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### Article

## Effect of external debt on economic growth in sub-Saharan Africa: System GMM estimation

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## **DEVELOPMENT ECONOMICS | RESEARCH ARTICLE**

# Effect of external debt on economic growth in sub-Saharan Africa: System GMM estimation

Isubalew Daba Ayana<sup>1</sup>\*, Wondaferahu Mulgeta Demissie<sup>2</sup> and Atnafu Gebremeskel Sore<sup>3</sup>

Abstract: Following the upsurge of external debt in SSA countries, the effect of external debt on economic growth has captured the attention of empirical studies during the last two decades of the twenty-first century. This study investigated the short- and long-run effect of external debt on the economic growth of 39 SSA countries during the last decade for the periods of 2011-2021. The annual balanced dynamic panel data for the study were sourced from a recognized trustworthy data source, the world development indicator. The result of the study divulged that external debt has a significant negative impact in both the short and long run. Unequivocally, other things remaining constant, a percentage change in total external debt is associated with a 0.034 percent decline in the real GDP of SSA in the short run, while it leads to 0.65 percent shrinkage in the real GDP of SSA in the long run. The study concludes that the negative impact of the long run is greater than that of the short run. The policy implication is that SSA countries should allocate the external debt on the projects that bring other investment opportunities to amortize external debt. Further, the strategies that improve domestic revenue mobilization sources that compliment external debt such as improving informal sectors to broaden tax bases and minimizing domestic revenue leakages need to be established in SSA countries.

Subjects: Macroeconomics; Econometrics; Development Economics

Keywords: external debt and real GDP; panel data; system GMM; SSA countries

#### 1. Introduction

One of the most current macroeconomic policy issues that significantly attracted the attentions of economic literature and policy makers across the globe is the extent to which external debt impact the economic growth of countries. Over the last four years, this concern is expectedly increased as COVID-19 pandemic complicated the external debt in developing countries in general and in SSA countries in particular by eliminating debt relief time. After the global economy is hit by the pandemic, the level of external debt of SSA dramatically increased as a means of complimenting it with the revenue mobilization in domestic economy (Sandow et al., 2022; UNCTAD, 2020). For example, out of 55 trillion US dollar in developing economies by 2018, the commercial debt of SSA countries accounts for about 70 percent of it. This includes 12 percent of multilateral debt from China alone (Agou et al., 2019).





© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent. Further, the rapid growth experience in developing countries, particularly SSA region, has also contributed to the rise in external debt of the countries. In addition to this, the high demand to finance public projects in SSA countries resulted in an abundant external debt (Lau et al., 2022; Ring et al., 2021).

Following this, several studies are conducted regarding the effect of external debt on economic growth of SSA countries. For instance, Manasseh et al. (2022) found negative relationship between external debt and economic growth in the selected SSA countries. Using dynamic Generalized Method of Moments (GMM) for the panel of 30 SSA countries from the period 1997 to 2020, they concluded that external debt has adverse effect on economic growth.

Some other recent literatures are reporting contradicting results on the effect of external debt on economic growth. For instance, Guei (2019) and Agyeman et al. (2022) reported that the short and long run effect of the external debt on economic growth varies and there was no any robust result observed between the two variables in the long run. On the other hand, Mohanty (2017) found that external debt is positively contributing to the economic growth of Ethiopia, one the most populous countries in SSA. Bakarr Tarawalie and Jalloh (2021) found that there is no empirical relationship between external debt and economic growth in the long run for the East African countries. All countries in East Africa are sub-Saharan Africa. Contrary to this, Chindengwike (2021) found that external debt contributes positively to economic growth of Tanzania, indicating literatures are still reporting contradicting results. This study therefore contributes to the existing stock of knowledge on the linkage between external debt and economic growth in SSA countries as there is still no consensus among literatures.

Compared to the huge debt burden recently facing SSA countries, there are still meager literatures in the areas of effect of external debt on economic growth. Except the studies of Sandow et al. (2022) and Agyeman and Fosu (Agyeman et al., 2022), there is recent study that link external debt with the economic growth in SSA countries. Thus, this study investigates the effect of external debt on economic growth in SSA countries using the recent method and updated panel data.

The present study is original due to four reasons. First, it deals with the effect of external debt on economic growth after covid19. It is obvious that the external debt has been tremendously increased to finance COVID-19-related cases in SSA countries. Second, this study employs the panel system GMM for panel of 39 SSA countries and dynamic panel data that updates the knowledge on the relationship between external debt and economic growth. Third, this study is unique as it extended the time span of the study. This study enables policy makers to understand the linkage between external debt and economic growth during the last decade from 2011 to 2021. Finally, this study provides insight about the short and long run relationship between external debt and economic growth as plenty of the studies limited themselves only to the short run analysis.

The rest segments of this paper are structured as follows. Section 2 reviews related and relevant empirical literature on the effect of external debt and economic growth. Method and data for carrying out our empirical investigation are presented in Section 3. In Section 4, our study presents the results and discussions while Section 5 presents the conclusion of the study.

#### 2. Relevant empirical literatures

The existing literatures on external debt and economic growth reported contradicting findings. As there is no common consensus among literatures, various empirical literature conveyed positive relationship between the two variables while numerous likewise reported negative relationship between external debt and economic growth. For the purpose of clarity, we classified the relevant literatures in two types based on the data utilized in the studies; literatures that used panel data and that utilized times series data (country specific studies). Second, we further classified the panel data literatures into two based on their finding; literatures that found positive relationship between the variables and the literatures that stated negative effect of external debt on economic growth. This is just to show that the link between external debt and economic growth is debating among empirical literature.

#### 2.1. Literatures reported positive effect of external debt

There are numerous empirical works that revealed positive relationship between external debt and economic growth. For instance, Mumba and Li (2020) examined the link between external debt and economic growth using panel data for 28 emerging countries in Asia. Their study employed panel fixed and random effect through panel integration for the study period 1995–2019 that covers 25 years. The major point of their conclusion was that effect of debt differs based on the ranges of time in which policy was implemented. Accordingly, their study found that the external debt positively influence economic growth in short run while it has negative impact in the long run.

Qureshi and Liaqat (2020) investigated the long-term consequences of external debt on economic growth using panel vector auto regression using 123 countries across the globe for the panel data from the period 1990 to 2015. The sample countries included in the study were based on level of their income. Their study found that there is positive relationship between external debt and economic growth in the lower and middle income countries while the overall external debt effect was found to have negative relationship on economic growth of the country. This shows that the effect of external debt on economic growth varies based on level of the countries.

Bakarr Tarawalie and Jalloh (2021) examined the nexus between external debt and economic growth for ECOWAS member states using panel co-integration through Fixed Effect Model (FEM) and Random Effect Model (REM). Utilizing the panel data from the period 2000 to 2019, their study revealed that there is nonlinear relationship between external debt of the member states and real GDP of the sample nations. However, it is found that the effect of external debt is below threshing hold (111%), implying the nonlinear relationship between the variables.

Epaphra and Mesiet (2021) examined the linkage between external debt and economic growth for a panel of 45 African countries from the study period 1990–2017. From Fixed Effects (FE) and Random Effects (RE) techniques of estimation, it was found that the effect of external debt on economic growth is based on the level of magnitude of the debt to GDP ratio. Accordingly, their study found that low level debt to GDP ratio has positive effect on economic growth of sample 45 African countries. This was not the case for considerably high level of external debt during the study period.

Bashir Jama (2021) investigated the effect of external debt on economic growth of East African countries using ARDL bound testing approach during the study period 2011–2019. It was concluded that there is no empirical result that detect relationship between external debt and economic growth in the long run in East African countries for the period under investigations. The result from the fixed effect model however shows the presence of negative and significant relationship between the two variables which is mainly resulted from improper debt management in the countries.

Zaghdoudi (2020) examined the impact of external debt and economic growth in the low and middle income countries using panel data from the study period 2002–2016 using a dynamic panel thresh hold estimation technique. From 109 sample countries included in the study, it was concluded that there is statistically significant relationship between external debt and economic growth of the countries. Further, the finding of this study revealed that external debt improves economy in middle and low income country under low regimes while it deteriorates economic growth of the middle income countries included in the sample.

On the other hand, the study by Ring et al. (2021) examined the relationship between external debt and economic growth using GMM estimation technique and panel data analysis for the data

2011–2014 with the main objective of understanding the role of government quality in the countries included under the study. Their study found that right policy is more important than that of good governance during the study periods. However, their study also assured that high governance countries found to have moderate level of quality institution concern in the country.

#### 2.2. Literatures reported negative influence of external debt

Many literatures reported negative relationship between an inverse linkage between external debt and economic growth. For example, Omotor et al. (2020) examined the impact of external debt on economic growth through the use of direct effect hypothesis with the major objective of identifying the major role of institutional quality in 32 SSA countries from the study period 2005–2017. From the OLS techniques of estimation applied to their study, the result of their study revealed that quality of governance has direct positive effect on economic growth while external debt burden found to negatively impact economic growth of the SSA countries.

Other similar works by Mumba and Li (2020) and Mumba and Li (2020) in the same year have found that both short- and long-term external debt affects the economic growth of nine southern African countries negatively for the sample study period from 2000 to 2018. The implication of the study was that southern African countries need to limit themselves from severe dependence on external debt to accelerate their economic growth in both short and long periods. This shows that there is a difference in argument among literature in different regions of the world.

Guei (2019) has investigated linkage between external debt and economic growth in emerging economies using panel of 13 emerging countries in the sample study period 1990–2016. From the panel ARDL technique of estimation employed, it was concluded that the effect of external debt in the long run is not robust in the sample countries. However, this was not found in the short run as the negative and significant relationship between the two variables was found.

The study by Azolibe (2022) found that external debt affects economic growth of SSA countries over the study period 1990–2017 in the panel sample of 20 countries. From the generalized method of moments estimation technique employed in the study, external debt is found to adversely affect economic growth confirming the debt overhang theory hold in the SSA countries during the periods under investigation.

The recent empirical investigation carried out by Makun (2021) confirmed that external debt impose greater negative adverse impact on economic growth over the study periods of 1980–2018 for the panels of Pacific Islands. Applying panel ARDL in the context of neoclassical growth theory, the study found negative effect of external debt on economic growth, and recommended better fiscal management and cutting unproductive expenditure.

Reehan Hameed et al. (2021) examined the effect of public debt on economic growth using the panel vector autoregressive method through fixed effect model estimation technique. Their study found that there is negative relationship between public debt and economic growth in South East Asian countries during the study period 1990–2019. Their study forwarded that productive and efficient debt utilization can change the negative effect of external debt on economic growth.

Asafo (2019) employed a two-step GMM model to investigate the effect of external debt on economic growth SSA for the study period 1990–2017. From 48 sample countries, the study found that external debt has significant negative relationship on economic growth while this is not the case for the lag of external debt as it is found to stimulate growth. It was also found that this affects both rich and poor countries in SSA Africa.

Yolcu Karadam (2018) employed panel smooth transition framework to examine the linear effects of economic growth in the panel of 135 countries of which 111 are developing countries from the period 1970–2012. The finding of their study revealed that non linearity between external

debt and economic growth mainly depends on the nature of debt structure of the country. Regarding the direction of the effect of external debt, the smooth transition from positive to negative was found.

Shkolnyk and Koilo (2018) studied the impact of external debt and economic growth in emerging economies from the period 2006–2016 covering 20 years. From 10 emerging sample countries included in the study and panel ARDL employed in the study, their study found that there is no significant impact between the two variables when no linearity assumption is applied. However, in the case of non-linearity assumption, it is found that external debt adversely affects economic growth when the marginal impact of external debt on GDP growth is negative. The overall implication of their study is appropriate integration of different organization to bring appropriate debt management.

Jarju et al. (2016) employed fixed effect model to examine the relationship between external debt and economic growth in West African monetary zone. The study confirmed that the linkage between external debt and economic growth during the study period is in line with debt overhang theory, indicating that debt overhang beyond certain limit has negative effect on economic growth. From the panel data set from the period 2004–2016, their study also found crowding out effect implying that public investment need to be productive in the region.

Gachunga (2019) employed panel Generalized Method of Moments estimation method to examine the effect of external debt on economic growth of SSA for the study period 1990–2016 covering 26 years in 38 sample countries in the region. It was found that external debt negatively affects the economic growth of SSA countries. In addition to this, the income of the country also matters as there is severe negative effect of external debt observed in middle income countries compared to the low income countries.

Another study by Senadza et al. (2017) has concluded that external debt adversely impacts growth rate of economy in SSA using panel data of 39 SSA countries for the study period 1990–2013 utilizing the estimation technique dubbed as System Generalized Methods of Moments (GMM). Hoti et al. (2022) investigated the effect of government debt on the long-term growth of Western Balkan countries using pane data from the period 1997–2019. Employing the pooled mean group estimator, their study concluded that the effect of the public debt in the long run is not contributing to long-term growth for Western Balkan countries.

Lau et al. (2022) studied the effect of external debt on economic growth of developing countries in Asia using panel data for 16 selected countries in the region for the study period 1980–2016. From the panel data analysis, they found that external debt has negative and significant impact on growth in most of Asian developing countries. The implication of the study was that fiscal discipline that targets appropriate debt to GDP ratio is very crucial to bring sustainable development in the region.

Previously, Law et al. (2021) has found that better institution tends to reduce the negative effect of external debt on economic growth of the region. This finding was derived from 71 developing countries during the study period 1984–2015 employing dynamic panel threshold econometric technique of estimation. Their study further concluded that the negative effect of public debt on economic growth is high in the countries with high public debt while it is low in the low public debt countries.

Sandow et al. (2022) employed a system GMM to examine the linkage between external debt and economic growth of 31 SSA countries from the period 2005–2017. Their study was conducted with the main objective of understating whether public sector management can create a difference on the relationship between the two variables in SSA and revealed that public sector management matters. Agyeman et al. (2022) employed the panel GMM estimation technique for the data covering 15 years from 2000 to 2015 for selected SSA countries. Their study was focused mainly on identifying how capital flight affects the linkage between external debt and economic growth in the region. Accordingly, the effect of external debt on economic growth was found to be negative even when combined with the level of capital flight during the time of investigation

Economic growth of countries is based on their level of domestic saving, capacity of resource mobilization in domestic economy, level of per capita income, the magnitude of fiscal deficit and the saving-investment gap. In the countries where all these variables are low, the external debt is unquestionably high. The fundamental cause of high external debt is inefficiency in the performance of domestic saving of the countries (Agyeman et al., 2022). The previous empirical work of Ighodalo Ehikioya et al. (2020) also confirmed the same result; external debt affects economic growth in the long run for SSA countries.

#### 2.3. Country-specific empirical studies

Different studies were conducted on the relationship between external debt and economic growth in individual countries of SSA. For instance, Akinlo (2020) studied the relationship between external debt and economic growth for economy of Nigeria through the use of time series data for the period 1970–2016. Employing the Markov regime switching approach, their study found that the impact of external debt on economic growth varies based on whether the external debt belongs to the public or private. However, for the study period under consideration in Nigeria, both variables found to be negatively and significantly affecting economic growth of the country.

Ohiomu (2020), who investigated the link between external debt and economic growth, found that external debt adversely affects economic growth of Nigeria. By employing ARDL bounds testing econometric technique, their study suggested that debt management system should be strict in addition to debt reduction strategies that should be carefully implemented.

Similar argument was also provided by the study of Manasseh et al. (2019), who conducted an impact analysis on the linkage between external debt and economic growth for the economy of Nigeria but came up with contradicting result. Employing an annual time series data from the period 1970–2015, their study concluded that external debt has positive and significant impact on economic growth of Nigerian economy. This shows that there is no consensus among literatures on the relationship between external debt and economic growth.

Study conducted in Ethiopia by Getinet (2020) found that public external debt affects economic growth of the country from the ARDL techniques of estimation and time series data from the period 1983–2018. It was mainly concluded that the major source of negative impact of public external debt was due to improper public debt management and spending the public debt into unproductive activities such as war. Similar study was conducted in Jordan by Moh'd AL-Tamimi and Jaradat (2019) to examine the linkage between external debt and economic growth using annual time series data from the period 2010–2017. From the econometric analysis, their study found that the effect of external debt is negative and significant for the economy of Jordan.

Antoine et al. (2021) studied the linkage between external debt and economic growth with the main objective of identifying the optimum level of external debt using time series data from the period 1986–2015 and VECM. Their study found that the relationship between external debt and economic growth is dependent on the size of the GDP in Republic of Congo for the study period under consideration. It follows that the larger the size of GDP of country, the smaller will be the negative effect of external debt of a country. Their study also found inverted "U" shape curve with the thresh hold ratio of 21.61% supporting the Laffer curve debt hypothesis.

James Tumba Henry (2022) investigated the effect of external debt on economic growth of Nigeria with the main objective of whether debt overhang happens to the economy between study

periods 1977–2019 employing econometric estimation technique dubbed as vector error correction model. The result of their study revealed that there is negative and significant effect of external debt on economic growth of Nigeria during the study time. This implies that there is an implication of debt over hang in the country. Further, they have found that the long run effect of debt burden reduces the economy of Nigeria by 2.2 percent. Similar study by Bob Hadji (2022) found the same result for the economy of Sierra Leone using time series data from the period 1973 and 2021 and employing ordinary least square (OLS) techniques of econometric estimation.

Kharusi and Ada (2018) investigated the linkage between external debt and economic growth for the economy of Oman from 1990 to 2015 through the use of time series data. From ARDL employed in the study, it was concluded that there is a negative and significant impact of external debt on economic growth in Oman during the study period. Their study recommended that debt management matters in the influence of external debt on economic growth.

Vaca et al. (2020) studied the relationship between public debt (public external debt) and economic growth for the economy of Mexico using annual time series data from 1994 and 2016 and econometric estimation techniques of OLS estimation technique. From the dynamic model included in the study, the finding from the study was that there is nonlinear inverted "U" shape relationship between external debt and economic growth. The debt to GDP thresh hold ratio was found to be 27 percent reflecting the presence of debt overhang in the study.

Ohiomu (2020) employed auto-regressive distributed lag bounds testing and co-integration to investigate the impact of external debt on economic growth of Nigeria from the period 1984–2018 covering 34 years of study. From the annual time series data employed, it was found that both debt overhang and overcrowding observed during the study period.

Rauf and Khan (2017) employed ARDL econometric model to investigate the relationship between foreign debt and economic growth for the study period 1972–2013 and using time series analysis. Their study found that there is negative influence on economic growth of Pakistan, indicating debt overhang in the country during the sample time. Error correction term shows the existence of stable relationship in the long run.

Koyuncu and Demirhan (2020) utilized the ARDL model to investigate the link between external debt and economic growth for the economy of Brazil using time series data from the period 1970–2015. Their study found that external debt and economic growth are negatively related to each other.

Mohanty (2017) employed time series data from the period 1981–2014 and vector autoregressive model to evaluate the relationship between external debt and economic growth in Ethiopia. From six explanatory variables included in the model, the study found that the external debt positively contributes to Ethiopian economy in the long run.

Yasar (2021) found that there is negative linkage between external debt and economic growth in the long run by employing ARDL and VECM for the study period 1995–2018. From the causality analysis conducted in the study, it was found that there is unidirectional relationship between two countries that runs from foreign debt to economic growth of common wealth independent states being observed.

Chindengwike (2021) employed a time series data from the period of 1988 through 2020 covering 32 years of time to investigate the effect of foreign debt on economic growth of Tanzania. The result of the study revealed that there is positive and significant relationship between external debt and economic growth of Tanzania during the study under considerations.

Nor-Eddine and Driss (2019) studied the link between external debt and economic growth for Morroccan economy by employing time series data from the period 1988–2016 and ARDL bound testing method estimation. Their study found negative relationship between external debt and economic growth in both short and long run. Further, the result of their study has also assured that the negative relationship is significant. It was also found that the short run effect of external debt is more desirable than that of long-term relationship.

Daka et al. (2017) employed autoregressive distributed lag model also dubbed as bound testing approach estimation to co-integration and time series data that ranges from the period of 1980 to 2014 to econometrically examine the relationship between external debt and economic growth for the economy of Zambia. Their study found positive relationship between the two variables in the short run while the negative effect of external debt on Zambia's economy was found in the long run. From the Granger causality test employed in the model, they found that there is a unidirectional causality that runs from external debt to Zambia's economic growth during the period under consideration.

#### 3. Method and data of the study

#### 3.1. Data and variables of the study

This study employed annual balanced data from the period 2001–2021. The study period is selected purposefully as it enables incorporation of recent data in the investigation. The panel data for this study were sourced from well recognized dependable data source, world development indicator; extracted from the data bank system of the World Bank (World Development Indicator, 2021).

The dependent variable of the study is real GDP (RGDP) while the major explanatory variable of the study is total external debt (EXDBT) which is debt owed to nonresidents repayable in currency, goods, or services. It is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, short-term debt, and use of IMF credit. Data are in current U.S. dollars.

Other independent variables of the study are inflation growth (CPI), export of goods and services as a percentage of GDP (EXP), GE, which stands for general government final consumption expenditure as a percentage of GDP, GCF which is gross capital formation as a percentage of GDP and proxy of investment in the model and labor force which shows the total labor force of the SSA countries (LBF). To sum up, the summary of variable description is provided in Table 1.

As explained in Table 1, seven variables (one dependent and six explanatory variables) are employed in the study. Since the estimation method is system GMM, the lag of the dependent variable is also employed as an independent variable in this study. The description of the variable is adopted from the world development indicator definition of the variables.

The year dummies have also been generated as it is one of the very important steps in running any type of GMM estimation. Thirty nine (39) sample SSA African countries were included in the study based on the data availability. Table 2 shows the list of sample SSA countries included in the sample of the study.

As indicated in Table 2, 39 SSA African countries are included in the study while some countries are excluded for the reasons related to panel data shortage. For instance, South Sudan, Eritrea, Somalia, Liberia, Malawi, SaoTome and Principe, Seychelles, Namibia, and Equatorial Guinea were excluded from the study due to the acute lack of the data on the study variables.

#### 3.2. System GMM Model specification

In order to estimate the effect of external debt on economic growth of 39 SSA, the study employed a system GMM estimation technique based on the work of Fosu (1996) who modeled economic growth from three explanatory factors, labor, export and capital, using the augmented production function. Further, the study also employed a two-step system GMM following the recommendation of Arellano and Bover (1995) and Blundell and Bond (1998). This is due to the fact that it tenacities

| Table 1. Descriptions of the study variables and expected sign of coefficients |   |        |               |  |  |
|--|---|--------|---------------|--|--|
| Variables of the study   | Description the<br>variables  | Source | Expected sign |  |  |
| Real GDP (RGDP)  | GDP per capita is gross<br>domestic product divided<br>by midyear population. It<br>is inflation adjusted GDP.                    | WDI    |               |  |  |
| Export(EXP) as % of GDP  | It represents the value of<br>all goods and other<br>market services provided<br>to the rest of the world.                        | WDI    | +             |  |  |
| Total external debt<br>(EXDBT)   | It is debt owed to<br>nonresidents repayable in<br>currency, goods, or<br>services. It is total<br>external debt to GDP<br>ratio. | WDI    | <u>+</u>      |  |  |
| Gross capital formation<br>(GCF) as % of GDP                                   | It is addition to the fixed<br>assets of the economy<br>plus net changes in the<br>level of inventories.                          | WDI    | ±             |  |  |
| Government<br>expenditure(GE) as % of<br>GDP                                   | It is general government final consumption expenditure.   | WDI    | -             |  |  |
| Inflation growth (CPI)   | It reflects the annual<br>percentage change in the<br>cost to the average<br>consumer.  | WDI    | -             |  |  |
| Labor force (LBF)  | It comprises people ages<br>15 and older who supply<br>labor for the production<br>of goods and services                          | WDI    | +             |  |  |

Source: Authors building, 2023; WDI denotes World Development Indicator.

the weak instruments problem by announcing two systems of equations; an equation in levels and an equation in differenced. The good side of this model is that first difference of the level equations is taken into consideration in the model which absolutely improves efficiency of the estimators in the model. Moreover, the combination the combination of first and differenced level equations through moment conditions leads to the required efficiency level in the system GMM. The model

| Table 2. Sample Sub-Saharan African (SSA) countries selected for the study |                      |                  |                  |                  |            |                     |              |
|--|----------------------|------------------|------------------|------------------|------------|---------------------|--------------|
| Sample countries   |                      | Sample countries |                  | Sample countries |            | Sample<br>countries |              |
| 1  | Angola               | 11               | Congo, Dem. Rep. | 21               | Kenya      | 31                  | Senegal      |
| 2  | Benin                | 12               | Congo, Rep.      | 22               | Lesotho    | 32                  | Sierra Leone |
| 3  | Botswana             | 13               | Cote d'Ivoire    | 23               | Madagascar | 33                  | South Africa |
| 4  | Burkina Faso         | 14               | Eswatini         | 24               | Mali       | 34                  | Sudan        |
| 5  | Burundi              | 15               | Ethiopia         | 25               | Mauritania | 35                  | Tanzania     |
| 6  | Cabo Verde           | 16               | Gabon            | 26               | Mauritius  | 36                  | Тодо         |
| 7  | Cameroon             | 17               | Gambia, The      | 27               | Mozambique | 37                  | Uganda       |
| 8  | Central African Rep. | 18               | Ghana            | 28               | Niger      | 38                  | Zambia       |
| 9  | Chad                 | 19               | Guinea           | 29               | Nigeria    | 39                  | Zimbabwe     |
| 10   | Comoros              | 20               | Guinea-Bissau    | 30               | Rwanda     |                     |              |

Source: Table is authors' building; countries are from World Development Indicator (2021).

also prohibits the correlation between the level instruments at first difference and fixed effects of the unobserved country.

The system GMM is designed with additional moment condition provided as:

$$G_{it} = \Upsilon_1 G_{it-1} + \Upsilon_2 E_{it} + \Upsilon_3 E_{it-1} + U_{it}$$
(1)

$$U_{it} = \partial_{it} + \mathbf{e}_{it} \tag{2}$$

$$\Delta G_{it} = \phi_1 \Delta G_{it-1} + \Upsilon_2 \Delta E_{it} + \Upsilon_3 \Delta E_{it-1} + \Delta U_{it}$$
(3)

$$\Delta U_{it} = \Delta \partial_{it} + \Delta \mathbf{e}_{it} \tag{4}$$

where,  $G_{it}$  and  $G_{it-1}$  denote the real GDP and it lagged dependant variable, respectively.

 $E_{it}$  and  $E_{it-1}$  represent matrix of explanatory variables (all explanatory) and their lag, respectively.

 $\Delta$  shows the difference operator in the model,  $U_{it}$  represents error terms that contains the country with unobserved country fixed effect ( $\partial_{it}$ ) and idiosyncratic disturbance terms ( $e_{it}$ ).

 $\Upsilon_1, \Upsilon_2$ , and  $\Upsilon_3$  are dubbed as vectors of the estimated parameters in the model while i = 1, N and  $t = 1 \dots T$ .

Equation 1 shows the level equation of the system GMM that is built from the real GDP and it lagged dependent variable, matrix of all explanatory variables and error term for the level equation. Equation 2 shows the components of error term in the level equation. What should be noted here is that the level equation error term is built from unobserved country fixed effect ( $\partial_{it}$ ) and idiosyncratic disturbance terms ( $e_{it}$ ). Further, equation 3 shows the difference level equation component of the system GMM with difference operator in the model  $\Delta$ . Finally, Equation 4 denotes error terms of the difference equation.

Although the presence of the lagged dependent variable leads to the serial correlation, the Arellano and Bond AR (1) at first differences and Arellano and Bond AR (2) at first difference tests are conducted to obtain the consistent estimator. The null hypothesis for both is that there is no serial correlation in the estimated model. The rejection of null hypothesis at 1% level of significance shows that the model is good and with no serial correlation AR (1) while the opposite is true in AR (2). We must fail to reject at 1% level of significance for AR (2) to indicate that the model is not suffering from the serial correlation.

Further, this study conducted the Hansen test of over identification to prohibit over identification restriction in the model. The null hypothesis is that instruments as a group in the model are exogenous while the alternative hypothesis shows that instruments as a group are not exogenous. Failing to reject the null hypothesis shows that the model we are estimating is not suffering from too many instruments while the model is in problem because of many instruments if we reject null hypothesis.

The estimated model of the study therefore is specified as follows in equation 5

$$RGDP_{it} = \psi_0 + \psi_1 RGDP_{t-i} + \psi_2 EXP_{it} + \psi_3 EXDBT_{it} + \psi_4 GE_{it} + \psi_5 GCF_{it} + \psi_6 CPI_{it} + \psi_7 LBF_{it}$$
(5)

where, *RGDP* shows real GDP, *EXP* denotes exports of goods and services as percentage of GDP, *EXDBT* is total external debt stocks. It is measured as total external debt to GDP ratio. *GE* denotes the general government final consumption expenditure as a percentage of GDP, *GCF* is the gross capital formation as a percentage of GDP, *CPI* shows the level of inflation. It is measured by consumer price index. The variables of the studies were selected inline of neoclassical production function. It is preferred as it works better in the areas of economic modeling.

Transforming the model in to the log, the model of the final estimation was

$$log_RGDP_{it} = \psi_0 + \psi_1 log_RGDP_{t-j} + \psi_2 log_EXP_{it} + \psi_3 log_EXDBT_{it} + \psi_4 log_GE_{it} + \psi_5 log_GCF_{it} + \psi_6 log_CPI_{it} + \psi_7 log_LBF_{it}$$
(6)

Equation 6 shows the model of the study in transformed format. The major reason why data transformation is required here is to simplify the process of interpretation. Once we transform the all variables of the study to natural logarithm, the interpretation takes the elasticity style and ceteris Paribus (assuming all else is held constant) mode which is a very popular way of interpretation in economics. It also means that expressing about the number is more convenient as large numbers are now easier due to the conversion made.

#### 3.3. Justification of system GMM and estimation technique

The main goal of this paper is to examine the effect of external debt on economic growth in SSA countries using the panel data from 2011 to 2021. The dynamic panel data are estimated to control for the potential endogeneity of external debt and other variables (control and explanatory variables). Our study estimated the models (equation 1, 2, 3, 4, 5, and 6 above) through the use of Arellano and Bond's (1991) model in order to tackle the problems linked with dynamic panel data estimation. For instance, this method of estimation takes into account the occurrence of endogeneity problems that arise from the feedback relationship between external and economic growth in the context of our study. Further, Arellano and Bond method of dynamic panel data estimation considers and resolves the correlation problems related to country specific in our crosssections such as geography and demographics of the panels. Furthermore, this method of estimation is dubbed superior over other dynamic panel data estimation due to its capacity of combating autocorrelation problem that arises as result of the inclusion of lag of dependent variable (lag of economic growth in our context). Finally, our study preferred Arellano and Bond's (1991) estimation technique as it uses only valid instruments in the model. This capacity of the estimation technique is generated from the fact that it uses both exogenous variables and the lag levels of endogenous variables as a means of validating instruments in the specified model.

Another superiority of the two-step system GMM (2SY-GMM) over two-stage least squares (2SLS) method is that the former uses both level equations and the difference equation to avoid the concern of weak instrumentation while the latter uses only difference equation. Further, in the former case, there is no threat of weak instrumentation while weak instrumentation can be the major agenda due to level equation in the latter. The other benefit of the two-step system GMM estimation procedure that forced its selection in our study is its advantage in correcting the entire model for heteroscedasticity problem (Blundell & Bond, 1998).

#### 4. Discussion and results

#### 4.1. Descriptive statistics of the study

Like any scientific investigation, we start by describing the data of the study. The results described in Table 3 show that real GDP of the SSA between the study periods 2011–2021 has the mean value of 4.38085 along with the standard deviation of 8.4251 (minimum value of the real GDP is 2.6928 and maximum value of the real GDP 6.0689). This implies that the average real GDP of SSA during last decade is averaged to 4.38. The high standard deviation reflects the growth variation

| Table 3. Descriptive analysis of the study variables |           |             |         |         |         |               |
|--|-----------|-------------|---------|---------|---------|---------------|
| Variables  | In shorts | Observation | Minimum | Maximum | Mean    | Standard dev. |
| Real GDP   | log_RGDP  | 429         | 2.6928  | 6.0689  | 4.38085 | 8.4251        |
| External debt  | log_EXDBT | 429         | 18.6830 | 25.9702 | 22.3641 | 1.4773        |
| Gov't expend.  | log_GE    | 429         | 1.2774  | 3.7026  | 2.5942  | 0.4402        |
| Gross Ca.Form.                                       | log_GCF   | 429         | 1.24193 | 4.3745  | 3.1250  | 0.4149        |
| Inflation  | log_CPI   | 429         | -0.1884 | 6.4726  | 4.5506  | 0.3155        |
| Labor force  | log_LBF   | 429         | 12.0470 | 18.0781 | 15.2382 | 1.4483        |

Source: Authors computation from STATA 15. Notes: all variables are in log form. Gross Ca.Form. Denotes gross capital formation, Gov't Expend is government final consumption expenditure.

among the SSA countries during the study period. The total number of observation in this sample is 429, demonstrating that data are composed of the cross sectional and panel data.

In a similar fashion, the major explanatory variable of this study, external debt (EXDBT), is found to have the mean value of 22.3641 accompanied with the minimum value of 18.6830 and the corresponding maximum value 25.9702. The standard deviation of external debt observed during the period is 1.4773. Another fact we observed is that real GDP and external debt in natural log form exhibit the greatest mean in the sample and low standard deviation. This shows that the average external debt in SSA is very high. It also shows that the external debt is high as it is the major source of income of all sample countries of SSA.

Table 3 further elaborates that Government final consumption expenditure (Gov't Expend.) as a percentage of GDP has the lowest mean (2.5942) in the sample with the standard deviation of 0.4402 and minimum value of 1.2774 and maximum value of 4.3745. This reflects that government consumption in SSA is limited as it is mainly subject to external debt. On the other hand, gross capital formation is observed with 3.1250 and standard deviation (0.4149). The maximum and minimum value of GCF in log form is 1.24193 while its maximum value is 4.3745, reflecting there is no major difference in SSA countries in capital formation that is investment.

Coming to inflation, the maximum and minimum value is observed to be 6.4726 and negative 0.1884, respectively, showing that the there is great variation among the cost of life of sample countries of SSA. The labor force (LBF) is found with the mean value of 15.2382 and standard deviation of 1.44832. This indicates that there is quite varying the level of the labor force across the sample SSA countries during the periods under investigation.

As depicted in Table 4, South Africa, Angola and Nigeria are the first three countries with greater mean value of external debt values of 25.7706, 24.6891 and 24.3768, respectively. This implies that samples countries that have the highest external debt burden have also the highest level of mean external debt. On the other hand, Guinea-Bissau, Gambia and Eswatini are found to have the lowest mean value of external debt with 19.9659, 20.3204 and 20.4826, respectively.

Table 5 presents the correlation matrix of the study. From the result, we observed that external debt has a negative correlation with real GDP of SSA Africa. The correlation coefficient is -0.897, indicating that external debt is strongly correlated to real GDP during the study period under consideration. The correlation matrix result has also indicated that government final consumption expenditure (GE) and inflation (CPI) are negatively correlated with real GDP.

It is also observed from Table 5 that export (EXP), gross capital formation (GCF) and labor force (LBF) have a positive correlation with real GDP (RDGP). The implication of the negative correlation of external total debt is that the total external debt may adversely deter the economic growth in SSA countries. The fact that there is positive or negative correlation between external debt and

| Table 4. Mean value of external debt across sample countries of SSA (2011–2021) |         |               |         |              |         |  |  |
|---|---------|---------------|---------|--------------|---------|--|--|
| Country   | EXDBT   | Country       | EXDBT   | Country      | EXDBT   |  |  |
| Angola  | 24.6891 | Eswatini      | 20.4826 | Mozambique   | 24.3528 |  |  |
| Benin   | 21.7642 | Ethiopia      | 23.6967 | Niger        | 21.7364 |  |  |
| Botswana  | 23.4577 | Gabon         | 22.4143 | Nigeria      | 24.3768 |  |  |
| Burkina Faso  | 23.3936 | Gambia, The   | 20.3204 | Rwanda       | 22.1001 |  |  |
| Burundi   | 21.6819 | Ghana         | 23.7368 | Senegal      | 23.2642 |  |  |
| Cabo Verde  | 21.3235 | Guinea        | 21.6266 | Sierra Leone | 21.2183 |  |  |
| Cameroon  | 24.3067 | Guinea-Bissau | 19.9659 | South Africa | 25.7706 |  |  |
| Central African<br>Rep.   | 21.4642 | Kenya         | 23.8083 | Sudan        | 23.8139 |  |  |
| Chad  | 23.1646 | Lesotho       | 20.9234 | Tanzania     | 23.6267 |  |  |
| Comoros   | 20.8200 | Madagascar    | 21.9667 | Тодо         | 21.0289 |  |  |
| Congo, Dem.<br>Rep.   | 22.7229 | Mali          | 22.1386 | Uganda       | 22.9773 |  |  |
| Congo, Rep.   | 22.2922 | Mauritania    | 22.2965 | Zambia       | 23.3310 |  |  |
| Cote d'Ivoire   | 23.3723 | Mauritius     | 23.1614 | Zimbabwe     | 23.0798 |  |  |

Source: Authors' computation from STATA 15. Notes: EXDBT is an external debt. It is in a log from.

economic growth enables us to investigate the magnitude by which external debt affects economic growth in SSA during the periods under consideration.

#### 4.2. The unit root test

Although non stationary is not the major concern in system GMM as time T is too small (Roodman, 2009), this study has employed two unit root tests, Levin-Lin-Chu (LLC) unit-root test and Harris-Tzavalis unit-root test, to avoid any tendency of panel unit root that leads to spurious regression and biased estimation of the system GMM. The major reason why LLC unit-root test is employed is due to its superiority in allowing the trend and intercept coefficient to vary across individual. LLC unit root also enables to conduct the stationary test for the separate variable for all series (Levin et al., 2002).

LLC is one of the most cited and popular unit root test in the panel data analysis due to its clarity and user friendliness. The null hypothesis for the LLC unit root test is that panels contain unit roots while the alternative hypothesis is that panels are stationary. The unit rejection of the null hypothesis shows that data are stationary and safe for further analysis (Westerlund, 2009).

| Table 5. Correlation matrix of the study variables |         |         |         |         |        |        |        |  |
|--|---------|---------|---------|---------|--------|--------|--------|--|
| Variable   | RGDP    | EXDBT   | EXP     | GE      | GCF    | СРІ    | LBF    |  |
| RGDP   | 1.0000  |         |         |         |        |        |        |  |
| EXDBT  | -0.8974 | 1.0000  |         |         |        |        |        |  |
| EXP  | 0.0656  | -0.0049 | 1.0000  |         |        |        |        |  |
| GE   | -0.2279 | -0.1148 | 0.0835  | 1.0000  |        |        |        |  |
| GCF  | 0.1379  | 0.2668  | 0.1074  | 0.1057  | 1.0000 |        |        |  |
| CPI  | -0.2289 | 0.2639  | -0.0499 | 0.0191  | 0.0501 | 1.0000 |        |  |
| LBF  | 0.8064  | 0.7257  | -0.2851 | -0.2924 | 0.1047 | 0.2650 | 1.0000 |  |

Source: Authors' computation from SATATA15. Notes: RGDP is a real GDP, EXDBT is external debt, EXP is export, GE is government consumption expenditure, GCF is gross capital formation, CPI is inflation and LBF is labour force. All variables are in the log form.

In a similar fashion, Harris-Tzavalis unit-root test is also employed in this study as it enables capturing the possibility of including the time trend in the unit root test to make the data safe for data analysis. This method is very familiar method that contains subtraction of crosssectional means. It also makes small sample adjustments to time that implied the popularity of this method. The null hypothesis of HT unit root test is that panels contain unit roots whereas stationary panels are the alternative hypothesis. The rejection of the null hypothesis implies that data are safe, and there is no unit root in the data and stationary. It follows that proceeding to analysis results in non-spurious regression which is good and expected (Harris & Tzavalis, 1999).

As indicated in Table 6, all variables of the study are found to be stationary at level following the panel unit root test of LLC and HT. This implies that our result of the study is free from any threat of bogus regression. In other words, it is possible to rely on our data to conclude and draw policy implication. In system GMM, we want the data only to be stationary. It can be either at level or at first difference. We are unfortunately lucky here. Our study variables are stationary at level. This fact is confirmed by two panel unit test methods. This means that this result is convincing.

#### 4.3. Hausman model selection test

This study employed Hausman test of model selection to identify whether system or difference GMM model is relevant for these particular data. This test of specification is selected following the work of Bond et al. (2001) as it is easier and clearer way of selecting between the two models. In this case, the pooled OLS estimate (0.9482) is considered as the upper bound while the fixed effect model estimated (0.6523) is lower bound in the decision process.

As indicated in Table 7, the difference GMM estimation (one step) is less than the fixed effect model estimation (0.1052 < 0.6523); the system GMM model is found to be appropriate for this data analysis. Thus, this study adopts the system GMM model to discuss the results.

Table 7 shows the result of two step generalized method of moment that is obtained from the dynamic panel data estimation. Since the number of instrument (21) is less than the number of groups (39), the model estimation is efficient. Further, the lagged dependent variable (log\_RGDP | L1) is found to be significant at 1 percent. AR (2) of Arellano-Bond test is 0.826 is insignificant, indicating that the model is good and the instruments are not suffering from the second order serial correlation. It follows that the instruments are not endogenous.

The Hansen test of over identification is found to be 0.217, revealing that instrument used in the estimation of the model is valid and there is no problem of over identification in the model. This shows that the model is well identified. The Wald chi2 (15) is large (111226.11), showing that the

| Table 6. The results of Levin-Lin-Chu unit-root test and Harris-Tzavalis unit-root test |                                    |          |                     |                                     |          |                     |  |
|---|------------------------------------|----------|---------------------|-------------------------------------|----------|---------------------|--|
|   | Levin-Lin-Chu (LLC) unit-root test |          |                     | Harris-Tzavalis (HT) unit-root test |          |                     |  |
| Variables   | Statistic                          | p-Value  | Decision at<br>I(0) | Statistic                           | p-Value  | Decision at<br>I(0) |  |
| log_RGDP  | -5.0861                            | 0.0000*  | Stationary          | 0.2995                              | 0.0005*  | Stationary          |  |
| log_EXP   | -7.3894                            | 0.0000*  | Stationary          | 0.6000                              | 0.0001*  | Stationary          |  |
| log_EXDBT   | -4.7866                            | 0.0000*  | Stationary          | 0.9076                              | 0.0080** | Stationary          |  |
| log_GE  | -4.5144                            | 0.0000*  | Stationary          | 0.5725                              | 0.0000*  | Stationary          |  |
| log_GCF   | -4.0930                            | 0.0000*  | Stationary          | 0.6200                              | 0.0007*  | Stationary          |  |
| log_CPI <sub>it</sub>   | -11.8973                           | 0.0000*  | Stationary          | 0.9058                              | 0.0018*  | Stationary          |  |
| log_LBF   | -2.3309                            | 0.0099** | Stationary          | 0.7033                              | 0.0000*  | Stationary          |  |

Source: Own computation from STATA 15. Notess: \*, \*\*denote 1% and 10% level of significance, respectively.

| Table 7. Results of Hausman test for model selection |            |                       |                |                |  |  |
|--|------------|-----------------------|----------------|----------------|--|--|
| Lagged<br>regressand                                 | Pooled OLS | Fixed Effect<br>Model | Difference GMM | Model selected |  |  |
| L1.log_RGDP  | 0.9482     | 0.6523                | 0.1052         | System GMM     |  |  |

Source: Own computation from STATA 15. Notes: L1.log\_RGDP is the lag 1 of the dependent variable of the study.

coefficient of the variables included the model is non-zero. These results show that the estimated model has passed the entire tests.

#### 4.4. Short run effect of external debt on economic growth in SSA (2011\_2021)

In this section, we discussed short run effect of external debt estimated from the two-step system GMM.

As indicated in Table 8, the result of the system GMM reveals that the total external debt (log\_EXDBT) adversely affects the real GDP (log\_RGDP) of SSA countries from the period 2011–2021. The negative effect of the total external debt is found to be significant at 1 percent level of significance. It is found that a percentage change in total external debt (log\_EXDBT) is associated with a 0.034 percent decline in the real GDP (log\_RGDP) of SSA in short run, other things remaining constant. This implies external debt impedes the real GDP rate level in SSA significantly in the short run. Hence, total external debt (log\_EXDBT) and the real GDP (log\_RGDP) of SSA countries exhibit inelastic relationship in the short run. This result is consistent with the work of Manasseh et al. (2022), Bashir Jama (2021); Zaghdoudi (2020); Gachunga (2019) and Shkolnyk and Koilo (2018).

Table 8 also shows that the lag of dependent variable (log\_RGDP |L1) is found to be positive and a significant contributor of the real GDP (the concurrent real GDP) in SSA. From the result of our study, we observed that the coefficient of first lag of real GDP (log\_RGDP |L1) is 1.02, implying that a percentage change in lag of real GDP (log\_RGDP |L1) is associated with 1.02 percent rise in the concurrent real GDP in SSA during the study period 2011–2021, holding other factors constant. This implies that the last year real GDP provides a better condition through availing funds for investment and saving in the economies. Our result corroborates with the work of Yolcu Karadam (2018) and Manasseh et al. (2022).

Regarding the control variables of the study, export of goods and services as a percentage of GDP (log\_EXP) and total labor force (log\_LBF) found to have positive effect on real GDP growth of

| Table 8. A two-step system GMM result on the effect of external debt and economic growth |                   |             |   |  |  |  |  |
|--|-------------------|-------------|---|--|--|--|--|
| Dynamic panel-data estimation, two-step system GMM (short run)                           |                   |             |   |  |  |  |  |
| Variables  | Coefficients      | P> z  value | Decision criteria's (panel diagnostic tests)      |  |  |  |  |
| log_RGDP  L1   | 1.0208 (0.0112)   | 0.000***    | Number of observations                            |  |  |  |  |
| log_EXDBT  | -0.0344 (0.0110)  | 0.002***    | = 390<br>Number of groups = 39                    |  |  |  |  |
| log_EXP  | 0.0277 (0.0043)   | 0.000***    | Number of instruments                             |  |  |  |  |
| log_LBF  | 0.0184 (0.0055)   | 0.001 ***   | = 21<br>Arellano-Bond test for AR                 |  |  |  |  |
| log_GCF  | 0.0056 (0.0196)   | 0.775       | (2) $Pr > z = 0.826$                              |  |  |  |  |
| log_GE   | -0.0209 (0.0171)  | 0.223       | Arellano-Bond test for AR<br>(1) $Pr > 7 = 0.031$ |  |  |  |  |
| log_CPI  | -0.0101 (0.0201)  | 0.614       | Hansen test of overid:                            |  |  |  |  |
| Year(y*)   | 0.0134 (0.0028)   | 0.000***    | Prob > chi2 = 0.217<br>Wald chi2(15)              |  |  |  |  |
| _cons  | -27.0114 (5.6858) | 0.000***    | = 111226.11                                       |  |  |  |  |

Source: Authors computation from STATA15. Notes: \*\*\*, \*\*,\* denote 1%, 5% and 10% level of significance, respectively; () shows the corrected standard errors.

SSA countries during the study period from 2011 to 2021. The positive effects of log\_LBF and log\_GCF on real GDP growth (log\_RGDP) of SSA are significant at 1 percent. Specifically, the result of the two-steps GMM revealed that a percentage change in export of goods and services (log\_EXP) in SSA is associated with 0.027 percent increase in the real GDP growth (log\_RGDP) in SSA countries during the study period in short run, holding other factors constant. The result of our study is consistent with the empirical work of Mensah and Okyere (2020).

The result of the system GMM has also revealed that a percentage change in total labor force (log\_LBF) leads to a 0.018 percent increase in the real GDP growth (log\_RGDP) in SSA, ceteris paribus, in the short run within the study period. This implies that export of goods and services and labor forces are the stimulants of the real GDP growth in SSA countries. The result of our study corroborate with empirical work of Asafo (2019).

However, our study revealed that gross capital formation as a percentage of GDP (log\_GCF), general government final consumption expenditure a percentage of GDP (log\_GE) and inflation (log\_CPI) do not significantly affect real GDP growth (log\_RGDP) in SSA in our sample. The dynamic panel data estimation revealed that GDP log\_GE and log\_CPI appeared with negative coefficients; negative 0.0209 and negative 0.0101, respectively, while log\_GCF is found to have 0.0056 positive coefficients. This indicates that the variables are not the major drivers in the sample countries from the study period 2011–2021. The result of our study concerning with log\_GCF, log\_GE and log\_CPI is consistent with the empirical works of Adu-Gyamfi et al. (2020); John Gachangua and Kuso (2019) and Khan et al. (2020).

#### 4.5. Long run effect of external debt on economic growth in SSA (2011-2021)

In the system GMM, we have generated the long run coefficients in the short run following the work of Kruiniger (2009) and Hansen (2018). The result of the long run two systems GMM disclosed in Table 9 shows that the impact of external debt on economic growth remains negative and significant at one percent. Like the short run, in the long run also external debt hampers the real GDP of the SSA countries between the study periods 2011–2021. The result of our study is consistent with the work of Mumba and Li (2020); Omotor et al. (2020) and Guei (2019).

This is due to the fact debt burden increases in the long run. Further, debt management might also be complicated in the long run, and improving debt administration and proper debt utilization might require another huge resource. Accordingly, in long run, our result revealed that a percent change in external debt leads to a 0.65 percent increase in real GDP of SSA during the last decades, other things remaining constant. Another point observed from our result is that the adverse impact

| Table 9. A two-step system GMM result on the effect of external debt and economic growth |              |             |  |  |  |  |
|--|--------------|-------------|--|--|--|--|
| Variables  | Coeffeceints | P> z  value | The GMM long run generation command        |  |  |  |
| log_EXDBT  | -0.648475    | 0.001***    | nlcom (_b[log_EXDBT])/<br>(1b[L.log_RGDP]) |  |  |  |
| log_EXP  | 0.327179     | 0.088**     | nlcom (_b[log_EXP])/<br>(1b[L.log_RGDP])   |  |  |  |
| log_LBF  | 0.8844943    | 0.153       | nlcom (_b[log_LBF])/(1b<br>[L.log_RGDP])   |  |  |  |
| log_GCF  | 0.2693906    | 0.766       | nlcom (_b[log_GCF])/<br>(1b[L.log_RGDP])   |  |  |  |
| Log_GE   | -0.001273    | 0.228       | nlcom (_b[log_GE])/(1b<br>[L.log_RGDP])    |  |  |  |
| log_CPI  | -0.4851951   | 0.651       | nlcom (_b[log_CPI])/(1b<br>[L.log_RGDP])   |  |  |  |

Source: authors' computation from stata15. Note: \*\*\*, \*\*, show 1%, and 10% significance level, respectively.

of external debt in the long run (-0.65) is greater than that of the short run (0.034). This reveals that the external debt of SSA countries and economic growth exhibited inelastic relationship in the long run during the period under consideration.

Coming to export (log\_EXP), we found it to be a significant stimulant of economic growth in the long run. A percentage change in export is associated to a 0.33 percent rise in economic growth in SSA, other thing remaining fixed, significant at 10 percent level of significance. Labor force (log\_LBF) is also one of stimulant of growth in the long run. However, it is found to be insignificant. This is attributed to the fact that creating skilled labor demands huge investment in education, health and improvement in standard of life activities, which African countries cannot afford. Further, the people quickly go out of labor force due to short life expectancies in SSA countries.

Another point disclosed by Table 9 is the long run coefficient generation command. In the system GMM, the stata15 software does not manually generate the coefficients. Rather, it requires the command "nlcom" the coefficient of explanatory variable divided by 1 less the coefficient of lagged dependent variable. For instance, the long run coefficient of external debt is generated by the command 'nlcom "(\_b [log\_EXDBT])/(1-\_b [L.log\_RGDP])". Thus, the long run coefficient generation in system GMM is very efficient and user friendly.

#### 5. Conclusion

This paper investigated the impact of external debt on economic growth of 39 SSA countries from the period 2011–2021 through the help of dynamic panel data analysis. A two-step system generalized method of moment (SGMM) estimation technique was adopted since it is more robust to panel-specific heteroscedasticity and autocorrelation. The result of the study confirmed that external debt has significant negative impact in both short and long run. The result also revealed that, other things remaining constant, a percentage change in total external debt is associated with a 0.034 percent decline in the real GDP of SSA countries in the short run, while a percent change in external debt leads to a 0.65 percent decrease in real GDP of SSA countries, in the long run. The conclusion derived from the study is that the negative influence of external debt in the long run is greater than that of the short run in SSA countries.

The policy implication of the study is that SSA countries should amortize the external debt by investing funds from external debt in revenue generating and supplementary opportunity crafting projects. The point to be noted here is that the negative impact of the external debt on economic growth does not mean the SSA countries should stop external sources of revenue.

Our study suggests that the priority attention should be given to the development schemes that bring other investment prospects in both short and long run. Further policy inference is that SSA countries need to design a mechanism through which external debt is well utilized and managed. The SSA countries should minimalize the conviction on the external debt in the long run by ensuring the better domestic revenue mobilization approaches. This stratagem includes broadening the domestic tax bases by incorporating informal sectors and launching efficient domestic revenue collection mechanisms that prohibit any leakages of the tax revenue from all sectors of economy in SSA countries.

#### 6. Limitations of the study

This study investigated the link between external debt and economic growth only in 39 SSA countries due to data availability problem in the rest of SSA countries.

#### 7. Recommendations for future researches

As the situation in SSA countries is very dynamic due to volatile nature of economic and social conditions, further researches are essential in the region. To capture the regional disparities, future researches should divide sub-Saharan African countries into different income groups to investigate the effect of external debt on economic growth. In addition to this, the government quality and

effectiveness can be included in the model to check whether governance indicators matters or not regarding the relationship between external debt and economic growth. Finally, we recommend related future researches to incorporate COVID-19 case related variables in the model.

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