




# “Foreign capital inflows, trade openness and output performance in selected sub-Saharan African countries”

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# FOREIGN CAPITAL INFLOWS, TRADE OPENNESS AND OUTPUT PERFORMANCE IN SELECTED SUB-SAHARAN AFRICAN COUNTRIES

## Abstract

This study empirically examined the dynamic impact of foreign capital inflows and trade openness on output performance and national productivity in 31 selected countries in sub-Saharan Africa (SSA) between 1985 and 2018. The study employed random effects and fixed effects models to estimate the coefficients. However, the results from the two models portray similar behaviors. Both estimates revealed a significant relationship between output performance and the independent variables. This suggests that the macroeconomic variables examined are good explanatory variables for analyzing the determinants of output performance and national productivity in the SSA region. The study further found that foreign capital inflows, trade openness and inflation rate have a positive and significant influence on output performance and national productivity. In contrast, exchange rate and interest rate exhibited a negative and significant relationship with such output performance. This result implies that policymakers in SSA countries must formulate policies that can successfully ensure trade openness and promote foreign capital inflows so as to stimulate national productivity and boost output performance in the region. Therefore, it can be concluded that foreign capital inflows and trade openness affect the industrial sector in contributing to output performance and national productivity in the SSA countries.

## Keywords

foreign capital inflows, trade openness, random effects, fixed effects, Cobb-Douglas production, national productivity

## JEL Classification

F40, F41, F43

## INTRODUCTION

Eradicating poverty and promoting employment through sustainable growth of industrial output production are among the fundamental goals of the United Nations' Sustainable Development Goals (SDGs) to be reached by 2030 (United Nations, 2020). In achieving these objectives, foreign capital inflows (FCI), trade openness (TO) and the development of the industrial sector have been identified as one of the key strategic plans to be promoted in the SSA countries. The plan is to create employment, increase domestic savings, encourage foreign investment, export promotion and boost industrial output production through innovation and infrastructural development (Nurunnabi et al., 2020). Unfortunately, over the last two decades, the region experienced the worst economic performance on record when compared to other regions of the world. For example, the region is threatened with high levels of unemployment, poverty, sluggish output growth and challenges of diversifying their economies in achieving industrialization and export growth.

The SSA region recorded its dawdling growth rate in 2015, the first time since 1998. IMF's Regional Economic Outlook for Africa (2016) showed that the economic growth rate in SSA fell from 5.1% to 3.4%,

from 2014 to 2015. In a study conducted in SSA, Wilfred and Bokana (2017) also established that the real Gross Domestic Product (GDP) of the region recorded an increase of 1.1%, from January to March in 2016. However, in the third quarter, the authors found an equivalent 1.0% decrease in the real GDP. According to the IMF, the GDP and export growth of the countries in the SSA region decreased from 2.9% to 1.4%. The inability to diversify the economy, enhance trade liberalization and development of the critical sector (like the industrial sector) have been hypothesized to be one of the major reasons why the SSA region is experiencing such a low economic growth and performance. Moreover, the IMF World Economic Outlook (2021) projection further revealed that the recovery rate in SSA region is likely to lag behind the rest of the world with an aggregate growth rate of 3.6% over the 2020–2025 period as compared to the rest of the world which is put at 14%. Within the period, the income gap based on real GDP per capita between the SSA region and the rest of the world is projected to grow wider.

In view of the forgoing, there is a need to investigate whether foreign capital inflows and trade openness affect the industrial sector in contributing to output performance and national productivity in the SSA region. While several studies have revealed that there is overwhelming evidence that more economies that are open experience high growth rates than less open ones. Nonetheless, as cited by Gwartney et al. (2009) and Murinde (2009), there are some countries in the SSA region that are open but still struggling to attract foreign capital inflows and hence, have slow growth rates. In view of this puzzling, this study seeks to examine the dynamic impact of foreign capital inflows and trade openness on output performance and national productivity in SSA countries.

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## 1. LITERATURE REVIEW

Empirical analyses of foreign capital inflows and trade openness and their comparative impacts on output performance and national productivity in SSA countries make sense and they are relevant based on the premise that they are properly related to the means through which a country can accelerate economic development. Empirical studies that summarize the relevance and nexus of foreign capital inflows, trade openness and output performance are hereby reviewed.

Yaoping (2010) investigated the interaction among foreign direct investment (FDI), trade openness and output growth in Cote d'Ivoire. The author showed a unidirectional causal link running through FDI, trade openness to output. Yaoping (2010) demonstrated another unidirectional relationship running through output, FDI to trade openness. Yaoping's (2010) study concluded that FDI and trade openness positively and significantly impacted the output growth in Cote d'Ivoire.

Related to the studies discussed above, Ayodele Folorunso et al. (2019) demonstrated that economic growth was conditional to foreign capital inflows in Nigeria but failed to establish a link between trade openness and the economic growth

in the country. These results do not only prove that foreign capital inflows are important for the economic growth in SSA but also emphasize that SSA has been dependent on foreign investors. A study conducted by Shaibu (2014) demonstrated that in the regime of trade openness, foreign capital inflows would cause a significant positive influence on economic growth, thus offering an empirical backing for the transformation theory that trade policy and capital inflow are complementary and growth-enhancing. In a similar development, Asamoah et al. (2019) investigated the empirical role of institutional factors and the nexus among trade openness, FDI, and economic growth in sub-Saharan African (SSA) countries and revealed an effect of FDI and trade openness on economic growth and a positive effect of institutions on trade openness.

In Ethiopia, Abebaw (2019) employed a time series data from 1992 to 2018 to analyze the influence of macroeconomic variables on the output growth of industrial sectors. The authors demonstrated a long-run association between industrial output growth and inflation rate, lending rate and trade. Both lending rate and trade were found to have a negative impact on industrial output growth, while inflation had a positive impact. The study recommended that "government has to keep

lending rate to the level that could be amenable for firms and maintaining the trade balance; via manipulating the export and import”.

The study conducted by Nketiah et al. (2019) on the interactions among FDI, trade openness and economic growth demonstrated that trade openness is the main factor influencing GDP growth in Ghana. The results further established that FDI and inflation respectively exhibited insignificant positive and negative impacts of the Ghanaian GDP growth. Furthermore, Adu-Gyamfi et al. (2019) employed some macroeconomic variables like inflation, real exchange rate, trade openness and investment to investigate their impacts on economic growth in nine West African countries. Using panel random effects and fixed effects model, the results revealed a negative and significant relationship between inflation and GDP. However, real exchange rate, trade openness and investment demonstrated a positive and significant impact on GDP.

Similar to the above studies, Sakyi et al. (2015) examined the long-run influence of trade openness and FDI on Ghana's economic growth and established that exports and FDI are conditional to the economic growth of Ghana. Finally, both Orji et al. (2014) and Awad (2011) explored the nexus among foreign capital inflows, openness, and economic growth in West Africa Monetary Zone (WAMZ) and SSA countries. Specifically, the study examined the implications of different forms of foreign capital inflows, comprising FDI, foreign Private Investment (FPI), Official Development Assistance (ODA), remittances and external debt on output growth. The results in both WAMZ and Sub Saharan Africa countries are similar. For example, in WAMZ, results revealed some variations in the growth impacts of the different types of foreign capital inflows, where some indicators showed positive impacts, while others showed negative impacts. In the SSA region, trade and aid positively influenced per capital income growth rate. On the other hand, the results demonstrated that debt had adversarial impact on output growth.

The research gap in this paper is linked to the puzzling that many SSA countries are open but yet still struggling to attract foreign capital inflows and achieve moderate growth rates. After

an extensive review of the literature, it was discovered that the majority of similar studies that have been conducted only focused on individual and developed countries (see, Adenutsi, 2007; Ayodele Folorunso et al., 2019; Ali et al., 2020). In Africa, only Siyakiya (2017) and Sikandar et al. (2021) attempted to examine the impact of FCI and TO on the economy. For instance, Siyakiya (2017) only assessed the impact of trade openness on output performance in selected African countries but did not include foreign capital inflows in the study. Sikandar et al. (2021), on the other hand, looked at the impact of FCI on agricultural growth and poverty reduction in developing countries. Therefore, none of these studies covered the focus area (industrial sector) and the scope (trade openness, foreign capital inflows and industrial output) that are currently investigated. It is in this vein that this study attempts to contribute to this area by investigating the dynamic impact of the foreign capital inflows and trade openness on output performance and national productivity in selected SSA countries.

## 2. METHODOLOGY

### 2.1. Model specification

This paper employs the augmented Cobb-Douglas production function to model the dynamic relationship that may exist between foreign capital inflows, trade openness and industrial output performance and national productivity in the SSA countries. The choice of this method is informed from its ability to handle multiples input in its generalized form in producing certain level of output and that the model does not self-initiate distortion data and results.

Given the above reasons for employing the augmented Cobb-Douglas production function in this study, the theory is systematically linked to an economy aiming to increase the level of foreign capital inflows, reducing poverty, create employment, promote export and boost productivity using the two types of factors of production (reproductive and non-reproductive economy). This is based on the assumption that the SSA countries use the same factors of production and the same technology in production of similar goods and services. It is further based on the assumption that

there are constant returns to scale in which doubling the input will lead to doubling the output and a competitive free international trade among all the countries. The theoretical model illustrates that output is a function of labor, capital or technology (total factor productivity). Consequently, the augmented Cobb-Douglas production function as given by Roubalová and Viskotová (2019) can be presented in the following form for SSA countries:

$$Y_{it} = A_{it} L_{it}^{\beta} K_{it}^{\alpha} \quad Y_{it} > 0.0 < \alpha < 1.0 < \beta < 1, \quad (1)$$

where  $Y_{it}$  is total output in country  $i$  at time  $t$ , which is measured by the real value of all the goods produced in a country;  $A_{it}$  is the level of technology in country  $i$  at time  $t$ , and popularly called total factor productivity.  $A_{it}$  is assumed in the equation as a constant as parametric efficiency.  $L_{it}$  is labor input in country  $i$  at time  $t$ , operationalized as the total man-hours of a country over a particular time range.  $K_{it}$  denotes the input of physical capital in country  $i$  at time  $t$ , measured as the real value of all equipment, machinery and buildings at a point in time.  $\beta$  and  $\alpha$  respectively represent the output elasticity of capital and labor. Available technology is used to determine the values of  $\beta$  and  $\alpha$ . Hence, the proportion of labor and capital substitution can vary.

Since the marginal product of labor and capital is always positive, this function permits returns to scale by summing  $\beta$  and  $\alpha$  (Roubalová & Viskotová, 2019). On the condition that  $(\beta + \alpha) = 1$ , the Cobb-Douglas production theory demonstrates constant return to scale. This implies that, by doubling the usage capital  $K_{it}$  and labor  $L_{it}$  (input), the output  $Y_{it}$  will double proportionally. On the other hand, if  $(\beta + \alpha) > 1$ , it suggests increasing return to scale, and if  $(\beta + \alpha) < 1$ , it implies a decreasing return to scale.

A corresponding form of equation (1) is a linear function of the model where the three variables are transformed into a logarithms form given as:

$$\log(Y_{it}) = c_{io} + \log(A_{it}) + \beta \log(L_{it}) + \alpha \log(K_{it}), \quad (2)$$

where  $Y_{it}$ ,  $L_{it}$  and  $K_{it}$  denote output, labor and capital, respectively;  $c_{io}$  is a constant parameter and  $A_{it}$

is Total Factor Productivity (TFP) or other factors not captured by labor and capital (also considered as unconventional inputs or level of technology). The other variables not captured by labor and capital (unconventional inputs and level of technology) include foreign direct investment (FDI), gross foreign capital inflows (GFCI), trade openness (TO), foreign portfolio investment (FPI), exchange rates (EXC), inflation (INF) and interest rates (IN). Therefore, it is assumed that TFP is a function of foreign direct investment, gross foreign capital inflows, trade openness, foreign portfolio investment, exchange rates, inflation and interest rates over a particular period of time  $t$  which is given by:

$$A_{it} = f(GFCI_{it}, FDI_{it}, FPI_{it}, TO_{it}, EXC_{it}, INF_{it}, IN_{it}). \quad (3)$$

By inserting  $A_{it}$  in equation (3) into equation (1), the following Cobb-Douglas production function is obtained:

$$Y_{it} = GFCI_{it}^{\beta_1} FDI_{it}^{\beta_2} FPI_{it}^{\beta_3} TO_{it}^{\beta_4} EXC_{it}^{\beta_5} INF_{it}^{\beta_6} IN_{it}^{\beta_7} L_{it}^{\beta} K_{it}^{\alpha}. \quad (4)$$

Following Omar and Hussin (2015, p. 102), the linear form of equation (4) can be given as follows:

$$\log Y_{it} = c_i + \beta_1 \log GFCI_{it} + \beta_2 \log FDI_{it} + \beta_3 \log FPI_{it} + \beta_4 \log TO_{it} + \beta_5 \log EXC_{it} + \beta_6 \log INF_{it} + \beta_7 \log IN_{it} + \beta \log L_{it} + \alpha \log K_{it} + \varepsilon_{it}, \quad (5)$$

where  $Y_{it}$  is industrial output production and national productivity in SSA countries;  $c_i$  is a constant term;

$$\beta_1 \log GFCI_{it} + \beta_2 \log FDI_{it} + \beta_3 \log FPI_{it} + \beta_4 \log TO_{it} + \beta_5 \log EXC_{it} + \beta_6 \log INF_{it} + \beta_7 \log IN_{it}$$

capture TFP;  $\beta \log L_{it}$  and  $\alpha \log K_{it}$  are labor and capital respectively;  $i$  is a country index;  $t$  is a time period; and  $\varepsilon_{it}$  is an error term.

Following Wilfred and Bokana (2017), Bloom et al. (2014) and Roodman (2009), this study builds a dynamic model into the system by introducing



the lag of dependent variable to the right hand side of equation (5) as follows:

$$\begin{aligned} \log Y_{it} = & c_i + \log Y_{it-1} + \\ & + \beta_1 \log GFCI_{it} + \beta_2 \log FDI_{it} + \\ & + \beta_3 \log FPI_{it} + \beta_4 \log TO_{it} + \\ & + \beta_5 \log EXC_{it} + \beta_6 \log INF_{it} + \\ & + \beta_7 \log IN_{it} + \beta \log L_{it} + a \log K_{it} + \varepsilon_{i,t}. \end{aligned} \quad (6)$$

## 2.2. Brief definition of variables

This study employs annual data that were collected from the SSA countries from 1985 to 2018. The variables are drawn from similar studies like Cinar and Nulambek (2018) and Ayirikame (2021), as well as theoretical model using the Cobb-Douglas production function. Those variables are briefly discussed below.

- **Output (Y)**

This is the production variable, and it represents a dependent variable in the model developed for this study. This variable was included in the model because the industrial sector significantly contributes to economic growth and assists to achieve specific objective like employment creation and economic growth.

- **Foreign direct investment (FDI)**

This is a form of direct business ownership or investment in one country by an entity based in another country. FDI is a form of foreign capital, which aims at accelerating economic development (Todaro & Smith, 2012).

- **Foreign portfolio investment (FPI)**

This is another form of foreign capital inflows aimed at accelerating economic development. It deals with investment in a grouping of assets such as stocks, bonds, and cash equivalents (Otiwu, 2018).

- **Gross foreign capital inflow (GFCI)**

GFCI is the sum of FDI and FPI as a ratio or percent of GDP. The gross foreign capital inflow is included in this paper because dealing with each component of capital flows in disaggregated forms

may sometimes be misleading because the volatility in capital flows may be dampened by the changes in another component (Chakraborty, 2006).

- **Inflation (INF)**

This variable is included to capture macroeconomic instability in the production processes or the economy as posited by Okonkwo et al. (2015) and Sahoo (2017). In addition, the variable will assist this study to establish the trade links among the SSA countries and with the rest of the world, as well as how prices attract foreign capital inflows, level of investment and output production in the economy.

- **Interest rate (IN)**

This variable represents the cost of borrowing and it allows this study to measure the process through which it is used to control inflation in the economy. For example, if inflation is high, central banks increase repo rate which eventually reduces the money supply in the economy and thus helps in curbing inflation (vice versa).

- **Trade openness (TO)**

Trade openness is simply the ratio or sum of a country's export and import. In this paper, trade openness as a percentage of GDP, i.e. (Imports + Exports) is employed, and this is in line with Wiredu et al. (2020). It is included in the study to see its impact on output performance.

- **Exchange rate (EXC)**

The inclusion of this variable in the model allows the study to investigate how variations in the value of the US Dollar affect selected variables in the SSA countries as posited by Bacchetta and Van Wincoop (2000). The SSA country's currency against the US dollar is used in this study because, as posited by Rodrik (2006), US is the most industrialized country in the world and their currency is the most traded in the foreign exchange market.

## 2.3. Data sources

The panel data for the SSA countries used in this paper was extracted from the databases International Financial Statistics (IFS) of IMS and the WDI

of the World Bank, UNDP and OECD database. The annual data spanned from 1985 to 2018.

## 2.4. Estimation technique

Following the empirical studies of Wilfred and Bokana (2017) and Wiredu et al. (2020), this paper employs the fixed effects model (FEM) and random effects model (REM) to investigate the dynamic impact of foreign capital inflows and trade openness on output performance and national productivity in SSA countries.

Supposing the panel fixed effects and random effects regression model for the SSA countries is specified as follows:

$$Y_{it} = \beta_{i0} + \beta_1 Y_{it-1} + \beta_2 X_{1it} + \beta_3 X_{2it} \dots + \beta_p X_{nit} + \mu_{it}, \quad (7)$$

where  $Y_{it}$  is the industrial output production and national productivity in SSA countries;  $\beta_{i0}$  is the constant term;  $i$  denotes individual country in the SSA countries;  $X_1 - X_n$  and  $Y_i$  are explanatory variables (for every  $i = 1, \dots, n$ );  $\beta_1 - \beta_p$  represent coefficient of the explanatory variables in the model; and  $\mu_{it}$  is the error terms. As earlier stated, the variables in the two models are Y, GFCI, FDI, FPI, TOP, EXC, INF and IN. Based on a priori expectation, a positive relationship is expected between Y and GFCI, FDI, FPI, TO and INF, while EXC and IN may show a negative relationship.

## 3. ESTIMATION RESULTS

The behavior of data in terms of its stationary status has implications on the validity of results.

Therefore, this paper begins by conducting a descriptive summary statistic to determine the behaviors of the data and their interaction in the model. Thereafter, a stationarity (testing for unit roots) of the dataset is carried out in order to prevent spurious results. Finally, the fixed effects and random effects analyses were conducted.

### 3.1. Results of summary statistics

Table 1 presents an overview of the data set using the raw data of the variables. As shown in Table 1, the summary statistics clusters around its mean in the model, since the mean gives the average value of each of the variable, while the median gives the middle value of each of the eight variables in the model. The minimum and maximum value tells us the smallest and largest value of each of the variables, while the standard deviation is the deviation of the sample mean with respect to each of the variable. It is obvious from Table 1 that the mean values of all the variables are not significantly dispersed from their minimum values relative to their maximum values. Hence, indicating low productivity and capital flows in the SSA countries. These results support the claims by Atardi and Sala-i-Martin (2003) that the economic growth in SSA is unstable. The skewness and kurtosis show that the output, trade openness and interest rate are platykurtic (because those values are  $<3$ ), hence, mirror normal distribution, and have a flat tail, while gross foreign capital inflows, foreign direct investment, exchange rate and inflation embodied positive leptokurtic (values  $>3$ ), therefore, have a long right tail. The Jarque-Bera statistics, on the other hand, measures the difference between the kurtosis and skewness of the se-

**Table 1.** Summary statistic results

Source: Authors' computation using model result.

Variable	Y	GFCI	FDI	FPI	TO	EXC	INF	IN
Mean	54.0726	7.2383	6.6670	0.2066	101.9330	53.6828	357.9006	10.1103
Median	52.7427	4.3153	3.7587	0.0000	100.0023	32.7940	30.4187	10.2500
Maximum	72.7173	40.1728	40.1672	3.4270	178.9393	252.8557	4800.532	10.5000
Minimum	41.9330	0.1939	0.0720	-3.6039	53.3701	2.9908	2.2137	9.75000
Std. Dev.	7.8294	7.7679	7.9479	1.1986	30.6505	61.1424	914.4096	0.2203
Skewness	0.6009	2.6273	2.6202	0.2723	0.5092	1.1737	3.7020	-0.2082
Kurtosis	2.9083	10.5422	10.3720	6.4923	2.6964	4.2974	17.0923	2.2196
Jarque-Bera	63.8076	3710.810	3592.788	548.6558	49.6080	315.912	11129.16	34.3565
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum	56992.61	7629.259	7027.085	217.779	107437.3	56581.72	377227.2	10656.25
Sum Sq. Dev.	64549.11	63538.50	66517.36	1512.792	989248.3	3936528.	8.8008	51.1158
Observations	1054	1054	1054	1054	1054	1054	1054	1054

quence following the normal distribution series. Given the probability value of each of the variable from the Jarque-Bera statistics, the study rejects the null hypothesis of a normal distribution because the probability values are highly significant. Given this observation, the study conducts a unit root test to prevent spurious results.

The result of the correlation matrix as contained in Table 2 shows a strong relationship among the variables. For example, the study discovers a strong relationship between the independent variables (GFCI, FDI, FPI, TO, EXC, INF and IN) and the dependent variable (Y). The implication of this is that those vari-

ables have impacts on output growth or performance and national productivity in SSA countries.

### 3.2. Panel unit root results

Prior to the estimation of the results, the study tested for the stationarity of the datasets. Three different stationary tests comprising Im, Pesaran and Shin (IPS), Augmented Dickey-Fuller (ADF) and Levin, Lin and Chu (LLC). As shown in Table 3, six variables (GFCI, FDI, FPI, Y, INF and IN) were stationary at 5% with both intercept and trend, while the other two variables (TO and EXC) were stationary at first differencing (I(1)).

**Table 2.** Correlation matrix

Source: Authors' computation using model result.

Probability	Y	GFCI	FDI	FPI	TO	EXC	INF	IN
Y	1.0000	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–
	–	–	–	–	–	–	–	–
GFCI	0.1746	1.0000	–	–	–	–	–	–
	5.7523	–	–	–	–	–	–	–
	0.0000	–	–	–	–	–	–	–
FDI	0.0993	0.9909	1.0000	–	–	–	–	–
	3.2381	239.1404	–	–	–	–	–	–
	0.0012	0.0000	–	–	–	–	–	–
FP	0.3508	0.1306	0.1692	1.0000	–	–	–	–
	12.1512	4.2757	5.5684	–	–	–	–	–
	0.0000	0.0000	0.0000	–	–	–	–	–
TOP	0.2204	0.5405	0.5465	0.2025	1.0000	–	–	–
	7.3291	20.8393	21.1682	6.7086	–	–	–	–
	0.0000	0.0000	0.0000	0.0000	–	–	–	–
EXC	0.5580	0.1197	0.1876	0.1721	0.4022	1.0000	–	–
	21.8099	3.9107	6.1972	5.6678	4.2497	–	–	–
	0.0000	0.0001	0.0000	0.0000	0.0000	–	–	–
INF	0.1137	–0.0392	–0.0120	0.0639	0.4475	–0.3113	1.0000	–
	3.7147	–1.2727	–0.3919	2.0788	16.2304	–10.6279	–	–
	0.0002	0.2034	0.6952	0.0379	0.0000	0.0000	–	–
IN	–0.5881	0.0909	–0.1517	0.0547	–0.3121	–0.8796	–0.2314	1.0000
	–23.5844	2.9629	–4.9782	1.7771	–10.6560	–59.9955	–7.7171	–
	0.0000	0.0031	0.0000	0.0758	0.0000	0.0000	0.0000	–

**Table 3.** LLC, IPS and Augmented ADF unit root tests

a)

Variables	LLC (individual intercept)			LLC (individual intercept and trend)		
	Order of integration	t-Statistics	P-Value	Order of integration	t-Statistics	P-Value
GFCI	I(0)	–5.04731	0.000***	I(0)	–4.9627	0.000***
FDI	I(0)	–5.6336	0.000***	I(0)	–59370	0.000***
FPI	I(0)	–14997	0.067*	I(0)	–13.9841	0.000***
Y	I(0)	–12.7018	0.000***	I(0)	–14.6290	0.000***
TOP	I(1)	–12.6082	0.000***	I(1)	–10.2972	0.000***
EXC	I(1)	–11.8201	0.000***	I(1)	–11.2214	0.000***
INF	I(0)	–8.9353	0.003***	I(0)	–10.1479	0.000***
IN	I(0)	–2.9203	0.002***	I(0)	–3.8112	0.001***

Note: \*\*\* = significant at 1%; \*\* = significant at 5%, and \* = significant at 10%.



**Table 3 (cont.).** LLC, IPS and Augmented ADF unit root tests

b)

Variables	IPS Unit root test (individual intercept)			IPS Unit root test (individual intercept and trend)		
	Order of integration	t-Statistics	P-Value	Order of integration	t-Statistics	P-Value
GFCI	I(0)	-5.8217	0.000***	I(0)	-6.2123	0.000***
FDI	I(0)	-6.0648	0.000***	I(0)	-6.7423	0.000***
FPI	I(0)	-5.1023	0.000***	I(0)	-4.8034	0.000***
Y	I(0)	-6.2956	0.000***	I(0)	-8.0395	0.000***
TOP	I(1)	-11.1394	0.000***	I(1)	-7.9600	0.000***
EXC	I(1)	-10.6501	0.000***	I(1)	-6.4469	0.000***
INF	I(0)	-10.0860	0.000***	I(0)	-9.9335	0.000***
IN	I(0)	-34.2566	0.002***	I(0)	-31.6250	0.000***

Note: \*\*\* = significant at 1%; \*\* = significant at 5%, and \* = significant at 10%.

c)

Variables	ADF-Fisher Chi Square Unit root-test (individual intercept)			ADF-Fisher Chi Square Unit root-test (individual intercept and trend)		
	Order of integration	t-Statistics	P-Value	Order of integration	t-Statistics	P-Value
GFCI	I(0)	138.988	0.000***	I(0)	151.361	0.000***
FDI	I(0)	145.247	0.000***	I(0)	157.721	0.000***
FPI	I(0)	145.146	0.000***	I(0)	146.888	0.000***
Y	I(0)	134.369	0.000***	I(0)	165.977	0.000***
TOP	I(1)	238.073	0.000***	I(1)	164.403	0.000***
EXC	I(1)	203.441	0.000***	I(1)	188.920	0.000***
INF	I(0)	227.083	0.000***	I(0)	212.883	0.000***
IN	I(0)	841.618	0.000***	I(0)	726.620	0.000***

Note: \*\*\* = significant at 1%; \*\* = significant at 5%, and \* = significant at 10%.

## 4. INTERPRETATION OF RESULTS

### 4.1. The fixed effects test results

Tables 4 and 5 present the regression results for estimating the impact of selected factors on industrial output and national productivity using panel FEM and REM, respectively. The results from the two models portray similar behaviors. At 5% level, all the variables in the two models significantly affect output production. This suggests that these macroeconomic variables are good explanatory variables for analyzing the determinants of industrial output performance and national productivity in the SSA region. It is an indication that they determine industrial output performance and national productivity among the SSA countries.

Based on the regression results, it is observed further that under the two models, the coefficients of gross foreign capital inflows, foreign portfolio in-

vestment, foreign direct investment, trade openness and inflation have positive impacts. The coefficients estimates of all the variables are totally significantly positive. This suggests that an increase in GFCI, FDI, FPI, TO and inflation will lead to an increase in industrial output performance and national productivity in the SSA countries. It can therefore be inferred that foreign capital inflows and trade openness affect the industrial sector in contributing to output performance and national productivity in the SSA region. These findings are in line with those of Saibu (2014), Yaoxing (2010) and Ayodele Folorunso et al. (2019).

On the other hand, exchange rate and interest rate have a negative impact. This is an indication that exchange rate instability and an increase in interest rate will decrease industrial output performance and national productivity in the region.

Given the above results, the SDGs 2030 fundamental's goals of eradicating poverty and promoting employment through sustainable growth of

**Table 4.** Fixed effects test result

Source: Authors' computation using model result.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GFCI	0.735728	0.164293	4.478155	0.0000
FDI	0.645844	0.163444	3.951467	0.0001
FPI	2.330714	0.142525	16.35299	0.0000
TOP	0.106530	0.006988	15.24436	0.0000
EXC	-0.072376	0.005369	-13.47928	0.0000
INF	0.000726	0.000187	3.891876	0.0003
IN	-7.089541	1.299110	-5.457229	0.0000
C	171.6541	54.36823	3.157249	0.0028

**Table 5.** Random effects test result

Source: Authors' computation using model result.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GFCI	3.393797	0.186567	18.19073	0.0000
FDI	3.339096	0.184490	18.09907	0.0000
FPI	1.542086	0.185189	8.327115	0.0000
TOP	0.079823	0.009843	8.109582	0.0000
EXC	-0.118869	0.011751	-10.11605	0.0000
INF	0.001033	0.000252	4.099447	0.0000
IN	-8.894563	1.655364	-5.373177	0.0000
C	306.7011	44.33546	6.917718	0.0001

**Table 6.** Hausman test results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	10.6147	7	0.0041

industrial output production can be achieved with a concerted efforts to promote foreign capital inflows, trade openness and the development of the industrial sector in the SSA countries. The strategic plans to develop and promote the key macroeconomic variables in the model will help to create employment, increase domestic savings, encourage capital flows, export promotion (remove trade restrictions and high tariffs) and boost industrial output production and national productivity among the SSA countries.

Table 6 shows the result of the Hausman test that investigates the most suitable model between the FEM and REM. At 5% level, the null hypothesis

(Ho) is rejected, which indicates that FEM is more suitable than the random effects model, hence, adopted for this study. In line with Wilfred and Bokana (2017), "the adoption of fixed effects model is premised upon justification that it can handle heterogeneity effect that may influence the outcome of our findings". However, all the significant variables in the RE model were also significant in the FE model. The size of the coefficients and their signs of the variables in both models were relatively similar. Therefore, confirm the earlier assertion that foreign capital inflows and trade openness affect the industrial sector in contributing to output performance and national productivity in the SSA region.

## CONCLUSION

Foreign capital inflows, trade openness and the development of the industrial sector have been identified as one of the key strategic plans to eradicating poverty and promoting employment in the SSA. Unfortunately, over the last two decades, the region experienced the worst economic performance on record when compared to other regions of the world. Therefore, this study examined the dynamic impact of foreign capital inflows and trade openness on industrial output performance and national produc-

tivity in the SSA countries. Annual data from 1985 to 2018 was used for the study. The study employed panel fixed effects and random effects models to analyze the data.

The results based on both the FE and RE models revealed that gross foreign capital inflows, FDI, trade openness, foreign portfolio investment and inflation positively affected industrial output performance and national productivity in SSA countries. This result implies that an increase in foreign capital inflows, trade openness and inflation stimulate the industrial output performance in the SSA region. On the other side, the results demonstrated that exchange and interest rates had a negative impact, suggesting that an increase in interest and exchange rates will decrease industrial output performance in the SSA region. The study concludes that FCI and trade openness affects the industrial sector in contributing to output performance and national productivity in the SSA countries.

The significant policy implication emanating from the findings is that policymakers in SSA countries have to formulate policies that can successfully promote foreign capital inflows and ensure trade openness. Policies towards managing a good combination of domestic investment and foreign capital inflows, as well as trade openness, must be formulated in order to boost output performance and national productivity in the SSA countries. As a policy recommendation, SSA countries should commit to creating viable economic environments that will entice foreign investors. This can be achieved through the promotion of trade and investment by establishing pragmatic and sound economic policies and strengthening both economic and policy institutions, which can help in taking full advantage of the gains from foreign capital inflows and trade openness in the SSA region in order to boost industrial output performance and national productivity.

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