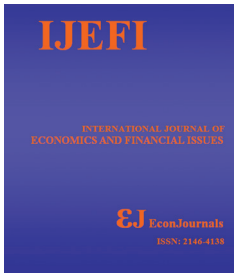


**International Journal of Economics and Financial Issues**

ISSN: 2146-4138

available at http: www.econjournals.com

**International Journal of Economics and Financial Issues, 2017, 7(4), 628-637.**

# Government Size and Economic Growth in Africa and the Organization for Economic Cooperation and Development Countries

**Wanjuu Zungwe Lazarus[1], Hlalefang Khobai[2]*, Pierre Le Roux[3]**

[1]Department of Economics, Nelson Mandela Metropolitan University, South Africa, [2]Department of Economics, Nelson Mandela Metropolitan University, South Africa, [3]Department of Economics, Nelson Mandela Metropolitan University, South Africa. *Email: hlalefangk@gmail.com

**ABSTRACT**

This study investigates the impact of government expenditure on economic growth of 27 countries of the Organization for Economic Cooperation and Development (OECD), 50 African countries, and 77 OECD and African countries. The study establishes that the optimum government sizes were 36.61%, 15.61%, and 23.13% for the 27 OECD, 50 African, and 77 African and OECD countries, respectively. The actual government sizes were 18.9%, 14.06%, and 18.76% of the RDGP for the 27 OECD countries, 50 African countries, and the 77 OECD and African countries, respectively. The study concludes that there exists inverted u-shape curve in the three panel regression models estimated. The optimum government sizes were below the actual government sizes in the three regression models studied. The optimum government size in Africa countries is lower than the optimum government size in the OECD countries. The low level of government size in Africa countries reflects the low level of economic development in Africa and vice versa for the OECD countries.

**Keywords:** Generalized Method of Moments, Optimum Government Size, Economic Growth
**JEL Classifications:** C23, E62, F43, O47

## 1. INTRODUCTION

There are two main growth models that explain economic growth. The first growth model is the Solow (1956) and Swan (1956) model and the second is the endogenous model developed by Romer (1986), Lucas (1988), Barro (1989) and Rebelo (1991). The first growth model states that economic growth is determined by an exogenous technological change. Internal variables like government policy, government expenditure, capital accumulation, economic institutions have no influence on economic growth except during the transitional period (Romer, 2011). Thus, the Solow-Swan model states that government expenditure and other endogenous variables cannot determine economic growth.

With the emergence of the endogenous growth theory, however, the theoretical reasoning has changed. The endogenous growth theory enunciates that the technological growth is endogenously determined. The endogenous growth theory states that not only technological change but government can influence the cause of long-run economic growth (Barro, 1990). This study is designed to assess how government expenditure can linearly affect economic growth in the context of OECD and African countries.

The study is designed to achieve two objectives. The first objective is to determine the effect of government expenditure on economic growth in the OECD countries, African countries, and OECD and African countries. The second objective is to ascertain if optimum government size exists and if it does exist what is the optimum size in the 27 OECD, 50 African countries, and 77 OECD and African countries. The study is, therefore, designed to investigate two contrasting scenarios, the impact of government expenditure in the group of richest and the poorest countries. This can, therefore, enable us to identify if separate government sizes exist for the poor and rich countries. The optimum government size is the ratio of government expenditure to the gross domestic product (GDP) that maximizes economic growth.

Theoretically, it is argued that the society without a government stands to have a very low level of economic growth. The reason is that there is no rule of law and property rights and so no incentive to work hard and own properties. When the state is formed, there is rule of law, property rights, and order. There is an incentive to work and own properties. The government also provides public goods that reduce the cost of private production. The reduced production cost gives a competitive advantage to private productive activities in the international arena (Wanjuu, 2016). All these lead to increasing private sector output.

On the other hand, the emergence of state leads to taxation of the public to provide public sector goods that are necessary for rule of law and property rights. Taxation reduces the incentive to work and reduces economic growth. As state activities increase, the efficiency in the use of state resources reduces. This leads to reduced utility of publicly provided services. At a low level of the government, the benefits from government provided services outweigh their cost leading to increasing productivity of government services. As state expenditure increases, the marginal productivity of government services falls until it becomes negative. From the foregoing, it can be argued that government provided services can improve the productivity of the society at the low level of spending but at a high level of government spending, government spending reduces the productivity of the private sector. Therefore, optimum government size must exist somewhere around the medium point. The optimum government size is computed using the using the BARS curve. The BARS curve is named after Barro (1989), Armey (1995), Armey and Armey (1995), Rahn and Fox (1996) and Scully (1994; 1995). The BARS curve has an inverted u curve.

The remainder of the paper is organized as follows: Section two reviews both theoretical and empirical literature. Section three explains the research methodology applied in this study. Section four presents the results of data analyses and discusses the result. Section five gives the concluding remarks of the study.

## 2. LITERATURE REVIEW

### 2.1. Theoretical Literature Review

The main theory that explains the relationship between government expenditure and economic growth is the BARS curve. The BARS curve measures the relationship between government sizes as the percentage of the GDP and the economic growth, the GDP growth rates. One explanation of the BARS curve is based on the theory of market failure (MF) and state failure, (Facchini and Melki, 2013). The inverted U-shape BARS curve simply means that government expenditure is good for economic growth up to a certain point beyond which government expenditure depresses economic growth (Facchini and Melki, 2013; Aleksandrivich and Upadhyaya, 2015). Mathematically, the BARS-curve can be stated as:

$$RGDPGR=\alpha+\beta G-\gamma G^2 \quad (1)$$

Equation (1) states that economic growth measured by real GDP growth rate (RGDPGR) is dependent on the size of government (G) measured by the ratio of total government expenditure divided by the RGDP and the square of G. The positive sign of the coefficient G indicates the beneficial effect of government expenditure on economic growth (Vedder and Gallaway, 1998). On the other hand, the negative coefficient of $G^2$ shows the negative effect of government size on economic growth (Tabassum, 2015). Equation (1) is BARS equation and it is presented in Figure 1.

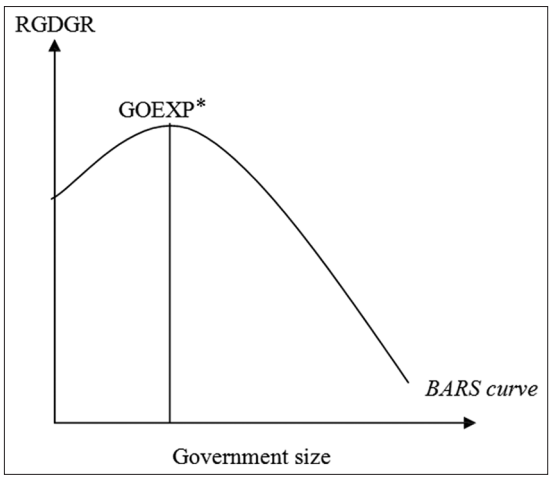
The factors accounting for the positive effect of G on economic growth are many. One, it is argued that the existence of government with government spending promotes RGDP growth (Herath, 2009). In a society without government, there is no order and anarchy prevails (Leeson, 2007; Stringham, 2005). When a state is formed, rule of law, property rights, order, and stability are established and the risk of legal predation is reduced (North et al., 2005; Cowen, 1992). Holcombe (2004) noted, without the modern state, predatory groups would spring up, collude among themselves, and form a clique to exploit the wealth of the society.

The second factor making the state intervention to remedy MF and to stimulate economic activities is the provision of public goods. Di Matteo (2013) noted that if the private sector is left alone to provide public goods (such as roads, education, sanitation, etc.) the quantity of public goods provided will be inadequate. The third factor is ameliorating negative externalities of the private sector businesses like pollution from factories (Pingle and Mahmoudi, 2015). It is argued that the modern level efficient production attained by the private sector is made possible by the state role in providing the medium of exchange.

On the other hand, there are certain aspects of government expenditure that depressed economic growth. These account for the falling BARS curve. One of the aspect of government intervention is taxation. Taxation discourages productive behaviour like investment and hard work (Peden, 1991; Vedder and Gallaway, 1998).

The second aspect of government activities that reduces economic activities is transfer payments discourages productive activities. Transfer payments discourage people from taking up some jobs. This reduces output. The existence of the public sector also creates opportunity of earning economic rent from unproductive activities

**Figure 1:** BARS curve



like having access to official foreign exchange and selling in the black market thereby earning economic rent (Peden, 1991). This discourages some talented individuals from engaging in productive activities.

All these factors which make government intervention in the economy disadvantageous for productive activities and are collectively called government failure (GF). Activities of government that cause GF make the BARS curve to fall while activities of government correcting MF stimulate economic growth thereby making the BARS curve to rise. As the size of government increases, the marginal productivity of government expenditure falls, like the marginal product of capital or labour. The declining marginal productivity of government expenditure reflects the fact that the harmful effect of GF has overpowered the beneficial effect of government activities in correcting MF. This makes the BARS curve to fall. As long as the beneficial effect of correcting for MF is greater than the harmful effect of GF the BARS curve will continue to rise. At the point, both the beneficial effects are equal to the harmful effects, the BARS curve is at the optimum point.

## 2.2. Empirical Literature Review

The effect of government activities in stimulating economic growth has prompted a plethora of empirical studies because of several theoretical postulations of how government activities are likely to impact on growth. These studies may be classified into two broad groups: (i) Linear relationship, and (ii) Non-linear relationship. Examples of these studies that estimate the linear impact of government expenditure on economic growth are Rubinson (1977), Ram (1986), Grossman (1987; 1988), Landau (1983), Barro (1990). Other early studies in this categories are Kormendi and Meguive (1985) and Hsieh and Lai (1994). Most of these studies established that government expenditure depressed economic growth. Facchini and Melki (2013) studied a sample of 47 of this linear relationship between government expenditure and economic growth. 30 of these studies showed that government expenditure depressed economic growth; 5 show that government expenditure stimulates economic growth, and 12 were inconclusive.

The studies showing that government expenditure impact on economic growth is not linearly related started in the late 1980s with the work of Grossman (1987; 1988), Peden (1991), Scully (1994) and Carlstrom and Gokhaire (1991). Most of these non-linear studies were based on the study of advanced countries. These studies were aimed at establishing the optimum size of government expenditure in a panel of countries or individual countries.

A review of a sample of 7 studies of non-linear relationship between government expenditure and economic growth in the United States of America (USA) indicates that the optimum size has a range of 17-22.9%. These studies are Grossman (1987) and Grossman (1988) who established the optimum size of 19% and no optimum size, respectively. Peden (1991) and Scully (1994) established the optimum government size of 20% and 21.5-22.9%, respectively.

Vedder and Gallaway established the optimum size of 19%; Carlstrom and Gokhale (1991) and Guerrero and Parker (2012) study did not establish any optimum size.

Ferris (2013) studied the optimum government size in New Zealand using the data for 1890-2012. The study applied ordinary least squares (OLS), fully modified OLS (FMOLS) and dynamic OLS (DOLS) regression models. It established that the optimum government sizes are 25.3%, 29.4% and 28% for OLS, FMOLS and DOLS, respectively. The actual government size was 33% for the period studied.

Chao and Grubel (1998) empirically established the optimum government size in Canada to be 27% of the RGDP. The data applied covered the period of 1929-1996. Mavrov (2007) has studied the optimum government size in Bulgaria. The study used data for the period of 1990-2004 and the study established the optimum government size to be 21.42% of the RGDP.

Herath (2009) investigated the optimum size of government in Sri Lanka. The data used was for the period of 1959-2003. The study established the optimum size of 26.87% of the GDP; while the actual government size was 29% of the RGDP. Tabassum (2015) established the optimum size in Pakistan to be 19.3%. The data applied covered the period of 1976 to 2013. The actual government size was 21.4% of the RGDP. Facchini and Melki (2013) studied the optimum government size in Italy using a long-time span of data covering the period of 1871-2008. The study established the existence of the BARS curve. The study established the optimum size of government to be 30% of the RGDP. Forte and Magazzino (2016) also investigated the optimum government size in Italy using data for the period of 1861-2008. The study breaks the data into sub-periods of 1886-1939, 1946-2008 as well as the entire period of 1861-2008. The results showed that optimum government expenditure existed in Italy. The result also showed that the existing public expenditure in Italy surpasses the optimum government size as the proportion of the RGDP.

Some panel data empirical studies of the impact of government size on economic growth are reported in this study. Among these studies are Karras (1997) who studied the optimum government size in a panel of 118 countries in both developed and developing countries. The data applied for the research covered the period of 1960-1985. This study established that government size in the countries studied was 23% of the GDP. Asimakopoulos and Karavias (2015) investigated the optimum government size of government expenditure on economic growth in a panel of 129 countries. These countries comprised of 43 less developed countries (LDCs) and 86 DCs. The method of estimation of the population parameters employed was the generalized method of moment (GMM). The study established the optimum government sizes in the LDCs to be 19.12% and 17.96% for DCS, respectively. The actual government size in the LDCs and DCs were 14.83% and 17.88% of the GDP, respectively. The result of this study showed that government expenditure stimulated growth in both LDCs and DCs.

Legge (2015) estimated the optimum government size in a panel data comprising of 167 countries. These countries comprised DCs and LDCs. Legge (2015) study did not find any optimum government size in the countries studied. Altunc and Aydin (2013) examined the existence of optimum government size in three

countries: Turkey, Romania and Bulgaria. The study used data covering the period of 1995-2011. The study applied GMM method of estimating the parameters of the population. The results of the study showed that the optimum government size in the countries studied were 25.21%, 20.44% and 22.45% for Turkey, Romania and Bulgaria, respectively.

Scully (2000) studied the optimum government size in 22 countries of the Organization for Economic Cooperation and Development (OECD). The results of the study showed that the optimum government size in the countries studies fell within the range of 20.2-22.3% of the RGDP. Afonso et al. (2003) also investigated the optimum government size in 23 OECD countries. The data applied covered the period of 1990-2000, a period of 11 years. The result showed that the optimum government size was 35% of the RGDP for the period studied.

Pevcin (2004) studied the optimum government size in 12 European Union (EU) countries. The data covered the period of 1950-1996. The study established the optimum government size to be 36-42% of the RGDP in the 28 EU countries studied. The result also showed that the optimum government size was 25% of the RGDP. Chobanov and Mladenova (2009) studied the optimum government size in the 28 EU countries. The data applied covered the period of 1970-2009. The result showed that the optimum government size is 25% of the RGDP. Forte and Magazzino (2010) applied data for the period of 1970-2009 in estimating optimum government size in 27 EU countries. The result established the optimum government size to be 35.39-43.5% of the RGDP.

To the best of our knowledge, there is no existing study, as shown above, that investigates the impact of government expenditure in OECD countries and African countries with the aim of finding the rationale for differences in government size of the two panel of countries. This study is, therefore, unique in the sense that it is carried out to fill existing gap estimating the size of government expenditure in a panel of low income countries of Africa and comparing them with the high income countries of OECD countries. The aim is to find out if low income countries of African have low government size than high income countries of OECD countries.

## 3. RESEARCH METHODOLOGY

### 3.1. Model Specification

This study employed an empirical model similar to empirical works of Forte and Magazzino (2016), Facchini and Melki (2013), Altunc and Aydin (2013) Hearth (2009), and Asimakopoulos and Karavias (2015). This study follows Forte and Magazzino in the sense that it applied most of the variables used in their study, except that this study applied labour force in place of population to control for diversity across the countries. Other variables like wars, and fiscal reforms were not included in this study. This study also follows Facchini and Melki (2011) and Herath (2009) by including all the variables included in their studies, except tax rate, population and unemployment, in the case of Facchini and Melki, and investment, in the case of Herath. This study follows Afonso and Jalles (2011), Altunc and Aydin (2013), and Asimakopoulos and Karavis, 2015) in using Arellano and Bound technique in estimating the parameters of the population. Most of the studies cited above, investigated the existence of inverted U-shape relationship between economic growth and government size as measured by government expenditure divided by the RGDP. Before estimating the optimum government size, this study estimates the impact of government expenditure on economic growth using linear regression model. The linear regression model is resented as follows:

$$RGDP_{it}=\beta_1 RGDP_{it-1}+\beta_2 GOEXP_{it}+\beta_3 TRAOPN_{it}+\beta_4 LABF_{it}+U_{it} \quad (2)$$

Where: RGDP is the RGDP; GOEXP is government expenditure; TRAOPN and LABF represent macroeconomic control variables of trade openness and LABF, respectively. It is important to note that $U_{it}=u_i+e_{it}$, $u_i \sim iid(0, \sigma_u)$; $e_{it} \sim iid(0, \sigma_e)$; $E(u_i e_{it})=0$; i=1, 2,…, 77 in the case of the total panel, 27 for OECD countries and 50 for African countries; and t = 1, 2,…, 47 years.

The non-linear regression model is presented as:

$$RGDPGR_{it}=\beta_1 RGDPGR_{it-1}+\beta_2 GERGDP_{it}+\beta_3 GERGDP_{it}^2 +\beta_4 TRAOPN_{it}+\beta_5 LABF_{it}+U_{it} \quad (3)$$

Where: RGDPGR is the RGDP growth rate; $RGDPGR_{it-1}$ is the first lagged value of RGDPGR; GERGDP is the government expenditure as the ratio of RGDP; TRAOPN and LABF represent macroeconomic control variables of trade openness and LABF, respectively, The $U_{it}$ has the characteristic as described earlier.

### 3.2. Data Sources and Definition of Variables

This study applies the following variables in the analysis of the impact of government size on economic growth: Real GDP ($RGDP_{it}$) is measured as the real GDP at 2005 constant prices in millions of US Dollars; RGDP growth rates ($RGDPGR_{it}$) is the computed as the result of the sum of $RGDP_{it}$ less $RGDP_{it-1}$ divided by the $RGDP_{it-1}$ and multiplying the result by 100; Government expenditure ($GOEXP_{it}$): $GOEXP_{it}$ is the same as the total government consumption expenditure and the figures are measured in millions of US Dollars; Government expenditure as the ratio of GDP (GERGDPit) is the total government consumption expenditure divided by the $RGFP_{it}$. This figures is multiply by 100 so that the (GERGDPit) is stated as the percentage of the RGDP; Trade openness ($TRAOPN_{it}$): $TRAOPN_{it}$ is measured as the sum of export and import divided by the RGDP multiplied by 100. The $TRAOPN_{it}$ measured the sum of export and import as the percentage of the RGDP; Labour force ($LABF_{it}$): The $LABF_{it}$ is the total labour force measured in thousands of people.

Data for all these variables was sourced from the United Nations Conference on Trade and Development (UNCTAD). The figures for RGDPit, exports, import, and government expenditure cover the period of 1970-2014 while data for labour covers the period between 1980 and 2015. The population of the study consists of 27 OECD, 50 African countries, and 77 OECD and African countries.

### 3.3. Data Analysis

#### *3.3.1. Unit root*

The paper also uses panel unit root tests to investigate the properties of the data applied in this paper. The panel unit root test employed are common or homogenous unit root processes such as the tests of Levin, Lin and Chu, (LLC, 2002) and Breitung (2000). The other type of panel unit root tests employed are individual or heterogeneous unit root processes and included in this category are: Im, Pesaran and Shin (IPS, 2003), and Fisher Augmented Dickey-Fuller (ADF). The rationale for investigating the time series properties of the data applied is that the time series properties determine the type of regression method to be applied in estimating the parameters of the model.

#### *3.3.2. Cointegration test*

The study also presents Kao residual cointegrated test. The null hyothesis of the Kao residual cointegration test is that there is no cointegration among the variables (Johansen, 1995; Larsson et al.,(2001). If the computed t-statistic is significant it means that there is cointegration among the variables. This method applies the residuals in estimating the co integration among the variables. The method is applied because of its simplicity and it can be applied even when the cross sectional units are more than seven when a competing method like Pedroni co integration method cannot be applied.

In order to investigate the impact of government expenditure and the other control variables on economic activities in the OECD and African countries, this study applies linear ARDL Arellano and Bond regression method in estimating the parameters of the population. The GMM is applied in estimating the parameters because it works well in the presence of endogeneity, where there is a bi-causal relationship between the explained variable and explanatory variable as is the case in this study. It is argued that RGDP causes government expenditure (Wagner, 1890) and government expenditure causes RGDP (Keynes, 1936). The second reason is that if there is a lag dependent variable the GMM is able to solve the autocorrelation that results from the introduction of lagged dependent variable (Cantore et al., 2014).

## 4. RESULTS AND ANALYSIS

The study presents the results of descriptive statistics in Table 1. The study also investigates the properties of the data applying panel unit root tests in Tables 2a and b. Table 3 presents the results of cointegration test. Tables 4 and 5 present the results of linear regression models and quadratic regression models. The results of data analysed using E-views 9.0.

### 4.1. Descriptive Analysis

Table 1 shows that the mean RGDP is US $897972.9 million for 27 OECD countries, US $15375.9 million for the 50 African countries, and US $3250223.3 million for the 77 OECD and African countries. The mean government expenditure of an OECD country is US $169758.3 million and the mean government expenditure of an African country is US $2161. For the combine panel of 77 countries of OECD and Africa, the mean RGDP and government expenditure are US $325023.3 million and US $60961.2 million. On comparative basis, the mean RGDP in Africa is 1.71% of mean RGDP of an OECD country; while the mean government expenditure of an African country is about 1.27% of the mean government expenditure of an OECD country. These figures show the disparities in the level of government expenditure and RGDP in the two panels.

The other important features of the Table 1 that need to be emphasized are that government expenditure constitutes 18.9% of the RGDP in the 27 OECD countries and 14.06% of the RGDP in the 50 African countries. By implication, the actual government expenditure is 18.9% of OECD countries and it is 14.06% of the RGDP in the 50 African countries. The remaining data like the median, the standard deviation, the Skewness, and the kurtosis show that the distributions of the data applied in this study are not normally distributed. The reasons are the mean values and their median counterparts are different; the skewness are significantly higher than zero; and the kurtosis are different from three.

### 4.2. Unit Root Tests

It is important to examine the properties of the variables applied in this study to determine the method of regression to use in estimating the parameters of the population of the study. The values of Jacque-Bera statistic shows that the distributions above are significant at 1%. The time series properties of the applied data are examined using LLC, Breitung, IPS, and AD-Fisher tests in Tables 2a and b. The methods of testing for unit root test applied are (LLC, 2002), Breitung (2000), (IPS, 2003), ADF-Fisher and PP - Fisher. The study applied unit root test with intercept and trend.

Tables 2a and b show that all the variables are trending at a level except RGDPGR and GERGDP. The RGDPGR and GERGDP are stationary at a level as shown in Table 2a. The other variables are not stationary at a level but they are first difference stationary.

**Table 1: Descriptive statistics**

| Description | OECD | | Africa | | OECD and Africa | |
|---|---|---|---|---|---|---|
| | GOEXP | RGDP | GOEXP | RGDP | GOEXP | RGDP |
| Mean | 169758.3 | 897972.9 | 2162.4 | 15375.9 | 60961.2 | 325023.3 |
| Median | 48812.3 | 270178.8 | 496.3 | 3378.9 | 1502.3 | 11543.2 |
| SD | 324607.9 | 1921371 | 6192.3 | 37192.1 | 208255 | 1213607 |
| Skewnss | 3.8 | 4.6 | 6.3 | 4.8 | 6.4 | 7.6 |
| Kurtosis | 19.1 | 26.7 | 50.8 | 29.7 | 51.6 | 71.9 |
| Jacque Bera | 16167 | 32628 | 229422 | 75542 | 365442 | 719590 |
| Probability | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

SD: Standard deviation, OECD: Organization for Economic Cooperation and Development

**Tables 2a: Panel unit root tests**

| Unit root test | Number of differencing | RGDPGR | GERGDP | TRAOPN |
|---|---|---|---|---|
| LLC | At a level | −22.2* | −1.88** | 1.4 |
| Breitung | At a level | −18.9** | 2.5** | 2.1 |
| IPS | At a level | −25.9** | −2.6** | 0.7 |
| ADF-Fisher | At a level | 897.9** | 207.9** | 140.3 |
| PP-Fisher | At a level | 1834** | 257.7** | 181.3 |
| LLC | First difference | - | - | −28.1** |
| Breitung | First difference | - | - | −15.1** |
| IPS | First difference | - | - | −31.9** |
| ADF-Fisher | First difference | - | - | 1154** |
| PP-Fisher | First difference | - | - | 3235** |

*.**Mean significant at 5% and 1% levels of significance, LLC: Levin, Lin and Chu, IPS: Im, Pesaran and Shin, ADF: Augmented Dickey-Fuller

**Table 2b: Panel unit root test**

| Unit root test | Number of differencing | LABF | GOEXP | RGDP |
|---|---|---|---|---|
| LLC | At a level | 2.1 | 7.14 | 8.4 |
| Breitung | At a level | −4,9** | 9.9 | 13.1 |
| IPS | At a level | 8.6 | 10.3 | 14.3 |
| ADF-Fisher | At alevel | 94.4 | 88.2 | 61.3 |
| PP-Fisher | At a level | 47.1 | 72.8 | 35.9 |
| LLC | First difference | 7.5** | −15.9** | −19.1** |
| Breitung | First difference | −5.9** | −12.3** | −6.3** |
| IPS | First difference | −10.1** | −23.4** | −20.8** |
| ADF-Fisher | First difference | 387** | 833* | 774** |
| PP-Fisher | First difference | 741** | 2232** | 1544** |

*.**Mean significant at 5% and 1% levels of significance. LLC: Levin, Lin and Chu, IPS: Im, Pesaran and Shin, ADF: Augmented Dickey-Fuller

### 4.3. Kao Residual Cointegration Test

Having established that four of the variables employed in this study are trending, while the remaining two are stationary, it is important to investigate if there are long run relationship among the variables employed. The long-run relationship is established using Kao residual cointegration test.

From the results of Table 3, this study concludes that the null hypothesis that the variables applied in estimating Equations (5) and (6) are not coointegrated cannot be accepted. The reason is that the computed t-statistics are significantly different from zero. Thus, this study concludes that the variables employed in this study have long run relationships among them. Since not all the variables employed in this study are stationary, this study has chosen to apply ARDL Arellano and Bond method in estimating the parameters of the population of the study.

### 4.4. Regression Results

In order to investigate the impact of government expenditure and the other control variables on economic activities in the OECD and African countries, this study applies linear ARDL Arellano and Bond regression method in estimating the parameters of the population. Table 4 estimates a linear relationship between economic growth and government expenditure and the other control variables using Equation (5). Table 5 estimates the optimum government size applying quadratic Equation (6) with the two control variables.

The results of the regression models show that the variables employed in the regression models are significant in explaining

**Table 3: Kao residual cointegration test**

| Type of test | Series: RGDP, GOEXP, TRAOPN, and LABF | Series: RGDPGR, GERGDP, TRAOPN, and LABF |
|---|---|---|
| | t-statistic | t-statistic |
| ADF | −2.13** | −6.64** |

*.**Mean significant at 5% and 1%, respectively. ADF: Augmented Dickey-Fuller

**Table 4: GMM linear regression model (RGDP is the dependent variable)**

| Variable | OECD countries | African countries | OECD and African countries |
|---|---|---|---|
| $RGDP_{t-1}$ | 0.4042** | 1.023** | 0.5454** |
| GOEXP | 2.2663** | 17.68** | 2.265** |
| TRAOPN | 1412.2 | −1.322** | 1229.9 |
| LABF | 35.23 | 0.2304 | 7.5979 |
| Wald $\chi^2$ | 2788** | 161** | 3149** |

*.**Mean significant at 5% and 1% levels of significance. GMM: Generalized method of moment, RGDP: Real gross domestic product, OECD: Organization for Economic Cooperation and Development

economic growth in all the panels of countries. The reason is that the null hypothesis, using Wald restricted test that all the variables collectively have zero effect on economic growth cannot be accepted even at 1% level of significance.

The results also show that government expenditure has a significant impact on economic growth. This is shown in all the three methods of regression estimated: (1) OECD countries; (2) African countries; and (3) OECD and African countries. The t-statistic values show that government expenditure stimulates economic growth in the countries studied even at one percent level of significance.

The control variables of trade openness which controls for external competitiveness, has significantly depressed economic growth at one percent level of significance in the panel of African countries. Trade openness, however, have no significant impact on growth in the OECD countries and the panel of OECD and African countries. LABF, a variable included in the model to capture the diversity among the countries, has not stimulated economic growth in any of the regression models.

Table 5 presents the results of estimated regression models for quadratic equation, the Equation (6). The regression models compute the optimum government size in the affected group of countries.

Table 5 shows that all the estimated parameters exhibit their expected signs for all the regression models, except LABF. The LABF exhibits a negative sign in the 77 OECD and African countries. The Wald null hypothesis that all the variables included in the regression models collectively have no significant impact on economic growth of the countries studied cannot be accepted. The reason is that the Wald tests are significant in all the regression models meaning that at least one of the variables influences economic growth in each of the models. As expected, the estimated parameters of the government expenditure as the ratio of RGDP has a positive and significance signs for OECD, Africa, and OECD and African countries. This positive signs of GERGDP parameters shows the beneficial effect of government

**Table 5: GMM regression model (RGDPGR is the dependent variable)**

| Variable | OECD countries | African countries | OECD and African countries |
|---|---|---|---|
| $RGDPGR_{t-i}$ | 0.6072** | 0.0336** | 0.0569** |
| GERGDP | 0.06737** | 0.17634** | 0.12214** |
| $GERGDP^2$ | −0.00092** | −0.00565** | −0.00264** |
| TRAOPN | 0.0010 | 0.06969** | 0.0491** |
| LABF | 5.3E-7 | 0.00007 | −0.0011 |
| Wald $\chi^2$ | 3201** | 316* | 1251** |
| Optimum government size (%) | 36.61 | 15.61 | 23.13 |
| Actual (mean) government size (%) | 18.90 | 14.06 | 18.76 |
| Optimum minus actual government size (%) | 17.71 | 1.55 | 4.37 |

***Mean significant at 5% and 1% levels of significance. GMM: Generalized method of moment, RGDPGR: real gross domestic product growth rate, OECD: Organization for Economic Cooperation and Development

expenditure on economic growth. The parameter of GERGDP is responsible for the upward sloping portion of the BARS curves.

The coefficient of the squared $GERGDP^2$ is negative and statistically significant and this accounts for the depressing effect of government expenditure on economic growth. As explained under the BARS curve, at a low level of government expenditure, the beneficial effect of government expenditure is greater than its harmful effect. But at a high level of government expenditure, the harmful effect of government expenditure predominates. The result of the control variable of TRAOPN indicates that trade openness is bad for economic growth in African countries as it exhibit significantly negative impact on economic growth. Trade openness has no impact on the panel of 77 OECD and Africa, and on the panel of 27 OECD countries. The LABF has promoted economic growth in all the three panels of countries studied as its impact is not significantly different from zero.

Another interesting aspect of the estimated regression models is that the optimum government size is 36.61% of the RGDP in OECD countries, 15.61% of the RGDP in African countries and 23.13% of the RGDP in both OECD and African countries. The result also show that the optimum government size exceeds the actual government expenditure in OECD countries by 17.71% of the RGDP. In Africa, the optimum government size exceeds the actual government expenditure by 1.55%; while in the panel of both OECD and Africa countries, the optimum government size is greater than actual government size by 4.37%.

### 4.5. Discussion

Rather than just presenting another set of evidence of the existence of the BARS curve, this study shows how its findings fit into existing studies elsewhere. The findings of this study are stated in the previous section. This section merely discusses such findings.

The finding of the optimum government size of 36.61% of the RGDP of the 27 OECD is not in agreement with the panel data studies of Scully (2000) involving 22 OECD countries who established optimum government size of 20.23-22.3%; and Chobanov and Mlandenova (2009) who established optimum government size in 28 EU countries to be 25% of the GDP. The finding of this study fits into the finding of Pevcin (2004) who established optimum government size in 12 EU countries to be 36.42% of the GDP. The finding also agrees with the finding of Forte and Magazzino (2010) who established optimum government size in to be 35.39-43.5% of the GDP. The result is, however, not in line with the finding of 40% of GDP by Davis (2009) in a panel data setting. On the whole, the finding of this study fits in with existing empirical literature in this area.

The study established the optimum size of government in Africa to be 15.61%. This finding shows that the optimum government size in the panel of 50 Africa countries is lower than the approximately 20% of the GDP as established in USA (Grossman, 1987; Scully, 1994; and Vedder and Galloway, 1998). The finding is also lower than that of Fachinin and Melki (2010) 30% of GDP in France. The finding of this study is also lower than those of other developing countries like Pakistan which is 21.4% of the GDP (Tabassan, 2015), Bulgaria with 21.42% of the GDP (Mavrou, 2007), and Sri Lanka with 26.87% of the GDP (Herath, 2009).

The result is also lower than the 19.12% of the GDP of 43 less developing countries as established by Asimakopoulos and Karavias (2015). However, when we look at the results against the background that optimum government size varies according to the level of economic development of the countries (Forte and Magazzino, 2016). This finding is reasonable. The reason is that Africa countries are among the least DCs in the world. As a result, their optimum government size ought to be low holding other factors constant.

This study also established the optimum government size in the 77 OECD and African countries to be 23.13% of the RGDP. This Finding shows that the optimum government size in the panel of OECD and Africa is at variance with about 20% of the GDP for USA by Grossman (1987), Scully (1994) and Vedder and Gallaway (1998). The finding of 23.13% is also higher than the optimum size established for Romania, 20.44% of the GDP; and Bulgaria, 22.45% of the GDP (Altunc and Aydin, 2013). The figure is higher than the 17.96% of GDP optimum size for 86 DCs established by Asimakopoulos and Karavias (2015). The finding of the optimum size of government expenditure to be 23.13% is lower than the finding of several studies. The finding is lower than Pevcin (2004) in 12 EU countries of 36.42%; Forte and Magazzino (2010) in the 27 EU of 35.3-43.5% of the GDP. This result, therefore, fits in the existing literature. It is broadly lower than the average of DCs because the results composed of both developing and DCs.

It is important to take into account an historical explanation of the optimum government size. Forte and Magazzino (2016)

offers an historical reason for existing government size. Forte and Magazzino (2016. p. 156) argued that there is a continuous growth of government expenditure as a proportion of this GDP as a country develops. Forte and Magazzino (2016) posit that the ratio of government size to GDP at the incubation age is about 10% of the GDP; at the take-off age, it is about 17% of the GDP, and at the industrialization age, and it is about 24% of the GDP. They claimed that it remains at 24% in the neo-capitalistic age. They also claimed that the ratio of government expenditure to the GDP increases to about 47% in what they described as European new age. Looking at this perspective, the findings of this study is reasonable. African countries are between incubation age to take-off age with the optimum government size of <17% but above 10% of the GDP. The OECD countries are between the ages of industrialization and European New Age. Their optimum government size is above 24%/the neo-capitalistic age and below 47% (the European new age).

There are different factors that explain variations of optimum government size across countries. One of such factors is historical data applied. It is important to take note of historical data applied as a possible explanation for the variations in BARS curve of different countries. Fachini and Melki (2013) stated that the time period the study covers as one explanation for variations in government size. Studies that use only a short time period may either use a period of time that the BARS curve is rising or stationary or falling only in carrying out analysis. Such studies find a linear relationship that reflect the economy's position at the period of the study. Forte and Magazzino also identified cultural and economic institutions as other variables that significantly impacted on the optimum government size. It may be argued that a country with good economic institutions and a culture that recognizes honesty, holding other factors constant, would tend to have higher optimum size than a country with poor economic institutions and bad culture that discourages honesty.

## 5. CONCLUSIONS

One of the theoretical postulations of the endogenous growth theory is that government can influence economic growth. It is against this background that existing empirical literature on the effect of government expenditure have investigated the impact of government expenditure on economic activities. This study fits within this framework of study. This paper presents the theoretical reasons why government expenditure may be beneficial to or harm economic growth. The beneficial aspect of government expenditure explains the rising portion of the BARS curve while the harmful aspect explains the falling portion of the BARS curve. When government expenditure is low, the beneficial effect of government expenditure predominates so that government expenditure is growth stimulating. On the other hand, when government expenditure is high, the harmful effect of government expenditure predominates as a result, the overall government expenditure is growth retarding and the BARS curve is falling. It follows that at the medium level when government expenditure is moderate, both beneficial and harmful effects of government expenditure are at par so that government expenditure exerts a neutral impact on economic growth. This is the optimal government size.

This study investigates the optimum impact of government expenditure in a panel of 27 OECD countries, 50 African countries, and 77 OECD and African countries. One of the contributions of this study is that the study presents empirical evidence to confirm or invalidate the inverted u-shape relationship between government expenditure ratio to the GDP and economic growth, the BARS curve, using data from OECD and African countries. The data applied covers the period between 1970 and 2015. The study estimates both linear and non-linear regressions showing the impact of government expenditure on economic growth. The linear regression demonstrated that overall government expenditure in 27 OECD countries, 50 African countries, and 77 OECD and African countries significantly stimulated economic activities. Trade openness depresses economic activities in African countries. The results further show that trade openness has no impact on economic activities in the panel consisting of 27 OECD countries and 77 OECD and African countries. LABF has not exerted significant impact on any of the panels of the countries studied.

The results of this study demonstrated the existence of BARS curve in all the three panels of countries studied. The reason is that the computed coefficient of GERGDP shows a positive sign and the computed $GERGDP^2$ shows a negative sign for the three panel data studied. The study establishes the optimum government size in OECD countries as 36.61% and the actual government size as 18.9% of the RGDP. The study also establishes the optimum government sizes in the 50 African countries and 77 OECD and African countries to be 15.61% and 23.13% of the RGDP, respectively. The actual government expenditure for 50 African countries and 77 OECD and African countries are 14.06% and 18.76% of the GDP, respectively. This means that the optimum government size exceeds the actual government expenditure in all the three panels studied. These results are consistent with the existing empirical studies conducted elsewhere. The exception is that the empirical finding in the case of African countries is one of the lowest. This is not abnormal as government size is partly dependent on the level of economic development. Given the status of African countries as one of the least developed continents, it is not surprising for the continent to have least optimum government size.

The study also provides empirical evidence that the optimum government size of the 27 OECD countries studied is 36.61% of the RGDP. This shows that the optimum government size of the OECD countries is between the Industrial Age and European New Age (Forte and Magazzino, 2016). This study also established the optimum government size in the entire 77 OECD and African countries studied to be 23.13% of the RGDP. This finding is consistent with some of the findings in this study. It is a compromise between low optimum government size of the 50 African countries and the high optimum government size of the 27 OECD countries.

This study has also established that there is consistency between the overall finding of the impact of government expenditure on economic growth and optimum government sizes of the panels of countries studied. Theoretically, government expenditure is expected to stimulate economic growth, holding other factors

constant, if the actual government expenditure (in this study the mean government expenditure) is below the optimum government size. The optimum government expenditure in the 27 OECD countries, the 50 African countries, and the 77 OECD and African countries are 36.61%, 15.61% and 23.12%, respectively. The mean (actual) government expenditures are 18.9%, 14.06%, and 18.76% for 27 OECD, 50 African, and 77 OECD and African countries, respectively. Thus, the actual government sizes are below the optimum government sizes for all the three panel regressions estimated. The empirical analysis of the impact of government expenditure on economic growth in all the panel regression models shows that government expenditure exerts significant impact on economic growth. This finding is consistent with the BARS theory.

## REFERENCES


Afonso, A., Jellies, J.T. (2011), Economic Performance and Government Size. European Central Bank Working Paper No. 1399. Available from: <http://www.eco.Europa.eu/pu/pdf>; <http://www.eco.Europa.eu/pu/pdf>. [Last accessed on 2017 Mar 12].

Afonso, A., Schuknecht, L., Tanzi, V. (2003), Public Sector Efficiency: An International Comparison. Working Paper Series, European Central Bank, NO. 242.

Aleksandrovich, A., Upadhyaya, K.P. (2015), Government size and economic growth: Evidences from selected OECD countries. International Journal of Economics and Finance, 7(5), 38-43.

Altunc, O.F., Aydin, C. (2013), The relationship between optimal size of government and economic growth: Empirical evidence from Turkey. Romania and Bulgaria, Social and Behavioral Sciences, 92, 66-75.

Arellano, M., Bond, S. (1991), Some tests for specification for panel data: Monte Carlo evidence and application to employment equations. Review of Economic Studies, 58, 277-297.

Armey, D. (1995), The Freedom Revolution. Washington, DC: Regnery Publishing.

Armey, R.K., Armey, R. (1995), The Freedom Revolution: The New Republic House Majority Leader Tells Why Big Government Failed, Why Freedom Works, and How We Will Rebuild America. Washington, DC: Regnery, Publising Co.

Asimakopoulos, S., Karavias, Y. (2015), The Impact of Government Size on Economic Growth: A Threshold Analysis. Granger Centre, University of Nottingham, Discussion Paper No. 15/02.

Barro, R. (1989), A Cross-Country Study of Growth, Saving and Government. National Bureau of Economic Research, Working Paper No. 2855.

Barro, R.J. (1990), Government spending in a simple model of endogenous growth. Journal of Political Economy, 98(5), 103-125.

Breitung, J. (2000), The local power of some unit root tests for panel data. Advances in Econometrics, 15, 161-177.

Cantor, C., Levine, P., Melina, G. (2014), Deep Versus Superficial Habit: It is All in the Persistence. University of Surrey Discussion Paper No. DP07/14. Available from: <http://www.city.ac.uk/_data/assets/pdf>. [Last accessed on Mar 12].

Carlstrom, C., Gokhale, J. (1991), Government consumption, taxation, and economic activity. Federal Reserve Bank of Cleveland Economic Review, 3, 28-45.

Chao, J., Grubel, H. (1998), Optimal Levels of Spending and Taxation in Canada, Chapter in How to Use the Fiscal Surplus: What is the Optimum Size of Government. Vancouver: The Fraser Institute.

Chobanov, D., Mlandenova, A. (2009), What is the Optimum Size of Government? Bulgaria: Institute of Market Economics. Available from: http://www.Ime.bg. [Last accessed on 2016 Dec 17].

Cowen, T. (1992), Law as public good: The economics of anarchy. Economics and Philosophy, 8, 249-267.

Davis, L., Hopkins, M. (2006), The Institutional Foundation of Inequality and Growth. Available from: http://www.projects.vassar.edu/lamacro/web/Davis_Hopkins.pdf. [Last accessed on 2015 Jun 29].

Davis, M. (2009), Financial regulation after global financial crisis. Australian Economic Review, 42(4), 453-456.

Di Matteo, L. (2013), Measuring Government in the Twenty-first Century: An International Overview of the Size and Efficiency of Public Spending. Vancouver, BC: Fraser Institute.

Facchini, F., Melki, M. (2013), Efficient government size: France in the 20th century. European Journal of Political Economy, 31, 1-14.

Ferris, J.S. (2013), Government Size, Government Debt and Economic Performance with Particular Application to New Zealand. Available from: http://www.06governmentsizeecogronewzealandpdf. [Last accessed on 2016 Dec 17].

Forte, F., Magazzino, C. (2016), Government size and economic growth in Italy: A time series analysis. European Scientific Journal, 12(7), 149-169.

Grossman, P. (1987), The optimal size of government. Public Choice, 93, 131-147.

Grossman, P. (1988), Growth in government and economic growth: The Australian experience. Australian Economic Papers, 27, 33-43.

Guerrero, F., Parker, E. (2012), The Effect of Federal Government Size on Long-term Economic Growth in the United States 1792-2004. Available from: http://www.unreconwp070020301.47pdf. [Last accessed on 2016 Dec 17].

Herath, S. (2009), The Size of the Government and Economic Growth: An Empirical Study of Sri Lanka. Working Paper, No. 08. Austria: Vienna University of Economics and Business.

Holcombe, R.G. (2004), Government: Unnecessary but inevitable. The Independent Review, 8, 325-342.

Hsieh, E., Lai, K. (1994), Government spending and economic growth: The G7 experience. Applied Economics, 26, 535-542.

Im, K.S., Pesaran, M.H., Shin, Y. (2003), Testing for unit root in heterogeneous panels. Journal of Econometrics, 115, 53-74.

Johansen, S. (1995), Statistical analysis for cointegration for 1(2) variables. Econometric Theory, 11, 25-59.

Kao, C.D., Chiang, M.H. (2000), On the estimation and inference of a co-integrated regression in panel data. Advances in Econometrics, 15, 179-222.

Karras, G. (1997), On the optimal government size in Europe: Theory and empirical evidence. The Manchester School of Economic and Social Studies, 65(3), 280-294.

Keynes, J.M. (1936), The General Theory of Employment, Interest and Money. London: Macmillan.

Kormendi, R., Meguire, P. (1985), Macroeconomic determinants of growth: Cross-country evidence. Journal of Monetary Economics, 16, 141-617.

Landau, D. (1983), Government expenditure and economic growth: A cross-country study. Southern Economic Journal, 49, 783-792.

Larsson, R., Lyhagen, J., Lothgren, M. (2001), Likelihood based cointegration test in heterogeneous panel. Econometric Journal, 4, 109-142.

Leeson, P.T. (2007), Anarchy: The law and economics of pirate organization. Journal of Political Economy, 115(6), 1049-1094.

Legge, S. (2015), Government Size and Economic Growth: The Role of Country Diversity. Available from: http://www.spring2015-2015-20103017pdf. [Last accessed on 2016 Dec 17].

Levin, A., Lin, C.F., Chu, C. (2002), Unit root tests in a panel data: Asymptotic and finite sample properties. Journal of Econometrics, 108, 1-24.

Lucas, R.E. (1988), On the mechanics of economic development. Journal of Monetary Economics, 22, 3-42.

Forte, F., Magazzino, C. (2010), Optimal Size of Government and

Economic Growth in EU-27. MPRA Paper No: 26669. Available from: http://www.mpra.ub.uni-muenchen.de/2669.
Mavrov, H. (2007), The size of government expenditure and the rate of economic growth in Bulgaria. Journal, 12(7), 149-169. Available from: http://www.alternativi.unwe.acad.bg/bu18/06.pdf.
North, D.C., Wallis, J.J., Weingast, B.R. (2005), The Natural State: The Political-Economy of Non - Development, Electronic Version.
Peden, E.A. (1991), Productivity in the United States and Its Relationship to Government Activity: An Analysis of 57 Years, 1929-1986, Public Choice, 86, December. p153-173.
Pedroni, P. (2000), Fully modified OLS for heterogeneous co-integrated panels. Advances in Econometrics, 15, 3-130.
Pevcin, P. (2004), Size of Budgetary and Non-Budgetary Government: Explaining Cross-Country Differences, Working Paper.
Pingle, M., Mamoudi, M. (2015), Economic Growth and Government Size. Available from: http://www.economicgrowthandgovernmentsizepdf. [Last accessed on 2016 Dec 17].
Rahn, R., Fox, H. (1996), What is the Optimum Size of Government? Denver: Vernon K. Krieble Foundation.
Ram, R. (1986), Government size and economic growth: A new framework and some evidence from cross-section and time series data. American Economic Review, 76(6), 191-203.
Rebelo, S. (1991), Long-run policy analysis and long-run growth. The Journal of Political Economy, 99(3), 500-521.
Romer, P. (2011), Advanced Macroeconomics. New York: McGraw-Hill.
Romer, P.M. (1986), Increasing returns and long-run growth. The Journal of Political Economy, 94(5), 1002-1037.
Rubinson, R. (1977), Dependency, government revenue and economic growth, 1955-1970. Studies of Comparative International Development, 12, 3-28.
Scully, G.W. (1994), What is the Optimum Size of Government in the United States? NCPA Policy Report No. 188.
Scully, G.W. (1995), The "growth tax" in United State. Public Choice, 85(1-2), 71-80.
Scully, G. (2000), The growth-maximizing tax-rate. Pacific Economic Review, 5, 200-242.
Solow, R.M. (1956), A contribution to the theory of economic growth. The Quarterly Journal of Economics, 70(1), 65-94.
Stringham, E. (2005), Anarchy and the Law: The Political Economy of Choice, Somerset. New Jersey: Transaction Publishers.
Swan, T.W. (1956), Economic growth and capital accumulation. Economic Record, 32(2), 334-361.
Tabassum, A. (2015), Size of Government and Economic Growth: A Nonlinear Analysis. Available from: http://www.techpublications.org/index.php/IJTNR/article/download/186/90. [Last accessed on 2016 Dec 17].
UNCTAD. (2014), Data Center; 2016. Available from: http://www.unctadstat.unctad.org/EN. [Last accessed on 2016 Dec 12].
Vedder, R.K., Gallaway, L.E. (1998), Government Size and Economic Growth, Prepared for the Joint Economic Committee, Jim Saxton, R-NJ, Chairman.
Wagner, A. (1890), Finanzwissenschaft. In: Musgrave, R.A., Peacock, A.F., editors. Partly Reprinted in The Classic in the Theory of Public Finance. 3rd ed. London: Macmillan.
Wanjuu, L.Z. (2016), Impact of Government Expenditure on Economic Growth in the Economic Community of West African States (ECOWAS). An Unpublished PhD Thesis Submitted to Nelson Mandela Metropolitan University (NMMU) for the Award of Doctor of Philosophy Degree in Economics.