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**The Impact of COVID-19 on the Relationship between Foreign Direct  
Investment and Sustainable Development**

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## **Abstract**

This study measures the role of COVID-19 on the nexus between FDI and sustainable development in SSA. The empirical analysis relies on a panel data from 38 SSA countries, covering 2000 – 2022. The findings suggest that during this period, FDI minimally effected economic growth and development. Specifically, FDI does not have a significant impact on sustainable development in the linear estimates, and a negative effect in the non-linear estimates. When the effect of FDI is further analysed on economic growth, the environment, and human development, the estimates remain consistent. While COVID-19 reduces the levels of economic growth, the environment, human development, and sustainable development, the moderating effect shows that FDI reduces the negative effect of COVID-19 on economic growth and sustainable development. Finally, it is observed that rule of law promotes sustainable development; financial development does not exert a significant connection with sustainable development, and negatively affects economic growth and human development, yet the interaction effects of economic growth and financial development on sustainable development is statistically insignificant. Appropriate policies are discussed.

## **Keywords**

foreign direct investment

sustainable development

coronavirus disease

instrumental variables regression

## **JEL Classification**

C26

F21

Q01

## 1. Introduction

The coronavirus disease (COVID-19) is the largest shock the global economy has suffered in decades (World Bank, 2020). In a general sense, pandemics inflict harm on both the demand and supply sides of the economy. Unsurprisingly, COVID-19 triggered severe demand-side and supply-side contractions, leading to lower investment, erosion of human capital, worsening poverty and job losses (Millard, 2020). This means, prospects for the global economy and development have been adversely affected. Also, the progress towards the sustainable development goals (SDGs) ante COVID-19 had been slow, and the pandemic has generated even more hindrances as inequalities have intensified, the quality of education has been impaired, and the global economy has contracted (Tonne, 2021). As a result, there have been income losses to vulnerable families and households in low-income economies, which may mean further spikes in poverty and reduced healthcare access even far beyond the COVID-19 pandemic (Evans & Over, 2020).

As the global economy moves towards the borderlines for the achievement of SDG, output growth has been projected to decline to 1.9% in 2023 (from an estimated 3% in 2022), making it one of the lowest growth rates recorded in recent decades. Nonetheless, the waves of COVID-19 still reverberate, while the climate crisis persistently subject many countries to massive humanitarian crises and economic damages caused by wildfires, heat waves, hurricanes and floods (United Nations, 2023). Despite surveillance, testing, sequencing and vaccination gaps can still leave opportunities for a new variant to emerge, even as more countries have reduced the pandemic-related restrictions (WHO, 2022b). Apart from the direct health and economic costs of COVID-19, several developing economies are now confronted with unprecedented reduction in some commodity prices, unexpected stops and reverse of capital inflows, as well as drastic devaluation of local currencies. While, in the short-run, the increased difficulty of access to foreign finances has substantially limited Government mitigation of the abrupt health and economic consequences of the pandemic, the interconnected shocks may result in severe balance of payments crises, at least in the medium term (Franz, 2021).

These financial imbalances may delay and extend the period of economic recovery from the pandemic as periods of extended lockdowns have raised both corporate and government debts, while foreign investment declines sharply (Wang & Huang, 2021; Donthu & Gustafsson, 2020). Similarly, the global pandemic is reversing economic globalisation due to both demand and supply shocks caused by containment measures; hence, the global production networks witnessed an unprecedented disruption. This has severely impacted multinational enterprises (MNEs) globally as the prevailing global value chains relied upon by the bulk of MNEs have been majorly disrupted, while several supply and demand shocks threaten the capability of numerous businesses (Nawo & Njangang, 2021).

Africa in particular has experienced adverse events described above (see EIU, 2022). The majority of the region's economies are dependent on primary products, with high revenue volatility. Thus, economic diversification – arguably the most feasible approach to sustaining their prosperity and survival when faced with uncertainties and vulnerabilities – was already compromised by the volatility in commodity prices and the negative effects of shocks, such as global financial crisis (GFC) and COVID-19, leading to disruptions in international trade (see UNCTAD, 2022b). Africa was estimated to be hard hit, with the largest level of contraction (OECD, 2020a). Even with some of the lowest confirmed cases and deaths relative to other regions<sup>1</sup>, the region was at a high risk because of its relatively low capacity for the management of health emergencies. The economic effect of the pandemic on the region was significant because of its high reliance on advanced economies that have been severely affected by the pandemic (see Lone & Ahmad, 2020). More so, many countries in Sub-Saharan Africa (SSA) had existing political and social challenges, which have exacerbated the severe impacts of COVID-19 (Fagbemi, 2021).

Because of underdeveloped healthcare facilities in Africa and the diversion of health system resources to the pandemic response, COVID-19 has resulted in serious disruption of health services (WHO, 2022a). The inequality of vaccines is another major concern; the level of (full) vaccination in the continent is far below other regions. Again, repeated and severe climate shocks have raised socioeconomic costs and eroded real incomes; the resulting economic slowdown has increased the proportion of Africans living below the extreme poverty level to 17.2% in 2020. Furthermore, the economy is projected to stay subdued, given the uncertain and volatile global environment compounding domestic challenges, and the output growth is expected to decline from 4.1% in 2022 to 3.8% in 2023 (United Nations, 2023).

Given its significant proportion in the overall capital flows, FDI could be regarded as the herald of economic development because of its propelling force in bridging domestic saving – investment gap. This relies on the assertion that FDI triggers both the demand-side effects – by increasing human capital accumulation via technology transfers, spillovers, and physical capital investments – and the supply-side effects – by promoting the level of education via change in employment and wage structures (see, e.g., Fagbemi & Osinubi, 2020). Besides, with advanced technologies, managerial and marketing expertise, improved financial resources and quality of local institutions, as well as its spillover effects on local firms, FDI enhances economic development in the host country (Long et al., 2015). It also enhances the productivity of local firms and boosts their integration into international markets (Qiang et al., 2021).

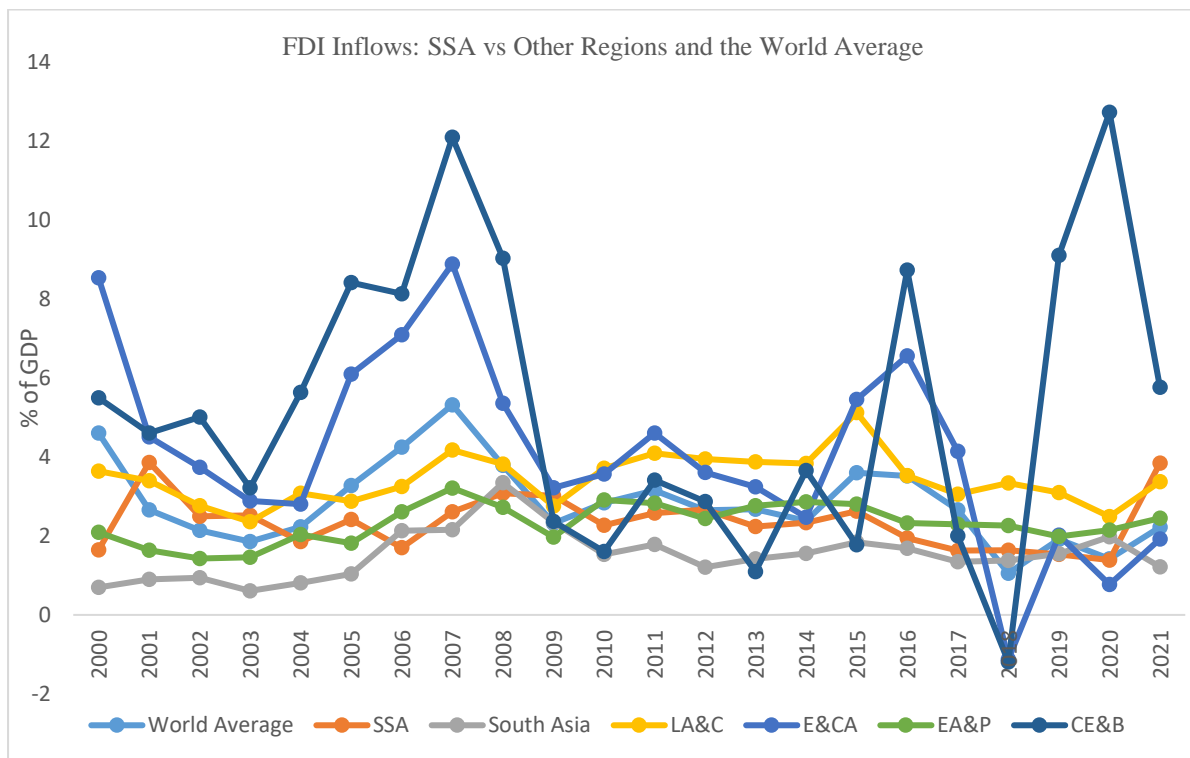
This COVID-19 pandemic has, however, turned around the global patterns of trade and investment by setting a reversal point for the hitherto globalised economies. This has hugely impacted all forms of economic globalisation and the inflow of foreign capital, thus altering the fundamental projections to the international economy. Although it rose to \$1.58 trillion in 2021,

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<sup>1</sup> see Appendix B

the global FDI flow in 2020 was below \$1 trillion and the SDG investment was significantly affected, with double-digit reductions in almost all the sectors (UNCTAD, 2022a). The developing countries are more vulnerable to economic shocks and, therefore, more affected by the pandemic than the developed ones because of their lower resilience capacities. As such, they face difficulties in meeting their financial needs as COVID-19 manifested in slower economic activities, reduced foreign investments, and worsening socio-economic inequalities. While mobility restrictions may have enhanced the attainment of SDGs 12 (responsible consumption and production) and 13 (climate action), some more goals have been adversely affected (e.g., SDG1: no poverty; SDG2: zero hunger; SDG3: good health and wellbeing; SDG8: decent work and economic growth; and SDG10: reduced inequalities) (see Joshi et al., 2021).

**Figure 1. FDI inwards in SSA in relation to some other regions' receipts**



Source: Authors' computation from the World Bank dataset

The flow of FDI to Africa hit a record \$83 billion in 2021, which is more than double that reported in the previous year when COVID-19 weighed deeply on investment flows to the region. Notwithstanding the strong growth, this flow of investment to the region is only 5.2% of the global FDI – a rise from 4.1% in 2020. Besides, the aggregate Greenfield investments<sup>2</sup> stayed depressed, at \$39 billion, with only a modest recovery from the low of \$32 billion in 2020 (a downward trend from \$77 billion in 2019). In terms of the sub-regions, West Africa, Southern Africa, and

<sup>2</sup> Greenfield investment defines both new projects and expansions by individual overseas investors

East Africa recorded increases in investment flows, while the flows to Central Africa remained flat and North Africa registered a decline (UNCTAD, 2022a). Also, as much as this form of capital flow promotes investments and finances deficits in an economy's current account, it may equally reduce her competitiveness, thus hampering growth and sustainable development (Naceur et al., 2012). This perverse economic effect tends to create a stalemate for governments and policymakers in the management of such inflows.

Africa's recovery from the health and economic effects of the pandemic has been rather costly, given that global demand and rising oil prices have largely advanced her macroeconomic fundamentals. As a result of the COVID-19 pandemic, some 30 million Africans transitioned into extreme poverty while about 22 million jobs were lost in 2021, the trend of which may persist through 2023 (African Development Bank, 2022). While FDI is essential to prompt economic recovery from the effects of COVID-19, its inflow into the region and participation in global value chains remains comparatively low. This underlies the need for more external investment in export-oriented and employment-intensive sectors (Qiang et al., 2021). Furthermore, the inflow of FDI into SSA has, for most periods, been comparatively low relative to other regions and the world average, but recorded a sharp increase in 2021 even in the middle of COVID-19 (refer to Fig. 1). Despite these positive indicators, unless clean technologies are applied in production, this increased FDI inflow may deepen environmental degradation and worsen the level of poverty, thus hampering sustainable development (see Akinlo & Dada, 2021). Again, besides the year 2021, the ratio falls short of other forms of capital inflow, including remittances and foreign aid<sup>3</sup>. While this may be attributed to many factors as evident in previous studies, such as dearth of infrastructure (Asongu & Odhiambo 2020), and inefficient institutions (Arogundade et al., 2021), it is more pertinent to examine the empirical role of the COVID-19 pandemic on the relationship between FDI and sustainable development, hence this study is novel.

The superiority of sustainable development indicators vis-à-vis other development measures used in the extant literature is premised on its concerns for development now and in the future. In the words of Kevin Urama<sup>4</sup>, the Vice President and Acting Chief Economist of The African Development Bank: "Climate change is the most existential challenge to Africa's development today. Finding policies that address climate adaptation and mitigation of greenhouse gas emissions while ensuring social and economic development is one of the most enduring policy challenges of our time". The use of sustainable development is particularly relevant in African literature, since the current growth in the region is achieved at the cost of environmental quality, which tends to worsen the loss of biodiversity, food security, and pollution-related mortalities (see Ofori et al., 2023). As evidenced in Lone and Ahmad (2020), China, United States and the European Union, India, and Russia are some of the largest CO<sub>2</sub> emitters in the world. While Africa contributes the least (given her relatively low CO<sub>2</sub>

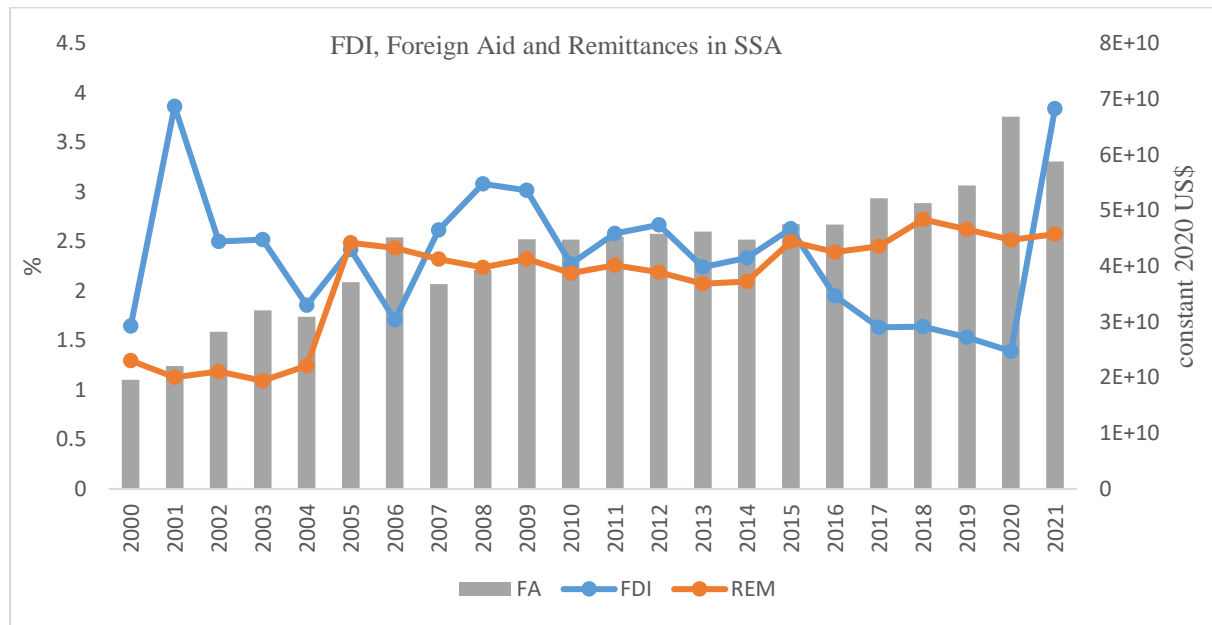
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<sup>3</sup> Refer to Fig. 2

<sup>4</sup> See African Development Bank (2022)

emissions per capita), the continent suffers significantly for climate-related adversities, ranging from infectious diseases to economic growth and sustainable development. As such, Africa is excessively affected by climate change to which she loses 5% - 15% of her GDP (see African Development Bank, 2022).

**Figure 2. FDI, Foreign aid and Remittances (all inwards) in SSA**



Source: Authors' computation from the World Bank dataset

The findings of this study provide important policy directions, not just for the SSA but also for other regions to draw insights, especially on how the pandemic impacted the relationship between FDI and economic development. They add to the stock of empirical solutions and first aid to possible economic adversities, should there be any similar shock on the SSA or the global economy in the future. In addition, the concern for the environment that defines the term sustainable development also infers the relevance of this study in providing reasonable decisions on environmental quality, both in the SSA region and globally.

In the second part of this study, the literature review is presented. Other sections are 3, 4, and 5, respectively, for data and methodology, empirical analysis, and conclusion.

## 2. Literature Review

One of the main underlying theories connecting the inflow of capital to growth and development is the two-gap model. Chenery and Stout (1966) asserts that foreign capital inflows complement domestic resources as a number of developing economies are constrained with inadequate savings and/or foreign exchange to finance investment and imports, respectively. Where domestic investment hinders economic growth, a savings gap exists; a

foreign exchange gap exists where imports exceed exports. International financing, such as FDI, is therefore necessary in clearing any of these gaps to achieve targeted rates of growth. Three hypotheses further define the theoretical connections between FDI and economic growth, as explained in Sunde (2017) and some others. It is possible that FDI enhances economic growth when it is linked with such factors as human capital and technology transfers (FDI-led growth hypothesis), while the latter may stimulate the former due to a potentially high profitability from increased aggregate demands and (foreign) investments (growth-led FDI hypothesis). The feedback hypothesis proposes an interdependence between the two variables, as improved economic growth tends to promote FDI inflows (and vice-versa).

As much as this theoretical exposition holds, some researchers are of the opinion that FDI may not produce the desired effects on growth and development without the efficiency of the host economy's absorptive capacity. For example, Long et al. (2015), and Nejati and Bahmani (2020) suppose that the extent of FDI spillovers relies on the absorptive capacity of the host economy to promote technology transfers, among other spillovers. Therefore, there may be negative impacts on the economy if the inflow of FDI lacks productivity spillovers. In explaining the nexus between FDI and economic growth and the conditions necessary for this relationship, Singh (2021) relies on the neo-classical and endogenous growth theories. While the former (advanced by Solow, 1956; Swan, 1956) contends that FDI promotes long-run economic growth by expanding the level of technology, the latter (see Romer, 1993; Borensztein et al., 1998) discusses the need for supportive domestic environments to sustain the growth process. Hence, FDI can both widen the host countries' capital (through the accumulation of more capital for investment) as well as improve their productivities via human capital development, technology transfer, and linkages of local firms with foreign networks – capital deepening (see, e.g., Cao et al., 2017).

Given the role of policy (un)certainty in the attractiveness of FDI, Nguyen and Lee (2021) measure the effects of financial development and uncertainty on FDI in 116 economies, between 1996 and 2017. Their estimates suggest that even though improved financial development raises FDI inflow, policy uncertainty reduces it. In relation to the business cycle, Doytch (2021) estimates the behavioural patterns of sectoral FDI in 19 Eastern European and Central Asian economies, for the period 1993–2011. The author finds that besides the services FDI inflows that rise during economic contractions and fall during expansions (countercyclical), the other FDI inflows do not change in relation to the business cycle.

With the recent pandemic, Nawo and Njangang (2021) observe the impact of COVID-19 outbreaks on FDI and how Sovereign Wealth Funds (SWFs) affect the relationship in 79 developing and developed economies. Based on the estimates from a cross-sectional OLS technique, the researchers claim that both the total cases and the total number of deaths are inversely correlated with FDI. Besides, COVID-19 is found to significantly reduce FDI in countries without SWFs, but the effect is non-significant in countries with SWFs. Similarly, Nwosa (2021) measures the effects of COVID-19 on stock market performance, exchange rate,



oil price, and its implications for FDI inflow in Nigeria. Based on daily data spanning 1 December 2019 to 31 May 2020, the researcher observes that COVID-19 negatively affects each of the variables, even more than the 2009 and 2016 global recessions, thus having implications for FDI inflow into the country.

In other empirical estimates, Sunde (2017) measures the impact of FDI and exports on the growth of the South African economy and obtains that FDI stimulates economic growth, while a unidirectional causality running from FDI through economic growth is established. In another aspect of development, Fagbemi and Osinubi (2020) observe the connection between FDI inflow to Nigeria and human capital development. Their estimates reveal that the effect of FDI on human capital development is significant in the short-run, but not in the long-run. While a unidirectional causality running from human capital to FDI is obtained, the asymmetric effects suggest that a long-run increase in FDI inflows to a certain rate may well raise the level of human capital development in Nigeria. Likewise, Ofori et al. (2023) evaluate the impacts of FDI and economic freedom on inclusive green growth (IGG) in 20 SSA countries. The researchers obtain that, unconditionally, FDI does not exert a significant effect on growth, and that inadequate economic freedom in SSA causes FDI to reduce inclusive green growth.

In another dimension, Akinlo and Dada (2021) study the role of FDI on the link between environmental degradation and poverty reduction using a panel of 39 SSA countries. They find that FDI largely contributes to poverty reduction. Besides, the interaction effect of FDI and environmental degradation mainly depends on the measures adopted: it fails to stimulate poverty reduction when poverty is measured by household final consumption expenditure. But when the human development index (HDI) is used as a measure of poverty, the interaction effect enhances poverty reduction, and is harmful to poverty reduction when poverty is measured by life expectancy. Also, Asongu et al. (2019) explore the relevance of external flows on inclusive human development in a panel of 48 SSA countries and establish that stimulating FDI has a net negative effect on inclusive development, and a threshold value of 33.3 (% of GDP) is required for FDI to turn to a positive net effect on inclusive human development.

Looking forward, Dhrifi et al. (2020) observe the connection between FDI, CO<sub>2</sub> emissions, and poverty for a panel of 98 developing economies (covering Africa, Asia, and Latin America), spanning 1995 – 2017. Their empirical findings suggest a significant negative nexus between FDI and poverty for other regions, except Africa; a negative relation between FDI and CO<sub>2</sub> emission in Africa; an inverted U-shaped nexus between FDI and CO<sub>2</sub> emissions in Asia; and a positive connection between FDI and environmental quality in Latin America. Also, their global estimates suggest a reverse causality between FDI and poverty, and between CO<sub>2</sub> emissions and poverty; but a unidirectional causality running from FDI through CO<sub>2</sub> emissions. More so, Waqih et al. (2019) study the contributions of FDI, economic growth, and energy consumption on CO<sub>2</sub> in South Asia. Among their major findings, the researchers observe that FDI raises CO<sub>2</sub> emissions in the short-run but reduces it in the long-run. Moreover, Sung et al. (2018) observe the impact of FDI on CO<sub>2</sub> emissions in 28 Chinese manufacturing

subsectors, from 2002–2015, based on System GMM estimators. Their empirical findings support the case that FDI stimulates environmental quality by advancing environmental-friendly technologies, thereby providing real benefits to the host economy.

Udemba and Yalçıntaş (2021) also investigate the role of FDI and natural resources on environmental performance in Algeria. Based on data spanning 1970 – 2018, the researchers show evidence of negative effects of economic growth and excessive fossil fuels use, though FDI is confirmed to positively impact the environment. Moreover, Deng et al. (2022) evaluate the effects of FDI, social globalisation, and finance on environmental pollution in 107 economies, based on threshold regression. Their empirical estimates indicate that FDI raises and reduces air pollution after and before the threshold level in the overall panel, the upper-middle-income and the low-income sub-panels; it raises environmental pollution before and after the threshold in lower-middle-income economies. Also, financial development raises and reduces environmental pollution, respectively, before and after the threshold levels.

In contrast to these, Singh (2021) evaluates the long-run connection of trade and FDI to economic growth in India (from 1991 to 2019) and observe that while FDI is adversely linked to economic growth, both the long-run and the short-run unidirectional causality exists from economic growth through FDI. Similarly, Cao et al. (2017) explore the impact of FDI on inequality-adjusted human development index in 23 Asian countries, covering 2013 – 2015. Their empirical estimates reveal that the effect of FDI on human development is not significant and FDI is observed to promote income inequality even though it reduces inequality in education. Further, Shahbaz et al. (2018) explore the roles of FDI, economic growth, financial development, energy research innovations, and energy consumption on CO<sub>2</sub> emissions using French data spanning 1955 – 2016. Their empirical findings upholds that a positive relationship exists between FDI and CO<sub>2</sub> emissions; energy research innovations and financial development exert a negative effect on CO<sub>2</sub> emissions; while consumption of energy is positively connected with CO<sub>2</sub> emissions.

Some other studies are of the opinion that the benefits of FDI to economic growth and/or development do not occur automatically, but through the absorptive capacity of the host country(ies). Among these studies, Arogundade et al. (2021) examine the role of absorptive capacity on the nexus between FDI and inclusive human development in 28 SSA countries, from 1996 to 2018. Employing a panel smooth transition regression (PSTR) model, the authors ascertain that the impact of FDI is nonlinear and that it is only positive on a threshold level of institutional quality and infrastructure. Similarly, Asongu and Odhiambo (2020) investigate the moderating role of information and communication technology (ICT) on the nexus between FDI and economic growth dynamics in 25 SSA countries. Applying the GMM estimator on the data for the period 1980–2014, their study finds that both the mobile phone and the internet penetrations stimulate the impact of FDI on the overall positive net effects of the dynamics of economic growth. In a similar sense, Aziz (2018) observes that institutional quality exerts a positive impact on economic growth. Applying a system GMM technique on 16 Arab countries,

between 1984 and 2012, while measuring the impact of institutional quality on the inflows of FDI, the empirical findings support that the ease of doing business, economic freedom, and the international country risk guide (ICRG) measures have a significant and positive linkage with FDI.

As much as it is evident that COVID-19 has affected the global health and economic well-being, its mediating role on the nexus between FDI and sustainable development has not been found in the public space. Even though there have been few empirical studies on the effect of the pandemic on FDI (see, for instance, Nawo & Njangang, 2021; Nwosa, 2021), and on economic growth (see, for example, Inegbedion, 2021), there is a need to establish an empirical channel through which economic development is impacted, as a result of which this study is novel. With respect to SSA and other developing economies, Wang and Huang (2021) support that even though the scope of research on COVID-19 is extensive, the depth of research on the subject is inadequate as it is more focused on advanced economies, whereas the effect of the pandemic on sustainable development is more critical in developing countries. Hence, this research is important for development policy in SSA as the region is among the least developed, with poor welfare distribution. Besides, it has suffered some of the worst environmental challenges and related adversity, especially with the complications of the COVID-19 pandemic. As part of this novelty, therefore, the index of COVID-19 is extracted from the World Uncertainty Index database (WUI) by Ahir et al. (2020) for the empirical estimation.

Besides, there have not been sufficient studies, to date, that measure the impact of this important capital flow on sustainable development in a panel of SSA countries. Again, the case for sustainable development is based on its consideration of environmental quality, even as improved economic welfare is pursued. The only studies close to what is researched in this study are those of Cao et al. (2017) and Arogundade et al. (2021) who, however, only concentrate on the human aspect of development, while ignoring the other vital aspects – including the concern for the environment. Also, the latter study only considers twenty-eight (28) SSA countries, which may not be a good representation, especially concerning the flows of FDI into the SSA region. This research, therefore, goes a step further by examining this important relationship that is robust to various economic, social, and environmental indicators.

Moreover, this study considers economic growth alongside other factors moderating FDI – sustainable development nexus. This is in support of a theoretical explanation (refer to Asongu & Odhiambo, 2020) that economic prosperity is important for economic development since the former aids consumption and investment, employment, and other paths that promote the general wellbeing. Finally, the study argues that a mere establishment of the nexus between FDI and development is not much informative for policymakers, unless the value of FDI at the threshold point is established. This is because an economy would be assumed to benefit from FDI at the same rate over time should the nexus be linear, thus ignoring a likely threshold after which the impact of FDI on economic growth/development diminishes or disappears. This, however, departs from that of Asongu et al. (2019) in their use of a quadratic term to measure the nonlinear effect; that of Ruiz et al. (2009) was not conducted on SSA.

### 3. Data and Method

#### Hypothesis

In examining the role of COVID-19 on the nexus between FDI and sustainable development, the following hypotheses are formulated:

**H1:** COVID-19 impacts sustainable development, directly and through the inflows of FDI.

**H2:** in addition to **H1**, other economic variables (such as growth and financial development) moderate the nexus between FDI and sustainable development

**H3:** The SSA economy does not benefit from FDI at the same rate over time; there is a threshold below (or beyond) which the initial impacts of FDI on economic growth and sustainable development change.

#### Model

Following the Two-Gap and other aligning theories, and some earlier studies, the following models are specified to study the relevance of COVID-19 in the relationship between FDI and sustainable development in the SSA.

$$SD_{it} = \gamma_0 + \gamma_1 FDI_{it} + \gamma_2 COVID19_{it} + \gamma_3 X_{it} + v_{it} \quad [1]$$

$$SD_{it} = \gamma_0 + \gamma_1 FDI_{it} + \gamma_2 COVID19_{it} + \gamma_3 GDPPC_{it} + \gamma_4 DCPS_{it} + \gamma_5 (FDI * COVID19)_{it} + \gamma_6 (FDI * GDPPC)_{it} + \gamma_7 (FDI * DCPS)_{it} + \gamma_8 X_{it} + v_{it} \quad [2]$$

In equation [1], the relationship between FDI, COVID-19 and sustainable development (SD) is examined in a panel of 38 SSA countries. Equation [2] is specified to examine the moderating role of COVID-19 on the nexus between FDI and sustainable development. The other interactive roles observed in equation [2] are those of economic growth (GDPPC) and financial development (DCPS). Other important drivers of sustainable development are captured by X. These include some social variables (school enrolment (NSER), electricity (PAEL), life expectancy (LEB), urbanisation (URB), health (DGGHE)), economic, monetary and financial variables (government size (SIZEG), interest rate (LIR), natural resources (NRR), foreign aid (FA), household consumption expenditure (HFCEG)).  $\gamma_i$  ( $i = 0, 1, 2, \dots, 38$ ) denotes the representative parameters for the intercept and slope coefficients;  $v_{it}$  is a residual term, which captures the impacts of other variables that are not included in the model;  $i$  represents the cross-section (countries);  $t$  is the time-series (in years).

These equations are estimated using the instrumental variable regression (with OLS and GMM options). This method is useful where the distribution of error cannot be said to be independent of the distribution of the explanatory variables. While the IV regression generates efficient estimates of the coefficients as well as consistent estimates of the standard errors, the GMM option better controls for heteroscedasticity of unknown forms (Baum, et al., 2003 Hansen, 1982).

Furthermore, equation [3] is constructed to measure a possible nonlinearity in FDI – SD relations. In order to identify the values of FDI for which its relationship with economic growth and sustainable development changes, we both incorporate the non-linear term of FDI,

and apply a fixed effects panel threshold regression technique developed by Hansen (1999). In each of these cases, the values of FDI at the reversal points are estimated, thereby allowing for more-efficient decisions.

$$SD_{it} = \begin{cases} \mu_i + \alpha_1 X_{i,t} + \beta_1 FDI_{i,t} + \varepsilon_{i,t}, & FDI_{i,t} < \gamma \\ \mu_i + \alpha_2 X_{i,t} + \beta_2 FDI_{i,t} + \varepsilon_{i,t}, & FDI_{i,t} \geq \gamma \end{cases} \quad [3]$$

where  $SD$  is the dependent variable;  $X$  is the vector of independent variables;  $FDI$  is the threshold variable;  $i$  and  $t$  denote country and time, respectively;  $\beta_1$  and  $\beta_2$  and  $\alpha_1$  and  $\alpha_2$  are, respectively, the coefficients of the threshold and independent variables;  $\gamma$  is the threshold value;  $\mu_i$  denotes the fixed effects; and  $\varepsilon_{i,t}$  is the error term with constant variance, zero mean, and independently and identically distributed (see, e.g., Liu et al., 2020).

Finally, equation [1] is disaggregated into economic growth (RGDPPC), environment (GHG; CO<sub>2</sub>), and human development (HDI) – as a robustness check – as a result of which equations [4] and [5] are constructed.

$$\begin{cases} HDI= \\ RGDPPC= \end{cases} \gamma_0 + \gamma_1 FDI_{it} + \gamma_2 COVID19_{it} + \gamma_3 X_{it} + v_{it} \quad [4]$$

$$\begin{cases} GHG= \\ CO2= \end{cases} \gamma_0 + \gamma_1 FDI_{it} + \gamma_2 COVID19_{it} + \gamma_3 GDPPCGR_{it} + \gamma_4 GDPPCGRSQ_{it} + \gamma_5 X_{it} + v_{it} \quad [5]$$

## Data

A panel of 38 SSA economies represent the sample of the analysis, covering 2000 – 2022, subject to data availability. The measurement of each variable and data source are presented in Table 1.

**Table 1: Variable Descriptions and Data Sources**

Variable	Measurement	Data Source
Coronavirus (COVID-19)	Disease 2019 It is calculated by counting the percent of the word “uncertain” (or its variant) in the EIU reports; multiplied by 1,000,000	World Pandemic Uncertainty Index (WPUI)
Human Development (HDI)	Human Development Index; ranges between <b>zero</b> and <b>one</b>	UNDP; Our World in Data
Institutions (ROL)	Rule of Law; percentile rank	World Governance Indicators (WGI)
Sustainable Development (SD)	Adjusted net savings, excluding particulate emission damage (current US\$)	
Foreign Direct Investment (FDI)	Foreign direct investment, net inflows (% of GDP)	
Greenhouse Gases Emissions (GHG)	Total greenhouse gas emissions (kt of CO <sub>2</sub> equivalent)	
Carbon dioxide Emissions (CO <sub>2</sub> )	CO <sub>2</sub> emissions (kt)	
Economic Growth (GDPPC / RGDPPC / GDPPCGR)	GDP per capita (current US\$) / GDP per capita (constant 2015)	

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	US\$) / GDP per capita growth (annual %)	
Foreign Aid (FA)	Net official development assistance and official aid received (constant 2020 US\$)	
Household Consumption Expenditure (HFCEG)	Households and NPISHs final consumption expenditure (% of GDP)	
Natural Resources (NRR)	Total natural resources rents (% of GDP)	
Size of Government (SIZEG)	General government final consumption expenditure (annual % growth)	World Development Indicators (WDI)
Interest Rate (LIR)	Lending Interest Rate	
Financial Development (DCPS)	Domestic credit to private sector (% of GDP)	
Health (DGGHE)	Domestic general government health expenditure (% of GDP)	
School enrolment (NSER)	School enrollment, secondary (% net)	
Electricity (PAEL)	Access to electricity (% of population)	
Life Expectancy (LEB)	Life expectancy at birth, total (years)	
Urbanisation (URB)	Urban population (% of total population)	
Fossil Fuel (FFEC)	Fossil fuel energy consumption (% of total)	
Renewable Energy (REC)	Renewable energy consumption (% of total final energy consumption)	

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#### 4. Result and Discussion

This section presents the empirical results, which incorporate fifteen (15) estimations as shown in Tables 3, 4, 5, and 6. The results of the IV regressions (with OLS and GMM options) are presented in Table 3, where the empirical relationship between FDI, COVID-19 and sustainable development is obtained. These estimates are robust to, and efficient for, arbitrary autocorrelation and heteroscedasticity. Besides, instruments validity and relevance are important questions in this estimation method. While controlling for the country heterogeneity in each of the estimates, the coefficients of Kleibergen-Paap rk LM statistic and Hansen J Statistic respectively confirm that the models are neither under-identified nor over-identified. The efficiency of these estimates is further confirmed by relatively high values of R-squared; significant values of F-statistics; and AR(2) statistics, which validates the absence of second-order serial correlations in the residuals.

**Table 2: Pairwise correlations**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) ANSC	1.000									
(2) FDI	0.231*	1.000								
(3) COVID-19	-0.301*	-0.092*	1.000							
(4) LEB	0.350*	0.666*	-0.028	1.000						
(5) NSER	0.207*	0.147*	-0.215*	0.135*	1.000					
(6) DCPS	0.116*	0.067*	-0.038	0.207*	0.067*	1.000				
(7) GDPPC	0.154*	0.053	0.032	0.006	0.021	-0.065*	1.000			
(8) SIZEG	0.285*	0.035	0.025	0.115*	0.027	0.117*	0.152*	1.000		
(9) NRR	0.330*	0.655*	-0.053	0.971*	0.140*	0.209*	-0.092*	0.107*	1.000	
(10) DGGHE	0.534*	0.463*	-0.377*	0.631*	0.189*	0.169*	-0.019	0.173*	0.634*	1.000

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

As presented in Table 2, with the exception of COVID-19 that shows a negative degree of relation with sustainable development, the results of the correlation analysis suggest that each of FDI, life expectancy, school enrolment rate, financial development, government size, economic growth, health expenditure, natural resources, and household consumption expenditure is positively correlated with sustainable development.

### Baseline Estimates

The empirical results in Table 3 support that sustainable development is influenced by its previous value. Given a positive and significant coefficient, at 1% level, the estimate establishes that sustainable development is persistent. Defying the a priori expectation, the coefficient of FDI is observed to be negative, but does not exert a statistically significant relationship with sustainable development. This result holds even with different specifications and estimation techniques, as demonstrated in columns 2, 3, and 4, and aligns with that of Ofori et al. (2023). This explains that Africa's sustainable development agenda has not really benefitted from the inflow of FDI into the region, possibly because of a relatively low level of FDI inflows into the region. While Europe, Latin America and the Caribbean, East Asia and the Pacific, and North Africa had FDI inflows of 30.34%, 13.25%, 26.45%, and 17.33%, respectively, between 2010 and 2016, the SSA region only had 1.87% of the world net FDI. With the COVID-19 pandemic, FDI inflows to the SSA region declined by 12%, while the investment flows to entire Africa was only 5.2% of the world FDI in 2020 (see, e.g., Adegboye & Okorie, 2023; UNCTAD, 2022a).

**Table 3: Estimation of Coefficient**

DV = ANSC	OLS	2-Step GMM	
DCPS	-0.003 (0.008)	-0.005 (0.013)	-0.005 (0.013)
GDPPC	0.009 (0.009)	0.023* (0.014)	0.024* (0.014)
SIZEG	-0.017*** (0.005)	-0.018** (0.009)	-0.019** (0.009)

NRR	-0.014 (0.025)	-0.338* (0.187)	-0.379* (0.205)
DGGHE	0.016*** (0.002)	0.021*** (0.004)	0.023*** (0.005)
HFCEG	0.012*** (0.002)	0.017*** (0.003)	0.017*** (0.003)
LIR	0.002** (0.001)	0.001 (0.001)	0.001 (0.001)
L.ANSC	0.485*** (0.028)	0.431*** (0.048)	0.427*** (0.050)
FDI	-0.044 (0.030)	-0.012 (0.034)	-0.054 (0.036)
COVID-19	-13.884*** (2.033)	-11.097*** (4.210)	-54.754*** (24.811)
LEB	0.024 (0.019)	0.200* (0.106)	0.217* (0.115)
URB	2.543 (2.497)	-3.190 (4.799)	-3.764 (5.039)
NSER	0.001** (0.0005)	0.001** (0.001)	0.001*** (0.001)
FA	-0.011 (0.009)	0.026 (0.031)	0.034 (0.033)
PAEL	-0.002*** (0.001)	–	–
FDI_COVID-19	–	–	0.026* (0.015)
Observation	836	836	836
F-Stats	38.38***	37.21***	35.01***
Country Effect	YES	YES	YES
R-Squared	0.698	0.636	0.624
Kleibergen-Paap rk	–	15.689***	13.955***
LM statistic			
Hansen J Statistic	Identified	Identified	Identified
AR(2): Prob.	–	0.225	0.224

Note: Standard errors are in parenthesis; \*\*\*, \*\* & \* imply significance at 1%, 5% & 10% level

Furthermore, COVID-19 follows the a priori expectation as the sign of the coefficient suggests that it is negatively connected to sustainable development. This finding is consistent with Adegboye and Okorie (2023), whose COVID-19 dummy shows a negative nexus with human development. This is expected, given that the pandemic has adversely affected nearly all economic activities, including those of SSA region. Although SSA recorded some of the lowest cases and deaths from COVID-19<sup>5</sup>, the region has witnessed some of its worst economic impacts arising from slower growth and the first recession in more than two decades (World Bank, 2020), while the progress towards the attainment of SDGs has been slow in the region and globally (Tonne, 2021). This is also in tandem with Nguyen and Lee (2021), who infer that policy uncertainty reduces FDI inflows, thus hampering sustainable development. A positive effect with a statistical significance is, however, obtained when FDI is interacted with COVID-19. This supposes that even though FDI does not directly promote development in SSA, its inflows tend to reduce the negative effect of COVID-19 on sustainable development. Specifically, FDI is found to reduce the negative impact of COVID-19 on sustainable development by 0.026%.

<sup>5</sup> Refer to Appendix B



While each of foreign aid, urbanisation, and financial development does not exert a significant impact on sustainable development, the level of education is found to be positively connected to sustainable development. This infers that sustainable development rises by 0.001% when the school enrolment rate increases by 1%. This aligns with the finding of Dhrifi (2020) who recognises education as a weapon against poverty. This is because increased school enrolment promotes skills and knowledge that are necessary for higher wages and increased income for meeting necessities, thus enhancing the standard of living. In the same way, each of the coefficients of health expenditure, household consumption expenditure, interest rate, economic growth, and life expectancy is significant and positively affects the level of sustainable development. On the contrary, an increase in government size adversely affects the level of sustainable development. The coefficient of natural resources endowment is equally negative, thus confirming the Dutch disease syndrome in the SSA region.

### **Extended Results and Robustness Tests**

For the robustness tests of the results in Table 3, the estimate is repeated for each of the sub-regions in the entire sample considered (Southern Africa, Eastern Africa, and West Africa), as presented in Table 5. Further, to empirically capture the UNGA's definition of sustainable development adopted in this research, the model is repeated for economic growth, human development, and the environment and the estimates are presented in Table 4. Finally, the rule of law (a measure of institutional quality) is incorporated into the model, while the relationship is further examined for the non-linear effects.

In Table 4, the estimates in columns 2, 4, 5, and 6 confirm the main findings of the baseline estimates. Specifically, FDI does not exert a significant relationship with economic growth, human development, and the environment. In column 3 of the table (where the threshold effects of FDI on economic growth is presented), the coefficient of FDI after the second threshold validates that FDI does not exert a significant relationship with economic growth in the long-run. The coefficient of COVID-19, however, depicts that it reduces each of economic growth and human development by 9.455% and 0.0002%; it also reduces GHG and CO<sub>2</sub> by 524.647% and 297.033%, respectively.

**Table 4: Estimation of Coefficient**

Dep. Var.	RGDPPC	RGDPPC	GHG	HDI	CO <sub>2</sub>
2-Step GMM					
DCPS	-0.034*** (0.010)	-0.015 (0.027)	0.229 (0.803)	-1.56e-06*** (4.36e-07)	-0.879 (0.948)
GDPPC	–	–	–	1.20e-06*** (4.45e-07)	–
SIZEG	0.009** (0.004)	0.004 (0.012)	1.027** (0.517)	8.35e-08 (3.70e-07)	0.431 (0.537)
NRR	0.095 (0.118)	-0.007 (0.054)	-55.539** (25.301)	-0.00002 (0.00002)	-41.167** (20.128)
DGGHE	-0.0004 (0.003)	-0.0003 (0.003)	–	5.84e-07** (2.50e-07)	–
HFCEG	-0.001 (0.001)	0.008** (0.003)	–	3.49e-08 (7.18e-08)	–
LIR	0.0002 (0.0005)	0.002 (0.001)	-0.057 (0.063)	-5.01e-09 (3.69e-08)	-0.075 (0.069)
L.GHG / L.CO <sub>2</sub>	–	–	13.026** (5.699)	–	7.285** (3.702)
L.RGDPPC	/ 0.970*** (0.045)	–	–	0.935*** (0.014)	–
L.HDI	–	–	–	–	–
FDI	-0.020 (0.028)	-0.137 (0.114)	-0.985 (1.648)	3.37e-07 (1.30e-06)	4.163 (2.961)
COVID-19	-9.455*** (3.353)	-50.089* (28.345)	-524.647*** (127.859)	-0.0002* (0.0001)	-297.033* (166.154)
LEB	-0.112* (0.064)	0.007 (0.040)	–	1.62e-07 (8.10e-07)	–
URB	6.332* (3.845)	41.917*** (5.291)	-493.668** (213.586)	0.0004** (0.0002)	-533.037** (240.577)
NSER	-0.001** (0.0004)	-0.004*** (0.001)	0.059** (0.031)	-1.31e-08 (1.80e-08)	0.051 (0.036)
FA	0.032 (0.033)	–	0.053 (0.472)	8.34e-07*** (2.27e-07)	5.804 (4.628)
FDI_COVID19	–	0.027* (0.017)	–	–	–
GDPPCGR	–	–	6.221** (2.604)	–	5.863** (2.431)
GDPPCGRSQ	–	–	-0.0003** (0.0001)	–	-0.0003** (0.0001)
FFEC	–	–	0.019 (0.075)	–	-0.070 (0.071)
REC	–	–	0.873*** (0.144)	–	1.348*** (0.237)
PAEL	–	–	-0.135** (0.062)	-2.28e-08 (4.66e-08)	-0.101 (0.084)
Observation	836	874	836	790	836
F-Stats	3606.00***	15.13***	213.44***	8302.55***	268.09***
Country Effect	YES		YES	YES	YES
R-Squared	0.99	0.28	0.894	0.99	0.852
Kleibergen-Paap rk LM statistic	11.036**		5.603**	4.849**	5.107**
Hansen J Statistic	Identified		Identified	Identified	Identified

Note: Standard errors are in parenthesis; \*\*\*, \*\* & \* imply significance at 1%, 5% & 10% level

Note: The threshold effect test is only significant for the Double Threshold, thus the second threshold coefficients are presented for FDI and DCPS in column 3. The coefficient of FDI turns **insignificant** after the second threshold (see column 3); this occurs at the threshold value of 17.43%. Similarly, the coefficient of DCPS remains insignificant even after the second threshold at 17.69%.

While the reductions in the rates of economic growth and human development confirm the projections of earlier researchers and various international organisations at the start of the pandemic (see, e.g., OECD, 2020a; Lone & Ahmad, 2020; Fagbemi, 2021), the environment effect may be attributed to a significant reduction in manufacturing (and other emitting) activities during the pandemic. In addition, the size of government stimulates economic growth, but raises the level of greenhouse gases emission, thus reducing the level of sustainable development. This is evident in Tables 4 (columns 2 & 4) and 3 (columns 2, 3 & 4), respectively. While this positive growth-effect may be attributed to government expenditure on cash transfers and access to socioeconomic overheads, the negative environment-effect may be that a large proportion of those spending have been on environmentally degrading goods and services. Moreover, the EKC hypothesis is validated, as the linear and non-linear terms of economic growth are, respectively, positive and negative (see columns 4 & 6). One other interesting finding is the coefficients of urbanisation in Table 4 (columns 2, 3, 4, 5, & 6), which provides that it raises economic growth, reduces environmental degradation, and improves the level of human development in the SSA region.

These key findings equally hold in Table 5, where the empirical model is estimated on the sub-regions. In each of Southern Africa, Eastern Africa, and West Africa, FDI does not exert any significant influence on sustainable development. On the contrary, COVID-19 reduces the levels of sustainable development by 31.79%, 7.72%, and 28.73%, respectively.

Table 6 presents extended results, where institutional quality is incorporated into the model, as shown in column 3. The non-linear effect of FDI on sustainable development is presented in columns 2, 4, and 5 of the table. In each of these estimates, COVID-19 is still observed to have a negative relationship with sustainable development. However, the insignificant FDI – sustainable development nexus turns significant when the institutions variable and the non-linear term of FDI are introduced into the model. Specifically, the estimates in Table 6 (columns 2, 4, and 5) argue that FDI promotes sustainable development, but the positive effect turns negative with a sustained increase in FDI inflows<sup>6</sup>.

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<sup>6</sup> The ratio of FDI to adjusted net savings at the reversal point is estimated at 13.575%

**Table 5: Estimation of Coefficient for the Sub-Regions**

DV = ANSC	Southern Africa	Eastern Africa	West Africa
L.ANSC	0.484*** (0.045)	0.400*** (0.064)	0.541*** (0.043)
FDI	-0.270 (0.393)	0.056 (0.147)	-0.088 (0.093)
COVID-19	-31.790*** (7.643)	-7.721*** (2.515)	-28.733*** (3.476)
LEB	0.014 (0.034)	1.647*** (0.428)	-0.602** (0.263)
URB	6.986 (9.597)	-26.023*** (7.180)	11.514** (5.808)
NSER	0.024 (0.030)	-0.001 (0.003)	0.003 (0.002)
DCPS	0.036 (0.032)	-0.012 (0.034)	0.0005 (0.032)
GDPPC	0.007 (0.025)	0.014 (0.011)	0.077* (0.042)
SIZEG	-0.150*** (0.026)	-0.072 (0.047)	-0.008 (0.015)
NRR	-0.369 (0.578)	-0.045 (0.064)	-0.052 (0.101)
DGGHE	0.555*** (0.039)	0.064*** (0.011)	0.042*** (0.008)
HFCEG	0.234*** (0.031)	0.072*** (0.017)	0.008 (0.007)
LIR	-0.109 (0.125)	-0.002 (0.006)	0.006*** (0.002)
FA	-0.147*** (0.053)	-0.054* (0.031)	0.098 (0.089)
PAEL	-0.022 (0.050)	-0.008 (0.006)	-0.0004 (0.004)
Observation	242	176	330
F-Stats	67.36***	26.17***	42.69***
Country Effect	YES	YES	YES
R-Squared	0.8746	0.7730	0.7847

Note: Standard errors are in parenthesis; \*\*\*, \*\* & \* imply significance at 1%, 5% & 10% level

**Table 6: Estimation of Coefficient (Non-linear Regression Analysis)**

ANSC	2-Step GMM			
DCPS	-0.008 (0.014)	0.016 (0.024)	-0.010 (0.014)	-0.043 (0.209)
GDPPC	0.011 (0.014)	0.034* (0.020)	0.015 (0.027)	0.012 (0.014)
SIZEG	-0.017* (0.010)	0.010 (0.019)	-0.016* (0.009)	-0.015* (0.009)
NRR	-0.448* (0.259)	-1.209 (0.860)	-0.415* (0.240)	-0.406** (0.208)
DGGHE	0.027*** (0.007)	0.003 (0.011)	0.025*** (0.006)	0.025*** (0.006)
HFCEG	0.018*** (0.004)	0.014*** (0.004)	0.018*** (0.004)	0.017*** (0.004)
LIR	0.001 (0.001)	0.001 (0.002)	0.001 (0.001)	0.001 (0.001)
L.ANSC	0.389*** (0.066)	0.396*** (0.066)	0.396*** (0.062)	0.399*** (0.058)
FDI	0.543** (0.275)	-0.126* (0.069)	0.621** (0.279)	0.588*** (0.238)
FDISQ	-0.0002** (0.0001)	–	-0.0002** (0.0001)	-0.0002* (0.0001)
COVID-19	-47.122** (21.088)	-17.831*** (5.070)	-9.939** (4.567)	-9.925** (4.582)
LEB	0.279 (0.174)	0.038 (0.034)	0.258 (0.162)	0.253* (0.142)
URB	-4.264 (6.117)	-10.316 (9.777)	-3.806 (5.789)	-3.801 (5.769)
NSER	0.001*** (0.001)	0.002** (0.001)	0.001*** (0.001)	0.001*** (0.001)
FDI_COVID-19	0.022* (0.013)	–	–	–
FDI_GDPPC	–	–	-1.50e-06 (9.32e-06)	–
FDI_DCPS	–	–	–	0.00002 (0.0001)
FA	–	-0.014 (0.014)	–	–
PAEL	–	-0.005** (0.002)	–	–
ROL	–	3.206* (1.898)	–	–
Observation	836	760	836	836
F-Stats	28.33***	13.20***	29.54***	28.53***
Country Effect	YES	YES	YES	YES
R-Squared	0.586	0.249	0.602	0.605
Kleibergen-Paap rk LM statistic	8.016***	2.649*	8.770***	10.001***
Hansen J Statistic	Identified	Identified	Identified	Identified
F- test (Prob)	–	–	0.642	0.837

Note: Standard errors are in parenthesis; \*\*\*, \*\* & \* imply significance at 1%, 5% & 10% level

## Discussion

Even though FDI is expected to stimulate economic growth and development in the SSA region, each of its observed effects on economic growth, the environment, and human development is found to be statistically insignificant. These confirm that variations in FDI do not explain the variations in economic growth, environment, and human development in the SSA region. When this effect test is applied on sustainable development, FDI is still largely observed to exert no significant relationship with sustainable development in SSA – though with a significant negative effect in non-linear estimates and when institutions variable is incorporated into the model. There are a few reasons why this finding may hold in Africa. First, foreign firms tend to take a larger share and drive domestic firms out of the market when they are fully integrated into the system. This is because of their greater access to superior technologies and the fact that they are able to attract the best workers with higher wages than the domestic firms. This may afford foreign investors some monopoly powers to raise their prices, leading to a long-run negative impact on sustainable development. Similar to this is the resource-seeking nature of FDI inflows into the region, as a large proportion is directed towards the oil and gas sector; a sector that is usually seen as weak in terms of both backward and forward linkages with the rest of the economy (Adeniyi et al., 2012; Ehigiamusoe & Lean, 2019). Moreover, FDI stimulates growth and development when there is optimal capacity utilisation in the host economies, such as efficient governance and financial institutions. Unfortunately, the SSA region is characterised by institutional challenges; a case in point is the ravaging disruption of democratic systems witnessed in many countries in the region in the last few years. The loss of confidence from these often hampers the performance of FDI inflows. This is because the SSA region's operating environment is attributed to weak legal framework and bureaucratic bottlenecks (see, e.g., Fagbemi & Osinubi, 2020; Nyuur et al., 2014).

In addition, natural resources endowment is observed to have no significant and, where it is significant, negative relationship with economic growth and sustainable development. Because the natural resources sector is the major driver of the SSA economy, however, both the direct and interactive roles of financial development are found to be largely insignificant and, where it is significant, negative. This equally explains why the interactive role of economic growth on FDI – sustainable development is insignificant, even though economic growth is observed to stimulate both human and sustainable development indicators. While explaining the insignificant moderating role of financial development on FDI – sustainable development nexus, this finding contends that providing domestic private sectors with more financial resources might not produce the expected impact on growth and sustainable development because of their minimal involvements in the growth and development process (see Adeniyi et al., 2012).

Even though the index of COVID-19 is found to exert a significant and negative relationship with economic growth, human development, the environment, and sustainable development, further empirical finding reveals that FDI reduces the negative effect of the pandemic on sustainable development. This argues that, among the countries in SSA, those

with increased FDI inflows experience some relieves in the negative impact of COVID-19. In general, Africa records the largest increases in FDI flows, having benefitted from six out of the top fifteen Greenfield megaprojects in 2022. Thus, the value of Greenfield projects nearly quadrupled (from \$52 billion in 2021 to \$195 billion in 2022), with the largest project increases in the construction, extractive, as well as energy and gas supply sectors (UNCTAD, 2023). This further highlights that FDI to Southern Africa returned to the pre-pandemic level, at \$6.7 billion after the peak in 2021; FDI to East Africa increased by 3% (to \$8.7 billion), while the flows to Central Africa declined by 7% (to \$6 billion). This interaction effect may, therefore, be explained in relation to business cycle. As reported earlier, the pandemic has caused the SSA region to witness some of its worst economic impacts arising from slower growth and first recession in decades. This supposes that the increase in FDI inflows may be attributed to the fact that the domestic assets are less expensive and more attractive to foreign investors (Doytch, 2021), thereby reducing the negative effect of COVID-19 on sustainable development.

## **5. Conclusion**

This research investigates the role of COVID-19 on the relationship between FDI and sustainable development in SSA. The empirical analysis relies on a panel data from 38 SSA countries, covering 2000 – 2022. Further, this study estimates the threshold values at which the patterns of the relationship between FDI and economic growth, on the one hand, and FDI and sustainable development, on the other hand, change. Besides, the interactive roles of COVID-19 and other important economic variables are measured in these empirical associations.

The estimates from the instrumental variable regressions (with OLS and GMM options) reveal that FDI does not exert the required effect on economic growth and development. Specifically, FDI does not have a significant impact on sustainable development in the linear estimates, and a negative effect in the non-linear estimates. When the effect of FDI is further analysed on economic growth, the environment, and human development, the estimates remain consistent. Another important form of capital flow, foreign aid, is found to have an insignificant effect on sustainable development. While COVID-19 reduces the levels of economic growth, the environment, human development, and sustainable development, the moderating effect shows that FDI reduces the negative effect of COVID-19 on economic growth and sustainable development. Other important findings suggest that urbanisation promotes economic growth and human development, and reduces environmental degradation; government size increases the rates of growth and environmental degradation, thereby reducing sustainable development. Even though economic growth raises the levels of human and sustainable development, natural resources adversely affects sustainable development – thus, confirming the Dutch disease syndrome. Finally, it is observed that rule of law promotes sustainable development; financial development does not exert a significant connection with sustainable development, and negatively affects economic growth and human development, yet the interaction effects of economic growth and financial development on sustainable development is statistically insignificant.

In view of these findings, this research recommends that appropriate economic environments that entrench the rule of law – devoid of nepotism, cronyism, and other institutional deficiencies – should be provided. This would not only enhance innovation, healthy competition, and environmental consciousness, but would also encourage both the existing and new foreign investments. While doing this, the SSA countries should promote environmentally sustainable and technology-intensive FDI inflows (in such areas as green technologies) in order foster economic growth, environmental quality, and sustainable development. As much as foreign investments are targeted, it should be in such a way that the domestic investments are allowed their rights of place in the SSA economy through equal market access and stable policies. The resulting economic prosperity from these actions ultimately promotes the environment, as validated by the EKC hypothesis, especially with sustainable strategies as green investments.

## Reference

- Adegboye, F. B., & Okorie, U. E. (2023). Fragility of FDI flows in sub-Saharan Africa region: does the paradox persist? *Future Business Journal*, 9(1), 8.
- Adeniyi, O. A., Omisakin, D. O. A., Egwaikhide, F., & Oyinlola, A. (2012). Foreign direct investment, economic growth and financial sector development in small open developing economies. *Economic Analysis & Policy*, 42(1).
- African Development Bank (2022). African Economic Outlook 2022: Africa’s 2021 economic rebound impacted by lingering COVID-19 pandemic and Russia-Ukraine war. Available online at <https://www.afdb.org/en/news-and-events/press-releases/african-economic-outlook-2022-africas-2021-economic-rebound-impacted-lingering-covid-19-pandemic-and-russia-ukraine-war-51865>
- Ahir, H., Bloom, N., and Furceri, D. (2018). *The World Uncertainty Index*. Available at SSRN: <https://ssrn.com/abstract=3275033> or <http://dx.doi.org/10.2139/ssrn.3275033>
- Akinlo, T., & Dada, J. T. (2021). The moderating effect of foreign direct investment on environmental degradation-poverty reduction nexus: evidence from sub-Saharan African countries. *Environment, Development and Sustainability*, 23(11), 15764-15784.
- Arogundade, S., Biyase, M., & Eita, J. H. (2021). Foreign Direct Investment and Inclusive Human Development in Sub-Saharan African Countries: Domestic Conditions Matter. *Economia Internazionale/International Economics*, 74(4), 463-498.
- Asongu, S. A., Uduji, J. I., & Okolo-Obasi, E. N. (2019). Thresholds of external flows for inclusive human development in sub-Saharan Africa. *International Journal of Community Well-Being*, 2(3), 213-233.
- Asongu, S. A., & Odhiambo, N. M. (2020). Foreign direct investment, information technology and economic growth dynamics in Sub-Saharan Africa. *Telecommunications Policy*, 44(1), 101838.
- Aziz, O. G. (2018). Institutional quality and FDI inflows in Arab economies. *Finance Research Letters*, 25, 111-123.
- Baum, C. F., Schaffer, M. E., & Stillman, S. (2003). Instrumental variables and GMM: Estimation and testing. *The Stata Journal*, 3(1), 1-31.
- Borensztein, E., De Gregorio, J., & Lee, J. W. (1998). How does foreign direct investment affect economic growth? *Journal of International Economics*, 45(1), 115-135.



- Cao, T. H. V., Trinh, Q. L., & Nguyen, T. A. L. (2017, June). The effect of FDI on Inequality-adjusted HDI (IHDI) in Asian countries. In *Vietnam Economist Annual Meeting 10th*.
- Deng, Q. S., Alvarado, R., Cuesta, L., Tillaguango, B., Murshed, M., Rehman, A., ... & López-Sánchez, M. (2022). Asymmetric impacts of foreign direct investment inflows, financial development, and social globalization on environmental pollution. *Economic Analysis and Policy*, 76, 236-251.
- Dhrifi, A., Jaziri, R., & Alnahdi, S. (2020). Does foreign direct investment and environmental degradation matter for poverty? Evidence from developing countries. *Structural Change and Economic Dynamics*, 52, 13-21.
- Doytch, N. (2021). Do FDI inflows to Eastern Europe and Central Asia respond to the business cycle? A sector level analysis. *The Journal of Economic Asymmetries*, 23, e00194.
- Economic Intelligence Unit (EIU, 2022). *Things to watch in Africa in 2023*. Assessed through <https://country.eiu.com/article.aspx?articleid=1952522378&Country=Nigeria&topic=Economy&subtopic=Outlook&subsubtopic=Overview>
- Ehigiamusoe, K. U., & Lean, H. H. (2019). Foreign capital inflows and economic growth in Nigeria: any nexus? *Journal of African Business*, 20(4), 455-471.
- Fagbemi, F., & Osinubi, T. T. (2020). Leveraging foreign direct investment for sustainability: An approach to sustainable human development in Nigeria. *Resources, Environment and Sustainability*, 2, 100005.
- Hansen, L. (1982). Large sample properties of generalized method of moments estimators. *Econometrica*, 50(3), 1029–1054.
- Hansen, B. E. (1999). Threshold effects in non-dynamic panels: Estimation, testing, and inference. *Journal of Econometrics*, 93(2), 345-368.
- Hoque, M. E., Akhter, T., & Yakob, N. A. (2018). Revisiting endogeneity among foreign direct investment, economic growth and stock market development: Moderating role of political instability. *Cogent Economics & Finance*, 6(1), 1492311. DOI: 10.1080/23322039.2018.1492311
- Joshi, T., Mainali, R. P., Marasini, S., Acharya, K. P., & Adhikari, S. (2021). Nepal at the edge of sword with two edges: The COVID-19 pandemics and sustainable development goals. *Journal of Agriculture and Food Research*, 4, 100138.
- Liu, H., Islam, M. A., Khan, M. A., Hossain, M. I., & Pervaiz, K. (2020). Does financial deepening attract foreign direct investment? Fresh evidence from panel threshold analysis. *Research in International Business and Finance*, 53, 101198.
- Lone, S. A., & Ahmad, A. (2020). COVID-19 pandemic – an African perspective. *Emerging Microbes & Infections*, 9(1), 1300-1308, DOI: 10.1080/22221751.2020.1775132
- Long, C., Yang, J., & Zhang, J. (2015). Institutional impact of foreign direct investment in China. *World Development*, 66, 31-48.
- Nawo, L., & Njangang, H. (2021). The effect of COVID-19 outbreak on foreign direct investment: do sovereign wealth funds matter? *Transnational Corporations Review*, 1 – 17. DOI: 10.1080/19186444.2021.1964313
- Nejati, M., & Bahmani, M. (2020). The economic impacts of foreign direct investment in oil and gas sector: A CGE analysis for Iranian economy. *Energy Strategy Reviews*, 32, 100579.
- Nguyen, C. P., & Lee, G. S. (2021). Uncertainty, financial development, and FDI inflows: Global evidence. *Economic Modelling*, 99, 105473. <https://doi.org/10.1016/j.econmod.2021.02.014>
- Nwosa, P. I. (2021). Oil price, exchange rate and stock market performance during the COVID-19 pandemic: Implications for TNCs and FDI inflow in Nigeria. *Transnational Corporations Review*, 13(1), 125-137.

- Nyuur, R. B., Osabutey, E. L., & Debrah, Y. A. (2014). *Doing business in Africa* (pp. 197-204). Routledge: Abingdon, Oxon, UK.
- Ofori, I. K., Figari, F., & Ojong, N. (2023). Towards sustainability: The relationship between foreign direct investment, economic freedom and inclusive green growth. *Journal of Cleaner Production*, 406, 137020.
- Opoku, E. E. O., & Boachie, M. K. (2020). The environmental impact of industrialization and foreign direct investment. *Energy Policy*, 137, 111178.
- Qiang, C. Z., Kusek, P., Steenbergen, V., and Viney, B. (2021). *The road to recovery in Sub-Saharan Africa: Capitalizing on transformative opportunities from shifting FDI patterns*. World Bank Blogs. Available on <https://blogs.worldbank.org/africacan/road-recovery-sub-saharan-africa-capitalizing-transformative-opportunities-shifting-fdi>
- Romer, P. (1993). Idea gaps and object gaps in economic development. *Journal of Monetary Economics*, 32(3), 543-573.
- Shahbaz, M., Nasir, M. A., & Roubaud, D. (2018). Environmental degradation in France: the effects of FDI, financial development, and energy innovations. *Energy Economics*, 74, 843-857.
- Singh, K. M. (2021). Cointegration and Causality between Foreign Direct Investment, Trade and Economic Growth: Empirical Evidence from India's Post Economic Reform Period. *FIIB Business Review*, 23197145211057327.
- Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1), 65-94.
- Sunde, T. (2017). Foreign direct investment, exports and economic growth: ADRL and causality analysis for South Africa. *Research in International Business and Finance*, 41, 434-444.
- Sung, B., Song, W. Y., & Park, S. D. (2018). How foreign direct investment affects CO2 emission levels in the Chinese manufacturing industry: evidence from panel data. *Economic Systems*, 42(2), 320-331.
- Swan, T. W. (1956). Economic growth and capital accumulation. *Economic Record*, 32(2), 334-361.
- Udemba, E. N., & Yalçıntaş, S. (2021). Interacting force of foreign direct invest (FDI), natural resource and economic growth in determining environmental performance: a nonlinear autoregressive distributed lag (NARDL) approach. *Resources Policy*, 73, 102168. <https://doi.org/10.1016/j.resourpol.2021.102168>
- United Nations (2023). *World Economic Situation and Prospects*. Retrieved from <https://desapublications.un.org/publications/world-economic-situation-and-prospects-2023>
- United Nations Conference on Trade and Development (2021). *World Investment Reports: Investing in Sustainable Recovery*. Accessed on 10/08/2021 via [https://unctad.org/system/files/official-document/wir2021\\_en.pdf](https://unctad.org/system/files/official-document/wir2021_en.pdf)
- United Nations Conference on Trade and Development (UNCTAD, 2022a). *World Investment Reports: International Tax Reforms and Sustainable Investment*. Available through <https://unctad.org/news/investment-flows-africa-reached-record-83-billion-2021>
- United Nations Conference on Trade and Development (UNCTAD, 2022b). *Rethinking the Foundations of Export Diversification in Africa – The Catalytic Role of Business and Financial Services*. Economic Development in Africa Report.
- United Nations Conference on Trade and Development (2023). *World Investment Reports: Investing in Sustainable Energy for All*. Accessed on 06/09/2023 via [https://unctad.org/system/files/official-document/wir2023\\_en.pdf](https://unctad.org/system/files/official-document/wir2023_en.pdf)

- United Nations Educational, Scientific and Cultural Organization (2021). *Building a peace in the minds of men and women*. Assessed on 30/12/2021 via <https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd>
- Waqih, M. A. U., Bhutto, N. A., Ghumro, N. H., Kumar, S., & Salam, M. A. (2019). Rising environmental degradation and impact of foreign direct investment: an empirical evidence from SAARC region. *Journal of Environmental Management*, 243, 472-480.
- World Bank (2020). The Global Economic Outlook During the COVID-19 Pandemic: A Changed World. Available on <https://www.worldbank.org/en/news/feature/2020/06/08/the-global-economic-outlook-during-the-covid-19-pandemic-a-changed-world>
- World Health Organisation (WHO, 2022a). The Global Health Observatory Database. Available on <https://www.who.int/data/gho>
- World Health Organisation (WHO, 2022b). WHO Director-General’s Opening Remarks at the Media Briefing – 2 December 2022. Geneva: WHO.
- World Health Organisation (2023). WHO Coronavirus (COVID-19) Dashboard. Available at <https://COVID-19.who.int/> (Accessed 12 October 2023).

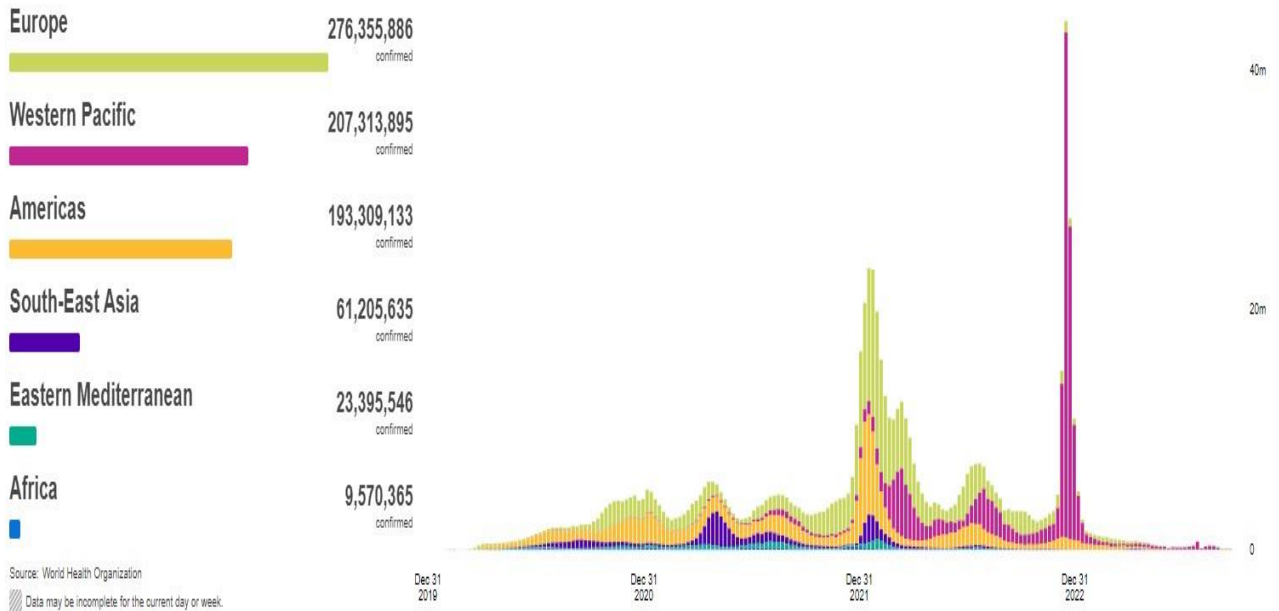
## Appendix

### Appendix A: List of Countries Considered

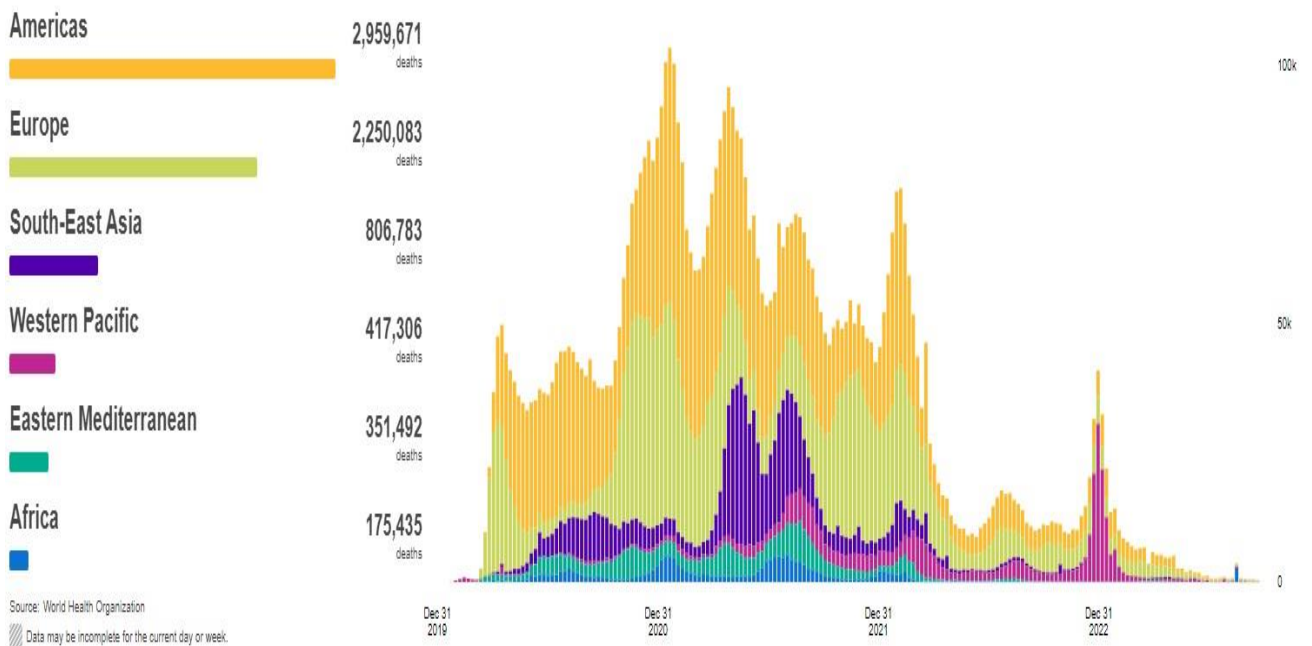
Benin	Congo, Dem. Rep.	Guinea	Senegal
Botswana	Congo, Rep.	Guinea-Bissau	Seychelles
Burkina Faso	Cote d'Ivoire	Kenya	Sierra Leone
Burundi	Eswatini	Lesotho	South Africa
Cabo Verde	Ethiopia	Madagascar	Tanzania
Cameroon	Gabon	Mali	
Comoros	Gambia, The	Mauritania	
Togo	Ghana	Mauritius	
Uganda	Angola	Mozambique	
Zambia	Namibia	Nigeria	
Zimbabwe	Niger	Rwanda	

## Appendix B: Weekly confirmed cases and deaths from COVID-19, as at 04 October 2023

### Situation by WHO Region



### Situation by WHO Region



Source: World Health Organisation (2023).