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Website: <https://www.ecofunai.ng>

ISSN (Print): 2536-6793 | ISSN (Electronic): 2536-6742

Volume 3 (2) August, 2026 (pp 40 - 61)

Submitted April 2026; Published August 2026.

CAPITAL INFLOWS AND HUMAN DEVELOPMENT IN SUB-SAHARAN AFRICA

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ABSTRACT

This study examines the relationship between capital inflows and human development in seventeen Sub-Saharan African (SSA) countries from 1990 to 2022. Human development is measured using the Human Development Index (HDI), which captures improvements in income, health, and education. The study employs panel econometric techniques, specifically the Driscoll–Kraay fixed-effects estimator with time dummies to correct for heteroskedasticity, autocorrelation, and cross-sectional dependence. The Two-Stage Least Squares (2SLS) technique is also used as a robustness check to address potential endogeneity. The study examines the effect of important capital inflows like foreign direct investment (FDI), remittances, and official development assistance (ODA) on human development. The findings show that remittances have a positive and statistically significant impact on human development, implying that migrant transfers contribute significantly to better welfare outcomes. In contrast, foreign direct investment has a negative but statistically insignificant effect. Official development assistance has a negative and significant relationship with human development, indicating that aid inflows do not always result in welfare improvements in the studied countries. However, the nonlinear analysis of ODA shows no significant threshold effect. Among the control variables, population has a positive and significant effect on human development, whereas trade openness and gross fixed capital formation are statistically insignificant. Overall, the results indicate that the developmental impact of capital inflows in SSA is determined by the type of inflow and the efficiency with which these resources are employed.

Keywords: Capital inflows, Human development, Remittances, Foreign direct investment, SSA.

JEL Classification: F21, F24, F35, I31, O15, O55.

1. Introduction

Human development has become a major focus in recent economic discussions, shifting attention away from the narrow pursuit of economic growth toward improving the overall well-being of people. To assess these broader aspects of development, the Human Development Index (HDI), developed by the United Nations Development Programme (UNDP), is commonly used. The index combines indicators of health, education, and standard of living into a single measure, providing a more comprehensive picture of human progress (UNDP, 2024). Yet, while large swaths of the globe have seen steady bumps in their HDI scores, Sub-Saharan Africa (SSA) continues to struggle. The region's scores consistently hover below global norms, and the discrepancies between neighboring nations can be jarring. This stubborn developmental gap makes one wonder which macroeconomic levers actually move the needle for people on the ground.

Over the last few decades, massive amounts of external capital have flowed into SSA. Proponents argue that things like foreign direct investment (FDI) bring much-needed tech and jobs, while remittances give families the direct cash they need to pay for school fees or basic healthcare (Yao & Kouakou, 2025). But the reality is rarely that simple. The region has experienced varying degrees of economic growth, but it has not reliably translated into sustained improvements in human development due to structural and institutional bottlenecks (Acemoglu & Robinson, 2012).

Much of this economic expansion has been driven by extractive industries. Mining and oil exports generate huge top-line numbers but rarely permeate the broader population. Because of this, poverty and youth unemployment remain massive barriers. While remittances clearly provide direct household relief, other inflows can be problematic. Official development assistance (ODA), for instance, carries the risk of creating dependency if it is not managed carefully (Braiton & Odhiambo, 2023). The core question driving this paper is straightforward: do these capital inflows actually advance human development in Sub-Saharan Africa when structural realities like population growth, domestic infrastructure investments, and trade openness are accounted for?

Research Questions

- a) Do remittances significantly impact human development in Sub-Saharan Africa?
- b) Does foreign direct investment have a significant effect on human development in Sub-Saharan Africa?
- c) Does official development assistance have a significant impact on human development in Sub-Saharan Africa?
- d) Does the relationship between official development assistance and human development exhibit a nonlinear pattern in Sub-Saharan Africa?

Objective of the Study

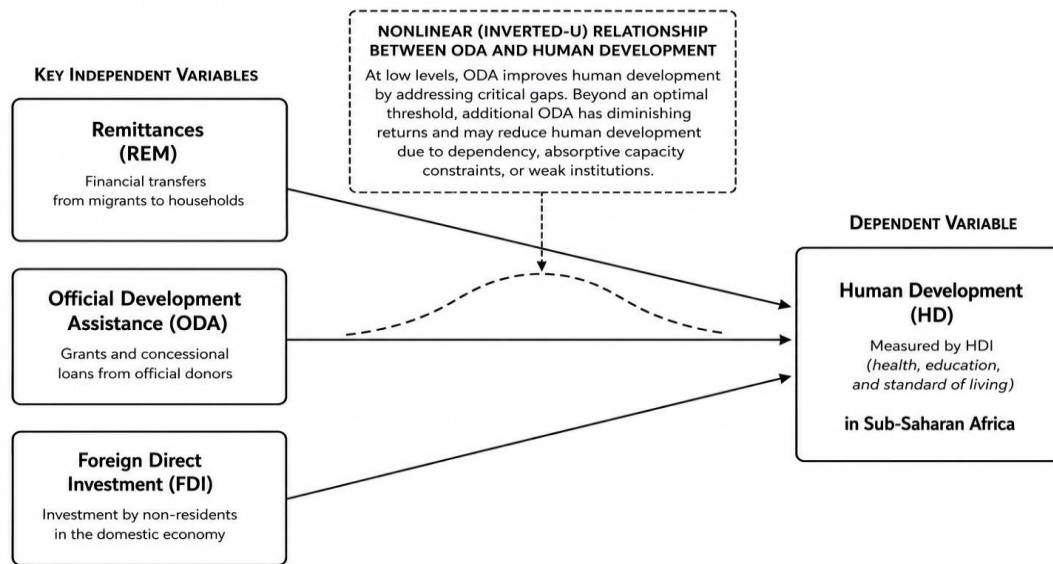
The major aim of this research is to examine the impact of financial development and capital inflows on development outcomes in Sub-Saharan Africa. Specifically is to

- a) To examine the impact of remittances on human development in Sub-Saharan Africa
- b) To examine the effect of foreign direct investment on human development in Sub-Saharan Africa

- c) To ascertain the effect of official development assistance on human development in Sub-Saharan Africa
- d) To test the hypothesis of a nonlinear relationship between official development assistance and human development in Sub-Saharan Africa.

2. Literature Review

2.1 Conceptual Framework



The conceptual framework illustrates how external financial inflows influence human development in Sub-Saharan Africa. Human Development (HD), measured by the Human Development Index (HDI), is the dependent variable, while Remittances (REM), Official Development Assistance (ODA), and Foreign Direct Investment (FDI) are the key explanatory variables. The framework assumes that remittances contribute to improvements in human development by increasing household income, reducing poverty, and enabling greater spending on education, healthcare, and other welfare-enhancing activities. Likewise, foreign direct investment is expected to promote human development through job creation, technology transfer, infrastructure development, and increased economic opportunities.

The framework also recognizes the role of official development assistance in enhancing human development. In the first instance, ODA is expected to have a direct positive effect on human development by providing financial resources for critical sectors such as health, education, social protection, and infrastructure. However, the relationship may not remain positive indefinitely. As aid inflows continue to increase, their effectiveness may diminish due to factors such as aid dependency, weak institutional capacity, inefficiencies in resource utilization, and governance challenges. Consequently, the framework further proposes a nonlinear (inverted-U) relationship between ODA and human development, suggesting that aid contributes positively to development up to an optimal level, after which additional aid yields diminishing returns and may even weaken development outcomes. Overall, the framework suggests that human development in Sub-Saharan Africa is influenced by remittances, foreign direct investment, and official development assistance,

while also accounting for the possibility that the impact of aid changes as its volume increases. By incorporating both the direct and nonlinear effects of ODA, the framework provides a more comprehensive understanding of how different forms of external financial inflows shape human development outcomes in the region.

Human Development

Human development emphasizes advancements in people's liberties, capacities, and well-being in addition to economic prosperity. The expansion of human choices and possibilities became the primary focus of Amartya Sen's capability approach, which moved away from solely income-based assessments. This method contends that development ought to enable people to lead the lifestyles they cherish, including having access to political freedom, healthcare, and education (Sen, 1999). Human development is especially important in SSA because of the region's high levels of inequality, ongoing poverty, and restricted access to basic amenities. The advantages have not always resulted in widespread welfare gains, even in cases where GDP growth has been robust. As a result, rather than concentrating only on growth, there is now more focus on how financial development and capital inflows may be used to directly improve health and education outcomes (Sakariyahu et al., 2022).

To assess human development at the national level, researchers and international organizations have created what are known as composite indices. The Human Development Index (HDI), created by the UN, is the most well-known of these metrics. This index examines human health and educational opportunities in addition to average income levels. Hence, the Human Development Index provides a more comprehensive view of human advancement than just income levels. The ranking of HDI according to the United Nations Development Programme (UNDP) ranges from 0 (lowest) to 1 (highest), reflecting average achievements in

- Health (life expectancy at birth)
- Education (mean years of schooling and expected years of schooling)
- Income (gross national income per capita, adjusted for purchasing power parity).

Not only do many African nations have low incomes, but their poor citizens also have restricted access to healthcare and education, which contributes to their low HDI rankings. The 10 nations at the top and bottom of the 2025 HDI are displayed in Table 1. The table demonstrates that most of the HDI's lowest-ranked nations are in Africa. However, there are some positive developments as well. Despite the current COVID-19 crisis and the HIV/AIDS epidemics, many African nations have made notable strides in the last two decades in all three HDI domains: average income levels have increased, access to education has expanded, and life expectancies have increased (WHO, 2022). However, inequality has not decreased as a result of these improvements. Income inequality has remained quite high in many African nations. To put it another way, some Africans now have better circumstances to make their own decisions, but not all of them do.

Table 1: The top 10 and bottom 10 countries of the UN Human Development Index 2025 (data up to 2023)

Top 10 Countries	HDI	Bottom 10 Countries	HDI
Iceland	0.972	Yemen	0.470
Switzerland	0.970	Sierra Leone	0.467
Norway	0.970	Burkina Faso	0.459

Denmark	0.962	Burundi	0.439
Germany	0.959	Mali	0.419
Sweden	0.959	Niger	0.419
Australia	0.958	Chad	0.416
Netherlands	0.955	Central African Republic	0.414
Hong Kong (China SAR)	0.955	Somalia	0.404
Belgium	0.951	South Sudan	0.388

Author's compilation

The poor HDI scores of African nations can be attributed in part to the fact that many African governments continue to struggle to fund the delivery of essential public services, including infrastructure, education, and health care. In order to improve citizens' access to public services, states need strong fiscal systems to fund these services and efficient bureaucracies to coordinate these expenditures. The significance of "good institutions" for human development is exemplified by this. But sometimes, African governments fail to act in the best interests of the poor (Acemoglu.D & Robinson, 2012).

2.2 Theoretical Literature

Schumpeterian Theory of Financial Development

The Schumpeter Theory of Financial Development was put forth by Joseph Schumpeter in 1911. This development economics theory places a strong emphasis on how banks and other financial institutions support economic growth by encouraging entrepreneurship and innovation (Schumpeter, 1911). According to Schumpeter, banks effectively distribute credit, mobilize savings, and give entrepreneurs the backing they need because they are the primary forces behind economic growth and technological advancement. The theory assumes that financial intermediaries promote profitable investment by lowering information and transaction costs. According to Schumpeter, economic expansion is both caused by and a result of financial development. Technological diffusion and structural change are made possible by robust financial systems. The theory applies to Sub-Saharan Africa (SSA) since the financial sectors of many of these nations are still in their infancy. In the end, strengthening banking institutions can help regional economic and human growth by enhancing investment allocation, encouraging innovation, and fostering the use of new technologies.

Too Much Finance Theory

A significant change to the traditional finance-growth relationship is offered by the Too Much Finance Theory, which contends that although financial development is necessary to boost economic growth in its early phases, excessive financial deepening beyond an ideal threshold may have unfavorable effects. The theory suggests a nonlinear, inverted U-shaped link between financial development and economic performance, challenging the conventional linear assumption that more money always translates into higher growth (Arcand et al., 2012).

In past decades, academics like Schumpeter (1911) and Goldsmith (1969) have highlighted the critical role that finance plays in fostering economic growth. They maintained that effective financial institutions accelerate economic growth by facilitating commerce, allocating resources, encouraging innovation, and mobilizing savings. The finance-led growth theory, which dominated development economics for decades, was based on these conventional ideas. However, by the late 1990s and early 2000s, empirical data started to show that the role of finance in economic growth starts to diminish and, in some situations, turns negative beyond a certain point of financial deepening. Based on this discovery, the Too Much Finance Theory was developed and explicitly presented in the works of Cecchetti and Kharroubi (2012; Arcand et al., 2012). The idea that "too much finance" might be harmful originated from both research findings that an excessive expansion of the financial sector may actually impede growth rather than foster it.

2.3 Empirical Literature

Empirical evidence on the relationship between energy consumption, environmental quality and human development remains mixed across countries and regions. Differences in economic structures, energy systems, environmental policies and methodological approaches have produced different conclusions regarding the nature and extent of these relationships. This section reviews the relevant studies, with particular consideration of the emerging role of geopolitical risk as a moderating factor.

In Nigeria, Oyeranti (2024) examined the effect of carbon dioxide (CO₂) emissions on life expectancy and found that increasing emissions significantly reduce life expectancy, highlighting the adverse consequences of environmental degradation on human welfare. In a related study, Haliru (2023) investigated the relationship between CO₂ emissions, energy intensity, and sustainable human development in Nigeria. The findings revealed that rising carbon emissions negatively affect sustainable human development, underscoring the importance of improving environmental quality to achieve better development outcomes. Beyond Nigeria, Kohlscheen et al. (2025) analyzed evidence from 121 countries and found that stronger environmental and climate policies help reduce carbon emissions while simultaneously promoting sustainable development. Likewise, Xu et al. (2024) analyzed data from 151 countries and established that higher carbon emissions and material footprints undermine sustainable human development, while better environmental management promotes balanced economic and social progress. More recently, Rahman and Sultana (2024) investigated 60 low-, lower-middle-, and upper-middle-income countries using GMM, FMOLS, and DOLS estimators and found that environmental quality, supported by renewable energy and good governance, significantly enhances human development, whereas increasing CO₂ emissions impede improvements in human welfare.

Djoudji and Nguea (2025) investigates the effects of energy vulnerability on human development, measured by the Human Development Index (HDI), infant and under-five mortality, life expectancy, and human capital in 27 African countries over the 2000–2019 period. The findings of this study suggest expanding access to electricity, promoting the development of renewable energy sources and energy-efficient technologies, and investing in energy infrastructure and capacity building to improve the reliability and quality of energy services. Similarly, Akpogheli et al. (2024) investigated the relationship between energy consumption and human development in

selected Sub-Saharan African and OECD countries using panel data from 1990 to 2022. Their findings revealed that energy consumption has a positive and statistically significant effect on human development in both regions, although the magnitude of the effect varies across countries. Furthermore, Akpolat and Bakırtaş (2024) analyzes the impact of renewable energy, fossil energy, CO₂ emissions, urbanization, international trade and industrialization on human development for the eight developing countries over the period 1990–2021 using Karavias and Tzavalis (2014) panel unit root test regarding structural breaks and cross-section dependence and feasible generalized least squares (FGLS) estimator technique. The findings reveal that there exists a U-shaped relationship between renewable energy consumption and HDI an inverted U-shaped relationship between fossil energy/CO₂ emissions and HDI. The study recommends that policies promoting urbanization, international trade, and industrialization are necessary to achieve high levels of human development, provided that the negative effects of these policies are mitigated. Focusing on renewable energy, Osakede et al. (2024) examined African countries between 2011 and 2023 using the System Generalized Method of Moments (System GMM) and Panel Corrected Standard Errors (PCSE). The study found that while aggregate renewable energy consumption had a negative effect on the Human Development Index (HDI), greater access to clean cooking fuels and technologies significantly improved human development. The study revealed that renewable energy consumption improves HDI after a threshold level is achieved, while fossil fuel energy and carbon emissions initially enhance development but eventually exert negative effects. This nonlinear relationship supports the Environmental Kuznets Curve (EKC) hypothesis and underscores the importance of energy structure in shaping sustainable human development. Another multi-country study, Linking Clean Energy Consumption, Globalization, and Financial Development to Ecological Footprint Nathaniel et al. (2024), used dynamic ARDL simulation tools to evaluate how clean energy impacts environmental sustainability. The study examined annual data from 1980 to 2020 and discovered that clean energy use greatly reduces ecological footprint in the long run, whereas fossil energy raises environmental strain. The authors suggest that clean energy adoption improves environmental quality, creating conditions suitable for long-term human growth. Nwaimo (2025) used ARDL and EKC frameworks to examine the effect of energy consumption on environmental quality in Nigeria, utilizing data from 1981 to 2022. The study found that fossil fuels contribute to environmental damage, whereas renewable energy reduces CO₂ emissions. The study indicates that environmental degradation caused by energy use undermines welfare benefits, highlighting the importance of incorporating environmental quality into human development calculations. At the regional level, Integration of ecological and economic factors in shaping human development by Madris et al. (2025) explored ASEAN countries using panel regression techniques from 1995–2022. The study incorporated energy consumption, environmental degradation indicators, and economic growth into an HDI framework. Findings indicate that renewable energy consumption enhances human development, while environmental degradation has a statistically significant negative effect on HDI. This reinforces the argument that environmental quality is a critical transmission channel between energy use and human development. Moreover, Abubakar, et al. (2024) investigated renewable energy shocks and human development in Nigeria using time-series econometric techniques. Their study revealed that positive renewable energy shocks improve HDI, while fossil fuel reliance undermines welfare through environmental degradation. The authors emphasize that Nigeria's human development trajectory depends largely on the speed and depth of

its energy transition. Collectively, recent empirical research shows that, while energy consumption is important for development, its impact on human development is heavily influenced by environmental quality and energy composition. Renewable energy has a favorable impact on HDI, while fossil fuel consumption and rising CO₂ emissions hinder long-term human development outcomes.

Recent empirical studies have increasingly recognized geopolitical risk as an important factor that influences energy transition and environmental sustainability. Luo and Sun (2024), Wang et al. (2024), Wang, Wang, et al. (2024), Bello and Hassan (2024), and Zhao et al. (2024) generally agree that heightened geopolitical tensions create uncertainty in energy markets, disrupt supply chains, influence investment decisions, and complicate the transition towards cleaner energy systems. These studies further suggest that geopolitical instability tends to worsen environmental quality by increasing carbon emissions and slowing progress toward sustainable energy development. Nevertheless, they argue that stronger environmental policies, green innovation, and increased investment in renewable energy can help reduce these adverse effects while improving energy security.

Empirical evidence reveals that geopolitical risk has become a major determinant of the global energy transition, while its impact varies by country and institutional framework. For example, Pata and Pata (2025) used Fourier ADL, FMOLS, and DOLS approaches to compare the effects of energy policy uncertainty, geopolitical risk, and R&D expenditure on renewable and fossil energy consumption in China. Their findings found that geopolitical risk inhibits renewable energy usage while reinforcing reliance on fossil fuels but increasing R&D investment speeds up the shift to greener energy sources. Similarly, Shittu et al. (2025) used moment quantile regression to examine a panel of 119 countries and found that geopolitical risk significantly reduces countries' energy transition readiness and overall transition performance, with the negative effects being more pronounced in countries at the lower stages of the energy transition. These findings support the premise that geopolitical uncertainty remains a significant barrier to attaining sustainable energy systems, particularly in emerging economies with little institutional capacity. However, the relationship between geopolitical risk and energy transition varies between economies. He et al. (2025), utilizing panel data from 41 nations from 2000 to 2021, discovered that, under certain situations, geopolitical risk might drive renewable energy transition by pushing countries to minimize reliance on imported fossil fuels and increase domestic energy security. The study also highlighted resource rents, trade openness, and technical innovation as key avenues through which geopolitical risk impacts the renewable energy transition. While this conclusion differs from that of Pata and Pata (2025) and Shittu et al. (2025), all three research agree that institutional quality and policy responses play a significant role in whether geopolitical shocks impede or accelerate the transition to greener energy systems. Further analysis emphasizes the relevance of policy consistency in minimizing the negative consequences of geopolitical uncertainty. Petrović and Ostojić (2025) study found that long-term investment in renewable energy projects is hindered by geopolitical risk and governmental uncertainty, resulting in decreased output. Similarly, recent global evidence published in Energy Reports shows that geopolitical risk undermines the renewable energy transition in developing and least-developed economies by limiting countries' ability to

respond effectively to external shocks. Nevertheless, the study discovered that industrialized economies are usually resilient and may even accelerate renewable energy adoption during times of global disruption, owing to better institutions and more technological capabilities. These studies together demonstrate that, while geopolitical risk is frequently related with disruptions in the energy transition, its total impact is determined by the quality of domestic institutions, policy stability, technical innovation, and nations' abilities to increase energy security.

3. Methodology

Theoretical Framework

To clarify the actual impact of these capital flows on human development, this study pulls annual panel data spanning 1990 to 2022 across 17 Sub-Saharan African countries. The selection was dictated by data availability and consistency. The approach is anchored in a standard development production function. Human development is modeled as being driven by domestic capital, external financial resources, and other macroeconomic conditions. Theoretically, it looks like this:

$$HD = AK^{\alpha} CI^{\beta} Z^{\gamma} \dots\dots\dots(1)$$

Where HD is human development, A represents institutional efficiency, K is domestic capital accumulation, CI stands for capital inflows, and Z represents other structural factors.

Since capital inflows in this study consist of foreign direct investment (FDI), remittances (REM), and official development assistance (ODA), while domestic capital accumulation is proxied by gross fixed capital formation (GFCF), and other macroeconomic conditions include population growth (POP) and trade openness (TOP), the empirical model can be specified as:

$$HDI=f(FDI,REM,ODA,GFCF,POP,TOP)\dots\dots\dots(2)$$

Where:

HDI = Human Development Index

FDI = foreign direct investment

REM = remittances

ODA = official development assistance

GFCF = gross fixed capital formation

POP = population growth

TOP = trade openness.

Model Specification

Translating that into specific variables to capture direct effects, the baseline empirical model is specified as:

$$HDI_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 REM_{it} + \beta_3 ODA_{it} + \beta_4 GFCF_{it} + \beta_5 POP_{it} + \beta_6 TOP_{it} + \mu_i + \lambda_t + \varepsilon_{it} \dots\dots\dots(2)$$

To test the hypothesis of a nonlinear relationship between aid and human development, a second model is set up that includes a squared ODA term (ODA^2). The goal was to see if a tipping point exists where aid suddenly becomes more or less effective at different volumes:

$$\text{HDI}_{it} = \beta_0 + \beta_1\text{FDI}_{it} + \beta_2\text{REM}_{it} + \beta_3\text{ODA}_{it} + \beta_4\text{ODA}^2_{it} + \beta_5\text{GFCF}_{it} + \beta_6\text{POP}_{it} + \beta_7\text{TOP}_{it} + \mu_i + \lambda_t + \varepsilon_{it} \dots \dots (3)$$

Estimation Technique

This study investigates the relationships between capital inflows and human development in 17 Sub-Saharan African countries from 1990 to 2022, due to data availability. Given the panel data characteristics, including cross-sectional dependence, heterogeneous country effects, and potential structural breaks, modern panel econometric techniques are employed. Cross-sectional dependence is first assessed using Pesaran’s (2004) CD test, which identifies whether shocks affecting one country may influence others in the panel. The CIPS (Cross-sectional Augmented IPS) unit root test is then applied to examine the stationarity of the series while accounting for cross-sectional dependence. Following this, the Westerlund (2007) ECM-based panel cointegration test is conducted to determine the existence of a long-run equilibrium relationship. This test also accommodates structural breaks, ensuring that shocks such as economic crises, policy changes, or external disturbances are considered. Together, these pre-estimation tests ensure that the data meet the necessary econometric conditions and provide a solid foundation for the use of Driscoll–Kraay Fixed Effects Regression with Time Dummies and Two-Stage Least Squares (2SLS) for robustness checks.

Table 1: Data Sources

Variable	Full Name / Description	Source	Coverage (Years)
HDI	Human Development Index – composite index measuring life expectancy, education, and standard of living	UNDP (2024)	1990–2022
ODA	Official Development Assistance received (% of Gross National Income)	WDI (2025)	1990–2022
ODA²	Squared term of Official Development Assistance	Computed by Author using WDI 2025 data with Stata 16	1990–2022
FDI	Foreign Direct Investment (net inflows, % of GDP)	UNCTAD (2025) and WDI (2025)	1990–2022
REM	Remittances (Personal remittance inflows, % of GDP)	WDI (2025)	1990–2022
POP	Population growth rate (annual %)	WDI (2025)	1990–2022
TRA	Trade Openness – Total trade (% of GDP)	WDI (2025)	1990–2022
GFC	Gross Fixed Capital Formation (% of GDP)	WDI (2025)	1990–2022
YEAR DUMMIES	Time fixed effects controlling for structural breaks and global shocks	Generated by Author using Stata 16	1990–2022

4. Results and Discussion of Findings

This chapter presents the empirical findings of the study and interprets them in line with the research objectives. It begins by describing the results obtained from the data analysis, including both descriptive and inferential statistics. The discussion that follows interprets these results in the context of existing literature and theoretical expectations. By linking the empirical evidence to prior studies and theoretical frameworks, this chapter provides insights into the relationship between capital inflows and human capital development in Sub-Saharan Africa.

Table 2. List of selected Sub-Saharan African Countries

Nigeria	Kenya	Benin
Sierra Leone	Guinea	Cameroon
Lesotho	Niger	South Africa
Senegal	Mali	Republic of Congo
Togo	Ghana	Gabon
Central African Republic	The Gambia	

Source: Author's Compilation

Descriptive Statistics

The descriptive statistics summarize the key characteristics of the variables used in the analysis, which include the Human Development Index (HDI), Foreign Direct Investment (FDI), Remittances (REM), Official Development Assistance (ODA), Population Growth (POP), Trade Openness (TRA), and Gross Fixed Capital Formation (GFCF).

Table 3: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
HDI	561	0.4739	0.1138	0.215	0.742
FDI	561	2.4091	4.0369	-17.2921	37.3228
REM	561	5.3887	16.4828	0	167.4331
ODA	561	7.0186	6.0262	-0.1884	34.2839
POP	561	2.4862	0.8856	-1.8996	5.9055
TRA	561	59.7826	29.0706	19.3	165.0489
GFCF	561	20.5240	9.2721	-2.4244	78.0009

Source: Author's Compilation using Stata 16

Table 3 shows that HDI has a mean value of 0.4739 and a standard deviation of 0.1138, indicating that human development levels vary moderately across the sampled nations. The minimum and maximum values, 0.215 and 0.742, respectively, indicate significant differences in human development within the group. Foreign direct investment has an average value of 2.41 and a rather large standard deviation of 4.04, showing significant differences in investment inflows between countries. The smallest value of -17.29 indicates that certain countries saw net capital outflows, while the maximum value of 37.32 indicates significant investment inflows.

Remittances have a mean value of 5.39 and a high standard deviation of 16.48, showing significant variation in remittance inflows between countries. The highest value of 167.43 indicates that some countries rely extensively on remittances as a source of foreign financing. Official development assistance has an average value of 7.02 and a standard deviation of 6.03, indicating significant diversity in the amount of help received by nations in the sample. Aid allocation and disbursement vary by country and time period, with numbers ranging from -0.19 to 34.28. Population growth has a mean value of 2.49 and a standard deviation of 0.89, indicating substantial variation in population growth rates across the sample. The minimum and maximum values of -1.90 and 5.91 demonstrate that some countries witnessed population reduction, while others reported comparatively significant growth rates. Trade openness has an average value of 59.78 and a standard deviation of 29.07, suggesting that the degree of integration with the global economy varies greatly among the countries investigated. The minimum and maximum values of 19.3 and 165.05, respectively, emphasize disparities in trade exposure. Finally, gross fixed capital formation has a mean value of 20.52 and a standard deviation of 9.27, showing moderate diversity in domestic investment levels among the samples. The figures range from -2.42 to 78.00, indicating that some countries witnessed investment contraction while others had comparatively high levels of capital formation.

Overall, the descriptive statistics show significant variety across the variables, which makes it appropriate for empirical study because it gives enough variance to investigate the relationship between capital inflows and human development. The relatively large standard deviations reported for some variables, particularly remittances and trade openness, show that the sample contains significant cross-country heterogeneity, necessitating the use of panel estimation techniques for the empirical study.

Table 4: Correlation Analysis

Variables	HDI	FDI	REM	ODA	POP	TRA	GFCF
HDI	1.0000						
FDI	0.1737	1.0000					
REM	0.0054	0.0302	1.0000				
ODA	-0.6144	0.0822	0.0486	1.0000			
POP	-0.1290	0.0726	-0.3102	-0.0170	1.0000		
TRA	0.3580	0.2258	0.2182	-0.0453	-0.1961	1.0000	
GFCF	0.3119	0.3806	0.3640	-0.2021	0.0053	0.3946	1.0000

Source: Author's Compilation using Stata 16

Table 4, shows the correlation matrix between the variables used in the study, which include the Human Development Index (HDI), Foreign Direct Investment (FDI), Remittances (REM), Official Development Assistance (ODA), Population Growth (POP), Trade Openness (TRA), and Gross Fixed Capital Formation (GFCF).

The findings indicate that HDI is positively correlated with FDI (0.1737), trade openness (0.3580), and gross fixed capital formation (0.3119), implying that higher levels of foreign investment, trade integration, and domestic capital formation are associated with advances in human development. However, the correlation between HDI and remittances is minimal (0.0054), implying a minor linear relationship between these variables. Interestingly, HDI has a strong negative association with ODA (-0.6144), implying that nations that receive more aid tend to have poorer levels of human development. This could be attributed to the fact that development assistance is frequently allocated toward countries facing bigger developmental challenges.

Population growth has a negative connection with HDI (-0.1290), meaning that increased population growth may put a strain on social and economic resources, potentially impeding progress in human development outcomes. Trade openness is positively connected with various variables, including FDI (0.2258), remittances (0.2182), and gross fixed capital formation (0.3946), implying that more open economies attract more external financial flows and investments. Finally, gross fixed capital formation has a positive relationship with FDI (0.3806) and remittances (0.3640), implying that both foreign investment and migrant transfers may contribute to domestic capital accumulation. Importantly, none of the pairwise correlation coefficients are above 0.80, showing that the explanatory factors do not exhibit significant multicollinearity. This implies that the variables can be used concurrently in the regression analysis without producing severe estimation issues.

Table 5: Pesaran's Test for Cross-Sectional Dependence

Pesaran's CD test was employed to examine cross-sectional dependence among variables in the 17 selected Sub-Saharan African countries.

Variable	CD Statistic	P-value	Average Correlation
HDI	57.78	0.000	0.862
FDI	12.64	0.000	0.189
REM	7.48	0.000	0.112
ODA	18.48	0.000	0.276
POP	5.40	0.000	0.081
TRA	3.58	0.000	0.053
GFCF	10.15	0.000	0.151

Source: Author's Compilation using Stata 16

Table 5, displays the results of the cross-sectional dependence test utilizing M. Hashem Pesaran's Pesaran CD test. The test determines if the cross-sectional units (countries) in the panel dataset are correlated. Null hypothesis: There is no cross-sectional dependency among the panel units.

Alternative hypothesis: There is cross-sectional dependence among the panel units.

The result show that the CD statistics for all variables, including the Human Development Index (HDI), Foreign Direct Investment (FDI), remittances (REM), Official Development Assistance (ODA), population growth (POP), trade openness (TRA), and gross fixed capital formation (GFCF), are statistically significant at the 1% level, as revealed by p-values of 0.000. As a result, the null hypothesis of cross-sectional independence is rejected for each variable.

This finding shows that there is cross-sectional dependence among the nations in the sample, implying that economic shocks or policy changes in one country may have an impact on others. Such dependency may result from regional economic integration, shared macroeconomic shocks, or trade and financial links between countries.

Since these results confirm that cross-sectional dependence is present, the use of second-generation panel methods such as CIPS unit root tests and Westerlund (2007) cointegration tests to confirm stationarity and possible long-run relationships among the variables is justified.

Unit Root Test

To determine the stationarity of variables while accounting for cross-sectional dependence, the Pesaran (2007) CIPS panel unit root test was applied. The results indicate a mixed order of integration, with some variables stationary in levels (I(0)) and others after first differencing (I(1)).

The CIPS test's null hypothesis states that the series has a unit root (non-stationary), but the alternative hypothesis argues that the series is stationary.

Table 5: CIPS (Cross-sectional Augmented IPS) Unit Root Test

Variable	Level t-bar	First Diff t-bar	5% Critical Value	Order of Integration
HDI	-1.342	-3.199	-2.200	I(1)
FDI	-2.438	—	-2.200	I(0)
REM	-2.207	—	-2.200	I(0)
ODA	-2.508	—	-2.200	I(0)
POP	-2.900	—	-2.200	I(0)
TRA	-1.880	-4.372	-2.200	I(1)
GFC	-2.038	-4.314	-2.200	I(1)

Author's compilation using Stata 16

The results indicate that FDI, REM, ODA, and POP are stationary at level, as their t-bar statistics are more negative than the critical values. Conversely, HDI, TRA, and GFC are not stationary at level since their t-bar statistics do not exceed the critical values in absolute terms. However, after taking the first difference, the results show that HDI, TRA, and GFC become stationary, as their t-bar statistics are significantly lower than the critical values. This implies that these variables are integrated of order one, I(1). Overall, the results show a mixed order of integration across the variables, with some remaining stationary at level and others

becoming stationary after first differencing. This combination of I(0) and I(1) variables lends itself to panel estimating approaches that fit mixed integration orders.

Table 6: Westerlund (2007) Panel Cointegration Test

Decision rule:

H₀: No cointegration (no long-run relationship)

H₁: Cointegration exists

Reject H₀ if Robust p-value < 0.05.

Statistic	Value	Robust P-value	Decision
Gt	-0.054	0.993	Fail to reject H ₀
Ga	-0.133	0.980	Fail to reject H ₀
Pt	-0.082	0.930	Fail to reject H ₀
Pa	-0.007	0.932	Fail to reject H ₀

Author's compilation using Stata 16

The Westerlund (2007) ECM-based panel cointegration test was used to investigate the long-run equilibrium relationship among HDI, FDI, remittances, ODA, population growth, trade openness, and gross fixed capital formation. The results show that all four test statistics (Gt = -0.054, Ga = -0.133, Pt = -0.082, and Pa = -0.007) are statistically insignificant, with robust p-values above the 5% significance level. As a result, the null hypothesis of no cointegration cannot be rejected, indicating the lack of a long-run equilibrium relationship among the variables in the panel sample. This suggests that there is no statistically significant long-run cointegrating link between the variables in the 17 Sub-Saharan African countries from 1990 to 2022. Importantly, because the Westerlund test accounts for potential structural breaks, these findings are robust to shocks such as recessions, policy changes, and external disturbances during the study period.

Table 7: Driscoll–Kraay Fixed Effects Regression with Time Dummies (Direct Effect)

Variables	Coefficient	Std. Error	t-Statistic	P-value	Decision
FDI	-0.000025	0.000162	-0.15	0.879	Not significant
REM	0.000770	0.0000715	10.77	0.000	Significant
ODA	-0.001662	0.0003589	-4.63	0.000	Significant
POP	0.006152	0.0016356	3.76	0.001	Significant
TRA	0.0000466	0.0001135	0.41	0.684	Not significant
GFCF	0.00000459	0.0001281	0.04	0.972	Not significant

Constant	0.396229	0.008602	46.06	0.000	Significant
Number	of	Observations:	561		
Number	of	Groups	(Countries):	17	
Within		R ² :	0.9009		
Maximum Lag (Driscoll-Kraay): 3					
Author's compilation using Stata 16					

The regression results obtained using the Driscoll-Kraay fixed-effects estimator show that remittances, official development assistance (ODA), and population all have statistically significant influence on human development in the sampled Sub-Saharan African countries.

Remittances have a positive and statistically significant influence on the Human Development Index (HDI) ($\beta = 0.000770$, $p < 0.01$), indicating that higher inflows lead to better welfare, education, and health outcomes. Official Development Assistance (ODA) has a negative and statistically significant connection with HDI ($\beta = -0.001662$, $p < 0.01$). This suggests that increased assistance inflows may not always result in greater human development results, potentially due to inefficiencies in aid utilization or dependency effects. Population has a positive and significant coefficient ($\beta = 0.006152$, $p < 0.01$), suggesting that demographic expansion may lead to better development outcomes, including labor force growth and market expansion. In contrast, foreign direct investment (FDI), trade openness, and gross fixed capital formation are not statistically significant, implying that their direct contributions to human development in the region were limited during the study period. The model has a strong explanatory power, with an R^2 of 0.9009, explaining over 90% of the diversity in human development across countries and time periods.

Overall, the findings suggest that remittances and population have a positive and statistically significant effect on human development in the selected Sub-Saharan African nations, whereas official development assistance (ODA) has a significant negative impact. In contrast, foreign direct investment (FDI), trade openness, and gross fixed capital formation have no statistically significant effect on HDI during the study period.

Table 8: Two-Stage Least Squares (2SLS) (Direct Effect)

Variables	Coefficient	Std. Error	z-statistic	P-value	Decision
FDI (Instrumented)	-0.000897	0.000729	-1.23	0.219	Not significant
Remittances	0.000814	0.000092	8.81	0.000	Significant
ODA	-0.001753	0.000214	-8.19	0.000	Significant
Population	0.005706	0.001217	4.69	0.000	Significant
Trade Openness	0.000074	0.0000615	1.20	0.229	Not significant
Gross Fixed Capital Formation	0.000202	0.000184	1.10	0.272	Not significant
Constant	0.394865	0.006721	58.75	0.000	Significant

Source: Author's compilation using Stata 16

The 2SLS regression was estimated to address endogeneity among the explanatory variables, which the Driscoll–Kraay Fixed Effects estimator cannot correct. The robustness check using the Two-Stage Least Squares (2SLS) estimator shows results consistent with the baseline model. Remittances have a positive and statistically significant effect on human development ($\beta = 0.000814$, $p < 0.01$), indicating that higher remittance inflows contribute to improvements in HDI. Official development assistance (ODA) maintains a negative and significant relationship with HDI ($\beta = -0.001753$, $p < 0.01$). Population also shows a positive and significant effect on human development ($\beta = 0.005706$, $p < 0.01$). However, foreign direct investment ($\beta = -0.000897$, $p = 0.219$), trade openness ($\beta = 0.000074$, $p = 0.229$), and gross fixed capital formation ($\beta = 0.000202$, $p = 0.272$) are still statistically insignificant. The consistency between the 2SLS results and the baseline estimates suggests that the primary findings are reliable and not influenced by FDI endogeneity.

Table 9: Nonlinear Effect of ODA on Human Development

Variables	Coefficient	Std. Error	t-statistic	P-value	Decision
FDI	-0.000014	0.000165	-0.08	0.936	Not significant
Remittances	0.000764	0.000072	10.64	0.000	Significant
ODA	-0.001069	0.000565	-1.89	0.068	Not significant (5%)
ODA ²	-0.000020	0.000024	-0.84	0.409	Not significant
Population	0.005870	0.001552	3.78	0.001	Significant
Trade	0.000048	0.000111	0.43	0.671	Not significant
GFCF	0.000007	0.000125	0.06	0.954	Not significant

Number of obs: 561 · Groups: 17 · Within R²: 0.9011

Author's compilation using Stata 16

The nonlinear regression results indicate that official development assistance (ODA) has a negative coefficient ($\beta = -0.001069$), which is only faintly significant at the 10% level ($p = 0.068$). The ODA² squared term exhibits a negative coefficient ($\beta = -0.000020$), but is statistically insignificant ($p = 0.409$). Because the squared term is not statistically significant, the findings do not support the hypothesis of a nonlinear relationship between ODA and human development. This suggests that the effect of official development assistance on human development does not follow a U-shaped or inverted U-shaped pattern in Sub-Saharan African countries over the period studied.

Meanwhile, remittances ($\beta = 0.000764$, $p < 0.01$) and population ($\beta = 0.005870$, $p < 0.01$) continue to positively impact human development, but FDI, trade openness, and gross fixed capital formation are statistically insignificant. Overall, the findings do not indicate a nonlinear effect of official development assistance on human development. This shows that increases in ODA do not have a declining or threshold effect on HDI during the study period.

4.2 Discussion of Findings

This study examined the effect of capital inflows on human development in selected Sub-Saharan African countries using the Driscoll-Kraay fixed-effects estimator. The findings show that the various forms of capital inflows do not contribute equally to human development, suggesting that the developmental impact of external financial resources depends on how they are utilized within recipient countries.

The results indicate that foreign direct investment (FDI) has a negative but statistically insignificant effect on human development. This suggests that despite the inflow of foreign investments into the region, these investments have not translated into meaningful improvements in health, education, and overall living standards. A possible explanation is that a significant proportion of FDI in Sub-Saharan Africa is concentrated in extractive industries, which often generate limited employment opportunities and weak linkages with the broader economy. This finding supports the argument of Zidouemba and Elitcha (2018), who noted that FDI concentrated in extractive sectors tends to produce limited developmental benefits. However, the result differs from the findings of Adegboye et al. (2021), who reported that FDI can enhance economic welfare when its benefits spread across the wider economy.

The study further reveals that remittances have a positive and statistically significant effect on human development. This implies that funds sent home by migrants play an important role in improving the welfare of households across the region. Such funds are often used to finance education, healthcare, food consumption, and other essential needs, thereby improving living standards. This finding is consistent with Mohammed (2020), who found that remittances significantly improve human development in Sub-Saharan Africa. It also supports the position of Yao and Kouakou (2025), who emphasized that remittances serve as an important source of support for household welfare and sustainable development.

The findings also show that official development assistance (ODA) has a negative and statistically significant effect on human development. This suggests that aid inflows have not generated the expected improvements in welfare outcomes within the sampled countries. The negative effect may be linked to issues such as weak institutional structures, poor governance, and inefficiencies in the allocation and utilization of aid resources. This finding contrasts with Ofori et al. (2024), who argued that foreign aid can contribute positively to development when it is properly managed and directed toward productive sectors of the economy.

Furthermore, the coefficient of the squared term of official development assistance (ODA^2) is negative but statistically insignificant, indicating the absence of a significant nonlinear relationship between aid and human development. This means that increases in aid inflows do not appear to generate either increasing or diminishing effects on human development within the study period. The result suggests that the effectiveness of aid depends more on how it is utilized than on the volume of aid received.

Overall, the findings indicate that remittances remain the most effective form of capital inflow for promoting human development in Sub-Saharan Africa, while the contributions of FDI and official development assistance appear to be constrained by structural and institutional challenges. These results underscore the need for stronger institutions, improved governance, and more effective policy frameworks to ensure that external financial inflows translate into meaningful improvements in human welfare.

5. Conclusion and Recommendation

5.1 Conclusion

Based on the study's findings, it can be concluded that the influence of capital inflows on human development in Sub-Saharan Africa varies with the type of inflow. Remittances appear to play an important role in enhancing human development outcomes since they directly fund household spending, education, and healthcare.

However, foreign direct investment does not appear to have a major impact on human development in the region, presumably because investments are concentrated in sectors with limited social spillovers. Similarly, the negative relationship between official development assistance and human development implies that aid inflows may not always be efficiently used or effectively targeted to improving welfare outcomes.

These findings suggest that the effects of external financial inflows are heavily reliant on how well they are handled and integrated into national development objectives. As a result, authorities in Sub-Saharan Africa must implement policies that ensure external financial resources are directed into industries that directly improve human development.

5.2 Recommendation

Based on the findings, the study proposes the following policy recommendations to strengthen the link between capital inflows and human development in Sub-Saharan Africa:

- a) Promote the productive use of remittances: Sub-Saharan African governments should establish policies that stimulate the productive use of remittances by creating investment opportunities and financial instruments that direct remittance inflows to areas such as education, healthcare, and small business growth.
- b) Improving the development impact of foreign direct investment: Policymakers should establish measures to attract foreign direct investment into sectors with strong links to the domestic economy, such as manufacturing, technology, and human capital development, rather than focusing solely on extractive industries.
- c) Improving the efficiency of foreign aid: Governments should establish institutional frameworks, transparency, and accountability procedures to guarantee that official development assistance is used efficiently in programs that directly increase human development outcomes.
- d) Governments should invest in education, healthcare, and skills development while implementing inclusive economic and governance policies that ensure population growth and external financial inflows translate into sustainable human development and improved welfare..

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