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The Impact of Trade Openness and Foreign Direct Investment on Human Development in Sub-Saharan African Countries: Evidence from Panel Data

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Abstract

This study investigates the impact of trade openness and foreign direct investment on human development. The study is based on data from 29 sub-Saharan African countries from 2010 to 2019. We used panel cointegration and a panel vector error correction model for econometric analysis. Besides, the study also attempted to determine the direction of causality among the dependent and independent variables. The empirical result of the study indicates that both trade openness and foreign direct investment have a positive and significant effect on the human development level of sub-Saharan African regions in the long run. Per capita GDP also has a positive and significant impact on the region's long-run human development. In contrast, foreign aid has a negative effect on the human development of sub-Saharan African countries both in the long and short run, and inflation has a negative effect on the region's long-term human development despite its positive effect in the short run. Hence, this study recommends promoting additional foreign investment activities by implementing effective policy tools, creating conducive environments to attract substantial foreign direct investment to the region, and encouraging its foreign investors to participate more in welfare-building activities. Secondly, the research also recommended developing policies that reduce tariff and non-tariff barriers to trade and facilitate the exchange of goods and services between countries by increasing trade agreements. Thirdly, instead of focusing on meeting basic humanitarian needs, development partners should tie their aid into social sector development such as education and health to have a greater impact on human development.

Keywords: Human development, trade openness, foreign direct investment, Sub-Saharan Africa, panel vector error correction model.

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Introduction

The UNDP human development indices are a pathbreaking work that has extended the frontiers of analytical thinking about human progress beyond economic growth. It also firmly places people and human well-being at the Center of development policies and strategies. For more than twenty-five years, human development reports have reported how successful countries look in human development. The human development of countries is usually measured by the human development index (HDI). It is a statistically calculated combination of life expectancy, education, and per capita income. Initially, it was developed by Pakistani economist Mahbub ul Haq and improved by an Indian economist, Amartya Sen, in 1990.

Globally, there is a trend toward improvement in human development (HD) despite the frequent challenges, both man-made and natural. For instance, in 2010, out of 189 countries for which human development is calculated, 46 countries were grouped into the very high HDI group and 49 countries were grouped into the low HDI group. However, after eight years, in 2018, 59 countries were grouped in the very high HDI group, and 38 countries were grouped in the low HDI group (UNDP, 2018). In 2019, according to the UNDP 2020 report, out of the 189 nations for which the HDI was calculated, 66 countries were in the very high HDI group, while only 33 were in the low HDI group. Because HD is a complex process, this overall improvement results from a change in several factors, including health, income, education, inequalities, GDP per capita, inflation, and others (Shah, 2016).

Even if the African economy is growing generally, nothing is known on how this growth will aff ect the average African citizen, particularly in terms of raising the continent's HD (Mbabazi, 201 7). Also, research shows that FDI and TOP have a variety of mixed results when it comes to influ encing economic growth (Cinar & Nulambeh, 2018). The OECD reported in 2002 that FDI can h elp to economic growth by producing technology spillovers and aiding in the development of hu man capital, depending on domestic policies and level of development. Because it offers foreign capital for investment, increases industry competitiveness, and pushes domestic businesses to ad opt various effective technologies, FDI is acknowledged as a significant growth driver (Ajayi, 20 06). The adoption of technology, which can be acquired through foreign investment, is supported

by trade as well, which boosts worker productivity overall and creates opportunities for growth a nd development (Holmes & Schmitz, 1995).

Studies on the direct links between TOP, FDI, and HD are limited (Hamdi & Hakimi, 2021; Reiter & Steensma, 2010). Furthermore, most of the available research tried to test either the effect of TOP or FDI on HD explicitly, as well as the indirect effects of these variables on health (Barlow, 2018; Burns et al., 2017; Novignon et al., 2018), education, and economic growth (Abdelaziz & Helmi, 2019; Chang et al., 2009; Keho, 2017). Even though there is more or less consensus on the positive impact of FDI on HD (Hamdi & Hakimi, 2021; Pérez-Segura, 2014; Reiter & Steensma, 2010; Sharma & Gani, 2004), there is no consistency in the impact of TOP on HD. For instance, some studies found that TOP has a positive and statistically significant effect on HD (Jawaid & Waheed, 2017; Kabadayi, 2013; Kumar, 2017; Mbabazi, 2017) or only the health component of HD (Hamid & Amin, 2013); Rash (2012) found that trade liberalization does not affect HD in SSA countries.

The primary goal of this study is to examine how trade openness (TOP) and foreign direct investment (FDI) in the context of SSA for the years 2010 to 2019 affect human development (HD). The SSA region is chosen as the focus of this study because it has historically and continues to experience unique issues, including unjust policies, poor education, subpar health care, low per capita income, political unpredictability, a lack of accountability, and inadequate infrastructure. The region is the poorest in the world as a result (Sahn & Younger, 2009). In terms of education, SSA is home to 26% of the world's adult illiterates (UNESCO, 2016). The HDI for SSA is 0.547, the lowest among all other regions (UNDP, 2020). All of these point to the seriousness of the issue in the area, and it is for these reasons that we have decided to focus our investigation on the SSA region in order to better understand the relationship between TOP, FDI, and HD.

In many ways, this work is a vital addition to the body of literature. First, as far as I'm aware, no research on HD have included both TOP and FDI in the model while considering SSA. Hence, by utilizing current and trustworthy data and including additional crucial control variables, this work has helped to close the knowledge gap in this field. Second, the linear framework used in the majority of studies on this subject use either a fixed or random panel analysis. This study, however, closes this gap by doing multivariate analysis based on models that are appropriate for our data

type, panel cointegration and panel vector error correction. With the use of this model, we can discover the causes of the series' long- and short-run relationships. Furthermore, because TOP and FDI conditions can change over time and consequently have varied effects on HD, we have selected the most trustworthy and recent data in this analysis. Overall, the size of the sample countries, the time frame, the control variable, and the econometric strategy used to answer the research issue distinguish this study from others.

Related Literature Review

Studies on economic growth and development have dominated the macroeconomic studies literature for the last few decades. FDI and trade have a special place despite the many factors mentioned in the literature that contribute to growth and development because FDI is acknowledged as a major growth engine because it provides foreign currency for investment, fosters industry competition, and motivates domestic firms to be more productive by implementing various efficient technologies (Ajayi, 2006). Trade also encourages the use of technology, which is acquired through foreign investment and boosts worker productivity overall and creates the conditions for growth and development (Holmes & Schmitz, 1995).

Yet, there have only been a few researches on the connections between TOP, FDI, and HD (Hamdi & Hakimi, 2021; Reiter & Steensma, 2010). Also, the majority of the research aimed to examine the direct effects of TOP or FDI on HD as well as the indirect effects of these variables on health, education, and economic growth (Barlow, 2018; Burns et al., 2017; Novignon et al., 2018). (Abdelaziz & Helmi, 2019; Chang et al., 2009; Keho, 2017). Although the beneficial effects of FDI on HD are generally agreed upon (Hamdi & Hakimi, 2021; Pérez-Segura, 2014; Reiter & Steensma, 2010; Sharma & Gani, 2004), the effects of TOP on HD are inconsistent. For instance, some studies discovered that TOP has a favorable and statistically significant impact on HD (Jawaid & Waheed, 2017; Kabadayi, 2013; Kumar, 2017; Mbabazi, 2017) or only the health aspect of HD (Hamid and Amin, 2013; Rash, 2012 found that trade liberalization has no impact on HD in SSA countries). Hamdi and Hakimi (2021) used panel cointegration analysis and the vector error correction model as their primary econometric techniques to study the combined effect of TOP and FDI on HD for the MENA area from 2002 to 2015. They are currently the only scholars

to have done so. They discovered that TOP and FDI had a significant and favorable direct effect on HD over the long term, but only FDI does so in the short term.

We have the work of Mbabazi and Rash, who look at the unique impact of TOP on HD in the context of SSA. Their research produced various results. Mbabazi (2017) discovered a link between improved human development in SSA and increasing trade openness. Rash (2012) discovered that trade liberalization had little impact on HD in SSA. Recently, Mbang (2022) used the auto-regressive distributed lagged model to examine the impact of net foreign direct investment inflows on Cameroon's human development from 1995 to 2019. (ARDL). He discovered that while FDI had a short-term negative impact on HDI, it had a long-term favourable impact on human development in Cameroon. There hasn't yet been a thorough empirical study on HD that combines TOP and FDI in the setting of SSA. By expanding the work of Mbabazi and Rash to examine the impact of TOP and FDI on HD in the SSA region, this study covers the gaps that have been identified.

Data and Methodology

Data Source, Analysis, and Measurement

Data on significant macroeconomic factors that are anticipated to have an impact on the human development of 29 Sub-Saharan African nations have been attempted to be gathered. Annual panel data that was gathered from reliable secondary sources was used in this investigation. One significant issue was the lack of data on important variables. Sadly, not all nations have a consistent collection of statistics, and even when they do, the time frame is usually short. For instance, the sample period was constrained since all of the sample countries lacked published long-term data on the dependent variable and some of the explanatory variables. However, statistics for a specific nation between 2010 and 2019 could be found. There are 290 observations total (29 countries X 10 time periods).

Both descriptive and econometric approaches of analysis are used in the study. The study uses a panel cointegration and panel vector error correction model for econometric analysis in order to look into the short- and long-term correlations between the dependent (endogenous) variables and independent (exogenous) variables. With the use of this model, we can determine whether a series'

relationship is long- or short-term, as well as its causes. Eviews12 is the statistical program utilized for the econometric analysis. Table 1 below indicates the measurement and sources of the data.

Table 1

Data Sources and Measurement

Variable	Measurement	Expectation	Data Source
HDI (Dependent Variables)	Human development: measured by HDI, it is a statistically calculated combination of three indexes: ✓ Life Expectancy Index ✓ Education Index ✓ Per capita income Index	---	UNDP data Center
TOP	Exports plus imports divided by GDP	Positive/Negative	WDI
FDI	The net inflow of FDI as a % of GDP	Positive	UNCTAD
PGDP	The annual percentage growth rate of per capita gross domestic product	Positive	IMF
INF	Inflation rate is measured by the consumer price index	Negative	WDI
FA	Net official development assistance received (% of GNI)	Positive	WDI

Source: Own compilation based on literature

Model Specification and Estimation Procedures

Model specification is a conceptual term that describes a mathematical statement of the relationship between variables. A small number of studies, as we discussed in the literature section, examine how TOP or FDI affect HD using various econometrics techniques, including the Generalized Method of Moments (GMM), fixed effect or random effect methods, simultaneous equation methods, and two-stage least-square instrumental variable approaches (2SLS). Nonetheless, we used the panel vector error correction model in this work to examine the relationship between our dependent and independent variables (PVECM). PVECM was used for

this study primarily because it considers how the shock variance and coefficients change over time (Canova & Ciccarelli, 2013). It can also be used to determine whether the variables are causally related in the case of a cointegrated series (Hamdi & Sbia, 2013). Also, in comparison to other models, it can enhance long-term forecasting (Engle & Granger, 1987). PVECM underwent a stationarity and cointegration pre-test before the real estimate procedure.

Panel unit root test

In this study, to determine whether the variables are stationary or not, we employed a three-panel unit root test, namely; Levin, Lin, and Chu [LLC (2002)], Im, Pesaran, and Shin [IPS (2003)], and ADF-Fisher Chi-square [F_ADF (1979)] tests. These tests are grouped into two-unit root processes: the common unit root process and the individual unit root process. Levin et al. (2002) tests assume the existence of a common unit root process, whereas Im et al. (2003) and the F_ADF test assumes the presence of an individual unit root process. For each test, the null hypothesis is that unit roots in the series imply the variables are nonstationary. The LLC panel unit root test investigates the unit root problem through ADF regression, and estimation of the following autoregressive model is necessary:

$$\Delta Y_{it} = \mu_i + \rho_i Y_{it-1} + \sum_{j=1}^{m} \delta_{ij} \Delta y_{it-j} + \mathcal{E}_{it} \; ; i = 1,2,3 \, , \ldots N; t = 1,2,3 \ldots T \quad \ldots\ldots\ldots\ldots \qquad (1)$$

Here; Δ denotes the first difference operator; Y_{it}, is the series for country $i = 1,2,3 \ldots \ldots N$ in the panel over period $t = 1,2.3, \ldots \ldots T$; m denotes lag length, ρ_i are autoregressive coefficients; μ_i denote unit-specific fixed effects. $\mathcal{E}_{it}$ are independently and normally distributed random variables for all i and t with zero mean and finite unit-specific variances. $\rho = 0$ hypothesis for all i will be tested against $\rho < 0$ hypotheses for all i. Rejection of the zero hypotheses will mean that the series is stationary. The LLC test is restrictive because it assumes homogeneity in the panel autoregressive coefficients.

IPS test is preferable over the LLC test because it relaxes the homogeneity restriction LLC by allowing for heterogeneity among individuals. It is applied only to balanced panel data and is proposed as an alternative testing procedure that depends on the calculation of t-statistics (Abdullah & Morley, 2014).

$$\bar{t} = \frac{\sum_{i=1}^{N} t_{\rho i}}{N} \quad \ldots \quad (2)$$

Where, $t_{\rho i}$ indicates the individual t-statistic for testing the null hypothesis in each panel cross-section, assuming each individual has a unit root. $\rho_i = 0, (\forall)\ i = \overline{1, N}$. Here are the specifications of the alternative hypothesis:

$$H_1 = \begin{cases} \rho_i < 0, \ \text{for } i = 1,2, \ldots, N_1 & \text{(No unit root)} \\ \rho_i = 0, \text{for } i = N_1 + 1, \ldots, N & \text{(unit root)} \end{cases}$$

Maddala and Wu (1999) developed the Fisher-ADF test by combining the $P -$ values obtained from unit root tests for each cross-section i. The test follows a chi-square distribution with 2n degrees of freedom, where n is the number of countries represented on the panel. Due to the finite sample properties, the Fisher test is more powerful than the IPS test. The following are the test statistics:

$$\lambda = -2 \sum_{i=1}^{n} \log_e(Pi) \sim \chi^2 2n(\text{d.f}) \ldots \quad 3)$$

Here, the p-value obtained from the ADF unit root test for unit i is denoted by Pi. The null and the alternative hypotheses of the Fisher-ADF test are the same as for the IPS test, but Fisher's test is not asymptotic; it is an exact test.

Panel Cointegration test

An econometric method called cointegration is used to look at how variables are related over the long run. In this work, we assess the long-run relationship among I (1) variables using the Pedroni residual cointegration test (1999,2004), the Kao (1999) test, and the Johansen-Fisher technique. Therefore, before doing the panel cointegration test, the suitable lag length must be established (Davidson and Mackinnon, 1999). The final prediction error, the Akaike information criterion, the Schwarz information criterion, and the Hannan-Quinn information criterion are used to make this determination. A heterogeneous panel cointegration approach that permits the availability of cross-sectional dependence in diverse individual effects is the Pedroni (1999, 2004) cointegration test.

Seven separate test statistics are included in this cointegration test under the within (in-group) and between (intergroup) dimensions. Within dimension, statistics include panel v-statistic, panel rho-statistic, panel PP-statistic, and panel ADF-statistic. These within-dimension statistics combine autoregressive coefficients across nations for unit root tests on estimated residuals. These statistics account for common time characteristics and variations across countries. In contrast, the between dimension contains three statistics: the group rho-statistic, the group PP-statistic, and the group ADF-statistic. These between-dimension statistics for each nation in the panel are based on averages of individual autoregressive coefficients and unit root tests of residuals. The panel v -statistic rejects the null hypothesis of no cointegration for large positive values. In contrast, the null hypothesis of no cointegration would be rejected if the remaining six test statistics had significant negative values. All seven tests have an asymptotic standard normal distribution. Examination of I (1) residuals regression is the basis for the Pedroni cointegration test. If the variables are cointegrated, the residuals should be I (0), and if they are not, they should be I (1). It tests the residuals from the following equation:

$$\hat{\varepsilon}_{it} = \rho_i + \hat{\varepsilon}_{it-1} + \delta_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (4)$$

Considering the within-dimension approach, Pedroni tested the null hypothesis of no cointegration ($\rho_i = \rho = 0$ for all i), against the alternative hypothesis of ($\rho_1 = \rho_2 = \rho_3 \ldots\ldots = \rho < 0$). for between dimensions, Pedroni tested the null hypothesis of no cointegration ($\rho_i = 0$ for all i), against the alternative hypothesis ($\rho_i < 0$ for all i). We also used Kao (1999) panel cointegration test, for which Gutierrez (2003), suggests that it has higher power than other competing tests, especially in a homogenous panel and that, as in our case, the time series length is relatively short. The difference between Kao's test and that of Pedroni's test is that the Pedroni test assumes heterogeneity across cross-sections in the equation.

$$\hat{\varepsilon}_{it} = \rho\hat{\varepsilon}_{it-1} + \sum_{j=1}^{p} \gamma_j \, \Delta\hat{\varepsilon}_{it-j} + \upsilon_{itp} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (5)$$

P denotes the number of the lags chosen to make the residuals in equation (3.5) serially uncorrelated. The ADF test statistic is expressed as the usual t-statistic when $\rho = 1$ in equation (3.5), which is normally and asymptotically distributed. To test whether variables are cointegrated

based on the ADF test statistic, the null and the alternative hypotheses can be written as H_0: $\rho = 1$ and H_1 : $\rho < 1$, respectively. Maddala and Wu (1999) utilized the panel cointegration of Fisher as an alternate method for assessing panel cointegration by combining tests from individual cross-sections to acquire the necessary test statistics for the null hypothesis. This test statistic presents the trace statistics and the maximum Eigenvalue test with the normalized cointegrating equation. The trace statistics and maximum eigenvalue statistics are shown in the equation below.

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{N} \ln(1-\hat{\lambda}_i) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

$$\lambda_{max}(r, r+1) = -T\ln\left(1-\hat{\lambda}_{r+1}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

The null and alternative hypothesis of maximum eigenvalue statistics is checking the r cointegrating vectors against the alternative hypothesis of 1+r cointegrating vectors. Where λ is the eigenvalues; r is the number of cointegrating vectors under the null hypothesis; T is the sample size. For the trace tests, the null hypothesis of a cointegration vector with a rank of less than or equal to r is compared to the alternative hypothesis of a cointegration vector with a rank of r=n.

Panel Vector Error Correction Model (PVECM)

This study adopts a PVECM and Granger causality approach to investigate the impact of TOP and FDI on HD in SSA. Our PVECM to find the effect of TOP and FDI on HD is derived from the function below.

$$HDI = f(TOP, FDI, PGDP, INF, FA) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

Here; HDI, Human development index; FDI, foreign direct investment as a percentage of GDP; TOP, trade openness; PGDP; percentage growth rate per capita GDP; INF, inflation; and FA, foreign aid. If the pre-test of stationarity and cointegration is satisfied, we can develop our PVECM as follows:

$$\Delta Y_{it} = \beta_0 + \sum_{j=1}^{n}\beta_1 \Delta Y_{it-j} + \sum_{j=1}^{n}\beta_2 \Delta X_{it-j} + \lambda ECT_{t-1} + \mathcal{E}_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (9)$$

In equation 3.9, Y_{it} is the dependent variable and X_{it} is the relevant independent variables used to explain the dependent variable. Δ, is represents the first difference operator. i represent countries,

and t represents time under analysis, n is the optimal lag length reduced by one, $\mathcal{E}_{it}$ is the error term and it is used to capture the unobserved effects and is assumed to have zero mean and non-serial correlation. β_1 is the coefficient of the lag of the dependent variable, whereas β_2 are associated with coefficients of the independent variables. ECT is the error correction term. λ is the coefficient of the error correction term of the panel model, which measures the speed of adjustments of the deviation of human development shocks from its long-run equilibrium. It should be significant and negative; otherwise, there will be difficulties inferring the long-run causality. From Equation 3.9, to meet the objective of the study, we can develop our PVECM equation as follows:

$$\Delta HDI_{it} = \beta_0 + \sum_{j=1}^{n}\beta_1\Delta HDI_{it-j} + \sum_{j=1}^{n}\beta_2\Delta TOP_{it-j} + \sum_{j=1}^{n}\beta_3\Delta FDI_{it-j} + \sum_{j=1}^{n}\beta_4\Delta PGDP_{it-j} + \sum_{j=1}^{n}\beta_5\Delta INF_{it-j} + \sum_{j=1}^{n}\beta_6\Delta FA_{it-j} + \lambda ECT_{t-1} + \mathcal{E}_{it} \quad \ldots\ldots\ldots\ldots \quad (10)$$

Where: ΔHDI_{it}= first difference in human development index of country i at a time t. ΔTOP_{it}= first difference in trade openness of country i at a time t. ΔFDI_{it}= first difference in foreign direct investment as a percentage of GDP of country i at a time t. $\Delta PGDP_{it}$= first difference in gross rate of per capita GDP of country i at a time t. ΔINF_{it}= first difference in inflation of country i at a time t. ΔFA_{it}= first difference in foreign aid of country i at a time t. n= is the optimal lag length reduced by one because we were difference from the VAR model to obtain a VECM; by doing so, we lost a lag. $\mathcal{E}_{it}$= is residual in the equation. The above PVECM specification regression results present the short-run and long-run relationships of the variables. ECT_{t-1} is the lagged residual of the cointegrated relationship. It is computed with the normalized long-run coefficient from the cointegrating vector.

$$ECT_{t-1} = HDI_{it-1} - \beta_0 - \beta_1 TOP_{it-1} - \beta_2 FDI_{it-1} - \beta_3 PGDP_{it-1} - \beta_4 INF_{it-1} - \beta_5 FA_{it-1} \ldots(11).$$

The coefficient from β_2 and β_3 is indicated the interest variable TOP and FDIimpact on human development, while the coefficients β_4 to β_6 are the measure of the short-run elasticities of PGDP, INF, and FA, respectively.

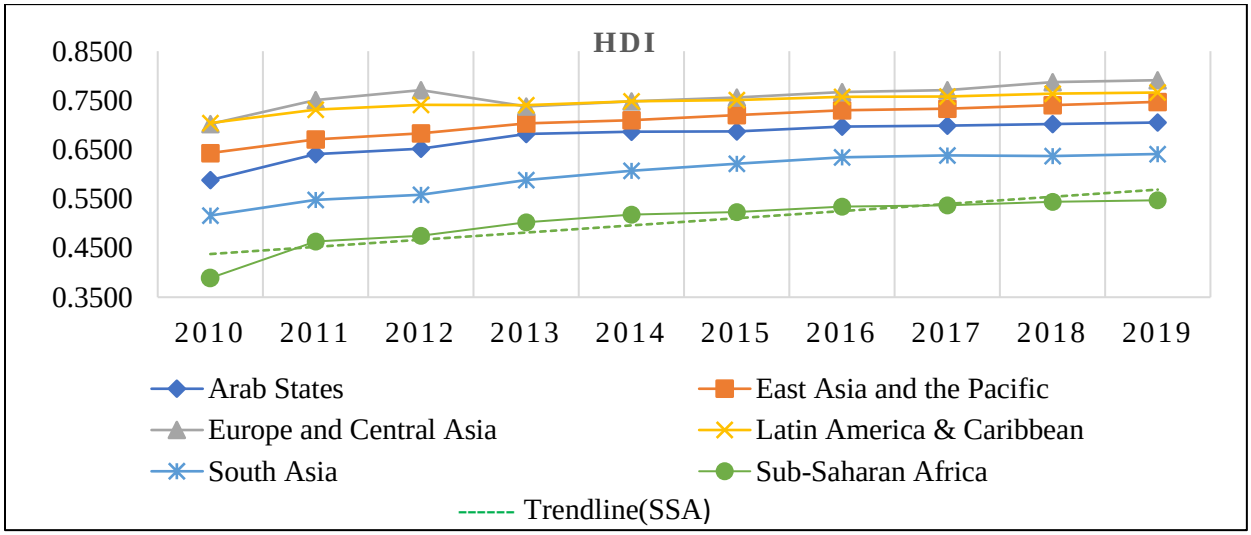
Result and Discussion

Trend of Human Development Index of SSA

Over the course of the study, the HDI of SSA has improved. Nonetheless, as we can see from figure 1, SSA has the lowest HDI when compared to other developing nations worldwide. In 2019, only Mauritius and Seychelles are classified as being in HD groups of very high and high, respectively. The remaining SSA nations fall within the low HD or medium HD category. This raises a crucial query: why is SSA low in human development? What effect do TOP and FDI have on enhancing regional human development? The primary goal or focus of this study is to provide an answer to this issue.

Figure 1

Regional HDI (2010-2019).



Source: Own computation using the data from UNDP

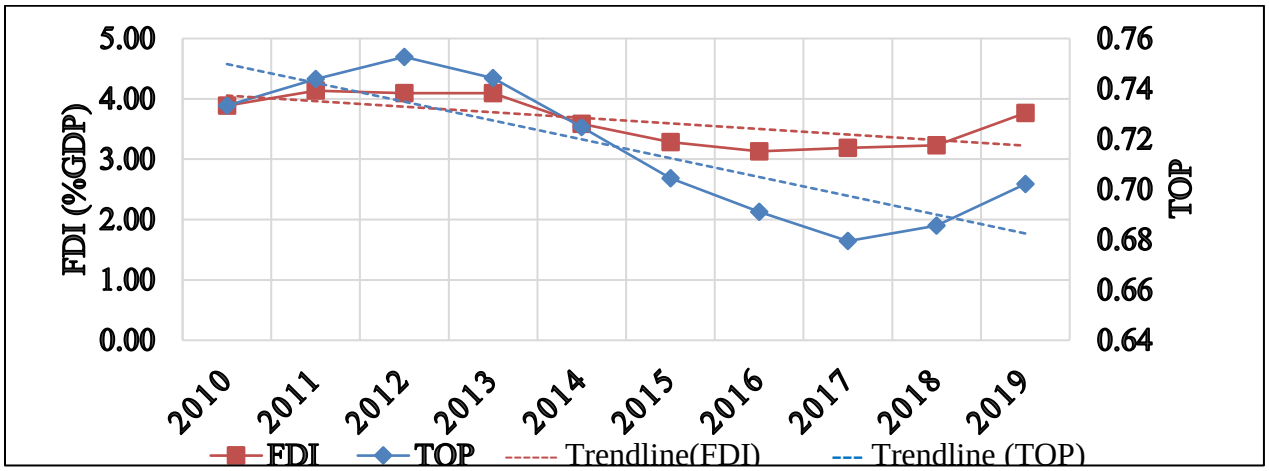
Trend of Trade openness and Foreign direct investment in the SSA region

Because of the South-East Asian nations' remarkable economic success, several Sub-Saharan African nations have pursued trade liberalization policies from the early 1980s (Fankem & Oumarou, 2020). SSA nations are gradually reducing all kinds of trade restrictions, despite the fact that the trend of TOP has slowed down throughout the study period. For instance, the lowest TOP during the study period, 0.68, was reported in 2017, which is still high by comparison. Many SSA

nations have also made efforts to entice FDI, particularly following the resolution of the 2008–2009 global financial crisis (Chen et al., 2015). Figure 2 shows that between 2010 and 2012, the GDP share of FDI flow to SSA increased. Nonetheless, it is dwindling, particularly between 2012 and 2017. This might be brought on by declining competitiveness, declining commodity prices, and a drop-in oil prices among countries with abundant natural resources (UNCTAD, 2016). Due to the rising prices of some commodities in 2018 and 2019, as well as the new discovery of oil in many nations in the region, the influx rose in those years (UNCTAD, 2020). Overall, TOP and FDI of SSA have been on the decline from 2010 to 2019 during the study period.

Figure 2

Trend of TOP and FDI in SSA (2010-2019).



Source: Own computation using data from WDI.

Descriptive statistics

Before estimating the data, it is essential to characterize the characteristics and behaviour of the study variables. Applying the variables to the estimation process should be done in a corrective manner. Some of the behaviour of the variables is described by the result in table 2 below.

Table 2

Summary Statistics

Variables	Obs.	Mean	Median	Maximum	Minimum	Std.
HDI	290	0.5475	0.5328	0.8040	0.3864	0.0838
TOP	290	0.7162	0.6669	1.4120	0.3314	0.2274
FDI	290	3.6399	3.1014	15.3528	-3.8511	2.7032
PGDP	290	1.7947	2.1340	8.4449	10.5470	2.6321
INF	290	127.9758	115.7493	213.5102	100	28.8228
FA	290	5.3188	5.1551	14.9618	0.2208	2.9821

Source: Own Computation using Eview12 statistical software.

As we can see from the above table, all variables in the model are, on average, positive. The average value of the HDI in the region is 0.5475, with a maximum of 0.804 and a minimum of 0.3864. Mauritius had the highest HDI in 2019, while Chad had the lowest in 2010. This average value of HDI indicates that the SSA region is categorized under the low-level or poor categories in terms of the human development categories of UNDP. The average value of TOP is 0.7162.

This average value of TOP is relatively high. For FDI, according to the descriptive statistics, the average level is 3.64 percent of GDP, with a maximum value of 15.3528 in Sierra Leone and a minimum value of -3.8511 in Angola. This suggests that the contribution of FDI to the economic performance of SSA is also low. The average growth in PGDP of the region is 1.7947, while the average rate of INF is 128 percent (calculated based on 2010 =100), which suggests that the average cost of living is high in the region and the average proportion of FA is 5.3188.

Correlation Analysis

Correlation refers to the degree of linear joint movement or relationship between two or more variables. If two or more variables in an econometric model have a correlation of up to 0.95, this can lead to a serious multicollinearity problem (Iyoha, 2004). Table 3 shows the Pearson correlation matrix between the HDI and the whole independent variable in the model. The correlation between HDI and TOP is weakly positive, and the correlation coefficient is 0.386. As this value is lower than 0.5 and statistically significant (p-value = 0.000), there is a weak and

significant positive relationship between HDI and TOP. There is also an insignificant and weak positive association between HDI and FDI with a correlation coefficient of 0.01. Overall, the pairwise correlation analysis shows that the relationship between the variables is weak or that there is no strong correlation between them. This indicates that our model does not have multicollinearity and the problems that come with it. It also shows that the model coefficients are stable and not very sensitive to small changes in the data.

Table 3

Correlation Matrix

Variables	HDI	TOP	FDI	PGDP	INF	FA
HDI	1.000	--	--	--	--	--
TOP	0.386	1.000	--	--	--	--
FDI	0.01	0.257	1.000	--	--	--
PGDP	-0.046	-0.214	0.128	1.000	--	--
INF	0.03	-0.241	-0.13	0.048	1.000	--
FA	-0.518	-0.284	0.329	0.224	0.013	1.000

Source: Own computation using Eview12 statistical software

Test for Panel Unit Root

Before doing any econometric analysis, testing stationarity is the preliminary step because the regression results are supposed to be interpreted if and only if the test for unit root is clearly established. The term "stationary" stand for the mean, variance, and covariance of a series are time-invariant processes (Gujarati, 2004). Unfortunately, most macroeconomic variables are nonstationary. The estimation of a nonstationary dependent variable Y_{it} upon a nonstationary independent variable of X_{it} may lead to false regression results, in which the estimators and test statistics are deceiving (Baltagi, 2013; Gujarati & Porter, 2009). Table 4 shows the level panel unit root test result, whereas Table 5 shows the first difference form panel unit root test results. Both the level and first difference panel unit root test are computed using Levin, Lin, and Chu [LLC (2002)], Im, Pesaran, and Shin [IPS (2003)], and ADF-Fisher Chi-square [F_ADF (1979)] test procedures. However, we preferred the [IPS (2003)] test due to its ability to cater to the individual country's heterogeneity. All these panel unit root tests examine the null hypothesis of a unit root

(nonstationary) with the alternative hypothesis of the absence of a unit root (stationary). The Schwarz information criteria (SIC) are automatically used to select the optimal lag length. As shown in table 4, the results of the LLC, IPS, and F_ADF panel unit root tests suggest that most of the level values of the six variables are panel nonstationary because most of the variables produce a p-value greater than 0.05 for level data. Under the LLC and F_ADF panel unit root test, TOP and PGDP are stationary at level I(0). However, the IPS (the preferred test) does not confirm this result. So, it shows that the data has not reached stationarity at level.

Table 4

Panel Unit Root Test in Level Form

	Test type with individual intercept only					
Variable	LLC	Prob.	IPS	Prob.	F_ADF	Prob.
HDI	-1.35	0.09	0.41	0.66	62.61	0.32
TOP	-4.56	0.00***	-0.64	0.26	91.05	0.004***
FDI	-4.33	0.00***	0.79	0.78	67.90	0.18
PGDP	-7.48	0.00***	-1.02	0.15	83.77	0.02**
INF	-1.09	0.14	-0.06	0.48	108.78	0.00***
FA	-1.99	0.02**	0.76	0.78	64.94	0.25
*** and ** indicate the rejection of the null hypothesis at 1 percent and 5 percent significance levels, respectively.						

Source: Own computation using Eview12 statistical software.

To obtain stationary variables, we need to take the first difference for each variable. According to table 5, since the p-values of the panel unit root test for each variable are less than 5 percent, all panel unit root tests reject the null hypothesis of the existence of a panel unit root for each variable at the 5 percent significance level. We can conclude that our six variables are nonstationary at levels but stationary at the first difference. As a result, the panel cointegration test is applied to see if a long-run relationship exists between the human development index and our independent variables.

Table 5

Panel Unit Root Test in First Difference Form

	Test type with individual intercept and trend					
Variable	LLC	Prob.	IPS	Prob.	F_ADF	Prob.
ΔHDI	-46.00	0.00***	-2.74	0.00***	98.00	0.00***
ΔTOP	-27.97	0.00***	-2.21	0.01**	119.39	0.00***
ΔFDI	-23.55	0.00***	-2.20	0.01**	120.54	0.00***
ΔPGDP	-9.60	0.00***	-3.09	0.00***	104.90	0.00***
ΔINF	-14.71	0.00***	-2.40	0.01**	119.91	0.00***
ΔFA	-15.10	0.00***	-2.05	0.02**	100.08	0.00***
Δ, indicates the first difference operator. *** and ** indicate the rejection of the null hypothesis at 1 percent and 5 percent significance levels, respectively.						

Source: Own computation using Eview12 statistical software.

Test for Panel Co-Integration

Once it is found from the panel unit root test that the variables are nonstationary at a level and they become stationary at the first difference, the next step is to identify the cointegrating relationships between the panel variables. The first step in the cointegration test is optimal lag length selection because the test is lag sensitive. According to FPE, AIC, SC, and HQ information criteria, the optimum lag length is two under the unrestricted panel VAR model. We have also checked the model stability with lag two, using the test roots of characteristic polynomial stability condition tests and autocorrelation using the Lagrange multiplier (LM) test. The results from this two-test showed that the model satisfied both the stability condition and no serial autocorrelation problem at lag two. After we identified the optimal lag length, we checked the panel cointegration test by using three-panel cointegration tests, namely, Pedroni (1999, 2004), Kao (1999) ADF type test, and the Johansen-Fisher panel cointegration test developed by Fisher (1932). For the whole Pedroni, Kao, and Johansen-fisher panel cointegration test, the null hypothesis is that there is no cointegration between the six variables, while the alternative hypothesis is that there is cointegration among all variables in the model.

As displayed in table 6, considering the specification of individual intercept only on the one hand and individual intercept and trend on the other hand, out of the seven Pedroni (1999, 2004) test statistics except for Panel v-Statistic, Panel rho-Statistic, and Group rho-Statistic, the remaining majority of four other tests indicates the rejection of the null hypothesis of no cointegrating equation at 1 percent level of significance. Therefore, we may conclude that our model is, in fact, panel cointegrated. To strengthen the panel cointegration result of Pedroni, the Kao panel cointegration test was further performed. The result from the Kao test also supports the result of Pedroni, which shows the existence of panel cointegration at the 1 percent level of significance.

Table 6

Pedroni and Kao Panel Cointegration Test

Test Methods					
Pedroni Residual Cointegration Test	Panel cointegration Statistics (Within-Dimension)				
		Deterministic trend specification			
	Test statistics	individual intercept		individual intercept and individual trend	
		Statistic	Prob.	Statistic	Prob.
	Panel v-Statistic	-2.4923	0.9937	-3.6618	0.9999
	Panel rho-Statistic	5.9266	1.0000	7.6731	1.0000
	Panel PP-Statistic	-8.1400	0.0000***	-10.8165	0.0000***
	Panel ADF-Statistic	-3.9433	0.0000***	-3.0751	0.0011***
	Group Mean Panel cointegration Statistics (Between Dimensions)				
	Group rho-Statistic	7.5027	1.0000	8.7717	1.0000
	Group PP-Statistic	-30.5336	0.0000***	-41.4331	0.0000***
	Group ADF-Statistic	-6.5055	0.0000***	-12.2378	0.0000***
Kao Residual Cointegration Test	Null Hypothesis	T-Statistic		P-value	
	ADF	-4.6827		0.0000***	
	Residual Variance	0.0003			
	HAC variance	0.0004			
*** indicates the rejection of the null hypothesis of no cointegrating equation at a 1 percent significance level.					

Source: Own computation using Eview12 statistical software.

The results from the Johansen Fisher panel cointegration test in table 7 also show the existence of four cointegrating equations at the 0.05 level of significance. However, only the results of one cointegrating equation are used here to avoid complexity (Brooks, 2019).

Table 7

Johansen_ Fisher Panel Cointegration Test

	Unrestricted Cointegration Rank Test			
Hypothesized	Maximum-Trace		Maximum-Eigen	
No. of CE(s)	Trace Static	Prob.	Max-Eigen Static	Prob.
None *	192.4234	0.0000***	73.6504	0.0000***
At most 1 *	118.7730	0.0000***	44.9413	0.0016***
At most 2 *	73.8317	0.0000***	36.9286	0.0024***
At most 3 *	36.9032	0.0064***	25.7035	0.0106**
At most 4	11.1996	0.1995	11.0238	0.1530
At most 5	0.1759	0.6749	0.1759	0.6749
*** and ** indicate the rejection of the null hypothesis of no cointegrating equation at 1 and 5 percent significance levels, respectively.				

Source: Own computation using Eview12 statistical software.

Panel Vector Error Correction Model Estimation Result

After confirming the existence of a long-run cointegration relationship among the variables, the next step is to run the appropriate panel vector error correction model (PVECM) to find out the long-run and short-run coefficients. The estimated PVECM is presented in table 8, and we evaluate the results of the long-term effects, the differenced short-term effects, and the error correction term in the following sections.

Long-Run Dynamics Result

The long-run relationship is econometrically reflected in the cointegrating equation. It is estimated by eliminating all short-run fluctuations. As a result, the interpretation of the sign of coefficients is inverted in the long run. We set all short-run variables equal to zero and solve the model for the

dependent variable, the human development index. We derive the long-run effect from the following equations:

$$1 * \text{HDI} - 0.4935 - 0.3511\text{TOP} - 0.0187\text{FDI} - 0.0269\text{PGDP} + 0.0016\text{INF} + 0.0194\text{FA}$$

Then, solve for the dependent variable.

$$\text{HDI} = 0.4935 + 0.3511\text{TOP} + 0.0187\text{FDI} + 0.0269\text{PGDP} - 0.0016\text{INF} - 0.0194\text{FA}$$

This equation represents the long-run equilibrium. From the result, in the long run, our two interest variables, TOP and FDI have a positive and significant impact on the human development level of Sub-Saharan Africa. PGDP also has a positive and significant effect, while INF and FA have a negative and significant impact.

The results of the study show that the TOP coefficient is positive (0.3511) and statistically significant at 1%. This finding suggests that economic liberalization in the country and the numerous trade agreements between Sub-Saharan African nations and other governments will have a long-term favorable impact on the region's human development. In the same way that more trade openness may cause prices to decline, it also has a long-term relationship to human development since it allows the region to invest more in human capital through investments in education, health, and training.

In order to compete in overseas markets, domestic companies may be compelled to lower the mark-up imposed on prime expenses in order to increase market share, which would result in a rise in local pricing. People can easily access utilities as a result, especially those in the education and healthcare sectors, because they can buy goods at fair prices. The aforementioned outcome is in line with theories of internal trade that support openness. This is particularly true in light of the endogenous growth theory, which contends that closed economies are less efficient at allocating various production variables than open market economies.

According to Prasad et al. (2007), TOP enables Sub-Saharan African countries to enhance productivity and economic activity in their domestic market, which would lead to a rise in income and the development of their economy. The finding is also consistent with the results of previous studies (Anetor et al., 2020; Asongu, 2014). They found that the effect of TOP on the human development of the region was positive. However, this finding contradicts the results of previous

studies (Goff & Singh, 2013; Huang & Singh, 2011; Jeanneney & Kpodar, 2011; Levine et al., 2007; Rash, 2012). They noted that the effect of TOP on the human development index is either negative or insignificant.

The result also demonstrates that, over time, FDI influx has a favorable and statistically significant effect on the SSA human development index. The FDI coefficient is positive (0.0187), and at one percent, it is statistically significant. It demonstrates how an increase in FDI helps to advance human development. This conclusion is accurate, especially when foreign businesses settle in host nations; they benefit from their presence both directly and indirectly. For instance, they can positively impact their economies by generating new jobs, capital accumulation, and increased tax revenue. By technology transfer, human capital development, knowledge transfer to local businesses and workers, opening up access to overseas markets, and quality enhancement, FDI has also indirectly impacted countries' economies. In this scenario, FDI turns into a useful tool for enhancing citizens' quality of life. Also, the majority of foreign direct investment (FDI) in the area flows to the agriculture sector, which may hire low-skilled employees and enable them to live well. The outcomes of previous investigations (Anetor et al., 2020; Fauzel et al., 2015; Fowowe & Shuaibu, 2014; Gohou & Soumaré, 2012; Magombeyi & Odhiambo, 2017) are corroborated by this finding. Another important variable that increases the region human development, in the long run, is PGDP. The result shows that the coefficient of PGDP is 0.0269, and it is statistically significant at a one percent level of significance. The positive coefficients of PGDP show the importance of economic activity in improving the region human development in the long run.

When an economy is doing well and growing, economic agents will be doing well, which will positively affect the well-being of citizens and public welfare. The other macroeconomic variables, INF and FA, have a negative impact on the human development of Sub-Saharan Africa in the long run. It is obvious that a high level of inflation is not good. Because high inflation would decrease investment, production efficiency, employment, and it discourages saving, which can ultimately affect their whole quality of life if their income is not increased proportionally with the rise in inflation. The coefficient of FA is also negative (-0.019) and is statistically significant at one percent. This means that an increase in FA has led to a decrease in human development in SSA countries. This may be due to the inappropriate use of an aid or assistant. When aid is inappropriately used, it does not meet its intended aim of improving human development in the

SSA part of the earth. This result supports the empirical findings of prior research (Anetor et al., 2020; Chong et al., 2009). Overall, our long-run estimation results are in line with our expectations, except for the effect of foreign aid.

Table 8

PVECM Estimation Result

	Long Run			
Variables	Coefficient	Standard error	t-statistics	Probability
HDI_{-1}	1			
TOP_{-1}	-0.3511	0.0726	-4.8343	0.0000***
FDI_{-1}	-0.0187	0.0063	-2.9699	0.0032***
$PGDP_{-1}$	-0.0269	0.0059	-4.5452	0.0000***
INF_{-1}	0.0016	0.0006	2.5139	0.0124**
FA_{-1}	0.0194	0.0056	3.4720	0.0005***
C	-0.4935			
	Short Run			
Variables	Coefficients	Standard error	t-statistics	Probability
ECT	-0.0218	0.0060	-3.61469	0.0003***
ΔHDI_{-1}	0.6104	0.0533	11.4443	0.0000***
ΔTOP_{-1}	-0.0013	0.0149	-0.08876	0.9293
ΔFDI_{-1}	0.0001	0.0009	0.14752	0.8827
$\Delta PGDP_{-1}$	0.0005	0.0008	0.67087	0.5024
ΔINF_{-1}	0.0003	0.0001	2.07641	0.0380**
ΔFA_{-1}	-0.0027	0.0014	-2.02960	0.0426**
C	-0.0008	0.0011	-0.75733	0.4490
	Diagnostics Test			
$R-squared$	0.483159	Adjusted $R-squared$		0.467008
S. E. of regression	0.012010	Mean dependent var		0.001771
Akaike AIC	-5.972249	S. D. dependent var		0.016451
Schwarz SC	-5.853396	Durbin − Watson stat		2.021545
$Chi-sq$	841.6139	$P(Chi-sq)$		0.1381
$F-statistics$	29.91462	$P(F-statistics)$		0.0000

***, and ** indicate significance at 1 and 5 percent levels, respectively; in the short-run model Δ, denotes the first difference operator.

Source: Own Computation Using EViews 12.

Short-Run Dynamics

Table 8 also presents the short-run results in which ΔHDI is the dependent variable. The following error correction model is estimated to examine the short-run effects of HDI, TOP, FDI, PGDP, INF, and FA in Sub-Saharan African countries from 2010 to 2019.

$$\Delta HDI_{it-1} = \beta_0 + \beta_1 \Delta TOP_{it-1} + \beta_2 \Delta FDI_{it-1} + \beta_3 \Delta PGDP_{it-1} + \beta_4 \Delta INF_{it-1} + \beta_5 \Delta FA_{it-1} + \lambda ECT_{it-1} + \epsilon_{it}$$

Where β_0 is a constant term and $\beta_1, \beta_2. \beta_3, \beta_4,$ and β_5 are the short-run coefficients of TOP, FDI, PGDP, INF, and FA, respectively. λ is the coefficient of ECT (error correction term), which measures the speed of adjustment towards long-run equilibrium; i is the cross-sectional index for the Sub-Saharan African countries, while t indicates the time.

Our short-run error correction model result indicates that human development for a certain period was positively affected by the human development of the previous year, with an estimated coefficient of 0.6104 (p-value 0.0000). The positive effect of human development on itself indicates that the governments or countries' efforts to increase human development have been relatively successful. Our interest variables, TOP and FDI have no significant effect on the human development index of the region. However, in the short run, we have obtained an interesting result of the positive (0.0016) effect of INF on the human development index of the region with a significance level of one percent. In the short run, regarding the effect of INF, this study supports the notion of the Tobin effect and Philips Curve theories.

The Tobin effect notation states that either inflation causes people to trade money for other interest-earning assets or that inflation motivates people to engage in various income-generating activities. Hence, inflation has a beneficial effect on both economic expansion and human development. The Philips curve theory demonstrates the inverse relationship between inflation and unemployment, whereby efforts by the government to eliminate unemployment result in an increase in aggregate demand, which, when supply is held constant, raises prices generally (Mankiw, 2003). So, when the cost of commodities rises, many people start their own businesses and make money, which they then reinvest to make even more money. By doing this, they increase employment and lower unemployment.

The Philips curve also shows that inflation has a beneficial effect on raising the standard of living, assuming that low unemployment is a sign of an increased standard of life. Keynesian economists arrived at a similar conclusion during the Great Depression. Notwithstanding the notion that raising the quantity requested at a fixed supply level will result in higher prices and, ultimately, inflation, Keynesian thinkers recommended increasing expenditure in order to strengthen the economy and encourage growth during the Great Depression. Inflation will, however, seriously impair the region's economic and human development if it continues for more than a generation.

As we have discussed earlier, we have obtained a negative and significant effect of INF on the region human development in the long run. As we mentioned in the long-run estimation, FA has a negative and statistically significant effect on the human development of Sub-Saharan Africa in the short run. From the diagnostics test of table 8, we can see that the adjusted R squared value of the panel vector error correction model is 0.467, suggesting that 46.7 percent of the systematic variations in the human development index of Sub-Saharan Africa are captured by all the independent variables in the model. The F-statistic (29.91) and corresponding p-value (0.0000) indicate a significant relationship between the human development index and all the independent variables or that the explanatory variable jointly explains the total variation in human development in the region. The Durbin-Watson statistic of 2.02 indicates no autocorrelation in the residual.

Error correction term

The error correction term coefficient value is -0.0218, which is negative as expected and statistically significant at one percent. This implies that any short-run shock will gradually converge to the long-run equilibrium. It also shows a causal relationship between independent and dependent variables.

Causality test

After examining the short-run and long-run relationships, the next estimation consists of inspecting the direction of causality among HDI, TOP, FDI, PGDP, INF, and FA. Our result from the panel cointegration test was strong evidence of the existence of long-run relationships among variables in the model, which also means that Granger causality exists in at least one way (Engle and Granger 1987). However, the cointegration result does not show the direction of causality, so to determine

the direction of causality, we applied the Granger causality test based on the result of PVECM. Unlike the usual Granger causality test, the test based on the result of PVECM can identify sources of causation and distinguish between a long-run and a short-run relationship in the series.

Table 9 below indicates the causality result, which is organized into two parts. The first shows the output of the short-run causality, and the second displays the long-run causality represented by the error correction coefficients. The long-run Granger causality is confirmed by the negative sign and significance of the ECT coefficient. The short-run Granger causality is performed through the Wald $\chi 2$ statistics. Chi-Square statistics and probability values are constructed under the null hypothesis of no Granger causality and the alternative hypothesis of the existence of Granger causality; significant probability values imply the rejection of the null hypothesis. As we can see from the table, in the short run, we find the existence of bidirectional Granger causality between foreign direct investment and per capita GDP (FDI↔PGDP). And there is evidence of unidirectional Granger causality from inflation to human development index (INF→HDI), foreign aid to human development index (FA→HDI), inflation to foreign direct investment (INF→FDI), and per capita GDP to inflation (PGDP→INF).

In the long run, when HDI is treated as a dependent variable, the coefficient of ECT is negative and statistically significant at the 1 percent level. This implies that trade openness, foreign direct investment, per capita GDP, inflation, and foreign aid Grange-Cause human development index in the long run. But when TOP, FDI, PGDP, INF, and FA are used as the dependent variable, the coefficient of the ECT term is not negative, which is not a good sign for the model. This implies the instability of the model, which is not reasonable, and the model is not converging in the long run in this case. The result indicates that there is only a unidirectional relationship between the dependent variable (HDI) and the independent variable (TOP, FDI, PGDP, INF, and FA) in the long run.

Table 9

Block Exogeneity Wald Granger Causality Test Based on PVECM Result

	Short − run ($\chi 2$ − stats)Independent Variable						Long run
Dependant Variable	ΔHDI	ΔTOP	ΔFDI	ΔPGDP	ΔINF	ΔFA	ECT (t − stat)
ΔHDI		0.008 (0.929)	0.022 (0.883)	0.450 (0.502)	4.311** (0.038)	4.119** (0.042)	-0.022*** (0.000)
ΔTOP	0.655 (0.418)		2.694 (0.101)	0.319 (0.572)	1.320 (0.251)	0.102 (0.749)	0.088 (0.000)
ΔFDI	0.577 (0.448)	0.288 (0.591)		4.549** (0.033)	4.372** (0.037)	0.471 (0.492)	1.249 (0.007)
ΔPGDP	0.448 (0.503)	0.004 (0.949)	10.541*** (0.001)		1.975 (0.160)	1.010 (0.315)	2.722 (0.000)
ΔINF	0.910 (0.340)	1.314 (0.252)	0.035 (0.852)	8.638*** (0.003)		0.141 (0.708)	0.067 (0.979)
ΔFA	2.832 (0.092)	2.772 (0.096)	3.811 (0.051)	2.084 (0.149)	0.005 (0.945)		0.109 (0.592)

Δ Denotes the first difference operator, numbers in bracket ( ) indicate the respective p-values, *** and ** represent the significance of coefficients at the 1 and 5 percent significance levels, respectively.

Source: Own Computation Using EViews 12.

Conclusions and Implications

The study main objective was to empirically analyse the short-run and long-run impacts of trade openness and foreign direct investment on the human development of 29 Sub-Saharan African countries. We used annual panel data obtained from the World Bank database (WDI), UNCTADSTAT, and IMF for 2010-2019.

Before doing any regression analysis, we have checked the stationarity of all variables using a three-panel unit root test, namely, Levin, Lin, and Chu [LLC (2002)], Im, Pesaran, and Shin [IPS (2003)], and ADF-Fisher Chi-square [F_ADF (1979)]. Our three-panel unit root test indicates that the variable is not stationary at level; instead, it becomes stationary after taking its first difference, i.e., our six variables are integrated of order one. After the unit root test, we performed the panel cointegration test of variables. Our panel cointegration test results using Pedroni, Kao, and Johansen Fisher confirm the existence of a long-run relationship among the panel variables in SSA. Following the cointegration properties of the variables, the study employed the PVECM technique to investigate the effect of TOP and FDI on the human development of Sub-Saharan African economies.

Our research using PVECM has confirmed the hypothesis that TOP and FDI have a favorable and statistically significant impact on the overall human development of Sub-Saharan African countries as measured by education, health, and standard of living. This is considering the countries examined over the long term. The study's findings also suggest that while inflation has a major negative influence on SSA countries' human development over the long term, per capita GDP growth has a favorable benefit. The coefficients of our interest variables TOP and FDI, however, are inconsequential in the short term. Our findings show that foreign aid has a detrimental impact on the region's human development over the long and short terms.

According to our panel granger causality test, TOP and FDI have no causal effect on human development in the near term. Yet, the research discovered a long-term unidirectional Granger causality that connected all independent variables to the human development index. Following are some policy ramifications of this study's findings for the long-term enhancement of human development in Sub-Saharan African nations. First, implementing effective (yet non-restrictive) policy tools and fostering favorable environments to draw significant FDI to the region and encourage its foreign investors to engage in more welfare-building activities are suggested by our results as a way to advance the human development of the regions.Second, our findings suggest that regional policymakers craft measures to lower tariff and non-tariff trade barriers and ease the flow of products and services between nations by expanding trade agreements. Thirdly, in order to have a better impact on human development, development partners should link their aid to the development of social sectors like education and health rather than concentrating on addressing humanitarian needs. Fourth, the regional administration should support additional study and

knowledge sharing to better understand how TOP and FDI affect the region's ability to advance human development.

This study does have some drawbacks, though. One significant drawback is that the empirical analysis of our model has not taken into consideration sectoral changes in the variables and has instead used thorough studies of the link between TOP, FDI, and human development. Furthermore, not all cross-country variances are taken into consideration in the study. For instance, differences in a country's level of national income, culture, labor force, political environment, and other factors could affect how TOP and FDI affect human development. The examination of a complex research topic in this study only considered a small number of factors, which is the study's final shortcoming.

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