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Financial Inclusion and Foreign Direct Investment in Sub-Saharan Africa

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Abstract

Financial inclusion in Africa has made significant progress over the last decade, largely due to the growth of digital financial services. The economic benefits of this progress are being explored. The objective of this paper is to examine the effect of financial inclusion on foreign direct investment in thirty-two (32) Sub-Saharan African countries over the period 2005 to 2020. The econometric model, is estimated using the Generalised Method of Moments (GMMs), Autoregressive Distributed Lag (ARDL) and the Panel-Corrected Standard Error (PCSE) estimator for the robustness test. The results show that financial inclusion has a positive and significant effect on foreign direct investment in the said countries. Indeed, financial inclusion, by facilitating access to financial services for a larger share of the population, has significant positive effects on foreign direct investment (FDI). These results lead us to recommend that government authorities and national and international financial institutions improve access to financial services and strengthen financial reforms aimed at increasing the level of financial inclusion in order to continue to attract more FDI flows.

Keywords

Financial Inclusion, Foreign Direct Investment, PCSE, GMMs

1. Introduction

Financing the economy is a major issue for both the state and the private sector in countries where financial systems remain underdeveloped (Beck et al., 2011). Consequently, Sub-Saharan African (SSA) countries with less developed financial systems do not have a good level of economic growth (Guérineau & Jacolin, 2014). Furthermore, Diaw and Fall (2022) points out that financial inclusion (FI) makes it possible to improve the level of investment through the mobilisation of savings

and access to credit for poor populations and small and medium-sized enterprises.

From this perspective, FI is represented by a set of indicators: access to financial services, availability of financial services and use of financial services (Sarma, 2008). Misati and Nyamongo (2011) have highlighted some of the benefits of a developed financial sector, such as facilitating domestic firms' access to local funds that will enable them to purchase new equipment, adopt cutting-edge technologies and attract skilled labour. Nevertheless, global FDI flows can be influenced by the FI in host and home economies. For example, Chen et al. (2022) point out that host economies need strong financial systems, as foreign affiliates may seek additional capital for future expansion in domestic financial markets.

According to the UNCTAD (2022), FDI flows to Africa fell by 16% in 2021, to $40 billion, compared with $47 billion in 2019. They reached a record high of 83 billion dollars in 2020, but fell by 45 billion dollars in 2021 (United Nations Conference on Trade and Development, UNCTAD, 2021). The bank penetration rate in SSA increased by 50% over the ten years from 2011 to 2021. The change in both inward FDI and the change in the level of financial inclusion in sub-Saharan African countries should be noted.

It is therefore important to reveal the confrontations of antagonistic ideas or contradictory situations in the existing economic literature on the relationship between financial inclusion and foreign direct investment. The analysis of the relationship between financial inclusion and foreign direct investment is fraught with controversy, which can be understood on theoretical, empirical and factual levels.

Dunning (1979), Hymer (1976), Caves (1996) and Vernon (1966) have also recognised the role of the financial sector in FDI. On the other hand, Modigliani and Miller (1958), Merton (1973) and Markowitz (1952) point out that other exogenous factors could disengage FDI from financial systems. Although there are theoretical discussions, there is little empirical evidence. However, some studies show a positive relationship between financial inclusion and FDI and others show a negative relationship between these two variables.

Another group of authors show that FI favours FDI (Bilir et al., 2019; Desbordes & Wei, 2017; Lestari, Lesmana, Yudaruddin, & Yudaruddin, 2022; Odugbesan, Ike, Olowu, & Adeleye, 2022; Nguyen & Lee, 2021; Lestari et al., 2022). Indeed, Odugbesan et al. (2022) studied the relationship between financial development (FD), FI and FDI in selected Sub-Saharan African countries for the years 2004-2018, and found that FD and FI have a positive effect on FDI. Bilir et al. (2019) assess the relationship between FI and FDI and find a positive relationship between FI and FDI.

However, Chen et al. (2022) alone have shown in both the short and long run that financial inclusion positively and significantly influences FDI in high-income countries and in EAP countries as a whole. Furthermore, they found that in low-income EAP countries, FI has a weak correlation with FDI. In view of the theoretical and empirical controversies, it is obvious to highlight both the stylised facts

of FI and FDI.

Over the period 2020 to 2022, the more inclusive financial sector in Sub-Saharan Africa will have 50% of accounts with financial institutions (World Bank, 2022). This compares with 71% in developing economies, 48% in the Middle East and North Africa (MENA) region, 72% in 2022 to 50% in 2023 in the United States and 71% in Latin America, 89% in East Asia and the Pacific (EAP) and 65% in 2017 to 78% in 2021 in Europe (World Bank, 2022). Just as FDI flows to Africa accounted for only 5.2% of global FDI in 2021, compared with 4.1% in 2020. Indeed, in terms of sub-regions, Southern Africa, East Africa and West Africa saw their FDI flows increase, while those destined for Central Africa remained stable (UNCTAD, 2022).

In view of the various controversies highlighted, the following research question arises: What is the effect of financial inclusion on foreign direct investment in Sub-Saharan African countries?

The main objective of this work is to determine the effect of financial inclusion on foreign direct investment in Sub-Saharan African countries. To better achieve this main objective, this work has for the main hypothesis: Financial inclusion has a positive effect on foreign direct investment in Sub-Saharan African countries.

This study introduces a new approach and aims to enrich the literature on the analysis of the relationship between financial inclusion and foreign direct investment. Indeed, there is empirical evidence of the effect of financial inclusion on poverty (Mbaye, 2023), on income inequality (Sekali & Lakhloufi, 2022), on inclusive growth (Diaw & Fall, 2022) and on economic growth (Xi & Wang, 2023), but economic growth cannot be achieved without sustainable investment guaranteed by financial inclusion. This study therefore seeks to fill this gap and it seems that the effect of FI on FDI in Sub-Saharan Africa is not known.

This study is relevant, because the 2030 Agenda for Sustainable Development has highlighted the lack of investment in African countries and the need to remedy this situation. In addition, unlike other studies, this study uses a composite FI index to capture financial inclusion; this index takes into account all the components of financial inclusion.

2. Literature Review

First, the theoretical foundations of the link between financial inclusion and foreign direct investment are presented, followed by a review of empirical work on this subject.

2.1. Theoretical Basis for the Link between Financial Inclusion and Foreign Direct Investment

FI can influence the decision of foreign investors in a given country. It highlights the role of financial stability, transparency and confidence in the financial system in attracting FDI (Chen et al., 2022). In the literature, numerous theories have sought to explain the determining factors that encourage a company to expand its

activities on a global scale. Some theories show a positive relationship between financial inclusion and foreign direct investment while others show a negative relationship between financial inclusion and foreign direct investment.

Most of the literature on FDI was based on the hypothesis of imperfections in goods and factor markets, which led to the emergence of internalisation theory, oligopolistic theory and the *Ownership advantage*, *Localisation advantage and Internalisation advantage* (O. L. I) approach. These theories emphasise that FDI occurs not because of differences in the cost of capital but because certain domestic assets are better used under foreign control (Froot and Stein 1991). Thus, based on the models explained by Dunning (1979), Hymer (1976), Caves (1996) and Vernon (1966) and other explanations in the economic literature, the role of financial inclusion in the attractiveness of FDI is theoretically assessed.

Dunning's theory (1979) attempts to identify the factors which determine the FDI. The author developed an analysis known as the eclectic theory, or the O. L. I paradigm. The eclectic paradigm, also known as the "OLI" paradigm, states that companies' investment decisions are a function of the advantages linked to ownership (O), location (L) and internalisation (I).

Dunning's theory (1979) maintains that companies seek to invest abroad in order to benefit from the comparative advantages of different countries. These advantages can include abundant natural resources and skilled labour. However, access to financial services can also be an important comparative advantage for firms i.e. when the FI is high in a country, it means that firms have easier access to the capital needed to invest. The FI would therefore theoretically have a positive effect on the attractiveness of FDI.

It should be noted that Hymer (1976) was the first economist to propose a theory of FDI. Hymer (1976) based his theory on the concept of market imperfection. According to him, multinational enterprises (MNEs) seek to exploit specific advantages that they possess over national enterprises. These advantages may relate to technology, natural resources, managerial skills or other factors. He argues that market imperfection creates an incentive for MNEs to invest directly in foreign subsidiaries rather than export their products or services. FI can reduce some of these market imperfections. Indeed, if financial services are accessible to everyone, including small and medium-sized enterprises (SMEs), this reduces information asymmetries in foreign markets and attracts FDI.

Building on Hymer's (1976) approach, Caves (1996) develops his own approach based on oligopolistic advantage (instead of monopolistic advantage), whose determinants are: imperfections in goods markets, imperfections in production factor markets, economies of scale (internal and external) and government action in host countries. He argues that barriers to entry, such as the cost of capital, research and development (R&D) expenditure and economies of scale, are market imperfections that explain the internationalisation of companies. He considers that a leading company in an oligopoly sets up abroad in order to turn the market structure to its advantage. In a situation of weakness, local competitors in turn relocate

thanks to an oligopolistic reaction. Intuitively, FI can promote competition on the international market by allowing local companies to compete with multinationals.

Vernon's theory, also known as the "product life cycle", was developed by Vernon (1966). This theory explains how international companies evolve as their products go through different stages in their life cycle. According to Vernon (1966), companies generally start by producing and selling their products in their home market. Once the product is well established and domestic demand begins to decline, the company may decide to export the product to other countries. Companies also need international banking services such as trade finance, foreign exchange risk management and cash flow management to succeed in foreign markets.

There are theories that challenge the idea that there is a direct and linear relationship between finance and FDI. Instead, these theories emphasise the complex factors that influence financial capital flows and FDI, highlighting the importance of considering several variables when analysing this relationship.

The theory of financial volatility seeks to explain how the prices of financial assets such as shares, bonds and currencies change. Many researchers and economists, including Merton (1973), Markowitz (1952) and Black and Scholes (1973), have contributed to the analysis of financial volatility by creating mathematical models to understand and evaluate the volatility of financial asset prices. According to this theory, economic uncertainty, changes in monetary and fiscal policy and irrational investor behaviour are the causes of volatility. However, foreign investors may be discouraged from committing FDI because of the volatility of financial markets. Financial crises and major fluctuations in exchange rates can make FDI riskier and less attractive to investors.

Modigliani and Miller (1958) developed the theory of capital substitution, also known as leverage theory. This theory examines the impact of a company's capital structure on its value and suggests that: in the absence of asymmetric information costs and tax advantages linked to debt, the combination of equity and debt does not affect the total value of a company (Modigliani & Miller, 1958). According to this theory, FDI flows can be replaced by financial capital flows. Rather than using FDI to finance their activities abroad, companies can obtain financing on the international financial markets. So theoretically financial inclusion would negatively affect FDI according to this theory.

Some theories show a positive relationship between financial inclusion and foreign direct investment while others show a negative relationship between financial inclusion and foreign direct investment; hence the importance of examining existing empirical work on the subject.

2.2. Review of Empirical Works

Previous work on the relationship between FI and FDI in an empirical way still seems to be little examined. Nevertheless, there is a contradiction between the existing studies; some find a positive relationship between FI and FDI, while others find a negative link.

However, Chen et al. (2022) explore the common and dynamic correlated effects of financial inclusion on FDI (FDI) in East Asian and Pacific (EAP) countries. They found that both short- and long-run estimates reveal that financial inclusion positively and significantly influences FDI in high-income countries and in EAP countries as a whole. Moreover, in low-income EAP countries, financial inclusion has an insignificant correlation with FDI, which becomes significant when an interaction term for institutional performance and financial inclusion is included.

Lestari et al. (2022) observed the association between FI and FDI. They explored the effect of FI and on FDI. The authors collected data for 108 developing countries from the World Bank's World Development Indicators (WDI) between 1993 and 2017. Their result shows that FI has a positive and significant effect on FDI.

Donaubauer et al. (2020) explored the effect of financial market development in host and home countries on bilateral FDI stocks. These authors concluded that the level of FDI is positively influenced by banking sector reserve requirements, loan availability and interest rates, implying that the FI influences the attractiveness of FDI. Similarly, Liu et al. (2020) examine the link between financial deepening (FD) and foreign direct investment (FDI) in the context of a heterogeneous panel of *One Belt One Road* partner countries. They show that FA has a significant positive effect on the attraction of foreign investment.

In a selection of 33 SSA economies between 2004 and 2018, Odugbesan et al. (2022) examine the links between financial development, financial inclusion, foreign direct investment and sustainable development. The presence of a lasting relationship between the model variables is revealed by panel cointegration tests. Before determining the direction of causality, Granger panel causality tests reveal bidirectional causality between FI and FDI. Bilir et al. (2019) showed theoretically that the host country's financial development (FD) affects FDI incentives through two channels: a financing effect that induces the entry and expansion of subsidiaries by improving their access to external financing, and a competition effect that redirects subsidiaries' sales away from the local market due to the increased entry of credit-constrained domestic firms.

Ongo Nkoa (2018) studied the impact of financial development on FDI in 52 African countries under the OLI paradigm from 1995 to 2015. The empirical results show that money and quasi-money, bank credit to the private sector and interest rate liberalisation play a positive role on FDI in countries without financial markets. Money and quasi-money, market capitalisation and the value of traded financial markets have a positive influence on FDI in countries with financial markets.

Desbordes and Wei (2017) found that FDI is affected in two ways by financial development. When the financial system directly finances their activities, the direct effect justifies a large positive influence on FDI. Following the same logic, Khan et al. (2017) found a positive and significant result for this effect by examining the case of Pakistan from 1972 to 2009.

When the financial system favours manufacturing or other important activities related to infrastructure, services and human development, the indirect effect occurs. In many cases, foreign companies do not really observe the indirect effect or cannot directly affect their activities. Researchers believe that DF attracts FDI (Hajilee & Al Nasser, 2015) because it allows the construction and allocation of financial resources between productive sectors of an economy at affordable costs (Ma, 2018). Adeniyi et al. (2012) determine that nations only reap the expected benefits from FDI when their financial system is well developed. This finding explains the importance of the host country's financial system in attracting FDI. Similarly, the role of institutions is essential in creating a favourable financial environment in order to reap the maximum benefits from FDI (Khan et al., 2020).

Anyanwu and Yameogo (2015) show that the level of bank credit discourages the attractiveness of FDI. The authors use a sample of 17 West African countries in the generalised method of moments. Kinda (2010) finds that financing problems discourage FDI in sub-Saharan Africa by 0.03%. The author applied instrumental fixed-effect logit (IV FE logit) and two-stage least squares (2SLS) techniques. He explained that financing fixed costs for foreign firms is a major challenge when the financial system is underdeveloped. In fact, credit constraints affect the decision of companies to invest abroad.

We approached the empirical review on the relationship between our two concepts and we showed on the one hand that the FI has a positive effect on FDI and on the other hand it does not have a positive effect on FDI. Based on the theoretical literature and empirical work, it is therefore important to conduct an empirical analysis of the relationship between FI and FDI in sub-Saharan African countries.

3. Methodological Approach

The aim is to methodically examine the effect of the FI on foreign direct investment in SSA countries. This section is organised as follows: model specification; choice of model variables, source and sample; and estimation technique.

3.1. Specification of the Econometric Model

To examine the effect of FI on FDI, we draw on the work of Blundell and Bond (1998). Thus, the method of generalised moments in a system (GMMs) will be used. The approach we use has the advantage of taking into account the heterogeneous nature of countries and also time dynamics (Roodman, 2009). Based on the work of Blundell and Bond (1998), the following equation forms the basis of the empirical specification of this work. It is written as follows:

$$Y_{it} = \alpha Y_{it-1} + \beta_1 X_{it} + u_i + v_t + \varepsilon_{it}$$

where, Y_{it} and Y_{it-1} represent the dependent variable and its lagged variable by one period, X_{it} which represents the explanatory variables, u_i the country specific time effect, v_t is the fixed or random country effect, ε_{it} the error term with $i = 1, 2, \cdots, N$ and $t = 1, 2, \cdots, T$ which represent the countries and years respectively.

Following the basic equation, we integrate our variables into the model, which gives the following equation:

$$\begin{aligned} IDE_{it} = {} & \alpha IDE_{it-1} + \beta_1 IF_{it} + \beta_2 PIBH_{it} + \beta_3 INFLA_{it} + \beta_4 OUVcom_{it} \\ & + \beta_5 Stabpo_{it} + \beta_6 INVdom_{it} + \beta_7 KH_{it} + u_i + v_t + \varepsilon_{it} \end{aligned}$$

where IDE_{it}: The dependent variable; IDE_{it-1}: Lagged FDI variable; IF_{it}: Denotes the IF variable which is our main variable of interest; $PIBH_{it}$; $INFLA_{it}$; $OUVcom_{it}$; $Stabpo_{it}$; $INVdom_{it}$; KH_{it}; represent the control variables of the model; $\beta_0, \cdots, \beta_8$ are the parameters to be estimated; u_i: The country-specific effect; v_t: The specific time efficiency; ε_{it}: The error term and i and t represent the countries and years respectively.

3.1.1. Selection of Variables

This section is structured as follows: the model variables are presented first. The sample and data sources are then presented.

❖ **Model variables**

A variable to be explained and explanatory variables are part of the current study. These variables are as follows:

- **Dependent variable: FDI**

The dependent variable Ide is measured by inward FDI flows expressed as a percentage of gross domestic product. It also captures the importance of foreign financial flows relative to domestic output. This indicator was used by Ongo Nkoa (2018), Chen et al. (2022) and Lestari et al. (2022) as part of their study.

Ide (−1): FDI lagged by one period. This variable reflects the influence that last year's FDI has on the current year's FDI. Indeed, the existence of FDI in a country reassures investors who wish to set up there; opportunities for partnerships and exchanges of information. The expected sign of this variable is positive.

- **Variable of interest**

Based on previous research, some researchers use only one or two indicators to represent FI (Sharma, 2016; Okoye et al., 2017). Demonstrating FI using a single indicator leads to biased results. In addition, incorporating many indicators into a regression is a complicated task (Ali et al., 2022). We therefore constructed a single index called the FI index based on the method used by Chen et al. (2022). We expect the FI to have a positive effect on FDI inflows.

- **Control variables**

Inflation **(INFLA)** can lead to uncertainty about the future profitability of investment projects (particularly when high inflation is also associated with increased price variability). This leads to more conservative investment strategies than would otherwise be the case, ultimately leading to lower levels of investment and economic growth (Chen et al., 2022; Lestari et al., 2022). According to the literature, the expected sign is **+/−**.

GDP per capita **(GDPH)** explains the size of the market and the level at which goods are purchased. It can substitute for the level of population growth. There is a broad consensus on its positive impact on FDI (Ongo Nkoa, 2018; Chen et al.,

2022). FDI flows are attracted by a large or growing market. We also expect a positive sign for this variable.

Human capital **(KH)**, which acts as an absorptive capacity or refers to the stock of created or innate human capacities and investment in human beings (spending on education, health and food). It enables foreign investors to make their investments. The main reason for this is that high human capital in the host country reduces the cost of importing skilled labour for foreign firms (Ongo Nkoa, 2018; Fayou et al., 2021; Njoda et al., 2022). Theoretical and empirical literature shows that the accumulation of the latter is a source of growth. We expect a negative sign for its estimated coefficient.

Domestic investment **(INVdom)**: it is generally accepted that FDI and domestic investment are complementary when the economic development of the host country reaches a certain level: this is the crowding-out effect of FDI on domestic investment (Stevens & Lipsey, 1992). This variable has been used by Ongo Nkoa (2018), Diaw & Fall (2022), Njoda et al. (2022) and Fayou et al. (2021). But in Africa, this result is not always verified. The expected sign is not determined a priori. A positive sign reflects the contribution of FDI to the accumulation of the latter. A plus or minus sign, on the other hand, indicates the existence of a substitution effect.

Trade openness **(OUVcom)**: This variable, measured by the ratio of the sum of exports and imports of goods and services to GDP, indicates the country's degree of participation in international trade. Trade openness is a key factor in promoting FDI inflows, as foreign investors prefer free trade to restricted trade. The results of empirical studies on this issue are not homogeneous. Nevertheless, several studies maintain that trade openness encourages the arrival of FDI (Fayou et al., 2021; Moujahid, 2021).

Political stability **(Stabpo)**: This variable provides overall information on the business climate in the host country, which should have a positive or negative impact on foreign investor confidence. In the context of this study, this variable concerns political stability **(SP)**. Thus, the decision to locate FDI may be influenced by differences in the levels of institutional quality existing between the countries of location. A large body of empirical work, including Asamoah et al. (2016) and Moujahid (2021), has emphasised that political stability favours FDI entry.

3.1.2. Data Sources and Sample of the Study

In our study, we use three databases provided by the World Bank, WB (2021), the IMF (2021) and UNCTAD (2021). To create the final database, we first transformed the secondary data collected on the said database, which means that we classified the selected variables according to SSA countries during the period 2005-2020. There are two reasons for choosing this study period: the first is that FI data is not available before 2004 and after 2020 (Chen et al., 2022).

We then eliminated the countries that were not affected by any of the explanatory variables and those that were not affected by half or more of the explanatory variables. Thus, 32 countries were retained after data cleaning and due to a lack of

sufficient data (Table 1).

Table 1. List of countries in the sample.

countries in the sample			
1) South Africa	9) Central African Republic	17) Kenya	25) Nigeria
2) Angola	10) Chad	18) Lesotho	26) Rwanda
3) Benin	11) Rep, Dem, Congo,	19) Madagascar	27) Sierra Leone
4) Botswana	12) Eswatini	20) Mali	28) Senegal
5) Burkina Faso	13) Gambia	21) Maurice	29) Sudan
6) Burundi	14) Ghana	22) Mozambique	30) Togo
7) Cape Verde	15) Guinea	23) Namibia	31) Uganda
8) Cameroon	16) Guinea-Bissau	24) Niger	32) Zimbabwe

Source: Authors' construction.

3.2. Econometric Model Estimation Procedure

When examining relationships in a panel data model, an important step is to test cross-sectional dependence and the homogeneity of the slope coefficients.

Cross-sectional dependency and homogeneity test

The cross-sectional dependence (CD) test proposed by Pesaran (2004) is essential in empirical research on panel data, particularly when representative countries have similar economic characteristics, such as emerging countries, growing economies and countries in transition. A similar economy is vulnerable to the impacts of any shock in other countries due to the internationalisation of trade, financial integration and globalisation. Consequently, a cross-sectional analysis of dependencies is often necessary in empirical research using panel data. We assume that the selected countries are interconnected, which leads to a common cointegration bias and heterogeneity in the coefficients.

In fact, panel data econometrics places great emphasis on the problem of heterogeneity. The homogeneity test is used to check whether the samples come from the same different population. It is used to determine whether the differences observed between the samples are statistically significant (Pesaran & Yamagata, 2008). Cross-sectional dependence and the homogeneity test are the determinants or the choice of stationarity test.

Unit Root Testing

Several tests are used to examine the stationarity of variables on panel data, in particular first and second generation tests. The first group is based on the individual independence hypothesis proposed by Levin and Lin (1992, 1993). Second-generation tests are based on the inter-individual dependence hypothesis and were proposed by Pesaran (2007). To ensure the stability of the robustness of stationarity, we will perform the tests commonly known as *Cross-Sectional Augmented Dickey*

Fuller (CADF) and *Cross-Sectional Im Pesaran Shin* (CIPS), which have been widely used. These tests allow cross-sectional dependence to be taken into account.

However, if it is found that at the end of the unit root test and the variables in the model have the same order of integration I (1) then this study will use the Westerlund and Edgerton (2007) cointegration test and suggests rejecting the null hypothesis of no cointegration. However, if we find that the variables in the model have a mixed order of integration, i.e. stationary levels I (0) and I (1), the Westerlund and Edgerton (2007) cointegration test no longer helps to verify cointegration between the panel series. In this case, we use ARDL panel estimation.

Estimation techniques

We will mainly use the method of generalised moments in a system (GMMs) to test our second hypothesis. A substitution of control variables and another estimation technique will be used to perform the robustness test. The main estimation method will be presented first, followed by the robustness test.

- **Main estimate**

A dynamic model is one in which one or more lags of the dependent variable appear as explanatory variables. Unlike the method of dynamic generalised moments developed by Blundell and Bond (1998), standard econometric techniques such as ordinary least squares OLS for a static model do not provide efficient estimates of such a model because of the presence of a lagged dependent variable on the right-hand side of the equation.

Random and fixed effects models are two options commonly used in the literature to estimate panel data regressions. The fixed effects model allows for a non-zero correlation between the country fixed effects and the explanatory variables, whereas the random effects model claims that there is no correlation. This is the main difference between the two models. The results of the random model are not consistent if there is a correlation between the explanatory variables and the country fixed effects. To choose between the two models, the Hausman specification test is recommended.

By controlling for country and time fixed effects, the fixed effect model can reduce omitted variable bias. However, endogeneity bias is resolved in dynamic panel data depending on the estimators used. According to Hansen (1982) and Hayashi (2000), the generalised method of moments (GMM) is widely used in economics, particularly in the fields of macroeconomics and finance.

There are two variants of the dynamic panel GMM estimator: the GMM first difference estimator (GMMD) and the GMM system estimator (GMMs). The GMM first-difference estimator consists of taking the first difference of the equation to be estimated for each period in order to eliminate country-specific effects, and then instrumenting the explanatory variables of the first-difference equation with their level values lagged by one period or more. Whereas in the GMM system on dynamic panel data the first difference equation and the level equation are combined.

To arrive at our results, we mainly use the estimation technique of the method

of generalised moments in system (GMMs) of Arellano and Bover, 1995/Blundell and Bond (1998). Indeed, Blundell and Bond (1998) and Bond (2002) have shown that the system GMM estimator is more efficient than the difference GMM estimator. However, the GMMs estimator makes it possible to resolve the problems of simultaneity bias, reverse causality and omitted variables that weaken the results of econometric estimates (Blundell & Bond, 1998). Blundell and Bond (1998) have developed estimators that are convergent, unbiased and asymptotically distributed.

The effectiveness of the GMM estimator depends on the validity of the following hypotheses: 1) the instruments are well validated and 2) the error terms are not autocorrelated. To test the validity of lagged variables as instruments, Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) propose Hansen/Sargan over-identification tests. The Hansen test is effective in the presence of autocorrelation and heteroscedasticity problems (Roodman, 2009). To test the hypothesis that the error terms are not correlated, we perform a second-order autocorrelation test, since by construction the first-difference error term is correlated of order 1 (Levine et al., 2000; Neanidis & Varvarigos, 2009). The advantage of this method is that it controls for national effects and the potential endogeneity of the explanatory variables. However, this method is too sensitive to the choice of instruments and the number of lags. The GMM method has limitations in terms of simultaneity bias.

- **Robustness test**

To check the robustness of our results, we focus on two mechanisms. Firstly, we replace the control variables with variables relating to consumer spending (Depcons), official development assistance (lnAPD) and government spending (Depgov). Secondly, we implement another estimation technique, namely the Panel Corrected Standard Error (PCSE) method. In fact, Beck and Katz (1995) propose a panel specification corrected for standard error (PCSE) which makes it possible to resolve cross-sectional dependence, which also makes it possible to obtain efficient estimators while correcting for autocorrelation and heteroscedasticity problems. The aim of these robustnesses is to find the same result.

4. Results and Discussion

These are the results of descriptive statistics and econometric model estimates.

4.1. Descriptive Analysis of Variables of the Model

The main characteristics of the statistical analysis are the means, standard deviations and differences between the maximum and minimum values of the variables used in the study. The following table therefore presents the results of the statistical analysis.

It shows that FDI inflows represent on average 3.40% of GDP and up to a maximum of 39.45% of GDP. Its standard deviation is 4.73, indicating that annual FDI inflows are variable.

The average value of the FI is 0.2%, with a minimum of 0 and a maximum of 1. This average rate is lower than the strict bancarisation rate, which is 21.8% in 2021 (Central Bank of West African States, 2022). This result can be explained by the fact that almost a third of the population aged 15 and over does not have a bank account in the official financial system (World Bank, 2018). The descriptive statistics of the variables are recorded in the following **Table 2**:

Table 2. Descriptive statistics for variables.

Variable	Comments	Average	Standard deviation	Minimum	Maximum
Foreign direct investment FDI	512	3.403096	4.734761	−10.95397	39.4562
Financial inclusion (FI)	512	0.2041441	0.1887396	0	1
Gross domestic product/inhabitant (GDPH)	512	1.366313	4.183178	−36.7777	19.93898
Domestic investment (INVdom)	512	6.812247	20.19907	−65.6894	231.9322
Human capital (KH)	512	3.810628	2.136267	1	9.73
Inflation (INFLA)	512	9.548402	31.67777	−16.76214	604.9459
Commercial opening (OUVcom)	512	66.03611	29.59569	0.7568755	163.6187
Political stability (Stabpo)	512	23.31653	18.83303	0	72.11539

Source: compiled from WB (2021), IMF (2021) and UNCTAD (2021) databases using Stata software.

Table 3 shows the correlation between the different variables. Indeed, after the statistical analysis, a correlation analysis between the dependent and independent variable is essential to determine the effect of FI on FDI in SSA. By highlighting the signs between the independent variables and the dependent variable, we find a positive correlation between FDI and financial inclusion. With the exception of human capital (KH) and inflation (INFLA), the other variables are positively correlated with FDI.

Table 3. Correlation of variables.

Variables	IDE	IF	PIBH	INVdom	KH	INFLA	OUVcom	Stabp
IDE	1							
IF	0.0615	1						
PIBH	0.1392	−0.026	1					
INVdom	0.1085	−0.1183	0.2803	1				
KH	−0.0709	0.1077	−0.0217	0.0368	1			
INFLA	−0.052	−0.0958	−0.1224	−0.0462	0.135	1		
OUVcom	0.2752	0.3225	0.1585	0.0925	0.0266	−0.0653	1	
Stabpo	0.0587	0.0854	0.0191	0.07	0.5186	0.0791	0.1187	1

Source: compiled from WB (2021), IMF (2021) and UNCTAD (2021) databases using Stata software.

4.2. Results and Discussion

4.2.1. Preliminary Test Results

Results of the cross-sectional dependency test

Table 4 shows that the null hypothesis of no panel dependence is rejected at the 1% significance level, as the probability values were found to be less than 1%. In fact, there is cross-sectional dependence for all variables except the first variable (INVnat). This result implies that a shock occurring in one SSA country can be transmitted to the other countries in the zone.

Table 4. Results of the cross-sectional dependency test.

Variables	CD-test	*p*-value
National investment	1.054	0.292
Financial Inclusion Index	69.152	0.000
Gross domestic product/capita	22.459	0.000
IDE	4.9	0.000
Inflation	8.832	0.000
Commercial opening	5.521	0.000
Human capital	11.404	0.000

Source: Compiled from WB (2021) and IMF (2021) databases using Stata software.

Results of the homogeneity test

Table 5 shows that the null hypothesis of slope homogeneity is rejected. The coefficients are therefore heterogeneous. However, second-generation stationarity tests (CADF and CIPS) (Pesaran, 2007) are used to take account of cross-sectional dependence. The stationarity results are reported in Table 5.

Table 5. Homogeneity test results.

Delta *p*-value
1.992 0.046
adj. 3.011 0.003

Source: Compiled from WB (2021) and IMF (2021) databases using Stata software.

Results of unit root tests

Pesaran's (2007) CIPS and CADF tests for unit roots were calculated. These unit root tests take cross-sectional dependence into account. The variables in the model have a mixed level of integration, i.e. stationary levels I (0) and I (1) (Table 6). In order to establish the existence of a stable long-run relationship between the variables, we will implement the ARDL model using the PMG panel estimator with error correction to test the short-run dynamics and the long-run relationship between the FI and national investment.

Table 6. Results of the unit root test.

VARIABLES	CIPS		CADF		Order of integration
	Level	Primary difference	Level	Primary difference	
National investment	−1.763	**−3.534*** **	0.809	**−9.417*** **	I (1)
Financial Inclusion Index	**−2.687*** **	---	**−5.308*** **	---	I (0)
Gross domestic product/capita	−1.652	**−2.738*** **	1.216	**−5.282*** **	I (1)
IDE	**−2.762*** **	**---**	**−3.132*** **	---	I (0)
Inflation	**−3.004*** **	---	−7**.067*** **	---	I (0)
Commercial opening	−1.681	**−3.207*** **	0.271	**−7.716*** **	I (1)
Human capital	−0.973	**−2.132** **	4.200	**−2.140** **	I (1)

Source: Compiled from WB (2021) and IMF (2021) databases using Stata software. The Stars represent the significance level at 10% (for *), 5% (for **) and 1% (for ***).

4.2.2. Estimation Results of Econometric Models and Discussion

The first section presents the main results and discusses them. The last section presents the results of the robustness analysis.

4.2.3. Effect of Financial Inclusion on Foreign Direct Investment in SSA Countries: Results of Estimates Using the GMMs Method

We used the method of generalised moments in a system to empirically verify the effect of the FI on FDI in SSA countries. The main estimation results are presented in Table 7 below.

Table 7. Effect of the FI on FDI in SSA between 2005 and 2020: results of the estimation using the method of generalised moments in system (GMMs).

Dependent variable: foreign direct investment (FDI)							
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IDE (−1)	0.835***	0.798***	0.838***	0.849***	0.686***	0.589***	0.556***
	(0.0379)	(0.0295)	(0.0604)	(0.0747)	(0.0598)	(0.0290)	(0.0330)
IF	**2.453** **	**2.589*** **	**2.535*** **	**2.566** **	**1.409***	**1.343** **	**1.945*** **
	(1.155)	(0.846)	(0.913)	(1.288)	(0.814)	(0.608)	(0.631)
PIBH		0.00224	0.00692	−0.0147	0.0282	0.0551**	0.0676***
		(0.0269)	(0.0266)	(0.0396)	(0.0333)	(0.0230)	(0.0243)
KH			0.125	0.131	−0.0608	−0.139**	−0.240***
			(0.107)	(0.114)	(0.0749)	(0.0548)	(0.0649)
INVdom				0.0134	−0.000227	−0.0295***	−0.0459***
				(0.0256)	(0.0218)	(0.0101)	(0.0114)
OUVcom					0.0447***	0.0576***	0.0748***
					(0.00898)	(0.00865)	(0.00808)
INFLA						0.000647	0.00627**
						(0.00119)	(0.00264)

Continued

Stabpo							−0.0784***
							(0.0203)
Constant	0.0696	0.106	−0.925	−1.079	−1.590*	−1.280***	0.252
	(0.287)	(0.198)	(1.058)	(1.344)	(0.892)	(0.453)	(0.763)
Comments	448	448	448	448	448	448	448
Number of countries	32	32	32	32	32	32	32
Instruments	12	17	17	17	23	28	28
AR1p	0.00968	0.00892	0.0107	0.0110	0.00768	0.00791	0.00823
AR2p	0.901	0.903	0.914	0.833	0.939	0.784	0.674
Sarganp	0.167	0.294	0.263	0.204	0.171	0.163	0.149
Hansenp	0.208	0.180	0.156	0.105	0.177	0.282	0.290

Source: compiled from databases using Stata software. Standard deviations in brackets; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

In general, the results of this estimation are conclusive. Consequently, it is important to stress that the validity of these results is confirmed by the various statistical tests involved in this estimation. These tests include the residual autocorrelation test and the Hansen-Sargan test. However, when the coefficients of the autocorrelation test are less than 10% at the first lag (AR1) and greater than 10% at the second lag (AR2), the null hypothesis (of the presence of autocorrelation) is accepted at the first lag (AR1) and rejected from the second lag (AR2) and the autocorrelation test is considered valid.

In addition, the Hansen and Sargan tests test the null hypothesis of non-correlation between the instruments and the residuals, and we find that their estimated coefficients in our model are greater than 10%, which confirms that the validity test for the instruments is confirmed.

We can therefore see that our different tests are valid in accordance with these different hypotheses. We can now provide more precise explanations of the values of the coefficients linked to our different variables, based on the results of these separate tests. The results we obtain from this estimation are generally conclusive. However, it is clear that all the variables selected are significant. This explains the importance of these variables for the attractiveness of FDI in the SSA zone. The variables behave in line with our expectations, which is a positive sign. However, the human capital and trade openness variables show opposite signs.

The table above (Table 7) summarising the results of the regression estimation using the GMMs method shows that the effect of the FI is positive and statistically significant at the 1% threshold on FDI flows. Consequently, when the FI increases by 1%, inward FDI increases by 1.94%. This result is justified by the increases in the FI linked to the availability or increase in the number of commercial bank branches, which help to facilitate inward FDI flows.

This finding is consistent with recent empirical literature, in particular the work of Chen et al. (2022). The banking sector's reserve requirements, the availability of loans and interest rates attract FDI. This result corroborates those found by Donaubauer et al. (2020). Thus, aggregate FDI flows are influenced by FI in both host and home economies. This result is consistent with Lestari et al. (2022). This result is in line with those obtained by Odugbesan et al. (2022) who examine the links between financial development, financial inclusion, foreign direct investment and sustainable development. This result is in line with the logic that the finance, FDI and growth relationship is justified by the fact that accessibility to financial services increases the level of physical capital accumulation and enhances firm productivity in the long run in line with the work of Ongo Nkoa (2018). This result confirms the hypothesis of this work that financial inclusion positively affects the attractiveness of FDI in sub-Saharan African countries.

4.2.4. Robustness Analysis

The objective of the robustness check is to find the same result. In fact, the following table shows that by changing the control variables, the FI has a positive and significant effect on FDI. Indeed, a 10% increase in the FI increases FDI by 1.22% on average. This positive effect confirms the basic results obtained previously (**Table 8**).

Table 8. Effect of FI on FDI in SSA between 2005 and 2020: robustness to changes in control variables.

Dependent variable: foreign direct investment (FDI)					
explanatory variables	(1)	(2)	(3)	(4)	(5)
IDE (−1)	0.835***	0.778***	0.728***	0.398***	0.353***
	(0.0379)	(0.0183)	(0.0127)	(0.0402)	(0.0461)
FI	**2.453****	**1.823****	**0.987****	**1.804*****	**1.224***
	(1.155)	(0.808)	(0.431)	(0.678)	(0.697)
Depcons		0.0239	0.0175	0.149**	0.120*
		(0.0187)	(0.0141)	(0.0586)	(0.0716)
LnAPD			0.728***	0.0806	−0.521
			(0.226)	(0.500)	(0.506)
LnDepgov				0.702**	0.459
				(0.303)	(0.296)
IPC					0.108**
					(0.0497)
Constant	0.0696	0.297*	−14.03***	−2.141	10.17
	(0.287)	(0.168)	(4.540)	(10.36)	(10.61)
Comments	448	448	448	372	372
Number of countries	32	32	32	32	32
Instruments	12	17	24	28	28

Continued

AR1p	0.00968	0.00855	0.00850	0.0545	0.0523
AR2p	0.901	0.933	0.977	0.415	0.666
Hansenp	0.208	0.141	0.137	0.728	0.929
Sarganp	0.167	0.156	0.346	0.239	0.318

Source: compiled from databases using Stata software. Standard deviations in brackets; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

The results obtained using the correlated panel standard error estimator (PCSE) in the following table (Table 9) also show that the coefficient associated with the IF variable is positive and statistically significant at the 1% threshold. This result suggests that the FI variable tends to have a positive influence on FDI and helps to promote this effect. Indeed, the results show that the dependent variable (Ide) is well explained by the independent variables in this model with an R^2 of 73.2%. In addition, the Wald Chi2 test shows that our model is highly significant at the 1% level (Prob > Chi2 = 0.0000). The results of the model show that the FI has a positive and significant effect at the 1% level on FDI in SSA countries. This result is the same for the main results obtained previously.

Table 9. Effect of the FI on FDI in SSA between 2005 and 2020: Prais-Winsten regression, corrected standard errors of correlated panels (PCSE).

	Dependent variable: FDI						
explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FI	**12.26*** ** (3.585)	**13.36*** ** (3.545)	**13.36*** ** (3.274)	**9.960*** ** (3.080)	**9.869*** ** (3.091)	**9.933*** ** (3.107)	**10.64*** ** (2.972)
PIBH		0.117*** (0.0395)	−0.00786 (0.0391)	−0.0149 (0.0377)	−0.0148 (0.0376)	−0.0154 (0.0380)	−0.00923 (0.0388)
INVdom			0.0611*** (0.00795)	0.0553*** (0.00774)	0.0553*** (0.00774)	0.0552*** (0.00775)	0.0566*** (0.00790)
OUVcom				0.0833*** (0.0145)	0.0829*** (0.0145)	0.0837*** (0.0162)	0.0801*** (0.0168)
INFLA					−0.00261 (0.00708)	−0.00255 (0.00710)	−0.00271 (0.00718)
KH						−0.0160 (0.0616)	−0.0126 (0.0612)
Stabpo							0.0483*** (0.0185)
Constant	18.85*** (0.828)	18.89*** (0.831)	18.51*** (0.786)	13.58*** (1.090)	13.65*** (1.097)	13.69*** (1.075)	12.63*** (1.002)
Comments	512	512	512	512	512	512	512
R-squared	0.569	0.602	0.649	0.686	0.685	0.684	0.732
Number of countries	32	32	32	32	32	32	32
Prob > Chi2	0.000629	3.17e−05	0.000	0.000	0.000	0.000	0.000
Wald Chi2	11.69	20.72	84.40	114.4	113.6	118.1	182.5

Source: compiled from databases using Stata software. Standard deviations in brackets; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

In the light of our results, we find that the FI has a significantly positive effect on inward FDI flows and that for a host country, political stability, domestic investment and gross domestic product per capita are essential to the attractiveness of FDI.

Indeed, financial inclusion, by facilitating access to financial services for a larger proportion of the population, can have significant positive effects on foreign direct investment (FDI), as an inclusive financial system strengthens the confidence of foreign investors. Access to credit for local businesses, including SMEs, creates a more dynamic and attractive business environment for FDI as foreign investors are more inclined to invest in a country where local businesses are strong and can potentially become business partners or suppliers.

Financial inclusion enables local businesses to grow, innovate and become more competitive. This growth in the domestic private sector attracts FDI seeking investment opportunities in dynamic and expanding businesses. Greater access to financial services encourages domestic savings. These increased savings can be channelled into productive investment, which in turn attracts FDI that sees an expanding domestic market and investment opportunities.

5. Conclusion

In our study, the objective was to determine the effect of the FI on foreign direct investment in Sub-Saharan African (SSA) countries. To achieve this objective, we used the *Financial Access Survey* database of the International Monetary Fund (2021) and the *World Development Indicators* database of the World Bank (2021) and the United Nations Conference on Trade and Development (2021). The financial and economic information collected relates to a set of 32 SSA countries over the period 2005-2020. After the theoretical examination of the effect of FI on FDI, the empirical verification of the effect of FI on FDI in SSA modelled by an ARDL model is estimated by the system generalized method of moments. The basic results show that the FI has a positive and significant effect on FDI in SSA countries. The robustness of these results is approved by two tests, namely changing the estimation technique and modifying the control variables. Financial inclusion is therefore a catalyst for FDI. Indeed, financial inclusion creates a virtuous circle by stimulating local economic activity, strengthening the financial system and improving the investment climate, which ultimately attracts more FDI and contributes to stronger and more inclusive economic growth.

Based on the main findings, it is recommended that government authorities and financial institutions improve access to financial services, strengthen financial reforms aimed at increasing the level of financial inclusion in order to continue to attract more FDI flows.

Conflicts of Interest

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

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