Effect of Total Debt Service, Capital stock and Inflation on Economic Growth in SSA: Difference GMM Analysis

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*Abstract:-*Over the past decades, the 1980s to mid-2005 rising debt levels raised concerns for many developing Nations. This was evidenced by the High Indebted Poor Countries Initiativean emblem of African countries struggle to tackle the debt problem. However, owing to the fact that there are limited studies on total debt service, various studies indicate divergent views on the effect of total debt service on economic growth. For this reason, it is not clear whether or not total debt service affect economic growth in Sub-Saharan Africa. The main objective of this study was to investigate the effect of total debt service on economic growth in Sub-Saharan Africa. The random effect model results indicated that total debt service had positive and statistically significant relationship with economic growth in SSA. One step difference Generalized Method of Moments results showed that total debt service had a positive and insignificant relationship with economic growth, capital stock had positive and statistically significant effect on economic growth in SSA while inflation had positive and statistically insignificant relationship with economic growth. The study recommends that SSA countries should exhibit restrain in contracting new external debt since total debt servicing was associated with decline in economic growth and also the governments should establish and adopt an optimal balance between external and domestic debt to maintain steady economic growth. The study concluded that SSA to actively engage in international trade since it facilitates technology transfer, exchange of information and opportunities to realize economies of scale and high volume of investment.

Keywords: Total debt service, economic growth, Sub-Saharan Africa

I. INTRODUCTION

1.0 Background of the study

Debt service refers to the portion of national budget funds allocated for paying country's debt obligation, including the principal payments and interest payments,(Republic of Kenya, 2014). High cost of debt servicing has an implication on the social and economic sectors investments and ultimately on the overall output of an economy. The overall output of the economy can be disaggregated into four components; private consumption, private investment, government spending and net exports, (Njuguna,2008).An assessment of how well the country is doing in reaching key objectives of government policy in terms of variables such as economic growth, inflation, investment, consumption and employment constitutes macroeconomic performance, (Kosimbei, 2009). It

is measured using an index of macroeconomic stability or the growth of annual gross domestic product. Macroeconomic stability reflected by low and stable inflation, sustainable debt of GDP ratio and appropriate exchange rates sends important signal to the private sector about the soundness of economic policies and credibility of authorities commitment to manage the economy efficiency (Ghura and Hadjimichael, 1996).Developing countries having insufficient domestic savings will essentially acquire financial aid to bridge the resources gaps(Ihoya, 1999). Over the past decades , the 1980s to mid-2005 rising debt levels raised concerns for many developing Nations. This was evidenced by the high indebted poor countries initiative(HIPCS) an emblem of African countries struggle to tackle the debt problem (Awiti, 2015). By 2003 19 out of 23 beneficiaries of HIPCS initiative were from Sub-Saharan Africa. This initiative aimed at getting the worlds rich countries forgive debts owed to them by very poor countries and who were overwhelmed by its servicing, which they could only sustain at an unacceptable very high social and environmental costs (Cunningham, 1993). Kenya did not benefit from this program because its debt ratio were relatively lower and could meet the debt obligations without requiring debt relief,(Njuguna, 2008).

II. LITERATURE REVIEW

2.1 Introduction

2.2 Empirical Literature

Total debt service and economic growth

Magero (2015) examined total debt servicing and macroeconomic performance in Kenya for the period from 1970 to 2013 using annual time series data. Results showed evidence of crowding out effect but no existence of debt overhang. Kenya was also found to have weak policy institutions thus remained vulnerable to adverse global exogenous shocks. In analyzing dynamic impact of innovations in debt servicing on selected macroeconomic variables a vector autoregressive (VAR) model was estimated with subsequent derivation of the Impulse Response Function (IRF) and variance decomposition that explained the dynamics of the model.

Kamundia (2015) investigated the effects of public debt and private investments and economic growth in Kenya for a

period from 1980 to 2013. The study used time series data and used granger causality test to determine the direction of causality between public debt and private investment and also between public debt and economic growth. Granger causality tests showed the presence of unidirectional causality from debt to private investment and GDP growth. Debt was found to have a negative effect on private investments and a positive effect on economic growth.

Halima (2015) examined the effect of external public debt on economic growth in East African countries. The study found that external debt had a negative effect on economic growth in EAC. Domestic debt on the other hand, had no significant effect on economic growth. Additionally, capital stock had a positive relationship with economic growth. However, macroeconomic factors such as real interest rate, inflation rate and exchange rate did not have a significant effect on economic growth. The risk-cost analysis showed that EAC Where GDP= is the GDP growth rate measured by economic growth

Ln= Natural logarithm

$ln\,tds\,it$ =is the natural log of total debt service

$\ln gds_{it}$ =is the natural log of gross domestic savings

$\ln \inf l_{it}$ =is the natural log of inflation

$\ln gcf_{it}$ =is the natural log of gross capital formation a proxy for capital stock

$ln\,fconsit$ =the natural log of final consumption expenditure

$\ln \operatorname{int} r_{it}$ =is the natural log of interest rate

$\ln \exp_{it}$ =is the natural log of net exports

ε_i = the error term

i=…n, where n is the number of firms. β_0 =constant/the intercept point of the regression line and the Y-axis. β =is the slope /gradient of the regression line. ε =is the error term.

The expected signs $\beta_{1\geq0}, \beta_{2\geq0}, \beta_{3\geq0}$

Source derived Maingi (2010)

2.3 Data measurement

Gross domestic product per capita, current us dollars was a proxy for economic growth, Debt service on external debt, total(TDS,current us dollars) a proxy for total debt service, consumer price(annual %) proxy for inflation, final consumption expenditure (annual % growth) for consumption expenditure growth, Gross domestic savings % of GDP for savings, interest payment(% of revenue) for interest rate,

countries face exchange rate risks when borrowing, specifically, a depreciation of local currencies led to an increase in public debt.

III. RESEARCH METHODOLOGY

3.1 Introduction

The section presents the model specified for the study. The variables used in the study are defined. The data sources and the methods used in data analysis are explained.

3.2 Model Specification

$ln\,G\,DP = \beta_0 + \beta_1 \ln tdsit + \beta_2 \ln g\,ds_{it} + \beta_3$

$lninf\,l_{it} + \beta_4 \ln g\,cf_{it} + \beta_5 \ln fcons\,it + \beta_6 lnint\,r_{it} + \beta_7 lnexp_{it} + \varepsilon_{it}$
....(3.9

Exports of goods and services(% annual) for net exports, Gross capital formation proxy for private investment growth.

3.3. Diagnostic Tests

To examine whether fixed and or random effects in the panel data and Hausman's test were conducted

3.3.1. Panel Unit Root Test

Panel unit root test was conducted to investigate whether there were any variables in the model that where non-stationary.

Table 3.1 ImPesaran and Shin Panel Unit Root Test

Variable	Level First difference	Constant	Constant +trend
LNGDP	Level	-2.7181 (0.0033)	-0.5465 (0.2924)
	1st difference		-4.0808 (0.0000)
LN TDS	Level	2.9098 (0.9982)	-1.2029 (0.1145)
	1st difference	-6.7098 (0.0000)	-5.5796 (0.0000)
LNGCF	Level	-4.2352 (0.0000)	-3.4895 (0.0002)
LNEXP	Level	0.7317 (0.7678)	0.5967 (0.7247)
	1st difference	-5.0660 (0.0000)	-3.1401 (0.0008)
LNGDS	Level	-4.1328 (0.0000)	-3.2931 (0.0005)
LNF C0NS	Level	-4.3236 (0.0000)	-2.1625 (0.0153)
LNINTR	Level	-2.0186 (0.0218)	-1.0369 (0.1499)
	1st difference		-4.3064 (0.0000)
LNINFL	Level	-5.1326 (0.0000)	-4.3476 (0.0000)

Source: Research data

From the panel unit root test table above , the results reveals that gross domestic product, gross capital formation, gross domestic savings, interest rates, inflation rate and final consumption expenditure were stationary at level. A

stochastic process is said to be stationary when the mean and variance do not change over time .Even though unit roots are often associated with time series data set, there is also need to test for stationarity of panel data sets .This is because running a regression with variables that are not stationary will produce spurious regression results (Nelson and Plosser,1982) and Nyokabi(2017).The table above presents panel unit root test between total debt service and economic growth in Sub-Saharan Africa. According to the Im-Pesaran-Shin test results in table 3.1 shows that the test statistic for variables gross capital formation, gross domestic savings, final consumption expenditure, interest rate, inflation and gross domestic product were statistically significant at one percent level.

However , test statistics for total debt service and net were not statistically significant. This suggests that these variables were not stationary at levels and had to be differenced once at least for them to become stationary. Also after including constant and trend the Im-Pesaran and Shin panel unit results revealed that Gross capital formation, gross domestic savings, final consumption expenditure and the inflation rate were statistically significant implying that they were stationary at level. However variables such as gross domestic product, total debt service, net exports and the interest rates were not statistically significant meaning that they were non-stationary at level after including trend . After differencing them they become stationary. Variables that could be considered not to be stationery at levels in accordance with IPS once they become stationary suggesting that they were integrated of order one(1),thus panel unit root test result in table 3.3 shows that the variables for the total debt service have mixed order of integration .some variables were integrated of order zero while others were integrated for order one (1).

3.3.2 Test for Autocorrelation

Autocorrelation refers to the degree of similarity between a given time series and a lagged version of itself over successive time intervals.

Table 3.2 Autocorrelation test

Estimated model tables	Order of correlation	Z statistics	Pr> z
Table 4.4	AR(1)	-2.47	0.014
	AR(2)	-1.15	0.251
Table 4.5	AR(1)	-5.95	0.000
	AR(2)	-1.19	0.232
Table 4.6	AR(1)	-6.05	0.000
	AR(2)	-1.7	0.089
Table 4.7	AR(1)	-6.03	0.000
	AR(2)	-1.19	0.233

Source: Research data

The p-values give the probability of correctly rejecting the null hypothesis of no autocorrelation.It is required that the

AR(1) tests of first order autocorrelation rejects the null, while the tests for second order autocorrelation fails to reject the null hypothesis of no autocorrelation,Arellanoand Bond 1991,1998).Therefore the system GMM estimator is consistent only when second order autocorrelation is not significant. Although first order correlation need not be zero. The hypothesis of the presence of autocorrelation of order one is accepted for the estimates results presented in tables 4.4,4.5,4.6 and 4.7 at 5 and 1 percent level of significance. While autocorrelation for order two is found to be absent in all the equations as shown in table3.2 respectively. This shows that the chosen lags are valid instruments for the model specifications. Considering together the various statistical tests that have been conducted satisfy the key assumptions of SGMM and DGMM estimations, this model is therefore an appropriate statistical generating mechanism.

3.3.3 SarganTest for Over identification

The system of GMM involves the use of instrumental variables, the instruments may be correlated with the error term thus may render the results inconsistent. The null hypothesis states that over identification restrictions are valid. To correct for overidentification some instruments would be dropped to make the estimation less restricted this could be done by adjusting the number of the lags (Arellano and Bond, 1999, Gibbons and Overman, 2012).The p-value test for the one-step System GMM in table 4.4 is 0.018,table 4.5is 0.006,table 4.6 is 0.012 and table 4.7 is 0.003which is less than the 5% level of significance and as such the null hypothesis that over identifying restrictions are valid is not accepted.TheSargan's test reflects the goodness of fit of the model. According to Baum(2013),when using GMM estimation the r-squared is no more bounded between 0 and 1,there is no measure of goodness of fit except checking the validity of the instruments.

3.3.4 Cointegration test

Table 3.3 Panel Cointegration Test

Kao Residual Cointegration Test				
Series: LNGDP LNTDS LNEXP1 LNFCONS1 LNGCF1 LNGDS1 LNINFL1 LNINTR1				
Included observations: 345				
Null Hypothesis: No cointegration				
Trend assumption: No deterministic trend				
Automatic lag length selection based on SIC with a max lag of 3				
			t-Statistic	Prob.
ADF			-6.533706	0.0000
Residual variance		0.021538		
HAC variance		0.030594		

Source: Research data

The above table 3.3 is the Kao panel cointegration test results. The panel cointegration test conducted was aimed at investigating whether there was more than a single

cointegrating relationship between total debt service and economic growth in Sub-Saharan African Countries. The Kao residual panel cointegration test showed rejection of null hypothesis of no cointegration for all the panel data sets, hence implying long run cointegration between total debt service and economic growth. The Kao residual cointegration test ADF was 0.000 which was significant. The null is no cointegration and alternative hypothesis cointegration exists. Thus we rejected the null and accepted the alternative. Acccording to Enders(1995) the evidence of cointegration between the variables implies no spurious correlation.

3.3.5 Hausman Specification Test

Table: 3.4 Hausman Test

---- Coefficients ----				
(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))	
	fixed	random	Difference	S.E.
lntds	.2177169	.2282008	-.0104839	.0050991
lngds1	.0190887	.0205314	-.0014427	.
lnfcons1	.0161545	.0161183	.0000363	.
lnintr1	.0284004	.0271667	.0012337	.
lnexp1	.0409178	.0452443	-.0043265	.
b = consistent under Ho and Ha; obtained from xtreg				
B = inconsistent under Ha, efficient under Ho; obtained from xtreg				
Test: Ho: difference in coefficients not systematic				
chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)=1.08				
Prob>chi2 = 0.9563				
(V_b-V_B is not positive definite)				

Source: Research data

Table 3.4 above was the Hausman specification test which showed that random effect model was the preferred mode. The null hypothesis was that the preferred model was random effect and the alternative fixed model preferred model.The probability was 0.9563 which was not statistically significant at 5 %.

The computed chi-square value at 5 degrees of freedom was 1.08 which is less than the p-value at 95.63% which is greater than the 5 % level of significance. This indicated that there was no correlation between the unique errors (ui) and the regressors.The probability was not significant implying that we shall not reject the null hypothesis but rather accept the null hypothesis. Thus the random effect model was the preferred model.

3.3.6 Breusch Pagan Test

Table 3.5 Heteroscedasticity Test

lngdp[id,t] = Xb + u[id] + e[id,t]
Estimated results:

Var	sd = sqrt(Var)	
lngdp	.9825576	.9912405
e	.0651627	.2552698
u	.5034149	.7095174
Test: Var(u) = 0		
chibar2(01) = 1571.89		
Prob > chibar2 = 0.0000		

Source: Research data

Table 3.5 Breusch –Pagan test of heteroscedasticity for economic growth was conducted. The null hypothesis was that no heteroscedasticity existed and alternative heteroscedasticity exists. The chi-square value at 1 degree of freedom was 1571.89 which is less than the probability value at 0.0000.The probability was 0.0000 % which was less than the 5% significant level. This indicated that heteroscedasticity existed. It therefore meant that the variance of the random component was not constant at 1% significant level.

IV. RESULTS AND DISCUSSION

4.1 Fixed effect model

Table 3.6 Fixed Effect Model on effect of Total Debt Servicing on Economic Growth in Sub-Saharan Africa

Fixed-effects (within) regression			Number of obs = 345			
Group variable: id			Number of groups = 23			
R-sq: within = 0.2886			Obs per group: min = 15			
Between = 0.4294			avg = 15.0			
Overall = 0.4009			max = 15			
			F(5,317) = 25.72			
corr(u_i, Xb) = 0.3430			Prob > F = 0.0000			
Lngdp	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Lntds	.2177169	.0250954	8.68	0.000	.1683424	.2670914
lngds1	.0190887	.0200448	0.95	0.342	-.0203489	.0585264
lnfcons1	.0161545	.0152016	1.06	0.289	-.0137542	.0460632
lnintr1	.0284004	.0083939	3.38	0.001	.0118857	.0449151
lnexp1	.0409178	.0167491	2.44	0.015	.0079644	.0738712
_cons	2.465239	.5063981	4.87	0.000	1.468913	3.461565
sigma_u .79026318						
sigma_e .25526977						
rho .90551735 (fraction of variance due to u_i)						
F test that all u_i=0: F(22, 317) = 115.44			Prob > F = 0.0000			

Source: Research data

The results for the fixed effect model are presented in the table 3.6. The table shows that total debt service had positive and statistically significant relationship with gross domestic product at one percent significance level. Whereas gross domestic savings had positive and insignificant relationship with gross domestic product. Also final consumption

expenditure had positive and statistically insignificant relationship with gross domestic product. Interest rate had positive and statistically significant relationship with gross domestic product at one percent significant level Net exports had positive and statistically significant relationship with economic growth at 5% level of significance. The coefficients for total debt, gross domestic savings, final consumption expenditure, interest rates and net exports were 0.22,0.02,0.02,0.03 and 0.04 (to two decimal point)respectively

4.2 Random effect model

Table 3.7 Random Effect Model on total debt service and GDP in Sub-Saharan Africa

Random-effects GLS regression				Number of obs = 345		
Group variable: id				Number of groups = 23		
R-sq: within = 0.2884				Obs per group: min = 15		
Between = 0.4318				avg = 15.0		
Overall = 0.4039				max = 15		
				Wald chi2(5) =140.37		
corr(u_i, X) = 0 (assumed)				Prob > chi2 = 0.0000		
Lngdp	Coef.	Std. Err.	Z	P>|z|	[95% Conf. Interval]	
Lntds	.2282008	.0245718	9.29	0.000	.1800408	.2763607
lngds1	.0205314	.0200994	1.02	0.307	-.0188626	.0599254
lnfcons1	.0161183	.015297	1.05	0.292	-.0138634	.0460999
lnintr1	.0271667	.008405	3.23	0.001	.0106931	.0436402
lnexp1	.0452443	.0167928	2.69	0.007	.012331	.0781575
_cons	2.237939	.5179445	4.32	0.000	1.222786	3.253091
sigma_u .70951737						
sigma_e .25526977						
rho .88539355 (fraction of variance due to u_i)						

Source: Research data

The random effect model results are presented in table 3.7 The results show that total debt service had positive and statistically significant relationship with economic growth. The relationship was statistically significant at one percent level.Whereas the gross domestic savings had positive and insignificant relationship with economic growth. Final consumption expenditure had also positive and insignificant relationship with economic growth . Interest rate had positive and statistically significant relationship with economic growth at 1% level of significance net exports had positive and statistically significant relationship with economic growth at 1% level of significance. From the random effect table debt service, gross domestic savings, final consumption expenditure ,interest rates, and net exports had coefficients of 0.23,0.02,0.02,0.03 and 0.04(to two decimal point) respectively.

Dynamic Panel Data Estimations

4.3 One-Step Difference GMM

Table.3.8 Effect of total debt servicing on economic growth in Sub-Saharan Africa

Dynamic panel-data estimation, one-step difference GMM						
Group variable: id			Number of obs = 299			
Time variable :yr			Number of groups = 23			
Number of instruments = 258			Obs per group: min = 13			
F(7, 292) =167.52			avg =13.00			
Prob > F = 0.000			max =13			
lngdp	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
lngdp L1.	.7222556	.034083	21.19	0.000	.6551761	.7893351
lntds	.0268938	.0164192	1.64	0.103	-.0054213	.0592089
lngds1	.0116279	.0106204	1.09	0.274	-.0092743	.0325301
lnfcons1	.03862	.0075977	5.08	0.000	.0236668	.0535732
lnintr1	-.0019732	.0046737	-0.42	0.673	-.0111716	.0072252
lnexp1	.0313588	.0096188	3.26	0.001	.0124278	.0502899
yr	.0029012	.0029547	0.98	0.327	-.0029139	.0087164
Instruments for first differences equation						
GMM-type (missing=0, separate instruments for each period unless collapsed)						
L(1/14).(L.lngdp lngds1 lninfl1 lngcf1)						
Arellano-Bond test for AR(1) in first differences: z = -5.95 Pr> z = 0.000						
Arellano-Bond test for AR(2) in first differences: z = -1.19 Pr> z = 0.232						
Sargan test of overid. restrictions: chi2(251) = 310.98 Prob > chi2 = 0.006						
(Not robust, but not weakened by many instruments.)						

Source: Research data

V. DISCUSSION OF FINDINGS

According to Blundell and Bond (1998) rule of thumb, if the dependent variables in an equation was persistent and close to being a random walk,i.e 0->1), the application of difference GMM estimator yields both a biased and inefficient estimate of ϕ in finite samples, and this is particularly acute when the T is short. Also Blundell and Bond (1998) attribute the poor performance of the difference GMM estimator is such as cases to the use of poor instruments. To address this, they propose use of a system GMM estimator .Also Bond (2001) rule of thumb was that the autoregressive model should be estimated by pooled OLS and fixed effects approach. The pooled OLS estimate for ϕ should be considered an upper- bound estimate, While the corresponding fixed effects estimates should be considered a lower bound estimate. If the difference GMM estimate obtained is close to or below the fixed effects estimate, this suggests that the former estimate is downwards

biased because of weak instrumentation and system GMM estimator should be preferred instead, (Bond, 2001)

One-Step Difference GMM

The main objective of the study was to investigate the effect of total debt service on economic growth Sub-Saharan Africa. The study specifically sought to examine the effect of total debt service on economic growth ,examine the effect on capital stock on economic growth and estimate the effect of inflation on economic growth in Sub-Saharan Africa using a dynamic panel date for 15years for the period from 2004 to 2018.The study employed one-step difference generalized method of moment by Arellano and Bond (1991) and used 23 countries in Sub-Saharan Africa based on availability of data from the world development indicators data source (2020), the countries included in the study were Angola, Botswana,Burkina,Faso,Cameroon,CongoRepublic,CotedIvoire,Gabon,Ghana,Kenya,Lesotho,Madagasca,Malawi,Mali,Mauritius,Mozambique,Rwanda,Senegal,South Africa, Sudan, Togo, Tanzania ,Uganda and Zimbabwe. The first objective of the study was to examine the effect total debt service on economic growth in Sub-Saharan Africa .Analysis of data on this objective was based on null hypothesis that total debt service has no effect on economic growth in Sub-Saharan Africa. The control variables used in this regression includes gross domestic savings, final consumption expenditure, interest rate and net exports .From the table 3.8,the lagged variable of economic growth has a positive and significant coefficient at 1 percent level of significance. The coefficient of the lagged dependent variable which is 0.7222 postulates the speed of adjustments which represents the lag effect. This suggests that a one percentage increase on economic growth will affect growth by 0. 72 per cent increase in the current period. This statistically significant lagged economic growth encourage the current level of economic growth. From the table results reveals that total debt service coefficient was not significantly different from zero. The statistical insignificance implied that total debt service contribution to the economic growth did not play any role in economic growth in Sub-Saharan Africa. Results shows that total debt service has a positive and insignificant relationship with economic growth.

Results are consistent with Magero (2015) who found positive effects of total debt service on economic growth in Kenya , which evidenced non-existence of debt overhang in Kenya. Existence of debt overhang signifies a debt burden that is so large that a country cannot take on additional debt to finance future projects, even those that have higher returns enough to enable it reduce its indebtedness over time(Ajayi,1997).Results are also in tandem with Kiganda (2015)who found positive relationship between external debt and economic growth in Kenya. And consistent with Putunoi and Mutuku (2012) and Sheikh ,Faradi and Tariq(2010) who found positive relationship between domestic debt and economic growth in Kenya and Pakistan respectively. According to Cohen (1993)domestic debt can have a positive effect on GDP growth up to a certain threshold beyond which

the effect is negative thus domestic debt can reduce economic growth by crowding out investments in the private sector .The insignificance of the relationship between total debt service and economic growth could be explained in part by the fact that most of the SSA countries have underdeveloped capital markets.

Results are inconsistent with Kamundia (2015) who found that debt service had a negative and significant relationship at 5% level of significance to GDP growth rate as indicated by the coefficient. Increasing debt service by 1% reduced economic growth by 0.75%. AlsoAkram (2011) found similar results in Pakistan. Other contrary results includesOryema (2009) whose results showed that external debt stock

to GDP ratio had statistically significant negative effect in economic growth in Sub-Saharan Africa for the period 1990 to 2005. Ofosuah (2014) found that debt had negative effect on growth in Sub-Saharan Africa. This is because primary debt servicing puts pressure on government to finance interest payment which are not growth engendering. Therefore it is expected that debt would be negatively related to economic growth. Also findings are contrary with Halima (2015) who found negative relationship and statistically significant relationship between external debt and GDP growth in Eastern Africa countries. Halima results (2015) are consistent with a prior expectation and economic theory. Results are not in tandem with Boboye and Ojo (2012), Akram (2011), and Mukui (2013) who found negative relationship between external debt in Pakistan, OECD, and Kenya respectively. External debt can discourage economic growth through several channels.

First to begin with, as external debt increases a large proportion of tax revenue has to be used to repay foreign loans. These constraints the amount of funds that are available for investment in development projects that developing countries need to improve economic growth. Repayment of external debt can also lead to the depreciation of local currencies thereby increasing inflation in Sub-Saharan African countries that are net importers, as a result GDP decreases. This decline is likely to be high if the proceeds of the external debt are mismanaged or invested in unproductive ventures which in turn constrains access to funds for servicing debt, Halima (2015).A significant increase in external debt also discourages investments by increasing uncertainty concerning government policies. An increasing external debt stock often creates expectations that the government is likely to resort to distortionary measures to meets its debt obligations. As a result the private sector investors are likely to postpone their investment which in turn reduce economic growth. The negative relationship between domestic debt and GDP growth is expected a prior Halima (2015) results does not support Mbate (2013) who showed that domestic debt had a negative relationship with economic growth in 21 Sub-Saharan African countries. Also Panizza and Presbitero (2014) Kumar (2014),Woo (2010) Zouhaier and Fatma (2014), Dinca and Dinca (2010) and Kamau (2001).From the

results, the study therefore does not reject the null hypothesis rather accept the null hypothesis that states that total debt service has no effect on economic growth in Sub-Saharan countries.

5.1 One-step difference GMM

Table 3.9 Effect of capital stock on economic growth in Sub-Saharan Africa

Dynamic panel-data estimation, one-step difference GMM						
Group variable: id			Number of obs = 299			
Time variable :yr			Number of groups = 23			
Number of instruments = 259			Obs per group: min = 13			
F(7, 292) = 167.94			avg = 13.00			
Prob >F = 0.000			max = 13			
lngdp	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
lngdp L1.	.7171333	.0346022	20.73	0.000	.649032	.7852347
lngcf1	.0215144	.0073317	2.93	0.004	.0070847	.035944
lngds1	.0155524	.0108348	1.44	0.152	-.0057717	.0368766
lnfcons1	.0348248	.0078355	4.44	0.000	.0194036	.050246
lnintr1	.0063612	.0042338	1.50	0.134	-.0019714	.0146938
lnexp1	.0235069	.009309	2.53	0.012	.0051857	.0418281
yr	.0043794	.0025548	1.71	0.088	-.0006487	.0094075
Instruments for first differences equation						
GMM-type (missing=0, separate instruments for each period unless collapsed)						
L(1/14).(L.lngdp lnintr1 lninfl1 lngcf1)						
Arellano-Bond test for AR(1) in first differences: z = -6.05 Pr> z = 0.000						
Arellano-Bond test for AR(2) in first differences: z = -1.70 Pr> z = 0.089						
Sargan test of overid. restrictions: chi2(252) = 305.01 Prob > chi2 = 0.012						
(Not robust, but not weakened by many instruments.)						

Source: Research data

The second objective of the study was to examine the effect of capital stock on economic growth in Sub-Saharan Africa. Analysis of data on this objective was based on the null hypothesis that the capital stock has no effect on economic growth in Sub-Saharan Africa. The study employed one step difference GMM dynamic panel developed by Arellano and Bond (1991) and estimated the model for the period from 2004-2018.Results revealed that the coefficient for the first lag of economic growth rate was positive and significant at 1% level. This implied that current economic growth rate depends on the economic growth from the previous period. Also coefficient for the capital stock had positive and statistically significant effect on economic growth in Sub-Saharan Africa. The coefficient which is 0.00215 indicates that 1% change in gross capital formation results to 0.0215 % increase in economic growth. Gross capital formation is statistically significant at 1% level of significance.

Results are consistent withOryema (2009) who found gross capital formation coefficient to be positive. This is similar to the studies to Mankiw *et al* (1992) Barro (1990) Bose *et al*

(2007) and Alexiou (2009) who found that capital expenditure is statistically significant and positively related to economic growth in 30 LDCS and inn South Eastern Europe (SEE) respectively.Other consistent results are Fikadu (2017) who examined the effect of trade openness on economic growth in Sub-Saharan Africa and found the coefficient of gross capital formation using Feasible Generalized Least Squares to have positive and statistically significant effect on economic growth at 1% level of significance. Results indicated that 1% increase in gross capital formation will induce 0.18% increment in real GDP per capita holding other variables constant. Also this supports theoretical expectation and empirical work of Muhammad and Toseef (2015), Pigka-Balanika (2013) which postulates a significant and positive influence of capital on economic growth. It also agrees with neoclassical framework in which they believe that more equipment enables workers to produce more output because from Cobb Douglas production function labour is combined with output to produce goods and services and it implies increasing returns to capital andlabour. Workers need machine ,tools and factories to work and use of this capitals makes the work more Productive.This means that as investments increases, the higher will be the output growth,Fikadu (2017). Results are also consistent with Charity (2018) who investigated the effect of remittances on economic growth in Sub-Saharan Africa and found the coefficient of real private investments with respect to GDP Per capita to be positive and statistically significant at 5%level.The results are consistent with economic theory .Investments is necessary to increase productivity and to gear up the economies towards higher levels of social and economic development . The results conform to findings of Fayissa and Nsiah (2008)who found that a 10%increase in real private investments will increase average per capita income by 1.06%.Results are also in tandem with Ofosuah(2014) who found that private investment had positive effect on economic growth in Sub-Saharan Africa.This was statistically significant at 1% for both OLS and the system GMM estimation. Results are consistent with growth theory that capital accumulation propels growth.Halima (2015)also found similar results.Capital stock had positive and significant relationship with GDP growth in East Africa.Also findings supports that of Drezgic (2008)and Limam and Miller(2003) who found that capital accumulation had positive effect on growth. Capital accumulation involves increased spending of a country's savings on capital goods that are necessary for production.An increase in capital investment is likely to increase labour productivity if it promotes technological progress. This resulting increase in aggregate output leads to improvement in GDP growth and standards of living.

However results are in consistent with Semwanga (2009)who found negative relationship between domestic capital and economic growth .This can be as a result of negative effects like stiff competition and pressure on the available resources ,market and the shift in the use of technology .Other contrary results is Kruah (2010)who found that gross capital formation

had statistically insignificant relationship with economic growth in Liberia. From this results therefore the study rejects the null hypothesis and accept the alternative hypothesis which states that capital stock affects economic growth in sub Saharan Africa because gross capital formation is statistically significant and positively affects economic growth in sub-Saharan Africa.

Effect of inflation on economic growth in Sub-Saharan Africa One-Step Difference GMM

The third objective of the study was to examine the effect of inflation of economic growth in Sub Saharan Africa for the period from 2004 to 2018.In the appendix section, table 4.0 results revealed that the lagged economic growth had positive and significant relationship with economic growth in the current period and was statistically significant at 1% level of significance while inflation had positive and statistically insignificant relationship with economic growth. This implies that inflation does not play any role in determining economic growth in Sub-Saharan Africa.Muritala (2011 whose results revealed that although money supply is positively related to economic growth performance but the result was however insignificant in the case of GDP growth rates and on the choice of inflation rate has no significant impact on economic growth performance. Results are also in tandem with Abebe (2014) who examined the determinates of financial performance of Ethiopian commercial banks and found positive and insignificant effect of inflation rate on performance. This may suggest that due to inability of banks to accurately predict the levels of inflation the banks lose the opportunity to benefit from inflation environment to increase profits. Other consistent results are Githiga(2014) who found that inflation which is an indicator of economic stability to be positively related to economic growth. The estimated coefficient of log of inflation was positive and statistically significant at 1% level of significance. The findings is in tandem with Pollin and Zhu (2005).

However results are contrary to Ocharo (2012) who found that macroeconomic stability proxied by inflation rate had a negative and statistically significant coefficient to economic growth at 10%. This is an indication that an unstable macroeconomic environment discourages growth. Results are also contrary to the findings of the Borenszten *et al* (1998) Ayanwale and Awolowo (2007) and Macias *et al* (2009) and Halima (2015) who found negative and significant relationship between inflation and economic growth in East Africa. The negative coefficient of inflation was based on the fact that an increase in price levels reduces GDP growth through its negative effect on aggregate demand. An increase in inflation also increases the cost of production thereby increasing economic growth

Other inconsistent results include Bruno and Easterly (1998) Degregorio (1993, Gomme (1993) and Valdovinoz (2003) found a negative relationship between inflation and economic growth and findings of Barro(1995) and Chimobi (2010) and

Mburu (2017) whose results found that inflation rate had weak negative and significant effect on economic growth in East African Community States. Results showed that a 0.99 percent drop in the level of growth of GDP per capita would occur as a result of 1% rise in the level of inflation among East African Countries. This is the case because inflation makes the returns to investment uncertain in the economy thus causing less investment and this affects economic growth

Also findings are not in tandem with Munyambonera (2012) who examined determinants of commercial bank performance in Sub-Saharan Africa and found negative and statistically significant relationship between inflation and economic growth. Also Panayiotis *et al*(2005) on Greek banks found out that the effect of inflation on bank profitability depends on the ability of inflation forecast by the bank management. If predictions become correct ,such adjustments in the interest rates could be incorporated inflation expectation ,to achieve higher profits. In this case the relationship between bank and inflation rates becomes positive suggesting that banks are able to project the effect of inflation expectations in their operational costs to increase profits ,Munyambonera (2012).Economic theory also argues that if the bank managers are able to predict inflation and incorporate in their cost the effect could be positive. From the study, therefore the study does not reject null hypothesis but rather accept the null hypothesis which states that inflation has no effect on comic growth in Sub-Saharan Africa because inflation rate is positive and statistically insignificant and does not affect economic growth in Sub-Saharan Africa.

VI. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study analyzed the effect of total debt service on economic growth in SSA using the data from the World Development Indicator (2020) for the period from 2004 to 2018. The main objective of the study was to determine the effect of total debt service on economic growth in SSA. Specifically, total debt service had positive and insignificant effect on economic growth in SSA countries. This implies that total debt service does not play any role in determining economic growth in SSA. Gross fixed capital formation exerted a positive and statistically significant effect on economic growth. This is an indication that gross fixed capital formation is critical in achieving sustained economic growth in SSA. Specifically, an increase in capital stock led to an increase in an economic growth. The study also found that inflation had a positive and insignificant relationship with economic growth implying that inflation does not play any role in determining economic growth in Sub-Saharan Africa. The study concluded that SSA to actively engage in international trade since it facilitates technology transfer, exchange of information and opportunities to realize economies of scale and high volume of investment.

6.2 Policy Recommendation

The aim of this research was to determine the effect of total debt serving on economic growth on Sub-Saharan Africa. The study recommends that SSA countries should exhibit restrain in contracting new external debt since total debt servicing was associated with decline in economic growth. It also recommended that government to embark on an expansionary fiscal policy in the form of investing in infrastructure particularly infrastructure that would boost human capital. Also the governments in SSA countries should establish and adopt an optimal balance between external and domestic debt to maintain steady economic growth.

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APPENDIX

4.5 One-Step Difference GMM

Table.4.0 Effect of inflation on economic growth in Sub-Saharan Africa

Dynamic panel-data estimation, one-step difference GMM						
Group variable: id		Number of obs = 299				
Time variable :yr		Number of groups = 23				
Number of instruments = 259		Obs per group: min = 13				
F(7, 292) = 167.85		avg = 13.00				
Prob >F = 0.000		max = 13				
lngdp	Coef.	Std. Err.	T	P>|t|	[95% Conf. Interval]	
lngdp L1.	.7274509	.0345174	21.07	0.000	.6595164	.7953853
lninfl 1	.0100835	.0090611	1.11	0.267	-.0077498	.0279168
lngds 1	.0119648	.0106606	1.12	0.263	-.0090165	.0329461
Lnfcons1	.0367676	.0075066	4.90	0.000	.0219942	.0515398
lnintr 1	.0003455	.0046896	0.07	0.941	-.0088842	.0095751
lnexp 1	.0317174	.0100311	3.16	0.002	.011975	.0514598
yr	.0050675	.0026575	1.91	0.058	-.0001628	.0102978
Instruments for first differences equation						
GMM-type (missing=0, separate instruments for each period unless collapsed) L(1/14).(L.lngdp lngds1 lndsext lngcf1)						
Arellano-Bond test for AR(1) in first differences: z = -6.03 Pr> z = 0.000						
Arellano-Bond test for AR(2) in first differences: z = -1.19 Pr> z = 0.233						
Sargan test of overid. restrictions: chi2(252) = 318.25 Prob > chi2 = 0.003						
(Not robust, but not weakened by many instruments.)						

Source:Research data

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