

The Effect of Official Development Assistance on Domestic Investment and Foreign Direct Investment in Sub-Saharan African Countries

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Abstract

The aim of this article is to examine the effect of official development assistance (ODA) on domestic investment and foreign direct investment (FDI) in 30 sub-Saharan African countries over the period 2006 to 2019. To achieve this objective, two linear models are specified on the basis of existing literature. The first model examines the effect of ODA on domestic investment, while the second model examines the effect of ODA on FDI. The estimation results, obtained using the Realisable Generalized Least Squares (RGLS) method of Parks (1967), show that ODA positively affects domestic investment, on the one hand, and FDI in sub-Saharan African countries, on the other. Estimation of these models using the method of Driscoll & Kraay (1998) confirms the robustness of our initial results. On the basis of these robust results, we recommend that the governments of sub-Saharan African countries and international institutions ensure that ODA is used in a way that complements national efforts and does not replace them. This complementarity requires strategic management of aid, with an emphasis on productive investment while at the same time aiming to attract FDI.

Keywords

Official Development Assistance, Domestic Investment, Foreign Direct Investment, FGLS

1. Introduction

As African countries gained independence in the 1960s, they were entrusted with the destiny of their states. Among many other responsibilities, Africans themselves took ownership of their economic policies. Driven by the spirit of nationalism, the

new African leaders all worked to establish their economies. So they embarked on major national investment projects, building housing and roads, and creating state institutions. In short, we are witnessing the accelerated implementation of infrastructure investments. Despite their goodwill, we have to recognise that African countries are faced with a whole string of projects, insufficient domestic investment and the need to attract FDI. The vast majority of them will be turning to the outside world to finance these projects.

Africans benefited from large sums of money to build up their economies, which raised great hopes in many countries in the first decade of independence. The 1980s saw the start of recurring economic crises in Africa, with sub-Saharan African countries experiencing excessively low economic growth and low incomes, which prevented them from building up sufficient financial capacity for development. The need for financing is growing. Recourse to external capital is proving more necessary than ever to finance these economies. Countries are therefore going to appeal to donors. In the majority of cases, countries have received official development assistance from the International Monetary Fund, the World Bank and other partners. The aid was essentially intended to make up for budget deficits that had become chronic, to solve food or health problems and many other problems.

Several researchers have worked on the relationship between official development assistance and investment, and have identified two commitments: the first indicates that official development assistance has a positive influence on investment, and the second indicates that official development assistance has a negative or non-existent influence on investment (national investment and foreign direct investment).

Indeed, researchers such as [Amusa et al. \(2016\)](#) in their work examine the role of foreign aid in increasing FDI flows in 31 sub-Saharan African countries between 1995 and 2012. Using panel data estimation techniques, they find that foreign aid can play a role in attracting FDI to Sub-Saharan Africa, but the type of aid matters. Aid that improves productive infrastructure is more likely to attract FDI. In the same way, [Pham \(2015\)](#), using data from 6 provinces in Vietnam over the period 1999-2002 and ordinary least squares (OLS) and two-stage least squares (2SLS) methods, helped to show that aid attracts more foreign direct investment. Similarly, [Kimura and Todo \(2010\)](#) use a cross-sectional gravity model to determine the effect of aid on the level of FDI from donor countries and find a positive result under very specific conditions.

[Gomanee et al. \(2005\)](#) identify investment as the channel through which ODA affects growth. They use panel data from 25 sub-Saharan African countries over the period 1970 to 1997 and show that ODA has a positive and significant effect on growth. On average, each percentage point increase in the ODA/GDP ratio contributes to a quarter percentage point increase in the growth rate. They state that Africa's slow growth should not be attributed to ineffective ODA. At the same time, in order to highlight the impact of ODA on growth in 48 developing countries over the period 1970 to 1998, [Moreira \(2005\)](#) used [Arellano and](#)

Bond's method of generalised moments (1991). His study reveals that ODA has had a positive impact on economic growth. Furthermore, the author states that ODA has less effect on growth in the short term than in the long term. He therefore concludes that time lags in the aid-growth relationship must be taken into account.

For other researchers, official development assistance has a negative influence on investment. Other economists have argued that there is no direct link between aid and FDI. **Kosack and Tobin (2006)** and **Janský (2012)** both argue that aid and FDI are independent sources of finance that affect a country's economy differently. Using panel data from 103 countries covering the period 1990-1999, the authors argue that ODA promotes growth in poor countries and that FDI is beneficial for both developed and developing countries but is independent of the influence of ODA. In the same vein, **Berg (1997)** concludes that the more aid tends to increase, the more the negative effects are accentuated and become destabilising in countries where aid reaches 5% of GDP. Above 10%, aid mainly affects public investment. **Easterly (2001)** tests the financing gap method by reviewing the results of 88 aid-recipient countries over the period 1965-1995. He concludes that only in Tunisia can the hypotheses associated with this method be confirmed empirically. To illustrate his point, he presents the example of Zambia: if the country had converted all aid received since 1960 into investment, and subsequently translated that investment into economic growth, its GDP per capita would have reached approximately twenty thousand dollars by the early 1990s. However, Zambia's GDP *per capita* was lower in the early 1990s than it had been in 1960, at around five hundred dollars.

The day after the Second World War, in a context marked by the Cold War, the beginning of independence and the need for reconstruction in Europe and Asia. From the 1960s onwards, a number of African countries gained their independence, which gave rise to great hopes among the people of Africa for socio-economic development.

Developing countries are constantly experiencing infrastructure problems of all kinds: a lack of infrastructure due to the weakness of their economies, which consequently have low tax revenues and too little domestic savings. These countries have no other recourse than to turn to the Western economies, which have managed to raise funds from savings, from their respective budgets and from the financial markets.

Official development assistance has always been characterised in the developing countries as a means of promoting development. But these strategies have not produced the expected results, because poverty still persists.

In the 1970s, it was a question of investing in actions that directly affected poor people. The 1980s saw the advent of SAPs. In the 1990s, the WB accepted labour-intensive projects based on the principle of distributing income to the poorest people by facilitating their access to work. The 2000s were characterised by the SR, whose expected results in developing countries are still disappointing. Today

we are faced with the MDGs, whose results are still awaited.

In sub-Saharan Africa, what is important for development is not the amount of money pledged or even actually allocated as official development assistance, but the actual impact of the ODA on the situation in these countries. In the opinion of the CAP and the OECD, there is no need for a method to measure the effectiveness of official development assistance in an indisputable way.

For a developing country with very little capital, recourse to external public aid enables it to overcome the instant budget constraint. It can expect high growth insofar as the inflow of capital allows the interest rate to be abolished and, consequently, the volume of aggregate output to rise.

According to [Chenery and Strout \(1966\)](#), the underdevelopment of poor countries is characterised by a reduction in their development possibilities due to a lack of savings, a lack of foreign currency and therefore the impossibility of importing. The role of official development assistance is to bridge the gap between savings and investment.

Theoretical and empirical controversies on the relationship between official development assistance and investment have been noted. We have two opposing schools of thought, one for those who believe that official development assistance has a positive influence: [Nyoni \(1998\)](#), [Papanek \(1973\)](#), [Levy \(1988\)](#), [Harms and Lutz \(2006\)](#), [Tarp \(2009\)](#), [Sachs \(2005\)](#). The other is for those who believe that official development assistance has a negative influence: [Khan and Ahmed \(2007\)](#), [Easterly \(2009\)](#), [Chauvet and Mesplé-Soms \(2007\)](#); [Camara \(2010\)](#).

In view of the various controversies, it is important to ask the following question: what effect does official development assistance have on investment? Two specific questions follow from this main question: what is the effect of official development assistance on domestic investment in sub-Saharan African countries?

What effect does official development assistance have on foreign direct investment in sub-Saharan African countries?

The main hypothesis of this article is that official development assistance has a positive effect on investment in sub-Saharan African countries. Two specific hypotheses are formulated: Hypothesis 1: Official development assistance has a positive influence on domestic investment in sub-Saharan African countries. Hypothesis 2: Official development assistance is a catalyst for the attractiveness of foreign direct investment in sub-Saharan African countries.

This study provides a better understanding of the complex mechanisms by which ODA influences investment and economic growth in developing countries. It contributes to enriching the economic theories of development and to testing their empirical validity in a specific context, that of sub-Saharan Africa. Sub-Saharan Africa, with its specific economic, institutional and social characteristics, is an ideal place in which to analyze the impact of ODA. The results of this study can enrich the existing empirical literature and provide elements for comparison with other regions of the world. The existing literature does not allow us to conclude directly on the nature of the link between ODA and investment.

2. Review of the Literature

This literature review presents the theoretical foundations and a review of empirical work.

2.1. Theoretical Foundations

Economic theories underpin a controversial relationship between ODA and investment. Some theories show a positive link while others show a negative link.

The Savings Gap Theory and the Double Deficit Theory show that ODA and OED are complementary. Indeed, ODA can make up for the shortfall in domestic savings and foreign exchange, creating a more stable and predictable macroeconomic environment. This stability, combined with improvements in infrastructure and the business environment as a result of ODA, can encourage FDI to complement the investments financed by aid. ODA then acts as a catalyst or leverage for FDI. Human capital theories emphasise the role of positive externalities, such as research and development and innovation, in economic growth. ODA can finance research and development activities, stimulate innovation and thus generate endogenous and sustainable growth, which also attracts investment.

By supporting research, development and innovation, ODA can create a comparative advantage for a country, attracting FDI in search of new technologies and expanding markets. ODA can also finance research and innovation infrastructure that directly benefits foreign companies. Based on endogenous growth theory, ODA funding for research, development and innovation can create a comparative advantage for a country, attracting FDI in search of new technologies and expanding markets. In addition, ODA funding of research and innovation infrastructure can directly benefit foreign companies. According to the theory of public goods, ODA funding for quality infrastructure (roads, ports, energy, telecommunications), a healthy environment and an educated and healthy population creates a more favourable environment for foreign investment. These public goods are important prerequisites for attracting FDI and facilitating its operations.

In some cases, ODA, by directly financing projects that could be financed by the private sector (including FDI), could create a crowding-out effect. This means that ODA could dissuade FDI from investing in certain sectors by creating public competition. This risk is greater when ODA finances commercial or industrial activities that could be profitable for the private sector. According to the Dependency Theory, over-reliance on ODA can create distortions in the local economy and reduce incentives to attract FDI through reforms and investment-friendly policies. If countries rely too heavily on aid, they may neglect efforts to improve their business climate and attract private investment. ODA conditionalities can sometimes conflict with FDI objectives. ODA can be volatile and dependent on the political priorities of donor countries. This instability can create uncertainty for investors, including FDI, who are looking for long-term predictability.

2.2. Review of Empirical Work

Some empirical studies show a positive link between ODA and investment, while others show a negative link or no link at all.

Harms and Lutz (2006) believe that ODA has two effects on FDI flows. On the one hand, it improves infrastructure (roads, telephone lines and electricity) in the recipient country and plays a positive role in education, health and the smooth running of the bureaucracy. ODA therefore encourages the flow of FDI into aid-receiving countries. On the other hand, ODA can encourage unproductive *rent-seeking* behaviour in the recipient country. The provision of aid is likely to reduce the marginal productivity of capital in the countries that receive it and therefore discourage FDI inflows to the country. The authors set out to investigate the effects of aid on FDI flows and assume that all aid is invested, which is not always the case in reality. This makes their results weak.

Tarp (2009) shows that the effect of foreign aid on investment is positive. The long-run elasticity of growth with respect to the share of aid in GDP is around 0.20. This is consistent with the view that foreign aid stimulates aggregate investment and also contributes to growth productivity despite the fraction of aid allocated to consumption. Aid, he states, has been and remains an important instrument for enhancing development prospects for developing countries. At the same time, Papanek (1973) and Levy (1988) have shown that aid not only stimulates growth by increasing savings and the capital stock, but also contributes to improving worker productivity through investment in education and public health. Papanek and Levy's work is certainly more interesting than Nyoni's, but it only covers the period from 1968 to 1982.

Nyoni (1998) examines the impact of foreign aid on macroeconomic variables such as the real exchange rate, export performance, government expenditure, investment and growth. Using cointegration techniques and the error correction model, he argues that increases in aid have been accompanied by record growth in domestic investment in Tanzania.

Work on the relationship between official development assistance and FDI by researchers such as Lisa Chauvet and Sandrine Mespele-Somps (2007) has shown that the allocation of official development assistance now tends to be directed towards countries where private funding flows are low. However, this compensatory influence of aid is not enough to ensure that the poorest countries in Africa receive priority funding. Econometric analysis suggests that aid tends to favour middle-income countries. There is therefore a risk that the poorest countries will receive insufficient support, despite the fact that official development assistance attempts to compensate for the lack of access to foreign capital.

Khan and Admed (2007) used the *Pooled Estimated Generalised Least Squares* (Pooled EGLS) method and showed that investment is considered to be one of the channels through which ODA affects economic growth. According to him, the volatility of aid has a negative impact on domestic private investment in the CEMAC countries, but if their export earnings are taken into account (via an

interactive variable), this effect is mitigated. The dependence of these countries on export earnings rather than aid makes aid volatility inconsistent. More attention should be paid to export earnings, which are more volatile and damaging than aid flows. Khan's method of analysis, based on generalised least squares, does not provide efficient estimators of such a panel model.

In the same vein, Easterly (2009) believes that most of the aid provided over the last 50 years has been ineffective. One of the reasons for this is a lack of control over the people responsible for managing it. Camara (2010) argues that the billions of dollars Equatorial Guinea has received over the past 25 years have been completely useless. The economic challenges it faced in the wake of colonisation remain unresolved, and it would be no exaggeration to point to socio-economic regression in many areas. He goes on to say that *the culture of handouts and the easy way out* implicit in the massive reliance on foreign aid calls for a rethink of this policy, which is advocated by both development partners and African states.

This literature review highlights the importance of an empirical study using the case of sub-Saharan African countries.

3. Methodology

The methodology presents the specification of the econometric models and the estimation procedure.

3.1. Specification of Econometric Models

Based on the existing literature, we estimate an econometric model of the following form:

$$Y_{it} = \alpha + \beta \text{APD}_{it} + \delta X_{it} + \epsilon_{it} \quad (1)$$

where Y_{it} represents the dependent variables (GFCF or FDI) for country i at t , APD_{it} is the main explanatory variable, X_{it} is a vector of control variables (GDP per capita, youth literacy rate, etc.) and ϵ_{it} is the error term. We therefore have the following two models:

Effect of ODA on national investment

$$\text{Ln}(\text{GFCF}_{it}) = b_1 \text{LnPIB}_{it} + b_2 \text{LTS}_{it} + b_3 \text{LTIR}_{it} + b_4 \text{LnQBU}_{it} + b_5 \text{LnAPD}_{it} + U_{it} \quad (\text{Model 1})$$

Effect of ODA on FDI

$$\text{Ln}(\text{IDE}_{it}) = b_1 \text{LnPIB}_{it} + b_2 \text{LnTS}_{it} + b_3 \text{LnTIR}_{it} + b_4 \text{LnQBU}_{it} + b_5 \text{LnAPD}_{it} + u_{it} \quad (\text{Model 2})$$

Dependent variables:

- The dependent variables are:

National investment measured by Gross Fixed Capital Formation/GDP (GFCF/GDP): This variable measures the share of investment in the economy. It is often used as an indicator of a country's investment effort.

Foreign direct investment measured by the flow of FDI in relation to GDP (FDI/GDP).

- **Variable of interest**

Based on its definition, we expect **Official Development Assistance** to have a positive relationship with the dependent variables. This variable is measured by ODA disbursed

Control variables:

- **GDP in constant dollars (LnPIBit):** GDP is a measure of the size of the economy. A higher GDP can attract more FDI and generate more domestic savings, which translates into higher investment.
- **Real interest rate (nLTIRit):** A high real interest rate makes financing investment more expensive, which can discourage domestic investment and FDI.
- **Literacy rate (RateAlphabit):** The literacy rate is an indicator of human capital. A more educated workforce is generally more productive and more attractive to FDI. A literate population is better able to adopt technologies and innovate, which encourages investment.
- **Bureaucratic quality (QBUit):** Good quality bureaucracy or institutions encourage domestic investment and attract FDI.

The variables are shown in **Table 1** below:

Table 1. Presentation of variables.

Variable	definition
ODA	Net ODA disbursements in constant dollars per capita and logarithmic measures
FDI/GDP	Net FDI flows as a proportion of GDP
GFCF	Gross fixed capital formation as a percentage of GDP
SHOOTING	Real interest rate
TS	Youth literacy rate
GDP	GDP in constant dollars
QBU	Bureaucratic quality

Source: Identified from the literature.

3.2. Data Source and Sample

The econometric estimates are based on a panel of 30 sub-Saharan African countries. The data used in this study comes from the World Bank's World Development Indicators database.

The quality of the data from these institutions is controversial. The study period runs from 2006 to 2019. This avoids the disruption caused by COVID 19 on the trend of the various variables.

Our sample is made up of the following 30 countries Cameroon, Chad, Djibouti, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Somalia, South Africa, Tanzania,

Togo, Zambia, Zimbabwe.

3.3. Estimation Procedure

It covers preliminary tests and estimation techniques.

3.3.1. Preliminary Tests

- Non-stationarity tests

Among the various test procedures, we will distinguish those which assume that the deterministic component follows a linear trend from those which assume that it follows a non-linear trend.

- The Dickey and Fuller test procedure

Fuller (1976) and Dickey (1976) were the first to provide a set of tools.

Formal statistics for detecting the presence of a unit root in a purely first-order autoregressive process. This now well-known test procedure is based on OLS estimation, under the alternative hypothesis, of three first-order autoregressive models whose errors are identically and independently distributed: the model without constant, the model with constant and the model with constant and trend.

Nevertheless, we will consider each of the data-generating processes (DGPs) leading to these regression models in turn and highlight their expression under the null hypothesis of the unit root and under the alternative hypothesis. The relationship between the parameters of the regression model and those of the process generating the data under the null and alternative hypotheses and, more specifically, the implications of the unit root on the parameters of the regression model under the null hypothesis, will play a key role in the development of a testing strategy (Perron & Vogelsang, 1993). We will therefore adopt the same logic as Campbell and Perron (1991) and Perron & Vogelsang (1993) in reading Dickey and Fuller's test procedure. This is a driftless random walk process characterised by non-stationarity of a purely stochastic nature, stationary in first differences (DS process).

This is a process characterised by non-stationarity of a purely deterministic nature, stationary in deviations from the linear trend (TS process).

However, the OLS estimators for r no longer asymptotically follow Normal distributions and the t and F statistics no longer follow Student and Fisher distributions.

However, Dickey and Fuller were able to calculate the critical values of these non-standard distributions using simulation methods (Fuller, 1976; Dickey & Fuller, 1981). Another characteristic of these distributions is that they depend on the model under consideration, in particular the presence or absence of a constant term and/or a deterministic trend. In practice, the Dickey and Fuller test is therefore performed by comparing the value of the usual t -statistic with critical values that are more severe than those of the Normal distribution and depend on the model under consideration.

The authors also proposed a non-parametric correction for the possible

autocorrelation of the error terms, similar to that introduced in [Phillips and Perron \(1988\)](#).

A DF Test Strategy

- **Levin, Lin and Chu (2002) unit root test**

[Levin, Lin and Chu \(2002\)](#) proposed the first panel unit root test. This test was inspired by the DF and ADF (1981) time series test.

The purpose of using panel data is to increase the power of the test. The procedure used here consists of admitting under the null hypothesis that each individual in the panel has an integrated time series of order 1, against the alternative according to which the chronicle is globally stationary. The authors point out the advantage of this test over the DF and ADF tests (1981) in terms of power. The authors show that the statistics of this test distributed research in theoretical econometrics is currently being developed in order to produce panel unit root tests that include the possibility of structural breaks.

- **Panel data cointegration test**

Non-stationary panel data econometrics is the use of different time series methods taking into account inter-individual dependencies. This dependency is a concept specific to the use of panel data. Non-stationary panel econometrics applied to the macroeconomy must not ignore such inter-individual dependence because it is rare for countries to behave in the same way in the long term, so we can envisage two types of cointegration relationships, intra-individual relationships and inter-individual relationships.

The idea behind the cointegration test on non-stationary panel data, which is not dissimilar to the unit root test on non-stationary panel data, is to combine the “best of both worlds”, the treatment of non-stationary series using time series methods and the increase in the number of data and the power of the tests by using the individual dimension. The seven tests of [Pedroni \(1999\)](#) are based on the null hypothesis of the absence of a cointegration relationship. These are residual tests analogous to the tests proposed by [Engel and Granger \(1987\)](#) in the context of time series. [Larsson et al. \(2001\)](#) is a test inspired by the work of [Johnsen \(1991\)](#) based on algebraic methods.

The cointegration test used in this work is that of [Pedroni \(1999, 2004\)](#), which proposes an extension of the heterogeneous cointegration relationship to several regressions. This test takes account of heterogeneity through parameters that may differ between individuals. Such heterogeneity can occur both at the level of cointegrating relationships and at the level of short-term dynamics. Thus, under the alternative hypothesis, there is a cointegrating relationship for each individual, and the parameters of this relationship are not necessarily the same for all the individuals in the panel. Taking such heterogeneity into account is an undeniable advantage since, in practice, it is rare for the cointegration vectors to be identical from one individual to another in the panel. Under these conditions, erroneously imposing homogeneity on the cointegrating vectors would result in the null

hypothesis of no cointegration not being rejected, even though the variables are cointegrated. However, the Pedroni test does not concern itself determining the number of cointegrating relationships; it only tests the null hypothesis of the absence of cointegration against the alternative hypothesis of the existence of the cointegrating relationship.

3.3.2. Estimation Techniques

In our research, we use the FGLS estimator from Parks (1967). The FGLS estimator for Feasible Generalized Least Squares is a method commonly used in econometrics to estimate regression models on panel data. This method makes it possible to estimate the parameters of the model while taking into account the correlation structure of the errors, which improves the efficiency of the estimates. In addition, the FGLS method allows heteroscedasticity to be taken into account, i.e. differences in variance between countries and periods, which are often present in the unbalanced panels of developing countries. Indeed, heterogeneity between sub-Saharan African countries (e.g. institutional, economic or geographical disparities) can lead to unequal residual variances, while common shocks (e.g. economic crises) can introduce correlation within time groups.

Robustness analysis is an essential aspect of econometrics which involves examining the stability of model results under different conditions and assumptions. It is a crucial technique for assessing the reliability of econometric models and ensuring that the results obtained are not artefacts of particular assumptions or data points.

In this research, for the robustness test, we use the Driscoll & Kraay estimator (1998) which controls for all time-invariant differences between individuals in the study, thus eliminating important potential sources of bias. The error structure is assumed to be heteroskedastic, autocorrelated up to a certain lag, and standard errors are well calibrated when cross-sectional dependence is present (Nchofoung et al., 2022). The robustness to cross-section correlation and autocorrelation is therefore its main advantage.

4. Results and Discussions

In this section we will present the stationarity test result, the cointegration test result, the Kao residual cointegration result, the Dickey Fuller augment test result and the Dynamics Ordinary Least Square estimation result.

4.1. Results of Preliminary Tests

Stationarity tests

The result of the stationarity test is shown in Table 2 below.

In this work the test used for stationarity is that of Livin Lin and Chu, given that the variables are not stationary at level. It should be noted that the variables in this model are stationary in first difference apart from the TIR variable which is stationary at 10% level. We then proceed to the cointegration test.

Table 2. Results of the stationarity test.

variables	Result of the Stationarity Test	
	A level	First difference
	Levin, lin & chu	Levin, lin & chu
LIDE	1.8	-18.4***
LIN	7.7	-15.15***
LAPD	3.31	-22.68***
COR	-0.57	-15.60***
LPIBPC	7.52	-16.82***
SHOOTING	-1.63*	

Source: Author using eviews10 software. Note: *significant at 10%, **significant at 5%, ***significant at 1%. Source: Determined using eviews10 software.

4.2. Cointegration Test Results

The following **Table 3** shows the results of the cointegration test:

Table 3. Cointegration test results.

statistics	Co-integration test results	
	Model 1	Model 2
Panel V-statistic	-4.61	-2.52
Panel rho-statistic	3.86	4.43
Panel PP-statistic	-4.02***	-8.61***
Panel ADF-statistic	-4.38***	-5.09***
Rho-statistic group	5.75	6.07
PP-statistics group	-11.91***	-14.01***
ADF-statistics group	-7.54***	-5.93***

Source: Determined using eviews10 software. Note: *significant at 10%, **significant at 5%, ***significant at 1%.

Given that the variables are stationary, we will carry out a cointegration test. The cointegration test used in this work is that of [Pedroni \(1999, 2004\)](#), which proposes an extension of the heterogeneous cointegration relation.

For model 1, the V-statistic panel test is negative and insignificant, the rho-statistic panel test is insignificant and positive, the PP-statistic test is negative and significant at 1%, the ADF-statistic panel test is negative and significant at 1%, the rho-statistic group test is positive and insignificant, the PP-statistic group test is negative and significant at 1%, the ADF-statistic group test is negative and significant at 1%.

For model 2, the V-statistic panel test is negative and insignificant, the rho-statistic panel test is insignificant and positive, the PP-statistic panel test is negative and significant at 1%, the ADF-statistic panel test is negative and significant

at 1%, the rho-statistic group test is positive and insignificant, the PP-statistic group test is negative and significant at 1%, the ADF-statistic group test is negative and significant at 1%.

We can conclude here that four out of seven tests are significant and therefore there cointegration between the variables for model 1 and even for model 2.

4.3. Estimation Results

We distinguish between the basic results and the results of the robustness test.

4.3.1. Estimation Results Using the FGLS Method

The following **Table 4** presents the main results of the econometric analysis of our two models. These are the basic results, the robustness of which will be tested later.

Table 4. Estimation using the FGLS method.

VARIABLES	(1)	(2)
	GFCF	IDEPIIB
ODA	7.995*** (1.197)	0.135** (0.0659)
GDP PER CAPITA	0.0174*** (0.00502)	-0.000424 (0.000277)
TAJ	-0.516 (0.364)	0.00601 (0.0195)
SHOOTING	1.699** (0.665)	0.0542 (0.0330)
QBU	-12.55 (16.36)	2.440*** (0.873)
Constant	-15.17 (40.89)	5.130** (2.185)
Comments	287	322
Number of ID	28	30

Source: Author based on stata 15. Note: Figures in brackets represent standard deviations. *significant at 10%, **significant at 5%, ***significant at 1%.

Now that the various models are statistically significant, we can interpret them. Analysis of the results reveals that Official Development Assistance (ODA) plays a central role in investment dynamics, both domestically and internationally. In terms of domestic investment, measured by Gross Fixed Capital Formation (GFCF), ODA has a positive and very significant effect. An increase in ODA per capita increases GFCF by 7995 units. This relationship demonstrates that ODA acts as a major lever to support the financing of domestic investment, by stimulating resources for the development of infrastructure and available local

productive capacity.

In terms of foreign direct investment (FDI), represented by net FDI flows relative to GDP (FDI/GDP), the impact of ODA is also significant. This result reflects the information that ODA makes recipient economies more attractive to foreign investors, effectively by financing structuring projects or improving macroeconomic stability. Consequently, ODA plays a dual role: it directly promotes domestic investment and creates a favourable environment for the inflow of foreign capital.

In parallel, GDP per capita (GDP/GDP) has a positive and significant influence on GFCF, with a marginal effect of 0.0174 units. This correlation suggests that higher income levels in an economy are synonymous with a greater ability to mobilise the resources needed to invest in fixed capital. However, GDP per capita has no significant effect on FDI, indicating that economic wealth alone is not sufficient to attract foreign investors. This finding highlights the importance of complementary institutional and structural factors, such as the quality of the economic environment.

In addition, bureaucratic quality (QBU) is distinguished by its differentiated impact on the two forms of investment. While its effect on GFCF is negative and statistically insignificant, its influence on FDI is significant and positive by 2440 units. This illustrates the importance of institutions in the decisions of foreign investors, for whom an efficient and transparent administrative environment is often a determining factor. These results confirm that improving institutions is a necessary condition for maximising FDI flows.

Furthermore, the real interest rate (RIR) has a positive and significant influence on GFCF, with an effect of 1699 units. This may seem counter-intuitive, but this result could be explained by the fact that real interest rates strongly encourage domestic savings, which increases the funds available for investment. However, the FIT has no significant effect on FDI, suggesting that foreign investors are more sensitive to other factors, such as project profitability or economic stability.

Finally, the impact of the youth literacy rate (YLR) is negligible in both models, which can be explained by the fact that literacy, although crucial in the long term, has no direct and immediate effect on investment decisions. This indicates that an improvement in the quality of the workforce requires a longer time horizon to translate into gains in terms of investment.

- **Interpreting the effect of official development assistance on domestic investment (results of model 1)**

Official development assistance has a positive effect on GFCF in sub-Saharan Africa, with a significance level of 1%. This means that a 5% increase in ODA leads to a 0.76% increase in GFCF. [Mushagalusa \(2021\)](#) and [Mallaye \(2010\)](#) have shown that ODA positively affects economic growth through investment. ODA can act as a complement to national savings, enabling the financing of public investment in key sectors such as infrastructure (roads, energy, telecommunications), education and health. These public investments create a more favourable environment for domestic private investment. In addition, ODA can stimulate domestic demand by funding social programmes, rural development projects and job creation initiatives. This

increase in demand encourages local businesses to invest to meet new needs.

However, ODA can, in some cases, have a crowding-out effect on domestic investment. This occurs when aid creates dependency, discourages domestic savings or finances projects that compete directly with local businesses. Consequently, strategic use of ODA to complement rather than replace national efforts is essential.

- **Interpreting the effect of official development assistance on foreign direct investment (results of model 2)**

Official development assistance has a positive effect on FDI in sub-Saharan Africa, with a significance level of 1%. This means that an increase in FDI is 1.10%. Lisa Chauvet and Sandrine Mesple-Soms (2007); Amusa et al. (2016) found that ODA complements FDI, also Mainguy (2004) confirms that ODA favours FDI.

ODA is a potential catalyst for FDI, particularly by financing essential infrastructure in the energy, transport and telecommunications sectors. These improvements make countries more attractive to foreign investors. In addition, ODA targeting specific sectors such as agriculture or renewable energy can generate targeted investment opportunities for FDI in these areas.

4.3.2. The Robustness Analysis

The robustness test is carried out by modifying the estimation technique. The following Table 5 shows the results of estimating the models using the Driscoll and Kraay (1998) estimator.

Table 5. Model estimation results using the Driscoll and Kraay (1998) estimator.

VARIABLES	(1)	(2)
	GFCF	IDE/PIIB
ODA	7.995*** (1.511)	0.135*** (0.0439)
GDP PER CAPITA	0.0174*** (0.00216)	-0.000424 (0.000278)
TAJ	-0.516** (0.232)	0.00601 (0.0139)
SHOOTING	1.699*** (0.367)	0.0542*** (0.0146)
QBU	-12.55*** (3.232)	2.440*** (0.746)
Constant	-15.17 (17.74)	5.130** (1.884)
Comments	287	322
R-squared	0.150	0.062
Number of groups	28	30

Source: author based on stata 15. *significant at 10%, **significant at 5%, ***significant at 1%. Standard errors in parentheses.

The results of the robustness analysis obtained using the [Driscoll and Kraay \(1998\)](#) estimator confirm and reinforce the significance of the effect of Official Development Assistance (ODA) on domestic and foreign investment. In model (1), which analyses the impact on gross fixed capital formation (GFCF), ODA exerts a positive and highly significant influence. This result indicates that ODA is an essential lever. In model (2), which measures the impact on foreign direct investment (FDI) flows relative to GDP (FDI/GDP), the effect of ODA is also positive and significant, with a coefficient of 0.135.

These results, which are robust to problems of time dependence and heteroscedasticity, underline the strategic importance of ODA in mobilising investment for development. They confirm that ODA can not only act directly on domestic capital accumulation, but can also act as a confidence signal to attract FDI flows, provided that local policies and institutions are adapted.

5. Conclusion

The existing literature raises controversy about the link between ODA and domestic investment, on the one hand, and between ODA and FDI, on the other. This study, which analyzes 30 sub-Saharan African countries over the period 2006-2019 using two linear models (one on the impact of ODA on domestic investment, the other on its impact on FDI), shows, using the FGLS methods of [Parks \(1967\)](#) and [Driscoll & Kraay \(1998\)](#) (for robustness), that ODA positively affects both types of investment. These results highlight the positive and significant influence of ODA on investment in Sub-Saharan Africa, both domestic investment and FDI, underlining its crucial role as a catalyst for economic development. Effective management of ODA can initiate a virtuous circle by stimulating investment, improving the business environment, boosting domestic demand and creating investment opportunities. However, careful management is imperative to avoid crowding out domestic investment. We therefore recommend that the governments of sub-Saharan African countries and international institutions use ODA in a way that complements national efforts, by strengthening local initiatives and giving priority to productive investments (infrastructure, agriculture, industry, human capital), while aiming to attract FDI through strategic management of ODA.

Conflicts of Interest

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

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