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Leaving No One Behind: Examining the effect of financial, gender, and digital inclusion on sustainable development

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Abstract

This paper analyzes the effects of different dimensions of inclusion toward the attainment of sustainable development in 33 sub-Saharan African (SSA) countries from the financial, gender, and technological perspectives between 2004 and 2021. This study employs the System Generalized Method of Moments given its ability to address potential endogeneity issues, capture the dynamic nature of relationships, and mitigate potential biases while adopting the Driscoll–Kraay standard errors for robustness check. Findings reveal two of the three measures of financial inclusion wield positive and significant effects on sustainable development while credit to the private sector is found to be detrimental. Also, all three measures of gender inclusion (female employment to population, female labor force participation rate, and the number of women holding a seat in parliament) positively influence sustainable development. Contrastingly, the coefficients of digital inclusion (mobile phone subscription and internet usage) were revealed to be harmful to sustainable development in SSA. This paper advocates for increased financial inclusion through financial literacy, customized financial products, and gender-sensitive financial services. Pertinent are gender policies that address gender norms in addition to the enactment, avowed commitment, and support for affirmative action toward closing gender gaps across all sectors and at all levels.

KEYWORDS
digital inclusion, financial inclusion, gender inclusion, sub-Sahara Africa, sustainable development

1 | INTRODUCTION

Operating on the principle of "Leave No One Behind", the critical role of inclusion cannot be downplayed in sustainable development. This principle embodies a commitment to reduce various forms of marginalization and exclusion that manifest in discrimination and inequalities in access to services, resources, and opportunities (UN, 2024). This is embedded in numerous goals of the Sustainable Development Goals (SDGs) and especially pronounced in SDG 3 on universal health; SDG 4 on inclusive and equitable quality education; SDG 5 on gender equality and empowerment for all women and girls; SDG 8 on inclusive and sustainable economic growth; SDG 9 on inclusive and sustainable industrialization; SDG 10 on reduced inequalities within and among countries; SDG 11 on inclusive and safe human settlements; and SDG 16 on peaceful and inclusive societies, accountable, and inclusive institutions and access to justice for all (IAEG-SDG, 2016). Inclusion has therefore been a subject of keen interest among different circles of policymakers, researchers, and development practitioners, particularly where sustainable development is concerned.

At the front burner of inclusion is financial inclusion that allows low-income individuals and households to acquire assets, smoothen

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consumption, absorb financial shocks, and invest in their health and education (Abdulkareem, 2023; Cavoli & Gopalan, 2023; Mattern, 2022). It also makes it possible for them to engage in investment and income-generating activities (Kuada, 2019). Studies such as Dahiya and Kumar (2020) and Erlando et al. (2020) suggest that financial inclusion propels economic growth through reduced inequalities, increased capital, and enhanced productivity. Thus, financial inclusion becomes fundamental to the sustainable development of any economy. Its impact on sustainable development can be direct, for example, on poverty (SDG 1), hunger (SDG 2), gender equality (SDG 5), decent work and economic growth (SDG 8), and industry, innovation and infrastructure (SDG 9); or indirect, for example, on good health and well-being (SDG 3), quality education (SDG 4), clean water and sanitation (SDG 6), and reduced inequalities (SDG 10).

In contrast, Qin et al. (2021) and Zaidi et al. (2021) established that financial inclusion degrades the environment by increasing carbon dioxide emissions from the expansion of medium-scale industries. This will harm the environmental goals of the SDGs such as SDGs 11 and 13 on sustainable cities and climate action, which implies that financial inclusion can be both a benefit and a blight in sustainable economic growth. Consequently, the varying effects of financial inclusion will depend on the level of a nation's financial development (Oanh et al., 2023) with financial stability being a crucial factor (Dinh et al., 2024).

Gender is another important dimension of inclusion in sustainable development. Aside from having an entire goal, SDG 5, dedicated to gender equality and women empowerment, gender is embedded in the targets and indicators of 10 other goals—SDGs 1, 2, 3, 4, 6, 8, 11, 13, 16, and 17 (UN, 2016). Yet, the 2023 gender snapshot reveals that 54% of the countries in the world do not have laws in basic areas of gender equality (SDG 5), progress has ceased on maternal mortality (SDG 3) since 2015, 380 million women and girls suffer from "water stress" (SDG 6) while women, girls, and children bear a disproportionate burden of poverty and food insecurity (SDGs 1 and 2) (UN Women & UNDESA, 2023). Furthermore, 614 million women and girls live in conflict-ridden areas in 2022, with female investors in international patents accounting for 17% in 2022 compared with their male counterparts, which was 83%. More so, women are twice more likely than men to be discriminated against (SDG 10) with only 61.4% of eligible women found in the labor force when compared to 90.6% of working men (UN Women & UNDESA, 2023). Women therefore encounter gender inequalities across various domains—economic participation, health care, education, and societal norms (Davis & Braunmiller, 2024). Should these trends continue, there will be dire consequences for sustainable development since gender is a crucial factor common to most global goals and achieving the SDGs will be elusive without it.

In terms of digital inclusion, there has been an unprecedented rise in the use of the internet with people relying heavily on digital technology for communication, consumption, work, socialization, and entertainment (OECD, 2020). The educational sector now embraces digital learning worldwide, the health sector has introduced telemedicine, companies and industries now digitalize their operations and products (McKinsey & Company, 2020), and governments have expanded their range of online services (OECD, 2020). It is on this premise that several of the SDGs have been indicated to be hinged on digital inclusion given its significance in promoting access and usage of information and communication technology (ICT) by all people irrespective of gender, age, and race (Salzmann-Erikson, 2023). In addition, Correa and Pavez (2016) have observed a digital divide between the urban and rural population in the initiatives to achieve the SDGs, particularly SDGs 3, 4, 8, 9, and 10.

ICT therefore has the potential to boost the attainment of the SDGs in several ways—by increasing the efficiency, reach and value-addition of programs, and projects for achieving goals such as universal health and quality education, job creation and innovation (Haftu, 2019), and a vehicle for bridging the gap between the haves and the haves-not since it allows the marginalized access to services such as finance (Del Gaudio et al., 2020; Owusu-Agyei et al., 2020). "Leaving no one behind also means leaving no one offline" (Deganis et al., 2021, p. 1).

Given the foregoing, this paper aimed to analyze the effects of these different dimensions of inclusion toward the attainment of sustainable development in 33 sub-Saharan African (SSA) countries from the financial, gender, and technological perspectives between 2004 and 2021. The limited focus of the mainstream literature in this area motivates this study to examine the effect of financial inclusion in the presence of other dimensions of inclusion given that financial inclusion has been found to have both a gender and digital divide (Gammage et al., 2017). Aside from the dearth of research that focuses on these dimensions of inclusion in the same contextual framework, the literature is divergent as to the nature of the relationship that exists between financial inclusion and sustainable development. This calls for more empirical studies nuanced with the current global realities and trends of inclusion as peculiar to sustainable development. Sustainable development in this study context encompasses the three fundamental dimensions of economic, social, and environmental aspects (Zhang et al., 2024) as embodied by the SDGs. This study therefore aimed to conduct a tripartite empirical analysis of financial, gender, and digital inclusion, in order to understand the interrelationships among these variables. This perspective will allow for the design and implementation of evidence-based and policy-relevant inclusive interventions.

This study focuses on SSA where several barriers financially exclude billions of people in SSA on the demand side, and market friction and inefficiencies undermine financial inclusion on the supply side (Girma & Huseynov, 2023). The region also ranks in the last three regions with the least number of account ownership and access (Chalwe-Mulenga & Coetzee, 2022). This has reportedly caused the poor, women, and youth to be disadvantaged and contributed to decreased productivity. The World Bank shows that 49% of the adult population in SSA was financially included in 2022 in comparison with 23% in 2011 (Chalwe-Mulenga & Coetzee, 2022; World Bank, 2024). This is however still relatively low when compared with middle-income and high-income countries that have 72% and 96% financial inclusion (World Bank, 2021). This rapid increase has been attributed

to mobile banking, which only a third of the SSA population has access to.

In gender inequalities, the literacy rate among women in SSA stood at 60% compared to the global average of 88% while maternal mortality is 536 per 100,000 live births which is more than double the 225 global average. In addition, 244 million women making up 62% of women in extreme poverty live in SSA. Also, 80% of the digitally excluded are in Africa and the Asia Pacific in addition to the fact that only 19% of the people in Least Developed Countries (LDCs) were online in 2019 compared to 87% for developed countries (ITU, 2019). These underscore the need to analyze the roles of inclusive financial, gender, and digital policies to propel the attainment of the SDGs in SSA.

The rest of the paper is structured as follows: Section 2 provides the theoretical background for the study and conducts an empirical review of relevant literature while Section 3 explains the methodology employed for the study; Section 4 presents the results of the empirical analysis and discusses findings; and Section 5 provides the conclusion and policy implications.

2 | LITERATURE REVIEW

2.1 | Theoretical background

Neoclassical growth theory, stemming from the seminal work of Solow (1956), provides a framework for understanding the drivers of long-term economic growth and its relationship with sustainable development. The theory emphasizes the role of capital accumulation, including physical and human capital, as a key determinant of economic growth. According to the neoclassical growth model, sustainable economic development can be achieved through a balanced combination of savings, investment, and technological progress. Higher savings rates lead to increased investment in capital formation, which in turn enhances the productive capacity of an economy (Solow, 1956). This accumulation of capital stock enables economies to achieve higher levels of output and income, thereby facilitating sustainable economic development.

According to Koirala and Pradhan (2020), sustainable development necessitates maintaining a level of consumption that does not jeopardize the well-being of future generations. Neoclassical models offer a path to achieving this goal through higher savings rates. Increased savings facilitate investment in productive capital, leading to the accumulation of wealth over time. This accumulation of capital stock enables economies to enhance their productive capacity and achieve higher levels of output and income, thereby paving the way for sustainable economic growth while preserving resources for future generations (Romer, 1990; Solow, 1956).

On the other hand, social sustainability and inclusive development theories emphasize the need to address social inequities, foster human well-being, and guarantee equitable allocation of resources and opportunities (Sachs, 2015). These ideas acknowledge the interconnection of the economic, environmental, and social components of sustainable development. In terms of financial, gender, and digital inclusion, social sustainability and inclusive development theories would prioritize the empowerment of marginalized groups, such as women and the financially excluded, by providing access to financial services, digital technologies, and economic opportunities. It would also fight for policies and activities that address systemic impediments and promote social justice (UN, 2015).

Finally, the environmental justice theory emphasizes the disproportionate impact of environmental degradation on underrepresented and vulnerable people, such as women and those without access to financial and digital resources (Bullard & Johnson, 2000). This theory emphasizes the importance of fair distribution of environmental benefits and responsibilities, as well as the involvement of varied perspectives in environmental decision-making processes. Sustainable development projects that promote financial inclusion, gender inclusion, and digital inclusion can empower marginalized groups, allow them to participate in decision-making processes, and solve environmental injustices (Adeola, 2000; Schlosberg, 2007).

2.2 | Empirical review

2.2.1 | Financial inclusion and sustainable development

Oanh (2024) examined the interplay between digital financial inclusion (DFI), technology progress, environment, and economic growth across 45 countries categorized based on the level of financial development from 2015 to 2020. Using panel vector autoregression and variance decomposition, impulse responses showed that DFI enhances both environment and technology in less financially developed countries but dampens growth, while in more developed contexts, DFI spurs growth but degrades ecology. Overall connections between variables prove tighter in less financially developed groups, which makes the paper conclude that the effect of financial inclusion on the environment and by extension, sustainable development, is mixed and rests on the level of financial development. A more definite positive effect was however found between DFI and sustainable development in Oanh and Dinh (2024) where quintile regressions and wavelet approach were adopted to examine the impact of DFI, financial stability, and sustainable development in Vietnam from 2004 to 2022.

Also, Chien (2023) investigated connections between green investment, eco-innovation, financial inclusion, and sustainable development in China from 1991 to 2020. The Bayesian auto-regressive distributed lag (BARDL) model adopted indicates that green investment, eco-innovation, R&D spending, and financial inclusion indicators such as bank branches, depositors and borrowing are positively associated with China's human development index. A critical review of the study is that the human development index has limitations as a proxy for sustainability. Utilizing two cross-country datasets from 2004 to 2019, Ozili (2022) investigated the link between financial inclusion and sustainable development globally. Financial inclusion was

measured through commercial bank branches per 100,000 adults while multivariate indicators proxy several dimensions of sustainability including renewable energy output, combustible waste and recycling rates. Applying Pearson's correlation analysis and Granger causality tests, the study found higher financial inclusion is associated with greater renewable electricity generation, lower recycling rates, and lower solid waste combustion. The study concludes that the nature of the relationship between financial inclusion and sustainable development is dependent on the indicators adopted.

In a similar vein, the role of financial inclusion in facilitating sustainable development was investigated by Qin et al. (2021) using carbon dioxide emissions to proxy the latter. Utilizing data from seven emerging countries over the period 2004 to 2016, the paper adopted panel quintile analysis, results of which show that financial inclusion reduces emissions in the 25th and 50th quantiles, which is linked to improvement in sustainable development. This finding aligns with the work of Soyemi et al. (2020) in Nigeria from 2001 to 2016. Loans to rural areas, the number of commercial bank branches, and demand deposits from rural areas were employed as measures of financial inclusion. Using an error correction model (ECM) and fully modified OLS (FMOLS) to analyze the data, the results revealed the existence of causality and the positive effect of the financial inclusion variables on sustainable development.

Focusing on the dynamic relationships between financial inclusion and carbon emission, Zaidi et al. (2021) utilized data from 23 OECD countries spanning 2004 to 2017. The study developed two indices for measuring financial inclusion and infrastructure using principal components analysis (PCA). Results from the Common Correlated Effects estimator under the augmented autoregressive distributed lag framework (CS-ARDL) showed positive associations between financial inclusion, energy use, and carbon emissions. Analyzing the causal relationship between financial inclusion, foreign direct investment (FDI), and sustainable development, Odugbesan et al. (2020) conducted a panel analysis using 33 SSA economies from 2004 to 2018. The panel cointegration tests utilized uncover the presence of a long-run relationship among the variables with a bidirectional causality found between financial inclusion and FDI as well as between financial development and FDI. A unidirectional causality from FDI toward sustainable development and resource rents was also discovered. Adopting an exploratory approach, Kuada (2019) assessed the influence of financial inclusion in achieving the SDGs. The study proposed that financial inclusion can propel sustainable development through its contribution to the reduction in poverty, ending hunger, gender equality and empowerment and decent work and economic growth.

2.2.2 | Gender inclusion and sustainable development

Through a systematic literature review, Mpofu (2023) established the barriers behind the persistent digital and financial exclusion of women in developing countries. Drawing from Scopus-indexed journals, the analysis revealed several interrelated factors driving subpar inclusion levels, such as deficiencies in digital literacy and access, sociocultural norms, taxation policies, legal regulatory hurdles, and broader socioeconomic challenges. By synthesizing past evidence, the study expanded common explanations for the gender gap and elucidated why enhancing inclusion remains critical for gender equality and economic progress. However, the study concentrated solely on economic participation rather than investigating inclusion's broader social and political implications for sustainable development sectors such as health, education, and resilience. Utilizing the Generalized Method of Moments (GMM) and Ordinary Least Squares (OLS) with the ratio of employed women as an indicator of inclusion, Tchamyou and Edoh (2022) conducted empirical research in 42 African nations from 2000 to 2019 to strengthen Mpofu's (2023) analysis of the relationship between promoting gender inclusion and sustainable development. The findings revealed that increasing gender participation has a favorable impact on Africa's sustainable development. As a result, the study advocated governmental initiatives to empower women through financial access, education, and participation in decision-making. However, a drawback was the lack of discussion on intersections with digitalization and financial inclusion, as examining these three forms of inclusion broadly across social strata may provide more in-depth economic findings. Despite this limitation, the study of Tchamyou and Edoh (2022) supports Mpofu's (2023) assessment of digital access limitations as a barrier to women's inclusion.

Using secondary data analysis and primary surveys, Kulkarni and Ghosh (2021) investigated barriers and opportunities for women's digital financial inclusion in various regions of India. Through on-the-ground surveys, the study found infrastructural constraints, a lack of information, and societal norms as major hurdles to digital financial inclusion, particularly among rural and low-income women. Using primary data, the study proved digitalization's potential to increase women's social and financial autonomy, emphasizing the significance of gender-sensitive financial inclusion strategies. Yet, the study did not quantify the effects on overall gender equality, women's empowerment, or sustainable economic development outcomes. In addition to the findings from Kulkarni and Ghosh (2021), Vyas-Doorgapersad (2019) conducted a qualitative examination of the integration of gender equality into poverty reduction efforts in SA. The findings revealed a positive outlook on gender equality's significance in socioeconomic development. However, the qualitative methodology was unable to prove causality or accurately assess poverty or sustainability implications. Furthermore, the confined geographic breadth limited generalizability.

Focusing on gender inclusion, inequality, and sustainable development, Asongu and Odhiambo (2019) investigated how enhancing gender inclusion affects inequality across 42 African countries from 2004 to 2014. Using GMM estimation on inequality indicators such as the Gini coefficient and female labor force participation/employment rates as gender inclusion measures, the study found overall positive net effects on inequality from increased inclusion. However, threshold analyses identified critical masses where further improving inclusion starts increasing inequality, with implications for sustainable development. While the study provided new insights into the link between inclusion

and inequality, it did not consider financial or digital inclusion, which are crucial for women's economic empowerment and sustainable development in SSA. Regional heterogeneity was also overlooked.

In a similar study, Dhar (2018) conducted a qualitative analysis of barriers to promoting women's rights and the SDG agenda for gender equality in India over the last two decades. The study examined progress made under prior UN gender equality compacts, such as Beijing 1995, highlighted persistent inequities, and questioned how the new SDGs will incorporate inclusiveness given these gaps. SDG 5 in India prioritized women's economic empowerment and the abolition of violence against women. However, the analysis relied mainly on descriptive narratives rather than quantitative data to support claims. While highlighting the lack of gender statistics for SDG monitoring, it provided little detail on meaningful indicators that countries could adopt.

2.2.3 | Digital inclusion and sustainable development

Li et al. (2023) utilized bibliometric analysis to comprehensively review the current state of research on design for digital inclusion. The study's descriptive analysis of 721 relevant English articles from Scopus revealed four main research themes—information technology, online education, assistive technology, and digital health. Comparison with the inclusive design highlighted distinctive features of the design for digital inclusion. Network analysis techniques such as bibliographic coupling and co-occurrence keywords identified gaps and future directions. The review traces the development of this growing field and provides insights into its maturation. Key findings include the top contributing journals, articles, authors, and institutions. While Li et al. (2023) provided a comprehensive bibliometric analysis of research on design for digital inclusion, their study overlooks important connections to financial and gender inclusion issues in the SSA context. Through a review of existing literature, Ojo (2022) explored the relationship between digital financial inclusion and women's economic empowerment in four African countries—Ghana, Kenya, Namibia, and Lesotho. The study concluded that proactive efforts to promote gender equity in the digital financial sphere will be critical to paving an inclusive pathway forward. By focusing only on four African countries, the study has limited geographic scope and may not fully capture the diversity of challenges and opportunities for women's digital financial inclusion across SSA.

With differences in scope and methodology, Pradhan et al. (2021) analyzed the short and long-term relationships between economic growth, financial inclusion programs, and ICT infrastructure development across 20 Indian states from 1991 to 2018. Using Granger causality tests, they found evidence of strong causal links between these factors in both the short and long run. Their empirical results suggest that carefully coordinating policies and strategies around ICT infrastructure expansion, increasing financial access, and promoting economic growth are crucial for these Indian states to achieve sustainable development over time. Just as in previous studies, the study failed to examine issues of gender inequality, which is a critical barrier to financial inclusion and sustainable development in SSA. Employing a two-step system GMM model, Haftu (2019) investigated the impact of mobile phones and internet on per capita income in 40 SSA countries from 2006 to 2015. The results showed that increasing mobile phone penetration significantly contributed to GDP per capita growth when controlling for other variables. A 10% rise in mobile phone penetration was associated with a 1.2% increase in GDP per capita. However, the study only examined the broad impact on per capita GDP and did not consider at how access to mobile phones and the internet may differentially impact women, the poor, rural populations, and other marginalized groups.

With a broader scope, Goodluck et al. (2016) examined the role of digital inclusion in achieving sustainable development in Nigeria. The study assessed the concept of digital inclusion. Analysis reveals that Nigerian libraries at all levels must play critical roles in overcoming digital exclusion challenges. The study concluded by proposing ways forward for libraries and stakeholders to promote digital inclusion and progress toward sustainable development in Nigeria. However, an appraisal of this study showed that while libraries can provide public access to technology, they cannot address the digital literacy skills needed to meaningfully utilize these technologies. Furthermore, libraries are just one part of bridging the digital divide. Focusing only on libraries oversimplifies the issue and overlooks other important factors like ICT infrastructure and policies.

2.2.4 | Statement of research gaps

Regarding research gaps, this study addresses several important areas that have been underexplored in the previous literature as evidenced in Table 1, which presents the Literature Review Matrix. First, it fills a gap in understanding the combined effects of financial, gender, and digital inclusion on sustainable development, particularly in the SSA environment. While existing research has often focused on these dimensions separately, there has been limited investigation into their interconnected impacts. Second, the study tackles the inconsistency in findings regarding the relationship between financial inclusion and sustainable development. By incorporating multiple measures of financial inclusion and controlling other forms of inclusion, this study provides a more in-depth understanding of how different aspects of financial inclusion contribute to sustainable development outcomes. Lastly, the research addresses a gap in the literature concerning the potential negative impacts of digital inclusion on sustainable development in SSA. While many studies have emphasized the benefits of digital technologies, this study highlights the need for a more critical examination of how digital inclusion may affect environmental and social sustainability in developing regions.

TABLE 1 Literature review matrix.

Author	Year	Title	Methodology	Findings	Gaps
Oanh	2024	Digital financial inclusion, technology progress, environment and economic growth	Panel vector autoregression and variance decomposition	DFI enhances both environment and technology in less financially developed countries but dampens growth in more developed contexts DFI spurs growth but degrades ecology.	The effect of financial inclusion on the environment and sustainable development is mixed.
Chien	2023	Green investment, eco-innovation, financial inclusion and sustainable development in China	Bayesian auto-regressive distributed lag (BARDL) model	Green investment, eco-innovation, and financial inclusion indicators are positively associated with China's human development index.	The human development index has limitations as a proxy for sustainability.
Ozili	2022	Financial inclusion and sustainable development globally	Pearson correlation analysis and Granger causality tests	Higher financial inclusion is associated with greater renewable electricity generation, lower recycling rates, and lower solid waste combustion.	The nature of the relationship depends on the indicators adopted.
Qin et al.	2021	Financial inclusion and carbon dioxide emissions	Panel quintile analysis	Financial inclusion reduces emissions in the 25th and 50th quantiles, linked to improvement in sustainable development.	Limited to seven emerging countries.
Soyemi et al.	2020	Financial inclusion and sustainable development in Nigeria	Error correction model (ECM) and fully modified OLS (FMOLS)	Positive effect of financial inclusion variables on sustainable development.	The study is specific to Nigeria and may lack generalizability.
Syed et al.	2021	Financial inclusion, energy use, and carbon emissions in OECD countries	Common Correlated Effects estimator under the CS-ARDL framework	Positive associations between financial inclusion, energy use, and carbon emissions.	The study does not explore the causality in depth.
Odugbesan et al.	2020	Financial inclusion, FDI and sustainable development in SSA	Panel analysis and cointegration tests	Bidirectional causality between financial inclusion and FDI.	The study is limited to financial inclusion.
Kuada	2019	Financial inclusion in achieving the SDGs	Exploratory approach	Financial inclusion can propel sustainable development by reducing poverty, promoting gender equality, etc.	The study is more theoretical and lacks empirical evidence.
Mpofu	2023	Barriers to digital and financial inclusion of women in developing countries	Systematic literature review	Identified barriers like digital literacy gaps, sociocultural norms, and legal regulatory challenges.	The study focused on economic participation and lacked exploration of broader social and political implications.
Tchamyou and Edoh	2022	Gender participation and sustainable development in Africa	Generalized Method of Moments (GMM) and Ordinary Least Squares (OLS)	Increasing gender participation positively impacts sustainable development.	The study did not discuss the intersections between digitalization and financial inclusion broadly across social strata.
Lalitagauri and Ghosh	2021	Barriers and opportunities for women's digital financial inclusion in India	Secondary data analysis and primary surveys	Infrastructural constraints, lack of information, and societal norms hinder digital financial inclusion.	Did not quantify the effects on overall gender equality and sustainable economic development outcomes.
Vyas-Doorgapersad	2019	Gender equality and poverty reduction in South Africa	Qualitative examination	Found a positive outlook on gender equality's significance in socio-economic development.	Qualitative methodology was unable to prove causality or accurately assess poverty or sustainability implications.
Asongu & Odhiambo	2019	Gender inclusion, inequality, and sustainable development in Africa	GMM estimation	Positive net effects on inequality from increased gender inclusion.	Did not consider at financial or digital inclusion and overlooked regional heterogeneity.

TABLE 1 (Continued)

Author	Year	Title	Methodology	Findings	Gaps
Dhar	2018	Barriers to promoting women's rights and SDGs in India	Qualitative analysis	Discovered progress and persistent inequities under prior UN gender equality compact.	Relied on descriptive narratives and lacked quantitative support for claims.
Li et al.	2023	Design for digital inclusion: A bibliometric review	Bibliometric analysis	Identified key research themes and gaps in design for digital inclusion.	Overlooked connections to financial and gender inclusion issues in the SSA context.
Ojo	2022	Digital financial inclusion and women's economic empowerment in Africa	Literature review	Concluded that proactive efforts to promote gender equity in the digital financial sphere are critical.	Limited geographic scope, focused on only 4 African countries.
Pradhan et al.	2021	ICT infrastructure development, financial inclusion, and economic growth in India	Granger causality tests	Strong causal links between ICT infrastructure, financial inclusion, and economic growth.	Did not examine issues of gender inequality or digital divides.
Haftu	2019	Impact of mobile phones and internet on per capita income in SSA	Two-step system GMM model	Mobile phone penetration significantly contributed to GDP per capita growth.	Did not examine differential impacts on women, the poor, or rural populations.
Goodluck et al.	2016	Role of digital inclusion in achieving sustainable development in Nigeria	Exploratory study	Highlighted digital inclusion as crucial for sustainable development, emphasized the role of libraries.	Focused primarily on libraries, overlooked broader issues like ICT infrastructure and policies.

Source: Authors' construct using the empirical review in Section 2.2. (2024).

3 | MATERIALS AND METHODS

3.1 | Methodology

Based on the underlying foundations of the neoclassical economic growth theory and the role of savings in capital accumulation, this study adapts the model of (Koirala & Pradhan, 2020; Pardi et al., 2015) to estimate the relationship between sustainable development and the three dimensions of inclusion. From their study, a savings function is derived from the neoclassical growth model augmented with natural resources (see full derivation in Pardi et al., 2015) which is given as follows:

$$\frac{s}{k} = \theta + \alpha\frac{dy}{y} - \beta n + \gamma u + \rho$$

where s is net savings, k denotes capital per capita, y is output per capita, θ represents the growth of factors, n is labor force growth, u is natural resource growth and ρ is population growth. Given the above, we hypothesize that adjusted net savings (as a measure of sustainable development) is a function given in Equation 1 below:

$$SD = f(FI, GI, DI, Z) \quad (1)$$

where SD is Adjusted Net Savings as a measure of Sustainable Development. FI, GI and DI are Financial, Gender, and Digital dimensions of inclusion and Z denotes other control variables affecting SD. The respective functions of each inclusion dimension are as follows:

$$FI = f(MS, CB, DC) \quad (2)$$

where MS is Broad Money Supply as a percentage of GDP, CB is Commercial Branch per 100,000 adults, and DC is Domestic Credit to the private sector.

$$GI = f(FE, FL, FP) \quad (3)$$

where FE is Female Employment to Population, FL is Female Labor Force Participation Rate, and FP is the Number of women holding a seat in parliament.

$$DI = f(MP, IN) \quad (4)$$

where MP is Mobile Phone Subscription and IN is Internet Usage.

$$Z = f(GDP, NRR) \quad (5)$$

where GDP is Gross Domestic Product per Capita and NRR is Natural Resource Rent. The full function and econometric format are given below:

$$SD = f(MS, CB, DC, FE, FL, FP, MP, IN) \quad (6)$$

$$SD_{it} = \beta_0 + \beta_1 MS_{it} + \beta_2 CB_{it} + \beta_3 DC_{it} + \beta_4 FE_{it} + \beta_5 FL_{it} + \beta_6 FP_{it} + \beta_7 MP_{it} + \beta_8 IN_{it} + \beta_9 GDP_{it} + \beta_{10} NRR_{it} + \mu_{it} \quad (7)$$

where the parameters β_{0-10} are the coefficients of the variables and μ_{it} is the error term.

For estimation purposes and since the variables do not have equal magnitudes, Equation 7 is specified in its natural logarithm format as follows:

$$\begin{aligned}\ln SD_{it} = {} & \beta_0 + \ln\beta_1 MS_{it} + \ln\beta_2 CB_{it} + \ln\beta_3 DC_{it} + \ln\beta_4 FE_{it} \\ & + \ln\beta_5 FL_{it} + \ln\beta_6 FP_{it} + \ln\beta_7 MP_{it} + \ln\beta_8 IN_{it} \\ & + \ln\beta_9 GDP_{it} + \ln\beta_{10} NRR_{it} + \mu_{it}\end{aligned} \quad (8)$$

3.2 | Method of analysis

This study utilizes the System Generalized Method of Moments (GMM) method to address potential endogeneity issues that may arise in examining the impact of financial, gender, and digital inclusion on sustainable development in SSA. Given that the cross section (N) of countries is greater than the time (T) periods observed, System GMM is well-suited for this analysis. System GMM allows for the utilization of both within-group and between-group variations over time, thereby capturing the dynamic nature of the relationships under investigation. By including lagged dependent variables as instruments, System GMM mitigates potential biases arising from endogeneity, ensuring more accurate estimates of the causal effects of the explanatory variables on sustainable development outcomes. For robustness check, this study employed Driscoll–Kraay standard errors, which correct for heteroscedasticity and serial correlation in the presence of cross-sectional dependence.

3.3 | Data description and source

This study employed secondary data for all the variables included in the model for a period of 2004 to 2021 for 33 SSA countries as shown in Figure 1. The 33 SSA countries that were included in the study and the number of years used are based on data availability as



FIGURE 1 Map of 33 SSA countries included in the study. *Source*: Authors' own creation from https://www.mapchart.net/africa.html (2024).

TABLE 2 Data definition and measurement.

Variables	Definition and measurement	Justification	A priori expectations
Sustainable development (SD)	SD is proxied with adjusted net savings which is the sum of net national savings and education expenditure minus energy depletion, mineral depletion, net forest depletion, and carbon dioxide.	Adjusted net savings is used to represent an assessment of human and natural capital on savings (Pardi et al., 2015)	Dependent Variable
Financial Inclusion measures (MS, CB, and DC)	Financial inclusion measures include: Broad Money supply (MS)—this is the sum of currency outside banks; demand deposits other than those of the central government. Commercial Bank Branches per 100,000 Adults (CB)—These are retail locations of resident commercial banks and other resident banks that function as commercial banks that provide financial services to customers. Domestic Credit to Private Sector (DC)—These are financial resources such as loans, trade credits and account receivables provided by financial corporations to private individuals	The money supply is a measure of financial development, while CB and DC are supplying side measures of financial inclusion (Ozili, 2022)	MS (+) CB (+) DC (+)
Gender Inclusion Measures (FE, FL, and FP)	The Gender inclusion measure includes: Percentage of Female Employment to Population (FE)—This is the female % of the population that is employed, and it is measured in percentages. Female labor force participation rate (FL)—the proportion of the population ages 15 and older that is economically active measure in rate. Female in Parliament (FP) – the percentage of parliamentary seats in a single or lower chamber held by women	FE, FL, and FP are measures of gender inclusion. It is posited that gender inclusion can bring about a net benefit for inclusive and sustainable development (Asongu, 2020; Tchamyou & Edoh, 2022)	FE (+) FL (+) FP (+)
Digital Inclusion Measures (MP, IN)	Digital inclusion measures include: Mobile phone subscription per 100 people (MP)—refers to the number of mobile phone users, including the number of prepaid sim cards active in the last 3 months to the data collection date. Internet User percentage of population—refers to the people with access to active internet in the last 3 months to the date of the data collection.	Digital inclusion can contribute positively to economic growth and sustainable development (Haftu, 2019) but can also be attributed to environmental hazards that may adversely affect sustainable development.	MP (+/−) IN (+/−)
Natural resource rent (NRR)	NRR represents the total natural resources endowments, and it is measured as a percentage of GDP	The contributions of natural resources could be beneficial for sustainable development (Pardi et al., 2015); however, the environmental depletion resulting from its accumulation can have a negative impact on sustainable development	NRR (+/−)
Gross Domestic Product per capita (GDP)	GDP represents the value of goods and services produced within an economy and it is measured in current US$	Theoretically, income is an important determinant of savings and it is expected that as income increases, savings will increase.	GDP (+)

Source: Authors' construct (2024).

shown in Table A1 in Appendix A. Many of the variables used to represent inclusion are available for the period selected. All data are sourced from the World Bank's WDI online database (World Bank, 2024). The definition of data including its measurement, justification and a priori expectations are presented in Table 2.

4 | RESULTS AND DISCUSSION

Table 3 presents the descriptive statistics of all the variables used in this study. These statistics include the mean, standard deviations, and the minimum and maximum number of observations. The mean and standard deviations provide insights into the central tendency and variability of all the variables. For instance, lnSD, representing the level of adjusted net savings, has a mean of approximately 20.66 with a standard deviation of 1.78, indicating moderate variability around the average level of adjusted net savings. Similarly, lnMP, lnIN, lnMS, lnCB, lnDC, lnFE, lnFL, lnNRR, lnGDP, and lnFP—which represent mobile phone subscription, internet usage, broad money supply, commercial banks per 100,000 adults, domestic credit to private sector, percentage of female employment, female labor participation, natural resources rent, gross domestic product per capita and female in

TABLE 3 Descriptive statistics.

Variables	Obs.	Mean	Std. dev.	Min.	Max.
lnSD	345	20.66261	1.78464	15.0879	25.19051
lnMP	592	3.831958	0.986578	0.254574	5.129451
lnIN	587	2.011611	1.328585	−1.66108	4.297286
lnMS	579	3.341624	0.532687	1.510799	5.074855
lnCB	569	1.269381	1.02041	−3.21888	3.739335
lnDC	585	2.737261	0.759456	−0.06752	4.652518
lnFE	594	3.943314	0.280959	3.252465	4.421728
lnFL	594	4.170693	0.169467	3.726825	4.498909
lnNRR	647	1.778396	1.544506	−6.04918	4.030501
lnGDP	648	7.272593	1.080202	4.856228	9.895945
lnFP	594	4.946058	0.474313	3.988984	5.57973

Note: lnSD, lnMP, lnIN, lnMS, lnCB, lnDC, lnFE, lnFL, lnNRR, lnGDP and lnFP represent the natural logarithm of sustainable development, Mobile phone subscription per 100 people, Internet User percentage of population, Money supply, Commercial Bank Branches per 100,000 Adults, Domestic Credit to Private Sector, Percentage of Female Employment to Population, Female labor force participation rate, total natural resources endowments, Gross Domestic Product per capita, and Female in Parliament, respectively.
Source: Authors' computation (2024).

TABLE 4 Correlation analysis.

	lnSD	lnMP	lnIN	lnMS	lnCB	lnDC	lnFE	lnFL	lnNRR	lnGDP	lnFP
lnSD	1										
lnMP	0.2471	1									
lnIN	0.1797	0.8452	1								
lnMS	0.0059	0.5656	0.6154	1							
lnCB	0.1765	0.6484	0.7219	0.8071	1						
lnDC	0.0488	0.5655	0.5756	0.6145	0.8041	1					
lnFE	0.1923	−0.2868	−0.395	−0.3453	−0.4232	−0.3921	1				
lnFL	0.1175	−0.3402	−0.4594	−0.3108	−0.4684	−0.3423	0.8099	1			
lnNRR	0.0335	−0.04	−0.039	−0.1542	−0.1057	−0.2235	0.1049	0.2663	1		
lnGDP	0.0794	0.2559	0.3233	0.1385	0.3968	0.1898	−0.2379	−0.5249	−0.3779	1	
lnFP	0.0902	0.065	0.1618	0.0496	0.0327	0.0434	−0.042	−0.182	−0.1024	0.022	1

Note: lnSD, lnMP, lnIN, lnMS, lnCB, lnDC, lnFE, lnFL, lnNRR, lnGDP and lnFP represent the natural logarithm of sustainable development, Mobile phone subscription per 100 people, Internet User percentage of population, Money supply, Commercial Bank Branches per 100,000 Adults, Domestic Credit to Private Sector, Percentage of Female Employment to Population, Female labor force participation rate, total natural resources endowments, Gross Domestic Product per capita, and Female in Parliament, respectively.
Source: Authors' construct (2024).

parliaments, respectively—exhibit varying levels of mean and standard deviation, suggesting differing degrees of central tendency and dispersion within each variable. For instance, lnNRR, representing natural resource rents, has a mean of approximately 1.78 with a high standard deviation of 1.54, indicating substantial variability in natural resource rents across observations. Conversely, lnGDP, representing GDP per capita, has a mean of approximately 7.27 with a standard deviation of 1.08, suggesting relatively less variability around the mean GDP values.

Table 4 presents the correlation matrix, which shows the relationships between all the variables including sustainable development (SD) across the countries. Positive correlations are observed between SD and factors such as mobile phone subscription (lnMP), internet usage (lnIN), broad money supply (lnMS), commercial banks per 100,000 adults (lnCB), and domestic credit to the private sector (lnDC), suggesting that higher levels of these variables tend to coincide with greater sustainable development. Notably, SD exhibits particularly strong positive correlations with lnMP, lnIN, and lnCB, indicating the importance of technological connectivity and financial infrastructure in fostering sustainable development. Conversely, SD shows a negative correlation with natural resource rents (lnNRR), gross domestic product per capita (lnGDP), and female participation in parliaments (lnFP), suggesting an inverse relationship with these variables.

TABLE 5 Coefficient estimation.

Variables	System GMM	Driscoll–Kraay (FE)	Driscoll–Kraay (RE)
DV = lnSD	Coefficients		
lnSD (−1)	0.681*** (0.017)		
lnMS	0.013* (0.007)	0.033207 (0.408527)	−0.0511184 (0.3856312)
lnCB	0.078*** (0.008)	1.4314259*** (0.2628635)	0.4158434** (0.2431841)
lnDC	−0.026*** (0.010)	−0.3751928 (0.3556324)	−0.3049083 (0.3318149)
lnFE	0.038** (0.015)	−7.44349 (4.106148)	−6.629548*** (3.790567)
lnFL	1.035*** (0.014)	13.59046*** (4.984106)	10.97136*** (4.708452)
lnFP	0.098*** (0.016)	0.2004821 (0.1283531)	0.2405127** (0.1266613)
lnMP	−0.016** (0.002)	0.246643 (0.1520563)	0.2690327** (0.1422588)
lnIN	−0.129** (0.062)	−0.1248499 (0.1013289)	−0.0642816 (0.0985019)
lnGDP	0.048*** (0.008)	0.4803855** (0.2515665)	1.251491*** (0.2022457)
lnNNR	−0.365*** (0.076)	−0.2379385** (0.1102399)	−0.1288577 (0.096299)
Observation	322	330	330
F-Stat/Wald Chi^2	66.71***	54.73***	57.14***
Hausman Chi^2 Stats.			0.30
Hansen, *p* value			.3540
AR(2), *p* value			.6831

Note: Instrument variables are the first difference of MS, CB, DC, FE, FL, FP, MP, IN, GDP and NNR. AR(2) is the *p* value for the second order serial correlation; the Hansen *p* value was used to test the relevance of the instruments in GMM and Hausman test was used to determine the preferred model between fixed and random Driscoll-Kraay models. ***, ** & * denote significance at 1%, 5% & 10% respectively.
Source: Authors' construct (2024).

In Table 5, all the measurements of financial inclusion used in this study produced a positive and significant relationship with sustainable development except credit to the private sector, which produced a negative association with sustainable development. Specifically, a percentage increase in the coefficients of the broad money supply as a percentage of GDP (lnMS) and commercial branch per 100,000 adults (lnCB), increase sustainable development by 0.013% and 0.07%, respectively. Conversely, a percentage increase in the credit to the private sector (lnDC) reduces sustainable development by 0.02%.

The positive effect of financial inclusion (broad money supply and commercial branch per 100,000 adults) on sustainable development aligns with the studies of Przychodzen and Przychodzen (2015) and Afshan and Yaqoob (2022). The positive effect of the broad money supply on sustainable development in Africa could be attributed to the increased availability of funds for investment, which stimulates entrepreneurship, job creation, and infrastructure development. Also, African countries have improved in providing access to financial services by facilitating a greater number of commercial bank branches, which led to a higher level of savings mobilization and credit access among underserved populations, particularly in rural areas. However, the negative effect of credit to the private sector aligns with the studies of Shahbaz et al. (2013) and Habiba and Xinbang (2022). Ho et al. (2013) attributed the negative effect of credit to the private sector on sustainable development in Africa to inadequate regulation and governance in the financial sector which often result in misallocation of resources and increased financial vulnerability. Balana and Oyeyemi (2022) attribute the negative effect of credit to the private sector on sustainable development in Africa to factors such as high interest rates, limited access to finance, and risk aversion among lenders.

The coefficients of gender inclusion in the system GMM model show that the three measures of gender inclusion used (female employment to population [lnFE], female labor force participation rate [lnFL], and the number of women holding a seat in parliament [lnFP]) have a positive effect on the sustainable development. Specifically, lnFE, lnFP, and lnFL increased sustainable development by 0.038%, 1.035%, and 0.098%, respectively. The positive effects of the

measures of gender inclusion in SSA are due to their multifaceted contributions to economic growth, social cohesion, and governance. Studies have shown that increasing female participation in the labor force enhances productivity and innovation, leading to higher economic output and GDP growth (Ogbuabor et al., 2023; Tchamyou & Edoh, 2022). Additionally, greater female employment opportunities reduce poverty and income inequality by providing women with financial independence and access to resources for education, health care, and entrepreneurship, which in turn fosters inclusive development. Moreover, female representation in political decision-making bodies such as parliament promotes gender-responsive policymaking, social justice, and human rights protections, ultimately contributing to more equitable and sustainable development outcomes by addressing the diverse needs and priorities of society. This underscores the critical role of gender, which is a crucial factor common to most of the global goals, indicating that achieving the SDGs will be elusive without it.

The coefficients of digital inclusion produced a negative relationship with sustainable development in SSA. A percentage increase in mobile phone subscription (lnMP) reduced sustainable development by 0.016% while a percentage increase in internet usage reduced sustainable development by 0.129%. This result contradicts the study of Haftu (2019), which shows that a 10% rise in mobile phone penetration was associated with a 1.2% increase in GDP per capita. Mobile phone subscriptions and internet usage may have negative effects on sustainable development in SSA due to several factors. First, the rapid proliferation of electronic devices contributes to e-waste accumulation, as obsolete devices are often disposed of improperly, causing environmental pollution and health hazards. Additionally, the energy consumption associated with charging devices and powering data centers for internet services adds strain to already fragile energy infrastructure, often reliant on non-renewable sources. Furthermore, the digital divide exacerbates socioeconomic disparities, as access to mobile phones and internet services remains limited in rural and marginalized communities, widening the gap in education, healthcare, and economic opportunities. Lastly, excessive screen time and reliance on digital communication may lead to a decline in traditional social interactions and cultural practices, potentially weakening community cohesion and resilience.

The two control variables (GDP per capita [lnGDP] and natural resources rent [NRR]) produced a positive and negative relationship with sustainable development, respectively. A percentage increase in GDP per capita increased sustainable development by 0.048%, while a percentage increase in natural resource rent reduced sustainable development by 0.365%. The AR(2) which is also known as Arellano–Bond test for second order serial correlation used most especially in dynamic panel such as system GMM. The p value of the statistic suggests that there is no evidence of second-order serial correlation in the differenced residual. The Hansen statistic was used in this study to test the validity of the instruments used in the GMM model. Since the p value of the Hansen test is larger than the significant level (0.05), we fail to reject the null hypothesis, which means that the instruments used are valid and not correlated with the error term.

5 | CONCLUSION AND POLICY RECOMMENDATIONS

This paper analyzed the effects of different dimensions of inclusion towards the attainment of sustainable development in 33 SSA countries from the financial, gender, and technological perspectives between 2004 and 2021. The study utilizes the System GMM as the main estimation technique given its ability to address potential endogeneity issues, capture the dynamic nature of relationships and mitigate potential biases. The Driscoll–Kraay standard error was employed for robustness check given its ability to correct for heteroscedasticity, serial correlation and cross-sectional dependence. Two of the three measurements of financial inclusion and all three measures of gender inclusion produced positive and significant effects on sustainable development. However, digital inclusion produced a negative relationship with sustainable development in SSA. This study therefore contributes to knowledge by conducting an empirical tripartite analysis of the financial, gender, and digital inclusion, which brings to the fore, the interrelationships among the variables to gain a holistic perspective for the design and implementation of evidence-based policy-relevant inclusive interventions.

The findings of this study lend empirical credence to the critical role inclusion plays in the achievement of the SDGs. Of the three dimensions of inclusion assessed, financial and gender inclusion are seen to be paramount in boosting sustainable development while digital inclusion is found to be detrimental to the attainment of the SDGs in SSA during the period under study. This means that financial inclusion can help accelerate progress on sustainable development through its positive impact, via both direct and indirect channels. Expanding financial access and usage for the majority of the SSA populace including the marginalized, will increase investment, productivity, employment, income and empowerment which has direct implications for SDGs 1, 2, 5, 8, and 9 with indirect consequences on education, health and inequality (SDGs 3, 4 and 10) outcomes through is spillover effects.

For gender inclusion, its practical implications cannot be overemphasized. While the SDGs have an entire goal dedicated to gender, gender is entrenched in more than half of the remaining goals. This notion is empirically validated by this study with gender inclusion wielding the most preponderance of evidence. The gender snapshot (2023) indicates that concerted efforts and speedy actions are needed in addressing gender issues in the SDGs such as the feminization of poverty (SDG 1), food insecurity among women and girls (SDG 2), maternal mortality (SDG 3), girl child education (SDG 4), gender inequality (SDG 5), gender gap in power and leadership (SDG 5), genderized water stress (SDG 6), gender wage gap (SDG 8) and discrimination (SDG 10). Otherwise, not only will the global goals not be met, but it will also be a financial and developmental loss to the world.

Owing to the above, several policy implications can be drawn to speed up actions toward the SDGs which have a deadline of barely six years away. First, is the need to aggressively increase the number of financial included through financial literacy to enhance acceptability, reduce risk aversion and promote an in-depth understanding of

financial concepts, products and services. It is also important that financial products be context-relevant and be designed to consider the peculiarities and needs of a particular target population rather than promoting "one-size-fits-all" financial policies and products across the length and breadth of SSA. More importantly, the financial inclusion gender gap needs to be closed. This can be done by formulating policies that directly address barriers to women's financial inclusion such as issues of consent and collateral. Gender-specific financial products should also be designed with the increased engagement of female financial agents.

Furthermore, a holistic approach should be pursued by governments, development partners, and other relevant stakeholders to implement gender policies that address key fundamental issues such as gender norms in addition to the enactment, avowed commitment and support for affirmative action toward closing the gender gaps across all sectors and at all levels. One of such policies will be to reduce excessive regulations that hinder female participation in the labor market and widen the gender gap (Akande et al., 2021). Women empowerment programs through training, credit, and entrepreneurship are also required to ensure that women have the knowledge, skills, and capacities to effectively participate in the economy in all sectors whether at the community, regional, national, or international levels.

The negative impact of digital inclusion on sustainable development is an indication that digital inclusion in SSA harms the environmental and social fabric of the region. This requires deliberate effort to bridge the digital divide that exists in SSA by expanding digital infrastructure such as mobile coverage and broadband networks to facilitate equitable digital access and resources. It is also recommended that research and development be intensified on energy-efficient practices and technologies such as the adoption of green energy from production to usage so that SSA not only benefit but also maximizes the potential of digital inclusion in boosting sustainable development.

In terms of limitation, this study is limited in temporal and spatial scope as the analysis of the different dimensions of inclusion on sustainable development in SSA is based on the countries and time period with data availability. Second, the countries in the SSA region are diverse in various ways in terms of economy, governance, policy, structure, etc., as there is diversity within their commonality. Hence, combining these countries for a single aggregate analysis may mask specific country dynamics that may affect the generalizability of results. Future studies may therefore consider a country-by-country analysis to account for country-level heterogeneity and understand the unique dynamics of each country in the region. Furthermore, future researchers may want to investigate the interaction effect of financial, gender, and digital inclusion on sustainable development to discover how these reinforce or counteract one another in the context of sustainable development.

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APPENDIX A

TABLE A1 List of 33 SSA countries included in the study and data sourced.

		Data sourced (2004–2021)										
S/N	Countries	SD	MS	CB	DC	FE	FL	FP	MP	IN	NRR	GDP
1	Angola	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Benin	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	Botswana	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	Burkina Faso	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	Burundi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	Cabo Verde	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	Cameroon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8	Comoros	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	Democratic Republic of Congo	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10	Republic of Congo	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
11	Cote d'Ivoire	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12	Eswatini	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
13	Gabon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
14	The Gambia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
15	Ghana	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
16	Guinea	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
17	Guinea-Bissau	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
18	Kenya	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
19	Lesotho	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20	Madagascar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
21	Mauritius	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
22	Mozambique	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
23	Namibia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
24	Niger	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
25	Nigeria	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
26	Rwanda	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
27	Senegal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
28	South Africa	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
29	Tanzania	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
30	Togo	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
31	Uganda	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
32	Zambia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
33	Zimbabwe	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Abbreviations: CB, Commercial Branch per 100,000 adults; DC, Domestic Credit to the private sector; FE, Female Employment to Population; FL, Female Labor Force Participation Rate; FP, Number of women holding a seat in parliament; GDP, Gross Domestic Product per Capita; IN, Internet Usage; MP, Mobile Phone Subscription; MS, Broad Money Supply as a percentage of GDP; NRR, Natural Resource Rent; SD, Sustainable Development measured with Adjusted Net Savings.
Source: Authors' Construct (2024).