

RE-VISITING THE MACROECONOMIC DETERMINANTS OF ECONOMIC GROWTH IN SUB-SAHARAN AFRICA AMIDST COVID-19

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Growth strategies play crucial roles in a region undergoing economic transformation that involves new policy formulation and implementation toward sustainable growth and development. In overall, the growth of any economy promotes development when the proceeds from it are appropriately channeled to developmental policies, and this in overall, increase well-being of the people. Therefore, this study revisits the macroeconomic determinants of economic growth in Sub-Saharan Africa amidst the coronavirus, 2019, from 1990 to 2023. Using the pooled mean estimation framework introduced by Pesaran et al. (2001) in an autoregressive distributive lag and the Dumitrescu-Hurlin Granger causality, findings show that foreign direct investment, trade openness, human capital, and population promote economic growth in SSA countries. Also, there is a bi-directional relationship between FDI and GDP, SCH and GDP, POP and GDP, OPEN and FDI, SCH and FDI, POP and FDI, POP and OPEN. However, there is a uni-directional relationship between OPEN and GDP, and SCH and OPEN. Then, the study recommends that governments of Sub-Saharan Africa (SSA) countries should promote policies that encourage foreign direct investment and trade openness. Promoting policies to encourage foreign direct investment allows more job opportunities in the host country, create opportunity of exchange of technical know-how, and so on. Also, make provisions for skill acquisitions through vocational training, workshops, and training of the available labour force in the region.

Keywords: Sub-Saharan Africa, Economic Growth, Pooled Mean Group, Autoregressive Distributed Lag, Westerlund Cointegration

JEL Classification: 02, 04, 05

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1. Introduction

Sub-Saharan Africa (SSA) is not an exception to the negative impacts of the coronavirus in 2019 (COVID-19) pandemic on the global economy, which has seen several rounds of health shocks in recent years (Anyanwu & Salami, 2021). The region's economic growth, which had been increasing quickly during the preceding 20 years, has been significantly hampered by the pandemic. Despite the fact that Africa's economic prospects have improved in the wake of the COVID-19 epidemic, progress remains precarious in the face of several internal and international shocks (Bi & Zhang, 2024). According to the International Monetary Fund (IMF), SSA's economic growth which slowed to -1.6% in 2020 is expected to rise to 3.6% in 2023 amid a global slowdown before accelerating to 4.2 percent in 2024 in tandem with a global recovery, declining inflation, and a slowdown in monetary policy tightening. Due to the unpredictable nature of the pandemic's course and the historically high costs of food and energy, this recovery is anticipated to confront global inequality, a rise in poverty, and a danger to progress toward achieving the Sustainable Development Goals (SDGs) (ILO 2022).

The recovery from the long-term effects of the COVID-19 pandemic has been hampered by geopolitical tensions worldwide, including the ongoing war in Ukraine and the resurgence of conflict in the Middle East (Desalegn, Tangi & Fekete-Farkas, 2022). Sub-Sahara Africa (SSA) GDP growth was 2.8% in 2023 as growth in the three largest SSA economies slowed. Angola recorded a growth rate of 1.0%, Nigeria had a growth rate of 2.9%, as the country's food affordability worsened further due to farming disruptions and displacement caused by devastating floods. South Africa recorded a growth rate of 0.7%, which was attributed to worsening electricity shortages and policy tightening accelerated to curb inflation (WDI, 2024). Countries like Rwanda, the Democratic Republic of the Congo, Eritrea, Mauritius, Guinea, and Ethiopia had faster growth of more than 6.5% in 2023 in spite of these slower growth rates. Despite these positive improvements, Africa still faces challenges in attracting foreign direct investment and promoting commercial liberalization (Rahman, 2024). The region's investment climate is often described as being characterized by bureaucratic barriers, inadequate infrastructure, and corruption (Alhassan, et al., 2024; Ojeka, et al., 2024). Furthermore, SSA countries have long been shut out of global trade because of their limited access to overseas markets and lack of export base diversification (Chigeto, Jayamohan & Ayeru, 2024). Because growth rates have not been strong enough to offset population growth, per capita GDP has increased very little.

As governments are willing to achieve stable macroeconomic conditions but need significant effective public spending, as they struggle with low household savings and limited tax revenue, thereby relying on foreign investment as a vital source of domestic recovery to boost economic growth (Dahmani & Makram, 2024). Trade openness and foreign direct investment (FDI) are becoming more widely acknowledged as crucial elements of economic progress as SSA nations attempt to recover from the epidemic and foster economic expansion (Bi, M., & Zhang, 2024; Hedeshi, 2024). While trade openness can open up new markets, promote competition, and

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stimulate innovation, foreign direct investment (FDI) may offer much-needed finance, technology, and managerial experience (Ajide, 2024). To increase Africa's overall growth resilience, both internal (endogenous) and external (exogenous) elements must be addressed, such as reducing macroeconomic vulnerabilities and improving institutional and governance frameworks (Foabeh & Aumeboonsuke, 2024; Raga, 2024).

Many African countries have made changes to their financial systems, investment regulations, and economic policies in order to create a favourable environment for investment (Khan, et al., 2024). In 2023, the worldwide recovery from the COVID-19 epidemic accelerated, largely primarily to rising economies. Despite these hopeful advances, Africa still struggles to attract foreign direct investment and progress trade liberalization. Prior to the pandemic, SSA's economic development was driven by investment, savings, trade, and fiscal policy. The outbreak has highlighted the importance of re-evaluating the macroeconomic issues that impact economic growth in Sub-Saharan Africa (Hosein, et al., 2024). The pandemic has disrupted global supply networks, reduced trade and investment flows, and left SSA countries with a greater debt burden. The pandemic has also revealed the SSA's economic deficiencies, such as a lack of diversification, limited budgetary space, and inadequate healthcare services (Dinh, 2021; Raga, 2024).

In light of this, it is necessary to reassess the macroeconomic variables that impact economic growth in SSA and look at new growth engines that can help the region recover from the epidemic and continue to make economic progress. By investigating the macroeconomic drivers of economic development in SSA during the COVID-19 pandemic, this paper seeks to close this research gap. In addition to identifying new growth drivers, the research will look at how the pandemic has affected the economies of SSA and offer policy suggestions for fostering sustainable economic development in the area.

The rest of the paper is structured as follows: Section two dealt with the literature review, while section three dealt with the methodology employed in the study. Lastly, section five considers the conclusion and policy recommendation.

1.1 Stylized Facts on Economic Growth Empirics in Sub-Saharan Africa (2010-2023)

Sub-Saharan Africa has a complicated economic environment characterised by both progress and chronic macroeconomic weaknesses. Countries in the area are attempting to conduct reforms to restore macroeconomic stability in the wake of recurrent negative shocks and the subsequent need for assistance (Adam, 2024; Dahmani & Makram, 2024). Despite the global issues that have taxed economies globally, the African continent is expected to stay robust. Real GDP growth is expected to accelerate to 3.7 percent in 2024 and 4.3 percent in 2025, as the effects of the factors weighing on growth in 2023 recede. (AFDB, 2024).

The COVID-19 epidemic caused Sub-Saharan Africa's (SSA) output to plummet to -2.0 percent in 2020, less than expected as the virus spread more slowly than expected (WDI, 2023). The

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region's growth resumed due to headway made in controlling COVID-19 outbreaks, particularly in Western and Central Africa, and positive spillovers from growing global economic activity (Legg & Sembene, 2022). The complex underlying pressures of food insecurity linked to high poverty, lack of job opportunities, and weak governance caused significant hardships in many countries, and insecurity, drought, and energy shortages dampened growth despite the positive recovery and resilience (Hamadjoda Lefe, Mom Njong & Edeme, 2024; Wudil, et al., 2022). Despite the recovery, many nations are still unable to afford finance due to restrictive domestic and international financial conditions (Gallagher et al., 2023; Soumtang Bime, Mignamissi & Koumis Ngagni, 2024). Reducing macroeconomic vulnerabilities while also attending to development requirements and making sure that changes are politically and socially acceptable is a challenging balancing act for governments in sub-Sahara Africa.

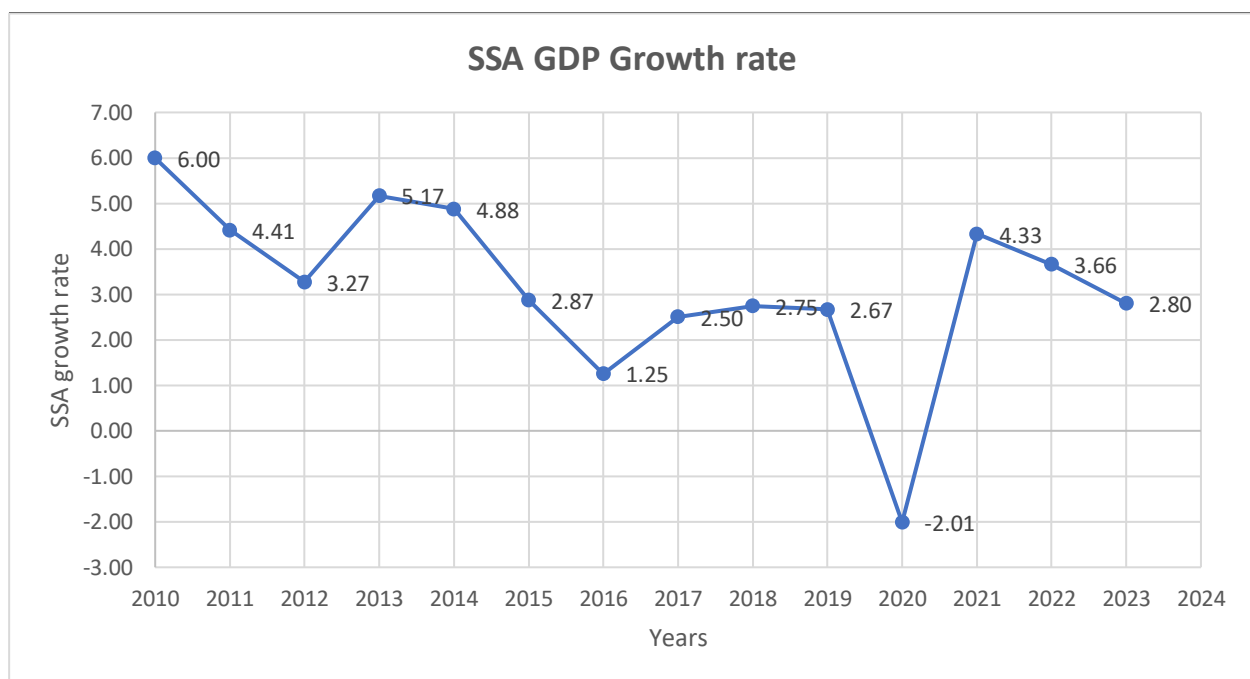


Figure 1. Sub Saharan Africa GDP Growth rate (2010-2023) Source: Data World Development Indicators

As governments reduce expenditure and implement steps to mobilize domestic income, budgetary positions are gradually regaining their pre-pandemic levels four years after the COVID-19 epidemic (AFDB, 2024; Barlow & Grugel, 2024). As revealed in figure 1, growth rebound took place in 2021 with a record of 4.3% from -2.0% in 2020 during the pandemic but slowed from 4.3 per cent in 2021 to 2.8 percent in 2023. High food and energy prices, the impact of climate change and harsh weather on agricultural productivity, and regions of political upheaval and violence in various African countries have all been cited for the decline (AFDB, 2024).

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The dynamics of Africa's macroeconomic foundations have remained uneven despite significant obstacles, resulting in regional variance. According to AFDB (2024), East Africa is predicted to recover as Africa's fastest-growing area, with real GDP growth of 4.9 percent in 2024 and up to 5.7 percent in 2025. A moderate yield increase rate of 4.1 percent in 2024 to 4.7 percent in 2025 is anticipated for Central Africa. In North Africa, growth is predicted to drop from an estimated 4.1 percent in 2023 to 3.6 percent in 2024 and then increase to 4.2 percent in 2025, while in West Africa, growth is predicted to increase to 4.2 percent in 2024 and 4.4 percent in 2025. In Southern Africa, growth is predicted to increase to 2.2 percent in 2024 and firm up to 2.7 percent in 2025.

1.2. Stylized Facts on Trade and Foreign Direct Investment in Sub-Saharan Africa amidst Covid-19

The economic recovery of Sub-Saharan African nations has been sluggish due to the pandemic's shocks, which have increased inflationary pressures that impact trade generally and cause volatility in terms of trade. Sub-Saharan Africa's trade to GDP ratio for 2022 was 60.7%, up 3.6% from 57.1% in 2021, according to data from World Development Indicators. However, trade has continued to support the region's growth recovery, even though it declined by 2% in 2023 to 58.7%. Africa's 2024 and 2025 growth projections are anticipated to be driven by increased economic activity throughout the continent as inflation declines. Trade is anticipated to be supported by stable development in many emerging nations and higher production growth in the majority of industrialised economies. African economies have suffered significant losses as a result of the COVID-19 pandemic's reduction in foreign direct investment flows. After reaching a record \$68 billion in 2021, foreign direct investment (FDI) flows to sub-Saharan Africa fell to around \$26 billion in 2023. Due to reasons including rising markets, substantial growth rates, and an abundance of natural resources, foreign direct investment (FDI) has been a driving force behind economic growth and development in Africa. FDI flow to Africa is nevertheless hampered by issues including political unpredictability, corruption, poor infrastructure, and unclear regulations.

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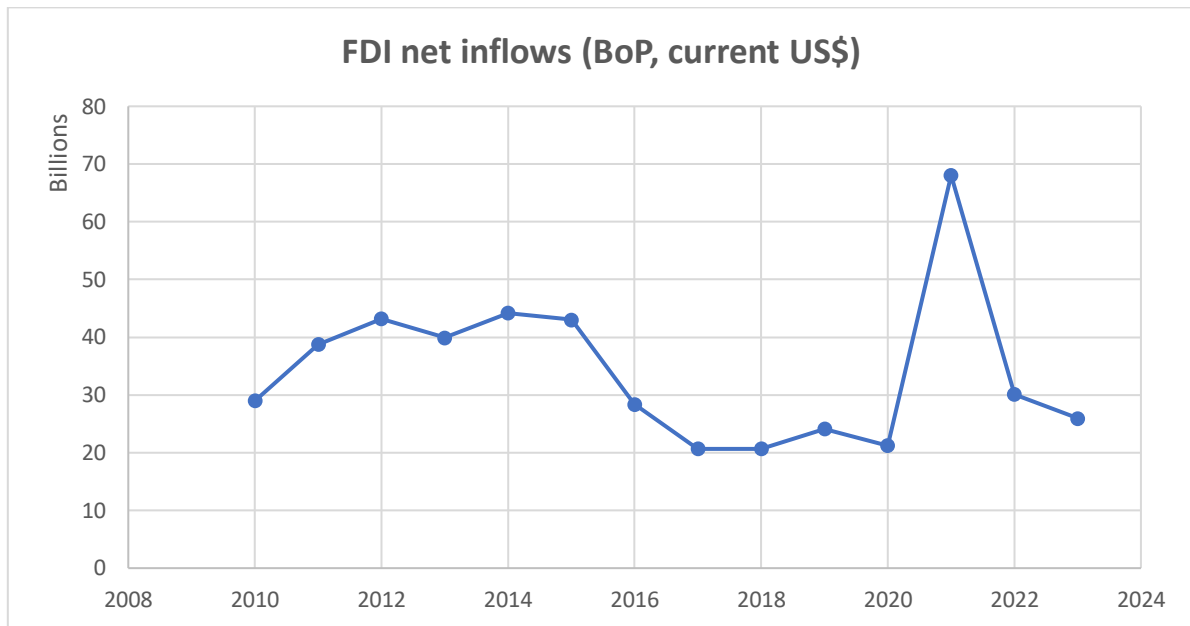


Figure 2. Sub Saharan Africa FDI net inflows (BoP, current US\$) (2010-2023) Source: Data World Development Indicators

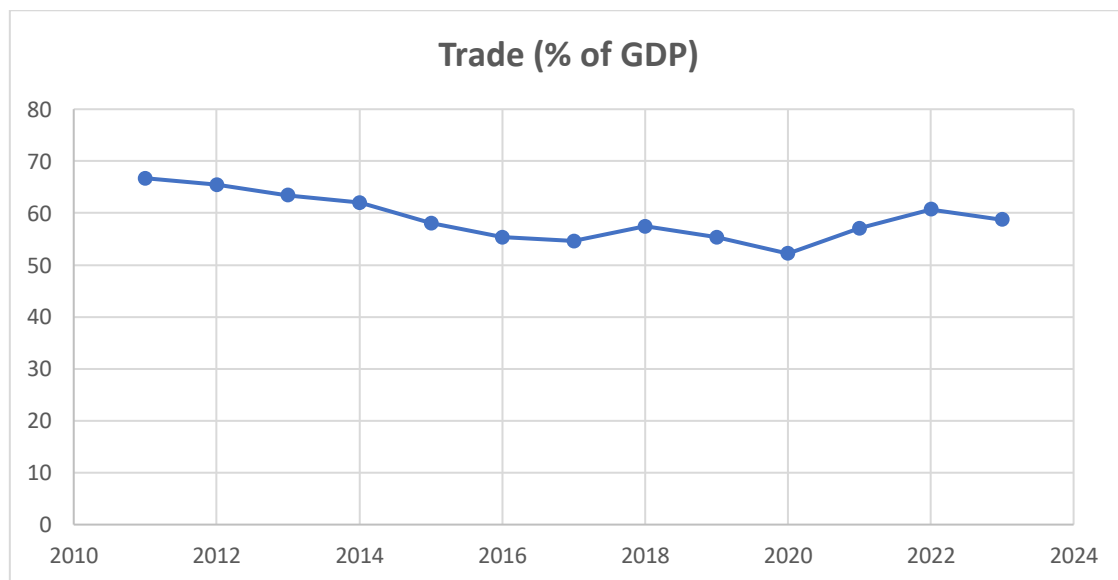


Figure 3. Sub Saharan Africa Trade (% of GDP (2010-2023) Source: Data World Development Indicators

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2. Literature Review in Macroeconomic Determinants of Growth Empirics

The study of the factors that promote or impede economic growth has been a major premise of theoretical and empirical growth research, although little agreement has been established thus far. Within the scope of economic growth theory, there have been two significant developments that have dominated most of the current discussion on economic growth. These include neoclassical and endogenous growth theories which considers the macroeconomic and environmental factors that helps in accumulating physical capital and developing human capital.

With the advent of the coronavirus pandemic, it is now more important than ever to identify the primary drivers of economic growth (IMF, 2020; World Bank, 2020). Understanding the main forces behind economic growth is a crucial first step in creating and executing policies that promote, maintain, and distribute growth in developing nations like those in sub-Saharan Africa (SSA) (Beyene, 2024). Furthermore, determining the macroeconomic variables that rapidly stimulate growth recovery represent a significant advancement for government in formulating growth plans towards enhancing sustainable development and growth (Ukwueze et al., 2021).

Over the past few decades, there has been a great deal of empirical research done on the connection between trade, FDI, and economic growth. The possible advantages of FDI to host nations, such as boosting competitiveness, generating employment opportunities, and taking use of sophisticated technology have been extensively studied by academics. Furthermore, FDI may be an essential source of outside funding, which could improve the host country's economic power. The impact of foreign direct investment and international trade on a nation's economic trajectory has become crucial due to the growing economic integration and interconnectedness of nations.

In the context of Nepal, Acharya (2019) emphasized the critical significance that international trade plays in advancing the country's economy. According to the study, the gross domestic product increased by 0.61 percent for every 1% increase in international trade. Similarly, Magar (2021) revealed that Nepal's economic growth was impacted by both imports and exports expansion. The beneficial effects of foreign direct investment on economic growth in developing nations were investigated by Sahu, (2021) with result suggesting that FDI inflows have significant positive impact on economic growth of the recipient countries both in the long-run and in the short-run. FDI inflows have significant positive effect on the long-run economic growth in Asia and Africa region.

According to Dahal, Bhattarai, and Budhathoki (2024), the trade-led growth hypothesis asserts that foreign trade is essential to a country's economic development. The argument for this hypothesis is based on the potential advantages of international trade, including access to larger markets, technological spill-overs, and increased specialization. A rise in exports can result in higher economic growth by gaining the advantages of economies of scale, technology transfer

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and innovation, production diversification, foreign currency earnings, and the creation of jobs, as well as helping the government's tax revenue. Additionally, trade openness boosts economic upsurge by encouraging gross capital formation and invigorating the labour force (Islam, 2021).

According to Banday, Murugan, and Maryam (2021), trade openness and foreign direct investment (FDI) have a favourable effect on the long-term economic growth of the BRICS nations between 1990 and 2018. Their research confirmed that trade openness and foreign direct investment are causally related in both directions, and that trade openness and foreign direct investment are causally related in a single direction. Using time series data on the Indian economy from 1985 to 2018, Kumar et al. (2023) discovered that FDI drives economic growth and economic growth drives FDI, confirming the bi-directional relationship. On the other hand, the study concluded that trade openness and economic growth are not causally related in any way. Moreover, Rakshit (2022), who based his research on India as an emerging economy and used data from 1979 to 2017, discovered that trade openness has a detrimental effect on economic growth over the long term, even though foreign direct investment (FDI) inflow seems to have no effect on growth in the short term. The negative effect of trade openness on growth implies that policymakers should adopt more export-oriented policies to increase economic growth over the long term, and that suitable policies should be designed to extract the long-term benefits of FDI inflow.

Using data on the Nigerian economy from 1980 to 2017, Ogudu, Pan, and Wu (2023) found that there is a negative long-term relationship between trade openness and GDP and a positive long-term relationship between FDI and GDP. The study found a unidirectional association between the factors and suggested that the government should invest more in infrastructure development, enforce export-oriented trade policies, and establish high-quality conflict management institutions in order to revitalize the Nigerian economy. Ben Abdallah (2024) uses time-series data from 1990 to 2012 to demonstrate that trade openness and foreign direct investment (FDI) have a long-term cointegration relationship in MENA nations, enhancing overall economic growth.

3. Methodology and the Data

3.1 Data

The time series data over the period 1990–2023 was used to empirically analyse the macroeconomic factors influencing economic growth amidst COVID-19 in Sub-Saharan African countries. To achieve the objective of the study, a theoretical framework of Solow (1956) was employed. The study specifies the model, description of variables, expected signs models, estimation techniques, and justification of the country's selection.

OLABISI, O. E., & AKEJU, K. F. (2025).*Re-Visiting the Macroeconomic Determinants of Economic Growth in Sub-Saharan Africa Amidst COVID-19***Model Specification**

The model specification for this section is based on the literature review of macroeconomic variables of economic growth and the theoretical framework of Solow model. Solow growth model assumed that changes in population, capital stock both human and physical capital contributes to a long-term economic growth. In line with this, the study employed Cobb-Dougllass production function as a baseline for our model specification as follows:

$$Y_t = A_t * (K_t)^\alpha * (L_t)^{1-\alpha} \quad (1)$$

Where Y_t is the output (GDP), A_t is level of technology, K_t is the capital and L_t is labour. The model assumes that before the output (GDP) can change, the inputs must be changed as well. For instance, a change in the capital stock by a proportional amount is expressed as $\frac{\Delta K}{K_t}$. Since in the production function, K_t is raised to a power α , therefore, the proportional changes (increase) in the output (Y) as a result of changes in the capital stock K_t is written as:

$$\frac{\Delta Y}{Y_t} = \frac{\alpha \Delta K}{K_t} \quad (2)$$

Also, changes in the output as a result of changes in labour can be written as:

$$\frac{\Delta Y}{Y_t} = \frac{1-\alpha \Delta L}{L_t} \quad (3)$$

In the same way, changes in the output as a result of changes in technology can be expressed as follows:

$$\frac{\Delta Y}{Y_t} = \frac{\Delta A}{A_t} \quad (4)$$

Considering the real situation where the three inputs are changing, then, the increase in the growth rate of the output can be expressed as follows:

$$\frac{\Delta Y}{Y_t} = \frac{\alpha \Delta K}{K_t} + \frac{1-\alpha \Delta L}{L_t} + \frac{\Delta A}{A_t} \quad (5)$$

Equation (5) implies proportional growth rate of output due to changes in capital per worker, labour and a given level of technology. Therefore, equation (5) is known as growth accounting framework and

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in this case, if any economy has not reached a steady state, it is possible to determine the contribution of labour, capital and technical changes to economic growth.

$$\log(Y - Y_t) = \alpha \log(K - K_t) + 1 - \alpha \log(L - L_t) + \log(A - A_t) \quad (6)$$

From Equation (6), the study specified its model as follows:

$$GDP_{it} = \alpha_0 + \alpha_1 SCH_{it} + \alpha_2 FDI_{it} + \alpha_3 OPEN_{it} + \alpha_4 POP_{it} + \varepsilon_{it} \quad (7)$$

For the purpose of econometric analysis, the employed the pooled mean group (PMG) estimation framework introduced by Pesaran et al (2001) in an autoregressive distributive lag, (ARDL) (p,q) as follows:

$$\begin{aligned} GDP_{it} = & \alpha_0 + \alpha_1 SCH_{it} + \alpha_2 FDI_{it} + \alpha_3 OPEN_{it} + \alpha_4 POP_{it} \sum_{j=1}^p \beta_{1ij} GDP_{i,t-j} + \\ & \sum_{j=0}^p \beta_{2ij} FDI_{i,t-j} + \sum_{j=0}^p \beta_{3ij} OPEN_{i,t-j} + \sum_{j=0}^p \beta_{4ij} SCH_{i,t-j} \\ & + \sum_{j=0}^p \beta_{5ij} POP_{i,t-j} + \mu_i + u_{it} \end{aligned} \quad (8)$$

The re-parameterised form of (1) can be written as follow:

$$\begin{aligned} \Delta GDP_{it} = & \psi_i (GDP_{i,t-1} - \phi'_i X_{it}) + \sum_{j=1}^p \beta_{1ij} \Delta GDP_{i,t-j} + \sum_{j=0}^p \beta_{2ij} \Delta FDI_{i,t-j} + \\ & + \sum_{j=0}^p \beta_{3ij} \Delta OPEN_{i,t-j} + \sum_{j=0}^p \beta_{4ij} \Delta SCH_{i,t-j} + \sum_{j=0}^p \beta_{5ij} \Delta POP_{i,t-j} \\ & + \mu_i + u_{it} \end{aligned} \quad (9)$$

Where $i = 1, 2, 3, 4 \dots 10$ (countries); $t = 1, 2, 3, 4 \dots 33$ (time periods).

GDP	=	log of gross domestic product (GDP) per capita
FDI	=	log of foreign direct investment to GDP ratio (FDI/GDP)
$OPEN$	=	log of openness (export+import/GDP)
SCH	=	gross secondary school enrolment (%)
POP	=	log of population

Estimation Techniques

The study employed panel unit root tests by Im, Pesaran and Shin (2003) and Levin, Lin, and Chu (2002). Also, the pooled mean group (PMG) estimation technique proposed by Pesaran et al (2001) was used to estimate the panel error regression. The Pooled Mean Group is an

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intermediate estimator that allows the short-term parameters to differ between groups while imposing equality of the long-term coefficients between groups (Bangake and Eggoh, 2012). The PMG allows for heterogeneous short-run dynamics while maintain a common long-run relationships, this makes it suitable for examining long-run homogeneity without imposing parameter. In most panel data estimation, there exists a different economy characteristics effect, but the use of PMG will allow a common long-run relationships to be established. The PMG also allow for a higher degree of parameter heterogeneity in growth regressions than the other estimators (Simões, 2011).

Lastly, Dumitrescu and Hurlin (2012) was used to test the Granger causality among the variables used in the study.

Justification of the country selection

The study selected 10 countries—Botswana, Cameroon, Ghana, Kenya, Malawi, Mauritius, Nigeria, Rwanda, South Africa, and Senegal—out of about 50 countries in the Sub-Saharan African countries during the period 1990 to 2023, mainly on the availability of data. Other criteria used for the selection are:

- i) A member of SSA region;
- ii) A member of one of the following communities: African Economic and Monetary Union (WAEMU), Central African Economic and Monetary Community (CEMAC), Common Market for Eastern and Southern Africa (COMESA), East African Community (EAC), Southern African Development Community (SADC), Southern Africa Customs Union (SACU), and Economic Community of West African States (ECOWAS);
- iii) A balanced mix of income classification groups (i.e., low income, lower middle income, upper middle, and higher income).

4. Discussion of Results

4.1 Panel Unit Root Test Results

The panel unit root tests in Table 4.1 indicates that at the 5% significance level, all the variables are a mixture of $I(1)$ and $I(0)$. This implies that all the variables-GDP, FDI, OPEN, SCH, and POP are not integrated of the same order. For instance, population growth is stationary at level, particularly when tested without trend. However, at first difference, all the variables are stationary at the 5% significance level. Since the data are a mixture of $I(1)$ and $I(0)$, the recommended estimation method by Pesaran et al. (2001) to estimate non-stationary data is therefore applied to determine the long run, short run coefficients and error correction terms.

OLABISI, O. E., & AKEJU, K. F. (2025).*Re-Visiting the Macroeconomic Determinants of Economic Growth in Sub-Saharan Africa Amidst COVID-19***Table 4.1.** Panel unit root tests results (level & first difference)

Variables	Without trend		With trend	
	LLC	IPS	LLC	IPS
GDP	9.87 (0.97)	11.27 (0.87)	6.22 (0.99)	9.60 (0.69)
FDI	18.93 (0.98)	20.18 (0.97)	14.28 (0.97)	14.28 (0.99)
OPEN	13.13 (0.92)	14.06 (0.99)	8.45 (0.91)	8.79 (0.98)
SCH	8.01 (0.91)	10.15 (0.97)	3.52 (0.99)	6.12 (0.95)
POP	-2.27 (0.01)*	-3.28 (0.00)*	0.09 (0.53)	-3.81 (0.00)*
first difference				
GDP	-5.55 (0.00)*	-4.27 (0.00)*	-9.01 (0.00)*	-7.39 (0.00)*
FDI	-0.16 (0.00)*	-2.14 (0.01)*	-5.30 (0.00)*	-7.27 (0.00)*
OPEN	-2.25 (0.00)*	-4.33 (0.00)*	-5.97 (0.00)*	-7.85 (0.00)*
SCH	-5.97 (0.00)*	-5.85 (0.00)*	-7.72 (0.00)*	-7.23 (0.00)*
POP	-3.68 (0.00)*	-7.99 (0.00)*	-2.55 (0.00)*	-8.24 (0.00)*

Note: The asterisk values show the *p*-values that signified statistical significance at 5 percent level**Source:** Author's estimation, 2025

4.2 Panel Cointegration Tests

To investigate whether variables with stochastic trend share a common one, the Pedroni panel cointegration test introduced by Pedroni (2004) is commonly used in the literature (Andrei et al 2025; Tleppayev et al, 2025). When this requirement is met, a long-term relationship is established among the variables, even if the individual variables are non-stationary. When the results of within dimensions and between dimensions of Pedroni cointegration are significant, a long-run relationship is established. Hence, Table 4.2 shows that the PP-statistics and ADF-statistics are statistically significant at 5% level, this implies that there is a common stochastic trend that exist among the series in this study.

Therefore, the null hypothesis of no cointegration is rejected and the alternate is thereby accepted that a long-run cointegration exists among the variables.

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Table 4.2. Pedroni panel cointegration test results

Test Statistics	Without Trend		With Trend	
	LLC	IPS	LLC	IPS
	Statistics	P-Values	Statistics	P-Values
Panel v-statistic	-0.30	(0.61)	-0.51	(0.70)
Panel ρ -statistic	0.18	(0.88)	0.98	(0.97)
Panel PP-statistic	-7.15	(0.02)*	-2.40	(0.00)*
Panel ADF-statistic	-3.50	(0.01)*	-3.19	(0.00)*
Group mean panel cointegration (Between Dimension)				
Group ρ -statistic	2.13	(0.87)	2.02	(0.79)
Group PP-statistic	-6.14	(0.00)*	-7.11	(0.00)*
Group ADF-statistic	-3.21	(0.00)*	-4.21	(0.00)*

Note: The asterisk values are p-values denotes statistically significant level at 5 percent**Source:** Author's estimation, 2025

4.3 Westerlund Panel Cointegration Tests Results

Table 4.3 shows the result of the Westerlund (2007) panel cointegration test that examine the null hypothesis of no cointegration. From the results in Table 4.3, the null hypothesis of no cointegration is rejected, this implies the existence of a long-run relationship among the variables- GDP, FDI, OPEN, SCH, and POP. From the results, the tests indicate that two out of four panel tests indicate that the mean group tests (H_1) show the existence of cointegration for at least one cross-section unit. The null hypothesis of cointegration (H_0) is tested by the panel statistics P_t and P_a against the alternative (H_1) of the panel cointegration G_t and G_a . One of the characteristics of Westerlund (2007) is that, it presents a robust p-values against cross sectional dependence through a bootstrapping approach which allows for heterogeneity at different levels. The results in the table reject the null hypothesis of no cointegration at the 5 per cent level of significance except G_a test statistics. The null hypothesis that implies no cointegration is then rejected in three out of four levels of statistics with the 5 per cent significance level from the bootstrapped p-values; this indicates that cross-sectional dependence is allowed. The bootstrapped p-values are an indication of the existence of strong co-integration among GDP, FDI, OPEN, SCH, and POP.

Table 4.3. Results of Westerlund-2007 panel cointegration tests

Statistic	Value	p-value	Robust p-value
Statistic	Value	p-value	Robust p-value
G_t	-9.18	0.00*	0.00*
G_a	-0.12	0.98	0.11
P_t	-9.04	0.00*	0.00*
P_a	-7.18	0.00*	0.00*

Source: Author's estimation

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4.4 Pooled Mean Group, ARDL Results of the Macroeconomic Factors that Influence Growth in SSA Countries

In this section, the study empirically examined the macroeconomic factors that can influence the growth of Sub-Saharan African region economy. Table 4.4 show the pooled mean group (PMG) and mean group (MG) results of the long run, short run coefficients and the error correction terms. Similarly, Hausman test is used to determine the best estimation method between PMG and MG. From the results, the probability of the chi-square is greater than 0.05, that is, 0.71. This implies that at 5% significance level, the long-run homogeneity restriction is accepted. Therefore, the study indicates that the pooled mean group estimation method is better and consistent than MG.

Table 4.4. Pooled mean group, ARDL results of macroeconomic factors that influence growth in SSA countries (Dependent variable: GDP per capita)

Variables	PMG		MG	
	Coefficient	P-value	Coefficient	P-value
Long-run coefficients				
FDI	0.11	(0.00)*	0.04	(0.16)
OPEN	0.07	(0.00)*	0.16	(0.01)*
SCH	0.04	(0.00)*	0.01	(0.29)
POP	0.16	(0.00)*	1.18	(0.04)*
Error-correction term	-0.46	(0.00)*	-0.14	(0.00)*
Short-run coefficients				
Δ GDP	0.13	(0.00)*	0.10	(0.00)*
Δ FDI (1)	0.09	(0.79)	-0.16	(0.45)
Δ OPEN (1)	0.12	(0.00)*	0.24	(0.00)*
Δ SCH (1)	0.01	(0.03)	0.07	(0.07)
Δ POP (1)	-19.19	(0.17)	-7.24	(0.45)
No. of observation	10			
Hausman Tests	Prob>Chi2(5) = 0.71			

Note: The asterisk values are p-values denotes statistically significant level at 5 percent

Source: Author's estimation, 2025

As expected, the long-run coefficients of the variables-FDI, OPEN, SCH, and POP are significant to explain the factors that determine growth in Sub-Saharan African countries. For instance, the ratio of foreign direct investment (FDI) to gross domestic product (GDP) used to proxy FDI show a positive and significant relationship with economic growth in SSA region. The result indicates that 1 per cent increase in foreign direct investment inflow in SSA region leads to increase in GDP per capita by 0.11 per cent. This implies that FDI plays a vital role in SSA region, for example, job creation, technology transfer, managerial skill and capital transfer and so on. The outcome of this

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estimation is in line with the previous works in the literature (see, Flexner, 2000, Lensink and Marrissey, 2001).

Also, the impact of trade openness on economic growth displayed a positive and significant relationship at 5 per cent significant level. The finding shows that 1 per cent increase in the level of trade openness leads to increase in the rate of real GDP per capita by 0.07 per cent. This result concurs with the neoclassical and endogenous growth models that believed openness to trade may contribute positively to economic growth. The outcome of this study has been established empirically that openness to trade promotes economic growth in SSA region. According to Grossman and Helpman (1991), openness through international flows of ideas, goods, services and capital promotes economic growth. More so, the finding support the empirical results of some early and recent previous studies in the literature (see, Sakyi et al, 2012; Amadou, 2013).

Similarly, gross secondary school enrolment (SCH) used to proxy human capital show a positive and significant relationship with economic growth in SSA region. This indicates that a 1 per cent increase in human capital investment in Sub-Saharan Africa countries leads to increase in GDP per capita by 0.04 per cent increase. This finding supports the empirical study by Barro (1991) that education and necessary skills acquisition enhance economic growth. The result also noted that countries with high skilled workers tend to have more increase in economic growth than countries with less skilled workers. As expected, the findings buttress the other previous empirical works by El-Wassal (2012) and Ndambiri et al. (2012) that human capital has a positive impact on economic growth. More so, the result is also in line with the new growth theory. That is, an increase in human capital enhances economic growth.

The findings further showed a positive and significant relationship between population growth rate and economic growth. Meanwhile, the increase in the population growth with a corresponding increase in the country's resources may amount to a positive effect on country's economy. This result indicates that a 1 per cent increase in population of Sub-Saharan Africa countries leads to GDP per capita by 0.16 per cent increase. Population growth plays a vital role in an economy in the areas of rising labour force which may create a cheap cost of labour that is necessary as part of locational factors that can attract more foreign investment as concluded by Dunning's theory. Also, the findings create the impression that in the long-run per capita GDP growth will be improved through productivity with the help of new ideas, innovations, cognitive abilities and new technology. The finding is in agreement with previous literature who also concluded positive and significant results—For example, Simon, 1981 and Kothare, 1999.

In the short run, the lagged value of GDP is positive and significant to determine the growth of SSA region. This implies that gain of the growth in the previous year can be used to finance certain investment that will generate further economic growth. To this end, at a 1 per cent increase in lagged value of GDP in Sub-Saharan Africa countries leads to increase in GDP growth by 0.13 per cent increase. Also, the lagged value of trade openness indicates a positive and significant relationship with economic growth of SSA region. In this case, a 1 per cent increase in lagged

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value of trade openness in Sub-Saharan Africa countries leads to increase in GDP per capita by 0.12 per cent increase. Similarly, a 1 per cent increase in the lagged value of human capital investment in Sub-Saharan Africa countries leads to increase in GDP per capita by 0.01 per cent increase. More so, the negative and significant value of -0.46 indicates the speed of adjustment of the error correction estimates. This value indicates that 46 per cent of the disequilibrium in the current period (t) was corrected in the previous period (t-1).

4.5 Panel Granger Causality Test Results

The cointegration test only examines the long-run relationship among variables but does not consider the cause and effect between two variables, thus, the Granger (1969) test put forward that the relationship among variables should be tested beyond just cointegration and long-run relationships, hence, the study employed the homogeneous null causality (HNC) developed by Dumitrescu and Hurlin (2012) as a useful Granger causality tool to carry out this causal test because it takes care of the issue of heterogeneity that may arise in both regression and causality models. Even under the conditions of cross-sectional dependence, it is also a very useful causality test instrument. Therefore, the study adopted the Dumitrescu and Hurlin (2012) to test the panel Granger homogeneous non-causality (HNC) hypothesis, that is, no individual causality relationship from X to Y exists.

According to the results as shown in Table 4.5, a bi-directional (FDI↔GDP) causal relationship was found between foreign direct investment and economic growth; this implies that an increase in FDI inflows is good to boost the gross domestic product of Sub-Saharan African countries. In this case, the government can achieve a fiscal benefit (tax) through FDI, and moreover, the presence of foreign investors in the host country can boost the level of employment and, in turn, increase the capita per head of the workers in the host country. In another way, growth in the host country is an indication that the country's economic performance is improving; this may increase the foreign investors' confidence in the host country. This finding is in agreement with Ahmadi and Ghanbarzadeh (2011), who also achieved a similar bi-directional relationship between FDI and economic growth.

Also, (OPEN → GDP) revealed a one-way causal relationship running from openness to economic growth. This implies that trade openness by host country allowing other countries to freely trade in goods, services and movement of capital with little restrictions improve the level of economic growth. This is a signal that free trade may have a positive impact on the economic growth of a country. This result support the empirical result by Edward (1992) that concluded that more opened economy develops faster than closed economy. Meanwhile, economic growth cannot cause trade openness.

Meanwhile, a bi-directional (SCH↔GDP) causal relationship was found between human capital proxy by gross secondary school enrolment and economic growth in the SSA countries, this result indicates that a country with a highly skilled manpower can easily adjust to changes in the

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technologies and thereby increase the growth rate of the country. It is obvious that the world economy has moved from industrial to knowledge-based economy. Therefore, highly skilled manpower promotes economic growth. More so, an increase in the real GDP per capita proxy for economic growth can also attract experts' skilled workers to the host nation. Because the increase in the real GDP per capita is a good signal for the whole world that the country is well functioning economically.

Table 4.5. Dumitrescu-Hurlin Panel Granger causality results for macroeconomic factors influence growth in SSA countries

Null Hypothesis	Test Statistics		Prob	Conclusion
	W^{HNC}	Z_{NT}^{HNC}		
FDI does not homogeneously cause GDP	6.44	5.68	0.00	Reject Ho
GDP does not homogeneously cause FDI	4.54	3.15	0.00	Reject Ho
OPEN does not homogeneously cause GDP	6.29	5.49	0.00	Reject Ho
GDP does not homogeneously cause OPEN	2.98	1.07	0.28	Do Not Reject Ho
SCH does not homogeneously cause GDP	3.49	1.76	0.04	Reject Ho
GDP does not homogeneously cause SCH	5.47	4.40	0.00	Reject Ho
POP does not homogeneously cause GDP	7.32	6.86	0.00	Reject Ho
GDP does not homogeneously cause POP	9.02	9.12	0.00	Reject Ho
OPEN does not homogeneously cause FDI	5.59	4.55	0.00	Reject Ho
FDI does not homogeneously cause OPEN	7.85	7.57	0.00	Reject Ho
SCH does not homogeneously cause FDI	3.97	2.39	0.01	Reject Ho
FDI does not homogeneously cause SCH	3.93	2.34	0.01	Reject Ho
POP does not homogeneously cause FDI	5.21	4.05	0.00	Reject Ho
FDI does not homogeneously cause POP	15.53	17.80	0.00	Reject Ho
SCH does not homogeneously cause OPEN	3.67	2.00	0.04	Reject Ho
OPEN does not homogeneously cause SCH	5.54	4.49	0.42	Reject Ho
POP does not homogeneously cause OPEN	7.85	7.57	0.00	Reject Ho
OPEN does not homogeneously cause POP	19.95	23.71	0.00	Reject Ho

Note: The asterisk values are *p*-values denotes statistically significant level at 5 percent

Source: Author's estimation, 2025

In a similar way, population growth and economic growth revealed a bidirectional (POP↔GDP) causal relationship; this indicates that a growing population implies more labour force available for the production of goods and services. In particular, a growing population with more skilled labour and high productivity tends to promote economic growth. In the same vein, an increase in economic growth in terms of real GDP per capita may also enhance population growth because citizens are happier and the tendency to have a good standard of living and the possibility to be more productive in giving birth is high.

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Openness and foreign direct investment revealed a bidirectional ($OPEN \leftrightarrow GDP$) causal relationship; this implies that as the economy is becoming more open, the foreign investors are willing to move their resources to an opened economy than closed one because it is the believe of the foreign investors that they will be able to operate freely and make more profit in an open economy. Similarly, inflows of more foreign direct investment can encourage the host country to reduce trade barriers in order to encourage more foreign investors.

In addition, human capital and foreign direct investment also revealed a bi-directional causal relationship ($SCH \leftrightarrow FDI$), the implication of this finding is that the presence of both skilled and unskilled labour in the SSA region can be a determinant factor to motivate the foreign investor into the host nation. As indicated in the locational proposition by Dunning OLI paradigm, the available labour in a particular country may serve as a factor to be considered by the MNCs in the course of making decision whether to invest or not in a host country. The cost of the available labour is also important to consider as many MNCs prefer a country with cheap labour. In the same vein, foreign direct investment may cause the human capital available in the host economy to improve through foreign knowledge and modern technology movement by the MNCs.

In the same direction, population and foreign direct investment revealed a bi-directional relationship ($POP \leftrightarrow FDI$); this finding is not surprising because most foreign investors consider the availability of people in a host country before making an investment. It is considered that a country with a large population attracts more investors. This is the case of China where many foreign direct investors are willing to site their plants because of the large population and market. Also, the presence of foreign direct investment in a country may increase the population of such country because many people who are looking for greener pastures may migrate from their country to a better environment where there is a surplus of jobs and a better standard of living. For instance, many people from the developing countries are willing to migrate to developed countries like Australia, Canada, New Zealand and so forth.

Also, human capital and openness revealed a bi-directional relationship ($SCH \leftrightarrow OPEN$); the implication of this is that the movement of human capital through education and jobs, especially in the more technical areas such as medicine and engineering, to other countries may lead to a more open economy. More so, the inadequacy of human capital required in the host economy may cause more openness. At the same time, a country that is open may attract more human capital, particularly for a better standard of living.

5. Conclusions and Policy Recommendations

The global variances in gross domestic product per capita among countries are wide and require strategically a set of quantifiable growth variables. One aspect of this set is the ability of a country to discover convergence terms and the necessary variables to enhance appreciable growth when

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there is low GDP per capita. However, this strategy is conditional on several growth factors such as the quality and quantity of human capital, the extent of trade openness, and large amounts of investments. This paper revisits the macroeconomic determinants of economic growth in Sub-Saharan Africa amidst COVID-19 from 1990 to 2023. The pooled mean group, ARDL approach was employed to estimate growth determinants relationships in the region. The causality among the series was examined by using the Dumitrescu-Hurlin Granger causality. The empirical findings on the conditional convergence term are in line with the Solow-Swan growth theory. That is, improving initial human capital enhances higher growth. Also, findings further show that openness to international trade and foreign direct investment promotes economic growth. The positive relationship between population growth and economic growth is revealed in the empirical findings, and this shows that a country with a large population creates an opportunity for a large market and attracts foreign investors. Thereby, it promotes growth. The study suggests the following as part of the policy recommendations: First, the SSA governments need to formulate and implement policies that will attract foreign investors to the region. This could be in the form of tax incentives, opportunities for profit repatriation, ease of business registration, favourable government policies, and a friendly business environment. All these factors will induce foreign direct investment inflows into the Sub-Saharan Africa region. Second, SSA governments should create a policy geared toward openness to trade where there are low tariffs, low duties, and trade incentives. Openness to trade among and outside the SSA countries will boost economic growth and development. Third, human capital is also important in promoting growth and development of any nation; therefore, SSA governments should promote human capital through standard education, workshops, conferences, and any form of skills' acquisition that can increase the workers' knowledge and know-how. Since the population of a country is one of the important growth determinants, the SSA governments should take advantage of its large population by creating friendly economic environmental policies that promote per capita income. When there is a reflection of high GDP per capita, foreign investors would be induced, and hence creates a possibility of economic growth.

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