Scientific Research Publishing

Theoretical Economics Letters, 2025, 15(1), 83-109
https://www.scirp.org/journal/tel
ISSN Online: 2162-2086
ISSN Print: 2162-2078

Can Foreign Aid Help Sub-Saharan African Countries with Economic Growth?

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How to cite this paper: Wu, Q. T., & Bote, D. (2025). Can Foreign Aid Help Sub-Saharan African Countries with Economic Growth? *Theoretical Economics Letters, 15,* 83-109.
https://doi.org/10.4236/tel.2025.151005

Received: September 19, 2024
Accepted: February 2, 2025
Published: February 5, 2025

Abstract

Foreign aid remains a crucial financial resource for many Sub-Saharan African countries, yet its impact on economic growth has been widely debated. This study re-examines the relationship using panel data from 43 Sub-Saharan African countries over the period 2005-2020. Our results show that fixed effects are significant, indicating that aid directly influences economic growth. Threshold analysis reveals that aid positively affects growth across various thresholds, highlighting its consistent impact. Additionally, our findings suggest that aid influences growth indirectly through transmission mechanisms such as increased domestic investment, improved health outcomes, and enhanced consumption. Based on these results, we present policy recommendations for optimizing aid allocation. Policymakers should focus on ensuring that aid is used efficiently to strengthen institutional frameworks, improve domestic investment climates, and enhance health and social systems. Furthermore, fostering economic freedom and stability will enable countries to fully leverage the benefits of aid and achieve sustainable growth.

Keywords

Foreign Aid, Economic Growth, Panel Data, Sub-Saharan African Countries

1. Introduction

Sub-Saharan Africa remains the most underdeveloped region globally, characterized by pervasive poverty, fragile institutions, and significant developmental challenges. Many countries in the region are classified by the World Bank as lower-income, with a GDP per capita below $800. Foreign aid has been pivotal in addressing these challenges, serving as a critical lifeline for populations dependent on external support. In this study, foreign aid refers to financial or material assistance provided by developed nations, international organizations, and multilateral

institutions to support economic and social development in less developed countries. This assistance includes grants, concessional loans, technical support, and humanitarian aid aimed at alleviating poverty, fostering sustainable development, and responding to emergencies such as natural disasters and conflicts. In Sub-Saharan Africa, foreign aid is often directed toward key areas such as infrastructure, healthcare, education, and governance reforms.

In 2022, global aid inflows to developing countries reached $204 billion, with Sub-Saharan Africa receiving a substantial share of approximately $70 billion. However, the role of foreign aid in promoting economic growth remains a topic of extensive debate. Advocates highlight its potential to drive development by alleviating resource constraints, especially in countries with limited domestic revenue. For instance, targeted aid initiatives in healthcare and education have been shown to enhance human capital and productivity. Conversely, critics argue that aid alone is insufficient to spur sustainable progress, pointing to cases where weak institutions, corruption, and political instability have undermined its effectiveness, leading to dependency and inefficiency. These contrasting perspectives underscore the complexity of the aid-growth relationship, necessitating context-specific analyses to understand the conditions under which aid can be most effective (Roodman, 2007; Bourguignon & Sundberg, 2007; Hansen and Tarp, 2001).

A comprehensive understanding of the aid-growth nexus requires attention to the unique socioeconomic and institutional landscape of Sub-Saharan Africa. Existing studies often pool African countries with those from other regions, potentially overlooking the distinct structural and developmental challenges faced by the region, such as weak governance, limited fiscal capacity, and high inequality. Addressing this gap, the present study focuses exclusively on Sub-Saharan Africa, examining the effectiveness of aid over a 16-year period. Specifically, the study explores sub-issues such as aid-growth transitions, the influence of aid on investment, the heterogeneity of aid impacts, and alternative sources of development finance. The selected research period reflects a phase of significant global and regional transformations, including shifts in aid policies, the emergence of new donor nations, and varying economic cycles within Sub-Saharan Africa. By analyzing data from 43 countries, this study aims to provide robust empirical insights into how foreign aid interacts with regional economic and institutional contexts.

The paper is structured as follows: Section 2 reviews relevant literature, Section 3 outlines the data and methodology, Section 4 presents the results and robustness checks, and Section 5 concludes with key findings and policy recommendations tailored to the region's developmental needs.

2. Literature Review

The discourse surrounding foreign aid as a mechanism for fostering economic growth in developing nations is indeed complex and has sparked significant debate. Foreign aid, which involves the transfer of resources such as capital, goods,

or services from developed to developing nations, is aimed at alleviating poverty, stimulating growth, and enhancing living standards (Moolio & Kong, 2016). However, the extent to which foreign aid achieves these goals is contested, with scholars like Khan and Ahmed (2022) and Qayyum and Haider (2022) presenting divergent views on its impact.

Theoretical frameworks like the **resource curse hypothesis** highlight that countries rich in natural resources may experience slower economic growth due to governance issues, such as corruption and rent-seeking (Sachs & Warner, 1999; Auty, 1990; Sachs & Warner, 2001). In the context of foreign aid, this suggests that aid might exacerbate these challenges if resource management is weak. Morrison (2012) points out that foreign aid, when coupled with weak governance, can further entrench corrupt power structures. Ravetti et al. (2018) add that such aid can create distorted incentives, leading to negative outcomes, including unsustainable debt.

The **conditionality theory** offers another perspective, suggesting that by imposing conditions on recipient countries, donor nations can guide the effective use of aid and promote accountability. Guillaumont and Chauvet (2001) argue that aid can have a significant positive impact when directed at countries with poor initial policies, as it not only provides financial resources but also stimulates policy reform. Similarly, Collier et al. (1997) note that conditional aid can send a positive signal to private investors, enhancing a state's economic environment. However, critics such as Kentikelenis et al. (2016) and Shah (2018) argue that conditionality often fails, particularly when conditions are imposed without adequate consultation, leading to ineffective or counterproductive outcomes.

One of the key arguments in favor of foreign aid is its role in bridging funding gaps in developing nations, where domestic resources may fall short of what is needed for development (Moolio & Kong, 2016; Haque et al., 2021). Aid can enable critical investments in infrastructure and public services, as seen in Nepal (Karki & Pappas, 2020). However, the effectiveness of such aid is heavily influenced by governance quality and the specific context of the recipient nation (Qayyum & Haider, 2022). Poorly governed countries often struggle with issues such as corruption and resource misallocation, which can diminish the potential benefits of foreign aid.

Another concern is the risk of **Dutch disease**, where an influx of foreign aid leads to currency appreciation, reducing the competitiveness of local industries. Agénor et al. (2008) argue that while aid can stimulate public investment, it can also create dependency and distort local economies. Khan and Ahmed (2022) add that foreign aid, while potentially beneficial, can act as a double-edged sword, fostering growth in some situations but hindering it in others, particularly when the institutional framework is weak.

The role of foreign direct investment (FDI) is also significant in this debate. Thangamani et al. (2011) and Kimura and Todo (2010) argue that foreign aid can play a pivotal role in creating conditions conducive to FDI, which in turn can stimulate

growth. However, the success of this relationship depends on the recipient country's ability to use aid effectively to build infrastructure and improve human capital.

Case studies, such as Mallik's (2008) analysis of six African countries and Jean's (2015) investigation of Haiti, illustrate the variability in foreign aid's effectiveness. These localized studies underscore the importance of context in understanding the diverse impacts of aid. For instance, Mallik's findings suggest that aid's influence on economic growth differs significantly across regions, reinforcing the need for tailored approaches to foreign aid.

The relationship between foreign aid and economic growth is multifaceted, with both positive and negative outcomes depending on various contingent factors such as governance, institutional capacity, and economic context. While foreign aid has the potential to act as a catalyst for development, its success is not guaranteed and requires nuanced, context-specific strategies to maximize its effectiveness (Minoiu & Reddy, 2010). Future research should continue to explore these dynamics, with a focus on how aid can be leveraged alongside FDI and domestic investment to foster sustainable growth.

3. Empirical Studies

The discourse surrounding the relationship between foreign aid and economic growth has evolved significantly since the early empirical studies that employed linear econometric models. Initial works, such as those by Chenery and Strout (1968), posited a straightforward positive relationship, suggesting that foreign aid could enhance economic growth by supplementing domestic savings and export earnings. This perspective was grounded in the belief that additional capital from foreign aid could be effectively utilized for investments in critical areas such as infrastructure, productive sectors, and human capital development, ultimately propelling economic advancement in developing countries (Gomanee et al., 2005; Dalgaard et al., 2004). The underlying assumption was that foreign aid acted as a catalyst, addressing the resource constraints that many developing nations face, thus facilitating economic growth.

de Ree and Nillesen (2009) analyze the impact of foreign aid on civil conflict, addressing key methodological gaps in the literature. Using donor countries' GDP levels as instruments to address endogeneity and employing first-differencing to control for unobserved country-specific effects, they account for the dynamic nature of conflict models. Their findings reveal that foreign aid significantly reduces the probability of ongoing civil conflicts continuing but does not affect the likelihood of new conflicts starting. These results highlight the potential role of aid in mitigating conflict duration while suggesting limited influence on conflict on-set. Juselius, Framroze, and Tarp's (2011) study provides an in-depth analysis of the long-term effects of foreign aid on economic growth in 36 African countries using a rigorous methodological approach. The authors employ a multivariate time series analysis with a cointegrated VAR model, which facilitates a detailed examination of the relationships between Official Development Assistance (ODA) and key

economic indicators over time. Their findings suggest a generally positive long-run impact of ODA on economic growth, challenging the prevalent narrative that foreign aid is either ineffective or detrimental to development. By highlighting the growth-enhancing potential of aid in the African context, the study underscores the importance of adopting a nuanced perspective when assessing the role of foreign aid in economic development.

However, subsequent research has revealed a more complex relationship between foreign aid and growth, challenging the simplistic linear models of earlier studies. Burnside and Dollar (2000) were pivotal in this regard, arguing that the effectiveness of foreign aid is contingent upon the economic and political context of the recipient country. Their findings underscored the importance of good governance, particularly the presence of sound macroeconomic policies and robust institutions, in maximizing the positive impacts of aid. They demonstrated that countries characterized by low inflation, minimal budget deficits, and a commitment to trade openness were more likely to experience the growth-enhancing effects of foreign aid (Ogbonna et al., 2021). Conversely, in nations with weak institutions and poor governance practices, foreign aid could lead to corruption and resource misallocation, ultimately undermining its intended benefits (Okada and Samreth, 2012; Hadjimichael & Ghura, 1995).

This nuanced understanding of the aid-growth relationship has been echoed by various scholars, including Collier and Dollar (2001) and Islam (2005), who emphasized the critical role of institutional quality and policy frameworks in mediating the effects of foreign aid. Their research indicated that foreign aid directed towards countries with strong institutions and sound economic policies was more likely to translate into sustainable economic growth. This perspective aligns with the findings of (Ogbonna et al., 2021), who noted that the marginal effect of foreign aid on economic growth is positive in contexts of high institutional quality but negative in environments characterized by low institutional quality (Ogbonna et al., 2021). Such insights highlight the necessity of considering recipient country characteristics when evaluating the effectiveness of foreign aid (Radelet et al., 2004).

The literature further delves into the significance of targeted aid programs and sector-specific investments. Scholars like Papanek (1973) and Levy (1988) have argued for the potential benefits of directing aid towards sectors crucial for long-term economic growth, such as education, healthcare, and infrastructure. Investments in these areas can equip a developing country's workforce with essential skills and knowledge, improve health outcomes, and create an enabling environment for private sector investment and economic activity (Fiodendji and Evlo, 2013). Clemens et al. (2004) also contributed to this discourse by differentiating between short-term and long-term impacts of aid, suggesting that the positive effects on growth may be more pronounced over time as investments in human capital and infrastructure yield returns (Boudreaux et al., 2021).

Moreover, the design of aid programs has come under scrutiny, particularly

concerning the conditionalities imposed by donor countries. These conditionalities can sometimes restrict recipient countries' policy autonomy and undermine their ownership of development strategies. Moyo (2009) raised concerns about the potential drawbacks of conditionality, advocating for a focus on capacity building and strengthening domestic institutions as a more beneficial approach in the long term (Herzer & Nunnenkamp, 2012). Studies by Easterly (2003) and Roodman (2007) further highlighted these issues, suggesting that conditionalities could inadvertently hinder the effectiveness of aid by imposing constraints that do not align with the unique needs and circumstances of recipient countries (Chong, 2006).

Despite the potential benefits of foreign aid, a counter-narrative exists within the literature that questions its overall effectiveness. Scholars like Mosley (1980) and Easterly et al. (2004) have raised concerns about issues such as mismanagement, corruption, and a lack of transparency in recipient countries. They argue that the misallocation of aid resources due to poor governance can lead to a situation where aid fosters dependence rather than promoting self-sustaining economic growth (Asongu, 2013; Singh, 1985). Additionally, some researchers contend that foreign aid can be weaponized by donor countries to pursue geopolitical interests, potentially distorting recipient countries' development priorities (Asongu & Jellal, 2013). This perspective is supported by (Rodrik, 2010) and (McGillivray, 2006), who argue that the motivations behind foreign aid can significantly influence its effectiveness and impact on growth (Yahyaoui & Bouchoucha, 2021).

The literature also acknowledges the importance of regional variations in the impact of foreign aid. Ekanayake and Charrna (2010) observed mixed effects across continents, noting that while foreign aid may have yielded positive results in Sub-Saharan Africa, it could exhibit negative consequences for Latin American and Caribbean economies (Ndambendia & Njoupouognigni, 2010). This underscores the necessity for context-specific analyses that take into account the unique economic, political, and social realities of different regions. Such an approach is essential for understanding the complex dynamics at play in the aid-growth relationship and for designing effective aid interventions.

In summary, the relationship between foreign aid and economic growth is multifaceted and influenced by a variety of factors, including institutional quality, governance, and regional context. Early empirical studies laid the groundwork for understanding this relationship, but subsequent research has revealed the importance of considering the specific characteristics of recipient countries and the design of aid programs. As the discourse continues to evolve, it is imperative for policymakers and researchers to adopt a nuanced perspective that recognizes the complexities inherent in the aid-growth nexus. Radelet et al. (2004) explore the link between foreign aid and economic growth, emphasizing the importance of aid type and context. They find that long-term aid in infrastructure, education, and health significantly boosts growth, especially in countries with strong policies

and governance. The study highlights that aid effectiveness relies on institutional quality and the broader policy environment. Their findings stress the need for targeted aid strategies to maximize developmental impact. Singh's (1985) study examines the interplay between state intervention, foreign aid, savings, and economic growth in less developed countries (LDCs), offering valuable policy insights. The findings reveal that while higher saving rates and foreign aid as a percentage of GDP are positively correlated with economic growth, the effectiveness of foreign aid diminishes when excessive state intervention is present. This suggests that government overreach can hinder the developmental impact of external assistance. Singh argues that foreign aid fosters growth only when accompanied by policies that reduce state intervention and promote market efficiency. These insights underscore the importance for policymakers in LDCs to adopt market-friendly policies, ensuring that foreign aid translates into sustainable economic development.

Recent research has increasingly scrutinized the relationship between foreign aid and economic growth, revealing that not all forms of aid exert the same impact. One critical aspect of this discourse is the distinction between different types of aid and their intended purposes. For instance, much of the aid provided, such as food assistance, healthcare supplies, and educational materials, is primarily aimed at addressing immediate needs rather than fostering long-term economic growth. This is particularly evident in studies that highlight how food aid, while crucial for alleviating hunger, does not directly contribute to sustainable economic development (Salonen et al., 2018). Such findings suggest that when researchers aggregate various forms of aid without considering their specific objectives, the resultant data often reflects a weak or ambiguous correlation with economic growth (Awino & Kioko, 2022; Jena & Sethi, 2019).

Moreover, the timing of aid disbursement relative to economic growth is another significant factor complicating this relationship. Many studies utilize panel data that typically spans four-year periods, which may not adequately capture the delayed effects of certain types of aid, such as investments in education or healthcare (Cai et al., 2018; Janjua et al., 2018). These forms of aid often require extended periods to manifest their benefits in terms of economic growth, which can lead to misleading conclusions if analyzed over shorter time frames. For example, while project aid has been shown to have a positive impact on growth, program aid often yields insignificant results, indicating that the nature and timing of aid are critical to understanding its effectiveness (Janjua et al., 2018; Pohwani et al., 2019). Thus, extending the time frame of studies could provide a clearer picture of how different types of aid influence economic growth over time, although it also introduces challenges in isolating the effects of aid from other growth determinants (Khan & Ahmed, 2022; Adams & Elassal, 2020).

In summary, the relationship between foreign aid and economic growth is nuanced and contingent upon the type of aid and its timing. Studies that fail to

differentiate between the various forms of aid or that do not account for the temporal dynamics of aid disbursement risk oversimplifying this complex relationship. Therefore, a more granular approach that disaggregates aid types and considers their specific impacts over appropriate time frames is essential for accurately assessing the role of foreign aid in promoting economic growth (Chauvet & Ehrhart, 2018; Yiew & Lau, 2018; Wan & Chen, 2022).

4. Sample Selection and Data

This study employs a panel data approach utilizing data from 43 Sub-Saharan African (SSA) countries spanning the period 2005 to 2020. We acknowledge that five countries were excluded due to data limitations, primarily related to socio-political instability during the study period. The chosen timeframe reflects the availability of comprehensive data from the World Bank database, which allows for a robust analysis of economic growth trends in SSA countries since the turn of the millennium.

4.1. Data Sources and Measurement

We obtained data on the following variables from the World Bank database: GDP growth, which serves as the dependent variable representing the annual percentage change in a country's Gross Domestic Product adjusted for inflation; economic structure, including agricultural, industrial, and service sector value-added to capture the composition of each country's economy; foreign aid, specifically Net Official Development Assistance (ODA) received, to assess the impact of external financial assistance on growth; trade and investment, encompassing merchandise trade data (imports and exports) and Foreign Direct Investment (FDI) to analyze the role of international trade and foreign capital; and population data, included to account for potential population growth effects on economic growth. It's important to note that due to the complexities in service trade data collection across nations, we solely rely on merchandise trade data from the World Bank's Standard International Trade Classification (SITC) Revision 3. To ensure data consistency, all values are presented in constant US dollars to eliminate inflation effects. This comprehensive dataset allows for a thorough analysis of the various factors influencing GDP growth and their interrelationships within different economic contexts.

4.2. Model Specification

We recognize that factors like geographical location and historical events can influence economic growth. To account for these time-invariant characteristics, we employ a panel data model with **country-fixed effects**. This approach effectively controls for unobserved country-specific factors that may influence growth patterns. Additionally, major global economic events like the 2008 financial crisis can have a significant impact on regional development. Therefore, we also incorporate **time-fixed effects** in our model. These two-way fixed effects model

simultaneously controls for both time-varying global shocks and country-specific unobserved factors. To confirm the suitability of this approach, we conducted a Hausman test, which indicated that a fixed effects model is the most appropriate choice for our study.

The baselines model is as follows.

$$Y_{It} = \beta_0 + \beta_1 \text{aid}_{it} + \beta_2 \text{aid}_{it}^2 + \beta_3 \text{stability}_{it} + \alpha X_{it} + \lambda_i + \gamma_t + \varepsilon_{it}$$

$$Y_{It} = \beta_0 + \beta_1 \text{aid}_{it} + \beta_2 \text{aid}_{it}^2 + \beta_3 \text{stability}_{it} + \beta_4 \text{aid} \times \text{stability}_{it} + \alpha X_{it} + \lambda_i + \gamma_t + \varepsilon_{it}$$

Y_{It} represents the dependent variable, aid_{it} denotes foreign aid received by country *I* at time *t*. aid_{it}^2 captures the potential non-linear effects of aid. stability_{it} represents measures of political or economic stability, which may condition the impact of aid. αX_{it} is a vector of control variables, including economic, demographic, or institutional factors. $\lambda_i + \gamma_t + \varepsilon_{it}$ captures unobserved country-specific effects, time-specific effects, and the error term.

The model examines how various factors influence the economic growth rate (GDP growth rate) of a country (denoted by subscript *i*) over time (denoted by subscript *t*). The dependent variable is GDP growth rate. Net Official Development Assistance (ODA), expressed as a percentage of a country's Gross National Income (GNI), is an independent variable that captures the financial aid a nation receives. The model also considers the squared term of ODA to account for a potentially non-linear relationship between aid and growth, where high aid levels might not always translate to positive growth. Political stability, measured by an index ranging from −2.5 (highly unstable) to 2.5 (highly stable), is another independent variable that reflects the perceived likelihood of government destabilization through violence or unconstitutional means. To understand how the interplay between aid and stability affects growth, an interaction term between ODA and stability is included in the model. Finally, the model incorporates several control variables commonly used in growth regressions. These control for the influence of other factors that might affect growth, such as the contribution of agriculture, industry, and services to the economy (agricultural added value, industrial added value, and service added value respectively), Foreign Direct Investment (FDI) inflows, the degree of a country's participation in international trade (trade openness), and its population growth rate. A more detailed explanation of these variables can be found in Table 1.

4.3. Transmission Mechanism

We analyze the transmission mechanisms through which aid indirectly influences economic growth. These mechanisms include **consumption**, **investment**, and **health sector expenditures**. To capture this relationship, we employ the following econometric specification:

$$Y_{It} = \beta_0 + \beta_1 \text{aid}_{it} + \beta_2 \text{aid}_{it}^2 + \beta_3 \text{stability}_{it} + \beta_4 \text{aid} \times \text{stability}_{it} + \alpha X_{it} + \lambda_i + \gamma_t + \varepsilon_{it}$$

where Y_{It} represents the dependent variable, which alternates among

consumption, **investment**, and **health sector expenditures** as key transmission mechanisms. aid_{it} denotes foreign aid received by country I at time t. aid_{it}^2 captures the potential non-linear effects of aid. stability_{it} represents measures of political or economic stability, which may condition the impact of aid. αX_{it} is a vector of control variables, including economic, demographic, or institutional factors. $\lambda_i + \gamma_t + \varepsilon_{it}$ captures unobserved country-specific effects, time-specific effects, and the error term.

Table 1. Names and descriptions.

Name of variable	Definition of variable	Calculation
Growth rate	Real GDP growth rate	(Current year GDP − Last year GDP)/Last year's GDP
Aid	Net oda/gni	Aid/GNI
Aid2	Square term of aid-GDP ratio	Square term of aid-GDP ratio
Man	Manufacturing Proportion of the manufacturing industry output value in GDP	The manufacturing industry output value/GDP Service Proportion of the service industry output value in GDP
FDI	Level of foreign direct investment	Foreign direct investment/GDP
Agr	The proportion of the agricultural industry output value in GDP	The agricultural industry output value/GDP
Services	The proportion of the service industry output value in GDP	The service industry output value/GDP
Trade	Level of openness	Total trade/GDP
Stability	stability and absence of violence	ranging from approximately −2.5 to 2.5.
Aid stability	Aid stability level	Aid stability level

5. Descriptive Statistics

The economic landscape of Sub-Saharan Africa (SSA) during the 16-year period from 2005 to 2020 reveals significant insights into the region's growth dynamics, challenges, and disparities. Analyzing the summary statistics for 43 SSA countries provides a clearer picture of the factors influencing economic performance and development.

One notable finding is the average annual GDP growth rate of 3.96% for the region. This relatively modest growth rate suggests that SSA has lagged behind other global regions in economic expansion. Within this context, there are considerable variations in economic performance among individual countries. For instance, the Central African Republic recorded the lowest average growth, highlighting economic struggles, while Zimbabwe displayed a remarkable recovery following a period of hyperinflation. This contrast underscores the diverse trajectories of

economic development within the region.

Foreign aid plays a critical role in the economies of many SSA countries. The average net official development assistance (ODA) received per capita was 7% across the continent. Interestingly, high-income countries such as Seychelles received the least amount of aid, reflecting their relatively stable economies. In contrast, lower-income countries like Zimbabwe received significant amounts of aid, particularly in 2008, as they sought to stabilize their economies. This disparity in aid distribution illustrates the varying needs and vulnerabilities of SSA nations.

The industrial structure in SSA also presents a mixed picture. The contribution of the manufacturing sector to GDP varied significantly, ranging from 0.233% to 35.215%. Such variability indicates a generally underdeveloped industrial base across most countries, which may hinder economic diversification and resilience. In contrast, the service sector has emerged as a more significant contributor to GDP, particularly in smaller African nations like Seychelles and Mauritius, where tourism development has been prioritized.

Foreign direct investment (FDI) is another essential aspect of economic growth in SSA. The average share of FDI in GDP was 4%, suggesting a moderate level of foreign capital inflows into the region. This influx of investment can be pivotal for fostering economic development and supporting infrastructure projects.

Trade openness is a critical indicator of economic integration and reliance on international markets. The average trade-to-GDP ratio for SSA was an impressive 70%, highlighting a high dependence on foreign trade for most countries. However, this figure also masks significant variations among individual nations, some of which are more reliant on trade than others.

Lastly, the demographic dynamics of the region are reflected in the average population growth rate of 2.456% per year. While this figure denotes a generally growing population, it also conceals substantial differences. For instance, Seychelles experienced negative growth in 2011, whereas Burundi exhibited the highest growth rate during the same period. These demographic trends can have profound implications for economic planning and resource allocation.

The observed heterogeneity across SSA countries in economic development, trade, investment, industrial structure, and population growth underscores the importance of employing a two-way fixed effects model. This approach effectively controls for unobserved country-specific factors (e.g., institutional quality, resource endowments) and time-varying global shocks (e.g., financial crises, commodity price fluctuations) that might influence the relationship between foreign aid and economic growth. By controlling for these factors, the fixed effects model allows us to isolate the true impact of foreign aid on growth, leading to more reliable estimates (Table 2, Table 3).

Our analysis identified a potential issue with multicollinearity. This arises when explanatory variables in a regression model exhibit a high degree of correlation with each other. In our case, the correlation between "aid" and "aid squared" is particularly concerning (0.915).

Table 2. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Growth (%)	688	3.944	4.801	−36.392	21.452
Aid (%)	688	7.142	6.503	0.004	39.282
Agr (%)	688	21.015	13.758	0.893	60.611
Man (%)	688	10.484	5.56	0.233	35.215
Services (%)	688	46.117	10.201	10.876	73.185
Fdi (%)	688	4.021	5.818	−18.918	57.877
Stability	688	−0.519	0.872	−2.699	1.201
Trade (%)	688	70.499	35.078	0.757	225.023
Pop (%)	688	2.465	0.934	−2.629	5.078

Table 3. Pairwise correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) growth	1.000										
(2) aid	0.056	1.000									
(3) agr	0.118	0.526	1.000								
(4) man	−0.143	−0.132	−0.383	1.000							
(5) services	−0.157	−0.194	−0.471	0.097	1.000						
(6) fdi	0.060	0.028	−0.078	−0.140	−0.001	1.000					
(7) stability	0.011	−0.202	−0.477	0.056	0.450	0.180	1.000				
(8) trade	−0.010	−0.258	−0.535	0.102	0.203	0.401	0.488	1.000			
(9) pop	0.110	0.092	0.180	−0.093	−0.522	−0.016	−0.218	−0.178	1.000		
(10) aid2	−0.024	0.915	0.357	−0.043	−0.152	−0.020	−0.189	−0.175	0.068	1.000	
(11) aidstab	0.026	−0.616	−0.384	−0.059	0.328	0.117	0.644	0.267	−0.085	−0.698	1.000

6. Baseline Results

We present the results of our fixed effects model in Table 4 below. To decide between using fixed effects or random effects, we applied a Hausman test. The results from the Hausman test suggest that the fixed effects model is the appropriate choice for our analysis. Specifically, each country's history, natural conditions, and geography correlate with the error term. Therefore, we use a fixed effects model to solve the endogeneity problem for these factors. By the model set and a two-way fixed effects model to investigate aid effectiveness.

Table 4. Comparing different fixed effects.

	(1)	(2)
VARIABLES	Fixed effects	Fixed effects
aid	0.313***	0.307***
	(0.0554)	(0.0553)
aid2	−0.00680***	−0.0108***
	(0.00167)	(0.00247)
stab	1.802***	2.917***
	(0.538)	(0.741)
aidstab		−0.121**
		(0.0556)
agr	−0.147***	−0.129**
	(0.0543)	(0.0548)
fdi	0.0237	0.0175
	(0.0369)	(0.0369)
pop	1.620***	1.654***
	(0.462)	(0.460)
services	−0.242***	−0.237***
	(0.0377)	(0.0376)
man	−0.341***	−0.334***
	(0.0896)	(0.0894)
Constant	16.95***	16.60***
	(3.012)	(3.007)
Observations	645	645
R-squared	0.191	0.197
Number of c_id	43	43
Country FE	YES	YES
Year FE	YES	YES

Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Model (1) uses basic variables Model (2) includes the same variables but adds an interaction term between aid and stability (aidstab) in addition to the other variables. The aidstab variable represents how the effect of aid on the outcome depends on the level of stability. One of the notable findings is the positive and statistically significant effect of aid on economic growth. In Model 1, a one-unit

increase in aid is associated with a 0.313 increase in growth, while in Model 2, the effect is 0.307. This suggests that foreign aid can play a constructive role in boosting economic development, potentially by financing infrastructure, healthcare, or other productive investments. However, the diminishing marginal effect of aid is captured by the negative and significant coefficients on the aid-squared term (−0.00680 in Model 1 and −0.0108 in Model 2), indicating that there are limits to the positive impact of aid, and excessive aid may actually have a detrimental effect on growth. Political and economic stability emerges as a crucial driver of economic growth. The large positive and significant coefficients on the stability variable (1.802 in Model 1 and 2.917 in Model 2) indicate that countries with more stable environments are better positioned to foster growth. This is likely due to the reduced uncertainty and improved investor confidence that comes with stability, leading to higher investment and economic activity. Interestingly, the negative and significant interaction between aid and stability (−0.121 in Model 2) suggests that the positive effect of aid on growth is dampened in more stable environments, potentially because aid is less critical for countries that are already functioning well. The results also highlight the importance of structural transformation in the economy. The negative and significant coefficients on the agriculture (−0.147 in Model 1 and −0.129 in Model 2), services (−0.242 in Model 1 and −0.237 in Model 2), and manufacturing (−0.341 in Model 1 and −0.334 in Model 2) variables suggest that a higher share of these sectors is associated with lower economic growth. This may reflect the need for developing countries to shift away from traditional, low-productivity sectors towards more dynamic and innovative industries that can drive productivity gains and technological progress. Population growth, on the other hand, appears to have a positive and significant impact on economic growth, with coefficients of 1.620 in Model 1 and 1.654 in Model 2. This could be due to the expanded labor force and potential for increased productivity, though policymakers should also consider the implications for resource allocation and service provision in rapidly growing populations.

7. Robustness Checks

To ensure we can effectively analyze the effects of aid on economic growth. We conduct some robustness checks. We first investigate using other estimations we did not include in our model.

Table 5 serves as a robustness check to evaluate the consistency of relationships between aid variables and economic growth across fixed effects, random effects, and GMM models. Aid consistently shows positive and significant effects on growth across all models, reinforcing its importance as a growth driver. However, the negative and significant quadratic term in static models highlights diminishing returns to aid, suggesting reduced effectiveness at higher volumes. The inclusion of lagged growth in the GMM model confirms the dynamic nature of growth, where past performance significantly influences current outcomes. This dynamic feature also addresses potential endogeneity, validating the GMM model as a robust framework.

Table 5. Comparing different models.

	(1)	(2)	(3)	(4)
Growth	fixed effects	fixed effects	random effects	gmm
L.growth				0.272**
				(0.102)
aid	0.307***	0.294***	0.301***	0.348***
	(0.0451)	(0.0551)	(0.0481)	(0.077)
aid2	−0.0114***	−0.0112***	−0.0107***	−0.006
	(0.00216)	(0.00244)	(0.00225)	(0.006)
aidstab	−0.0392	−0.109*	−0.0574	0.037
	(0.0367)	(0.0557)	(0.0434)	(0.093)
stab	0.798**	2.870***	1.258***	0.253
	(0.371)	(0.739)	(0.470)	(1.326)
fdi	0.00282	−0.0140	−0.00390	−0.012
	(0.0348)	(0.0384)	(0.0365)	(0.035)
pop	0.0994	1.651***	0.342	−0.268
	(0.230)	(0.459)	(0.292)	(0.513)
trade	−9.93e−05	0.0487***	0.00954	0.006
	(0.00681)	(0.0158)	(0.00857)	(0.015)
services	−0.0674***	−0.175***	−0.108***	−0.084*
	(0.0231)	(0.0384)	(0.0274)	(0.047)
man	−0.0744**	−0.255***	−0.110**	−0.020
	(0.0342)	(0.0875)	(0.0456)	(0.054)
Constant	6.572***	7.089**	7.705***	5.491
	(1.690)	(2.956)	(2.051)	(4.191)
Observations	645	645	645	645
R-squared	0.115	0.203		
Number of c_id		43	43	43
ar1p				0.0159
ar2p				0.712
hansenp				0.967
sarganp				0.211

Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Negative effects of services and manufacturing on growth persist across models but diminish in the GMM framework, indicating that these structural challenges may weaken over time. Mixed results for stability variables suggest that institutional and policy contexts may play a context-specific role in growth. The Hansen J-test, Sargan test, and absence of second-order serial correlation confirm the reliability of the GMM model. Overall, the results highlight aid's positive role in growth, the need to manage diminishing returns, and the importance of addressing structural inefficiencies.

To address potential heterogeneity issues, we conducted separate regressions for different income levels. The countries were categorized based on the World Bank's income classifications into three groups: lower-income countries, lower-middle-income countries, and upper-middle-income. This approach allowed us to analyze the impact of aid within each income category. Most countries in Sub-Saharan Africa fall within the lower-income group. Below, we present the regression results for each income level (Table 6).

Table 6. Different income levels using fixed effects.

	(1)	(2)	(3)
VARIABLES	Lower middle income	low income	high income
aid	0.183	0.0421	−4.957*
	(0.204)	(0.211)	(2.546)
aid2	−0.00601	−0.0101	0.688**
	(0.00688)	(0.00686)	(0.282)
stability	1.831*	4.086***	0.0578
	(1.031)	(1.144)	(4.139)
aidstab	0.181	−0.219**	−0.730
	(0.122)	(0.0853)	(2.940)
inf	−0.0124*	0.0256	−0.107*
	(0.00643)	(0.0352)	(0.0573)
domesticinv	−0.0223	0.0196	0.109
	(0.0395)	(0.0686)	(0.0911)
fdi	0.0649	−0.0698	
	(0.0483)	(0.0885)	
services	−0.0731	−0.162	−0.667***
	(0.0589)	(0.113)	(0.110)
trade	0.0834***	0.0250	0.0134
	(0.0206)	(0.0326)	(0.0443)

Continued

pop	2.180***	3.083***	−1.205
	(0.820)	(0.940)	(0.850)
agr	−0.279***	−0.125	0.864
	(0.100)	(0.0987)	(0.655)
man	−0.491***	−0.336**	−0.0617
	(0.131)	(0.151)	(0.160)
Constant	6.960	10.67	37.56***
	(4.898)	(8.304)	(9.687)
Observations	304	272	109
R-squared	0.229	0.149	0.470
Number of c_id	19	17	7

Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

As shown in Table 6, there is a negative association between aid and economic growth in high-income countries, and this result is significant at the 10% level. These findings suggest a non-linear relationship between aid and economic growth, resembling a U-shaped curve similar to the Kuznets curve. This indicates that beyond a certain threshold, aid may negatively impact economic growth in these countries.

For low-income countries, aid alone does not have a significant effect on growth. However, when combined with a stable political environment, aid contributes positively to economic growth. Many of the countries in this study suffer from poor economic and political conditions, which implies that large amounts of aid, in the absence of a stable environment, can have a negative effect on growth. In contrast, there is no significant relationship between aid and economic growth in lower-middle-income countries.

8. Transmission Mechanisms

We present the transmission mechanism through which aid influences economic growth by affecting domestic investment, health, and consumption, as analyzed using fixed effects models. Aid contributes to growth by channeling resources that enhance domestic investment, fostering capital formation and infrastructure development. Additionally, aid directed toward health initiatives improves labor productivity and reduces mortality rates, creating a healthier and more productive workforce. Furthermore, aid can boost consumption by increasing household incomes, particularly in lower-income countries, thereby stimulating aggregate demand. These effects collectively demonstrate how aid operates through multiple channels to promote economic growth. The fixed effects model captures these relationships by accounting for unobservable heterogeneity across countries,

ensuring robust estimates of the impact of aid on these key transmission variables (Table 7).

Table 7. Mechanism analysis.

	(1)	(2)	(3)
VARIABLES	investment	health	consumption
aid	−0.756***	−0.416*	0.333*
	(0.147)	(0.232)	(0.174)
aid2	0.0184***	0.00387	−0.00580
	(0.00464)	(0.00730)	(0.00548)
stability	1.598*	3.279**	3.233***
	(0.836)	(1.315)	(0.987)
aidstab	0.0137	−0.151	−0.124*
	(0.0635)	(0.0998)	(0.0749)
fdi	0.258***	0.0146	0.0589
	(0.0444)	(0.0698)	(0.0524)
agr	−0.334***	−0.157	0.877***
	(0.0616)	(0.0968)	(0.0727)
man	−0.0554	−0.119	0.591***
	(0.0975)	(0.153)	(0.115)
services	−0.131***	0.00753	0.776***
	(0.0448)	(0.0704)	(0.0529)
trade	0.106***	0.0441	−0.0896***
	(0.0180)	(0.0283)	(0.0212)
pop	−0.0309	−0.502	2.357***
	(0.532)	(0.836)	(0.627)
Constant	32.17***	18.57***	8.140*
	(3.953)	(6.217)	(4.667)
Observations	688	688	688
R-squared	0.224	0.025	0.394
Number of c_id	43	43	43
Country FE	YES	YES	YES
Year FE	YES	YES	YES

Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Aid influences economic growth through investment, health, and consumption, with varying impacts across these mechanisms. In investment, aid shows initial crowding-out effects but becomes more effective at higher levels, highlighting the importance of better allocation and governance. Stability significantly boosts investment by fostering a conducive environment, while FDI and productive sectors like agriculture also play vital roles. In health, aid's marginally negative impact suggests inefficiencies, emphasizing the need for direct targeting rather than reliance on sectoral growth, while stability enhances health outcomes by strengthening institutions. Aid positively affects consumption by driving household and government spending, with productive sectors like agriculture and manufacturing significantly contributing, though trade exhibits negative effects, likely due to imbalances or liberalization costs. Across all mechanisms, stability emerges as a critical enabler of aid effectiveness, underscoring the importance of fostering governance and institutional strength (Table 8).

Table 8. Panel threshold analysis.

	(1)
Growth	Aid
aid2	−0.0311***
	(0.00673)
polstab	0.106***
	(0.0290)
aidpolstab	−0.00389*
	(0.00233)
domesticinv	0.0655**
	(0.0323)
hdi	−27.44***
	(5.402)
trade	0.0295*
	(0.0161)
fdi	−0.0306
	(0.0398)
services	−0.191***
	(0.0377)
man	−0.414***
	(0.0824)
agr	−0.156***
	(0.0527)

Continued

Baseline	4.493***
	(1.501)
First threshold	0.451***
	(0.169)
Second threshold	0.640***
	(0.184)
Third threshold	1.036***
	(0.241)
Constant	26.80***
	(4.460)
Observations	688
Number of c_id	43
R-squared	0.214

Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

The current analysis explores threshold effects of foreign aid: how the impact of aid changes at different stages of development-institutional capacity.

Using a dynamic model in this paper, the relationship between foreign aid and economic development shows a non-linear trend. The effectiveness of aid is not constant but jumps along with the level of development and quality of the recipient country's institutions. Based on this analysis, four threshold categories were identified: Baseline category: In those countries that are least developed and politically unstable situations, foreign aid tends to affect them positively. These countries have no alternative sources of capital and investment, so that aid becomes an imperative to jumpstart economic activities and infrastructure development and respond to minimum social needs. First threshold category: As the country's progress is toward the threshold of moderate development level, the effectiveness of aid gradually starts to decline. This might be because after a threshold, a country can fulfill the basic resources with its internal potential thereby leading to diminishment in return. Second threshold category: At this threshold, again the effectiveness of aid increases. That would mean an optimum threshold where countries are found to have enough institutional capacity to absorb and utilize foreign aid effectively, yet the development needs remain acute. Highest threshold category: In developed developing countries with the best institutions, aid is still productive, although its effectiveness could be less significant than in poor countries. These findings raise the challenge of proving aid in ways that are matched to the needs and development levels of various recipients. What works best in terms of the optimal level of aid, and the type of intervention, will differ across contexts; a uniform approach is unlikely to succeed.

To assess the robustness of our initial model, we conducted a regression analysis using GDP at current prices and aid received in the $U.S. as the dependent variable, while keeping the other explanatory variables unchanged. This approach aimed to validate the findings and ensure the model's reliability across different specifications.

The regression results provided valuable insights into the model's explanatory power. The within-group R-squared value was 0.2724, indicating that approximately 27.24% of the variance in GDP can be attributed to the independent variables when considering variations within the same group. A closer examination of the coefficients revealed key relationships between GDP and the independent variables. The variable aid demonstrated a positive coefficient of 32.87, suggesting that increases in aid are associated with higher GDP, indicating a beneficial relationship. However, the squared term, aid2, exhibited a negative coefficient of −5.50e−09, highlighting diminishing returns; as aid increases, its marginal impact on GDP declines. The interactive variable between aid and political stability variable presented a significant negative coefficient indicating that instability in the order of state adversely affects GDP. This finding underscores the importance of political and economic stability for fostering economic growth. Conversely, the variable polstab showed a positive coefficient, emphasizing that political stability is correlated with enhanced GDP.

Certain variables, such as pop (population size) and fdi (foreign direct investment), did not demonstrate significant effects on GDP, suggesting that these factors may not play a crucial role in influencing economic performance. On the other hand, both domestic investment and agriculture exhibited significant negative coefficients of respectively. These results indicate that higher domestic investment and agricultural performance may be associated with lower GDP, which warrants further investigation to understand the underlying causes. The services sector emerged as a significant contributor to GDP, with a positive coefficient of indicating that growth in this sector is beneficial for the economy. Additionally, inflation (inf) presented a surprising positive association with GDP, which may require deeper analysis to reconcile this counterintuitive finding. In summary, the robustness testing of the model using GDP at current prices confirmed significant relationships previously identified. The findings highlight the critical roles of aid, political stability, and the services sector in influencing GDP, while also revealing areas that may require further exploration to enhance economic performance (Table 9).

9. Conclusion

Sub-Saharan Africa is a region with diverse economic development, ranging from countries rich in natural resources to those heavily dependent on agriculture. Despite its resource wealth, the region is characterized by low levels of industrialization, inadequate transportation infrastructure, and weak institutions. Poverty and inequality remain widespread, with many people living below the international

poverty line. Although Sub-Saharan Africa has experienced periods of economic growth, this progress has been irregular, often constrained by political risks and macroeconomic instabilities, including conflicts and commodity price volatility. As a result, the region remains highly dependent on external financing, particularly foreign aid, while efforts to mobilize sufficient domestic resources continue to face significant challenges. This economic situation highlights the need to assess the role of foreign aid in addressing these systemic issues and promoting sustainable development.

Table 9. Fixed effects with different variables.

	(1)
VARIABLES	fixed effects
netoda	32.868***
	(3.910)
netoda2	−0.000***
	(0.000)
odastab	−13.102***
	(2.557)
polstab	8.935e+09***
	(2.955e+09)
pop	2.790e+09
	(2.544e+09)
fdi	−1.413e+08
	(1.967e+08)
domesticinv	−3.111e+08**
	(1.499e+08)
agri	−6.342e+08**
	(3.066e+08)
trade	−1.810e+08**
	(77301191.257)
man	−3.360e+08
	(2.111e+08)
inf	23652523.193**
	(10504290.988)
services	4.947e+08***
	(1.720e+08)

Continued

Constant	1.337e+10 (1.475e+10)
Observations	924
Number of c_id	42
R-squared	0.272

Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

In this context, the findings of the present study support Tang and Bundhoo (2017), who noted that while foreign aid can stimulate economic development, its effectiveness is highly contingent upon institutional quality and political stability. Their research emphasizes the complexity of the issues in Sub-Saharan Africa, warning that blanket aid approaches are unlikely to address the region's diverse challenges. This view is further supported by Fatima (2014), who argues that there is no direct correlation between aid and growth. For aid to contribute to development, it must be combined with good governance and efficient utilization strategies. These perspectives reinforce the earlier argument that aid alone is insufficient to drive sustainable development; instead, it must be part of a broader, context-specific approach that addresses the unique challenges faced by countries in Sub-Saharan Africa.

The effectiveness of foreign aid can be improved by considering the political and institutional factors of each recipient country. Understanding a country's political environment, level of economic development, and institutional capacity is crucial to designing effective aid strategies. Furthermore, reducing the stringent conditions attached to aid can empower recipient countries to allocate resources more efficiently and address their most pressing needs. Future research should focus on determining optimal aid levels and ensuring that aid aligns with long-term development objectives.

On the part of recipient countries, achieving social and political stability is essential for fostering economic growth and ensuring the effective utilization of aid. Aid should be used strategically to acquire advanced technologies, improve managerial skills, and build the capacity to finance and implement development projects. Ultimately, the goal should be to reduce dependence on external aid and prioritize sustainable development.

In conclusion, the effectiveness of international aid in Sub-Saharan Africa can only be achieved through a collaborative approach, where both donors and recipient countries work together with a clear understanding of the regional context. Donors must provide targeted support that encourages good governance and avoids fostering dependency, while recipient countries must manage aid strategically to build a solid foundation for self-sustaining development. This dual commitment is crucial for realizing the region's potential for sustainable and inclusive

economic growth.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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