

Foreign Development Assistance and Macroeconomic Policy Stance: The Underlying Levers of Growth in Emerging SSA Countries

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Abstract

The role of foreign development assistance and macroeconomic policy stance, in economic growth performance of the emerging Sub-Saharan African economies, is investigated in this study. The GMM and VECM methods are employed in estimating the relationships and impacts, for the period 1980-2019. Results from the two estimation methods are comparable and consistent. The effect of foreign development assistance is revealed to be positive, and more significant than that of monetary policy, but less significant than fiscal policy. The control variable, exchange rate, exerts significant negative effect on growth. The results also reveal that economic growth is unable to significantly reinforce itself. Generally, the estimation results conform to theoretical expectations of the relationships that exist between economic growth and the underlying variables. The results are also considered to be significantly reliable for forecasting and policy making.

Keywords: Development assistance; Macroeconomic policies; Economic growth; Developing countries

JEL classification: E51, F21, F43, O55

1. Introduction

Foreign development assistance tends to flow toward less developed economies of the world that lack adequate resources to finance growth and development. Over the last three decades, the scarcity of resources in these economies led to slow economic growth and rising level of poverty. This scenario motivated some advanced countries of the world to initiate development assistance, which aims to alleviate the economic problems confronting the less developed economies. So far, the development assistance has been able to substantially increase the amount of resources available to facilitate economic growth in these economies. Aside from the the inflows of development assistance, the less developed countries also apply macroeconomic policies to facilitate growth. Thus, foreign

development assistance and macroeconomic policies play complementary roles in facilitating the growth process in developing countries. The inflows of development assistance have been greatly encouraged by the political and economic reforms that took place in most of the developing countries, which created conducive environment for more advanced countries to supply foreign aid. The conducive environment also attracted more capital inflows through foreign direct investment (Edo, 2007). Today, the countries of East Europe, Africa, and Asia, where reforms have taken place, are the major recipients of foreign development assistance and foreign direct investment. The increasing trend of foreign development assistance has continued to engage the attention of researchers.

Previous research works have, so far, produced conflicting results about the effect of foreign development assistance on economic growth, thus signaling a lack of consensus. The lack of consensus has been blamed largely on the use of certain empirical techniques that do not possess the same level of efficiency, and also not sufficiently rigorous to produce authentic results. Secondly, most of the studies employed models that ignored important variables that help to optimize the effect of foreign development assistance on economic growth. Thus, more research work needs to be done, to ascertain the true impact of foreign development assistance on economic growth, by selecting co-explanatory variables that are most likely to enhance the impact. In this context, macroeconomic policies may be considered appropriate, due to their strong multiplier effect. These policies impact directly on economic growth, and also help to foster the effect of foreign development assistance. In view of the foregoing, this study attempts to build and estimate the model that relates economic growth to foreign development assistance and macroeconomic policies. The aim is to produce more consistent and reliable estimates, that would be highly useful for policy making in Sub-Saharan Africa. The investigation is expected to improve upon previous research works, and contribute meaningfully to existing body of knowledge on the economic growth of developing economies.

The study employs the techniques of general method of moments (GMM) and vector error correction mechanism (VECM) to evaluate the relative impacts of foreign development assistance and macroeconomic policies on economic growth, and determine whether they

conform to expectations or not. In terms of scope, the study covers the emerging economies in Sub-Saharan Africa, and the period 1980–2019. The emerging economies are the top five, in terms of their contributions to total GDP of the sub-region (IMF, 2019). The economies and their respective contributions are Nigeria (18.13%), South Africa (15.12%), Kenya (4.04%), Angola (3.71%), and Ethiopia (3.7%). The study is structured into six sections: (1) Introduction (2) Literature Review (3) Descriptive Background of Emerging SSA Economies (4) The Empirical Model (5) Estimation Techniques (6) Estimation Results and Analysis (7) Conclusion.

2. Literature Review

2.1 Foreign Development Assistance and Economic Growth

The role of foreign development assistance has been a topical issue in the growth process of developing countries. According to McGillivray et al. (2006), this role is greatly influenced by external conditions, political environment, and institutional quality. Previous empirical studies on the role produced mixed results, where some of the studies found positive impact of foreign development assistance on growth, while others found negative impact, or no impact at all.

Mallik (2008) investigated the role of foreign aid in the six poor African countries of Mali, Malawi, Niger, Sierra Leone, Togo, and Central Africa Republic. The study covered thirty five years, and found the long-run effect of foreign aid on economic growth to be negative. On the contrary, Doucouliagos and Paldam (2009) asserted that foreign development assistance stimulates economic growth by supplementing domestic resources, investment, and capital stock. The study on the same issue by Refaei and Sameti (2015), also reported a positive relationship in Iran. It revealed a significantly positive long-run effect of foreign aid on economic growth, over the period 1980-2012. The fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) estimation techniques were employed to produce the results. It concluded that foreign aid is more productive than domestic resources and other forms of capital inflow. The positive effect of foreign development assistance on economic growth is corroborated in a study of Economic

Community of West African States (ECOWAS). In this study, Adamu (2013) used panel data, for the period 1990-2009, and found the effect to be strong and positive. The other variables that impacted significantly on growth in the study are interest rate, foreign direct investment, and international reserves. Results of the study suggested that ECOWAS member countries need to seek more foreign aid, in order to accelerate economic growth.

Mahembe and Odhiambo (2019) employed panel vector error correction model (VECM) to estimate the relationship between foreign aid and economic growth in eighty-two developing countries, over the period 1981-2013. The results revealed that a unidirectional relationship exists between them in the short-run, which tends to converge in the long-run. In a similar study, Martinez (2015) covered one hundred and four low and medium income countries. The results of the study showed a modest positive impact of foreign aid on economic growth in the recipient countries. Furthermore, the impact was quickly felt, with over fifty percent of it manifesting within six months. In a single country study, covering the period 2003-2015, Abdul et al. (2018) also discovered the immense benefit of foreign development aid to economic growth in Nigeria. The benefit to human development was reported to be particularly significant. The study, therefore, recommended that more inflows of foreign aid should be encouraged, in order to accelerate growth and development.

In Ghana, Appiah-Konadu (2016) tested the hypothesis which states that foreign aid promotes growth in developing countries. The ARDL bounds test showed that long-run convergence exists between foreign aid and economic growth. The speed of adjustment toward convergence was found to be moderate. It was therefore recommended, that inflows of foreign aid should be channeled into projects that facilitate economic growth, in order to maximize the benefits. In the case of Morocco, Aghoutane and Karim (2017) used VECM method to investigate the impact, and discovered that foreign aid promoted growth in the short-run, but the impact became negative in the long-run. M'Amanja and Morrissey (2005) also investigated foreign aid and economic growth in Kenya, over the period 1964-2002. The empirical results revealed that foreign aid had significant negative long-run effect on growth. The policy implication of this finding is that the government needs to

promote more domestic private investment, to complement the role of foreign development assistance.

The scarcity of domestic resources in Ethiopia, over a long period of time, prompted the government to look outward for foreign aid, in order to accelerate economic growth. A favourable policy environment was therefore created, which led to a large inflow of foreign aid that stimulated investment and growth (Gurmu, 2020). It follows that favourable policy environment attracts more foreign aid. The top aid donors to Ethiopia were reported to be United States, World Bank, and United Kingdom. Foreign assistance from advanced countries and multilateral organizations also remained a major source of capital inflows to Uganda, in the period 1970-2017, but Edward and Karamuriro (2020) revealed that it did not impact significantly on economic growth. Instead, economic growth in the country was driven more by domestic investment and exports. These results were obtained from the estimation of ARDL model of economic growth for Uganda.

2.2 Macroeconomic Policies and Economic Growth

The capacity of developing countries to sustain economic growth, in a dynamic global system, rests on their ability to effectively utilize macroeconomic policies. Monetary and fiscal policies are often deployed to maintain economic growth and stability. Over time, these policies have tended to exert diverse impact on economic growth in developing countries. There is a wide range of studies on the relationship between monetary policy and economic growth, but the nexus between the two remains highly contentious (Twinoburyo and Odhiambo, 2018). In countries with fairly developed financial markets and independent central banks, the nexus between monetary policy and economic growth is reported to be significantly strong. The nexus tends to be weak in countries with less developed financial markets. It follows that financial development helps monetary policy to effectively impact economic growth.

The effect of monetary policy on economic growth in Nigeria was recently investigated, and found to be significantly positive (Ufoeze, 2018). The study also revealed that long-run relationship exists between them. Monetary policy was discovered to have explained a

significant percent of the changes in economic growth, hence it concluded that the policy can be relied upon to stabilize the price level and improve aggregate output. In an earlier study of the same country, covering 1980-2011, Baghebo and Stephen (2014) found that monetary policy played important role in encouraging investment and economic growth. This positive result was replicated in Malaysia, where Akalpler and Duhok (2018) found that monetary policy affected growth, though the effect was considered to be moderate. On the contrary, monetary policy in Sri Lanka, over the period 1978-2005, was found to have affected economic growth adversely, because it was targeted more at containing inflation (Amarasekara, 2008). The results were obtained from the estimation of a VAR model of the economy.

Precious and Makhetha (2014) carried out a study on the role played by monetary policy in promoting economic growth in South Africa, over the period 2000-2010. The study employed the VECM methodology, which produced results, showing that the effect of money supply on economic growth is insignificant. It recommended that monetary policy should be fine-tuned to achieve the desired goal of rapid economic growth. In addition, it was recommended that government should increase spending, as monetary policy alone cannot adequately drive economic growth. Aliyev et al. (2020) also employed VECM to investigate monetary policy and economic growth in Azerbaijan, for the period 2005-2018. The estimation results showed that monetary base had a significant positive impact on economic growth in the long-run. The study concluded that policy makers should focus more on the monetary base of the economy, in order to stimulate rapid growth and development. Nouri and Samimi (2011) also found a significant positive relationship between money supply and economic growth in Iran. This was derived by using the ordinary least squares (OLS) estimation technique on annualized time series data for the period 1974 -2008.

The Kaleckian model of growth sets budget deficit ratio as an indicator of fiscal policy. The model posits that increase in budget deficit could have ambiguous effect on growth in the long-run, since higher debt burden may generate negative effect on growth, in spite of the positive effect of expenditure. This proposition is re-affirmed by Min-Chang (2018), in his

theoretical exposition of the relationship between fiscal policy and economic growth. Following this proposition, Tun (2019) carried out a study in Myanmar, using the ordinary least squares (OLS) estimation method, to examine the effect of fiscal policy on economic growth, for the period 1979-2016. The results, however, revealed a statistically significant positive relationship between fiscal deficit and economic growth, which was considered to be in conformity with expectations of the Kaleckian model. During the period, the country increased public spending on infrastructure, leading to appreciable growth in GDP. The study, therefore, recommended that governments need to spend more on infrastructure development, in order to ensure accelerated economic growth. Similar results were obtained from the study carried out on Pakistan, within the period 1972-2008. In the study, Ali et al. (2010) employed ARDL and ECM models to estimate the effect of fiscal policy on growth, and found that fiscal deficit had significant positive impact on growth in the short-run, but a negative impact in the long-run. The study, therefore, recommended that budget deficit ratio should be controlled within a narrow band of 3-4 percent.

The South African economy witnessed considerable increase in fiscal expenditures on consumption and investment, in the period 1990-2008. The positive effect of these expenditures on output growth was found to be quite moderate, based on the impulse response of real GDP to government expenditure shocks, in a structural VAR model of the economy (Ocran, 2011). A similar empirical study was undertaken in Nigeria, where Osuala and Jones (2014) discovered that long-run equilibrium relationship exists between fiscal policy and economic growth, during the period 1986-2010. The study employed the ARDL model to estimate the harmonious relationship, and recommended that fiscal policy should be complemented by monetary policy, in order to achieve a more stable economic growth. Ismal (2011) also employed ARDL model to investigate fiscal policy and economic growth in Indonesia, and found that a positive relationship exists between them. The study, therefore, concluded that the Indonesian economy obeys Wagner and Keynes laws. The strategic role of fiscal policy in economic growth was further confirmed in a study of the Tajikistan economy, where Brownbridge and Canagarajah (2008) revealed that higher levels of government spending translated into stronger economic growth and

poverty reduction. The study advocated a a more efficient fiscal policy framework that would sustain the positive effect of government spending on growth and development.

2.3 Other Salient Factors Affecting Economic Growth

In neoclassical theory, exchange rate is considered a major factor that influences capital inflows and economic growth in all countries. In the light of this position, De Vita and Kyaw (2011) re-visited the issue of floating exchange rate affecting the long-term growth of developing countries. The investigation, covering seventy countries, revealed that exchange rate did not have the expected robust impact on economic growth, during the period 1981-2004. In another study of sixteen developing countries, within the period 1970-2006, Ashour and Yong (2017) found the impact of flexible exchange rate on economic growth to be positive and significant. This impact was more significant than that of fixed exchange rate, which was in operation during the preceding period. The study, therefore, recommended that developing countries should stick with flexible exchange rate regime, in order to sustain growth and development. In a country study of Bangladesh, Razzaque et al. (2017) used cointegration techniques to determine the response of output to currency depreciation. The results showed that 10 percent depreciation caused a slight decline of 0.5 percent in aggregate output, in the short-run. However, the same amount of depreciation caused output to grow by 3.2 percent, in the long-run.

Basirat et al. (2014) conducted a study on exchange rate and economic growth in a panel of eighteen developing countries, for the period 1986-2010. The results revealed that exchange rate fluctuations had significant negative effect on economic growth. This finding was supported in another study of forty-five developing countries, for the period 1985-2015, where Barguelli et al. (2018) discovered that exchange rate volatility had a negative impact on economic growth. This negative effect was aggravated by financial openness of the countries. The country study on Ghana, spanning the period 1983-2010, produced similar results. In that study, Adjei (2019) used the ARCH and GARCH models to estimate the determinants of economic growth, which revealed negative effect of exchange rate volatility on economic growth, in the short-run and long-run. The volatility led to decline in economic growth, by reducing capital inflows.

Foreign direct investment (FDI) also plays important role in economic growth. Li and Liu (2005) investigated this issue in a panel of eighty-four developing countries, for the period 1970-1999, using simultaneous equation estimation techniques. It was discovered that FDI promoted growth directly, and indirectly, through interaction with other factors. In particular, the interaction with human capital exerted a strong positive effect on growth. Similarly, Iamsiroroj and Ulubasoglu (2015) conducted a global study of 140 countries, over the period 1970-2009, and reported that FDI affected economic growth positively. Further more, it was discovered that this relationship holds in both developed and developing countries. Similar result was produced in a study of FDI and growth in Bangladesh, conducted by Sarker and Khan (2020). The study investigated the nexus between FDI and growth, using the ARDL bounds testing approach, and found a unidirectional causality and strong positive long-run relationship. In Australia, this strong positive relationship could not be established, as Pandya and Sisombat (2017) used multiple regression to derive a weak relationship between FDI and growth. This weak relationship was also found in a study of Turkey, for the period 1980-2012, where Aga (2014) discovered that the effect of FDI, though positive, was statistically insignificant. The results were obtained from the ordinary least squares (OLS) estimation of growth model of the country.

External debt is a key factor in the economic growth of developing countries, particularly in Africa, where governments embark on ambitious fiscal budgeting to accelerate growth and development. Some of these countries depend largely on revenue from crude oil export, which is highly volatile, causing them to borrow externally when oil prices slump. External borrowing is not peculiar to oil exporting countries, as more countries are reported to have borrowed massively to supplement local resources (Edo, 2002). The impact of external debt on economic growth was investigated in forty-four countries, where Reinhart and Rudolf (2017) found that external debt burden of about 60 percent led to 50 percent decline in economic growth. Adesola (2009) also found a slightly negative impact of debt service on long-run economic growth in Nigeria, within the period 1981-2004. On the contrary, Ijirsha et al. (2016) discovered a significant positive effect in Nigeria, for the

period 1981-2014. In a comparative study of South Africa and Nigeria, Ayadi and Ayadi (2008) produced mixed effects of external debt on growth. The effect was positive in the short-run, but became negative in the long-run. Similarly, Lau and Kon (2014) investigated several developing countries, and discovered a positive impact in some countries, and a negative impact in others.

The quality of governance is fundamental to economic growth of developing countries. Several countries have experienced a checkered history of political governance and institutional framework, with far-reaching implications for economic growth. Fayissa and Nsiah (2013) investigated the role of governance in the growth performance of African countries, and found that quality of governance accounted for the differences in economic growth across the countries. The implication is that macroeconomic policies, aimed at encouraging growth, may hardly achieve this goal in the absence of good governance. A similar investigation on less developed countries by AlBassam (2013), revealed a strong negative relationship between governance crisis and economic growth. The suggestion here revolves around the need to ensure political stability in less developed countries. In the light of this suggestion, Hemed (2019) investigated the political systems in East African countries, within the period 1996-2019. The results revealed that countries with democratic system were more stable than countries with autocratic system. The effect of autocratic system on economic growth was not only negative, but highly significant, which suggests that countries need to embrace democratic system, in order to accelerate growth.

Rivera-Batiz (2002) did a similar study of the impact of governance on growth, in a cross-section of countries, over the period 1960-1990. The study developed a model showing how democratic system of governance can raise economic growth. The model posited that strong democratic system reduces corruption, which in turn stimulates technological progress and economic growth. A validity test was subsequently conducted on the model, where democratic system was actually found to be a major driver of factor productivity and economic growth in all the countries. Shchegolev and Hayat (2018) also found significant positive effect of democratic governance on economic growth in former member countries

of Soviet Union, over the period 1996-2015. This study employed the fully modified ordinary least squares (FMOLS) method to estimate the effect.

2.4 Some Shortcomings in Previous Research Works

So far, the literature survey in this section has revealed a considerable number of factors influencing economic growth in developing countries. There were conflicting results emanating from several studies, with respect to the role of foreign development assistance. Some of these studies may have included inappropriate control variables that interacted unfavorably with foreign development assistance, to produce biased and unreliable estimates. This problem may be eliminated by selecting more appropriate variables that can effectively combine with foreign development assistance to optimize its role. In this current study, attempt is made to do that, by choosing macroeconomic policies, which are considered to have strong multiplier effect. The combination of foreign development assistance and macroeconomic policies is expected to produce more consistent and reliable estimates of economic growth in Sub-Saharan African countries.

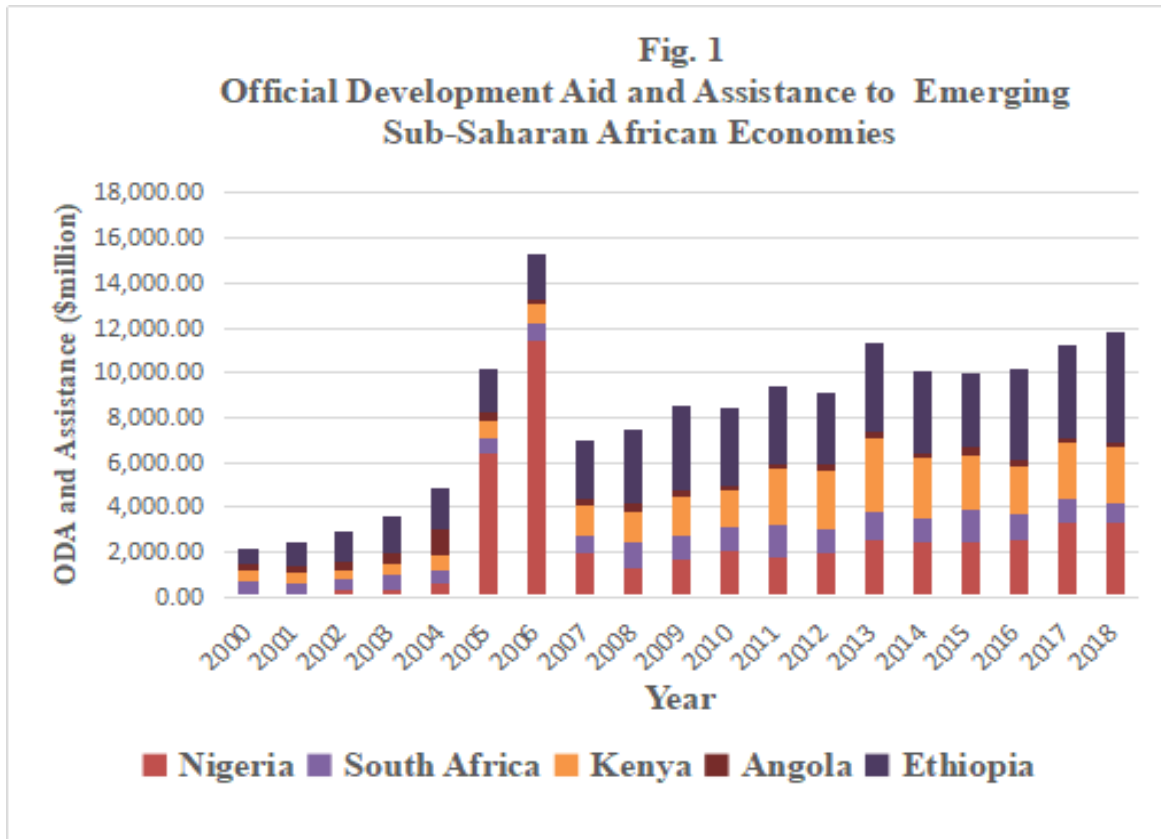
3. Descriptive Background of the Emerging Economies

3.1 Foreign Development Assistance

Foreign development assistance has continued to flow from advanced economies to less development economies, mostly in Sub-Saharan Africa (SSA), helping to ameliorate macroeconomic instability in the sub-region. Inflows to the five emerging economies of SSA have increased significantly, in the last two decades (Fig.1).

Nigeria is currently the largest economy in SSA, with a significant part of fiscal revenue accruing from crude oil exports. The economy has experienced fluctuations in the level of development assistance, with an inflow of \$0.17 billion in 2000, which rose to all time high of \$11.4 billion in 2006, and subsequently dropped to \$3.3 billion in 2018. The period 2000-2004 witnessed particularly poor inflows, with an average of \$0.31 billion. **South Africa**, on the other hand, is the most highly indebted country in SSA, depending largely on external borrowing to sustain economy. In addition to borrowing, the economy receives development assistance, which has also fluctuated from \$0.49 billion in 2000, to a peak of

\$1.42 billion in 2015, but declined to \$0.91 billion 2018. The initial period of 2000-2007 recorded unimpressive inflows, but significantly improved in the period 2008-2018. **Kenya** also received development assistance, which is far larger than that of South Africa. The inflow rose steadily from \$0.51 billion in 2000, to the highest level of \$3.31 billion in 2013, but dropped slightly to \$2.49 billion in 2018. The trend was particularly impressive in the period 2001-2018.



Sources of data: World Bank Open Database, 2019

Angola, like Nigeria, depends predominantly on oil export. The economy recorded abysmal performance in the inflows of Development assistance, which was relatively low during the period. The inflows declined significantly from \$0.31 billion in 2000, to the lowest level of \$0.16 billion in 2018, which is also the overall lowest among the five economies. It follows that the economy has been a poor recipient of foreign development assistance. **Ethiopia** experienced impressive inflow, as the economy is reported to be the

highest recipient of development assistance, among the top five economies. It recorded the lowest inflow of \$0.69 billion in 2000, which rose astronomically to the highest level of \$4.93 billion in 2018. This level level is the overall highest among the five economies

All the economies, together, recorded appreciable inflows of development assistance within the period 2000-2018. The aggregate inflows increased from \$2.09 billion in 2000, to a peak of \$15.52 billion in 2006, but dropped to \$11.93 billion in 2018. The years 2005-2018 are quite remarkable, as the aggregate inflows stayed above \$7.0 billion. This is a clear indication that SSA economies benefited largely from foreign development assistance, during the period.

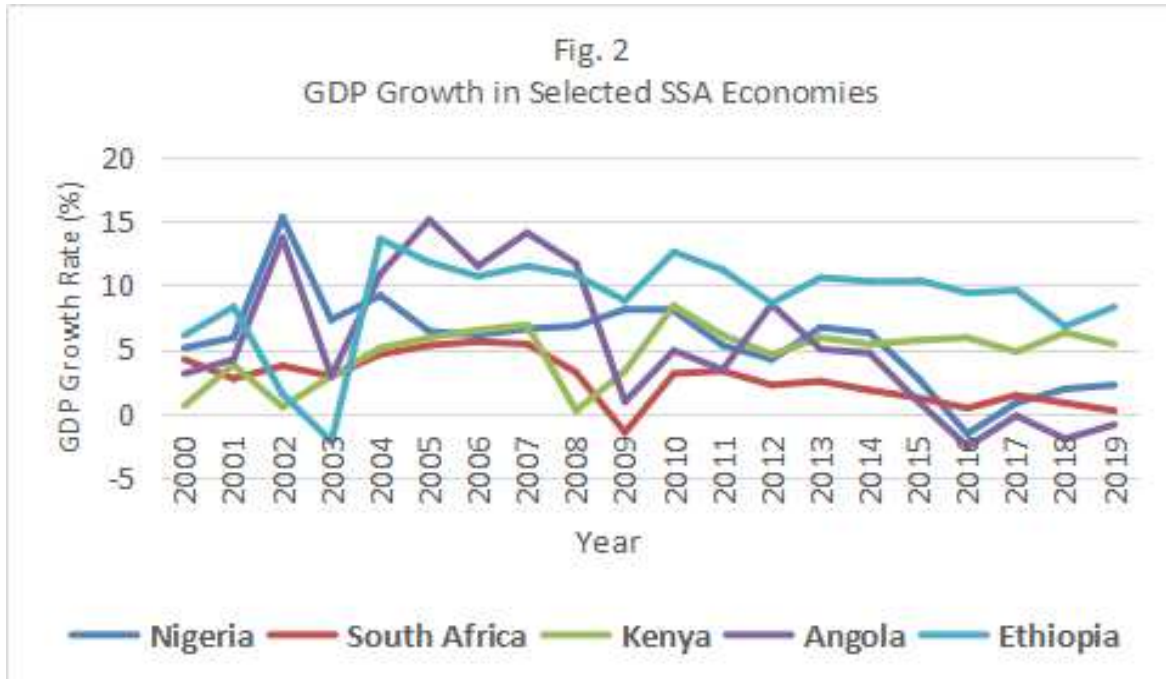
3.2 Economic Growth

Sub-Saharan Africa (SSA) experienced significant economic growth within the period 2000-2019, driven largely by Ethiopia with average growth rate above 10 percent (Fig. 2). Some of the economies, however, witnessed a decline in growth rate that necessitated the application of monetary and fiscal policies to defend the economy. The decline, in most cases, was caused largely by external shocks arising from global financial crisis and oil price slump.

Nigeria is currently the leading economy in SSA, with an impressive GDP growth rate of 5.1 percent in 2000, which rose to a record high of 8.1 percent in 2009. The growth rate, however, dropped to a record low of -1.6 percent in 2016, and remained below IMF/World Bank recommended minimum growth rate of 6 percent, as a result of oil market crash. Nigeria, being a major world exporter of crude oil, has tended to depend solely on oil revenue, thus making the economy highly vulnerable to oil market shocks. This suggests that the economy needs to reduce dependence on oil sector, by deploying macroeconomic policies to develop the non-oil sector.

South Africa was the most dominant economy in Africa, up to 2007, and currently ranks as the second largest economy in SSA. The economy has been considerably unstable, as the growth rate rose from 4.2 percent in 2000, to 5.6 percent in 2006, and fell to its lowest level of -1.5 percent in 2009. It only improved marginally to 0.2 percent in 2019, indicating

the economy has been struggling to come out of depression. The economic growth predicament is attributed to several factors, such as the global financial crisis of 2008-2009, and the turbulent global oil market.



Source: Authors' construction base on World Development Indicators, 2019

Kenya is ranked as the ninth largest economy in Africa, although it is the leading economy in the eastern part of SSA, as at 2019. The GDP growth rate rose from abysmal rate of 0.6 percent in 2000, to the highest rate of 8.4 percent in 2010. Thereafter, it recorded a slight drop to 5.4 percent in 2019. Election crises in the country and global financial crisis accounted for the growth rate of less than 1 percent in 2002 and 2008. The impressive growth performance of the economy within the period 2010-2019 may be attributed to significant political and economic reforms, which created stable macroeconomic environment. The country has thus become one of fastest growing economies in SSA.

Angola is highly dependent on oil export, which is the main driver of growth and development. The growth performance which stood at 3.1 percent in 2000, rose astronomically to a peak of 15.1 percent 2005, and dropped to a record low of -2.6 percent in 2016. The period 2002-2008 witnessed outstanding performance, with the average growth rate exceeding 10 percent. The economy was severely affected by the slump in

global oil price, which led to the unprecedented decline in growth rates towards the end of the period.

Ethiopia dominated all other economies in growth performance, during the period, with outstanding average growth rate of over 10 percent. The economy is ranked among the fastest growing economies in the world. Although it experienced a slight hiccup in 2002-2003, the growth performance remained far above the IMF/World Bank recommended minimum growth rate of 6 percent for developing countries. The highest growth of 13.6 percent was recorded in 2004, while the lowest growth rate of -2.2 percent occurred in 2003. The impressive growth performance of this economy can be attributed largely to inflows of capital through external borrowing and foreign aid. The inflows were effectively deployed into infrastructure development, which led to rapid economic growth.

4. The Empirical Model

4.1 Generalized Method of Moments Model (GMM)

The panel model relating economic growth to foreign development assistance and macroeconomic policies is constructed in two stages. First stage shows the functional and stochastic relationships between the dependent and explanatory variables as follows.

$$ECG_{it} = f(FDA_{it}, MOP_{it}, FIP_{it}, EXR_{it}) \quad (1a)$$

$$ECG_{it} = \alpha_0 + \sum_{j=1}^4 \alpha_j X_{it} + \mu_{it} \quad (1b)$$

The dependent variable in the model is ECG_{it} (Economic growth). The explanatory variables are FDA_{it} (Foreign development assistance), MOP_{it} (Monetary policy), FIP_{it} (Fiscal policy), and EXR_{it} (Exchange rate). The vector X_{it} contains all the explanatory variables, and μ_{it} is the error term. The parameters α_j ($j = 1, 2, 3, \text{ and } 4$) are elasticity coefficients of the corresponding explanatory variables.

The second stage involves transformation of stochastic model (1b) into the generalized method of moments (GMM) model, proposed by Arellano and Bond (1991), and extended by Blundell and Bond (1998). The main feature of the GMM model is that it relates the dependent variable to its own lag and the lags of explanatory variables, as presented below.

$$ECG_{it} = \beta_0 + \beta_1 ECG_{it-1} + \sum_{j=2}^4 \beta_j X_{it-1} + \tau_{it} + v_{it} \quad (2a)$$

$$\Delta ECG_{it} = \lambda_0 + \lambda_1 \Delta ECG_{it-1} + \sum_{j=2}^4 \lambda_j \Delta X_{it-1} + \omega_{it} \quad (2b)$$

The parameter τ_{it} represents country fixed effect, which is eliminated by casting the variables in first difference form, denoted by the Δ operator. The model is expected to be well behaved when the moments condition is satisfied, that is, the expected value of random error term becomes zero. The condition is stated as $E[f(X_j, \alpha_j)] = 0$, where X_j = vector of random variables, and α_j = vector of parameters.

The theoretical expectations of the model are:

- 1) Increase in foreign development assistance enhances economic growth (direct relationship).
- 2) Expansionary monetary policy fosters economic growth (direct relationship).
- 3) Expansionary fiscal policy encourages economic growth (direct relationship).
- 4) Rising exchange rate tends to impair economic growth (inverse relationship).

4.2 Vector Error Correction Model (VECM)

In order to check for consistency and robustness of estimated relationships, a complementary model is specified, showing the relationship between dependent and explanatory variables. The model is also constructed in two stages. The first stage presents all the variables as endogenous, and the simultaneous inter-relationships among them. This is the conventional Vector Auto-regressive model (VAR). The second stage involves the transformation of VAR model into the Vector error correction model (VECM), following Engle and Granger (1987), which is more dynamic in reconciling short-run and long-run movements. Equation (3a) is the conventional VAR model, which is transformed into VECM in equation (3b), by introducing the first difference operator Δ , and the error correction term ECT_{it-1} , as shown below.

$$Z_{it} = \pi_0 + \sum_{j=2}^4 \pi_j Z_{it-1} + \varepsilon_{it} \quad (3a)$$

$$\Delta Z_{it} = \eta_0 + \sum_{j=2}^4 \eta_j \Delta Z_{it-1} + ECT_{it-1} + v_{it} \quad (3b)$$

The vector Z_{it} in the model is a composition of dependent variables, while the matrix Z_{it-1} contains all the lag variables (dependent and explanatory). The inclusion of lag dependent variable in the matrix eliminates the problem of endogeneity from the model. The dependent variables are in first differences, while explanatory variables are in lags and first differences.

5. Estimation Techniques

The panel unit root test is employed to ascertain stationarity of variables, which is a condition that will enable the model to produce consistent and unbiased estimates. The test involves the three techniques of LLC, IPS, and HD, proposed by Levin et al.(2002), Im et al. (2003), and Hadri (2000), respectively. The cointegration test is also employed to ascertain the long-run convergence of the variables, which will ensure that estimates are reliable for purpose of forecasting and policy making. The cointegration test employed in this study was proposed by Pedroni (2004). The test is based on three vital diagnostic values of Variance ratio, Rho statistic, and PP statistic. The generalized method of moments (GMM) technique is used to estimate the relationship between dependent and explanatory variables. In order to ensure robustness and compatibility of estimates, an alternative technique of vector error correction mechanism (VECM) is used to determine the relationships among the variables. Both techniques have been employed in previous studies to produce reliable estimation results, in developed and less developed economies.

The estimation is undertaken for the period 2000-2019, with data obtained from several sources. The sources include World Bank Open Database, World Development Indicators, OECD Statistics, IMF World Debt Table, Global Financial Development Database, African Development Bank Statistical Indicators, and Central Bank Statistical Bulletins of the respective countries. The following measures of variables are used in the study.

- a) Economic growth (GDP growth rate)
- b) Foreign development assistance (total value of ODA and aid)
- c) Monetary policy (percentage change in money supply)
- d) Fiscal policy (percentage change in fiscal expenditures)
- e) Exchange rate (dollar value of local currency)

6. Estimation Results and Analysis

6.1 Unit Root and Co-integration Tests

These preliminary investigations are usually conducted to confirm that variables in the model possess desirable empirical properties. The test results are reported in levels and first differences (Table 1).

Table 1: Unit Root and Co-integration Test Results

Sample size: 5 Economies Estimation period: 2000-2019						
Unit Root test						
Variable	Level			First difference		
	LLC	IPS	HD	LLC	IPS	HD
ECG	0.68	0.77	1.99	6.06*	3.81*	0.78*
FDA	2.94*	3.04*	2.01	4.12*	5.02*	1.04*
MOP	1.05	0.98	1.98	6.33*	2.96*	0.99*
FIP	2.87*	1.22	0.88*	7.05*	4.43*	1.17*
EXR	0.93	1.03	2.55	5.17*	3.71*	1.06*
Cointegration Test (Pedroni)						
Variance ratio (%) (critical range: $0 \leq r \leq 5$)			Rho statistic (critical range: $0 \leq \sigma \leq 1$)		PP statistic (critical range: $1.5 \leq p \leq 5$)	
2.11*			0.86*		3.05*	

*Variables are stationary (unit root test) and convergent (cointegration test)

Variables: ECG=Economic growth, FDA=Foreign Development Assistance, MOP=Monetary Policy, FIP=Fiscal Policy, EXR=Exchange rate.

Note: In LLC and IPS tests, larger statistics indicate more stationary variables. In HD test, smaller statistics indicate more stationary variables.

Source: Authors' estimation from Eviews Computer software

In levels, the LLC and IPS tests produced significant FDA values of 2.94 and 3.04, respectively. Similarly, the LLC and HD tests produced significant FIP values of 2.87 and 0.88, respectively. It follows that only two variables are stationary in levels, and thus possess expected empirical properties. In first differences, however, each test produced significant values for all variables, which indicate they are all stationary. Therefore, the

null hypothesis of non-stationarity is rejected, hence the variables are qualified for empirical estimation.

In the case of co-integration test, the Pedroni variance ratio of 2.11 percent falls within the critical range. Similarly, the rho statistic of 0.86 and PP statistic of 3.05 fall within the critical range. These are indications that all the variables tend to move towards equilibrium, and are most likely to converge in the long-run. Therefore, the null hypothesis of non-convergence is rejected, to allow the variables qualify for estimation.

6.2 GMM Estimation

The model relating economic growth to foreign development assistance, macroeconomic policies and exchange rate was estimated by employing the GMM method. The estimation results are reported in Table 2, together with the diagnostics. The estimate of ΔFDA_{-1} is 0.09, which is positive and significant at 5 percent, indicating that foreign development assistance impacted well on economic growth. The estimate of ΔMOP_{-1} is 0.03, which indicates monetary policy effect is also significant at 5 percent. However, the impact of foreign development assistance exceeds that of monetary policy. The effect of fiscal policy (ΔFIP_{-1}) is indicated by the positive and significant estimate of 0.14, which is, however, stronger than that of foreign development assistance. Exchange rate (ΔEXR_{-1}) is the only variable that impacted negatively on economic growth, as shown by the estimate -0.12, which is significant at 5 percent. The adjustment of economic growth to its own lag (ΔECG_{-1}) is positive, but insignificant, indicating that growth did not reinforce itself. The other results in the table represent various effects of interaction among the variables.

Generally, foreign development assistance, over the period 1980-2019, can be considered quite beneficial in facilitating economic growth of Sub-Saharan Africa. Again, the positive role of macroeconomic policies cannot be underestimated. Aside from impacting directly on economic growth, it is most likely they also enhanced the effect of foreign development assistance. Only exchange rate, as a control variable, tended to impair economic growth. All the variables satisfy theoretical expectations.

Table 2: Estimation Results (GMM Model)

Dependent variable	Explanatory variable	Explanatory variable					
		Intercept	Δ ECG ₁	Δ FDA ₋₁	Δ MOP ₋₁	Δ FIP ₋₁	Δ EXR ₋₁
ECG	Intercept	1.05* (3.27)	0.02 (1.11)	0.09* (2.96)	0.03* (1.92)	0.14* (4.01)	-0.12* (-3.24)
	Δ ECG ₋₁	1.28* (2.02)	0.13 (0.97)	0.49 (1.33)	0.69* (2.04)	0.12 (1.26)	1.01 (0.93)
	Δ FDA ₋₁	0.41 (1.18)	0.66 (1.08)	0.81* (1.88)	1.11* (3.19)	0.85 (1.31)	-0.37 (-1.04)
	Δ MOP ₋₁	2.11* (4.05)	0.92 (1.14)	1.19* (2.88)	0.21 (1.01)	0.95** (9.12)	1.13* (3.32)
	Δ FIP ₋₁	1.12* (1.99)	0.51 (1.27)	-0.85 (-1.11)	0.94** (8.22)	0.55* (3.32)	0.55 (0.98)
	Δ EXR ₋₁	0.84 (1.22)	0.71 (1.08)	-0.62* (-1.98)	1.15* (2.22)	0.48 (1.03)	-0.39* (-2.22)
	Diagnostics of ECG equation						
Sargan chi-square statistic (0.05 < p ≤ 1)	5.96 (0.34)	4.02 (0.63)	6.22 (0.58)	3.66 (0.49)	4.46 (0.66)	7.88 (0.51)	
A-B 1 st order z-statistic (0 < p < 0.1)	1.89 (0.08)	2.02 (0.07)	3.11 (0.05)	2.66 (0.06)	1.97 (0.09)	3.58 (0.04)	
A-B 2 nd order z-statistic (0.25 < p ≤ 1)	1.21 (0.26)	1.37 (0.39)	1.06 (0.58)	1.18 (0.42)	0.97 (0.61)	1.13 (0.48)	

(*)(**) Coefficient is significant at 5 percent, and 1 percent, respectively

Variables: ECG=Economic growth, FDA=Foreign Development Assistance, MOP=Monetary Policy, FIP=Fiscal Policy, EXR=Exchange rate.

Note: The dependent variable is in levels, while explanatory variables are in lags and first differences.

Source: Authors' estimation from Eviews Computer software

In the diagnostics, p-values of Sargan statistics fall within critical range, hence the null hypothesis of no correlation between instrumental variables and residuals can be accepted. Similarly, the p-values of A-B statistics fall within critical range, indicating acceptance of the null hypothesis of no correlation among the residuals. The estimates from GMM model are, therefore, unbiased and reliable.

6.3 VECM Estimation

The estimation of VECM is undertaken to further confirm the relationship existing between economic growth and the explanatory variables. The estimation results are reported in Table 3, where foreign development assistance (Δ FDA₋₁) is observed to have a positive and significant estimate of 0.13, at 5 percent level. It shows that the effect on economic growth

(ΔECG) is appreciable and conforms to theoretical expectation. Similarly, the monetary policy (ΔMOP_{-1}) estimate of 0.11 is significant at 5 percent, while fiscal policy (ΔFIP_{-1}) estimate of 0.23 is significant at 1 percent. The two variables also conform to theoretical expectations. However, the significance of foreign development assistance is greater than that of monetary policy, but lesser than fiscal policy. The estimate of exchange rate (ΔEXR_{-1}) is -0.07, which is significant and conforms to expectation. It is indicated to have impaired economic growth during the period.

Table 3: Estimation Results (VECM)

Dependent variable	Explanatory variable						
	Intercept	ΔECG_{-1}	ΔFDA_{-1}	ΔMOP_{-1}	ΔFIP_{-1}	ΔEXR_{-1}	ECT_{-1}
ΔECG	1.08* (2.33)	0.09 (1.13)	0.13* (3.02)	0.11* (2.11)	0.23** (6.14)	-0.07* (-2.32)	-0.78* (-1.96)
ΔFDA	0.91 (1.07)	0.02 (0.96)	0.16 (1.13)	-1.02* (-2.41)	0.22 (1.25)	-0.08 (-1.06)	-0.31 (-1.04)
ΔMOP	1.26* (3.25)	2.20 (1.19)	-0.44* (-2.21)	1.15 (1.33)	0.04 (0.88)	0.03 (1.10)	-0.77* (-3.19)
ΔFIP	0.77 (1.14)	0.02 (0.74)	0.66* (3.31)	0.12 (0.87)	0.09 (1.27)	0.21 (0.93)	-0.39 (-1.18)
ΔEXR	0.05 (1.11)	0.03 (1.06)	0.07 (1.21)	-0.35* (-2.54)	-1.16 (-0.95)	0.42 (1.31)	-0.27 (-0.93)
Diagnostics of ΔFDA Equation							
R ² (adjusted) = 0.88, F-statistic = 29.06**, Sargan statistic 2.72 (> 1.65), Arch statistic = 0.22, log likelihood-ratio = 74.13, Durbin's h = 2.02,							

(*)(**) Coefficient is significant at 5 percent, and 1 percent, respectively

Variables: ECG=Economic growth, FDA=Foreign Development Assistance, MOP=Monetary Policy, FIP=Fiscal Policy, EXR=Exchange rate. ECT_{-1} = Error correction term.

Note: The dependent variables are in first differences, while the explanatory variables are in lags and first differences.

Source: Authors' estimation from Eviews Computer software

The insignificant estimate of lag economic growth (ΔECG_{-1}) shows that growth did not significantly reinforce itself. Other estimates represent the several relationships that exist among the variables, which help to minimize or eliminate the problem of endogeneity. It is also observed that economic growth exhibited a fairly dynamic trend, in response to changing explanatory variables, as indicated by the error correction term (ECT_{-1}) estimate of -0.78. The estimate represents speed of adjustment, revealing that economic growth is most likely to adjust fully, after a period of one and a quarter years, as a result of systemic

change in the explanatory variables. This is slightly longer than the standard one year period that is required for long-run adjustment.

Reliability of the results is confirmed by the various diagnostic statistics. The adjusted R-square of 0.88 is an indication that the explanatory variables account for about 88 percent of systemic variation in economic growth. The F-statistic of 29.06 shows that explanatory power of the model is significant at 1 percent. The Sargan statistic of 2.72 is significantly higher than the minimum threshold, which implies that economic growth is highly dependent on itself and other variables. The Arch statistic of 0.22 is low, indicating that changes in economic growth do not significantly deviate from changes in explanatory variables. The log likelihood-ratio of 74.13 implies a high probability that all explanatory variables contributed substantially to the change in economic growth. The Durbin's h-statistic of 2.02 shows that auto-correlation and spuriousness are considerably minimized. All these statistics point to the strong linkage of economic growth to foreign development assistance and macroeconomic policies in Sub-Saharan Africa.

6.4 Temporal Comparability of GMM and VECM Estimations

The two methods of estimation produced results that are compared, and used to confirm the consistency of estimates, during the period 1980-2019. A comparison of the results, as shown in Table 4, clearly reveals FDA_{-1} estimate of 0.09 and ΔFDA_{-1} estimate of 0.13, which are both positive and significant at 5 percent. The respective estimates represent the effects of foreign development assistance on economic growth, for the GMM and VECM estimations. The effects are largely similar, though slightly more significant for VECM. The effects of monetary policy in the two estimation methods are also observed to be largely similar. The GMM monetary policy (MOP_{-1}) estimate is 0.03, while the corresponding VECM monetary policy (ΔMOP_{-1}) estimate is 0.11. Both estimates are significant at 5 percent. Again, the estimate of GMM fiscal policy (FIP_{-1}) is 0.14, while that of VECM fiscal policy (ΔFIP_{-1}) is 0.23, which are significant at 5 percent and 1 percent, respectively. The impact of exchange rate is negative and significant in both estimations, as indicated by GMM exchange rate (EXR_{-1}) estimate of -0.12, and VECM exchange rate (ΔEXR_{-1}) estimate of -0.07. The lag economic growth (ECG_{-1}) estimate for

GMM is 0.02, while VECM has lag economic growth (ΔECG_{-1}) estimate of 0.09, which are not significant. It follows that economic growth could not reinforce itself in both estimations.

Further comparison of the results shows that the effect of foreign development assistance is more significant than monetary policy, but less significant than fiscal policy, in both estimations. Similarly, exchange rate is the only variable that tends to impair economic growth in both estimations. In all, the GMM results can be considered largely consistent with the results of VECM, thus confirming robustness of the estimates.

Table 4: Temporal Estimation Results (GMM and VECM)

GMM		VECM	
Dependent variable: ECG Sample size: 5 Economies Estimation period: 1980-2019		Dependent variable: ΔECG Sample size: 5 Economies Estimation period: 1980-2019	
Explanatory variable	Coefficient	Explanatory variable	Coefficient
ECG ₋₁	0.02 (1.11)	ΔECG_{-1}	0.09 (1.13)
FDA ₋₁	0.09* (2.96)	ΔFDA_{-1}	0.13* (3.02)
MOP ₋₁	0.03* (1.92)	ΔMOP_{-1}	0.11* (2.11)
FIP ₋₁	0.14* (4.01)	ΔFIP_{-1}	0.23** (6.14)
EXR ₋₁	-0.12* (-3.24)	ΔEXR_{-1}	-0.07* (-2.32)

(*)(**) Coefficient is significant at 5 percent, and 1 percent, respectively

Variables: ECG=Economic growth, FDA=Foreign Development Assistance, MOP=Monetary Policy, FIP=Fiscal Policy, EXR=Exchange rate.

Note: The explanatory variables for GMM are in lags, while VECM variables are in lags and first differences.

Source: Authors' estimation from Eviews Computer software

6.5 Inter-temporal Comparability of GMM and VECM Estimations

In order to ensure that the estimation results are useful to policy making, a further analysis is undertaken to confirm inter-temporal consistency of estimates between sub-periods. The procedure involves splitting the entire period of study into two uniform sub-periods, and re-estimating the models for each sub-period, following the procedure of Yu et al. (2008). For the purpose of this study, the entire period is broken into two parts, comprising sub-

period 1 (1980-2000) and sub-period 2 (2001-2019), as shown in Table 5. The sub-period estimates for each model are compared to determine their consistency. In the GMM estimation, results for the two sub-periods are largely similar, except for exchange rate (EXR₋₁) that is slightly insignificant in sub-period 1, but turned out to be significant in sub-period 2. In the case of VECM, results for the two periods are also similar, except for monetary policy (Δ MOP₋₁) that is significant in sub-period 1, but slightly insignificant in sub-period 2.

Generally, the sub-period estimates for both GMM and VECM can be considered significantly consistent, which makes them considerably reliable for purpose of forecasting and policy making.

Table 5: Inter-temporal Estimation Results (GMM and VECM)

GMM			VECM		
Dependent variable: ECG Sample size: 5 Economies			Dependent variable: Δ ECG Sample size: 5 Economies		
Explanatory variable	Coefficient		Explanatory variable	Coefficient	
	Sub-period 1 (1980-2000)	Sub-period 2 (2001-2019)		Sub-period 1 (1980-2000)	Sub-period 2 (2001-2019)
ECG ₋₁	0.06 (1.01)	0.04 (0.89)	Δ ECG ₋₁	0.10 (1.29)	0.08 (1.16)
FDA ₋₁	0.11* (1.97)	0.13* (2.04)	Δ FDA ₋₁	0.15* (2.12)	0.17* (2.32)
MOP ₋₁	0.08 (1.33)	0.07 (1.21)	Δ MOP ₋₁	0.12* (4.02)	0.04 (1.44)
FIP ₋₁	0.14** (7.33)	0.12* (4.18)	Δ FIP ₋₁	0.09* (3.55)	0.11* (3.85)
EXR ₋₁	-0.05 (-1.36)	-0.10* (-3.02)	Δ EXR ₋₁	-0.08* (-2.38)	-0.06* (1.99)

(*)(**) Coefficient is significant at 5 percent, and 1 percent, respectively.

Variables: ECG=Economic growth, FDA=Foreign Development Assistance, MOP=Monetary Policy, FIP=Fiscal Policy, EXR=Exchange rate.

Note: The explanatory variables for GMM are in lags, while VECM variables are in lags and first differences.

Source: Authors' estimation from Eviews computer software

6.6 Policy Implications of Estimation Results

The analysis of GMM and VECM estimation results revealed that foreign development assistance exerted significant positive impact on economic growth in the five emerging economies of Sub-Saharan Africa. The impact is more significant than that of monetary

policy, but less significant than fiscal policy. On the other hand, exchange rate is the only variable that impacted negatively on economic growth. Further more, economic growth was unable to reinforce itself during the period. Some policy implications of these results are as follows:

- a) Foreign development assistance needs to be sustained in order to facilitate economic growth.
- b) Monetary policy stance can be improved upon to enhanced economic growth.
- c) Fiscal policy stance should be maintained to accelerate economic growth.
- d) Exchange rate can be made to operate more efficiently, to enable it drive economic growth in the positive direction.
- e) Prioritization of projects with high multiplier effect can help economic growth to reinforce itself.

The foregoing implications are quite instructive to policy makers in Sub-Saharan African countries, saddled with the enormous task of raising and sustaining economic growth.

7. Conclusion

Foreign development assistance, macroeconomic policies, and exchange rate have played different roles in economic growth of developing countries. Adequate study has yet to be undertaken, on how foreign development assistance and macroeconomic policies inter-relate, to produce consistent and reliable impact on economic growth of Sub-Saharan African countries. The study, therefore, employed the techniques of general method of moments (GMM) and vector error correction mechanism (VECM) to investigate the issue, in the five emerging Sub-Saharan African economies, within the the period 1980–2019.

The GMM results revealed that foreign development assistance exerted positive and significant impact on economic growth. The impact exceeded that of Monetary policy, but lesser than the effect of fiscal policy. Exchange rate is the only variable that impaired economic growth. It was also observed that economic growth could not significantly reinforce itself. Similar results were produced by the VECM, which shows that the estimates are consistent and reliable. Therefore, the role of foreign development assistance

and macroeconomic policies, over the period 1980-2019, can be considered quite beneficial to economic growth of Sub-Saharan Africa. Furthermore, the inter-temporal consistency of estimates confirmed their usefulness in forecasting and policy making.

The results produced by the two estimation methods conform largely to theoretical expectations, which state that foreign development assistance, monetary policy, and fiscal policy are directly related to economic growth, while exchange rate is inversely related. The policy implications of the estimation results are not far-fetched. They include sustenance of foreign development assistance, improvement of monetary policy stance, maintenance of fiscal policy stance, enhancement of exchange rate efficiency, and prioritization of projects with high multiplier effect.

Declarations

Availability of data and materials

The data that support the findings of this study are available in World Bank Open Database (2020). No restrictions on the World Bank data.

Competing interests

No competing interests in this work. It is the exclusive and original work of the authors.

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Authors' contributions

The first author carried out the comprehensive analysis of all estimation results. The second author sourced the data and estimated the models. The third author carried out elaborate literature review in the study.

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Figures

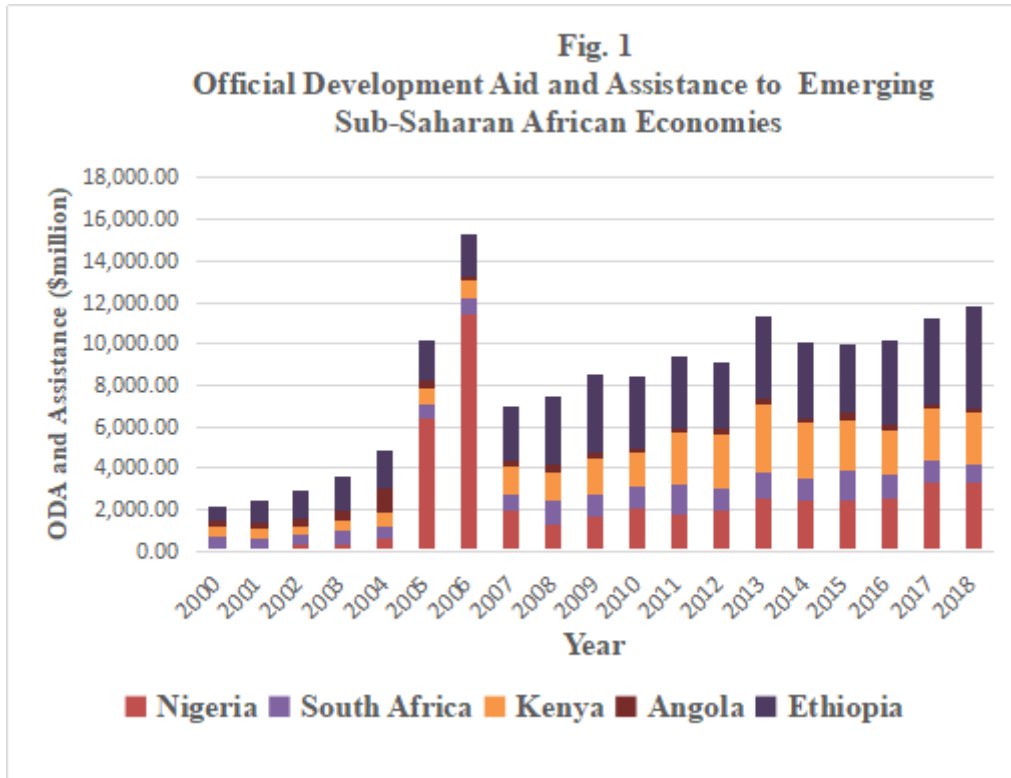


Figure 1

Official Development Aid and Assistance to Emerging Sub-Saharan African Economies

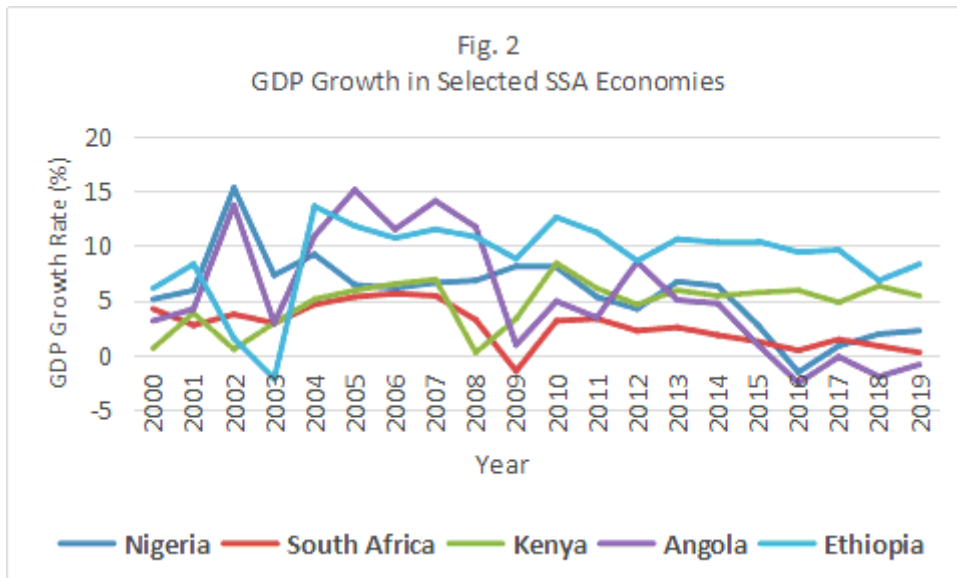


Figure 2

GDP Growth in Selected SSA Economies