International Journal of Social Sciences and Management Review

Volume: 07, Issue: 05 September - October 2024

ISSN 2582-0176

ON THE THRESHOLD BETWEEN GOVERNMENT SIZE AND ECONOMIC GROWTH: EVIDENCE FROM TANZANIA

MICHAEL O.A. NDANSHAU & CORNEL JOSEPH
Dar Es Salaam Tumaini University, Tanzania

https://doi.org/10.37602/IJSSMR.2024.7521

ABSTRACT

This paper sought to empirically investigate the relationship between government size and economic growth in Tanzania by using annual time series data for the period 1967-2020, a period for which reliable data was available. Estimation by Autoregressive Distributed Lag (ARDL) bounds cointegration approach revealed the existence of a long-run and short-run relationship between economic growth, government size and other covariates of the estimation model. The results revealed the long-run effect of government size on economic growth was negative and was positive when it increased, suggesting the inexistence of a BARS curve in Tanzania during the sample period. Even though, the results supported the conventional views that price stability and openness of the economy are good for economic growth. While the results revealed the existence of a positive effect of population growth on economic growth, the effect of gross domestic investment was unexpectedly negative, both over the short and long-run period. The results suggest quadrupling the government size (consumption) is good for growth over the long run but not over the short run period. Also, the importance of price stability and commitment to openness of the economy to promote economic growth is underscored by the results.

Keywords: BARS curve, economic reforms, ARDL model, developing country.

1.0 INTRODUCTION

Contemporary public finance theory has three schools of thought on the relationship between government size and economic growth: the Classical view, Keynesian, and the Neo-Classical views. Investigation into the relevancy of each of the three blocs of theories in and outside developing countries has been pursued in two directions: one is through the use of diverse econometric methods to estimate the short-run and long-run impact of government size on economic growth (output). The other has involved an investigation into the nature of the causality between the government size and economic growth. The "causative studies", as Singh and Sahni (1984) note, have been by use of estimation models with public expenditure as either a behavioural variable, following Wagner's (1883) thesis, or as a policy instrument based on Keynesian macroeconomic theory. The most recent dimension of the research on the economic growth-government expenditure nexus has been on the BARS curve, also referred to as the Armey curve, by which it is maintained that there exists an optimal government size beyond which economic growth is compromised (Berg and Henrekson, 2011; Armey 1995)[1].

[1] The BARS is an abbreviation for Barro (1989), Armey (1995), Rahn & Fox (1996), and Scully (1989, respectively, who are associated with the so-called BARS curve.

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The main objective of this paper is to investigate the relevance of the BARS curve in Tanzania. The value addition of the study is two-fold. First, it sheds light on the scope and limits of fiscal policy actions in the process of socio-economic development in Tanzania. In this regard it serves to answer two interrelated questions: is small or big government good for economic growth and development? Second, there is a dearth of studies on the BARS curve in Tanzania. Instead, a literature survey by Mdadila and Ndanshau (2023) established the studies that exist are on the linear or causal relationship between government size and economic growth in Tanzania. The study, therefore, fills the gaps in the existing literature of studies on Tanzania, among others by using a larger sample size and frontier econometrics method, specifically, the now-in-vogue autoregressive distributed lag (ARDL) bounds cointegration approach. Besides, as a country-specific study, it provides a basis for comparing its findings with those obtained by country-specific studies elsewhere in SSA and the developing countries at large.

The rest of this paper is organized as follows. The evolution of the government size and economic growth in Tanzania is covered in Section 2. Section 3 dwells on the literature survey; and, the methodology of the study is handled in Section 4. Empirical results are presented, discussed, and compared with those of previous studies in Section 5. Section 6 concludes the paper with a presentation of the main findings, their policy implications, and a suggestion of some areas for further research.

2.0 GOVERNMENT SIZE AND ECONOMIC GROWTH IN TANZANIA: AN OVERVIEW

Attainment of economic growth has been at the center of the economic development agenda in Tanzania since the attainment of political independence from the British protectorate government in 1961. After independence, the government had "to expressly attend to several socio-economic challenges, among others, poverty, ignorance and diseases, which afflicted a majority of the country's population of about 10.35 million people" (Mdadila & Ndanshau, 2023, p. 11). Thus, fighting the three vices remained at the center of the country's development agenda. Accordingly, the government's size slowly grew not only from expenditure on public goods but also production and supply of private goods. The latter became enhanced by the implementation of the Ujamaa and Self-Reliance Policy of the Arusha Declaration which was promulgated in 1967. The Arusha Declaration led to the nationalization of private economic activities in favour of government-funded public enterprises (PEs) that were established to serve the key sectors of the national economy, among others, agriculture, banking, manufacturing, commerce, foreign trade, education, and health. Also, consistent with the Ujamaa and Self Reliance policy, among others, the government-financed provision of free education, health services, and subsidization of small-holder agriculture and even ailing PEs.

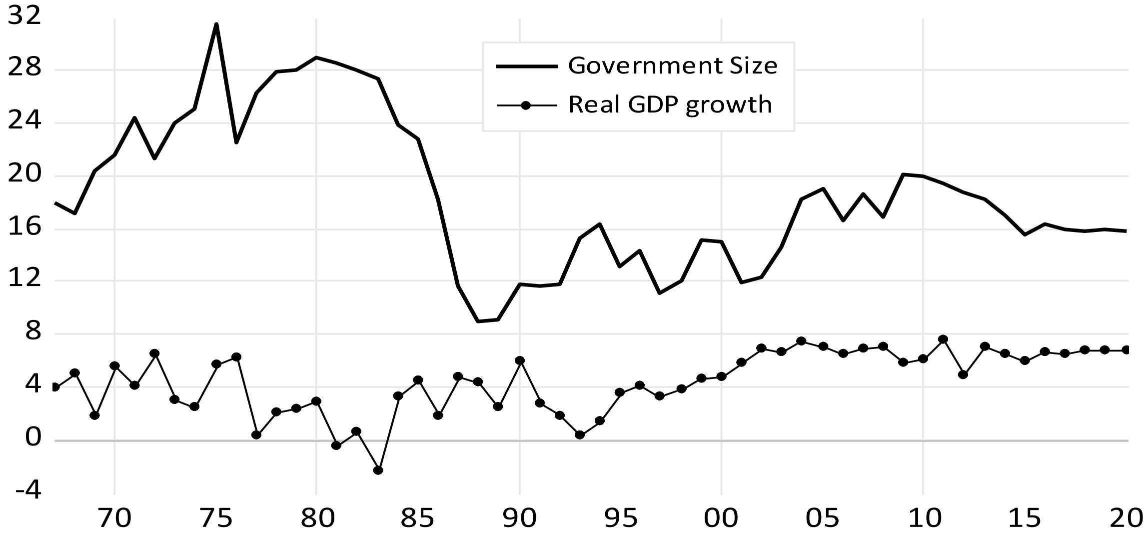
It is worth noting that the government also had to contend with several adverse internal and external shocks which increased its size since 1967. They included, among others, an increase in oil prices in 1973-1974, villagization drive in 1974, drought in 1975, break-down of the East African Community (EAC) in 1977, war against Idi Amin of Uganda in 1978-1979, and a second-wave of the increase in oil prices in 1979. Thus, as notable in Figure 1, the size of the government, measured as a share of government expenditure to the Gross Domestic Product (GDP), rose sharply to an unprecedented peak in 1975. Notable, however, the government size assumed a downward trend from 1981 through 1983, seemingly due to fiscal prudence

Volume: 07, Issue: 05 September - October 2024

ISSN 2582-0176

observed during the implementation of the so-called "home-made" stabilization programmes, namely, the National Economic Survival Programme (NESP) in 1981/1982 and the Structural Adjustment Programme (SAP) in 1982/1983.

Figure 1: Economic Growth and Size of the Government in Tanzania,1967 – 2020



The two "homemade" stabilization programmes are known to have failed to arrest macroeconomic crises (Kitilya, 2016). Nonetheless, the plots in Figure 1 reveal some gains in economic growth since 1983 that became propped up by the implementation of the World Bank and IMF (International Monetary Fund) sponsored Economic Recovery Programme (ERP) implemented since mid-1986.

Partly, the prudent fiscal and monetary policy actions reduced and thereby, seemingly stabilized the government size that elicited economic growth. As the government size decreased since the 1980s the rate of economic growth rose to a peak in 1990 only to be eroded in the period between 1991 and 1993 (Figure 1). Undoubtedly, the strict fiscal prudence observed by reducing monetization of fiscal deficits, especially after price stability became the prime objective of monetary policy actions of the Bank of Tanzania in 1995, sustained the stable positive rate of economic growth ushered by economic reforms since the mid-1990s through the early 2020s. Notable, however, is an increase in government size in 2008 which was caused by endeavours to abort the side effects of the Global Financial Crisis (GFC) that apparently "dented" the rate of economic growth in 2012 (Figure 1).

Generally, the two regimes characterize the evolution of the government size and the real rate of economic growth in Tanzania in the period between 1967 and 2020. One is a negative (inverse) relationship between economic growth and government size over the period 1967-1983, the period of a centrally owned, planned, and regulated economy. The other is the seemingly positive relationship between economic growth and government size over the period 1993-2020, the period of economic reforms in favour of the development of a private sector-based market economy. The two regimes suggest the existence of a structural break in the relationship between government size and real economic growth in Tanzania during the sample period. In the first regime, economic growth is inversely related to the government size; and,

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in the second regime, economic growth is positively related to the government size. The two regimes speculatively suggest the hypothesis underlying the BARS curve may not hold water in Tanzania during the sample period. This contention is investigated hereafter by using econometrics methods.

3.0 REVIEW OF RELEVANT LITERATURE

The relationship between government size and economic growth is characterized by two main but divorced theoretical views: the so-called Classical view, on the one hand, and the Keynesian and Neo-Classical view, on the other. In the context of the Classical school government expenditure, hereafter government size, lacks impact on economic growth over the long run. Rather, it is endogenously determined, implying it grows with the rate of economic growth. This implies fiscal policy actions lack direct influence on the rate of economic growth. At worst, an increase in government size would undermine economic growth by undermining private investment, among others.

The Keynesians, and also the Neo-Classical view, maintain the existence of a positive effect of an increase in government size on economic growth over the short run. As maintained, even when it is directed to unproductive expenditure, government expenditure directly increases aggregate demand and, therefore output; and, in tandem, it indirectly impacts output through the government expenditure multiplier (Stiglitz et al., 2006). In the context of the endogenous growth model, which is associated with Barro (1990), an increase in government size may impact economic growth but if it is in the form of investment in the directly productive sectors of an economy or is in sectors that support productive economic activities of the private sector, for example, education (human capital), security for the protection of private property, basic infrastructure, and enforcement of property rights, etc.

A middle-rung view is represented in the literature by the so-called BARS curve, by which it is maintained that there exists an inverted U-shaped relationship between government size and economic growth. Thus, in the context of the BARS curve, the relationship between the government size and economic growth is non-linear, not linear as maintained in both Classical and Keynesian, and even the Neo-Classical theories. Implicit in the BARS curve is the existence of a positive effect of the government size on economic growth as maintained by Keynesians but up to a threshold level where it tapers to a negative effect on economic growth as maintained in the Classical economic theory. It is implicit in the BARS curve that economic growth would be maximized at the optimal level of government size.

Table 1 reveals the existence of a big variation in empirical findings on the optimal size of the government across regions and countries in and outside sub-Saharan Africa (SSA). Specifically, the optimal size of the government established by panel studies on OECD (Organisation for Economic Co-operation and Development) countries differs significantly; and, the same applies to panel data studies on developing countries and the SSA in particular (Table 1). The variation in the threshold government size in country-specific studies on Europe, on the one hand, and the developing countries, on the other, is also evidenced in Table 1. In the SSA the optimal government size ranges from 11.17 per cent in Sudan to 23.3 per cent in

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Kenya. It follows, therefore, that the empirical studies on the BARS curve are inconclusive[2]. Thus, the empirical evidence available so far does not offer a basis for the generalization of the BARS curve in either developed economies or developing economies in general and the SSA in particular. It is evident in Table 1 that there lacks any empirical studies that have brought data to bear on the BARS curve in Tanzania. Instead, the previous studies on Tanzania estimated linear models to investigate either the effect and/or the nature of the causality between government size and economic growth (Mdadila & Ndanshau, 2023).

Table 1 Findings of Some Empirical Studies on Threshold Hypothesis (by country)

Study	Sample period	Methods of Analysis	Country/Region	Optimal Size of the Government
Lazarus et al. (2017)	1970 -2015	ARDL & Arellano & Bond	○ 27 OECD countries ○ 50 LDCs in Africa	○ 36.61% ○ 15.61%
Facchini & Melki (2011)	1871- 2008	OLS	○ France	○ 30%
Asimakopoulos & Karavias (2016)	1980 – 2009	GMM	○ 129 countries ○ Developed countries ○ LDCs	○ 18.04% ○ 17.96% ○ 19.12%
Jain et al. (2021)	2007-2016	System GMM	○ Emerging Economies	○ 24.31%
Altunca and Aydin (2013)	1995-2011	ARDL	○ Turkey, ○ Romania ○ Bulgaria	○ 25.21% ○ 20.44% ○ 22.45%
Coayla (2018)	1984-2017	OLS	○ Peru	○ 20.76%
Ahmad & Othman (2014),	1970 - 2012	OLS	○ Malaysia	○ 16.32%
Sriyana (2016)	1970-2014	OLS	○ Indonesia	○ 12.55%
Tabassum (2015)	1976-2013	OLS	○ Pakistan	○ 21.4%
Jain and Sinha (2022)	1961-2018	OLS & ARDL	○ India	○ 11.89%
Hassan (2022)			○ Sudan	○ 11.17%
Asogwa et al. (2019)	1981-2019	OLS	○ Ghana ○ Nigeria	○ 7.3% ○ 12.5%
Anaduaka et al. (2016)	1970 -2014	OLS	○ Nigeria ○ Ghana	○ 12.1% ○ 9.8%
Munene (2015)	1963-2021	OLS	○ Kenya	○ 23.3%
Alimi (2014)	1970-2012	OLS	○ Nigeria	○ 18.81% & 12.58%
Olaleye et al. (2014)	1983-2012	OLS	○ Nigeria	○ 11%
Zungu and Greyling (2021)	1988-2019	(PSTR)	○ 10 African emerging economies	○ 27.84%
Nouira and Kouni (2021)	1988-2016	ARDL	○ MENA & LDCs	20%-30%

[2] Among others, a detailed and concise literature survey by Agel *et al.* (1997) offers a wide range of factors which explains the persistency of the contradictory results on the hypothesis.

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Notes: i) Compiled from the literature.

ii) PSTR=Panel smooth transition regression; OECD=Organization of Economically Developed Countries; and, MENA=Middle East and North Africa.

Notable, the studies on the SSA and other less developed countries (LDCs) are quite few. Nonetheless that the BARS curve may not apply at that level of economic development can be speculated. In the early stages of economic development, the LDCs are characterized by poverty, illiteracy, poor infrastructure and both underdeveloped private and industrial sectors. The role of the government is thus not limited to the Classical provision of the basic public goods, typically, water, security, education, health, electricity, transport, and communication, etc. Rather, and even more significantly, the governments are challenged by the low level of socio-economic development to significantly venture into production of goods that would otherwise be produced by the private sector. This explains the raison d'etre of the so-called parastatal or public sector enterprises in some LDCs that are involved in the production of consumer goods and services. Granted, in the early stage of economic development, the marginal product of government expenditure in LDCs would be positive and increasing. However, in the context of Dobrescu (2015), the linear relationship between government size and economic growth would most likely be attenuated by corruption, capital flight, plunder and squandering of budgeted public funds, population growth, debt servicing, increased taxation (multiple taxes innovated to serve revenue generation for the finance of the ever-growing public sector), among other. In the long-living self-centered and corrupt dictatorial political regimes, which are not uncommon in SSA, a premature BARS curve would obtain or be a cause of a perfectly elastic relationship between the government size and economic growth that would liken an inverted but slanted L-shaped curve. Where short-lived, the corrupt political regimes, would cause a dent in the linear relationship between the government size and economic growth. This contention, nonetheless, demands for comparative country-specific studies empirical studies on the nexus between economic growth and the government size in LDCs.

4.0 METHODOLOGY

4.1 Estimation model

Investigation of the BARS curve is based on a model that has been used in some previous studies, for example, Facchini & Melki (2011). It reads as:

$$g_t = \alpha_0 + \alpha_1 gs_t - \alpha_2 gs_t^2 + u_t \qquad (1)$$

where g is the real rate of economic growth, gs is government size, and u is a white noise error term. Notable, gs enters equation (1), hereafter Equ. 1, in linear and non-linear (gs^2) form. The testable null hypothesis that underly Equ. 1 is that: $\alpha_1 < 0$ and $\alpha_2 > 0$, simply implying that the BARS curve does not apply in Tanzania.

In the context of the Keynesian, Neo-Classical, and endogenous growth models, Equ. 1 is modified to include four "growth conditioning factors" that are relevant to Tanzania, namely, inflation (π), gross domestic investment (i), population growth (n), and economic openness

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Volume: 07, Issue: 05 September - October 2024
ISSN 2582-0176

(op). In addition, a dummy variable (D) is included in the estimation of the model to capture the structural break noted in the evolution of economic growth and government size in Tanzania during the sample period. Granted, the modified estimation model, which is almost similar to the endogenous growth model used, among others, Asimakopoulos & Karavias (2016) and Awolaja et al. (2012), reads as:

$$g_t = \alpha_0 + \alpha_1 gs_t - \alpha_2 gs_t^2 + \alpha_3 \pi_t + \alpha_4 i_t + \alpha_5 n_t + \alpha_6 op_t + \alpha_7 D_t + u_t \quad (2)$$

The basic estimation model has two variables: one is the real rate of economic growth, which is measured as the per cent of the first difference of the natural logarithm of the real GDP, that is, nominal GDP deflated by the consumer price index (CPI) for Tanzania, base 2010. The other is government size, which is the percentage of the ratio of total government expenditure to the GDP. Other variables are referred to in the literature as "growth conditioning factors": inflation (π), which is the first difference of the natural logarithm of the CPI in Tanzania; gross domestic investment (i) which is measured as per cent of the ratio of real Gross Fixed Capital Formation (GFCF) to the real GDP; population growth (n), which is the population growth in Tanzania, in per cent and, economic openness (op), which is the absolute sum of exports and imports expressed as a ratio of the GDP. The structural break factor (D) was assigned a value of 1 for the period 1967-1983 and 1 for the economic reforms period between 1984 and 2020.

Estimation of the model (Equ. 2) is based on annual time series data for the period 1967 to 2020. The choice of the sample period mainly was dictated by data availability. The data were obtained from diverse secondary sources. The data for nominal GDP and population were obtained from publications of the International Monetary Fund (IMF). The data for the government expenditure and the national CPI were obtained from the publications of the Bank of Tanzania (BoT). The data for private GFCF and population were obtained from the publications of the National Bureau of Statistics (NBS) in Tanzania. The analysis of data was carried out by using E-Views (Version 12).

Following Pesaran, Smith & Shin (2001), and practice in some of the previous studies, for example, Mdadila and Ndanshau (2023) and Altunc & Aydine (2013), Equ. (3) was estimated by using an unrestricted conditional Autoregressive Distributed Lag (ARDL) model that reads as:

$$\Delta g_t = \emptyset + \alpha_1 g_{t-1} + \alpha_2 gs_{t-1} - \alpha_3 gs_{t-1_{t-1}}^2 + \theta_j Z_{t-1} + \sum_{i=0}^{p} \beta_i \Delta gs_{t-i} + \sum_{i=0}^{p} \vartheta_i gs_{t-i}^2 + \sum_{i=0}^{p} \gamma_i \Delta Z_j + \lambda D + u_t \quad (3)$$

where Z is a vector of the growth conditioning factors $\{j = 1,2, \dots 4\}$; Δ is a first difference operator; the β_i, ϑ_i, and γ_i are short-run impact multipliers; the α_i and θ_j are long-run parameters; λ is the structural break parameter; p is the lag length; and, u_t is a well behaved stochastic error term. The Wald (F-statistic) approach was used to test the null hypothesis of no cointegration relationship between economic growth and the government size and the growth conditioning factors, that is, $\alpha_i\ (i = 1,2,3) \neq 0$ and $\theta_j (j = 1,2, \dots ,4 \neq 0$. The alternative hypothesis tested is that $\alpha_i\ (i = 1,2,3) \neq 0$ and $\theta_j (j = 1,2, \dots ,4 \neq 0$. The critical values of the F-statistics in EViews were used to test the null hypothesis.

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Volume: 07, Issue: 05 September - October 2024

ISSN 2582-0176

According to Gujarati and Porter (2009) and Mukherjee, White and Wuyts (1998), most time series economic data that have strong trends are not stationary. For this reason, first, the natural logarithm operator was used to transform the basic data (Mukherjee, White, & Wuyts, 1998). Second, Augmented Dickey-Fuller (ADF) approach was used to test the null hypothesis that the variables were not stationary. Third, the Ordinary Least Square (OLS) method was used to fit Equ. 2. Altunc and Aydın (2013) approach was used to establish the optimal size of government.[3] Not least, a battery of tests in the EViews (Version 12) was used to establish the robustness of the estimation model. In particular, the null of homoscedasticity was tested by the Breusch-Pagan-Godfrey (BPG) LM (Lagrange Multiplier) method; the Breusch-Pagan (BP) LM approach was used to test the null of no serial correlation; and the null hypothesis of no model misspecification was tested by Ramsey's RESET (Regression Equation Specification Error Test) method.

5.0 EMPIRICAL RESULTS

Estimation of the basic model was preceded by some tests aimed at establishing the adequacy and reliability of the data used in econometric analysis[4].

5.1 Descriptive Statistics

Table 2 presents descriptive statistics of the variables of the estimation model in level. The statistics show the average growth rate of the national income ranged from -2.4 per cent to 7.9 per cent, with a mean and median of about 4.6 per cent and 4.9 per cent, respectively.

Table 2: Some Descriptive Statistics of the Basic Data (in level)

	g	gs	π	i	n	op
Mean	4.59	18.53	14.93	24.03	2.89	34.59
Median	4.90	17.55	11.29	24.34	2.95	36.22
Maximum	7.90	31.53	35.83	43.12	7.20	55.29
Minimum	-2.40	8.97	1.66	13.70	0.70	17.25
Std. Dev.	2.45	5.63	11.04	7.46	1.00	10.56
Skewness	-0.68	0.46	0.55	0.57	1.21	-0.05
Kurtosis	2.76	2.39	1.76	2.73	8.88	1.92
Jarque-Bera	4.32	2.74	6.25	3.05	91.12	2.66
Prob.	0.12	0.25	0.04	0.22	0.00	0.26
Obs.	54	54	54	54	54	54

Source: Based on the basic data.

[3] On the basis of the first and second order condition applied to Equ. 1, the equation used by Altunc and Aydın (2013) to obtain the optimal size of government size (gs) reads as, $gs^* = -\frac{\alpha_1}{2\alpha_2}$.

[4] For a detailed insight on the relevance of this *a priori* data screening approach, among others, see Mukherjee, White and Wuyts (1998).

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Table 2 also shows the mean government size (gs) is about 18.5 per cent and range from about 9 per cent to about 32 per cent, whereof the median was 17.55 per cent. Average inflation is about 15 per cent and it ranges from about 1.7 per cent to about 35.8 per cent, and the median is about 11.3 per cent. Both the average and the median gross domestic investment are about 24 per cent. The mean and median of the population growth rate, which is a proxy measure for human capital, are about 3 per cent; and, the mean and median of openness of the economy are about 35 per cent and 36 per cent, respectively, that is, below 50 per cent. In general, serve for population growth and inflation rates, the distribution of the data is symmetric: the means of the variables are almost equal to the respective median values. However, most variables have thicker than normal tails[5]. Even though, estimation of the basic model is expected to produce the best linear unbiased estimators (BLUE).

5.2 Correlation of the Variables

The correlation coefficients in Table 3, by and large, are very low[6]. The highest correlation is between government size and the squared government size (0.99) and between real economic growth and inflation (-0.54). Notable, economic growth and both government size and government size squared are, unexpectedly, negatively correlated with economic growth. This could be attributed to the dominance of government expenditure on investments with a high gestation period and repayment of public debt. The signs for the correlation between economic growth, inflation, and gross domestic investment and economic openness, though very low, are theory-consistent. The sign on the correlation between economic growth is positive but very small (0.10).

Table 3: Correlation Matrix of Variables (in level)

Variable		g	gs	gs^2	π	i	n	op
Economic growth	g	1.00	-0.33	-0.38	-0.54	0.33	0.10	0.03
Government size	gs	-0.33	1.00	0.99	0.04	-0.09	0.07	0.18
Government size x 2	gs^2	-0.38	0.99	1.00	0.12	-0.14	0.06	0.14
Inflation	π	-0.54	0.04	0.12	1.00	-0.17	-0.14	-0.19
Investment	i	0.33	-0.09	-0.14	-0.17	1.00	0.05	0.10
Population growth	n	0.10	0.07	0.06	-0.14	0.05	1.00	0.02
Openness	op	0.03	0.18	0.14	-0.19	0.10	0.02	1.00

Source: Based on data.

It should be noted that the correlation between the government size and government size squared is very high, suggesting the possible existence of a collinearity problem which may cause a multicollinearity problem and, consequently, lead to poor parameter estimates (Gujarat and Porter, 2009). The rule of thumb would demand the dropping of either of the two variables

[5] Transformation of the data by applying natural logarithm gave even thicker than normal tails for all the variables.

[6] The real growth rate (g) in Tanzania was -0.5% in 1981 and -2.4%. Thus, it was raised by a constant number (+3) in order to serve its transformation by a natural logarithm operator.

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in order to address the potential multicollinearity problem in the analysis. This was not done because both variables are at the center of the analysis (Gujarati and Porter, 2009).

Unit Root Test

The ADF unit root test results (with intercept only) in Table 4 show all regressors (in natural logarithm), except one, have unit root (I(1)) in level but all are first difference stationary (I(0)). Moreover, the ADF test results (with intercept and trend) show three regressors are I(0) in level and all are first difference stationary. Notably in both ADF tests (with and without an intercept and trend) none of the regressors was second difference stationary I(2), a finding which would nullify the use of the ARDL bounds cointegration test (Pesaran, Smith, & Shin, 2001). Notable also in the results is the lack of a big difference in the results of the two models, that is, the ADF test with and without trend.

Table 4: ADF Unit Root Test Results

Variable in natural logarithm	with intercept & and no trend^{a}		with intercept & trend^{b}	
	level	1st diff	level	1st diff
g	-2.10	-11.28***	-4.48***	-11.20***
gs	-1.17	-8.03***	-2.25	-7.97***
gs^2	-1.91	-9.46***	-2.50	-9.40***
π	-1.77	-7.85***	-2.03	-7.98***
i	-1.41	-5.78***	-2.03	-5.80***
n	-5.21***	-6.22***	-5.20***	-6.14***
op	-3.44	-6.30***	-3.53**	-6.24***

Notes: a) Significance test of the tau: ***=1% (-3.56); **=5% (2.92); and, *=10% (-2.60).

b) Significance test of the tau: ***=1% (-4.15); **=5% (-3.50); and, *=10% (-3.18).

The ADF results do not suggest existence of potential spurious or nonsensical regression results in the estimation of the basic model. Nonetheless, Peron (1989) maintains that the standard ADF test results could be unreliable in the presence of structural break such as that identified in the evolution of the rate of economic growth and the government size in Tanzania during the sample period. While there are several methods for controlling unit root with structural break, for example, the Zevot-Adrews (ZA) technique, they have not been used. Instead a dummy variable (1 for event and 0 for no event) was used to control for the structural break observed in the evolution of economic growth and government size in Tanzania in 1983.

5.4 Choice of the Optimal Lag and the ARDL Cointegration Test Results

Estimation of the basic ARDL model was preceded by the choice of its most optimal lag length by using Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) approach. Table 5 shows four lags minimize the AIC; and, three lags minimize the SIC. By the conventional rule, the optimal lags are 4 lags. In the context of Pesaran and Shin (1999) two

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lags identified by SIC are most ideal for annual time series data. However, 4 lags were used in estimation because Pesaran and Shin (1999) also maintain that the AIC is superior to the SIC.

Table 5: Choice of Lag Length

Lag length	AIC	SIC	F-statistic	R^2
4	1.13*	2.21	5.98	0.88
3	1.39	2.11*	6.01	0.77
2	1.66	2.11	5.27	0.58
1	1.66	2.11	5.27	0.59

Source: Authors' Estimation.

The ARDL bounds cointegration test results in Table 6 rejects the null hypothesis of no cointegration between economic growth, government size and other regressors included in the estimation model. The estimated F-statistics (10.25) is higher than the upper bound threshold level (4.43) at the 1 per cent level of significance test. The absolute value of the t-statistic bounds test also surpasses the upper bound critical value (4.99) (Table 6).

Table 6: ARDL Cointegration Test Results

F-Bounds Test: Null Hypothesis: No levels relationship				
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	10.25	10%	2.12	3.23
k	6	5%	2.45	3.61
		2.50%	2.75	3.99
		1%	3.15	4.43
t-Bounds Test				
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-7.66	0.10	-2.57	-4.04
		0.05	-2.86	-4.38
		0.03	-3.13	-4.66
		0.01	-3.43	-4.99

Source: Regression.

Given the cointegration, the ARDL (1, 3, 3, 3, 2, 0, 0) results in Equ. 4 shows the long-run effect of government size on economic growth is negative and statistically significant (at the 5 per cent test level). Also, the coefficient of gs^2 is positive and statistically significant at the 5 per cent test level. Th estimated long run parameters suggests a 1 per cent increase in government size would reduce economic growth by 12.39 per cent; and, if the augmented government size (gs^2) is increased by 1 per cent, economic growth would increase by 2.32 per cent.

$$g = 16.19 ** -12.39gs^{**} + 2.32gs^{2**} - 0.56\pi - 1.00i^{**} + 0.61n + 1.31op^{***} \quad (4)$$

(-2.14) (-2.11) (2.14) (-5.03) (2.93) (1.43) (4.21)

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Notes: Significance test levels are: ***=1%, **=5% and *=10%.

The result suggests that small and large government size, respectively, have a negative and positive effect on economic growth. This finding is similar to that obtained by Sinha & Kalayakgosi (2018) in a study on Botswana. Noteworthy, the negative effect of government size on economic growth may not be unexpected. It feature in some of the previous studies on Tanzania and some developing countries.[7] However, in the context of the "threshold hypothesis", the negative effect of the government size on economic growth was unexpected, and so is the positive effect of the squared government size. Both findings runs counter to the BARS curve hypothesis. By applying the Altunc and Aydın (2013) approach, the threshold government size is 2.67, which is very low if compared to that established by most previous studies, among others, those on SSA. Specifically, the finding is inconsistent with the BARS curve and does not compare favourably with results of the previous studies on other countries summarized in Table 1, among others, Olalaje et al. (2014) and Alimi (2014) in Nigeria.

The proven irrelevance of the BARS curve in Tanzania during the sample period could be attributed to two factors. One is the negative correlation in the evolution of economic growth and government size during the sample period (Table 3). Second, but subject to further empirical test, is the method used to establish the optimal government size. Even though, the finding may not be unexpected. Foremost, negative correlation characterised the evolution of economic growth and government size during the sample period (Table 3). Besides, during the sample period, particularly the period 1967-1985, was characterized by an increase in government size supported by monetization of budget deficits.[8] It is not unlikely, therefore, that the negative effect of the government size on economic growth was partly caused by inflationary pressure from the monetization of budget deficits and demand for tax revenues that undermined economic growth by impacting adversely on private investment. Also, the positive effect of the augmented government size on economic growth could be attributed to prudent fiscal and monetary actions undertaken to restore macroeconomic stability and also openness of the economy after the launch of the IMF and World Bank-sponsored economic reforms in mid-1986.

Notable, the rest of the results in Equ. 4 suggests the long-run effect of inflation on economic growth is consistent with theory: it is negative and statistically significant at the 1 per cent test level. Specifically, the finding suggests a one per cent increase in inflation would decrease economic growth by about 0.2 per cent over the long run period. The finding conforms with the findings of some of the previous studies on Tanzania, among others, Kasidi and Mwakamela (2013) and Shitundu and Luvanga (2000). Furthermore, the results show the effect of investment (as a ratio to the GDP) is negative and very statistically significant at the 5 per cent significance test level. The finding is inconsistent with theory but has been established for most other SSA countries (Guseh, 2007; Devarajan, Easterly, & Pack, 2003). As better explained by Guseh (2007) for a study on Nigeria, it could be attributed to: public investment

[7] See the literature survey by Mdadila and Ndanshau (2023) for details.

[8] In the period 1967-1983, when the economy was led by the public sector, the maximum government size was about 32 per cent and the minimum was about 17 per cent, whereas both mean and median were about 25 per cent. In contrast, after the launch of economic reforms in mid-1986, the maximum government size was about 14 per cent, the minimum was 9 per cent and both mean and median ere about 16 per cent.

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in projects with long gestation periods --- construction of roads, hydropower, and standard gauge railway, among others; and, private investment in financial assets, treasury bills in particular. Notable, the finding does not reconcile well with policies and strategies implemented by the government to promote investment, particularly private investment, since the launch of economic reforms in the mid-1980s. The coefficient of the degree of openness of the economy is positive as expected and is statistically significant at the 10 per cent level test level. The finding, which is similar to that obtained by Guseh (2007) for Nigeria, is consistent with the conventional theory on the long-run effect of openness on economic growth. The findings suggest the opening of the economy since the mid-1980s led to a positive but insignificant effect on economic growth in Tanzania.

The short-run parameters obtained by estimating the ARDL ECM show the contemporaneous government size lacks an effect on economic growth (Table 7). However, the effect of the contemporaneous and the one-period lagged augmented government size-squared (gs^2) is positive and statistically significant at the 1 per cent and 10 per cent test levels, respectively. Moreover, the ECM results show that the short-run effect of the contemporaneous inflation rate on economic growth is negative but statistically insignificant, and the short-run effect of gross domestic investment is positive but statistically insignificant at the conventional test levels. According to the results in Table 7, the effects of contemporaneous investment, population growth, and economic openness are statistically insignificant at the conventional test levels. Notable, however, the results reveal the existence of significant lagged positive effects of inflation and investment on economic growth, on the one hand, and a negative lagged short-run effect of population growth on economic growth. Moreover, the estimated parameter for regime shift is positive and statistically significant at the 1 per cent test level. The finding suggests the economic reforms implemented in the country since the 1980s impacted positively on economic growth.

Table 7: ARDL ECM Regression Results: Selected Model: ARDL ((1, 0, 2, 2, 2, 3, 1)

	Variable	Coefficient	Std. Error
Constant	C	16.35***	1.54
Government size x2	gs^2	2.15***	0.22
	gs^2(-1)	-0.14**	0.08
Inflation	π	-0.35**	0.19
	$\pi(-1)$	0.69***	0.17
	i	0.83	0.51
	$I(-1)$	0.65	0.45
Population growth	n	-0.05	0.15
	$n(-1)$	-0.48***	0.16
	$n(-2)$	-0.72***	0.12
Openness	op	0.60	0.38
Structural break	$D83$	1.65***	0.17
Adjustment	$EC(-1)$	-1.01***	0.09
	R-squared	0.83	
	F-statistic	15.94***	
	DW stat	2.31	

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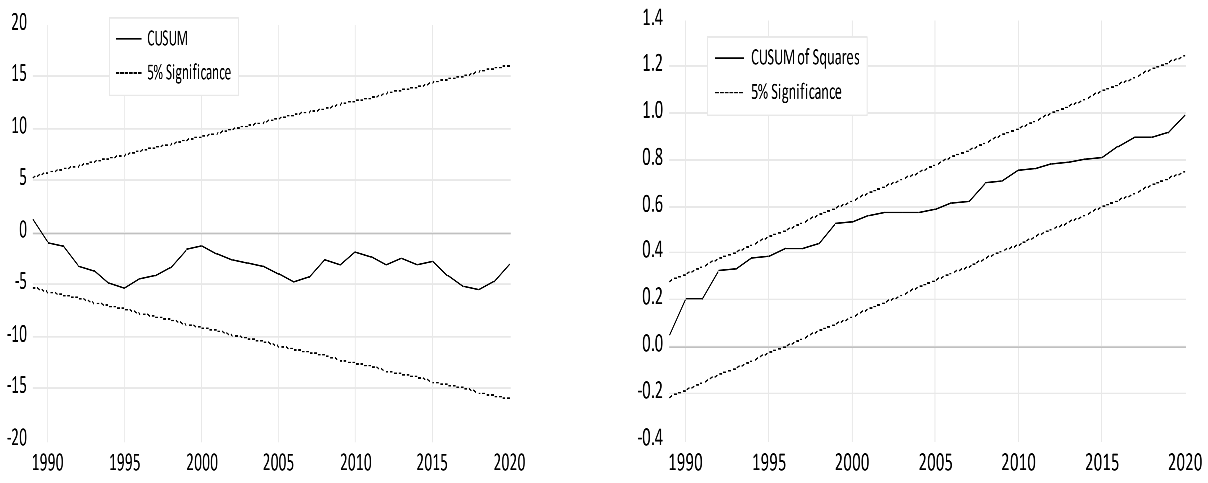
Notes: Significance test levels are: ***=1%, **=5% and *=10%.

The coefficient of the cointegration equation, first, is negative, as expected, and is statistically significant at the 1 per cent test level. This finding, first, suggests the existence of a long-run equilibrium between economic growth, the government size and other growth condition factors. Second, it suggests the existence of at least unidirectional causality between economic growth and either or both government size and other growth conditioning factors over the long run. Third, the size of the coefficient of the cointegrating equation is larger than unity, suggesting that adjustment from short-run shocks to the long-run equilibrium is very fast!

The estimation results are seemingly quite reliable, among others, for forecasting: the BPG LM test failed to reject the null hypothesis of homoscedasticity: the p-value of $chi - squared$ (4.04) was not less than 0.05; and, the Breusch-Godfrey Serial Correlation LM Test reject existence of autocorrelation: χ^2(4.04) was 0.11, and p-value was larger than 0.05. Notable, however, the RESET test revealed the existence of misspecification of the model, even when the most relevant "growth-conditioning factors" were dropped. Notable, nonetheless, the estimated model is consistent and, therefore, the misspecification can be tolerated.

Figure 2: CUSUM and CUSUM-q Plots for Stability Test

(a) (b)



The plots of CUSUM and CUSUM of squares in Figure 2 suggest the estimated model was very stable.

5.0 CONCLUSION

This paper sought to investigate empirically the relevance to Tanzania of the so-called BARS-curve. Annual time series data for the period between 1967 and 2020 was used to fit a non-linear quadratic model of the relationship between economic growth and government size. ARDL bounds cointegration test was used and an ARDL error correction model (ECM) was estimated to establish the short-run dynamics between government expenditure and economic growth in Tanzania.

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The econometric results failed to reveal the existence of the BARS curve in Tanzania both over the long and short-run periods. The long-run parameter estimates revealed a decrease in economic growth when the government size was small and an increase with a larger government size. The short-run results revealed the existence of a significant positive effect of government size on economic growth. The results also revealed the existence of a significant positive effect of a larger government size on economic growth over the short run. The econometric results further revealed the existence of a long-run equilibrium and at least a unidirectional causality between economic growth and government size, given the growth conditioning factors.

The results for the growth conditioning factors were theory consistent, serve that for gross domestic investment. The long-run effect of inflation on economic growth was negative and that of and economic openness was positive. Moreover, the study established the effect of population growth was negative while that of economic openness was positive. Implicitly, the results suggest price stability and economic openness are good for economic growth over the short run and long run periods. Further empirical investigations are called for, among others, on threshold government size by using other model specifications and other estimation methods in the case of Tanzania.

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Volume: 07, Issue: 05 September - October 2024

ISSN 2582-0176

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