External Debt Stock, Real Exchange Rate and Economic Growth in Sub Saharan Africa: A System GMM Approach.

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Abstract

This study investigate the impact of external debt on economic growth in Sub Saharan African (SSA) countries, the study sampled 13 SSA countries using the System GMM estimation for the period 1999 to 2019, the study period is justified owing to economic rigidities and shocks that has continued to bedevil the SSA region. The result of the study revealed that the lagged value of economic growth has a positive and statistical significant effect on current growth. A positive but non-significant relationship exists between external debt and economic growth in the short run. Gross fixed capital formation had a positive but non-significant relationship with economic growth. The coefficient exchange rate revealed a negative and statistical significant relationship on economic growth.

1. Introduction

Debt Sustainability Framework (DFM) is a policy designed by World Bank and IMF to review periodically project debt sustainability as a function of past debt, interest payment and financing lacuna projected in the Gross Domestic Product (GDP), exchange rate, government revenue and expenditure in low-income countries (Battaile, Hernández & Norambuena, 2015). Despite the policy option, it is glaring that Sub Saharan African countries are guilty of violating it. Shockingly, the period 1981 and 1990 occasioned by SAP 1986, when the average annual growth rate of real GDP in Sub Saharan Africa pegged at 1.7%. Albeit rising rate in population growth rate and poverty, the average annual growth rate of GDP per capita for the period between 1981 and 1990 stood at -0.9 (lyoha, 1999).

In 1990, external debt build-up to about US$176.36 billion, it further rose to about US$235.94 billion in 1995, the region is saddled with rapid debt profile peaking to US$269.08 in 2010. To worsen the situation, SSA region was reported to have recorded US$367.51 billion in 2013. Of particular concern is the report where estimates show that about half of the countries in the sub Saharan region have recorded double external debt stocks (International Debt Statistics, 2020).

In 2018 for instance, the average debt-to-GNI and debt-to-export ratios of countries in SSA region with the exception of South Africa, stood at 32% and 127%, respectively; the comparable ratios for 2009 were 24% and 87% (International Debt Statistics, 2020). Borrowing externally may not be inimical to growth for it is used to finance basic real economic indicators that can spur growth. Despite the activities of World Bank and IMF on debt sustainability analysis, risk of caveat on debt distress as well as framework and path way to mitigating debt crisis across SSA countries, the effort yielded less response.

There are several studies on nexus between external debt and GDP but largely on single country analysis. Relatively few studies have emerged on panel data analysis, of particular concern is Generalized Method of Moments (GMM) (Senadza; Fiagbe & Quartey, 2018; Daud & Podivinsky, 2012). More so, the period under study 2009 through 2019 unravels structural economic rigidities and economic crisis especially recession of 2009 which technically, may increase the SSA countries' debt profile. In addition to the above mentioned, the dynamics of debt has an unclear movement, thus results to researches with mixed evidences.

From the forgoing background, this study seeks to investigate the nexus between external debt, real exchange rate and economic growth and other factors that affect economic growth. This study is structured into five sections including the introduction. Section two of the study explores the literature review, section three discusses the methodology, and section four explains the data analysis and presentation while section five of the study includes the summary, conclusion and implication for policy direction and implementation.

2. Literature Review

Theoretical Framework
Several theories have shown that debt can endanger growth prospect, for instance the classical economist Ricardo (1951) perceived debt to be inimical to growth future prospect. Scarcely resource economies resort to borrowing to implement administrative goals and target projects. The dual-gap theory postulated by Chenery and Strout (1966) support the savings gap and foreign exchange gap, and rationalized motive on the introduction of external borrowing to a growth model. The savings gap and foreign exchange gap explains that domestic economies with less resource base to undertake and accomplish a desired or expected level of growth and development will require borrowing thus, external borrowing cannot be underscored hence, a function of saving-investment gap, import-export.

Debt is inevitable, although debt accrued to cover saving-investment gap maybe a deleterious to some economies. The debt overhang hypothesis can be traced to the works of Krugman, (1988) explains that when debt accumulates to a defined threshold, it can inhibit the credibility of the debtor to repay its debts. The debt overhang hypothesis explains the implication of too much borrowing as it affects the credibility of the debtor to pay the principal with interest. When countries borrow resources beyond certain threshold, they are subjected to pay the principal and the interest that accrues to the money borrowed over time. Sachs (1986) argued

that countries with expanded debt ratio might raise the future tax rate thus inhibit growth prospect.

There are several studies on the nexus between external debt and economic growth with mixed evidences. In a recent study, Edo, Osadolor and Dading (2020) used the auto regressive distributed lag (ARDL) to investigate nexus between external debt and economic growth in the countries for the period 2005 to 2017. The result of the study reveals that there is insignificant positive impact of both external debt and export on economic growth in the short run. Senadza; Fiagbe and Quartey (2018) in their study employed the GMM technique to estimate the impact of external debt on GDP using panel data of 39 SSA countries for the period 1990 to 2013. Their study revealed that, external debt negatively impact on growth in SSA. Statistically, a 1% point increase in external debt to GDP ratio reduces GDP growth by 0.05 % points. Fosu (1996) examined the effect of external debt on economic growth in SSA countries for the period 1970 to 1986 covering sample of 26 countries using ordinary least square regression technique of estimate. The result of the study revealed a negative relationship between debts on economic growth in SSA countries. In another study, Fosu (2011) examined 35 SSA countries span 1980-1990 to explore the effect of external debt on economic growth in sub-Saharan Africa applying OLS approach, the result shows a negative nexus between external debt and economic growth. However, the impact is less felt on investment. Contrarily, Ijirshar, Joseph and Godoo (2016) in their analysis investigated the effect of external debt on economic growth in Nigeria for the period 1981-2014 applying the ADF stationarity test and Johansen Cointegration test technique. The authors found that positive relationship between external debts on economic growth in Nigeria in the long-run. But external debt servicing had both long-run and short-run negative effect on economic growth.

However, Ayadi & Ayadi (2008) investigated the impact of external debt and debt servicing on econo9mic growth comparing South Africa and Nigeria by applying the OLS and generalized square regression technique. The authors in their analysis used sample period of 1980 to 2007 and the result of the study shows that external debt had a positive effect on Nigerian growth but at a point of threshold, it becomes negative. However, South Africa external debt on growth seems to perform better on economic growth. In a separate study, Burhanudeen, Muda, Nathan and Arshad (2017) employed data on Malaysia for the period 1970 to 2015 applying the auto regressive distributed lag model, the result of their study shows a positive relationship between external debt and growth in short and long run. However, the result further shows a uni-directional relationship running from external debt to economic growth in Malaysia. Ali & Mustapha (2012) in a study used time series data span from 1970 to 2010 to estimate the effect of external debt on Pakistan economic growth applying Johansen (1988). The result of the study shows that external debt had a negative long run effect on economic growth. For instance, a one percent point increase in external debt as percentage of GDP reduces the GNP by 0.42%. The result also reveals a negative and significant short run relationship between external debt and economic growth. In the same vein, Siddique; Ullah, and Ul-Haq (2017) used data on Pakistan economy span from 1975-2015 applying the

ARDL technique of estimation. Result of the study depicts a negative and significant effect between external debt and economic growth in Pakistan economy.

Daud and Podivinsky (2012) investigated the effect of external debt on economic growth for 31 developing countries for the period 1970 to 2005using GMM-system. The result of the study posit that external debt negatively affect economic growth. Were (2001) investigated Kenyan economy on the effect of external debt and debt servicing on growth spanning 1970-1995. The result of the study indicates that external debt stock had a negative impact on both economic growth and private investment. Debt servicing had no severe effect on growth but severely affects investment negatively. Yeltulme and Kwesi (2017) in their study investigated the effect of real exchange rate on economic growth in Ghana using time series data set spaning from 1984 to 2014 and applying the ARDL model. The result of the study indicates a positive and statistically significant relationship between real exchange rate and economic growth at the time period of study. In another study Bo (2014) applied the Cointegrated VAR (CVAR) model to investigate empirically the nexus between Real Exchange Rate (RER) and economic growth in China span 1994 to 2012 and the result revealed that there is no significant long run relationship between real exchange rate and economic growth.

3. Methodology

Data sources
This study employed the panel data set sourced from World Data Indicator (WDI) for the period 2009 to 2019. A panel of 13 SSA countries was obtained as sample countries for observation, and the rational for using the secondary data source is due to availability of data in form of non-probability sampling technique. The rationale of using large number of country groups is to solve the issue of country specific effect problem and endogeneity related issue common with panel data estimation.

Empirical Model and Description of Variables
This study used a modified model of Cunningham (1993) which is expressed in form of production function: Y = f(HC, K, T, L, ED) ……………………………. 1

In the case of Cunningham (1993)model, the dependent variable GDP per capita is used as a proxy of economic growth (Y) and employed by Siddique and Majeed (2015), Siddique *et al*. (2016), Siddique and Ul Haq. However, the explanatory variables are gross fixed capital formation (K), human capital (HC), labor force (L), and external debt (ED) respectively.

$Yt = \beta0 + \beta1 \, HC + \beta2 \, K + \beta 3 \, L + \beta 4 \, ED + \beta 5 \, T + \varepsilon t$ 2

So also, considering the unique study by study by Beck, Levine & Loayza (2000), and Calderón and Servén (2004) which allows the use of lag value of the dependent variable to be used to solve for endogeneity and unobserved country specific effect commonly associated with panel data estimation. This study employs the GMM estimation.

To specify the dynamic model, we have

$$InY_{it} = \phi InY_{it-1} + YZ'_{it} + \beta X'_{it} + d_t + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. \ 3$$

Z' Implies control variables, X' implies explanatory variables InY_{it-1} is lagged value of dependent variable.

The differenced GMM is expressed as:

$$InY_{it} = \phi InY_{it-1} + YZ'_{it} + \beta X'_{it} + d_t + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. \ 4$$

$$i = 1, 2, \dots, N; t = 1, 2, \dots, T$$

The implication of the above differenced GMM model is that, if the dependent variable is close to random walk for instance ($\Phi -> 1$) that is the lagged dependent variable is moving toward one (1). The Difference GMM estimation will not yield a robust estimate rather a biased and inefficient estimate and consequently could be acute when the time panel is short Blundell and Bond (1998).

The significant coefficients in the GMM estimations are important tool for determining long run equilibrium. The long-run coefficients were generated through short-run significant coefficient of ECM. Thus, the long-run effects for the Kth parameter is computed as

$$\beta_k + (1 - \Phi) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \ 5$$

The system GMM is preferred in most respect; firstly, the static model does not capture short and long-run relationship. Secondly, the Sys-GMM estimator captures the persistent nature of regressors on the dependent variable which also addresses the problem of omitted variables, measurement error, endogeneity, and country-specific heterogeneity (Adeleye; Osabuohien & Bowale, 2017). To produce robustness of estimation, this study applies the consistent system-GMM estimator which is assessed by two specification tests.

Firstly, the Hansen test of over-identifying restrictions tests is for the overall validity of the instruments. Secondly, the other test examines the null hypothesis that the error term is not serially correlated. Failure to reject both null hypotheses gives support to the model (Arellano and Bond 1991; Arellano & Bover 1995; Blundell & Bond 1998) cited in Adeleye *et al* (2017).

Variable measurement
Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables were also considered capital formation (see World Development Indicators, 2020).

Unemployment refers to the share of the labor force that is without work but available for and seeking employment (see WDI, 2020).

GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant local currency (see WDI, 2020)

Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments (see WDI, 2020)

GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars (see WDI, 2020)

Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs (see WDI, 2020)

Total external debt is debt owed to nonresidents repayable in currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt. Data are in current U.S. dollars (see WDI, 2020).

4. Results
The result shown in table 1 column 1 indicates the baseline model and it revealed that the lagged value of the dependent variable has a statistical significant relationship with the dependent variable explaining that the previous period had an impact on current period. From the analysis of differenced GMM estimation, it posit that lag value of GDP per capital i.e. previous period had a positive and statistical significant impact on current economic growth from the baseline model 0.356 at 1% level of significance in the short run.

The outcome of previous period on current period is also evident and persistent across model 2-6 showing that the lagged value of economic growth has a positive and statistical significant impact on current economic growth at 1% level of significance. Similarly, External Debt has a positive and significant at 10% across model 1, 2, 3, 5, 6; but negative at 10% level (-0.0198). Gross fixed capital formation is positive in model 3, 4, 5 at 10% level of significance.

The coefficient of real exchange rate depicts a negative and statistical significant impact on economic growth across all models. AR (2) is not significant across all models indicating that the results do not suffer from second-order serial correlation. The Hansen test statistics also indicates that, the instruments are not over-identified

Table 1: Differenced GMM

variable	1	2	3	4	5	5	6
lnGdpper_1	0.3567***	0.3567***	0.3223***	0.3218***	0.2541***	0.3200***	0.3200***
	(0.07)	(0.07)	(0.09)	(0.06)	(0.08)	(0.06)	(0.06)
lnexdebt	0.0342*	0.0493*	0.0647*	-0.0198*	0.0304*	0.0493*	0.0493*
	(0.16)	(0.09)	(0.10)	(0.15)	(0.08)	(0.07)	(0.07)
lngfcf	-0.0148*	-0.0108*	0.0104*	0.0202*	0.0377*	-0.0104*	-0.0108
	(0.10)	(0.10)	(0.09)	(0.10)	(0.09)	(.04)	(0.04)
Real exch	-1.1742***	-1.1981***	-1.1604***	-1.1264***	-1.1546***	-1.1981***	-1.1981
	(0.14)	(0.11)	(0.10)	(0.13)	(0.11)	(0.08)	(0.08)
No. of Obs	90	90	90	90	90	90	90
Time Dummies	Yes	Yes	Yes	yes	yes	yes	Yes
Number of Instruments	33	12	12	32	11	12	12
No of groups	13	13	13	13	13	13	13
F Statistic	22.59	37.86	24.97	24.97	33.62	62.36	330.12
GMM Instrument Lag	1	1	1	1	1	1	1
AR(*1*)	0.997	0.799	0.895	0.889	0.381	0.724	0.718
AR(2)	0.225	0.225	0.251	0.249	0.248	0.025	0.021
Hansen test	1.000	0.430	0.515	0.987	0.411		

*Notes: *** ** * denotes 1% 5% 10% statistical significance. Z statistics (in parenthesis)*
Source: Authors computation

System GMM

It is pertinent to note that GMM estimation relates to short run analysis. In essence, the long run relationship can be generated from the significant coefficients. The result on table 2 posit a positive and statistical significant relationship between lagged value of economic growth and current economic growth at 1%. This is evident across all models except in 2 where it depicts a negative and statistical significant relationship (-0.0298) at 1% level.

External debt indicates negative at 5% level of significance in model 1 and 2 given the values -0.2865 and -0.2020 respectively. The coefficient gross fixed capital formation has a positive sign (0.2356) at 5% level in model 2 and in model 6 (0.1153) at 5% level respectively. Real exchange rate has a negative and statistical significant relationship with economic growth at 1% level of significance across all models of specification AR (2) statistics indicates that the models do not suffer serial-order correlation because none of the AR (2) is significant across all models of specification. The Hansen test statistics also shows that, those instruments used are not over-identified.

Table 2: System GMM

Variables	1	2	3	4	5	6
Lngdpper	0.1826**	-0.0298***	0.4702***	0.3876***	0.1689***	0.2662***
	(0.21)	(0.17)	(0.11)	(0.12)	(0.11)	(0.13)
Lnexdebt	-0.4040**	-0.2865**	-0.0058*	-0.0116*	-0.0398*	0.0338*
	(0.55)	(0.20)	(0.15)	(0.13)	(0.17)	(0.07)
Lngfcf	-0.0085*	0.2356**	0.0254*	0.0435*	0.0078*	0.1153**
	(0.22)	(0.19)	(0.09)	(0.11)	(0.22)	(0.09)
Lnrexr	-1.5416***	-1.4773***	-0.7860***	-0.8562***	-1.2958***	-0.9566***
	(0.44)	(0.36)	(0.15)	(0.16)	(0.13)	(0.11)
No. of Obs	90	90	90	90	90	90
Time Dummies	Yes	Yes	Yes	yes	yes	Yes
Number of Instruments	28	7	33	12	15	20
No of groups	13	13	13	13	13	13
F Statistic	116.49		186.64	180.21		137.80
GMM Instrument Lag	1	1	1	1	1	1
AR(*1*)	0.418	0.171	0.398	0.608	0.191	0.711
AR(*2*)	0.200	0.442	0.771	0.500	0.198	0.484
Hansen test	1.000	0.726	0.999	0.354	0.657	0.985

Notes: *** ** * denotes 1% 5% 10% statistical significance. Z statistics (in parenthesis)
Source: Authors computation

Some reasons may attribute to insignificance of coefficient external debt. Firstly, SSA debt is unsustainable with huge risk, poor management and inefficiency which have been the norms of every regime. Thus, it is not surprising that despite the acute debt profiles, it lacks the strength to drive growth. Secondly, the poor allocation of resources to real sector capable to spur growth also attributes to insignificant external debt growth nexus .to further affirm this, the coefficient gross fixed capital formation also exerts much significance on growth.

To ensure robustness of the GMM estimate, a cursory estimate at lag 2 is essentially important in Table 3. The result is not different from the initial system GMM estimation at lag one in Table 2. The difference is the significance of lag GDP per capital at 5% in model 1 and in System GMM robust estimation; it's 5% in model 3. All lagged values across all models are significant at 1% level in the short run. The significance of the coefficient external debt in robust estimation does not improve comparatively to initial system GMM although varies across model of specification. The parameter real exchange rate has the same sign and level of significance comparatively to System GMM in table 2.

Table 3: Robustness of System GMM check

Variables	1	2	3	4	5
Loggdpper_2	0.3241***	0.2542***	0.2712**	0.2967***	0.2891***
	(0.16)	(0.08)	(0.15)	(0.10)	0.1101
Logexdebt	0.0679*	0.0325*	-0.0295*	0.0056*	-0.0090*
	(0.41)	(0.14)	(0.18)	(0.11)	(0.13)
Loggfcf	-0.2090**	0.0558*	-0.0596*	0.1052**	0.1162**
	.2874494	(0.16)	(0.14)	(0.11)	(0.12)
Logrexr	-1.4214***	-1.0701***	-1.5335***	-0.9985***	-1.0316***
	(0.22)	(0.18)	(0.59)	(0.14)	(0.15)
No. of Obs	77	77	77	77	77
Time Dummies	Yes	yes	Yes	yes	Yes
Number of Instruments	21	11	14	19	21
No of groups	13	13	13	13	13
F Statistic	11.37	36.31	3.25	35.16	32.49
GMM Instrument Lag	2	2	2	2	2
AR(1)	0.132	0.064	0.145	0.114	0.117
AR(2)	0.536	0.675	0.721	0.407	0.411
Hansen test	0.996	0.325	0.886	0.711	0.136

*Notes: *** ** * denotes 1% 5% 10% statistical significance. Z statistics (in parenthesis)*
Source: Author's computation

5. Conclusion

Considering the mixed evidences in the literature on the nexus between external debt and economic growth nexus in SSA countries, this study investigates the impact of external debt on economic growth in SSA covering the period 2009 to 2019. A panel of 13 SSA countries is employed and the System GMM is employed. The result of the study shows that, the lagged value of economic growth had a positive and statistical significant effect on current growth.

A positive but non-significant relationship exists between external debt and economic growth in SSA and this certainly may be attributed to inefficiency in the allocation of external funds to growth indicators. Real exchange rate is negative across all models of specification.

Implication for the study despite huge debt accumulation by SSA countries, has less desired impact on the economy thus SSA must as a policy concern observe regulations defined by World Bank and International Monetary Fund on risk and sustainable debt and in most cases, utilize efficiently external resources on economic indicators that drives growth.

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