.0595	-2.312**	0.0214
EXPTPCGDP	0.0913	9.500*	0.0000
IMPTPCGDP	-0.0778	- 9.438*	0.0000
EXCRT	-0.0003	-1.202	0.2304
INFRT	0.016	8.095*	0.0000
PGRT	0.3246	2.776*	0.0058
C	21.808	46.652*	0.0000
R^2	0.432		
R^{-2}	*0.42*		
F-stat	*27.526*		0.0000

** (**) denotet (1%), (5%) significance level*

This result does not conform to several prior studies who have established a non-monotonic relationship in line with Armey Curve scenario. Barro (1990) who established 25% optimal (max) for the US economy. Scully (1994) found a slightly different optimal (max) of 23% for the USA. Vedder and Gallaway (1998) confirmed optimal (max) of 17.5% for the United States between 1947 and 1997. Witte and Moesen (2010) obtained optimal (max) of 32% for the USA. Chen and Lee (2005) established optimal (max) of 20.6% for Taiwan. Mustacu and Milos (2009) found optimal (max) of 30.42% for a sample of 15-EU countries. Pevcin (2004) confirmed optimal (max) of between 36% and 42% for a sample of 12 European countries. Miller (2019) established an optimal (max) of 20.6% for Mississippi between 1992 and 2015. Nasiru (2012) confirmed an optimal (max) of about 23% for Nigeria. However, the finding conforms with the Big-Push theory otherwise known as the Critical Minimum Effort (CME) which suggests that anything less than the minimum investment outlay may not lead to economic development in many developing countries. Modest investment was said to be to no avail. Governments of developing countries are big investment providers and sustainers.

Considering the low income per capita and level of poverty, government expenditure must rise to the point of making a sustainable positive impact on economic growth to ensure the fortune of mass unemployed and vulnerable individuals across countries in this economic sub-region.

Conclusion

The main focus of this study is to test the hypothesis of non-monotonic relationship between government size and economic growth with consideration to stock of money in the economy, import, and export of goods and services, population growth rate, inflation, unemployment and exchange rate in the ECOWAS region. Data covering 1991 to 2018 on key variables were sourced mainly from World Bank Group database. Models were formulated following the conventional growth model based on simple Cobb-Douglas production function. The study employed the non-linear approach using panel econometric technique of analysis to achieve its objective. The result of panel least square confirms the non-monotonic hypothesis in favour of U-shaped curve as against inverted U-shaped **[**∩**]** of Armey Curve scenario found for many developed countries. This indicates that there is existence of non-monotonic relationship between government size and economic growth in the ECOWAS region. The result also shows that while money supply and exchange rate were not significant, unemployment rate and import of goods and services significantly contribute to the low pace of economic growth in this region. Export of goods and services is found to have positive and significant impact on growth.

The policy implication is that while each of the member countries should adhere strictly to the optimal (min) of about 42% of GDP, which seems to be the level at which government size begins to contribute meaningfully to economic growth, they should equally pay adequate attention to any measure that promote export of goods and services. Every attempt should be made to expand export trade to generate additional employment and foreign exchange earnings for the economies. The use of local content should also be encouraged to sustain the growth of export trade sub-sector. Discretionary import policy should be adopted. Imports that complement local production for export expansion can be allowed across the borders while those imports that hinder the growth of local firms should be banned. The use of import quota becomes necessary so that the relative importance of every foreign goods and services must be verified before such are given considerations.

Inflation rate should be moderate such that does not constitute a problem to both the demand and supply channels. Policy focus should be geared against unemployment. The economies should be able to employ and absorb all resources within the region. There should be no vacuum for waste or idle capacity. Money supply should be jerked up to make it significant and allow the interest rate to be very low to make loanable fund affordable to allow entrepreneurial intentions translate into entrepreneurial action in form of new jobs openings in different sectors of the economy. Some urgent measures have to be taken to raise the value of domestic currencies to bring down the escalated exchange rates and suppress the highly volatile exchange rate regime that has been harmful to economic growth. The stability of the value of domestic currencies relative to foreign currencies should be of great concern to policy makers. The needed synergy should be provided to move the economy away from the state of fragility to state of stability. The study therefore concluded that while there is existence of non-monotonic relation between government size and economic growth, the Armey Curve scenario cannot be verified in the ECOWAS region.

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