**IMPORTED CAPITAL GOODS** **AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA**

***Abstract***

*Worldwide, economic performance remains a key benchmark for national development, driven by factors such as investment, productivity, and technological advancement. The study investigates the impact of imported capital goods (independent variable) on economic output (dependent variable) in Sub-Saharan Africa (SSA). The specific objectives are to examine the trend of imported capital goods in the region; and analyze the trend of economic output growth, and evaluate the long-run and short-run impact of imported capital goods on economic output. The study adopts an ex-post facto research design, employing secondary data from 1991–2023 for 32 SSA countries, sourced from the World Bank in 2025. Methodologically, the study applies second-generation panel cointegration test, introduced by Westerlund (2007), since the data in this study exhibits cross-sectional dependence, the second-generation panel cointegration test was employed. The findings reveal a consistent upward trend in the level of imported capital goods across the region, contrasted with a fluctuating pattern in economic output growth. Empirical results further indicate the existence of a long-run co-integration between imported capital goods and output growth, suggesting that external capital inflows significantly contribute to productive capacity in SSA. The study is relevant to policy makers, as it emphasizes the need for policies that enhance the absorptive capacity of SSA economies, strengthen local industries, and maximize the growth benefits of imported capital goods. The implication of the findings is that imported capital goods significantly enhance productivity and output growth in SSA and policymakers should reduce trade barriers while strengthening human capital, infrastructure and industrial capacity to maximize benefits. Meanwhile, regional cooperation, technology transfer and local assembly are vital for translating imports into sustainable economic growth.*

*Keywords: Imported capital goods, trade openness, population growth rate, labour force participation and economic growth.*

**1.0 Introduction**

Worldwide, economic production is a key indicator towards defining the development of a country, which is a product of investments and productivity as well as technological skills. Complete inequality in the levels of output has become an issue lately, influenced by unequal access to both innovation and industrial infrastructure (Unegbu & Ugwunna, 2024). Structural weaknesses, weak technological applicability, and lack of industry in Africa all combine to shrink the continent contribution to economic output globally. Nonetheless, technology is transferred through capital imports which include machinery and equipment that enhance industrial capacity and productivity (Anifowose & Chummun, 2025). This has been proven by the fact that economies that adopt the use of imported capital goods are more likely to record a faster transfer of technology and improvement in output. In Sub-Saharan Africa, capital goods importation is imperative to mitigate the negative effect of export of primary goods on industrialization and economic diversification. (Chukwuka et al., 2025). However, the region continues to trail in transforming these imports into sustainable technological advancement and expansion in outputs. Hence, the correlation of imported capital goods and output performance makes it pertinent to stimulate the importation of capital goods. This study is justifiable because the study is aimed at determining the interface between the imports of capital goods and economic output in the development pattern of Sub-Saharan Africa.

This study is unique and imperative for several reasons. Firstly, it is an extension and improvement of previous researches such as ( Aramowo ,2014; Nyatakyi and Munemo, 2014) which focuses primarily on Nigeria, and (Ayeni & Akeju, 2023) which focuses on West African Sub-region. Secondly, trend analysis is incorporated in this study. Thirdly, this study adopts the use of both Panel Co-integration and Panel ARDL Technique which is a deviation from previous studies.

**1.1 Statement of Problem**

Comparatively, African economies accounts for only 2.8 percent of world Gross Domestic Product (GDP), while Asia, North America, South America and Europe accounts for 39 percent, 28 percent, 34.3 percent and 24.75 percent respectively (World Bank, 2021). Invariably, Africa is the poorest continent on the earth with every third person on the continent living below the poverty line. Out of the fifty largest economies in terms of nominal GDP, only three African states namely: Nigeria, South Africa and Egypt which represents the 31st, 32nd, and the 34th economies respectively made the list (World Bank, 2021). In several studies, it is a general perception that the wealth disparity between the developed world and developing countries especially in Sub-Saharan Africa can be largely accounted for by gap in technological knowhow (Ogunsakin & Idris 2020; Nyataki & Munemo,2020; Aramowo, 2014).

Furthermore, considering the expenditure on importation of capital goods from the four prominent capital goods producing nations which are China, U.S.A, Germany and France, the share of Africa of the world expenditure on capital goods import is terribly low. 27.91 percent from China, 8.19 percent from U.S.A, 6.7 percent from Germany and 4.34 percent from France (World Bank, 2021). It is agreeable among scholars that a country’s level of output growth depends largely on manufacturing and service sectors productivity which depends on the efficient use of capital goods (Abraham & Asien, 2020; Nyatakyi & Munemo; 2020). Also, this is supported by studies such as Adhikary (2011) and Liu, Burridge & Sinclair (2002) that capital goods import significantly enhance growth to developing regions by bridging technology gaps.

 Capital goods are generally inadequate in Sub Saharan Africa, according to the Food and Agriculture Organisation (2023), there are four tractors per hectare in SSA, while there are ten tractors per hectare in East Asian Countries.

Based on the aforementioned issues, the further research questions are formulated as follows:

1. What are the trends of imported capital goods and economic output in Sub-Saharan Africa?
2. What is the effect of imported capital goods on economic output in Sub-Saharan Africa?

The broad objective of this study is to examine the impact of imported capital goods on economic output in Sub-Saharan Africa. The study specifically examined the trends of imported capital goods, and economic output in Sub-Saharan Africa.

**1.2 Scope of the Study**

This study covered the period (1991-2023). While not all the countries that make up the sub-Saharan Africa region are represented in this study, the study will ensure that all the four major economic blocs that make up the sub-Saharan African region are represented. They are: Communaute Economique de l’ Africa Centrale (CEMAC), Eastern Africa Community (EAC), Economic Community of West African States (ECOWAS) and Southern Africa Development Economic Council (SADC). 32 countries which have statistical records in respect of all the variables specified in this study are selected.

The countries selected includes: ECOWAS (Nigeria, Ghana, Mali, Niger, Cote D’ Ivoire, Benin Republic, Burkina Faso, Gambia, Senegal, Togo, Cape Verde, Guinea Bissau, Mauritania)

EAC (Keny a, Rwanda, Tanzania, Uganda, Burundi, Ethiopia)

CEMAC (Cameroon, Gabon,,Congo DR, Congo R).

SADC (South Africa, Lesotho, Madagascar, Mauritius, Botswana, Angola, Zambia, Malawi, Eswatini).

**2.0 Literature Review**

**2.1. Conceptual Review**

**2.1.1 Economic Output**

Ferdinand et al. (2025) indicate that economic output is the amount of goods and services produced in a given economy over a given time, and it is normally gauged in form of Gross Domestic Product (GDP). Unegbu and Ugwunna (2024) believe that the economic output is one of the essential parameters to determine the state of economy of any country in terms of its productivity, capacity to develop and ensure its efficiency. Economic output is a measure of the effective use of resources, the level of technology, and the strength of the industry in any economy, as when the economic output is high it means that the production and income is strong and vice versa that low output means the economy is performing poorly and is weak (Ndanusa et al., 2025; Anam et al., 2024). Low industrialization, poor infrastructure, and poor absorbance of technology limit the economic output in developing economies such as Sub-Saharan Africa.

**2.1.2 Imported Capital** **Goods**

Capital goods are tools of production commodities that in the long run will facilitate growth of economy, such as machines and equipment. Imported Capital Goods may be defined as those tangible goods that have been manufactured outside the country and imported into an economy to be employed in the manufacture of goods and services (Mazeli et al., 2024). These commodities do not get consumed directly as goods are subject to production process; thus, expanding industrial capacity, and productivity. Technological transfer and innovation are promoted through the importation of capital goods, which are essential in the developing economies that do not even have their manufacturing capabilities (Adekunle, 2025). Most often, the imported capital goods supplement the home investment and closes the infrastructure gap and production gap. The imported capital goods are also important to increase the efficiency of productive systems and to improve growth in the economy (Ayeni & Akeju, 2023). There is the risk of overdependence on imports which expose the country to external shocks as well as fluctuations in exchange rates. Strategic prime policies and local capacity building are therefore required to ensure that they have maximum effects over the long term (Abinabo & Abubakar, 2023).

**2.1.3 Trade Openness**

Abinabo and Abubakar (2023) postulate that trade openness refers to the level of participation of a nation in foreign trade through endorsing goods and services. It is commonly calculated as a quotient between the trade (exports + imports) and GDP. Trade openness also allows countries to tap into bigger markets, to obtain foreign technology and also to enhance specialization that helps in the improvement of resource allocation (Umoh & Effiong, 2013). To the developing economies, openness is associated with higher productivity, economic diversifications and competitiveness due to the fact that being too open without reasonable controls exposes economies to external shocks and trade imbalances (Ullah, 2018). The issue of establishing an equilibrium between openness and strategic protection of new industrial activities is essential and trade policies must be implemented that integrate economies but secure national interests.

**2.1.4 Population Growth Rate**

Population Growth Rate is the proportion of change that the population of a particular country has undergone throughout a particular period of time which is mostly a year. It indicates change in population caused by a combination of causes due to births, deaths and net migration (Chinda, 2025). The high population growth rate leads to an increase in labour supply and number of consumers, which may presumably cause an economic boost (Ali et al.,2018). However, when not coupled with adequate infrastructure, education and jobs, it puts solicited strain of services and lead to underemployment as most developing countries, have a lot to do in population management to achieve sustainable development (Anifowose and Chummun, 2025). There is a need to invest in health, family planning, and education as demographic dividends may be achieved through balanced population policies that are essential to long-term growth (Ojo, 2021).

**2.1.5 Labour Force**

Ogunjobi et al. (2025) explain that labour force consists of the sum total of persons of working age and gainfully employed or actively seeking employment of all types both skilled and unskilled contributing to the production of goods and services. Effectively utilizing the trafficked labour, it can bring lucrative returns to the economy and national revenues as a surging labour force is a plus (Sallam, 2021). Trends such as ensuring human capital is developed, building vocational skills and positioning inclusive employment policies are important to the issues of reaping benefits of labour force since when an existing market inefficiencies, underemployment and skills mismatch weaken this potential (Yakubu et al., 2020). There are opportunities and challenges associated with a young and growing labour force.

**2.2 Theoretical Framework**

The study reviewed the following theories: Endogenous Growth Theory and Product Cycle Theory. However, the study in underpinned on endogenous growth theory because it emphasizes the role of technological progress, capital accumulation, and human capital factors influenced by policy and investment in driving long-term economic growth.

**2.2.1 Romer Endogenous Growth Theory**

 Paul Romer (1980) postulates that economic growth is caused by internal forces like investment in human capital, innovation and knowledge instead of being caused by external factors. According to the theory, technological advancement and productivity gains are the results of specific measures taken in the economy, in particular, research, education, and capital accumulation (Ojo, 2021). The theory presupposes the existence of no decreasing returns to investment in knowledge and innovation and assumes that the effects of research spillovers lead to positive contributions to the society as a whole (Yakubu et al., 2020). The theory can be discussed as a significant strength that is represented by explaining long-term growth based on policy actions and investments in both technology and education (Sallam, 2021). The primary limitation is that the effects of knowledge spillovers and the separation of internal changes and outside influences are difficult to calculate (Ali et al., 2018). The theory is suitable to Sub-Saharan Africa since it highlights the importance of foreign capital goods and human capital formation in improving technology transfer and in increasing the economic production.

**2.2.2 Product Cycle Theory**

Raymond Vernon proposed the Product Cycle Theory in 1966. He explains how the production and export of a product change over time, starting with discovery in wealthy countries and ending with adoption and manufacture in developing countries. The idea posits that new products are initially manufactured in advanced economies owing to better technology and market demand; but, as the product evolves, production transitions to poorer nations where costs are reduced (Emeka et al., 2022). The hypothesis posits that technical innovation emanates from industrialised nations and that companies endeavour to reduce prices when products attain standardisation (Isah et al., 2025). One of the best things about the idea is that it can explain how global production patterns and technology transfer change over time (Saka, 2024). One of its biggest flaws is that it doesn't work well in fast-paced global markets because innovation and production might happen at the same time in several places (Agbeyinka, 2025). The idea is pertinent to Sub-Saharan Africa as it illustrates how imported capital goods can integrate into a global product cycle, facilitating the region's adoption of advanced technology and enhancing economic productivity.

**2.3 Empirical Literature Review**

Anifowose and Chummun (2025) investigated the determinants affecting financial inclusion in Sub-Saharan Africa (SSA). They employed the Panel Least Squares (PLS) method to look at the data. Their results showed that economic growth (GRO), Islamic banking (ISMAIC), money supply (MSS), internet users (USERS), and credit availability (CREDIT) all have a positive and significant effect on financial inclusion, with coefficients of 0.001298, 4.926809, 1.08 × 10−6, 0.459388, and 0.657431, respectively, and p-values of 0.0008, 0.0023, 0.0000, 0.0000, and 0.000, respectively. Inflation (INFL) and interest rate (INT.) exhibit negative coefficient values of -0.02853 and -0.08317, but their p-values of 0.2841 and 0.2501 are not significant. The finding shows that a lot of the variables have a big effect on financial inclusion.

Martinho (2025) sought to evaluate the convergence process in Sub-Saharan African countries over the last thirty years. The gross domestic product (GDP) per capita from 1990 to 2021 was based on data from the World Bank. We used panel data methods based on convergence theory models to look at this statistical information. The ideas of sigma and beta convergence, as well as the idea of catch-up rates, were spoken about in detail. The results of her study provide proof of the existence of convergence clubs among Sub-Saharan African countries and the mechanisms of catching up.

Chukwuka et al. (2025) investigated the impact of fiscal policy changes on the performance of the Nigerian economy from 2004 to 2024. Utilised secondary data sourced from the Central Bank of Nigeria, employing STATA analytical software for the analysis. Their research indicates that non-oil revenue significantly contributes to economic growth, akin to the circumstances in most non-oil producing nations, and that the application of domestic debt directly to productive and growth-enhancing initiatives yields immediate effects on the economy.

Obigwe et al. (2025) conducted a study on the impact of foreign direct investment, foreign portfolio investment, and external borrowing on real gross domestic product. Utilised secondary data from the Central Bank of Nigeria (CBN) spanning thirty-eight (38) years, from 1986 to 2023. The Autoregressive Distributed Lag (ARDL) method was used in their investigation. Their research findings indicated a significant negative correlation between foreign direct investment and real gross domestic product, an insignificant negative correlation between external borrowing and real gross domestic product, and an insignificant positive correlation between foreign portfolio investment and real gross domestic product. Additionally, capital importation variables such as foreign direct investment, foreign portfolio investment, and external borrowing exert no meaningful influence on real gross domestic product.

Agbeyinka (2025) discovered the influence of import growth on the advancement of the manufacturing industry sector in Nigeria. The research utilised basic regression with the ordinary least squares (OLS) regression methodology. The sample size spanned from 1981 to 2015, including 34 years. As a result, secondary data sources from the Central Bank of Nigeria (CBN) were utilised. The results of his research demonstrated a substantial positive correlation between import growth and industrial sector production. There is a strong link between the exchange rate and output in the industrial sector, even though it is positive and not what was expected.
Anam et al. (2024) analysed the Nigerian economy's experience with the plan. This is study done at a desk. Data are sourced from secondary sources and subjected to content analysis. It utilises existing literature and the publications from the National Bureau of Statistics (2017), the Budget Office of the Federal Republic of Nigeria (2020), and the Nigeria Economic and Sustainability Plan (2020) to examine the framework and execution of the Economic Recovery and Growth Plan (ERGP), the Economic Sustainability Plan, and the National Development Plan in Nigeria. Their content analysis results indicate that various elements influence the effective execution of the economic plan.

Ayeni and Akeju (2023) examined the interplay of human capital, capital goods imports, and economic growth in West Africa. The research encompasses a panel of 13 West African countries (7 low-income and 6 lower-middle-income nations) from 1980 to 2018. The Panel Autoregressive Distributed Lag (ARDL) co-integration technique was utilised to determine the short-term and long-term relationships among the variables. The results indicate that human capital does not enhance production efficiency nor enable the relevant West African countries to capitalise on imported equipment from other nations, mostly due to insufficient levels of human capital.

Aisien and Abraham (2020) examined the influence of capital goods imports on industrial production in Nigeria from 1981 to 2017. The Autoregressive Distributed Lag (ARDL) modelling technique for co-integration was utilised. The empirical findings indicate that the importation of capital goods positively influences the output of the manufacturing sector in Nigeria. The research advocates for enhanced trade openness.

Ogunsakin and Ismail (2020) considered the effects of capital goods import on physical capital formation and economic growth in Sub-Saharan African Countries from 1985 to 2018. The study employed descriptive statistics, Panel Granger Causality Test and Panel co-integration test as estimation techniques. Findings show that the contribution of capital goods import to both economic growth and physical capital formation are significant but not large enough as it contributes little to economic growth and to physical capital formation. The study recommends that governments in Sub-Saharan Africa needs to formulate policies to encourage manufacturing sector productivity of their economies so that they can really make effective use of capital goods, such policies may include friendly tariff policies and removal.

Ogbonna (2015) employed the Johansen Co-integration Technique and Standard desk top Pairwise Granger Causality test technique to investigate the Impact of import on output growth in Nigeria between 1985 to 2000 using secondary data. The result show that certain factors such as not maximizing the advantage of advanced technologies in imported capital goods and inability to install manufacturing capacity can partly explain why the import led growth does not hold for Nigeria.

**3.0 Methodology**

The model is specified below:

 f(ICG*it*,, ,) .......................................................................... 1

Explicitly, equation 1, can be re-stated as below:

 ICG*it* + + + + ........................................2

Where GDPgr= Gross Domestic Product growth rate, ICG Imported Capital Goods, TOP= Trade Openness, POPgr= Population Growth Rate, LF= Labour Force participation and . ICG is the main independent variable, while TOP, POP, LF are control variables. In a bid to achieve the objectives of the study, Panel ARDL cointegration approach and Panel ARDL approach were employed. The study used second-generation panel cointegration test, introduced by Westerlund (2007) to provides more robust results. Since the data used in the study exhibits cross-sectional dependence, the second-generation panel cointegration test was employed.

**Table 1: Description and Measurements of Variables**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variables** | **Variable Type** | **Measurements** | **Sources of Data** | **Expected Signs.** |
| Real Gross Domestic Product (GDP) | Dependent | Real Gross Domestic Product is an inflation adjusted measure that reflects the value of all goods and services produced by an economy in a given year and expressed in base year prices. | World Bank Development Indicator | Positive |
| Trade Openness (TOP) | Independent | This is measured by the ratio to the sum of export and import to real GDP. | World Bank Development Indicator. | Positive |
| Imported Capital Goods (ICG) | Independent | Measured by capital goods import and GDP ratio. | World Bank Development Indicator. | Positive |
| Population Growth Rate (PGR) | Independent | Measured as the percentage change in a population over a specific period, usually expressed annually | World Bank Development Indicator. | Positive |
| Labour Force Participation (LFP) | Independent | This indicates the total population of workforce in a country. It can be measured by the total available work force. | World Bank Development Indicator. | Positive |

**Source: Author’s Computation (2025)**

**RESULT and DISCUSSION**

**4.0 Data Analysis**

**4.1 Descriptive Statistics**

**Table 1: Descriptive statistics of variables in SSA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables  | Mean |  Std. Dev. |  Max |  Min | Skew | Kurt | J-Bera | Prob.  |
| GDP  | 31.36 | 74.59 | 570.0 | 0.320 | 4.329 | 22.67 | 20959 | 0.000 |
| ICG | 10.57 | 333.3 | 11000 | 6E-07 | 32.95 | 10.87 | 53498 | 0.000 |
| TOP | 50.05 | 27.82 | 175.4 | 2.706 | 1.433 | 4.959 | 547.04 | 0.000 |
| PopGr | 2.493 | 1.313 | 16.63 | -16.88 | -4.236 | 97.76 | 41066 | 0.000 |
| LF | 65.92 | 11.12 | 89.59 | 40.38 | 0.048 | 2.205 | 29.120 | 0.000 |

**Source: Author’s Computation, 2025.**

As shown in table 1, the descriptive statistics of significant variables in SSA such as GDP, imported capital goods (ICG), trade openness (TOP), population growth (PopGr), and labor force participation (LF) have been provided. There is a high standard deviation (74.59) and mean GDP of 31.36 which means a great difference in the economic output among the countries. ICG has an extreme variability (mean = 10.57, max = 11,000), and a high skewness of 32.95, which indicates severe outliers. The degree of trade openness is significantly skewed (1.433), which implies the existence of countries, which are much more open than the others. The skew of population growth (-4.236) is negative whereas there are some extreme low values which may be as a result of demographic shock. There is relative consistency of the labor force participation with the skew being 0.048 making it evenly distributed. Based on Jarque-Bera (J-era) test, p -values = 0.000, which implies that the data is not normally distributed and there is possibility of transformation of the data to enable some econometric estimations to be performed.

**4.1.1 Trend Analysis**

**Figure 1**: *The trend of imported capital goods in SSA from 1991 to 2023*



Figure 1 depicts the trend of the value of capital goods imported in Sub-Sahara Africa from 1991 to 2023 and a general upward trend can be observed, with periods of stagnation and fluctuations.

**Source: Author’s Computation (2025)**

**Figure 2**: *The trend of GDP in SSA from 1991 to 2023*



Figure 2 depicts the trend of average GDP and its growth in Sub-Sahara Africa from 1991 to 2023 to illustrate the region's economic trajectory over the decades, reflecting periods of expansion, stagnation, and contraction, influenced by global and domestic factors.

**Source: Author’s Computation (2025)**

**Table 2: Pesaran Cross-Sectional Dependent Test Results**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable |  | CD-test |  | mean ρ |  | T |  | p-value |
| GDP  |  | 119.1 |  | 0.900 |  | 33 |  | 0.000 |
| ICG |  | 31.54 |  | 0.240 |  | 33 |  | 0.000 |
| TOP |  | 14.09 |  | 0.110 |  | 33 |  | 0.000 |
| PopGr |  | 9.050 |  | 0.070 |  | 33 |  | 0.000 |
| LF |  | 42.52 |  | 0.320 |  | 33 |  | 0.000 |

**Source: Author’s Computation (2025)**

The findings of Pesaran's Cross-Sectional Dependence (CD) test for all variables are shown in Table 2. The CD-statistics for GDP (119.1), ICG (31.54), TOP (14.09), PopGr (9.050), and LF (42.52) are all statistically significant at the 1% level (p-value = 0.000). This shows that all the variables are strongly dependent on each other, which means that changes in policy or shocks to the economy in one Sub-Saharan African country are likely to affect others. The high mean ρ values, especially for GDP (0.900), show that there is a lot of relationship between the two. These results support the utilisation of second-generation panel estimate methods that accommodate cross-sectional dependence, like panel cointegration models with common components or dynamic common correlated effects (CCE) estimators.

**Table 3: Summary of the Panel Unit Root Test Results at the Level and First Difference**

|  |  |  |  |
| --- | --- | --- | --- |
| Variable |  | Common unit root | Individual unit root |
|  |  | LLC |  | IPS | ADF | PP |
|  |  | 0.910 |  | 6.457 | 13.55 | 14.43 |
|  |  | -24.86\*\*\* |  | -24.71\*\*\* | 590.8\*\*\* | 654.9\*\*\* |
|  |  | -10.29\*\*\* |  | -9.324\*\*\* | 230.8\*\*\* | 260.8\*\*\* |
|  |  | -39.30\*\*\* |  | -38.63\*\*\* | 911.8\*\*\* | 989.9\*\*\* |
|  |  | -4.211\*\*\* |  | -4.119\*\*\* | 118.7\*\*\* | 110.4\*\*\* |
|  |  | -28.24\*\*\* |  | -28.05\*\*\* | 677.5\*\*\* | 816.2\*\*\* |
|  |  | 2.284 |  | -8.092\*\*\* | 209.7\*\*\* | 162.8\*\*\* |
|  |  | 10.89 |  | -18.58\*\*\* | 424.2\*\*\* | 432.3\*\*\* |
|  |  | -2.934\*\*\* |  | -1.477\* | 90.85\*\* | 64.39 |
|  |  | 11.55 |  | -10.14\*\*\* | 314.8\*\*\* | 508.4\*\*\* |

*Note*: \*\*\*p < 1%, \*\*p < 5%, \*\*p < 10%.

**Source: Author’s Computation (2025)**

Table 3 above reports the findings of panel unit roots tests of stationarity in terms of common unit root (LLC) and individual unit root (IPS, ADF, PP) tests at levels and first differences. Even at level, the variables such as ln (GDP) and PopGr present themselves as non-stationary given that the test statistics are not significant. Nonetheless, following first differencing, these two and the rest of the other variables, that is, GDP, ICG, trade openness (TOP), population growth (PopGr), and labor force (LF) are stationary at the 1 percent (\*),\*\* level, and they are therefore integrated of order one, I(1). This finding explains why techniques like panel cointegration technique and vector error correction model are applicable in the analysis later. On the whole, the possibility of stationary of the variables when the variables are differentiated augers it well with regard to the reliability of the long-run dynamic modeling.

**Table 4: Summary of Panel Cointegration Test Results**

|  |  |  |
| --- | --- | --- |
| Pedroni |  | Kao |
| Common AR Coef. |  | Individual AR Coef. |  |  |
| ADF t-stat | PP t-stat |  | ADF t-stat | PP t-stat |  | ADF t-stat |
| -3.171\*\*\* | -3.737\*\*\* |  | -2.307\*\* | -2.550\*\*\* |  | -0.316 |

*Note*: \*\*\* p < 1%, \*\* p < 5%, \* p < 10%.

**Source: Author’s Computation (2025)**

Table 4 is the panel cointegration test results of the test carried out to test the long-term relationship between importation of capital goods and the economic growth. Cointegration tests, Pedroni and Kao are calculated to establish whether there exists long term relationship between imported capital goods and economic output. In the case of Pedroni test, ADF t-stat and PP t-stat show the result of common AR coefficient and individual AR coefficient to be significantly -3.171, -3.737, -2.307 and -2.550, respectively. The counterparts of these statistic values of significance at 1 and 5 percent levels indicate that there is overwhelming evidence of cointegration between economic growth and imported capital goods and that the hypothesis on long term cointegrating relationship holds true between these two variables across the panel. Nevertheless, the Kao test shows the ADF t-stat of -0.316 that is not significant. This means that the Kao test does not give strong results to support cointegration. The findings of the Pedroni test however indicate that although there is inconsistency in the Kao test results, there is a high level of evidence of long-term panel cointegration relationship between imported capital goods and economic growth.

**Table 5:** *PMG estimates for the impact of imported capital goods on economic growth*

|  |  |  |
| --- | --- | --- |
| Independent Variables |  | DV:  |
|  |  | Coeff. | Std. Err. | T-Stat. | Prob.  |
| *Long-run (pooled) estimates*  |  |  |  |  |  |
|  |  | 0.795 | 0.058 | 13.70 | 0.000\*\*\* |
|  |  | 0.031 | 0.010 | 3.162 | 0.002\*\*\* |
|  |  | 0.575 | 0.171 | 3.364 | 0.001\*\*\* |
|  |  | 0.045 | 0.013 | 3.372 | 0.001\*\*\* |
|  |  | 10.79 | 1.200 | 8.992 | 0.000\*\*\* |
| *Short-run (mean group) estimates* |  |  |  |  |  |
|  |  | -0.013 | 0.006 | -2.206 | 0.028\*\* |
|  |  | -0.009 | 0.002 | -5.392 | 0.000\*\*\* |
|  |  | 0.070 | 0.083 | 0.842 | 0.400 |
|  |  | 0.037 | 0.024 | 1.558 | 0.120 |
| *Adjustment coefficient estimate* |  |  |  |  |  |
|  |  | -0.041 | 0.005 | -7.850 | 0.000\*\*\* |
| Log-Likelihood |  | 752.6 |  |  |  |

*Note*: \*\*\* p < 1%, \*\* p < 5%, \* p < 10%.

**Source: Author’s Computation (2025)**

In the short run, the coefficient for log imported capital goods is negative (-0.013) and statistically significant at the 5% level. This finding suggests that increases in imported capital goods initially constrain economic growth. The negative short-run impact may be attributed to inefficiencies in the immediate utilization of these goods, such as delays in installation, integration costs, or an over-reliance on foreign goods that displace domestic production. However, in the long run, the coefficient becomes positive (0.795) and highly significant at the 1% level.

Also, the coefficient for trade openness in the short run is negative (-0.009) and significant at the 1% level, suggesting that greater trade openness may initially reduce economic growth.. Developing economies often face challenges in competing with established global players, which can lead to trade imbalances or the erosion of local industries. In the long run, however, the coefficient is positive (0.031) and highly significant, indicating that trade openness fosters economic growth over time by enhancing resource allocation, increasing market access, and facilitating the transfer of technology and knowledge.

The study further observed that the coefficient for population growth is positive in the short run (0.070) but statistically insignificant, suggesting that immediate changes in population growth do not significantly impact economic performance. This aligns with theories emphasizing the time lag required for demographic shifts to translate into economic outcomes, as population growth often imposes short-term pressures on resources and infrastructure. However, in the long run, the coefficient becomes significantly positive (0.575) at the 1% level, indicating that population growth contributes to economic growth over time.

For the labour force participation rate, the short-run coefficient is positive (0.037) but statistically insignificant, indicating that immediate changes in labour force participation do not significantly affect economic growth. This result might reflect structural challenges such as skill mismatches, underemployment, or low productivity in the labour force, which limit the immediate impact of workforce expansion. In the long run, the coefficient is positive (0.045) and highly significant at the 1% level, suggesting that sustained increases in labour force participation are crucial for economic growth. Lastly, the error correction term is negative (-0.041) and statistically significant at the 1% level, indicating a moderate speed of adjustment toward long-run equilibrium. This suggests that approximately 4.1% of short-term deviations from the long-run relationship between imported capital goods and economic growth are corrected in each period. The presence of a significant error correction term highlights the stability of the long-run relationship and underscores the importance of aligning short-term policies with long-term objectives.

**4.2 Discussion**

 There is general upward trend in the level of imported capital goods and technology transfer over the years under review. The cross-sectional dependence (CD) test results indicate substantial economic interdependencies among Sub-Saharan African (SSA) Countries. For the Panel Co-Integration Test, findings show evidence of cointegration between imported capital goods and output growth in SSA. The Panel ARDL estimate (short run mean group estimate) show that in the short run, the coefficient for imported capital goods is negative. However, the long run (Pooled mean group estimate) is positive and statistically significant. The statistics result of Pesaran cross-sectional dependence test depicts that variables have statistically significant cross-sectional dependence. This means that it is not possible that economic activities or policy shifts in one nation in the Sub-Saharan African region is an isolated case and therefore it tends to affect other countries as a result of regional integration or external shock. The existence of such dependence implies that there is a lot of interconnectedness between the countries under study. Therefore, second-generation panel cointegration test, introduced by Westerlund (2007) was exhibited since the data in this study cross-sectional dependence, the second-generation panel cointegration test was employed. Thus, panel estimation techniques that take account of the cross-sectional dependence should be used in carrying out robust and reliable estimations, especially in the second-generation. Therefore, the study findings are consistent with the findings in the study by Agbeyinka (2025) which studied the relationship that existed between increasing imports and development of manufacturing industrial sector in Nigeria, his study results revealed a strong positive correlation between the growth of imports and the output in the manufacturing industrial sector. It is further attested that there exists a considerable association between the exchange rate and industrial sector output but the association is positive and contrary to the a priori expectation. This research nullified the result of the study conducted by Obigwe et al. (2025) who had examined the effects of foreign direct investment, foreign portfolio investment and external borrowing on real gross domestic product, their results showed that there exists positive insignificant relationship between foreign portfolio investment and real gross domestic product. The paradox is due to the differences in focus. Agbeyinka (2025) focused on imported capital goods that directly add to industrial productivity whereas Obigwe et al. (2025) looked at financial inflows that may not necessarily translate to productive investment and therefore their marginal effect on GDP is not significant and the nature and use of the inflows is what explains the difference.

**4.3 Conclusion**

From the findings of the study, it is pertinent that imported capital goods exerts significant impact on output growth in Sub-Saharan Africa. Therefore, to promote inclusive economic growth and drive sustainable development in Sub-Sahara Africa, the role of imported capital goods in boosting output growth cannot be over-emphasized.

**4.4 Policy Recommendations**.

Findings indicate a long-run relationship between imported capital goods and output growth in SSA, underscoring the need for governments to reduce tariffs on such imports to stimulate trade volumes and boost growth. However, trade openness exerts a negative influence on economic performance in the region; to fully harness the benefits of openness, export diversification is essential, with a strategic shift from primary product exports to value-added semi-finished products.

**4.5 Implication**

The implication of the findings is that imported capital goods significantly enhance productivity and output growth in SSA with these policymakers should reduce trade barriers while strengthening human capital, infrastructure and industrial capacity to maximize benefits. Meanwhile, regional cooperation, technology transfer and local assembly are vital for translating imports into sustainable economic growth.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declared that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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