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Abstract

Over the last two decades, Sub-Saharan Africa has witnessed significant growth in the usage of digital financial services. However, women and rural dwellers report lower usage rate than men and urban dwellers which has negative implications in the regions ability to achieve SDG 5 and 10. While existing studies highlight inequalities in digital literacy as a key driver of these disparities, rigorous empirical assessments remain limited. This study addresses this gap by analysing cross-sectional data from Kenya, Tanzania, Nigeria, and Uganda to estimate gender and locational inequalities in digital literacy, identify their drivers, and assess their impact on digital financial inclusion. Using regression decomposition techniques, the study finds that digital literacy accounts for up to 33% of the gender gap and 38% of the locational gap in mobile money usage, and even higher shares in debit card and online banking use. The analysis also reveals that inequalities in digital literacy are primarily driven by disparities in smartphone ownership, educational attainment, financial literacy, and decision-making autonomy. These results underscore the urgent need for targeted policies that enhance digital skills among women and rural populations as a pathway to inclusive financial development in the region.

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1. Introduction

Over the last two decades, Sub-Saharan Africa (SSA) has seen significant growth in the supply of digital financial services (DFS), which refers to financial services offered through digital channels, including mobile phones, the internet and smart cards (Johnen, & Mußhoff, 2023; Demirgüç-Kunt, Klapper, Singer, & Ansar, 2021; Aker & Demirgüç-Kunt, 2016). Unlike the traditional banking system, DFS usually require minimal documentation for registration (Mchugh et al., 2014), attract lower transaction charges (Wang & He, 2020), and are accessible in rural areas with limited financial infrastructure (Demirgüç-Kunt et al., 2018; Aker & Demirgüç-Kunt, 2016). Given these attributes, DFS is expected to play a crucial role in addressing the high levels of financial exclusion in the SSA region, particularly among vulnerable groups such as women and rural dwellers (Coffie et al.,2024; Johnen, & Mußhoff, 2023; Andersson-Manjang & Naghavi, 2021).

Unfortunately, the evidence from multiple surveys in the region paint the opposite picture where women and rural dwellers constantly record lower levels of digital financial inclusion (DFI) than men and urban dwellers ((Demirgüç-Kunt, Klapper, Singer, & Ansar, 2021). For instance, the 2017 Financial Inclusion Insights survey on SSA, covering four countries (Kenya, Tanzania, Nigeria and Uganda) highlights significant gender and location inequalities in DFS with women disproportionately affected in all four countries (See Figure 1). Similarly, urban residents exhibit a significantly higher DFI than rural dwellers in these countries (see Figure 2). If these inequalities are left unaddressed, they risk deepening existing gender and locational inequalities in income, education, health access (Staveren, 2001) and more importantly stifle the achievement of the sustainable developments Goals, specifically SDG 5 and 10 (Kulkarni, & Ghosh, 2021).

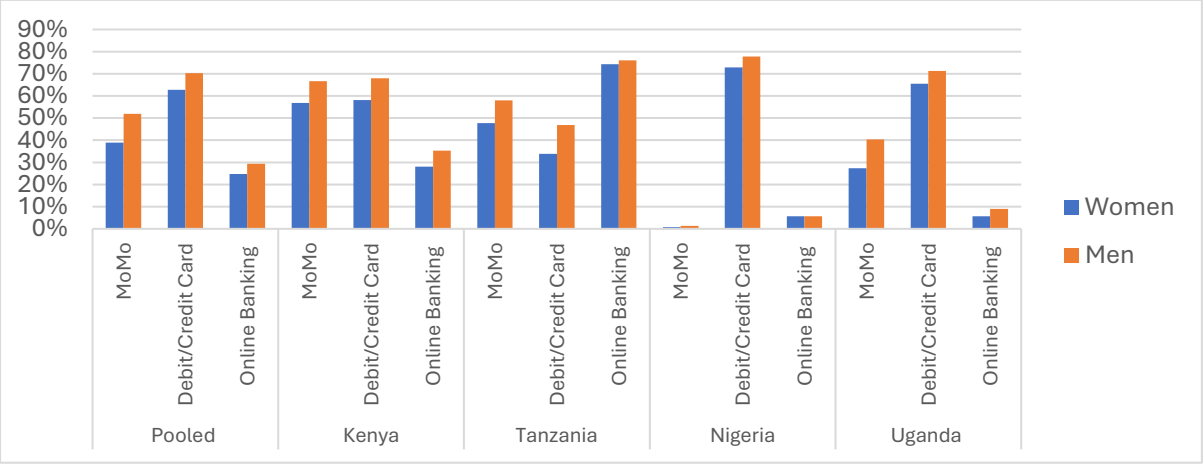

Figure 1: Gender Gap in Digital Financial Inclusion; *Source:* Authors, with Financial Inclusion Insights Survey.

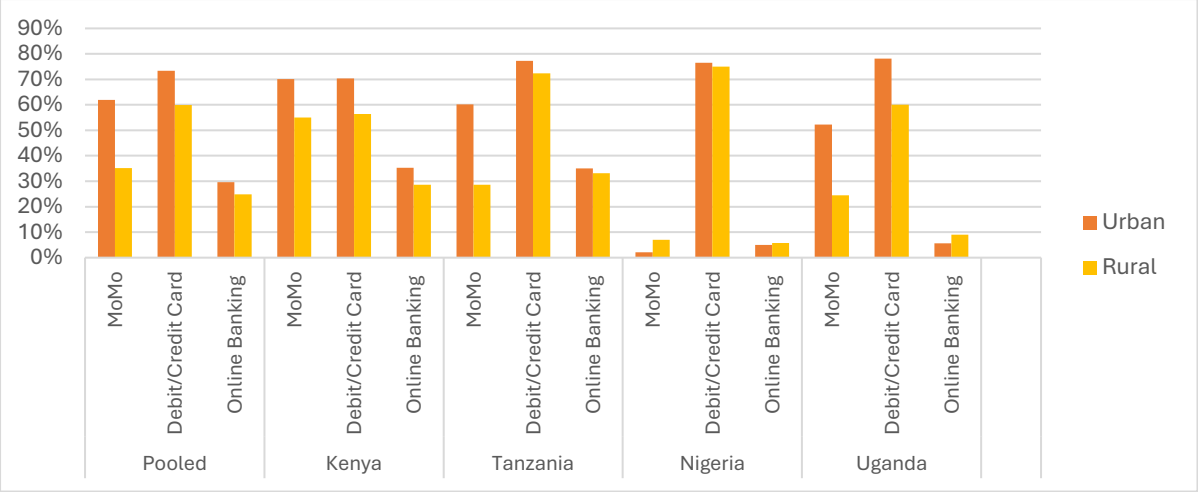

Figure 2: Location Gap in Digital Financial Inclusion; *Source:* Authors, with Financial Inclusion Insights Survey.

In other to address the gender and locational inequalities in DFI, it is critical to first ascertain the drivers of these inequalities. According to the Capability theory, inequalities in an outcome arises when the resources that drive the outcome is unequally distributed (Ndoya, & Tsala, 2021; Aterido et al., 2013). Building on this theoretical framework, previous research has explored how inequalities in resources such as financial literacy, income, education, legal requirements and employment drive inequalities in DFI (Were, Odongo, and Israel, 2021; Ghosh & Vinod, 2017; Blau & Kahn, 2017; Zins & Weill, 2016). More specifically, Zins and Weill (2016) report that lower financial literacy levels among women and rural populations are a key barrier of DFI because individuals in these groups often lack the knowledge or confidence to engage with digital financial products. Additionally, Ghosh and Vinod (2017) highlight the role of digital infrastructure, noting that rural areas frequently face inadequate access to stable internet and digital payment systems, significantly limiting adoption rates.

Beyond these factors, one other potential resource whose unequal distribution can also account for the gender and locational inequalities in DFI in the SSA region is digital literacy. Digital literacy (DL) relates to having the know-how and capabilities to use digital tools like mobile phones, smartphones, and tablets and navigate digital platforms (Demirgüç-Kunt et al., 2018). It encompasses various competencies, such as internet searching, hypertext navigation, knowledge assembly, and content evaluation (Julien, 2015)**.** Prior research highlights a strong correlation between high digital literacy and increased DFS usage, suggesting that unequal distribution of digital literacy may cause gender and locational disparities in DFI (Tinmaz et al., 2023; van Deursen & van Dijk, 2019). However, limited empirical evidence exists on the extent of gender and locational inequalities in digital literacy, their drivers, and their effect on inequalities in DFI.

Thus, this study seeks to close these existing gaps by first, quantifying the extent of gender and locational inequalities in digital literacy; secondly, ascertaining the drivers of the gender and locational inequalities in digital literacy; and lastly, examining their impact on gender and locational inequalities in DFI within SSA. Our study has several policy implications. First, by quantifying the disparities in digital literacy, the study provides evidence for targeted policy interventions to reduce these inequalities. Second, the findings highlight the need for integrating digital literacy programs into broader financial inclusion strategies. Finally, this research adds to the growing evidence base that underscores the critical role of digital literacy in achieving equitable financial inclusion.

The rest of the study is organized as follows. Section two covers some empirical works as well as theoretical motivations of the study. Section three discusses issues relating to datasets, definitions and measurement of key variables, and empirical estimation strategy. Section four also covers the results and discussion. The final section (sections five) contains the conclusions of the study.

2. Literature review

2.1. Gender and Locational inequalities in digital financial inclusion

Empirical studies estimating gender and locational inequalities in DFI has expanded in recent times (Johnen, and Mußhoff, 2023**;** GSMA, 2021b; Minischetti, 2017; Mndolwa & Alhassan, 2020; Potnis et al., 2020; Spencer et al., 2018). For instance, Reynolds et al., (2023) analysed the gender gap in mobile money usage across four SSA countries, Kenya, Nigeria, Tanzania and Uganda. Using a probit regression, the study found significant gender gaps in favour of men across all four countries. Johnen and Mußhoff (2023**)** also explored the gender gap in digital credit in Kenya. The study was based on cross-sectional data sourced from the FinAccess household surveys. Akin to the work of Johnen and Mußhoff (2023), Were, Odongo, and Israel (2021) used cross-sectional data sourced from the 2017 FinAccess household survey, and logistic regression to analysis the data. The empirical results show that women—especially married women—are less likely to access mobile money services and banking financial services compared with men.

Other studies, in addition to analysing the gender and location gaps in DFI, also explore the causes of the gaps (Ndoya, & Tsala, 2021; Mndolwa, & Alhassan, 2020; Ghosh & Chaudhury; 2019). For instance, Ghosh and Chaudhury (2019) as part of their analysis, examined the gender gap in digital financial services in India. The variables considered in the decomposition analysis were age, income, education and employment status. The study employed the Fairlie nonlinear decomposition technique, and data were sourced from the 2021 Global Findex dataset. The study confirmed a significant gender gap in

digital financial inclusion, with differences in educational attainment between males and females accounting for the majority of the gap. Ndoya, and Tsala (2021) also used cross-sectional data to examine the drivers of the gender gap in digital financial inclusion (mobile money, credit card and debit card) in Cameroon. In addition to socioeconomic variables considered in previous studies, the study also considered legal barriers and the nature of employment. The study identified variations in education as the foremost driver of the gender gap in financial inclusion.

Mndolwa, and Alhassan (2020), on the other hand, examined the locational disparities in digital financial inclusion in Tanzania. Using household survey data and a multivariate decomposition approach. The study revealed that access to digital infrastructure, such as reliable internet and mobile network coverage, was a primary determinant of locational gaps. Furthermore, disparities in educational attainment and income levels significantly influenced locational inequalities in digital financial inclusion. Adegbite and Machethe (2020) also assessed the gender inequalities in DFI in Nigeria, considering legal and regulatory factors. The study reported the effect of sociocultural, institutional, legal and regulatory factors on DFI in Nigeria.

From the above review, it is evident while there is some appreciable literature on gender and locational inequalities in DFI, most of the existing studies do not provide a comprehensive assessment of the various dimensions of DFI. Instead, most focus on only one form of DFI. Furthermore, many of these studies rely on logistic regression techniques, which do not quantify the extent of the gender and locational gaps in DFI. Finally, while some of the existing studies have explored how inequalities in resources such as education and income drive gender and locational inequalities in DFI, digital literacy which is also a potential driver has received limited attention. Thus, the study seeks to answer these research questions

i. To ascertain the extent and drivers of the gender and locational inequalities in digital literacy
ii. Assess the contribution of digital literacy to gender and locational disparities in DFI

3. Data and Methodology

3.1. Data source and measurement of variables

The study used cross-sectional data from the fourth wave of the Financial Inclusion Insights (FII) survey, which covered four Sub-Saharan African (SSA) countries—Kenya, Tanzania, Nigeria, and Uganda—and three South Asian countries. The survey gathered micro-level data from nationally representative samples of adults aged 15 years or older living in these countries. The specific variables

in the data set considered in our analysis include use of digital financial inclusion indicators (mobile money services, online banking, and debit card), indicators of digital literacy level, and other socioeconomic characteristics, including educational attainment, poverty level, gender, employment status, location and age.

In terms of measurement, digital financial inclusion variables considered in this study were measured as dummy variables, where 1 represents the use of the particular digital service and 0 represents otherwise. Digital literacy, our main independent variable, was captured as an index created from summing up individuals' responses to eight questions that reflect their communication competence(dimension-1) and media competence (dimension-2). Using the same approach, a financial literacy index was created by summing up seven questions covering key areas such as risk diversification, inflation, and compound interest.

3.2. Estimation Strategy

To ascertain the extent and drivers of the gender and locational inequalities in digital literacy, we use the Blinder–Oaxaca decomposition method, which is a widely used econometric technique that partitions differences in an outcome variable, such as digital literacy, into two main components: those attributable to differences in endowments (e.g., resources, skills, or access) and those due to differences in coefficients (e.g., structural or systemic factors influencing how endowments translate into outcomes) (Oaxaca, & Ransom, 1994; Blinder, 1973).This method involves running separate regression models for different groups, including urban vs. rural (locational inequalities) and male vs. female (gender inequalities).

For locational inequalities, we define the outcome Y for urban and rural groups as follows:

$$Y_U = X_U\beta_U + \epsilon_U \quad \text{(for Urban)} \qquad (1)$$

$$Y_R = X_R\beta_R + \epsilon_R \quad \text{(for Rural)} \qquad (2)$$

For gender inequalities, the outcome Y for male and female groups is specified as:

$$Y_M = X_M\beta_M + \epsilon_M \quad \text{(for Male)} \qquad (3)$$

$$Y_F = X_F\beta_F + \epsilon_F \quad \text{(for Female)} \qquad (4)$$

Where Y represents use of digital financial services (mobile money, debit card and online banking), X is a vector of explanatory variables, including digital literacy, β is a vector of coefficients representing the returns to each characteristic within each group, U represents urban dwellers, R represent rural dwellers, M represents males, F represents females and $\in$ is the error term for each group. The decomposition equations for locational and gender inequalities in DFS are specified below.

$$\Delta Y = E(Y_U) - E(Y_R) = [\mathrm{E}\,(X_U) - \mathrm{E}\,(X_R)]\beta_R + \mathrm{E}(X_R)(\beta_U - \beta_R) \qquad (5)$$

Where ΔY is the difference in mean DFS access between urban and rural groups; $[\mathrm{E}\,(X_U) - \mathrm{E}\,(X_R)]\beta_R$ represents the explained component, representing the portion of the difference due to varying characteristics (e.g., income, education); and $\mathrm{E}(X_R)(\beta_U - \beta_R)$ represents the unexplained component.

$$\Delta Y = E(Y_M) - E(Y_F) = [\mathrm{E}\,(X_M) - \mathrm{E}\,(X_F)]\beta_F + \mathrm{E}(X_F)(\beta_M - \beta_F) \qquad (6)$$

Where ΔY is the difference in mean DFS access between male and female groups; $[\mathrm{E}\,(X_M) - \mathrm{E}\,(X_F)]\beta_F$ represents the explained component, due to differences in characteristics between men and women; $\mathrm{E}(X_F)(\beta_M - \beta_F)$ represent the unexplained component.

To assess locational and gender inequalities in digital financial inclusion, the study uses the Fairlie decomposition method (Rahimi & Hashemi Nazari, 2021; Jann, 2008; Fairlie, 2005; Fairlie & Meyer,1999). The Fairlie decomposition is an extension of the Blinder–Oaxaca decomposition method, which is specifically designed for nonlinear models. We start by specifying separate regression models for each group (urban vs. rural and male vs. Female). These models allow us to estimate the relationship between DFS usage and a set of explanatory variables for each subgroup, such as digital literacy, income, education, and digital literacy.

Following Fairlie and Meyer (1999), the decomposition for a nonlinear equation for gender is specified as equation 7 and that of location is specified as equation 8

$$\text{Y=}\ \bar{Y}^M - \bar{Y}^F = \left[\sum_{i=1}^{N^M} \frac{F(X_i^M \hat{\beta}^F)}{N^M} - \sum_{i=1}^{N^F} \frac{F(X_i^F \hat{\beta}^F)}{N^F}\right] + \left[\sum_{i=1}^{N^M} \frac{F(X_i^M \hat{\beta}^M)}{N^M} - \sum_{i=1}^{N^F} \frac{F(X_i^M \hat{\beta}^F)}{N^F}\right] \qquad (7)$$

$$Y = \bar{Y}^U - \bar{Y}^R = \left[\sum_{i=1}^{N^M} \frac{F(X_i^U \hat{\beta}^R)}{N^M} - \sum_{i=1}^{N^R} \frac{F(X_i^R \hat{\beta}^R)}{N^R}\right] + \left[\sum_{i=1}^{N^U} \frac{F(X_i^U \hat{\beta}^U)}{N^U} - \sum_{i=1}^{N^R} \frac{F(X_i^U \hat{\beta}^R)}{N^R}\right] \qquad (8)$$

where Nj is the sample size for gender j and Y is the outcome variable, which measures financial inclusion. For example, M stands for "Male" and F for "Female." The gender gap caused by group variations in X distributions is represented by the first term in brackets, while the gender gap caused by differences in group processes affecting levels of Y is represented by the second term.

As a robustness check, we re-conducted the analysis using the multivariate decomposition for the nonlinear response model (Powers, Yoshioka, & Yun, 2011). Similar to Fairlie decomposition, the multivariate decomposition method accounts for the nonlinear nature of our dependent variable. It also disaggregates the contributions of explanatory variables, allowing for a detailed breakdown of the observed gap's explained and unexplained components.

3.6 Descriptive analysis

Table 1 contains the descriptive statistics of the variables used in the analysis by gender and location. We find that more men (51.82%) use mobile money than women (38.9%). A similar trend is seen for debit card usage (63% for females and 70.25% for males) and online banking (25.01% for females and 29% for males). Also, we find that 39.45 percent of urban dwellers use mobile money, 74.36 percent use debit cards, and 16.72 percent use online banking. These figures are relatively higher when compared to rural areas, where 20.28 percent use mobile money, 63.42 percent debit and 13.49 percent use online banking. Males have higher educational attainment (6.75%) relative to females (4.30%). Economic inequalities are also evident, with females experiencing higher unemployment (38.51% for males and 23.85% for females) and poverty rates (60.96% for males and 56.34% for females). Marital and family status disparities indicate that females are more likely to be divorced (8.12%) or widowed (9.90%) compared to males (4.21% and 2.22%, respectively), suggesting greater social vulnerabilities. Poverty levels are significantly higher in rural areas (70.53% for males and 33.49% for females), further underscoring the urban-rural divide. Addressing these disparities requires targeted interventions to improve digital and financial literacy among women and rural populations, enhance access to technology, and promote equitable education and employment opportunities.

Table 1: Descriptive Statistics

	Gender			**Location**		
	(1)	(2)	(3)	(4)	(5)	(6)
	Female	**Male**	p	**Urban**	**Rural**	**P**
MoMo Usage	0.3889	0.5182	0.0000	0.3945	0.2028	0.0000
Debit Card-Usage	0.6300	0.7025	0.0026	0.7436	0.6956	0.0016
Online Banking	0.2500	0.2951	0.0485	0.1672	0.1349	0.0075
Financial literacy	2.1132	2.4206	0.0000	2.3375	2.1590	0.0000
Decision Autonomy	2.6152	3.8290	0.0000	3.3251	3.0827	0.000
Smartphone Ownership	0.1430	0.1555	0.3075	0.1672	0.1349	0.0075
Educational Attainment						
Primary educ.	0.5570	0.5286	0.0084	0.3442	0.4190	0.0000
Secondary educ.	0.2568	0.3245	0.0000	0.4255	0.2833	0.0000
Tertiary educ.	0.0430	0.0675	0.0000	0.1458	0.1055	0.0000
Age	33.6136	36.2005	0.0000	34.3540	35.3304	0.0002
Poor	0.6096	0.5634	0.0000	0.3349	0.7053	0.0000
Marital Status						
Married	0.5567	0.5642	0.4840	0.5041	0.6022	0.0000
Divorced	0.0812	0.0421	0.0000	0.0549	0.0458	0.0155
Widowed	0.0990	0.0222	0.0000	0.0648	0.0648	0.9980
Cohabitation	0.0598	0.0421	0.0003	0.0379	0.0337	0.1969
Unemployed	0.3851	0.2385	0.0000	0.3450	0.3486	0.6663

Source: Financial inclusion insight survey-2015/2016

4. Results

Extent and Drivers of Gender Inequalities in Digital Literacy

Table 2 presents the Oaxaca decomposition results, highlighting the extent of gender inequality in digital literacy and its underlying drivers. As indicated in the methods section, we present both the pooled data results (*see columns 1 and 2*) and country-by-country results (*see columns 3-10*). The analysis shows that men have higher digital literacy levels than women. The pooled data shows a gap of 0.537 points, while the country-specific analysis shows that Kenya and Tanzania have smaller gender gaps, with differences of 0.456 points and 0.436 points, respectively, compared to Nigeria (0.632 points) and Uganda (0.535 points). Further, our decomposition analysis revealed that the unequal distribution of the endowment variables in favour of men account for 87.52 percent of the gender gap in digital literacy. The country-specific analysis also shows a similar trend. In Nigeria, the unequal distribution of the endowment variables accounts for 98.73 percent of the gap. The value reduces to 82.80 percent for Uganda, then 72.81 for Kenya. In relation to the relative contributions of the individual variables, the pooled data shows that the gender differences in endowment of smartphones are the topmost driver of the gender inequality in digital literacy. Differences in decision autonomy also stand out as the second most important driver of gender inequality in digital literacy, explaining 21.23 percent of the pooled gap. Gender differences in educational attainment, employment (7.8%) and poverty (5.9%) also account for a significant portion of the gap. The country-by-country analysis reveals a similar trend to the pooled data results. That is, gender differences in endowment of smartphones are the topmost driver of the gender gap in digital literacy for all countries except Tanzania, where it contributes 11.02 percent, making it second to decision autonomy, which accounts for 31.88 percent of the gap. Also, gender differences in endowment of educational attainment, employment status and poverty consistently account for a sizable proportion of the gap in all the four countries. The second and third important drivers of for up to 31.88 percent in Tanzania.

Table 2: Oaxaca decomposition of drivers of gender inequality in digital literacy

	Pooled		Kenya		Tanzania		Nigeria		Uganda	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	endowments	PCT	endowments	PCT	endowments	PCT	endowments	PCT	endowments	PCT
Men (M)	3.230***		3.965***		3.225***		3.118***		2.714***	
	(0.026)		(0.057)		(0.054)		(0.041)		(0.061)	
Women (W)	2.693***		3.509***		2.789***		2.486***		2.179***	
	(0.021)		(0.044)		(0.040)		(0.041)		(0.037)	
Gender Gap (M-W)	0.537***		0.456***		0.436***		0.632***		0.535***	
	(0.034)		(0.072)		(0.067)		(0.058)		(0.071)	
Endowments (Explained)	0.470***	87.52%	0.332***	72.81%	0.304***	69.72%	0.624***	98.73%	0.443***	82.80%
	(0.028)		(0.058)		(0.053)		(0.051)		(0.054)	
Coefficients	0.018	3.35%	0.177***	38.81%	0.082	18.81%	-0.044	-6.96%	-0.018	-3.36%
	(0.036)		(0.065)		(0.073)		(0.062)		(0.081)	
Interaction	0.049	9.13%	-0.053	-11.62%	0.050	11.47%	0.051	8.06%	0.110	20.56%
	(0.031)		(0.048)		(0.063)		(0.057)		(0.071)	
Independent-vari.										
Decision Autonomy	0.114***	21.23%	0.056***	12.28%	0.139***	31.88%	0.156***	24.68%	0.065***	12.15%
	(0.013)		(0.021)		(0.023)		(0.031)		(0.021)	
Smartphone ownership	0.149***	27.75%	0.166***	36.40%	0.048	11.02%	0.178***	28.16%	0.121***	22.62%
	(0.014)		(0.032)		(0.030)		(0.025)		(0.024)	
Financial Literacy	0.019***	3.54%	0.019**	4.17%	0.016**	11.01%	0.013***	2.06%	0.034***	6.36%
	(0.003)		(0.008)		(0.007)		(0.005)		(0.009)	
Employment status	0.042***	7.8%	0.028***	6.14%	0.010	2.29%	0.074***	11.71%	0.038***	7.10%
	(0.006)		(0.009)		(0.012)		(0.015)		(0.011)	
Primary education	-0.044***	-8.19%	-0.050***	-10.96%	-0.004	-0.92%	-0.014***	-2.22%	-0.005	-0.93%
	(0.006)		(0.016)		(0.010)		(0.005)		(0.010)	
Secondary education	0.089***	16.57%	0.055**	12.06%	0.065***	14.91%	0.069***	10.92%	0.107***	20%
	(0.009)		(0.025)		(0.018)		(0.014)		(0.022)	
Tertiary education	0.068***	12.66%	0.074***	16.23%	0.015*	3.44%	0.043***	7.33%	0.035***	6.54%
	(0.008)		(0.026)		(0.009)		(0.010)		(0.013)	
Age	-0.001	-0.19%	-0.037***	-8.11%	-0.003	0.69%	0.003	0.47%	0.002	0.37%
	(0.003)		(0.012)		(0.009)		(0.003)		(0.003)	
Rural	-0.014***	-2.61%	-0.003	0.66%	-0.042***	-9.63%	-0.013***	-2.06%	-0.008*	1.49%
	(0.003)		(0.004)		(0.011)		(0.005)		(0.005)	
Poverty	0.032***	5.95%	0.027***	5.92%	0.004	0.92%	0.041***	6.49%	0.044***	8.22%
	(0.006)		(0.009)		(0.003)		(0.012)		(0.015)	
Married	0.005**	0.93%	-0.003	-0.65%	-0.000	-0.00%	0.044***	6.96%	0.000	0.00%
	(0.002)		(0.003)		(0.004)		(0.011)		(0.004)	
Divorced	0.007***	1.30%	-0.000	0.00%	0.018**	4.13%	-0.005	-0.79%	-0.001	-0.19%
	(0.002)		(0.001)		(0.008)		(0.003)		(0.006)	
Widower	0.029***	0.54%	0.002	0.44%	0.038***	8.72%	0.043***	6.80%	0.018	3.36%
	(0.006)		(0.008)		(0.012)		(0.013)		(0.015)	
Cohabitation	-0.001	-0.19%	-0.002	-0.44%	-0.000	-0.00%	0.000	0.00%	-0.008*	-1.49%
	(0.001)		(0.002)		(0.001)		(0.001)		(0.005)	
Tanzania	0.004**	0.744%								
	(0.002)									
Nigeria	-0.086***	-16.01%								
	(0.008)									
Uganda	0.057***	10.61%								
	(0.006)									
Constant										
Observations	15,181	15,181	2,991	2,991	2,998	2,998	6,216	6,216	2,976	2,976

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Extent and Drivers of Locational Inequalities in Digital Literacy

The analysis presented in Table 3 highlights the drivers of locational inequality in digital literacy between urban and rural areas, with a decomposition of contributions from endowments, coefficients, and interaction effects. Across all samples, urban residents consistently exhibit higher digital literacy levels than their rural counterparts. The urban-rural differences range from 0.984 to 1.195, with a substantial portion of these differences attributed to endowment disparities. The decomposition analysis revealed that the unequal distribution of endowment variables especially decision autonomy, smartphone ownership and higher educational attainment in favour of urban dwellers account for 78.66 percent of the location gap in DL in Kenya, 59.01% in Tanzania, 87.83 percent in Nigeria and 74.04 percent in Uganda. These results underscore the critical role of equal allocation of resources such as education, technology, and income in shaping equality in digital literacy. These findings paint a clear picture: improving digital literacy in rural areas will require more than just access to devices. It demands deliberate investments in education, empowerment, and digital infrastructure. Bridging the digital divide means ensuring that a rural child has the same chance to own a smartphone, complete secondary school, and make independent decisions as their urban counterpart. Without such inclusive efforts, location will continue to determine who thrives in the digital age and who is left behind.

Table 3: Drivers of locational inequality in Digital Literacy

	Pooled		Kenya		Tanzania		Nigeria		Uganda	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	endowments	PCT	endowments	PCT	endowments	PCT	endowments	PCT	endowments	
Urban	3.758***		4.298***		3.724***		3.660***		3.224***	
	(0.031)		(0.059)		(0.063)		(0.053)		(0.070)	
Rural	2.563***		3.315***		2.587***		2.494***		2.053***	
	(0.019)		(0.041)		(0.035)		(0.034)		(0.033)	
difference	1.195***		0.984***		1.137***		1.167***		1.171***	
	(0.036)		(0.072)		(0.072)		(0.062)		(0.078)	
endowments	0.985***	82.43%	0.774***	78.66%	0.671***	59.01%	1.025***	87.83%	0.867***	74.04%
	(0.030)		(0.055)		(0.061)		(0.052)		(0.059)	
coefficients	0.426***	35.65%	0.176***	17.89%	0.496***	43.62%	0.495***	42.42%	0.267***	22.80%
	(0.034)		(0.064)		(0.068)		(0.061)		(0.079)	
interaction	-0.216***	-18.08%	0.034	3.46%	-0.030	-2.64%	-0.353***	-30.225%	0.037	3.16%
	(0.026)		(0.045)		(0.058)		(0.046)		(0.067)	
Decision Autonomy	0.030***	2.51%	0.015**	1.52%	0.023**	2.02%	0.046***	3.94%	0.029***	2.48%
	(0.005)		(0.007)		(0.009)		(0.010)		(0.009)	
Smart Phone	0.401***	33.57%	0.363***	36.89%	0.408***	35.88%	0.400***	34.28%	0.218***	18.62%
	(0.020)		(0.037)		(0.043)		(0.035)		(0.032)	
Financial Literacy	0.020***	1.67%	0.007	0.711%	0.021***	1.85%	0.014**	1.20%	0.017***	1.45%
	(0.003)		(0.007)		(0.007)		(0.007)		(0.006)	
Unemployed	0.001	0.08%	0.012**	1.22%	-0.020**	1.76%	0.010**	0.86%	-0.011**	-0.94%
	(0.002)		(0.005)		(0.008)		(0.004)		(0.005)	
Primary	-0.046***	-3.85%	-0.104***	-10.57%	-0.055***	-4.84%	-0.013**	-1.11%	-0.121***	-10.33%
	(0.006)		(0.021)		(0.014)		(0.006)		(0.021)	
Secondary	0.152***	12.72%	0.195***	19.82%	0.126***	11.08%	0.125***	10.71%	0.232***	19.81%
	(0.011)		(0.031)		(0.022)		(0.017)		(0.030)	
Tertiary	0.042***	3.51%	0.141***	14.33%	0.032***	2.81%	0.027***	2.31%	0.170***	14.52%
	(0.007)		(0.029)		(0.011)		(0.010)		(0.030)	
Age	0.004**	0.33%	0.052***	5.28%	0.005	0.44%	-0.002	-0.17%	0.014	1.20%
	(0.002)		(0.012)		(0.004)		(0.004)		(0.010)	
Female	-0.001	-0.08%	-0.002	0.20%	-0.011*	0.97%	0.002	0.17%	0.000	0.00%
	(0.002)		(0.003)		(0.006)		(0.003)		(0.003)	
Poor	0.311***	26.03%	0.116***	11.79%	0.144***	12.66%	0.413***	35.39%	0.333***	28.44%
	(0.015)		(0.022)		(0.039)		(0.027)		(0.031)	
Married	0.013***	1.09%	-0.022**	-2.24%	0.008	0.70%	0.017***	1.45%	-0.028*	-2.39%
	(0.004)		(0.010)		(0.011)		(0.006)		(0.015)	
Divorced	-0.003**	-0.25%	0.003	0.30%	-0.005	0.44%	-0.000	-0.00%	-0.001	0.09%
	(0.001)		(0.005)		(0.004)		(0.001)		(0.002)	
Widower	-0.000	-0.00%	-0.002	-0.20%	-0.005	0.44%	-0.014**	-1.20%	0.006	0.51%
	(0.002)		(0.004)		(0.004)		(0.006)		(0.006)	
Cohabitation	-0.000	-0.00%	0.000	0.00%	-0.000	-0.00%	0.000	0.00%	0.009	0.79%
	(0.000)		(0.001)		(0.001)		(0.001)		(0.005)	
Tanzania	-0.002	-0.17%								
	(0.001)									
Nigeria	0.034***	2.85%								
	(0.006)									
Uganda	0.030***	2.51%								
	(0.006)									
Constant										
Observations	15,181	15,181	2,991	2,991	2,998	2,998	6,216	6,216	2,976	2,976

4.1. *Assess the contribution of digital literacy to gender and locational disparities in digital financial inclusion.*

Gender Inequalities in DFI

Table 4 presents the decomposition results examining gender disparities in digital financial inclusion (DFI) across mobile money, debit card usage, and online banking. The pooled results (columns 1–3) reveal that the observed differences in individual and household characteristics account for 68.75% of the gender gap in mobile money usage, 53.96% of the gap in debit card usage, and over 81% of the gap in online banking. These findings suggest that a significant portion of gender disparities in DFI can be attributed to observable factors, with the remaining gap possibly due to differences in returns to characteristics or unobserved factors.

A closer look at the contribution of individual variables shows that digital literacy consistently emerges as the most influential factor across all financial services. In the pooled sample, digital literacy accounts for 26.3% of the gender gap in mobile money, 23.8% in debit card usage, and approximately 17.1% in online banking. This pattern holds across most countries, though the magnitude varies. For example, in Kenya and Nigeria, digital literacy explains a substantial portion of the gender gap in mobile money and online banking, while in Tanzania, the effect is more muted. These results strongly affirm that digital literacy is a core driver of gender inequality in DFI. Women's lower levels of digital literacy limit their ability to navigate mobile and internet-based financial services, excluding them from an increasingly digital financial ecosystem. This reinforces structural inequalities, as digital skills are increasingly essential not only for accessing financial services but also for building economic independence (UNESCO, 2018; OECD, 2019).

	Pooled			Kenya			Tanzania			Nigeria			Uganda		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	MoMo	Debit Card	Online Banking	MoMo	Debit Card	Online Banking	MoMo	Debit Card	Online Banking	MoMo	Debit Card	Online Banking	MoMo	Debit Card	Online Banking
Male	0.2971	0.749	0.1489	0.66586	0.6796	0.3531	0.46794	0.7604	0.3844	0.01392	0.77806	.05208	0.40439	0.7134	0.1045
Female	0.2285	0.686	0.1053	0.56872	0.5817	0.2812	0.33889	0.7426	0.3181	0.00686	0.72820	.03306	0.27305	0.6549	0.0631
Gender Difference	0.0685	0.063	0.0436	0.0971	0.0979	0.0719	0.1290	0.0178	0.0662	0.00706	0.0498	.01901	0.13134	0.0585	0.0413
Total explained	**0.0471**	**0.034**	0.0355	0.065	0.0146	0.0245	0.0774	0.0118	0.0729	0.00526	0.0301	.01423	0.09484	-.0060	0.0310
	[68.75%]	**[53.96%]**	[81.42%]	[66.95%]	[14.9%]	[34.01%]	[60%]	[66.29%]	[110.27%]	[74.50%]	[60%]	[74.86%]	[72.21%]	[10.25%]	[75.06%]
Contribution of individual															
Digital Literacy	**0.018*** **	**0.015*** **	**-0.007*** **	**0.037*** **	**0.015*** **	**-0.026*** **	**0.048*** **	**-0.001**	**-0.027*** **	**0.001**	**0.017*** **	**-0.002**	**0.058*** **	**-0.002**	**0.016*** *
	(0.001)	**(0.003)**	**(0.002)**	**(0.004)**	**(0.006)**	**(0.009)**	**(0.003)**	**(0.004)**	**(0.009)**	**(0.000)**	**(0.004)**	**(0.001)**	**(0.004)**	**(0.011)**	**(0.008)**
Financial Literacy	0.002***	0.006***	0.001	0.001	0.003	0.020	0.010***	0.014	0.019	0.001	0.003**	0.001	0.000	-0.004	0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.006)	(0.014)	(0.003)	(0.015)	(0.014)	(0.000)	(0.001)	(0.001)	(0.004)	(0.006)	(0.003)
Primary education	-0.001**	-0.000	-0.106***	-0.004	0.004	-0.043***	-0.003*	0.007	-0.044***	-0.146***	0.002	0.000	-0.004	-0.005	0.000
	(0.001)	(0.001)	(0.003)	(0.003)	(0.008)	(0.014)	(0.002)	(0.037)	(0.014)	(0.000)	(0.002)	(0.000)	(0.004)	(0.006)	(0.000)
Secondary education	0.005***	0.004	-0.015***	0.008***	-0.001	0.018	0.010***	-0.011	0.017	0.020***	-0.000	-0.136***	0.016*	0.058	-0.079***
	(0.001)	(0.003)	(0.002)	(0.003)	(0.005)	(0.012)	(0.003)	(0.024)	(0.012)	(0.001)	(0.002)	(0.002)	(0.009)	(0.045)	(0.009)
Tertiary education	-0.000	0.003*	0.115***	0.013***	0.011	0.022	0.001	-0.000	0.025*	0.127***	0.011***	0.139***	0.001*	-0.036	0.082***
	(0.000)	(0.002)	(0.003)	(0.001)	(0.007)	(0.014)	(0.001)	(0.008)	(0.014)	(0.001)	(0.003)	(0.001)	(0.001)	(0.040)	(0.010)
age	0.001***	-0.001	0.002	0.006**	-0.011**	-0.008	0.008*	-0.004	-0.008	-0.001	-0.006*	0.000	0.002	-0.010	0.007
	(0.000)	(0.002)	(0.002)	(0.003)	(0.006)	(0.022)	(0.004)	(0.017)	(0.022)	(0.001)	(0.003)	(0.000)	(0.002)	(0.007)	(0.006)
Married	-0.004***	0.002	-0.002	-0.015***	0.004	0.021	0.010***	-0.011	0.021	0.000	0.006**	0.005**	-0.001	-0.013	0.005
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.023)	(0.002)	(0.027)	(0.023)	(0.000)	(0.003)	(0.002)	(0.001)	(0.016)	(0.005)
Divorced	-0.001	-0.000	-0.000	-0.003*	-0.000	0.000	-0.002	0.000	0.000	0.000	0.000	0.000	0.002	0.003	-0.008
	(0.001)	(0.001)	(0.000)	(0.002)	(0.001)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.002)	(0.019)	(0.012)
Widower	-0.002	0.004	0.001	-0.008	-0.015*	-0.005	0.000	0.030*	-0.005	0.000	0.008	0.000	-0.001	0.003	0.000
	(0.002)	(0.004)	(0.001)	(0.006)	(0.008)	(0.015)	(0.006)	(0.016)	(0.015)	(0.000)	(0.007)	(0.000)	(0.007)	(0.024)	(0.000)
Cohabitation	-0.001***	-0.000	0.001**	0.000	0.000	0.000	-0.001	0.025	0.000	-0.000	-0.000	0.000	-0.007***	0.008	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.025)	(0.000)	(0.000)	(0.001)	(0.000)	(0.002)	(0.011)	(0.000)

Poor	0.002***	-0.001**	-0.002	0.008***	0.000	0.002	0.002***	-0.000	0.002	0.002***	-0.002**	-0.000	0.013***	-0.000	-0.002
	(0.000)	(0.000)	(0.001)	(0.002)	(0.001)	(0.005)	(0.001)	(0.004)	(0.005)	(0.001)	(0.001)	(0.001)	(0.003)	(0.002)	(0.004)
Rural	-0.001***	-0.002	-0.000	-0.000	-0.005**	-0.004	-0.013***	-0.034**	-0.004	-0.000	0.003	-0.001	-0.003	-0.012	0.009
	(0.000)	(0.001)	(0.000)	(0.000)	(0.003)	(0.012)	(0.003)	(0.017)	(0.013)	(0.000)	(0.003)	(0.001)	(0.002)	(0.012)	(0.007)
Employed	0.012***	0.009***	0.007***	0.024***	0.010*	0.024	0.008	0.015	0.024	0.002*	0.007***	0.007**	0.018***	0.004	0.005
	(0.001)	(0.002)	(0.002)	(0.004)	(0.005)	(0.022)	(0.006)	(0.021)	(0.022)	(0.001)	(0.002)	(0.003)	(0.006)	(0.019)	(0.005)
Tanzania	-0.001***	0.002***	0.002												
	(0.000)	(0.001)	(0.001)												
Nigeria	0.015***	-0.009***	0.036***												
	(0.001)	(0.002)	(0.003)												
Uganda	0.002***	0.001	0.005***												
	(0.001)	(0.001)	(0.001)												
Observations	15,181	3,482	3,482	2,991	903	303	2,998	303	303	6,216	1,956	1,956	2,976	320	320

Location Inequalities in DFI

Table 5 presents the decomposition results examining the contribution of digital literacy to urban–rural disparities in DFI, specifically mobile money usage, debit card usage, and online banking. The analysis reveals that urban residents consistently exhibit higher levels of DFI than their rural counterparts, with locational gaps of 19.2 percentage points in mobile money, 4.5 points in debit card use, and 1.8 points in online banking. More importantly, digital literacy emerges as a major explanatory factor. In the pooled results, digital literacy alone accounts for 27.03% of the mobile money gap, 24.66% of the debit card gap, and 15.49% of the online banking gap—making it one of the largest individual contributors to these disparities. This suggests that if rural populations had the same level of digital literacy as urban dwellers, nearly one-third of the locational inequality in mobile money usage could be eliminated. This pattern holds across countries. In Kenya, digital literacy explains 34.55% of the mobile money gap and 25.48% of the online banking gap. In Nigeria, though the overall explained share is quite high (95.24% for mobile money), digital literacy contributes more modestly—about 15% to mobile money and a negative share to online banking, possibly due to interactions with other factors. In Tanzania, digital literacy accounts for 40% of the gap in online banking and 21% in mobile money, though its contribution to debit card use is minimal. Uganda presents the most remarkable case: digital literacy explains 45.15% of the mobile money gap and a staggering 68.97% of the online banking gap. These findings emphasize that while the magnitude of the DFI gap varies by country, digital literacy consistently stands out as a powerful determinant. Closing the digital skills gap between urban and rural populations could substantially reduce locational inequalities in access to digital financial services across Sub-Saharan Africa.

	Pooled			Kenya			Tanzania			Nigeria			Uganda		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	MoMo	Debit Card	Online Banking	MoMo	Debit Card	Online Banking	MoMo	Debit Card	Online Banking	MoMo	Debit Card	Online Banking	MoMo	Debit Card	Online Banking
Urban	0.3968	0.74258	0.1402	0.70094	0.7039	0 .35307	0.6018	0.7727	0.35227	.0127	0.7511	0.05769	0.5357	0.7834	0.0848
Rural	0.2044	0.69797	0.1218	0.5504	0.5637	0.28635	0.2861	0.7244	0.33070	.0084	0.7501	0.04976	0.2500	0.6103	0.06451
location	0.1924	0.0446	0.0183	0.15050	0.14018	0.06671	0.3156	0.04831	0.02156	.0042	0.0010	0.0079	0.2857	0.1731	0.0203
Difference															
Total explained	0.1136	0.0389	0.0163	0.08408	0.0527	0.04426	0.1230	-0.00791	0.06587	.0040	0.0615	0.0003	0.1853	0.0663	0.0198
	[59.04%]	[87.22%]	[89.07%]	[55.86%]	[37.59%]	[66.35%]	[38.97%]	[16.37%]	[305%]	[95.24%]	[304.73%]	[3.79%]	[64.05%]	[38.30%]	[97.53%]
Digital Literacy	0.052***	0.011***	0.005***	0.052***	0.021**	0.017**	0.117***	-0.009	0.040***	-0.001	0.015***	-0.016***	0.129***	0.011	0.014*
	(0.003)	(0.004)	(0.001)	(0.008)	(0.010)	(0.008)	(0.009)	(0.012)	(0.014)	(0.001)	(0.003)	(0.002)	(0.010)	(0.023)	(0.009)
Financial Literacy	0.001	0.001	-0.000	-0.001	0.004	-0.003	0.004	-0.001	-0.005	0.000	0.004***	-0.000	0.002	0.000	0.001
	(0.001)	(0.000)	(0.000)	(0.002)	(0.005)	(0.005)	(0.002)	(0.007)	(0.006)	(0.000)	(0.001)	(0.001)	(0.003)	(0.004)	(0.004)
Primary education	-0.009***	-0.001	-0.004	-0.012***	-0.003	-0.004	-0.010**	0.003	-0.131***	-0.137***	0.004*	0.000	-0.036**	-0.048**	-0.314***
	(0.002)	(0.002)	(0.012)	(0.003)	(0.016)	(0.024)	(0.005)	(0.017)	(0.015)	(0.000)	(0.002)	(0.000)	(0.016)	(0.020)	(0.008)
Secondary education	0.016***	0.014**	0.003	0.022***	0.014	0.004	0.021***	0.029	0.132***	0.031***	0.008	-0.079***	0.037**	0.072***	0.067***
	(0.003)	(0.007)	(0.003)	(0.004)	(0.019)	(0.015)	(0.007)	(0.041)	(0.013)	(0.001)	(0.006)	(0.001)	(0.019)	(0.023)	(0.010)
Tertiary education	0.001**	0.001	-0.006	0.025***	0.014***	0.009	0.002	-0.006	0.003	0.106***	-0.007	0.076***	0.020***	0.010	0.247***
	(0.001)	(0.004)	(0.009)	(0.002)	(0.004)	(0.012)	(0.003)	(0.023)	(0.011)	(0.001)	(0.005)	(0.002)	(0.002)	(0.020)	(0.009)
age	-0.010***	0.009***	0.000	-0.025***	0.020*	0.005	-0.002*	0.007	-0.001	-0.002	0.000	0.000	-0.010**	0.022	-0.002
	(0.001)	(0.002)	(0.001)	(0.004)	(0.012)	(0.010)	(0.001)	(0.008)	(0.003)	(0.002)	(0.001)	(0.002)	(0.004)	(0.022)	(0.005)
Married	-0.008***	-0.004*	0.000	-0.011***	-0.027***	0.006	-0.016***	0.004	-0.019**	-0.000	0.000	-0.012***	0.002	0.017	-0.001
	(0.002)	(0.002)	(0.000)	(0.003)	(0.007)	(0.005)	(0.005)	(0.020)	(0.009)	(0.002)	(0.003)	(0.003)	(0.007)	(0.019)	(0.003)
Divorced	0.000	0.000**	-0.001	0.001***	0.001	-0.002	0.002**	0.003	-0.002	0.000	-0.001	0.000	-0.000	0.002	0.004
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.006)	(0.006)	(0.000)	(0.001)	(0.000)	(0.001)	(0.007)	(0.008)
Widower	-0.000	0.000	0.000	-0.001	-0.002	0.002	0.001	0.001	0.014**	0.001	-0.000	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)	(0.002)	(0.001)	(0.007)	(0.006)	(0.001)	(0.001)	(0.001)	(0.002)	(0.005)	(0.000)

Cohabitation	0.000*	-0.000	0.000	-0.000	0.000	0.000	0.001	-0.000	0.007***	0.000	0.006***	0.000	0.001	-0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.007)	(0.003)	(0.000)	(0.002)	(0.000)	(0.001)	(0.006)	(0.000)
Poor	0.018***	0.014**	0.003***	0.026***	0.009	0.005	0.019*	0.010	0.032**	0.001	0.037***	0.003	0.042**	-0.007	0.000
	(0.004)	(0.006)	(0.001)	(0.008)	(0.011)	(0.012)	(0.011)	(0.015)	(0.016)	(0.001)	(0.006)	(0.003)	(0.018)	(0.036)	(0.000)
Rural	-0.001	-0.007**	-0.003**	-0.000	-0.003	0.001	-0.003	-0.046*	-0.014	0.000	-0.005*	-0.003**	0.000	0.000	0.003
	(0.001)	(0.003)	(0.001)	(0.000)	(0.002)	(0.001)	(0.003)	(0.024)	(0.011)	(0.001)	(0.003)	(0.001)	(0.001)	(0.005)	(0.005)
Unemployed	0.003***	-0.001	0.000	0.008***	0.005*	0.005	-0.011***	-0.003	0.010	0.005**	0.000	0.017***	-0.001	-0.009	0.000
	(0.000)	(0.000)	(0.001)	(0.002)	(0.003)	(0.004)	(0.003)	(0.009)	(0.008)	(0.002)	(0.002)	(0.004)	(0.001)	(0.008)	(0.001)
Tanzania	-0.000	0.003***	0.002												
	(0.000)	(0.001)	(0.002)												
Nigeria	0.051***	-0.002	0.032***												
	(0.001)	(0.001)	(0.003)												
Uganda	0.004***	-0.001	0.013***												
	(0.002)	(0.001)	(0.002)												
Observations	15,181	3,482	3,482	2991	903	903	2,998	303	303	6,216	1,956	1,956	2,976	320	320

Robustness Checks

As indicated in the methodological section, the study employed the Yun multivariate decomposition technique to validate and further unpack the findings previously obtained using Fairlie's decomposition. Table 6 presents the summary results of the Yun multivariate decomposition (full table available in the appendix-Table A2) assessing the contribution of digital literacy to gender inequalities in DFI. The results confirm that the endowment effect, which represents differences in characteristics between men and women, accounts for the majority of the gender gap in digital financial inclusion (DFI) across all three DFS: mobile money, debit card usage, and online banking. Specifically, 68.85% of the gender gap in mobile money usage, 76.55% in debit card usage, and 76.56% in online banking can be attributed to differences in endowments. This aligns closely with the earlier decomposition results and reinforces the argument that structural inequalities are the primary drivers of DFI gaps.

Among all predictors, digital literacy consistently emerges as the most significant contributor to gender inequality in DFI. Specifically, digital literacy alone explains 63.33% of the gender gap in mobile money usage, 21.30% in debit card usage, and a striking 57.38% in online banking. These findings suggest that even when controlling for other important factors such as financial literacy, education, employment, and household characteristics, digital literacy remains the strongest predictor of why women are significantly less likely than men to use digital financial tools. This result is not surprising, as access to and ability to navigate digital platforms are prerequisites for engaging with digital financial services. Without the necessary digital skills, women are more likely to experience barriers in account registration, PIN and password management, mobile app navigation, and interpreting digital transaction records. These constraints not only reduce adoption but may also erode trust and discourage regular use (GSMA, 2021; World Bank, 2022).

Table 6: Drivers of Gender Inequality in DFI (Yun multivariate decomposition)

	Mobile Money		Debit Card Usage		Online Banking	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	E	Percentage contribution	E	Percentage Contribution	E	Percentage Contribution
E	0.047***	68.85%	0.066***	76.55%	0.024***	76.56%
	(0.004)		(0.014)		(0.003)	
C	0.021***	31.15%	0.020	23.45%	0.007	23.44%
	(0.006)		(0.035)		(0.009)	
R	0.069***		0.086***		0.032***	
	(0.005)		(0.029)		(0.009)	
Digital Literacy	**0.044*** **	**63.33%**	**0.018*** **	**21.30%**	**0.018*** **	**57.38%**
	(0.002)		**(0.004)**		**(0.002)**	
Other variables	Yes		Yes		Yes	
Observations	15,381	15,381	15,381	15,381	15,381	15,381

Other variables-financial literacy, educational attainment, age, marital status, poverty, gender, employment status and country dummies

Table 7 presents the summary results of the Yun multivariate decomposition (full table available in the appendix-Table A2) assessing the contribution of digital literacy to locational inequalities in DFI. These results align closely with the earlier findings from the Fairlie decomposition, providing robust validation. The decomposition shows that the model explains a substantial share of the locational disparities in DFI: 59.07% of the rural-urban gap in mobile money usage, 102.41% in debit card usage, and 107.45% in online banking. The over-100% explanatory power in debit card and online banking usage suggests that the characteristics included in the model not only account for the observed gaps but also offset counteracting effects from unexplained components.

A closer look at the contribution of individual variables confirms that digital literacy remains the most significant driver of locational disparities. Specifically, differences in digital literacy explain 28.76% of the rural-urban gap in debit card usage, 32.71% in mobile money usage, and 37.94% in online banking usage. These findings reinforce the central argument that unequal access to digital skills and competencies significantly limits the participation of rural residents in the digital financial ecosystem. While other factors—such as poverty status, secondary and tertiary education, and regional dummies—also contribute to the explained gap, none have as large or as consistent an effect as digital literacy. In particular, poverty explains a significant portion of the gap in debit card (34.54%) and online banking usage (24.60%), suggesting that financial constraints amplify the digital divide. Still, these constraints are compounded when basic digital competencies are lacking, especially in rural areas where infrastructure and access to digital training are limited.

Table 7: Drivers of locational Inequality in DFI (Yun multivariate decomposition)

	Mobile Money		Debit Card Usage		Online Banking	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	E	Percentage contribution	E	Percentage Contribution	E	Percentage Contribution
E	0.043***	59.07%	0.138***	102.41%	0.063***	107.45%
	(0.005)		(0.011)		(0.005)	
C	0.080***	40.93%	-0.063**	-2.41%	-0.004	-7.45%
	(0.008)		(0.029)		(0.012)	
R	0.123***		0.075***		0.058***	
	(0.005)		(0.024)		(0.012)	
Digital Literacy	**0.055*** **	**28.76%**	**0.035*** **	**32.71%**	**0.022*** **	**37.94%**
	(0.003)		**(0.007)**		**(0.004)**	
Other Variables	Yes		Yes		Yes	
Observations	15,381	15,381	15,381	15,381	15,381	15,381

Other variables-financial literacy, educational attainment, age, marital status, poverty, gender, employment status and country dummies

5. **Conclusion and recommendations**

Digital financial services are seen as the future of financial service provision due to their affordability, convenience, and potential to bridge financial inclusion gaps by providing access to underserved populations. Yet, the emerging data shows that vulnerable groups, including women and rural dwellers, record lower levels of adoption relative to urban dwellers and men. While some studies have attributed these inequalities partly to differences in digital literacy among these groups, empirical evidence validating disparities in digital literacy, its drivers and impact on DFI inequalities is unavailable. Thus, this study sought to close these gaps in the literature.

Secondary data from the 2017 Financial Inclusion Insights survey which covered 4 SSA countries: Nigeria, Kenya, Tanzania and Uganda were analysed. By way of an estimation approach, this study employed the Blinder–Oaxaca decomposition method to quantify the degree and drivers of gender and locational inequality in digital financial inclusion. The study also used the Fairlie decomposition method to quantify the effect of digital literacy on gender and locational inequality in digital financial inclusion. The Blinder–Oaxaca decomposition method confirmed significant inequalities in digital literacy in favour of men across all four countries. From the decomposition analysis, the main drivers of gender inequality are decision autonomy, education level and financial literacy, Locational inequality are also driven by smartphone ownership, decision autonomy, educational attainment, and financial literacy. The decomposition of the inequalities in DFI which was also conducted using first

the Fairlie decomposition method and the multivariate decomposition for the nonlinear response model revealed inequalities in digital literacy as the main driver of gender and locational inequalities in digital financial inclusion.

Based on the findings, policymakers in Sub-Saharan Africa should prioritise policies aimed at reducing gender and locational inequalities in digital literacy to bridge disparities in digital financial inclusion. First, efforts should enhance women's decision-making autonomy by promoting gender equity in households and communities. This can be achieved through initiatives that empower women to participate actively in financial and digital decisions. Second, financial literacy programs tailored to women and rural populations should be implemented to improve their understanding and use of digital financial services. Additionally, increasing access to smartphones for underserved groups is crucial; this can be facilitated through subsidies or affordable financing schemes to ensure affordability. Finally, significant investment in education is necessary to close gaps in digital competencies across gender and location. These strategies collectively address structural inequalities and promote equitable access to digital financial services, fostering inclusive economic growth in the region.

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Appendix

Table A1: Drivers of Gender Inequality in DFI (Yun multivariate decomposition)

	Mobile Money		Debit Card Usage		Online Banking	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	E	Percentage contribution	E	Percentage Contribution	E	Percentage Contribution
E	0.047***	68.85%	0.066***	76.55%	0.024***	76.56%
	(0.004)		(0.014)		(0.003)	
C	0.021***	31.15%	0.020	23.45%	0.007	23.44%
	(0.006)		(0.035)		(0.009)	
R	0.069***		0.086***		0.032***	
	(0.005)		(0.029)		(0.009)	
Digital Literacy	0.044***	63.33%	0.018***	21.30%	0.018***	57.38%
	(0.002)		(0.004)		(0.002)	
Financial literacy	0.003***	4.21%	0.004**	5.08%	0.002	4.88%
	(0.001)		(0.002)		(0.001)	
Primary education	-0.003***	-3.94%	0.004	4.10%		
	(0.001)		(0.005)			
Secondary education	0.006***	8.67%	0.003	3.54%		
	(0.002)		(0.005)			
Tertiary education	0.009***	13.67%	0.011***	12.33%		
	(0.001)		(0.004)			
age	0.001***	1.68%	-0.006***	-6.80%	-0.000	-1.54%
	(0.000)		(0.002)		(0.000)	
Married	-0.006***	-8.69%	0.000	0.41%	-0.001*	-4.17%
	(0.001)		(0.001)		(0.001)	
Divorced	-0.000	-0.68%	-0.001	-0.90%	-0.002**	-5.29%
	(0.001)		(0.002)		(0.001)	
Widower	-0.002	-3.58%	0.003	3.77%	-0.001	-1.92%
	(0.003)		(0.007)		(0.004)	
Cohabitation	-0.001***	-1.30%	0.001	1.02%	0.001*	4.19%
	(0.000)		(0.002)		(0.001)	
Poor	0.006***	9.07%	0.002*	2.71%	0.001	3.77%
	(0.001)		(0.001)		(0.001)	
Rural	-0.000***	-0.36%	-0.001	-0.78%	0.000	0.09%
	(0.000)		(0.001)		(0.000)	
Unemployed	0.014***	20.58%	0.021***	24.32%	0.006***	19.18%
	(0.002)		(0.005)		(0.002)	
Tanzania	0.000***	0.71%	-0.005***	-5.64%	-0.000	0.00%
	(0.000)		(0.002)		(0.000)	
Nigeria	-0.025***	-36.71%	0.013***	15.14%	-0.005***	15.62%
	(0.001)		(0.004)		(0.001)	
Uganda	0.001***	2.17%	-0.003	-3.06%	0.002***	5.29%
	(0.000)		(0.003)		(0.000)	
Constant	0.000		0.000		0.000	-0.031
	(0.000)		(0.000)		(0.000)	(0.051)
Observations	15,381	15,381	15,381	15,381	15,381	15,381

Table A2: Drivers of locational Inequality in DFI (Yun multivariate decomposition)

	Mobile Money		Debit Card Usage		Online Banking	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	E	Percentage contribution	E	Percentage Contribution	E	Percentage Contribution
E	0.043***	59.07%	0.138***	102.41%	0.063***	107.45%
	(0.005)		(0.011)		(0.005)	
C	0.080***	40.93%	-0.063**	-2.41%	-0.004	-7.45%
	(0.008)		(0.029)		(0.012)	
R	0.123***		0.075***		0.058***	
	(0.005)		(0.024)		(0.012)	
Digital Literacy	**0.055*** **	**28.76%**	**0.035*** **	**32.71%**	**0.022*** **	**37.94%**
	(0.003)		**(0.007)**		**(0.004)**	
Financial Literacy	0.000	0.23%	0.007***	2.42%	0.000	0.62%
	(0.001)		(0.002)		(0.001)	
Primary education	-0.006***	-3.27%	0.001	-1.59%	-0.005	-7.84%
	(0.001)		(0.007)		(0.005)	
Secondary education	0.013***	6.78%	0.023***	25.87%	0.010	16.65%
	(0.003)		(0.008)		(0.010)	
Tertiary education	0.008***	4.31%	0.016***	13.98%	0.005*	8.34%
	(0.001)		(0.003)		(0.003)	
Age	-0.003***	-1.34%	0.001	5.10%	0.000	0.67%
	(0.000)		(0.001)		(0.001)	
Married	-0.005***	-2.49%	-0.002	-6.44%	0.000	0.22%
	(0.001)		(0.002)		(0.001)	
Divorced	0.000	0.11%	0.000*	1.58%	-0.000	-0.39%
	(0.000)		(0.000)		(0.000)	
Widower	0.000	0.00%	-0.000	0.03%	0.000	0.01%
	(0.000)		(0.001)		(0.000)	
Cohabitation	0.000*	0.07%	0.000	0.32%	0.000	0.38%
	(0.000)		(0.001)		(0.000)	
Poverty	0.016***	8.39%	0.061***	34.54%	0.014**	24.60%
	(0.004)		(0.009)		(0.006)	
Female	-0.000	-0.25%	-0.000***	-3.86%	-0.001**	-2.20%
	(0.001)		(0.000)		(0.001)	
Unemployed	0.000***	0.21%	-0.000	0.49%	0.000	0.10%
	(0.000)		(0.000)		(0.000)	
	-0.000	-0.11%	-0.001***	3.30%	0.000	0.49%
	(0.000)		(0.000)		(0.000)	
3.Country	0.033***	17.01%	0.004*	-3.16%	0.010***	16.97%
	(0.001)		(0.002)		(0.001)	
4.Country	0.001***	0.67%	-0.005	-2.88%	0.006***	10.91%
	(0.000)		(0.004)		(0.001)	
Constant	0.000		0.000		0.000	
	(0.000)		(0.000)		(0.000)	
Observations	15,381		15,381		15,381	

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