International Journal of Business, Economics and Management
2019 Vol. 6, No. 1, pp. 39-48
ISSN(e): 2312-0916
ISSN(p): 2312-5772
DOI: 10.18488/journal.62.2019.61.39.48

EXTERNAL DEBT AND ECONOMIC GROWTH: TWO-STEP SYSTEM GMM EVIDENCE FOR SUB-SAHARAN AFRICA COUNTRIES

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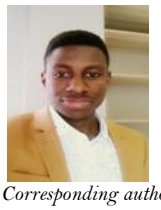

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Article History
Received: 23 October 2018
Revised: 30 November 2018
Accepted: 3 January 2019
Published: 28 February 2019

Keywords
External debt
Economic growth
Panel data models
System GMM
Instrumental variables estimation
Econometric software.

JEL Classification:
F34, F43, C23, C36, C26, C87.

ABSTRACT

This paper examines external debt and economic growth relationship in a panel of 48 Sub-Saharan Africa countries (SSA) for the period 1990-2017 using a two-step system General Method of Moments (GMM) technique. Our study shows that contemporaneously, external debt has a negative and statistically significant impact on GDP growth. However, the first lag of external debt variables stimulates GDP growth. The implication is that external debt accumulated in the previous period makes funds available for growth enhancing expenditure in the next period. Furthermore, our study found no evidence of a non-linear relationship between debt and economic growth. Lastly, we found that the deleterious impact of external debt on GDP growth does not preclude poor or rich SSA countries. We recommend the adoption of state-of-the-art measures in collecting domestic revenue to complement external revenue sources. In addition, we advocate for strong macroeconomic environment in SSA so that yield negotiation on the debt will not dissipate the coffers of SSA countries via high debt servicing cost.

Contribution/Originality: This study uses new estimation methodology to unravel the external debt and economic growth nexus in Sub-Saharan Africa countries.

1. INTRODUCTION

Sustainable economic growth and development is the main concern for all economies world-wide, especially Sub-Saharan Africa (SSA)[1] countries that happen to find themselves at the lower end of the growth chart. The quest to achieve these goals of economic growth and sustainable development calls for huge outlays which invariably comes from external sources with high servicing cost which perhaps, has plunged SSA into an uncomfortable fiscal position. Researchers like (Eaton, 1993) argues that external debt complements domestic savings and investment, hence it enhances growth. Of different opinion is Krugman (1988) who posits that debt servicing causes disruptions in an economy, hence it discourages investment and economic growth. The impact of the global economic downturn in the mid-1980s on developing economies, including the debt crisis, was such that the 1980s is often referred to as the *lost decade* for Africa (Iyoha, 1999). The debt burden on SSA after the *lost decade* has stagnated many of its

[1]According to the United Nations, Sub-Saharan Africa countries are all African countries who are fully or partially located south of the Sahara.

economies which led to the adoption of SAPS[2] aimed at reducing the SSA fiscal imbalances. However, the pace of external debt growth did not halt. There is the argument by Todaro and Smith (2006); Panizza *et al.* (2010) that in the early stages of development for LDCs[3], insufficient domestic capital for investment makes external borrowing a necessity. The rhetoric has always been *is external debt necessary for the progress of countries?* Findings on external debt and economic growth has been diverse and contradictory especially on accounts of the metric used in measuring external debt (for-instance debt outstanding or debt service), the empirical approach used and also the channel used (savings and investment as a channel).Notable findings in this regard are Jayaraman and Lau (2009); Warner (1992) who found a positive impact of external debt on growth. Reinhart and Rogoff (2010); Were (2001); Iyoha (1999); Fosu (1999); Elbadawi *et al.* (1996) found a negative relationship between external debt and growth. Furthermore, Frimpong and Oteng-Abayie (2006); Cohen (1993) could not establish any relationship between external debt and growth.

The objective of this paper is to examine the relationship between external debt and economic growth in SSA. This objective emanates firstly, from the meagre literature available on SSA in relation to external debt and economic growth. Secondly, due to the huge debt problems facing SSA countries.

Following Senadza *et al.* (2017) we contribute to the literature by providing fresh evidence on external debt and economic growth nexus in SSA. However, this paper differs from theirs in the following ways;

a) We employed the two-step system GMM approach ahead of the default one-step approach. The reason is that the standard covariance matrix of the two-step technique is robust to panel-specific autocorrelation and heteroscedasticity.
b) We extended the number of SSA countries to 48 and also extended the time series for the period 1990-2017.

Our findings generally corroborate the literature. We found a negative and statistically significant relationship between external debt and economic growth as confirmed by Senadza *et al.* (2017); Iyoha (1999); Fosu (1999) Elbadawi *et al.* (1996). The implication is that if external debt increases by 1 percent, GDP[4] growth shrinks by 0.05 percent. Secondly, if the first lag of external debt increases by 1 percent, growth upsurges by 0.04 percent. It implies that debt accumulation in previous period makes revenue available for growth enhancing expenditure in the next period. This finding is contrary to Elbadawi *et al.* (1996) who found that the lagged debt variable is deleterious to growth. Furthermore, we found no evidence for the non-linear relationship between external debt and economic growth. Though this confirms (Senadza *et al.*, 2017) it contradicts findings of Fosu (1999) for SSA and Matuka and Asafo (2018) for Ghana. In addition, the GDP per capita interaction dummy shows no statistically significant relationship with economic growth. This implied that being a middle income SSA does not mean external debt will be benign to growth prospects.

Lastly, we subjected our results to some robustness check by excluding certain variables from the model. Though our contemporaneous debt coefficient is smaller, the negative impact of external on economic growth is still established nevertheless. The other covariates such as; exports growth, labour force growth and capital(proxy for investment) shows positive and statistically significant relationship with growth. This is confirms their position as potent explanatory variables for economic growth.

The remainder of the paper is as follows. Section 2 discusses some related empirical literature, section 3 discusses the methodology, section 4 shows the data, section 5 discusses estimation, section 6 presents the results, section 7 provides the concluding remarks.

[2]Structural Adjustment Programmes

[3]Least Developed Countries.

[4]Gross Domestic Product.

2. RELATED EMPIRICAL LITERATURE

Matuka and Asafo (2018) employed a Johansen co-integration and an error correction approach to estimate the impact of external debt on economic growth in Ghana from 1970-2017. They found that external debt inflows stimulates economic growth both in the short run and the long run. Furthermore, there is evidence of Debt Overhang, crowding effect and the non-linear effect of external debt on economic growth in Ghana.

Senadza *et al.* (2017) conducted an empirical assessment of external debt and economic growth relationship for 39 SSA countries for the period 1990-2013. Their employed a system GMM methodology. Apart from finding evidence for a negative impact of external debt on growth, they also found no evidence for a non-linear relationship between debt and growth. Furthermore, they found that the income per capita dummy is not significant, which implies that being a rich or poor SSA does not change the narrative that external debt hampers economic growth.

Siddique *et al.* (2015) using panel data revealed that there exists short and long-run causality running from external debt service to GDP for the period of 1970-2007 for the heavily indebted poor (HIPC) countries.

Atique and Malik (2012) estimated the impact of domestic and external debt on economic growth in Pakistan from 1980 to 2010 using ordinary least squares estimator. Their findings show an inverse relationship between debt(both domestic and external) and economic growth. However, comparatively the impact of external debt on economic growth is much stronger.

Furthermore, Sulaiman and Azeez (2012) built an over parametrized model with GDP as an endogenous variable and external debt, ratio of external debt , exchange rate and inflation as exogenous variables. Co-integration test gives evidence of a long-run relationship whereas error correction approach determines that there is a positive impact of external debt on economic growth.

Kasidi and Said (2013) employed co-integration and vector error correction to examine the external debt-growth nexus in Tanzania from 1990 to 2010. Their findings are that external debt affects growth positively whereas debt service payment influences growth negatively.

Ajayi *et al.* (2012) studied the impact of cost of foreign borrowing of Nigeria as a developing economy using regression analysis. Their findings established an inverse relationship between foreign loans and the nation's GDP and GDP per capita.

Musebu (2012) found that external debt does not promote economic growth in Highly Indebted Poor Countries (HIPC) and Southern Africa Development Community (SADC) countries.

Frimpong and Oteng-Abayie (2006) used a co-integration and an error correction approach on annual data from 1970-1999 to estimate the effect of external debt on economic growth in Ghana. They found that total debt servicing has a negative impact on growth whereas external debt has a positive impact. In addition, their paper highlights debt overhang effect and crowding out effect explained by debt accumulation and debt servicing respectively.

Elbadawi *et al.* (1996) adopted a non-linear fixed effect panel model of 99 countries including SSA to estimate the relationship between external debt, investment and economic growth. They found that current debt stimulates growth whilst the lagged debt variable is deleterious to growth. Their study corroborates the literature that excessive debt hampers investment and growth in developing countries thus, a confirmation of debt overhang and crowding out effect of external debt.

Mwaba (2001) used ordinary least squares regression to estimate a basic growth equation on the negative impact that accumulated external debt has on economic growth in Uganda. The estimated results confirmed that accumulated debt has a negative and statistically significant deleterious impact on growth whilst current debt inflows have a positive impact on growth.

Fosu (1996) used an augmented aggregate production function and establishes a nonlinear relationship between debt and growth in SSA, thus confirming the debt Laffer curve hypothesis. Furthermore, Fosu (1999) again established a negative effect of external debt on growth in SSA.

Were (2001) estimated the impact of external debt on economic growth and private investment in Kenya using time series data from 1970-1995. The findings from this study confirm debt overhang in Kenya since accumulated debt negatively impacts growth in Kenya.

Iyoha (1999) using a simulation approach to investigate the impact of external debt on economic growth in Sub- Saharan Africa countries for the period 1970 to 1994. His finding reveals that mounting external debt depresses investment through both a "disincentive effect" and a "crowding-out effect". He again reveals that external debt stock reduction would have significant positive impact on investment and economic growth.

Reinhart and Rogoff (2010) examined a simple correlation from 1990 -2009 for a sample of 20 countries and the main finding is that above 90 percent of debt/GDP ratio in advanced and emerging economies lead to lower economic growth. Below this level, the correlation of external debt and economic growth is weak.

3. METHODOLOGY

In order to estimate the direct effect of external debt on growth in a panel of 48 SSA, we firstly specify an augmented production function following (Fosu, 1996) who expressed growth as a function of labor, capital and exports. Secondly, we include our main independent variable (external debt) into a dynamic panel which was estimated with a two-step system GMM. The rest of estimation involves a fisher type unit root test, Hausman test and the two step system GMM estimation.

3.1. The Augmented Production Function

$$q_i = \Gamma_0 + \Gamma_1 l_i + \Gamma_2 k_i + \Gamma_3 x_i + e_i \quad (1)$$

Where q denotes the growth rate of gross domestic product, l denotes the growth of labor force, k is the growth rate of capital(proxy for investment), x represents the growth rate of exports; e denotes the disturbance term and $\Gamma_0, \Gamma_1, \Gamma_2, \Gamma_3$ are parameters to be estimated. Exports was added to labor and capital because it is widely accepted as a significant contributor to economic growth (Fosu, 1990).

3.2. Differenced GMM and System GMM

External debt and economic growth relationship is estimated using a two-step system GMM estimator. To resolve possible issue of endogeneity, we employed difference GMM proposed by Arellano and Bond (1991). This difference GMM approach takes first differences and uses the lagged regressors as instruments thereby eliminating the unobserved country specific fixed effects this intends to improve the consistency of the estimates. Sometimes, the unobserved country specific fixed effect may be vital but due to its elimination through differencing, the model might be wrongly specified and our instruments might be weak thereby undermining the asymptotic properties of the difference estimator. System GMM proposed by Arellano and Bover (1995); Blundell and Bond (1998) augments difference GMM by resolving the weak instruments problem by introducing two systems of equations, a differenced equation and an equation in levels. Because variables in the levels equation are instrumented with their own first differences, additional instruments can be obtained thereby increasing efficiency. Efficiency of the equation under estimation is improved if moment conditions of its level form and the differenced forms are combined (Roodman, 2009). The system GMM works on a strong assumption that the first-differenced instruments used for the variables in levels should not be correlated with the unobserved country fixed effects. The system GMM is designed within additional moment condition which is specified as follows:

$$q_{it} = \beta_1 q_{it-1} + \beta_2 w_{it} + \beta_3 w_{it-1} + u_{it} \quad (2)$$

$$u_{it} = v_i + e_{it} \quad (3)$$

$$\Delta q_{it} = \beta_1 \Delta q_{it-1} + \beta_2 \Delta w_{it} + \beta_3 \Delta w_{it-1} + \Delta u_{it} \quad (4)$$

$$\Delta u_{it} = \Delta v_i + \Delta e_{it} \quad (5)$$

for i=1,…N , t=1,…T

Where Δ denotes first differences operator, q_{it} and q_{it-1} denotes real GDP growth and its lagged values respectively; w_{it} and $w_{it-1}$is a matrix of all explanatory variables and their respective lags; $u_{it}$is the error term which contains the unobserved country fixed effects v_i ı and the idiosyncratic disturbance terms e_{it}, β_1, β_2 andβ_3 are vectors of parameters to be estimated, *t* is the number of time periods available to each individual country *i*.

The presence of lagged dependent variable gives rise to serial correlation. To estimate consistent estimators for the instruments with further lags of the dependent variable, we test the null hypothesis of no serial correlation. At 1% level of significance, we reject the Arellano and Bond AR (1) at first differences. On the other-hand we fail to reject Arellano and Bond AR (2) at first differences implying no presence of autocorrelation. Furthermore, we reported the Hansen test to detect over-identifying restrictions. The null hypothesis of this test is that, *instruments as a group are exogenous*. We fail to reject the null hypothesis implying that our model does not suffer from too many instruments.

3.3. Model Specification

$$gdp_{it} = \gamma_0 + \gamma_1 gdp_{t-k} + \gamma_2 labor_{it} + \gamma_3 capital_{it} + \gamma_4 exports_{it}$$

$$+\gamma_5 debt_{it-p} + \gamma_6 sq\_debt_{it} + \gamma_7 middle\_income_{it}$$

$$+\gamma_8 debt\_income_{it} + u_{it} \quad (6)$$

Where, $\boldsymbol{gdp}$ growth denotes real gdp growth, $\boldsymbol{labor}$ denotes labour force growth , $\boldsymbol{capital}$ refers to gross fixed capital formation as percentage of Gdp (proxy for investment) , $\boldsymbol{exports}$ denotes growth rate of exports, $\boldsymbol{debt}$ denotes external debt as a percentage of GDP, $\boldsymbol{sq\_debt}$ denotes square of external debt as a percentage of GDP (to capture non-linear effect), $\boldsymbol{middle\_income}$ refers to dummy for country groupings (middle income country = 1 , lower income country =0), $\boldsymbol{debt\_income}$ denotes interaction term for debt and country groupings $\boldsymbol{u_{it}}$ is disturbance term , *t and i* = year and countries respectively,

4. DATA

Annual data for the period 1990-2017 was taken from World Development Indicators, 2018 to estimate the impact of external debt on economic growth in SSA. The variables are: growth rate of GDP; growth rate of labor force; gross fixed capital formation as a percentage f GDP(proxy for investment); exports is the annual growth rate of exports; debt denotes external debt as a percentage of GDP; sq_debt refers to square of external debt as a percentage of GDP(capture non-linear effect), middle-income denotes dummy for country groupings (middle income country = 1 , lower income country =0), debt_income = interaction term for debt and country groupings.

5. ESTIMATION

5.1. Stationarity Test

A Fisher type test based on Augmented Dicker Fuller test for unit root was conducted to eliminate any non-stationary tendencies in the panel. The null hypothesis is that, all panels contain unit root. Findings presented in Table 1, indicates a rejection of the null hypothesis implying that our panel is stationar hence our estimates will not be spurious. What follows next is to perform a Hausman test to choose between the random effect model and the fixed effect model. The null hypothesis is that, the random effect model is appropriate. The Table 2, shows that we have satisfied the prerequisite to estimate a two-step system GMM since we reject the null hypothesis in favor of fixed effect model.

Table-1. Augmented Dicker Fuller Test.

Variable	Inverse chi-squared		Inverse normal		Inverse logit		Modified inverse chi-squared	
	Statistic	prob	Statistic	prob	Statistic	prob	Statistic	prob
GDP	376.73	0.000***	-13.206	0.000***	-15.0137	0.000***	20.6207	0.000***
Labor	501.8659	0.0000	-11.5018	0.000***	-18.7865	0.000***	29.7467	0.000***
capital	167.0227	0.000***	-1.9382	0.026**	-3.6139	0.000***	5.3257	0.000***
Exports	575.2452	0.000***	-16.5720	0.000***	-22.9443	0.000***	36.1680	0.000***
External debt	177.8010	0.000***	-6.7538	0.000***	-6.5358	0.000***	6.9998	0.000***
Debt_income	114.7476	0.000***	-5.1778	0.000***	-5.9421	0.000***	8.3570	0.000***
Sq_Debt	219.8825	0.000***	-7.9953	0.000***	-8.0038	0.000***	10.2084	0.000***
Middle_income	61.4139	0.000***	-4.5462	0.000***	-4.8281	0.000***	5.9419	0.000***

Notes: * , **, *** denotes 10% , 5% and 1% levels of significance.

Table-2. Hausman Test.

Test: null hypothesis: difference in coefficients not systematic
Chi2(10) = (b-b)'[(v_b-v_b)^(-1)](b-b) = 83.45
Prob>chi2 = 0.0000

6. RESULTS

The Table 3, gives a descriptive statistic on the mean and the standard deviation of our main regressors from 1990-2017. It is evident that GDP growth, labour force growth, investment , export growth and external debt averaged 4.2%, 14.7%, 21.1% 7.9%, 84.% respectively across our sample. The degree to which they vary across the sample also stood at 8.5, 1.5 , 15.9, 23.3, 108.7 respectively. The Table 4, provides estimates on the fixed effect model, random effect model and the two-step system GMM. The two step system gmm estimates are classified into restricted model and full model. To ensure the presentation of our results in an empirically coherent manner the restricted model excludes ;lags of external debt , square of external debt and debt- middle income dummy whilst the full model presents results without the exclusion of any variables.

Table-3. Descriptive Statistics.

Variables	Mean	Standard deviation
GDP growth rate	4.2	8.5
Labour force	14.7	1.5
Capital	21.1	15.9
Exports growth	7.9	23.3
External debt	84.0	108.7

Table-4. System GMM Estimates.

Variables	Fixed effects	Random effect	System GMM Restricted Model	System GMM Full model
GDP lag 1	0.058*	0.121***	0.121***	0.109***
	(0.031)	(0.030)	(0.009)	(0.014)
GDP lag2	0.053*	0.106 ***	0.076***	0.074***
	(0.031)	(0.03)	(0.008)	(0.012)
Labour force	-0.688*	-0.603*	7.233***	7.145**
	(0.399)	(0.396)	(2.204)	(3.263)
Capital	0.081***	0.059**	0.058***	0.064***
	(0.025)	(0.019)	(0.014)	(0.012)
Exports	0.081 ***	0.085***	0.088***	0.082***
	(0.007)	(0.007)	(0.004)	(0.005)
Debt	-0.045 ***	-0.046***	-0.008*** (0.000)	-0.0471***
	(0.007)	(0.006)		(0.007)
Lag1 Debt	-0.045***	0.029 ***		0.041***
	(0.007)	(0.006)		(0.003)
Lag2 Debt	0.008*	0.006*		0.001
	(0.004)	(0.004)		(0.002)
Square of debt	3.17e-06	3.93e-06		3.17e-06
	(4.67e-06)	(4.21e-06)		(4.31e-06)
Middle income	0.341	-0.166	0.097	1.218*
	(1.037)	(0.473)	(0.287)	(0.711)
Debt* income	0.006	0.004		-0.010
	(0.006)	(0.005)		(0.013)
Constant	1.635**	1.865 ***	1.748***	1.168
	(0.762)	(0.571)	(0.298)	(0.470)
Observations	899	899	903	899
Wald chi2(11)		324.30		
F(11,846)	23.92			
Prob> f	0.0000	0.0000	0.000	0.000
Nos of instruments			36	36
Nos of groups			42	42
Arellano-bond AR(1)			0.002	0.001
Arellano-bond AR(2)			0.610	0.259
Hansen test			0.311	0.298

Note: standard errors in parenthesis, *** p<0.01,** p<0.05, *p<0.1.

6.1. Full GMM Model

Firstly, coefficients in the full model show that exports growth, investment and labor force growth are positive and statistically significant in explaining growth. This confirms that these variables stimulate growth. Secondly, there is evidence that external debt adversely affects growth in SSA. The results are present in Table 4, show some coherence with the fixed effect and random effect estimates. It also corroborates findings of Senadza *et al.* (2017); Iyoha (1999); Fosu (1996); Fosu (1999). The contemporaneous external debt parameter shows that a 1 percent increase in external debt leads to a 0.05 percent fall in GDP growth. Furthermore, the first lag and second lag of external debt are both positive, however, only the first lag is statistically significant. The implication is that if external debt accumulation in the previous period increases by 1 percent, GDP growth in the next period increases by 0.04 percent. In addition, we used the square of external debt in an attempt to capture the Debt Laffer curve

hypothesis[5]. We found that the square of debt is statistically insignificant, in explaining economic growth in our sample. This finding contradicts (Fosu, 1996; Matuka and Asafo, 2018) who found evidence of a non-linear relationship between external debt and economic growth for Ghana and SSA respectively. Lastly, we found that being a poor or rich SSA country does not change the narrative that external debt hampers growth as the levels of significance were above any of the conventional levels.

6.2. Restricted GMM Model

We found that irrespective of the exclusion of lags of external debt, square of external debt and debt- middle income dummy, there is evidence of a negative and statistically significant relationship external debt and GDP growth in SSA. If external debt increases by 1 percent, GDP growth falls by 0.01 percent. Albeit, the negative contemporaneous debt coefficient is smaller in the restricted model the negative impact of debt on GDP growth is established nonetheless. In addition, there is also evidence that export growth, capital/GDP ratio and labor force growth are significant contributors to economic growth in SSA.

7. CONCLUSION

This paper adopted a two-step system GMM technique to unravel the external debt and economic relationship in SSA from 1990-2017. This approach is favored ahead of the one-step system GMM approach due to the fact that its standard covariance matrix is robust to panel-specific autocorrelation and heteroscedasticity. We estimated a full system GMM model (all variables) and a restricted system GMM model (lags of external debt, square of external debt and debt- middle income dummy are excluded). Firstly, we found that, export growth, capital/GDP ratio and labor force growth offer a significant stimulus to GDP growth in SSA. Secondly, there is evidence of a negative impact of external debt on GDP growth at a magnitude of 0.05 percent (full model) and 0.01 percent (restricted model). Furthermore, the lag of external debt shows that accumulated debt in the previous year makes funds available for growth enhancing expenditure in the next period. Lastly, there is also evidence that being a middle income SSA does not make external debt to be benign to GDP growth.

The hampering effect of external debt accumulation on GDP growth in SSA does not mean SSA economies should shy away from sourcing for external funds. We suggest the adoption of robust ways to generate domestic revenue to complement external sources of funding such as the inclusion of all domestic informal businesses onto a common state- of-the-art platform so that domestic revenue collection will be effective. In addition, since debt servicing forms a chunk of the debt burden, we suggest that SSA countries should strive for a relatively stable macroeconomic environment so that they will be in a stronger position to negotiate the terms of their debt.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Contributors/Acknowledgement: Special gratitude to all other graduate students and researchers who made their contributions towards the preparation of this paper. However, all errors remain the responsibility of the authors.

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[5]The DLFH simply says that there is a nonlinear relationship between debt and growth conditioned on the fact that there is an optimal level of debt that will enhance growth. Beyond that optimal level, more debt is detrimental to growth.

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