Economics Bulletin

Volume 43, Issue 1

Optimal size of public expenditure in the countries of the West African Economic and Monetary Union (WAEMU)

Maiga Nouhoun Oumarou
University of Thomas Sankara

Sirpe Gnanderman
University of Thomas Sankara

Abstract

This article uses annual data covering the period 2000-2019 to verify the existence of an optimal size of general government consumption expenditure in the countries of the West African Economic and Monetary Union (WAEMU). Our work is based on a quadratic modeling using the Armey curve (1995) developed by Vedder and Gallaway (1998). The Pooled Mean Group (PMG) estimator was used to perform the estimation. The results of the model's estimation lead to the conclusion that there is an optimal size of public expenditure estimated at 15.65%.

Citation: Maiga Nouhoun Oumarou and Sirpe Gnanderman, (2023) "Optimal size of public expenditure in the countries of the West African Economic and Monetary Union (WAEMU)", *Economics Bulletin*, Volume 43, Issue 1, pages 146-160
Contact: Maiga Nouhoun Oumarou - nouhounmaiga87@yahoo.com, Sirpe Gnanderman - gsirpe@yahoo.fr.
Submitted: January 28, 2022. **Published:** March 30, 2023.

1. Introduction

The analysis of whether a large government promotes or retards economic growth is increasingly important in the economics literature. This analysis was born out of the controversy between two approaches. On the one hand, the Keynesian theory which shows that in the short term and in a situation of unemployment or weak economic growth, public expenditure, whatever its destination, contributes to reviving or maintaining economic activity through their effects on the income of economic agents. On the other hand, the new classics postulate that public spending brings long-term economic growth, provided that it is essentially oriented towards the development of infrastructure, which is essential for the effectiveness of private investment (Barro, 1990). Beyond the controversy, both approaches recognize a role for public spending in the production of goods and services. However, the resources mobilized for this purpose must be relatively limited.

While government spending, in general, is necessary for a well-functioning market economy to support aggregate income growth, its continued expansion cannot be assumed to be compatible with long-term maximization of economic growth (Forte and Magazzino, 2016). Indeed, increased public spending implies an increased tax burden, which can dampen growth, or a deficit that can increase public debt with an increased cost of servicing it and an increased risk of insolvency. In addition, a growing share of this debt in foreign hands generates a current account deficit which can constitute an obstacle to economic growth (Forte and Magazzino, 2016).

The literature on the link between public spending and economic growth was then oriented towards the hypothesis of a non-linear relationship between these two economic magnitudes (Facchini and Melki, 2013). Barro (1989), Scully (1994), Armey (1995), Rahn and Fox (1996) deepen this analysis of non-linearity by introducing the notion of optimal size of public expenditure. The optimal size of public expenditure can be defined as the level of public expenditure that exerts the greatest positive and significant impact on economic growth. Theoretically, Armey (1995) presents this non-linear effect of public spending on aggregate output by an inverted "U" curve. The peak of the curve would then provide the optimal size of expenditure that would maximize gross domestic product (GDP). The existence of an optimal size of public expenditure has been verified both in developed economies (Facchini and Melki, 2013; Forte and Magazzino, 2016) and in developing countries (Herath, 2012; Mengue Bidzo, 2013; Lazarus et al., 2017). In line with these authors, this article aims to verify the existence of an optimal size of public expenditure in the countries of the West African Economic and Monetary Union (WAEMU[1]).

The determination of such a threshold appears essential because it contributes to the choice of the various objectives of public policy and to the improvement of the quality of the public sector. Such an analysis is particularly important for WAEMU economies, whose member countries have renounced the use of an active monetary policy. Fiscal policy, in this case public expenditure policy, is therefore the main instrument available to WAEMU member states to respond to the various asymmetric shocks that may affect their economies (Nubukpo, 2007). In addition, the countries of the Union are governed by a convergence treaty which obliges them to make budgetary adjustments with a view to reducing public deficits. Also, the economic crises of recent years have led developed countries to reduce their public

[1] WAEMU was created in January 1994 and since 1997 has brought together eight member states: Benin, Burkina Faso, Guinea Bissau, Ivory Coast, Mali, Niger, Senegal and Togo. Before the accession of Guinea Bissau in 1997, WAEMU comprised seven countries.

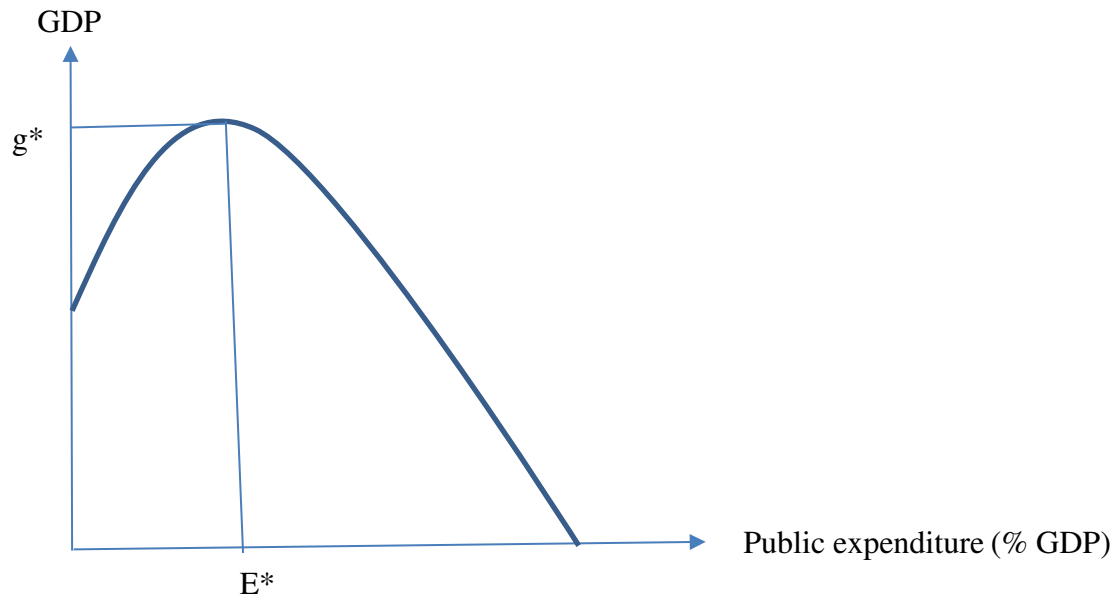
development aid in favor of developing countries such as those of WAEMU. Their fiscal revenue levels, however, are still relatively low and volatile, which limits their ability to finance public expenditure (Bayraktar and Moreno-Dodson, 2018). Most countries are still heavily dependent on foreign aid. The objective of this article is therefore to verify the existence of an optimal level of public expenditure in WAEMU countries.

The rest of the paper is organized as follows. Section 2 is devoted to a review of the literature on the existence of an optimal size of public expenditure. Section 3 highlights the methodological approach. Section 4 is reserved for the presentation and discussion of the empirical results and Section 5 concludes the work.

2. Literature review

The analysis of the optimal size of public expenditure comes from the economic literature on the role of public expenditure on economic growth. In doing so, the analysis of the effects of public spending on production highlights two extreme positions. On the one hand, the Ricardian equivalence theory shows that public spending cannot encourage global production because of the presence of a crowding-out phenomenon of public spending. On the other hand, Keynes (1936) considers public expenditure as an instrument to stabilize the product at its full employment level. This extreme analysis of public spending is relative to the analyzes of new classical economics and new keynesian economics. In this perspective, authors such as Barro (1989), Armey (1995), Rahn and Fox (1996) and Scully (1994) popularize the existence of an optimal size of public expenditure represented by a U-shaped curve reversed. This curve is known in the literature as the BARS curve (in reference to the four authors: Barro, Armey, Rahn and Scully). The BARS curve means that public expenditure is a source of economic growth up to a certain level from which it begins to reduce economic growth (Facchini and Melki, 2013). The following graph shows the relationship between public spending and economic growth according to Armey.

Graph 1: Public spending and economic growth (Armey curve).



Source : Armey (1995)

Barro (1989) explains the shape of this curve by two opposing effects. The author shows that increased public spending improves private sector productivity (infrastructure, health, education). However, he adds that the increase in taxation induced by the rise in public spending reduces the rate of economic growth by triggering discouraging effects. Thus, the author concludes that public services are provided at an optimal level when their marginal product is unitary.

For his part, Armey (1995) argues that when public expenditure is low, the provision of a certain number of public goods and services favorable to development is poorly assured. On the other hand, very high rates of public expenditure would discourage economic agents from investing and producing because of the high tax burden. In this case, too, GDP growth is uncertain. In sum, as long as the economic decisions are shared by the public and private sectors, output per capita can be very high.

In the literature, several empirical studies have attempted to verify the existence of an optimal size of public spending. The first studies focused on developed countries, particularly the United States. Several of these studies estimate the optimal size of public expenditure for the case of the United States at around 20% (Grossman, 1987; Peden, 1991; Scully, 1994; Vedder and Gallaway, 1998). Indeed, Grossman (1987) and Peden (1991) find respectively 19% and 20% over the respective periods of 1929-1982 and 1929-1986. Scully (1994) finds that the level of public expenditure should be between 21.5% and 22.9% of GDP over the period 1929-1989. Vedder and Gallaway (1998) estimate this value at 17.45% over the period 1947-1997. However, the share of public expenditure on GDP approached 20 to 22% of GDP during this period. The authors deduce that the American federal state should reduce its public expenditure because it exceeds the ideal threshold to maximize growth.

Following the United States, the analysis of the existence of the optimal size has become popular in other developed countries. Chao and Grubel (1998) estimate this size at 27% in Canada over the period 1929-1996. For the case of France, Facchini and Melki (2013) estimate it at 30% of GDP over the period 1871-2008. In Italy, Magazzino (2008) estimates it at 33% of GDP over the period 1950-1998. For the same country, Forte and Magazzino (2016) estimate it at 20.64% over a relatively long period (1861-2008). On the other hand, Scully (2000) looks at 22 Organization for Economic Cooperation and Development (OECD) countries and finds that the optimal size of government spending in these countries is between 20.2% and 22.3%. Kustepeli (2005), on the other hand, analyzes the optimal size of public spending in the 12 new European Union (EU) accession countries and the two candidate countries, referring to the period 1994-2001. The author initially subdivided the sample into three groups, according to the average share of expenditure in GDP: low (26-33%); medium (34-40%) and high (41-47%). The results of his work show that small size positively influences the growth rates of the economy. This result was also highlighted by Pevcin (2008) in 12 European countries over the period 1950-1996. Asimakopoulos and Karavias (2015) adopt the approach of Armey (1995) and study the optimal size of public consumption expenditures in a panel of 129 countries including 43 developing and 86 developed countries. They establish the optimal size of public spending at 19.12% and 17.96% for the least developed and developed countries respectively.

The analysis of optimal size was developed late in developing countries. Handoussa and Reiffers (2003) study the relationship between size of the government and economic growth in the case of Tunisia. Using data from 1968 to 1997, the authors attempt to establish the Armey and argue that 35% of government expenditure is the ideal threshold required in the context of Tunisia. The study asserts this government size as credible taking in to account the significant role played by the Tunisian state in economic activity. Schoeman and Heerden (2009) estimate

the size of government expenditure in South Africa at 18.5% over the period 1960-2007. Keho (2010) finds for the case of Ivory Coast, an optimal size that varies between 21.1% and 22.3%. Similarly, based on the economies of the Economic and Monetary Community of Central Africa (CEMAC), Mengue Bidzo (2013) estimates the optimal size of public spending at 20.05%; 19.2%; 25.3%; 25.5%; 23.6% respectively for Cameroon, Central Africa, Congo, Gabon and Chad over the period 1980 2011. Turan (2014) estimates the optimal size of government in Turkey for the periods 1950-2012 and 1970-2012 and finds 8.80% and 15.4% of GDP respectively. Tabassum (2015) on the other hand finds that the optimal government size is 19.3% of GDP in Pakistan over the period 1976-2013.

The empirical literature on the optimal size of public spending for African countries, particularly WAEMU countries, is very limited. The studies that mention WAEMU countries have not focused solely on WAEMU countries. However, the empirical literature shows that the optimal size is a function of the level of development of countries and the level of government intervention in the economy. Our research fills this gap by examining the optimal size of public spending in a set of relatively homogeneous countries that share the same budgetary constraints.

3. Methodology and data

3.1. Model Specification

In the literature, the BARS curve approach, in particular the quadratic approach of Armey (1995) developed by de Vedder and Gallaway (1998) is a reference. Based on the data on the one hand (see 3.3. data) and the empirical literature on the other, we opt for this model. This model is as follows: $Y_{it} = a + \alpha_1 G_{it} + \alpha_2 G_{it}^2 + \varepsilon_{it}$ (1)

With, i represents the country and t the year, Y_{it} represents the growth rate of GDP of country i at period t, G_{it} represents the size of public expenditure of country i at period t. The quadratic function exhibits a parabolic shape in which the apex of the inverted U curve represents the optimal solution. According to equation (1), for the parabolic curve to have an inverted U shape, it must satisfy the following condition: $0 < \alpha_1$ and $\alpha_2 < 0$.

The negative sign for the quadratic term (G_{it}^2) evokes the undesirable effects associated with an increase in the size of the state. On the other hand, the expected positive sign of the linear term G_{it} reflects the beneficial effects of public spending on economic growth.

According to the empirical literature, other variables are introduced into equation (1) as control variables. Like Facchini and Melki (2013), Herath (2012) and Forte and Magazzino (2016), we add economic openness to the model. According to the new theory of international trade (Krugman, 1987), economic openness promotes economic growth. In this context, we expect a positive effect of this variable on economic growth. We also consider the unemployment rate, assumed to be controlled by economic cycles according to Grossman (1987) and Vedder and Gallaway (1998). The unemployment rate varies inversely with economic growth. Thus, a negative relationship is expected between the unemployment rate and the level of domestic production. In addition, following Forte and Magazzino (2016) and Bayraktar and Moreno-Dodson (2018), public debt as a percentage of GDP is introduced into the model. Indeed, the more public debt increases to reach high levels, the more economic growth takes a hit. Thus, we expect this variable to act negatively on economic growth. In addition, inflation measured by the consumer price index is introduced into the model to capture the effect of monetary policy. It should also be noted that the dynamism of an economy depends on the general price

level prevailing on the domestic market. Thus, the consumer price index is introduced into the list of control variables. A negative link is expected between the level of inflation and economic growth. The model looks like this: $GDP_{it} = c + \alpha_1 G_{it} + \alpha_2 G_{it}^2 + \beta_1 OPEN_{it} + \beta_2 U_{it} + \beta_3 PUD_{it} + \beta_4 INF_{it} + \beta_5 GDP_{i(t-1)} + \varepsilon_{it}$ (2)

With, GDP_{it} the real GDP growth rate of country i at period t; $GDP_{i(t-1)}$, the real GDP growth rate of country i lagged to year t-1; G_{it}, public expenditure as a percentage of GDP; U_{it}; unemployment rate; $OPEN_{it}$, the sum of exports and imports as a percentage of GDP; PUD_{it} represents the stock of public debt as a percentage of GDP; and INF_{it} represents inflation. The optimal size is obtained if it exists by canceling the first derivative of GDP_{it} with respect to G_{it}.

3.2. Cointegration analysis

Before analyzing the cointegration, it is necessary to study the stationarity of the variables. Based on the results of the dependence test of the panel variables, the test of Levin et al. (2002), Breitung (2000) and Im et al. (2003) are used to test the stationarity of the public expenditure variable (G) and unemployment rate (U) , while the Pesaran (2007) test is used for the other variables. These tests oppose two hypotheses: the null hypothesis of non-stationarity and the alternative hypothesis of stationarity. Table I summarizes the results of the stationarity tests.

Table I: Results of the stationarity tests of the variables

Variables	Test	Level		First difference		Stationarity level
		Stat	Prob	Stat	Prob	
G	LLC	-2.6370**	0.0042			0
	IPC	-1.9911**	0.0232			0
	breitung	-2.3487***	0.0094			0
U	LLC	-1.3702*	0.0853	-4.2150***	0.0000	1
	IPC	3.3173	0.9995	-4.3658***	0.0000	1
	breitung	-0.7572	0.2245	-7.2657***	0.0000	1
GDP	CIPS test	-4.811***				0
	CADF test	-5.192	0.000			0
OPEN	CIPS test	-1.954		-5.168***		1
	CADF test	-1.851	0.395	-5.231	0.0000	1
PDU	CIPS test	-1.941		-5.287***		1
	CADF test	-1.941	0.298	5.287***	0.000	1
INF	CIPS test	-5.537***				0
	CADF test	-3.292	0.000			0

*Note: the theoretical values of CIPS are-2.21 to 10%, -2.33 to 5% and-2.55 to 1%; ***, ** and * denote the rejection of the null hypothesis of the presence of a unit root at the threshold of 1%, 5% and 10%, respectively.*
Source : Author

The results of the unit root tests recorded in the table I indicate that the variables public expenditure and the unemployment rate admit a unit root and become stationary only at first difference while the others are stationary at level. Our variables being integrated of different orders (I(0) and I(1)), the test of Pesaran et al. (2001) is used to analyze the cointegration

between our series. This test contrasts two hypotheses: the null hypothesis of the absence of a long-term relationship and the alternative hypothesis of the existence of a long-term relationship. Before proceeding to the analysis of the cointegration between the variables, it is necessary to choose the optimal number of lags. The examination of the optimal number of lags through the Akaike information criterion (AIC) shows that the lag that minimizes the Akaike criterion is 1. Table II presents the results of the cointegration test.

Table II: Result of the cointegration test

ARDL	F-statistics	1%		5%		10%	
		Borne inf.	Borne sup.	Borne inf.	Borne sup.	Borne inf.	Borne sup.
(1,1,1,1,1,1,1)	6.662***	3.15	4.43	2.45	3.61	2.12	3.23

*Note: *** designates the significance of the Fisher statistic at the 1% level.*
Source : Author

The calculated Fisher statistic is above the upper limit of the theoretical value at 1%. Therefore, the null hypothesis of no cointegration between the variables is rejected at the 1% level. From the perspective of analyzing short- and long-term effects, dynamic panel regression can be incorporated into an error-correction model using autoregressive stepped lag (ARDL) modeling (Pesaran et al., 1999). Thus, the presentation of the previous equation in the form of an ARDL model is as follows:

$$\Delta GDP_{it} = c + \alpha_1 G_{it} + \alpha_2 G_{it}^2 + \beta_1 OPEN_{it} + \beta_2 U_{it} + \beta_3 PUD_{it} + \beta_4 INF_{it} + \beta_5 GDP_{i(t-1)} + \sum_{j=1}^{p} \gamma_{1j} \Delta G_{it-j} + \sum_{j=1}^{q} \gamma_{2j} \Delta G2_{it-j} + \sum_{j=1}^{r} \gamma_{3j} \Delta OPEN_{it-j} + \sum_{j=1}^{r} \gamma_{4j} \Delta U_{it-j} + \sum_{j=1}^{r} \gamma_{5j} \Delta PUD_{it-j} + \sum_{j=1}^{r} \gamma_{6j} \Delta INF_{it-j} + \varepsilon_{it} \quad (3)$$

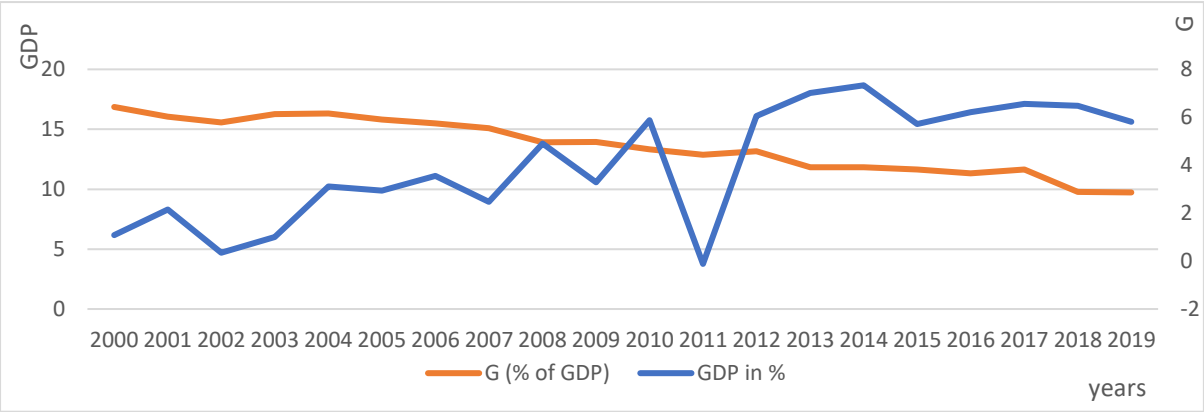
$\frac{\partial GDP_{it}}{\partial G_{it}} = 0 \Leftrightarrow \alpha_1 + 2\alpha_2 G = 0 \Leftrightarrow G^* = \frac{-\alpha_1}{2\alpha_2}$ with G^*, the optimal size of public expenditure that would maximize economic growth.

The use of an ARDL method is suitable for endogeneity problems, because we use lagged dependent variables as explanatory variables. With reference to the literature, the estimation of the panel ARDL model can be done through the Pooled Mean Group (PMG), the Mean Group (MG), the Dynamic Fixed Effect (DFE). The choice of the estimation method is made through the Hausman (1978) test.

3.3. Data

In this section, we present descriptive statistics on government spending and economic growth. Graph 2 presents the evolution of economic growth and public expenditure. While, graph 3 presents the relationship between economic growth and public expenditure as a percentage of GDP.

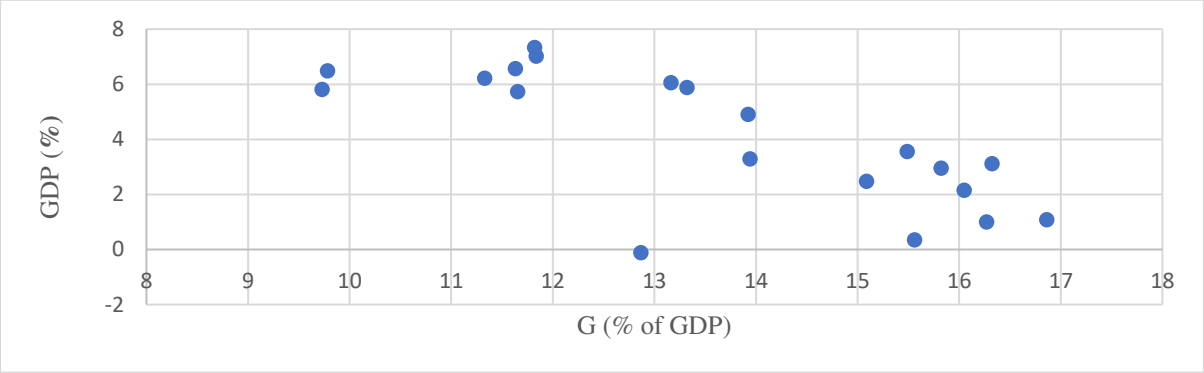
Graph 2: Evolution of GDP growth rate and public expenditure as a percentage of GDP (2000-2019)



Source: Author

Graph 2 shows the evolution of the growth rate of GDP and of public spending. The graph allows us to see that public spending tends to decrease while the growth rate evolves in a sawtooth fashion, with an upward trend.

Graph 3: Relationship between GDP growth rate (%) and public expenditure as a percentage of GDP (2000-2019)



Source: Author

Graph 3 presents the relationship between public spending and economic growth. As can be observed in the graphs, the dispersion of the data does not allow us to say that the relationship between the two variables is linear. However, low levels of public spending have been associated with relatively strong growth while high levels of public spending are characterized by very low growth rates.

The data used in this article comes from two databases including that of the World Development Indicators (WDI) and the Central Bank of West African States. Table III below presents some descriptive statistics on the different variables used in this analysis.

Table III: Descriptive statistics of the sample data

Variables	Obs	Mean	Std. Dev.	Min	Max	Source
GDP growth rate (%)	160	4.330	2.904	-4.666	15.376	WDI (2021)

General government consumption expenditure as % of GDP	160	13.702	2.809	7.122	20.712	WDI (2021)
Economic openness	160	57.630	17.323	30.368	112.761	WDI (2021)
Public debt as % of GDP	160	41.700	39.379	10.477	236.080	BCEAO (2021)
Unemployment rate	160	4.304	2.677	0.32	11.71	WDI (2021)
inflation rate	160	2.021	3.158	-4.787	20.377	WDI (2021)

Source : author

The table III shows that the average growth rate of real GDP in WAEMU is 4.33% over the period 2000-2019. Over the same period, the minimum and maximum values of the GDP growth rate recorded in the Union are respectively -4.666% and 15.37%. The lowest rate of GDP growth was recorded in 2005 in Togo. In contrast, the highest GDP growth rate in the Union was recorded in Mali in 2001. For general government consumption expenditure as a percentage of GDP, the Union average value is 13.702%. The lowest percentage of GDP devoted to general government consumption expenditure in the Union is 7.122%. This ratio was recorded in Guinea Bissau in 2013. The highest percentage is around 20.712% recorded in Niger in 2000.

4. RESULTS

4. 1. Basic results

Hausman (1978) test reveals that the PMG is appropriate. The results of the estimation (equation (3)) of the long-term coefficients are shown in Table IV below.

Table IV: Results of the estimation

Dependent variable: GDP	PMG
Return force	-0.892***
	(0.180)
G	3.084***
	(0.891)
G2	-0.0985***
	(0.0308)
OPEN	0.0304**
	(0.0145)
PUD	-0.0321***
	(0.00646)
U	-0.504***
	(0.0986)

INF	-0.208***
	(0.0631)
Constant	-15.01***
	(2.975)
G*	15.65
Observations	152

Note: ***, ** and * denote the significance of the coefficients at 1%, 5% and 10% respectively; G*: Optimal size of government spending. The values in the parentheses represent the standard deviations associated with the estimated coefficients.
Source: author's estimate.

The estimation of a basic shows that the restoring force is negative and statistically significant at the 1% level. It is then possible to conclude that there is a long-term relationship between economic growth and the explanatory variables used. The result of the estimation does not reject the existence of an optimal size of public expenditure. Indeed, the estimated optimal size is 15.65%. This result is in line with the theoretical expectations of Barro (1989) and Armey (1995) and the empirical conclusions of Schoeman and Heerden (2009), Keho (2010), Herath (2012), Mengue Bidzo (2013), Asimakopoulos and Karavis (2015) and Lazarus et al. (2017). Indeed, these last works highlight the existence of an optimal size of public expenditure for the case of developing countries. Our result is similar to that of Lazarus et al. (2017) who find an optimal size of public expenditure of 15.61% of GDP in a study of fifty (50) African countries. Similarly, our result corroborates that of Schoeman and Heerden (2009) and Asimakopoulos and Karavis (2015) who establish the optimal size respectively for South Africa at 18.50% and for a panel of least developed countries at 19, 12% of GDP.

However, the result of this research is lower than that of Keho (2010) who estimates the optimal size for Ivory Coast between 21.1% and 22.3%. However, the difference in result may be due to the difference in study periods or the difference in development between the country or study area. Indeed, Forte and Magazzino (2016) show that the optimal size of government varies according to the level of economic development of countries. For Fachini and Melki (2013), it is the study period that partly explains the variations in the size of public spending. They show that studies that only use a short time period can use a time period, during which the BARS curve is rising or stationary, or falling only. Forte and Magazzino (2016) also identified cultural and economic institutions as other variables with a significant impact on the optimal size of public spending. Thus, a country with good economic institutions and a culture that recognizes honesty, while holding other factors constant, would tend to have a larger optimal size than a country with bad economic institutions and a bad culture that discourages honesty (Asimakopoulos and Karavis, 2015).

4.2. Analysis of the sensitivity of the results

4.2.1. Addition control variables and dummy variables

In order to test the sensitivity of our results, we undertook two robustness exercises. This involves the introduction, on the one hand, of additional variables in the model to ensure that our model does not suffer from the omission of relevant variables and, on the other hand, of dummy variables to take into account significant events in the WAEMU economies over the period considered. The results of robustness check (addition control variables and dummy variables) are recorded in Table V.

Table V: Results of the estimation of robustness check: addition control variables and dummy variables

Dependent variable: GDP	PMG (5.1)	PMG (5.2)	PMG (5.3)
Return force	-0.897***	-0.911***	-0.911***
	(0.187)	(0.170)	(0.175)
G	2.506***	3.511***	2.759***
	(0.947)	(0.804)	(0.885)
G2	-0.0747**	-0.116***	-0.0885***
	(0.0329)	(0.0279)	(0.0305)
OPEN	0.0453***	0.0165	0.0163
	(0.0152)	(0.0139)	(0.0170)
PUD	-0.0300***	-0.0374***	-0.0286***
	(0.00683)	(0.00653)	(0.00725)
U	-0.616***	-0.421***	-0.487***
	(0.0985)	(0.0904)	(0.0971)
INF	-0.175***	-0.215***	-0.177***
	(0.0624)	(0.0543)	(0.0657)
Conf_Viol	-2.579***		
	(0.758)		
INST		1.182**	
		(0.500)	
Dummy_2008			0.500
			(0.424)
Constant	-12.18***	-15.37***	-12.82***
	(2.545)	(2.936)	(2.414)
G^*	16.77	15.13	15.58
Observations	144	152	152

Note: ***, ** and * denote the significance of the coefficients at 1%, 5% and 10% respectively; G*: Optimal size of government spending. The values in the parentheses represent the standard deviations associated with the estimated coefficients.
Source: author's estimate.

As for the first exercise, we reestimated the model by adding to the list of explanatory variables a variable (conf_viol) which captures civil conflicts and wars and a variable (INT) which measures the quality of institutions in the countries of WAEMU. Indeed, a better economic performance of a country requires a secure environment. However, civil conflicts and wars have affected a large number of countries since the1960s since 20% of nations have experienced at least 10 years of civil war (Blattman and Miguel, 2010). WAEMU countries have not remained on the sidelines of civil conflicts and wars, especially over the past two decades with the resurgence of terrorist acts. The addition of this variable therefore seems relevant to us. This variable measures major episodes of political violence. It takes into account the wars of international independence, civil violence, civil wars, ethnic violence and ethnic wars. It comes from the Center for Systemic Peace (CSP) database: Major Episodes of Political Violence, 1946-2018. As can be seen in Table V in column (5.1), after adding the variable conf_viol, the signs of the coefficients associated with the variables public expenditure and public expenditure squared remain unchanged. The signs obtained allow us to conclude that the addition of this variable does not fundamentally change the result that it is possible to establish the existence of a BARS curve for the case of WAEMU countries from 2000-2019. After the estimation, it appears that the optimal size obtained (16.77%) remains similar to the value calculated in the basic result (15.65%).

Regarding the introduction of the quality of institutions variable, the article is based on the work of North (1990) who mentions that the fundamental source of income differences between countries is the difference in the quality of institutions. Better quality institutions require more effective government, which allocates public resources more efficiently and stimulates economic growth (Law and Habibullah, 2006). Delavallade and De La Croix (2011) also show that economic growth takes a hit when political rights are limited and judicial institutions do not function normally in a country. Thus, taking this variable into account in a growth model is important. This variable is measured by a weighted average of the six institutional quality variables published by the World Bank. It is calculated by principal component analysis. The estimation results are reported in Table V (column 5.2). After the estimation, it appears that the optimal size obtained (15.13%) remains similar to the value calculated in the basic result (15.65%).

The second exercise in the sensitivity analysis of our results consists of introducing dummy variable into the model. In this context, we used dummy variable to take into account the economic crisis of 2008. Like most developing countries, WAEMU countries implemented structural adjustment programs in the 1990s and 2000s for some. The dummy variable used is dummy_2008 and takes into account the economic crisis of 2008 which affected the various economies of the world including those of WAEMU. The result of the estimation with the dummy variable into account does not also modify the basic results. Indeed, the signs associated with public expenditure and public expenditure squared are respectively negative and positive at only 5%. The optimal size of public expenditure that emerges from this result is 15.58%.

4.2.2. Countries heterogeneity

Finally, we test the sensitivity of the results by excluding certain countries from our sample to take into account the heterogeneity of WAEMU countries. To this end, our sample being relatively small, we undertook to exclude the countries which have levels of public expenditure that are furthest from the average. Thus, we have re-estimated by excluding on the one hand the country (Benin) with the lowest level of expenditure (5.4) and on the other hand the two countries (Burkina Faso and Niger) with the highest levels (5.5). The results of robustness check (excluding countries) are recorded in Table VI.

Table VI: Results of the estimation of robustness check: excluding countries

Dependent variable: GDP	PMG (5.4)	PMG (5.5)
Return force	-0.938***	-0.717***
	(0.148)	(0.178)
G	3.289***	4.131***
	(0.953)	(1.819)
G2	-0.1067**	-0.137***
	(0.0323)	(0.0658)
OPEN	0.0302***	-0.112
	(0.0333)	(0.0671)
PUD	-0.0300***	-0.050***
	(0.00683)	(0.0109)
U	-0.616***	-0.5794***
	(0.0985)	(0.138)
INF	-0.175***	-0.379***
	(0.0624)	(0.126)

Constant	-12.18***	-11.62***
	(2.545)	(2.83)
G^*	15.51	15.07
Observations	133	114

Note: ***, ** and * denote the significance of the coefficients at 1%, 5% and 10% respectively; G*: Optimal size of government spending. The values in the parentheses represent the standard deviations associated with the estimated coefficients.
Source: author's estimate.

The estimation results are consistent with the baseline results. The results do not reject the existence of an optimal size of public expenditure.

5. Conclusion

The objective of this article was to verify the existence of an optimal size of public expenditure for the case of WAEMU countries over the period 2000-2019. In order to achieve this objective, a theoretical and empirical analysis on the existence of the optimal size of public expenditure has been developed in a first section. Following this theoretical and empirical analysis, the methodological approach was presented. The methodological approach made it possible to retain the quadratic model developed by Vedder and Gallaway (1998) for the estimation. The Pooled Mean Group (PMG) estimator is used for estimating the model. In the third section it was a question of presenting the estimation results and analyzing them.

The research results do not call into question the existence of an optimal size in the case of WAEMU countries. The main implication of this result is that there is an optimal size of public expenditure in the Union estimated at 15.65% of GDP over the period 2000-2019. In this regard, public expenditure in WAEMU countries is favorable to economic growth, but this trend is reversed when the size of public expenditure reaches around 15.65%. In view of these results obtained, research encourages the countries of the Union to devote nearly 15.65% of their GDP to consumption expenditure by public administrations to enable them to fully play their productive role in economic growth.

References

Armey, R. (1995). The Freedom Revolution. *Regnery Publishing Co*.

Asimakopoulos, S., & Karavias, Y. (2015). The Impact of Government Size on Economic Growth: A Threshold Analysis. *Granger Centre,University of Nottingham, Discussion Paper*(15/02).

Barro, R. J. (1989). he Ricardian Approach to Budget Deficits. *Journal of Economic Perspectives, 3*(2), 37-54.

Barro, R. J. (1990). Government Spending in a Simple Model of Endogenous Growth. *Journal of Political Economy, 98*(5), 103-130.

Bayraktar, N., & Moreno-Dodson, B. (2018). Public expenditures and growth in a monetary union : the case of WAEMU. *Eurasian Journal of Economics and Finance, 6*(1), 107-132.

Blattman, C., & Miguel, E. (2010). Civil War. *Journal of Economic Literature, 48*(1), 3-57.

Breitung, J. (2000). The Local Pover of some Unit Roots Tests for Panel Data,161-177. In Baltagli, B.H. (Ed.). *nonstationary panels, panel cointegration , and dynamic panels*, Elsevier, Amsterdam.

Chao, J., & Grubel, H. (1998). *Optimal Levels of Spending and Taxation in Canada. How to use fiscal policy.* Vancouver: Franser Institute.

Delavallade, C., & De La Croix, D. (2011). Democracy, rule of law, corruption incentives, and growth. *Journal of Public Economic Theory, 13*(2), 155–187.

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

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

Grossman, P. (1987). The Optimal Size of Government. *Public Choice, 56*, 193-200.

Handoussa, H., & Reiffers, J. (2003). Femise report on the euro-mediterrenean parternership-analysis and proposals of the euro-mediterranean forum of economic institutes. *report presented at the steering committee of FEMISE*.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica, 46*, 1251-1271.

Herath, S. (2012). Size of government and economic growth: A nonlinear analysis. *Economic Annals, 57*(194), 7-30.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 53–74.

Keho, Y. (2010). Estimating The Growth-Maximising Tax Rate for Côte d'Ivoire: Evidence and Implication. *Journal of Economic and International Finance, 2*(9), 164-174.

Keynes, J. (1936). *Théorie générale de l'emploi, de l'intérêt et de la monnaie.* Paris: Payot.

Krugman, P. (1987). Is Free Trade Passe? *Journal of Economic Perspectives, 1*(2), 131-144.

Kustepeli, Y. (2005). The relationship between government size and economic growth: evidence from a panel data analysis. *Discussion Paper Series 05/06*.

Law, S., & Habibullah, M. (2006). Financial Development, Institutional Quality and Economic Performance in East Asian Economies. *Review of Applied Economics, 2*(2), 201-216.

Lazarus, W. Z., Khobai, H., & Le Roux, P. (2017). Government Size and Economic Growth in Africa and the Organization for Economic Cooperation and Development Countries. *International Journal of Economics and Financial Issues, 7*(4), 628-673.

Levin, A., Lin, C., & Chu., C. (2002). Unit Root Test in Panel Data : Asymptotic and Finite Sample Properties. *Journal of Econometrics, 108*, 1-24.

Magazzino, C. (2008). Modelli interpretative della dinamica della spesa pubblica e"curva di Armey": il caso italiano, 1862–2001. *Notizie di Politeia, 92*, 45–60.

Mengue Bidzo, M. (2013). Taille optimale de l'Etat dans une union monétaire : le cas de la CEMAC. *Revue d'Economie Appliquée, 1*(1), 28-50.

North, D. C. (1990). *Institutions, institutional change and economic performance.* New York: Cambridge university press.

Nubukpo, K. K. (2007). Dépenses publiques et croissance des pays de l'Union économique et monétaire ouest-africaine. *Afrique Contemporaine, 2*(222), 223-250.

Peden, E. (1991). Productivity in United States and its relationship to government activity: An Analysis of 57 years, 1929-1986. *Public Choice, 69*, 153-173.

Pesaran, M. H. (2007). A Simple Panel Unit Root Test In The Prresence of Cross-section dependance. *Journal of Applied Economics, 22*(2), 265–312.

Pesaran, M. H., Shin, Y., & Smith, R. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*, 289-326.

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. *Journal of the American Statistical Association, 94*(446), 621-634.

Pevcin, P. (2008). The Issue Of The ecocomically Perferred Size Of Governement. *EABR & TLC Conference Proceedings.* Salzburg.

Rahn, R., & Fox, H. (1996). *What is the Optimum Size of Government.* Vernon K. Krieble Foundation.

Schoeman, N., & Heerden, Y. (2009). Finding the optimal level of taxes in South Africa: a balanced budget approach. *The South African Jourrnal of Industrial Engineering, 20*(2), 15-31.

Scully, G. (1994). What is the Optimal Size of Government in US? *National Center for Policy Analysis, policy Report, 188*.

Scully, G. (2000). The growth-maximizing tax-rate. *Pacific Economic Review, 5*, 200-242.

Tabassum, A. (2015). Size of Government and Economic Growth: A Nonlinear Analysis. Retrieved Décembre 18, 2016, from http://www.techpublications. org/index.php/IJTNR/article/download/186/90

Turan, T. (2014). Optimal size of Government in Turkey. *International Journal of Economics and Financial Issues, 4*(2), 286-294.

Vedder, R., & Gallaway, L. (1998). *Government Size and Economic Growth.* Joint Economic Committee.