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Inclusive Education and Financial Development in Africa

Éducation inclusive et développement financier en Afrique

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Abstract

The study assesses the effect of inclusive education on the level of financial development in 50 African countries from 2003 to 2020. The study adopts the two-step system GMM as a strategy. The study employs the primary, secondary and tertiary enrolments at the gender parity index as indicators of inclusive education. The study employed inclusive measures of financial development in aspects of financial efficiency measured by the ratio of banks' credit on deposits, financial depth indicated by liquid liability, banking size indicated by banks' assets, and the growth in the banking sector's activities indicated by private domestic credit from financial institutions. The results of the study show that secondary and tertiary enrolments significantly influence financial efficiency, depth, banking size and growth in banking activities, indicating a positive effect of inclusive education on inclusive financial development in Africa. The study recommends policymakers invest more in the knowledge economy to promote digital and mobile banking, which increases the rate of financial inclusion and development in most African countries. Studies have shown that the rate of financial inclusion in Africa has increased in the last two decades because of mobile banking and internet penetration, which can be enhanced through education.

Keywords: Inclusive education; financial development; Africa; GMM; Financial efficiency

Résumé

L'étude évalue l'effet de l'éducation inclusive sur le niveau de développement financier dans 50 pays africains de 2003 à 2020. L'étude adopte le système en deux étapes GMM comme stratégie. L'étude utilise les inscriptions dans le primaire, le secondaire et le supérieur selon l'indice de parité entre les sexes comme indicateurs de l'éducation inclusive. L'étude a utilisé des mesures inclusives du développement financier dans certains aspects de l'efficacité financière mesurée par le ratio du crédit des banques sur les dépôts, la profondeur financière indiquée par les liquidités, la taille des banques indiquée par les actifs des banques et la croissance des activités du secteur bancaire indiquée par le crédit intérieur privé des institutions financières. Les résultats de l'étude montrent que les inscriptions dans les niveaux secondaire et supérieur influencent de manière significative l'efficacité financière, la profondeur, la taille des banques et la croissance des activités bancaires, indiquant un effet positif de l'éducation inclusive sur le développement financier inclusif en Afrique. L'étude recommande aux décideurs politiques d'investir davantage dans l'économie de la connaissance pour promouvoir les services bancaires numériques et mobiles, ce qui augmente le taux d'inclusion financière et de développement dans la plupart des pays africains. Des études ont montré que le taux d'inclusion financière en Afrique a augmenté au cours des deux dernières décennies en raison de la pénétration des services bancaires mobiles et d'Internet, qui peuvent être améliorés grâce à l'éducation.

Mots clés : Éducation inclusive ; développement financier ; Afrique ; GMM ; Efficacité financière.

Introduction

Access to affordable financial services has increased steadily in Africa in the last two decades (Owusu-Agyei et al., 2020). The level of financial development in these sectors has been justified by increasing bank assets and the number of bank account owners, which, according to IFAD (2011), less than 20 per cent of households, on average, have access to affordable financial services in Africa. Financial resources provided by financial institutions increased from 27.9% in 1965 to 40.9 in 2017 and back to 37.9 in 2020, caused to the Covid-19 pandemic. A greater proportion of Africans depend on financial services from the informal financial sector. The rate of financial inclusion has increased over the years with an increase in the percentage of the population with a bank account, increasing from 23.5% in 2011 to 42.65% in 2017. The African economy is less financially developed as compared to other regions like Europe, America and some countries in Asia such as Japan and China, which is partly due to limited communication infrastructures, lack of educational infrastructures, poor management and poor transport facilities, all accounting for the lack of formal financial services in extensive regions across the continent (Adebayo et al., 2021; Owusu-Agyei et al., 2020; World Bank, 2021). In the regions where financial services are made available by the formal financial sector, low-income households face some difficulties meeting the lending requirements, such as the ability to provide collateral and strict documentation, attributed to a low level of educational development. Africa is lagging in terms of financial development when compared with other regions of the world (Ejemeyovwi et al., 2021; Tchamyou, 2019, 2021). Educational development provides a better understanding of banking activities. The African economy is far back when considering investments in human capital and the dimension of education, though the percentage of literacy has increased over the years from 49% in 1985 to 59 in 2010 and 66% in 2020. This increase is still far lagging to ensure inclusive finance through advancement in technological innovation in the financial sector in the names of mobile and internet banking, which can only involve those who have gone to school.

Financial history is characterized by the banking crises of 2007-09 and the 2014 price shocks, which have called into perspective the significant role of monetary policy regarding financial policy matters, revealing major shortcomings in markets' regulation and supervision (Musah et al., 2022; Sare et al., 2022). The new era of technology has transformed the banking sector into an information and communication business. Inclusive education facilitates the launch and the growth of digital banking, interpreted by most Africans to be providing more affordable financial services than the formal financial sectors. Information and communication technology

and education have led to a rapid increase in the number of people enjoying affordable formal and informal financial services (Asongu et al., 2019). The African banking sectors have progressed in the last two decades, but financial liberalization and stabilization in these sectors have yet to indicate more affordable and accessible financial services that reach all the households in the African economy. Financial development is facilitated by foreign direct investments, infrastructural development and trade openness (Asongu et al., 2017). According to the World Bank (2021), inclusive finance has reduced the level of inequality and poverty in Africa by increasing equality of opportunities for the poor.

Considering that standard human capital theories of (Becker, 1964; Lucas 1988 Romer 1990) suggested that better educational outcomes realized through investments in education and the health sector would ameliorate the level of economic performance, is still to be determined in the financial sector, in terms of the system's stability and inclusivity. To a certain extent, higher education can impede the creative thinking that is necessary for innovation (Dutta and Sobel, 2018; Baumol, 2004). Baumol (2004) argued that the true and original creativity necessary for breakthrough innovations that could enhance the level of economic performance is disturbed by higher education. Dutta and Sobel (2018) argued that the financial sector could realize some series of developments when young entrepreneurs are created through investments in human capital and can also result in expanded job opportunities which will create an atmosphere with a high demand for banks' credit for investments and hence the growth in the banking sector's activities. Education expands the avenues by which financial resources are mobilized to efficiently allocate productive investments that generate sustainability in both the financial and the economic sectors (Nchofoung et al., 2021; Shobande and Asongu, 2021). Educational development and the growth of the financial markets are fundamental for economic activities as most transactions in the formal economy are financed through the formal financial system (Asongu et al., 2021; Tchamyou, 2019).

The secondary and primary educational enrolments are well documented in the literature to have a positive influence on macroeconomic indicators in developing economies during the initial stages of industrialization (Asongu et al., 2019; Tchamyou, 2019). Investing in human capital and extending financial access to remote areas across the African continent by ensuring infrastructural development through the help of information and communication technology could mean a large initial investment into building a bank branch to access formal financial services. Financial services provided to most poverty-hit regions are not affordable, maintaining the problem of the exclusion of millions of Africans from accessing financial services (Ibrahim

and Alagidede, 2018). In addition, financial exclusion has dropped considerably with increasing mobile money penetration, with Africa becoming one of the regions with the highest potential users of mobile money platforms provided at a much lower cost (Nguena, 2019). In European countries, there is a high diffusion of technologies as compared to the diffusion rate in Africa. The recent development of information technologies and its diffusion facilitated by education development has increased the level of financial development and inclusion in Africa (Owusu-Agyei et al., 2020). Other determinants of financial development have been highlighted in the literature. Owusu-Agyei et al. (2020) employed institutional factors, economic freedom and human capital development as the main determinants of financial development. Similarly, Majeed et al. (2021) argued that trade openness and foreign direct investments are determinants of financial development. Also, Voghouei et al. (2011) employed legal tradition, institutions and political economy as key drivers of financial development, and Asongu et al. (2017) employed internet, trade and GDP as determining factors of financial development. These studies did not employ education as a determinant of financial development.

The study focuses on Africa since it is considered the continent with the highest percentage of individuals who do not have access to financial services as compared to other regions of the World (Owusu-Agyei et al., 2020). The study also aimed to investigate whether the high level of exclusive finance is caused by low education attainments or enrolments. The study also considers the less competition in the African financial market, whose market power has been very high as compared to other regions whose rapid technological diffusion has improved efficiency and financial independence than the African financial sector (Ahmed, 2016; Asongu et al., 2017). Are issues specific to the region? It should be said that most of the financial markets in the African region remain less competitive, small and fragmented. The study explores the measures of inclusive education at both the lower and the higher levels of educational enrolment ranging from primary to tertiary enrolments at gender parity indexes. The extant literature justified inclusive education to include enrolment in education accounting for gender and age differences in demographic structures (Asongu et al., 2019 and 2021). The level of financial inclusion is studied inclusively by examining the depth, size, the banking system's efficiency and the growth in the banking sector's activities. The African financial sector has expanded rapidly in the last 10 years despite starting from a small base (Ahmed, 2016; Shinohara, 2013). The African economy had shown signs of economic recovery after the 2007-2009 financial crisis and the 2014 price shocks with strong investment flows and enhanced productivity. It is documented by Shinohara (2013) that further developments in

financial markets can help meet the objective of economic and financial sustainability with better access to a deeper pool of affordable funding for productive investments.

The contributions of the study to the field of research are threefold: Firstly, to the best of our knowledge, no study has been conducted examining the effect of inclusive education on financial development accounting for demographic characteristics of gender differences. This aspect is important in the African context, given that the level of inclusion has been far from being applauded, with a higher rate of female child school dropped-out. Secondly, the study assesses the effect of the primary, secondary and tertiary educational enrolments at the gender parity index on different aspects of financial development, which are: financial system efficiency, the financial sector's depth, growth in banking activities and the size of the banking sector. All these identified dimensions of financial development justify how financial development is inclusively studied in this research work. Thirdly, the study went further to compute a component score indicator that accounts for efficiency, bank size, depth and growth in activities which is not seen in the existing literature on education and financial development. This component score makes it possible to account for and integrate different specific features of financial development.

The rest of the paper is organized with a review of literature on education and financial development in section 2, which is presented after the introduction section; the data, justification of the variables and the methodology adopted in the study are further exposed in section 3, in section 4, we present and discusses the findings of the study, comparing with the extant literature and in section, we conclude with the policy implications and further research directives.

1. Literature review

1.1. Theoretical and empirical review

The literature on the effect of inclusive education or education development on financial development is very rare. No study has been found exactly investigating the effect of inclusive education on financial development. Studies closely related to this study are all conducted on human capital and entrepreneurship or the determinants of financial development. The few related studies found on the topic are inconclusive and will be reviewed in this section of the study. The first strand of literature reviews studies conducted on human capital and financial development. In the second extant, the study highlights past works conducted on the determinants of financial development and how their findings differ from each other.

Among the studies conducted on human capital and financial development are those of Dutta and Sobel (2018), who investigated the human capital-financial entrepreneurship relationship and attempted to clarify the mixed findings in extant literature. The authors found that a rise in the level of tertiary enrollment benefits financial enterprises when the level of financial development is low. The results of the authors, though not establish a direct link between education and financial development but show that the effect of tertiary enrollment on financial entrepreneurs remained positive at higher levels of financial development measured by bank assets, deposits, liquidity and private credits. Similarly, Ahmad et al. (2020) investigated the effect of human capital and financial development on ecological footprints. His findings unveiled that human capital and institutional quality reduce ecological footprints and further reveal that financial development fosters environmental sustainability through the channel of human capital. The author establishes a linear direction movement between human capital and financial development. Also, Satrovic (2017) investigated the impact of human capital on financial development in Turkey from 1986 to 2015. The author conducted his investigations in the long run and short-run using the autoregressive approach, employing broad money and liquid liabilities as indicators of financial development. They obtained results indicating a significant positive effect of human capital on broad money and liquid liabilities in both the short and the long run. Hakeem and Oluitan (2012) conducted a study investigating the effect of human capital on financial development in South Africa from the period of 1965 to 2005. The author employed M2 and liquid liabilities as financial indicators and obtained results suggesting two directions of causality from human capital to financial development with a reverse causality from financial development to human capital. The findings further reveal that liquid liabilities as a financial indicator suggest a one-way directional causality from human capital to financial development in South Africa. Similarly, Zaidi et al. (2019) examine the effect of human capital on financial development by controlling the effect of economic performance in the Organization of Economic Cooperation and Development (OECD) countries from 1990 to 2016. The findings of the authors reveal a positive and significant impact of human capital on financial development. Among other authors whose findings confirmed a positive effect of human capital on the level of financial development are Kargbo et al. (2016), Nik et al. (2013) and Sethi et al. (2019), who indicated that the financial sector performance and human capital development have a positive relation.

Another strand of literature that accounts for the determinants of financial development apart from human capital is assessed. Ibrahim and Sare (2018) examine the determinants of financial

sector development in 46 African countries spanning from 1980 to 2015. The authors examined whether the interaction between trade openness and human capital could influence financial development. The findings of the authors show that while human capital robustly influences financial development, trade openness robustly matters more for private credit than other measures of financial development. The results further reveal that the interactive terms of trade openness and human capital significantly influence the level of financial development and also that human capital has a positive impact on private domestic credit. Similarly, Owusu-Agyei et al. (2020) investigated how human capital development and economic freedom influenced the effect of ICT on financial development in 42 African countries from the period 2000 to 2016. The authors revealed that there is a positive impact of ICT on different measures of financial development. The findings reveal that the effect of ICT on financial development is influenced by the differences in the levels of human capital development and economic freedom. Also, Philippon and Reshef (2007) investigated the effect of technology and human capital on financial development in the American banking sector and found that technological and financial innovations both played a role in this transformation of the financial sector facilitated by human capital. He argued that due to the increase in human capital accumulation, there was a shift away from low-skill jobs towards market-oriented activities within the sector with an increase in relative wages. Asongu et al. (2017) examined the effect of ICT-driven information on conditional financial development in 53 African countries from 2004 to 2011. The author employed credit, deposits, money supply and liquid liability as indicators of financial development. The results of the authors indicated that there are positive effects of ICT-driven information sharing on financial development in Africa. Other authors who have also employed ICT as an indicator of financial development include Edo et al. (2019), Salahuddin and Gow (2016) and Park et al. (2018). Asamoah (2021), on his part, conducted a study on the determinants of financial development and also examined the brinks of financial development at which foreign direct investment enhances economic growth. The findings show that growth is enhanced by the interaction between financial development and foreign direct investments. Among others, Majeed et al. (2021), Asamoah (2021), and Asongu et al. (2017) considered trade and foreign direct investments as determinants of financial development.

The literature is focused mostly on human capital, and no study has been found on inclusive education and financial development, nor health and financial development. Studies have only focused on examining the effects of human capital on financial development without examining the different dimensions of financial development, except in the works of Asongu et al. (2017),

where different aspects of financial development, such as the depth of the financial sector, the banking size, the financial system's efficiency and growth in banking activities are examined. Contrary to what is applied in the works of Asongu et al. (2019) and this work, authors such as Hakeem and Oluitan (2012), Ahmad et al. (2020), Edo et al. (2019), Salahuddin and Gow (2016) and Park et al. (2018). Asamoah (2021) has not examined all these dimensions of financial development. The study filled the gap, considering that no work has been conducted on inclusive education and inclusive financial development, which accounts for different development indicators in the financial sector.

2. Methodology

The study adopts as an estimation strategy the Two-Step System Generalised Method of Moments which is an empirical strategy based on Roodman (2009a, 2009b) and an extension of the Arellano and Bover (1995), and Blundell and Bond (1998). The two-step system GMM is a robust standard error corrected strategy for finite samples which addresses issues related to the error term (Windmeijer, 2005). The following four arguments are put forward for the justification of the GMM strategy: Firstly, the study adopts a panel data analysis for 19 years and 50 individuals which can be analyzed by the GMM method, given that it is more efficient than other strategies in dynamic panel settings and it accounts for cross-country variation as they are inherent in panel analyses. Secondly, the number of cross-sections (50) is greater than the number of time series in the study's panel (19) and it is considered a baseline requirement for the implementation of the GMM. Thirdly, the correlation between the inclusive financial development indicators and their first lags is greater than 0.800, considered the threshold or rule of thumb for the essential establishment of the variables' persistence (Nchofoung et al., 2022). Fourthly, the technique is also robust as it accounts for endogeneity by controlling simultaneity through an instrumentation process and also accounts for time-invariant omitted variables. Also, the GMM technique controls for cross-sectional dependence which if not addressed, will expose the estimated model to misspecification (Tchamyou, 2019; Baltagi et al., 2014). The variables employed in the study are presented in equation 1. Equation 1 presents the control variables with the main variables of interests in their respective acronyms

$$IFD_{it} = \alpha_0 + \alpha_1 IE_{it} + \alpha_2 Trade_{it} + \alpha_3 FDI_{it} + \alpha_4 INF_{it} + \alpha_5 GDP_{it} + \alpha_6 AIDI_{it} + \varepsilon_{it} \quad .. \quad (1)$$

Where i and t represent individual cross sections and time series respectively, IFD signifies inclusive financial development, IE stands for inclusive education captured by the gender parity school enrolments. Trade represents trade in services, FDI signifies foreign direct investments,

INF stands for the rate of inflation, GDP and represent gross domestic product and AIDI is a composite indicator of the African infrastructural development indicator the error term represented by ε.

The system GMM technique adopted in the study can be summarised with the equation in levels as follows.

$$\boldsymbol{IFD_{it} = \alpha_0 + \alpha_1 IFD_{i(t-\tau)} + \alpha_2 IE_{it} \sum_{h=1}^{k} \delta_h \, Z_{h\,i(t-\tau)} + \eta_i + \gamma_t + \varepsilon_{it}} \quad \ldots\ldots\ldots \quad \textbf{(2)}$$

The model can be summarised with the equation in first difference as follows

$$\boldsymbol{IFD_{it} - IFD_{i(t-\tau)} = \alpha_1 (IFD_{i(t-\tau)} - IFD_{i(t-2\tau)}) + \alpha_2 (IE_{it} - \alpha_2 IE_{i(t-\tau)} +}$$

$$\boldsymbol{\sum_{h=1}^{k} \delta_h \, (Z_{h\,i(t-\tau)} + Z_{h\,i(t-2\tau)}) + (\gamma_t - \gamma_{(t-\tau)}) + (\varepsilon_{it} - \varepsilon_{i(t-\tau)})} \quad \ldots\ldots\ldots \quad \textbf{(3)}$$

Z represents a vector of control variables. $\boldsymbol{\eta i}$ is the country specific effect, $\boldsymbol{\gamma t}$ is the time-specific constant, $\boldsymbol{\tau}$ is the lagging coefficient and $\boldsymbol{\varepsilon it}$ is the error term. We employed the Hansen statistics to test to restrict over identification and limit the proliferation of instruments. All the determinants of financial developments (explanatory variables) are suspected of endogeneity, following both the contemporary and the non-contemporary literature on GMM strategy (Nchofoung et al., 2022). As such, we employ these variables as instruments while applying lags in the second stage of the GMM instrumentation process to deal with simultaneity bias. We adopt the two-step instead of the one-step procedure to address the problem of heteroscedasticity instead of the on step GMM which is not robust to heteroscedasticy issues (Kouladoum et al., 2022).

The study assesses the effect of inclusive education on inclusive financial development which suffices to derivate equation 3 of inclusive financial development with respect to inclusive education to obtain the estimated effect of IE on IFD in Africa.

The derivation of equation 3 will results to $\boldsymbol{\frac{\partial IFD_{it}}{\partial IE_{it}} = \alpha_1}$ **... (4)**

The coefficient $\boldsymbol{\alpha_1}$ represents the value at which inclusive financial development will vary if there is a 1% change in inclusive education. The respective coefficients of $\boldsymbol{\alpha}$ in different equations present the results on the effects of primary, secondary and the tertiary enrolments on financial development indicators.

2.1. Data

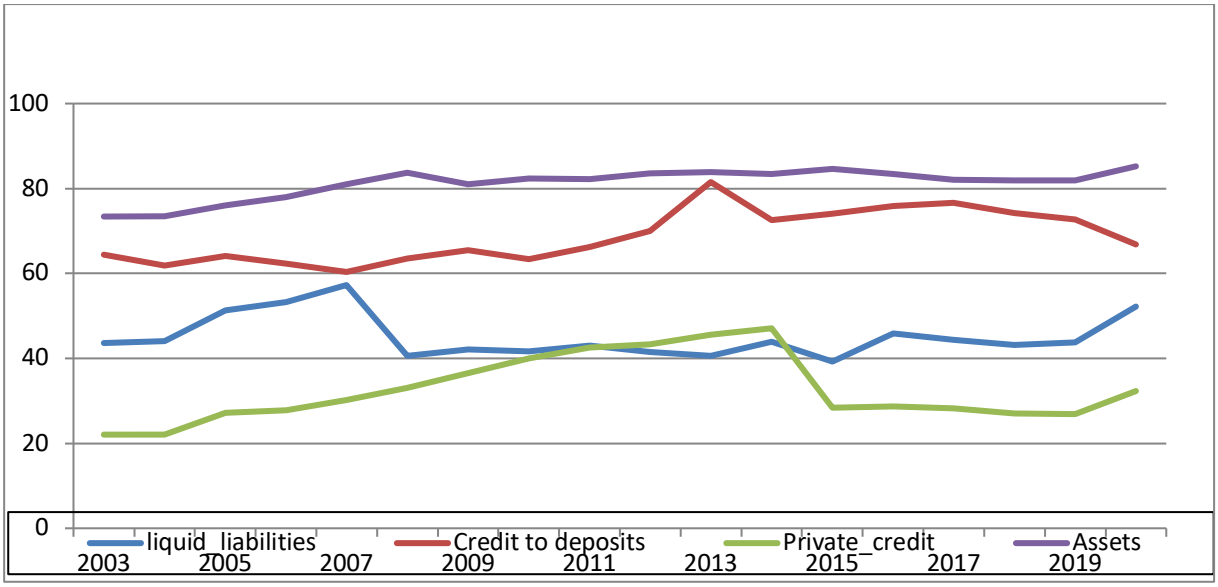
The study employed secondary data on [1]50 African countries from 2003 to 2020. The sample size adopted, the number of countries selected and the time period of the study's investigation are constrained by limited data on the outcome variable. The secondary data employed in our study is obtained from the following sources. (1) The World Development Indicators where the data on inclusive education and the control variables were obtained. (ii) Banks' credit, deposits, banks' liabilities and banks' assets were obtained from the Financial Development Indicators of the World Bank (iii) and the level of infrastructural development in Africa was obtained from the African Development Banks.

2.2. Dependent variable

The dependent variable of the study is financial development. Financial development is measured inclusively to account for different aspects of development in the financial sector. Financial developments measure the financial depth, financial system's efficiency, bank size, and growth in banking activities (Ahmad et al., 2021). The banking system's depth is measured by liquid liabilities which, financial assets indicate the size of the financial system, credit to deposit ratio measures financial efficiency and, growth in banking activities indicated by private credit from financial institutions. The study employs all these four dimensions to assess financial development inclusively. The study also employed a component score from a principal component analysis (PCA). The component score is measured as a component score that encompasses depth, size, efficiency and growth in banking activities. The study draws its inspirations to employ these indicators from the works of Asongu et al. (2017), Tchamyou (2019), Ahmad et al. (2021) and Ahmad et al. (2022). The trends of these variables are presented in figure 1.

[1] Algeria, Angola, Burkina Faso, Benin, Burundi, Gabon, Comoros, Chad, Congo, Dem. Rep. Guinea-Bissau, Djibouti, Central African Republic Sao Tome and Principe, South Africa, , Tanzania (United Republic of), Niger, Uganda, Guinea, Tunisia, Mauritania, Rwanda, Senegal, Eritrea, Kenya, Ethiopia, Namibia Sierra Leone, Equatorial Guinea, Mauritius, Congo, Rep., Egypt, Malawi, , Zambia, Libya, Botswana, Liberia, Cabo Verde, Cameroon, Mali, Morocco, Ghana, Zimbabwe, Lesotho, Nigeria, Madagascar, Côte d'Ivoire, Togo, Seychelles and Mozambique.

Figure N°1: The trends in financial development indicators



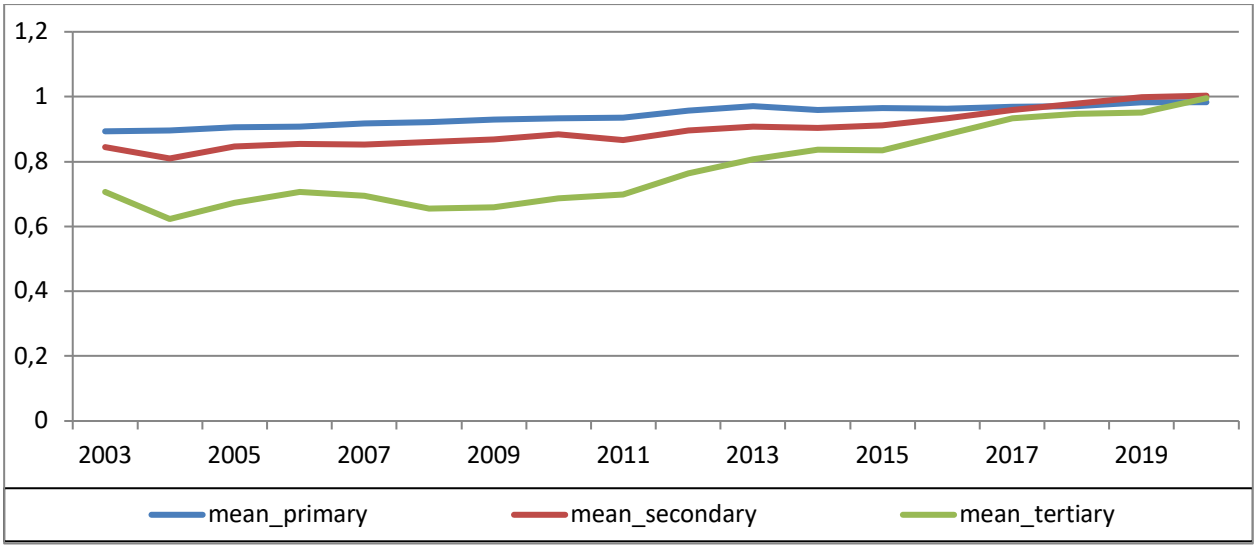
Source : authors based on data

Figure presents the evolution of the indicators of inclusive financial development. Financial depth indicated by liquid liabilities increased from 44.06 in 2003 to 52.22739 in 2020. Financial efficiency indicated by the ratio of banks credit to deposit increases from 64.40 in 2003 to 66.90 in 2020. The African financial system also registered some growth in banking size indicated by an increasing asset between 2003 (73.39) and 2020 (85.22). The African banking sectors also realized a growth in their banking activities indicated by an increase of domestic private credit from 22.05 in 2003 to 32.27 in 2020. Figure 2 shows an increasing trend in all financial development indicators from 2003 to 2020. In 2014, all these indicators except assets have a decreasing trend which is highly attributed to the 2014 economic recessions caused by commodity price shocks.

Independent variable of interest

The study assesses the effect of inclusive education on financial development in Africa. The independent variable of interest is inclusive education measured by primary, secondary and tertiary enrolments at the gender parity index. Education enrolment is considered inclusive when measured as a gender parity index (Asongu et al., 2019 and 2021). The gender parity index measures the relative access to education by males and females and not the inequality in accessing education (Moriña, 2017). The choice of primary, secondary and tertiary enrolment is inspired by studies conducted on inclusive education especially the works of Asongu et al. (2019, 2020 and 2021), Pather (2019), and Tchamyou (2018) and Engelbrecht (2020). Figure 2 presents the evolution of inclusive education indicators from 2003 to 2020.

Figure N°2: The trends in inclusive education indicators



Source: authors based on data

Figure 2 presents the trends in inclusive education between 2003 and 2020. The figure shows increasing trends of all indicators of inclusive education. The figure shows that the primary enrolments increase form 0.893 in 2003 to 0.95 in 2020, the secondary enrolment increases from 0.845 in 2003 to 1.003167 in 2020, and the tertiary enrolment increases from 0.707205 in 2003 to 0.995346 in 2020. The figure shows that primary education has the highest enrolments followed by the secondary education with least enrolments in the tertiary sector. The African economies have invested more in the knowledge economy which explains why the number of enrolments has increased in recent years.

Control variables

The control variables are chosen based on extant literature on the determinants of financial development. These indicators selected to test their effect on the level of financial development are foreign direct investments, which according to Majeed et al. (2021), foreign direct investments are expected to have a positive effect on the level of financial development due to their facilitation of the capital flows between different currencies. Also, we employed trade openness as a determinant of financial development as employed in the works of Khan et al. (2020) and Majeed et al. (2021). Trade openness provides an opportunity for the enhancement of financial development if the national currency is used in international trade, which is expected to have a positive influence on the level of financial development indicators (Asongu et al., 2017; Khan et al., 2020 and Majeed et al., 2021). The rate of inflation also influences the level of financial development (Asongu et al., 2017; Majeed et al., 2021; and Farouq and Sulong, 2020). To attain sustained development, countries need enough access to credit through

effective savings mobilization and borrowings from external economies to build their financial and economic sectors. Though, excessive levels of external debt can hamper economies' ability to invest in their financial and economic future plans since the limited revenue generated from the credit borrowed goes to loan servicing. The employment of external debt as a determinant of financial development is inspired by the works of Agyapong and Bedjabeng (2019) and Hauner (2009). Infrastructural development is measured by ICT, electricity, transport infrastructures and environmental infrastructures. Asongu et al. (2017) employed ICT captured through mobile cellular subscriptions as an indicator of financial development. The present study employed the African infrastructural development index that encompasses ICT, electricity, transport and environmental infrastructures. The table 1 presents descriptive statistics.

Table N°1 : Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Liquid liabilities	809	3.462	.741	1.234	6.791
Credit to deposit	801	4.133	.455	2.637	6.336
Assets	816	3.167	.943	-.115	6.71
Private credit	818	2.828	.96	-.716	6.894
Findev	770	0.01	1.05	-1.141	5.32
Primary	669	.939	.086	.629	1.151
Secondary	493	.888	.202	.323	1.388
Tertiary	463	.769	.354	.064	1.711
Trade	773	74.528	39.635	20.722	347.997
FDI	724	1.201	6.439	-10.5	75.999
Inflation	823	7.304	22.203	-8.975	557.202
external debt stocks	802	48.65	51.01	2.551	610.452
AIDI	882	21.796	19.158	.369	96.732

Source : authors based on data

3. Results and discussion

Section 3 presents and discusses the findings of the study. The results are presented in 5 tables representing different aspects of financial development. The different aspects of financial development accounted for in the study are what make it to be inclusive. Table 2 presents the results of the effect of inclusive education on financial system activity in Africa. Table 3 measures the effect of inclusive education on the financial system's efficiency. Table 4

estimates the effect of inclusive education on a bank's size indicated by banks' assets. Similarly, Table 5 still measures the effect of inclusive finance on financial development but the aspect of financial depth is measured by liquid liabilities as in extant literature (Asongu et al. 2017 Tchamyou, 2019). Table 6 presents the results of the robustness checks with a composite indicator of inclusive financial development.

Table 2: Inclusive education and financial system's activity in Africa

	(1)	(2)	(3)
VARIABLES	Private credit/GDP	Private credit/GDP	Private credit/GDP
L. private credit	0.926***	0.925***	0.902***
	(0.00803)	(0.0142)	(0.00945)
Primary	-0.0434		
	(0.113)		
Secondary		0.174**	
		(0.0674)	
Tertiary			0.124***
			(0.0285)
Trade	0.000446**	0.000759***	0.000295
	(0.000208)	(0.000236)	(0.000231)
FDI	0.00123	0.0207***	-0.00462
	(0.00148)	(0.00387)	(0.00581)
Inflation	-0.000160***	-0.00161	-0.00272***
	(3.45e-05)	(0.00135)	(0.000918)
External debt	0.00384	0.0120	0.00182
	(0.00536)	(0.00717)	(0.00665)
AIDI	0.000455	-0.000841**	-0.000607
	(0.000368)	(0.000308)	(0.000392)
Constant	0.235**	0.0256	0.238***
	(0.0970)	(0.0711)	(0.0301)
Observations	278	173	219
Number of id	34	27	30
Prop>AR1	0.140	0.203	0.00676
Prop>AR2	0.981	0.943	0.506
Instruments	22	22	22
Prop>hansen	0.220	0.249	0.567

Source : authors based on data

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2 presents the results of the effect of inclusive education on financial development measured by private credit from financial institutions. Private credit from financial institutions measures the development of financial activities. The results show that the effect of inclusive

education on the development of banking activities depends on the measure of inclusive education. Primary education has an insignificant effect on the development of banking activities and private credit by deposit banks. Secondary enrolment has a positive significant effect on private credit. It shows that secondary education increases the level of financial development in Africa. The findings also indicate that tertiary education has a significant positive effect on financial development. The results confirmed that financial development measured by private credit from banks is enhanced by inclusive education in Africa.

Table 3: Inclusive education and banking system efficiency in Africa

	(1)	(2)	(3)
VARIABLES	Credit/Deposit	Credit/Deposit	Credit/Deposit
L.credit/deposit	0.936***	0.936***	0.922***
	(0.00967)	(0.0127)	(0.00896)
Primary	-0.102		
	(0.113)		
Secondary		0.0944*	
		(0.0478)	
Tertiary			0.104***
			(0.0177)
Trade	0.000411*	0.000337	0.000498*
	(0.000240)	(0.000279)	(0.000289)
FDI	0.00281*	0.0160**	-0.000505
	(0.00143)	(0.00611)	(0.000964)
Inflation	-0.000156***	0.00148	0.000209
	(4.89e-05)	(0.00109)	(0.000892)
External debt	8.90e-05	0.000620***	8.47e-05
	(0.000199)	(0.000217)	(0.000278)
AIDI	0.000580	-0.000537**	-0.000628**
	(0.000366)	(0.000203)	(0.000295)
Constant	0.272***	0.0978	0.165***
	(0.0907)	(0.0642)	(0.0350)
Observations	278	182	208
Number of countries	34	27	29
Prop>AR1	0.148	0.212	0.00344
Prop>AR2	0.631	0.603	0.491
Instruments	22	22	22
Prop>hansen	0.181	0.603	0.119

Source : authors based on data

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3 reports the effect of inclusive education on the banking system efficiency measured by the ratio of banks' credit to banks' deposits. Financial system efficiency is a dimension of financial development which appears to be enhanced by inclusive education. Secondary enrolment has a significant positive effect on banks' credit to bank deposits which signify that secondary enrolment enhances banking efficiency in Africa. Tertiary enrolment has a positive significant effect on the banking system efficiency in Africa. It, therefore, signifies that financial development in Africa is enhanced by inclusive education.

Table 4: Inclusive education and financial Size

	(1)	(2)	(3)
VARIABLES	Assets/GDP	Assets/GDP	Assets/GDP
L. size	0.930***	0.934***	0.920***
	(0.00825)	(0.0115)	(0.00715)
Primary	0.00961		
	(0.0886)		
Secondary		0.0987***	
		(0.0298)	
Tertiary			0.115***
			(0.0190)
Trade	0.000263	0.000191	-0.000171
	(0.000190)	(0.000249)	(0.000175)
FDI	0.00168	0.0168***	-0.00163
	(0.00222)	(0.00434)	(0.00171)
Inflation	0.000364***	-0.00129	-0.00223*
	(5.87e-05)	(0.000917)	(0.00118)
External debt	-5.31e-06	0.000118	5.55e-05
	(0.000113)	(0.000212)	(0.000215)
AIDI	0.00106***	0.000318	-0.000174
	(0.000264)	(0.000197)	(0.000251)
Constant	0.215***	0.152***	0.247***
	(0.0745)	(0.0472)	(0.0243)
Observations	305	195	234
Number of id	34	28	30
Prop>AR1	0.139	0.246	0.0873
Prop>AR2	0.267	0.537	0.295
Instruments	22	22	22
Prop>Hansen	0.198	0.481	0.255

Source : authors based on data

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4 presents the effect of inclusive education on financial development measured by the size of the financial system. Financial development measured by banks' assets shows that it is positively influenced by inclusive education. Secondary and tertiary education have significant positive impacts on financial development in Africa. The results further reveal that inclusive education increases the size of the African banking sector. Similarly,

Table 5: Inclusive education and Financial System Depth

	(1)	(2)	(3)
VARIABLES	Liquid liabilities/GDP	Liquid liabilities/GDP	Liquid liabilities/GDP
L.Liquid liabilities	0.940***	0.926***	0.933***
	(0.00743)	(0.00822)	(0.00933)
Primary	-0.1000		
	(0.0681)		
Secondary		0.117*	
		(0.0593)	
Tertiary			0.0967***
			(0.0206)
Trade	0.000482***	0.000682***	0.000197
	(0.000151)	(0.000211)	(0.000196)
FDI	-0.00168**	-0.000210	-0.00303
	(0.000616)	(0.00231)	(0.00279)
Inflation	0.000399***	-0.00106	-0.00125
	(3.37e-05)	(0.000780)	(0.000841)
External debt	-0.00238	-0.00748	-0.0108
	(0.00648)	(0.00726)	(0.00710)
AIDI	0.000603**	0.000150	-0.000281
	(0.000229)	(0.000248)	(0.000281)
Constant	0.287***	0.158**	0.225***
	(0.0620)	(0.0724)	(0.0398)
Observations	308	185	233
Number of id	34	27	30
Prop>AR1	0.117	0.169	0.0165
Prop>AR2	0.761	0.899	0.954
Instruments	22	22	22
Prop>hansen	0.168	0.491	0.194

Source : authors based on data

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5 presents the results on the effect of inclusive education on liquid liabilities in Africa. Liquid liability is a financial depth and a financial stability indicator, which are all indicators of financial development. Table 5 shows that the secondary and tertiary enrolments enhanced

the level of financial development in Africa. The findings of the study are supported by the findings of Dutta and Sobel (2018), which reveal that human capital enhances the level of financial development and entrepreneurship's profit. The results are also supported by the findings of Ahmad et al. (2020), Satrovic (2017), Dutta and Sobel (2018), and Hakeem and Oluitan (2012), whose results reveal that human capital enhances the level of financial development. Though these studies are based on human capital and since education is an indicator of human capital, we employed these studies to support the findings of our study since no study has been found on inclusive education and financial development.

Other determinants that could influence the level of financial development have been discussed. The level of infrastructural development measured by a composite indicator that encompasses ICT, transport infrastructures, electricity and environmental development shows a positive significant effect on inclusive financial development in Africa which is supported by the findings of Asongu et al. (2017) who demonstrated that ICT significantly enhances financial development in African countries. The findings reveal that external debt has a significant positive relationship with financial development in African economies. This positive effect is registered in the ratio of bank credit to bank deposit which measures financial efficiency. The positive effect of external debt, therefore, signifies an increase in the African financial system's efficiency which is in line with the findings of Agyapong and Bedjabeng (2019). Foreign direct investment enhances the size and depth of the banking sector, the system's financial efficiency and growth in banking activities, supported by the findings of Khan et al. (2020) and Majeed et al. (2021). The level of inflation has a negative influence on the financial activities and growth in banking activities but remains inconclusive on how it affects the system's efficiency because of its varied signs in both equations. The negative effect of inflation on financial development conforms to the findings of Asongu et al. (2017). Trade openness has a significant positive effect on financial efficiency and bank activity and conforms to the findings of Majeed et al. (2021). These control variables show that though educational development enhances inclusive financial development, other factors such as infrastructural development, foreign direct investments and trade openness affect the level of financial development in Africa.

3.1. Robustness checks

To test the robustness of our findings, we computed a component score that encompasses the four indicators of financial development employed in the literature. The robustness analysis is done by adopting the two-step GMM technique to see if the effect of inclusive education on

financial development in Africa will change if a component score is employed. The results of the robustness checks are presented in table 6 with the PCA index being normally distributed.

Table 6: Inclusive education and inclusive financial development

	(1)	(2)	(3)
VARIABLES	Findev	Findev	Findev
L.Findev	0.953***	0.903***	0.910***
	(0.00387)	(0.00227)	(0.00828)
Primary	0.00802		
	(0.103)		
Secondary		0.294***	
		(0.0420)	
Tertiary			0.205***
			(0.0305)
Trade	0.000260	0.00102**	-0.000154
	(0.000216)	(0.000442)	(0.000573)
FDI	-0.000597	0.00265	0.000413
	(0.00100)	(0.00261)	(0.00108)
Inflation	0.000259***	-0.00334***	-0.00153
	(4.42e-05)	(0.000941)	(0.00111)
External debt	0.00101***	0.000737	0.00235***
	(0.000301)	(0.000476)	(0.000481)
AIDI	0.000196	-0.000740***	-0.00122***
	(0.000178)	(0.000161)	(0.000250)
Constant	-0.0395	-0.298***	-0.154**
	(0.105)	(0.0356)	(0.0671)
	304	184	219
Observations	34	26	30
Number of id	0.286	0.295	0.0979
Prop>AR1	0.124	0.247	0.270
Prop>AR2	22	22	22
Instruments	0.237	0.356	0.491

Source : authors based on data

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6 presents the results of the robustness analysis. The robustness analysis considered a component score of inclusive financial development indicators, which encompasses banks' assets, liquid liabilities, banks' deposits and private credit from financial institutions. The results indicate that inclusive education significantly influences financial development in Africa. The robustness checks show that the level of financial development is enhanced by secondary and tertiary education. The results of the robustness checks confirm the consistency

of the findings with the results obtained in previous analyses accounting for different aspects of financial development, which are banking system efficiency, the financial depth of the banking sector, the size of the banking sector and the growth in the activities of the financial sector. The findings of the robustness analysis show that financial development in Africa is enhanced by the level of inclusive education enrolment.

Conclusion and policy recommendations

The study assessed the effect of inclusive education on financial development in 50 African countries from 2003 to 2020. The study adopted the two-steps generalized method of moment strategy for its analysis since the data was structured in a panel form. The study employed the primary, secondary, and tertiary enrolments in gender parity indexes as indicators of financial development. The study adopts four indicators of financial development with its composite indicator. We employ the ratio of liquid liabilities as a financial development indicator of the depth of the African financial markets, banks' assets as an indicator of the size of the financial system, bank credit as a system's efficiency indicator and private credits issued by banks as a bank activity that determines the growth of the financial sector. All these indicators have been employed to determine the influence of inclusive education on different aspects of financial development. The results indicate that the secondary and tertiary enrolments enhance the financial resources provided to the private sector by domestic banks, saving deposits at domestic deposit banks, the total demand for financial services and the supply of money in the region. The findings of the study further reveal that inclusive education enhances the efficiency, the depth of the banking sector and the growth of the African financial sectors. The results reveal that financial development is highly influenced by secondary and tertiary enrolments. The findings of the robustness analysis with a component financial development indicator conform to the findings of the study, affirming that the level of financial development is enhanced by inclusive education in Africa. The findings of the study also show that external debt and infrastructural development enhance the level of financial development in Africa.

The study recommends policymakers invest more in the knowledge economy since it appears to enhance the level of economic development. Inclusive education in Africa proved to be enhancing the financial system depth indicated by bank deposits, financial efficiency depicted by banks' credit, financial system's size measured by assets and the growth in the sector's activities indicated by credit as well as an increase in the rate of financial inclusion through advancements in technology and the introduction of e-banking all facilitated by investments in human capital. The study recommends investments in infrastructural development which

influence financial development positively, such as in the aspects of information centers, transport and electricity infrastructures. The study only applied four indicators of financial development which is not sufficient since all the dimensions of financial development are not well exploited. This caveat can be addressed by future research to investigate the effect of inclusive education on the financial system development of different banking sectors with other financial development indicators such as banking competition and money supply that encompasses M1, M2 and M3. The study should also be conducted in individual African countries to test whether the established findings withstand empirical scrutiny from country-specific perspectives.

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