

Abstract

This study employs quantitative methods to analyse the results of the 2021 FinAccess Household Survey to identify socio-economic factors that affect gender inclusion in digital financial services (DFS). Key informant interviews were performed to assess the effectiveness of some existing policies on gender inclusion in DFS. Logistic regression model and multivariate probit model were used to identify the socio-economic factors affecting uptake of DFS. To investigate the drivers of gender gaps in digital financial inclusion in Kenya, the Fairlie decomposition technique was applied. Results of the regression models indicated that socio-economic factors such as residence, age, marital status, education, income, telephone ownership, possession of identification documents (ID) and financial literacy are significant for the various DFS indicators. Higher levels of education were associated with increased DFS inclusion. Lower income earners were more likely to be included in the DFS_Credit as they seek for alternative ways of getting more finances. Ownership of telephones and possession of IDs were also associated with higher uptake of DFS across all indicators. Fairlie decomposition of the gender gap for each of the DFS indicators showed that socio-economic factors explained more than 50% of the existing gender gap in the use of DFS in Kenya. Education was the major consistent factor that brings about the gender differences in DFS inclusivity, with its contribution at an average of 16% across all DFS indicators. Telephone ownership is ranked high in the explained differences in DFS_Savings and DFS_Account. Therefore, efforts aimed at bridging the gender gap in employment and education in particular financial literacy and digital skills across all gender groups should be emphasized to ensure inclusivity in DFS. Strengthening the regulatory framework, addressing infrastructural gaps, promoting affordable DFS devices and Internet connectivity and creating DFS products tailored towards a specific gender group will encourage uptake of DFS.

Keywords: *Digital Financial Inclusion, Gender, Digital financial services, Fairlie decomposition*

2. Literature review

Gender inclusion in DFS is a key issue in empowering women to realize their full potential and has been documented in many studies (see, for example, Akudugu, 2013; Karpowicz, 2014). Gender inclusivity in DFS brings more advantages to households, women owned businesses and eventually the economy at large (Liu et al., 2021). The current gender gap in financial inclusion and the gender digital divide can be traced to many common factors, ranging from unequal opportunities, structural barriers, policies, social-economic factors, and cultural settings. The overlap of these barriers creates greater risks for women to be excluded from the opportunities associated with the digitalization of finance and to prevent them from bridging the current divide (Arnold and Gammage, 2019).

Previous studies have demonstrated the indicators to consider while measuring financial inclusion. The most basic and common indicator that has been widely used in determining financial inclusion is ownership of a formal account (Allen et al., 2016). According to Zins and Weill (2016), financial inclusion determinants can be shown by looking at ownership of accounts and use of savings and credit services rendered by financial institutions. Although these are indicators of financial inclusion, factors that drive inclusivity may vary accordingly.

The determinants of DFS can be traced to financial services that are offered using digital platforms. For example, in Kenya the most common digital financial service used is M-Pesa which allows consumers to have mobile accounts that can facilitate payment, saving and remittances. M-Shwari is a common DFS that helps consumers access credit digitally (Suri and Jack, 2016). A study by Aker et al. (2016) found that with mobile money there was a greater bargaining power for women and an increase in household consumption due to increased access to cost-effective financial services.

Many regulators find it a challenge to keep an adequate understanding of the implications of evolving business models and the rise of technology in the financial sector. Policy makers struggle with resource and capacity gaps regarding technological developments. As a result, policy makers resort to regulatory frameworks that are restrictive and ill-suited for technology-driven innovation, or that exacerbate pre-existing market gaps that hinder financial inclusion (UN Women1, 2019). Many countries still have laws that discriminate against women and have a direct impact on their ability to access and use digital financial services. Women face barriers in going places, starting a job, getting paid, getting married, having children, running a business, managing assets, and getting a pension (World Bank, 2019). In some countries, husbands can legally prevent their wives from working and other countries have laws which prevent women from inheriting equally as a spouse. In some countries, women cannot be the head of household or family and other countries have laws which prevent women from traveling outside their homes (UN Women2, 2019). Laws on non-discriminatory access to credit,

Econometric model and estimation

In order to evaluate the effect of the socio-economic variables on the digital financial inclusion indicators, the logit regression model was used as follows:

$$y_i = \mathbf{X}'_i \boldsymbol{\beta}_i + \varepsilon_i; \quad y_i = 0, 1; \quad i = 1, 2, \dots, n \quad (3)$$

where $\mathbf{X}'_i \boldsymbol{\beta}_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_k x_{ik}$. In this case the \mathbf{X}'_i represent the independent variables/ socio-economic variables and y_i represents the dependent variable/ digital financial inclusion indicator for the i^{th} individual. If the i^{th} individual chooses to be financially included then $y_i = 1$, otherwise, $y_i = 0$. Equation 3 represents a model with a binary choice involving an estimation of the probability of an individual adult in Kenya being financially included (y_i) given a set of factors (\mathbf{X}'_i) which are exogenous to the individual. Since $\Pr(Y_i=1)=p_i$ and $0 \leq p_i \leq 1$, using the logit transformation we have:

$$\ln \left(\frac{p_i}{1-p_i} \right) = \mathbf{X}'_i \boldsymbol{\beta} \quad (4)$$

and $p_i = E(y_i) = \frac{e^{\mathbf{x}_i \boldsymbol{\beta}_i}}{1 + e^{\mathbf{x}_i \boldsymbol{\beta}_i}}$ for $y_i = 1$ or 0 . Table 1 presents the dependent variables used in the logit regression model described in Equation 1.

The study also used the multivariate probit model to regress a vector of correlated binary DFS indicator variables on a mixture of continuous and discrete predictors. This was specifically important since most DFS inclusion indicators are suspected to be correlated. The multivariate probit model is a generalization of the bivariate probit model. The bivariate probit model has two binary dependent variables y_1 and y_2 so that there are two latent variables: y_1^* and y_2^* . It is assumed that each observed variable takes on the value 1 if and only if its underlying continuous latent variable takes on a positive value: $y_1 = \begin{cases} 1 & \text{if } y_1^* > 0 \\ 0 & \text{if } y_1^* < 0 \end{cases}$ and $y_2 = \begin{cases} 1 & \text{if } y_2^* > 0 \\ 0 & \text{if } y_2^* < 0 \end{cases}$ with $\begin{cases} y_1^* = \mathbf{x}'_1 \boldsymbol{\beta}_1 + \varepsilon_1 \\ y_2^* = \mathbf{x}'_2 \boldsymbol{\beta}_2 + \varepsilon_2 \end{cases}$ and $\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} | \mathbf{X} \sim \mathbf{N} \left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right)$. Fitting the bivariate probit model involves estimating the values of, $\boldsymbol{\beta}_1, \boldsymbol{\beta}_2$ and ρ . The multivariate probit model has n correlated binary dependent variables (Jeliazkov and Lee, 2010).

4. Results and discussion

Descriptive Statistics

Table 3 presents descriptive statistics of the digital financial inclusion indicators and gender gap in DFS_Savings, DFS_Credit, DFS_Account and DFS_Others.

Table 3: Descriptive statistics for digital financial inclusion indicators

Sample (n)	Female		Male		Total		Gender gap
	12,159 (58.2%)		8,732 (41.8%)		20,891		
	Size	%	Size	%	Size	%	% point
DFS_Savings	7,052	58.00	5,565	63.73	12,617	60.39	-5.80
DFS_Credit	2,779	22.86	2,676	30.65	5,455	26.11	-7.79
DFS_Account	9,447	77.70	7,262	83.17	16,709	79.98	-5.47
DFS_Others	2,197	18.07	2,257	25.85	4,454	21.32	-7.78

Out of a sample of size 20,891 considered in the study, 58.2% were female and 41.8% were male. Most respondents (79.98%) had DFS_Account with either a mobile bank or mobile money, 60.39% saved through mobile banking or a mobile money provider but only 26.11% accessed credit through digital financial services. In addition, 21.32% performed other transactions through digital financial services. These transactions included use of a debit card, credit card, acquiring an insurance policy by searching online and buying the policy, access to bank account, and buying securities using digital channels.

There exists a gender gap across all the four DFS indicators. First, a gender gap of -5.47% points exist in DFS_Accounts implying fewer women have DFS account than men. Though the gap has been reducing over the years (KNBS, 2021) it still exists and should be bridged. This gender disparity in usage of mobile money and mobile bank services reflects the existence of barriers in access to mobile telephones and Internet for women compared to men. Consistent with DFS accounts, a gender gap of -5.80% points exist in access to DFS savings, implying that more women are excluded in access to DFS savings. A gender gap exists in access to DFS credit (-7.79% points) where women have lower access to DFS credit than men, 22.86% versus 30.65%, respectively. Fewer women than men (18.07% versus 25.85% respectively) conduct

Table 4 Continued

Sample (n)	Female		Male		Total	
	Size	%	Size	%	Size	%
	12,159	58.20	8,732	41.80	20,891	100
Farming	2,534	20.84	2,043	23.40	4,577	21.91
Waged	859	7.06	1,180	13.51	2,039	9.76
Casual worker	2,838	23.34	3,115	35.67	5,953	28.50
Self employed	2,073	17.05	1,173	13.43	3,246	15.54
Retired	48	0.39	98	1.12	146	0.69
Total respondents	12,159	58.20	8,732	41.80	20,891	100
<i>Residence</i>						
Rural	7,952	65.40	5,661	64.83	13,613	65.16
Urban	4,207	34.60	3,071	35.17	7,278	34.84
Total respondents	12,159	58.20	8,732	41.80	20,891	100
<i>Disability</i>						
Disabled	1,835	15.10	1,022	11.71	2,857	13.68
Not disabled	10,315	84.90	7,705	88.29	18,020	87.32
Total respondents	12,150	58.20	8,727	41.80	20,877	99.93
<i>Financial Literacy</i>						
Literate	4,827	39.77	4,338	49.75	9,165	43.94
Illiterate	7,311	60.23	4,382	50.25	11,693	56.06
Total respondents	12,138	58.20	8,720	41.80	20,858	99.84
<i>Phone Ownership</i>						
Own	9,899	81.66	7,507	86.34	17,406	83.61
Not own	2,223	18.66	1,188	13.66	3,411	16.39
Total respondents	12,122	58.23	8,695	41.77	20,817	99.65
<i>Internet Usage</i>						
Daily	8,618	71.09	5,266	60.56	13,884	66.69
Weekly	1,913	15.78	2,039	23.45	3,952	18.98
Monthly	866	7.14	770	8.86	1,636	7.86
Less often	138	1.14	129	1.48	267	1.28
Never	588	4.85	491	5.65	1,079	5.18
Total respondents	12,123	58.23	8,695	41.77	20,818	99.65
<i>Identification_Documents (IDs)</i>						
Has IDs	11,327	93.39	8,161	93.83	19,488	93.57
No IDs	802	6.61	537	6.17	1,339	6.43
Total respondents	12,129	58.24	8,698	41.76	20,827	99.69

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Table 4 Continued

Sample (n)	Female		Male		Total	
	Size	%	Size	%	Size	%
	12,159	58.20	8,732	41.80	20,891	100
Central	1,252	10.30	844	9.67	2,096	10.03
Coast	1,208	9.94	1,068	12.23	2,276	10.89
Eastern	2,109	17.35	1,554	17.80	3,663	17.53
North Eastern	636	5.23	537	6.15	1,173	5.61
Nyanza	1,765	14.52	1,191	13.64	2,956	14.15
Rift Valley	3,639	29.93	2,527	28.94	6,166	29.52
Western	1,191	9.080	764	8.75	1,955	9.36
Total respondents	12,159	58.20	8,732	41.80	20,891	100

These statistics show that 57.42% of respondents were married, 22.54% were single, 12.32% were widowed, and 7.72% were divorced. Widows made up 18.44% of female respondents and 3.78% of men. Youth (18–35) made up the majority of responders. This group has 51.41 percent female respondents and 47.56 percent male respondents. Primary education was obtained by 40.34 percent of respondents, followed by secondary education by 28.65 percent. There were 22.79 percent female responders and 13.44 percent male respondents without schooling. Women respondents are mostly low-income (95.63%), with a small percentage in the high-income category (4.37%). This was lower than the 9.86 percent of higher-income male respondents. Female respondents were mostly self-employed (17.05%), whereas men dominated other occupations. 65.16 percent of participants lived in rural areas, with women outnumbering men (65.4% vs. 64.84%). Participants were 56.06 percent financially illiterate. Male respondents (49.75%) were more financially literate than female respondents (39.77%). Many male participants had IDs and phones (86.34 % had phones and 93.83% had IDs). Most responders were from the Rift valley, Eastern, and Nyanza areas (29.52, 17.53, and 14.15%).

Regression results

This section examines if gender differences still hold in the uptake of digital financial services when controlling for other individual level socio-economic variables/ characteristics. Logit regression results for the main indicators of digital financial inclusion are displayed in Table 5. Specifically, Table 5 presents the logistic regression marginal effects. The logic regression coefficients are presented in Appendix A. Appendix B presents the coefficients from the multivariate probit model. From the results in Appendix B, all the DFS inclusion indicators are significantly correlated. However, the coefficients from the logistic model and the multivariate probit model move in the same direction and leading to the same conclusion.

5. Emerging themes from the key informant interviews on policy landscape in DFS

Policy guidelines for digital financial inclusion advocate the need to develop an enabling environment, a robust digital infrastructure and payment systems; enhance inclusivity, literacy and education; and prioritize the interests of consumers. The policies not only strengthen and spread financial services and literacy but also make them inclusive of youth, women, persons with disabilities, rural areas, low-income households and small enterprises. The following thematic areas arose in understanding the policy landscape and how it affects uptake of DFS in Kenya;

The requirements to access DFS like opening a DFS_Account and accessing DFS_Credit are gender neutral (they are universal and do not give any special attention to gender orientation of customers):

DFS providers require that all customers regardless of gender present documents such as ID and Kenya Revenue Authority (KRA) pin certificate. From the quantitative analysis, results revealed that possession of such documents was positively significant meaning that possession increased the chances to be included in DFS. Moreover, the quantitative results also showed that 11.22% of the gender difference in ownership of a DFS_Account was explained by possession of IDs. The FinAccess survey of 2021 (KNBS, 2021) showed that more adults in rural areas lacked IDs than in urban areas at 10.3% and 6.7% respectively. The survey also found out that more adult women did not have IDs than male adults. This means this policy leads to exclusion of more women in accessing digital financial services considering that they also form a large population of people living in rural areas and those in lower income brackets. The chances of not owning a national ID are exacerbated for people in lower income brackets and those who do not own mobile telephones. Similar experiences have been shared in other countries, for example, a study in Uganda by Tsubira and Mbabazi (2021) revealed that ID ownership was statistically significant in prediction of financial inclusion. Kodongo (2018) recommended that the Government of Kenya consider relaxing requirements of national ID in some instances as some countries like India have done. However, more awareness and sensitization can be done, especially through local administration units like chiefs, to encourage registration since the pros of these requirements outweigh the cons.

Age-restricting regulatory requirements are often regarded as a factor limiting financial inclusion. However, access to financial products by underage individuals is often restricted intentionally and appropriately. Increasing access for the sake of

access may compromise financial protection of young consumers and lead to long-lasting financial problems. Some countries have introduced limited exceptions and regulatory changes to lower the minimum age to access specific types of financial products (i.e., particular kinds of savings accounts), in an attempt to increase youth financial inclusion and promote youth empowerment (Monye, 2022).

Data from Communications Authority of Kenya indicated that there were 64.8 million SIM cards registered in Kenya as at September 2021 (Sunday, 2022). This was against an adult population that stood at 26 million in 2019, according to the Kenya National Bureau of Statistics (Sunday, 2022). That additionally meant that many minors resorted to using their parents' or guardians' ID to register SIM card to access digital financial services such as M-Pesa since it is impossible to register an M-Pesa line without an ID card, which you obtain at 18 years old. This meant minors under the age of 18 could not register an M-Pesa line. For this reason, Safaricom introduced a new service, M-Pesa GO, which seeks to empower parents and guardians to raise a generation that is financially healthy and is prepared for a cashless world. The M-Pesa GO is similar to the M-Pesa app which is geared towards enhancing the financial literacy as it is tailored for minors of between the age of 10 and 17 years old .

Data protection Act may encourage women participation in DFS due to guaranteed privacy.

The Office of Data Protection Commissioner (ODPC) is mandated to regulate the processing of personal data and protect the privacy of all individuals residing in Kenya as per the Data Protection Laws. The Data Protection Act, 2019 came into force on 25 November 2019 and is now the primary statute on data protection in the country. It gives effect to Article 31 (c) and (d) of the Constitution of Kenya, 2010 (right to privacy). However, the awareness of these laws among consumers is still low. In many cases of financial fraud women are the most likely to be victims where they voluntarily give personal data without knowledge of where the data will be used, and privacy agreements set out. Moreover, women fall behind in digital literacy and knowledge, especially those living in marginalized areas like rural settings (Wechsler and Siwakoti, 2022). In fact, quantitative results reveal that women feature more in the lower levels of education than men. Kenya The ODPC should sensitize people on its mandate and conduct countrywide education drives on the importance of data privacy and protection. Such efforts can catalyse curbing the gender gap in DFS inclusivity as more women will be encouraged to use digital financial services.

There is commitment by the regulators such as Communications Authority of Kenya, and the Ministry of Information, communication and Technology (ICT) Innovation and Youth Affairs to enhance the digital infrastructure in Kenya.

The government through the Ministry of ICT Innovations and Youth Affairs recently rolled out the Kenya National Digital Masterplan that gives guidelines on how the digital infrastructure in Kenya is set to be improved. Imbalance in infrastructure development between urban and rural areas is still evident and a big factor in

contributing to exclusion of women in digital financial services. The ICT policy guidelines of 2020, show that there is a commitment to connect up to 66 million Kenyans to the Internet by 2030. The GSMA report on mobile gender gap carried out in 2019 showed that women were 39% less likely to have access to Internet compared to men (GSMA 2019). This is in line with the quantitative results from this current study that show that there is a gender difference in telephone ownership in favour of men. The ICT policy commits to inclusivity in ICT environment by ensuring gender equality and accessibility by persons with disability. However, the policy does not specifically elaborate how gender equality will be achieved to ensure inclusivity. Therefore, such a commitment may just remain on paper rather than being implemented fully.

Digital financial services and products are gender neutral

Digital financial services providers revealed that there are no specific considerations on gender when designing products. This means that they do not consider gender biases that arise due to socially constructed notions, beliefs and cultural norms that contribute to exclusion of women in DFS. For example, where women are not part of the decision-making process in the household, they may not be involved in making decisions about money (Manta, 2019). This means that they do not have the financial freedom to enable them access DFS. Therefore, bringing products that are specifically tailored to attract women may boost inclusivity of women where such cultural norms exist. Presently, there are efforts by some financial institutions who now have services tailored specifically for women. These efforts may help to reduce gender gap between men and women in DFS.

Government investing in DFS by providing digital credit that attracts low interest rates compared to other digital credit providers will encourage uptake of DFS.

In November 2022 the government launched the first phase of the financial inclusion fund, a digital financial fund that lends to the people of Kenya at low interest rate, with no collateral. The fund also does not list defaulters in the credit reference bureau. For these reasons the fund is attractive and easily accessible to all Kenyans. These efforts by the government will ensure more people are included in the DFS, especially DFS credit. From, the quantitative results DFS_Credit ranks lowest in terms of uptake; therefore, such efforts will boost accessibility and uptake, especially by groups in low-income brackets, low levels of education and those living in rural areas.

DFS providers have innovative products and policies that are designed to attract low-income earners in the community hence encouraging DFS uptake, especially in rural areas and by women.

DFS providers have introduced innovative products and options that cater for the needs of people in low-income groups. Such products include access to mobile telephones by paying on credit referred to as lipa mdogo mdogo introduced by Safaricom and use of Bonga points to pay for mobile telephones. Such products encourage more people to have access to telephones, increasing the uptake of DFS.

The policy on universal education for all is a step to boost literacy levels in Kenya that will in turn boost the uptake of DFS.

In 2003 the Government of Kenya introduced the free primary education programme with the aim of providing more opportunities to the disadvantaged school age children (Otach 2008). Kenya's access to basic education is a human right entrenched in the 2010 Constitution. However, over the years the government has struggled to make this a reality since some children still miss school and drop out due to different factors. This is pronounced in marginalized areas, arid and semi-arid areas of the country where parents prefer to educate male children over female children. Educational participation in terms of access, retention and progression of children, especially girls from one level of education to another in arid and semi-arid areas continues to be extremely low compared to sedentary regions (Ruto, Ongweny and Mugo, 2008). If access to education is fully achieved this would improve literacy levels in the country to a great extent. Education mainly influences the uptake of DFS as revealed by the quantitative results. Therefore, the implementation of universal education fully will encourage uptake of DFS.

Innovation and Technology

Development in technology and innovation has become an integral part of the modern financial system, which has led to changes in the financial system niche, proving it possible to strengthen the relationship between the financial management tools and man. Financial technology and innovation of various forms enhance the efficiency of financial intermediation, provide new choices of financial products and services, facilitate trade and consumption and enhance financial inclusion with positive outcomes on growth which has become an integral part of financial deepening in Kenya (Misati et al., 2022).

The current changes in the financial system have been proliferated by the rapid innovations and technological advancements that have resulted in new financial products, multiple delivery channels, adoption of new business models and development of DFS. The utilization of DFS has had several benefits such as the increase in efficiency in financial service delivery, enhanced speed, transparency, security and availability of tailored financial services that serve all categories of consumers. Some of the examples of technologically enabled financial innovations in Kenya include branchless banking, electronic payment systems, Internet banking and mobile banking. These innovations have also redefined the delivery of services as financial institutions strive to enhance access to customers as well as differentiate their products and services. Banks in Kenya have thus continuously leveraged on digital financial platforms to manage micro-accounts, build up deposits and extend financial services to the previously unbanked and underserved population. For example, banks have introduced new products that are pegged on digital payments as such is the adoption of Fuliza, a digital overdraft facility offered by banks through Safaricom mobile money operator (KNBS, 2021). The overdraft facility enables Safaricom customers, mostly at the retail end, to make payments, receive money,

pay bills and buy goods and services from their telephones.

With such it is noted that the extent to which advancements in innovation and technology can positively impact the digital financial services niche is tremendous, and with Internet usage, everything around us has been in continuous change. Whether it is a business process, a financial transaction, money management, currency exchange, search for financial institutions and lenders, using credit cards, inquiring about a loan or getting a home equity loan, it has been directly and tremendously affected by the Internet and its technologies.

Regulation of digital credit lenders/providers by the Kenyan government through the Central Bank of Kenya

All digital credit providers (DCP) should be regulated by the Central Bank of Kenya (CBK) as per the CBK Act of 2022. The regulations provide for the licensing and oversight of previously unregulated DCPs. The regulations seek to address concerns raised by the public given the recent significant growth of digital lending particularly through mobile telephones. These concerns relate to the predatory practices of the previously unregulated DCPs, and in particular, their high cost, unethical debt collection practices and the abuse of personal information. The regulations provide for inter alia the licensing, governance and lending practices of DCPs. They also provide for consumer protection and credit information sharing and outline the Anti-Money Laundering and Combating the Financing of Terrorism (AML/CFT) obligations of DCPs. From the KIIs it was noted that these regulations will encourage gender inclusion in DFS since many borrowers particularly women will be protected by these regulations.

Levies charged on mobile money transfers and digital credit services

Digital platforms for money transfer and lending play an important role in including the poorest populations in digital financial services. In addition, digital platforms are the biggest enablers to accessing finances in the most marginalized areas. In many rural areas it is common to find residents without bank accounts, but they have mobile money accounts for saving, accessing credit and generally carrying out other transactions. However, the levies charged on such services are incurred by the consumer, making the services expensive. This threatens financial inclusion, especially for marginalized groups and communities. During the Covid-19 pandemic, the Government of Kenya suspended all charges relating to transactions between bank accounts and mobile money wallets. These led generally to an increase in uptake of DFS. These charges have since been reintroduced though significantly reduced from those initially charged before the pandemic. According to Ndung'u (2017), excise taxes follow a laffer curve, whereby once the optimal point is surpassed then it becomes a distortion. Contrary to traditional belief that this does not change consumer behaviour it actually distorts it. Therefore, such levies lead to exit of consumers, resulting in financial exclusion. From the KIIs it was noted policies around these charges should be designed to determine the effect of such charges on consumer behaviour.

Conclusion and policy implications

Kenya continues to lead in provision of digital financial services in Africa with the biggest use being mobile money services. This has attracted more investment in fintech and challenged banks to innovate, resulting in the industry digitizing its services. The gender gap in digital financial inclusivity has reduced over the years, and now stands at 4% based on the FinAccess survey of 2021 (KNBS, 2021). In order to fully realize digital financial inclusivity and close the gender gap, DFS providers in collaboration with regulators need to address the issues that contribute to this gap. This study found that socio-economic factors are significant in bringing about the gender gap in digital financial services inclusivity.

Logit regression model and multivariate probit model were used to identify socio-economic factors contributing to the gender gap in uptake of DFS. Most of the variables in the empirical model were significant. The residence variable was positively significant for DFS_Savings indicator and negatively significant for DFS_Credit indicator. This implied that those living in rural areas were less likely to be included in DFS_Credit but more likely to be in DFS_Savings. The gender variable was negatively significant to DFS_Credit, showing that female respondents were more likely to be excluded from access to DFS_Credit. Marital status was positively significant across all the DFS indicators. Interestingly, respondents who were divorced were more likely to be included in the DFS_Credit and DFS_Account. The education variable was positively significant across all levels of education and all DFS indicators. This showed that the higher the level of education the more likely one was to be included in DFS. Further, we established that respondents in lower income levels were more likely to be included in the DFS_Credit. Telephones and identification documents were positively significant across all DFS indicators, showing that possession of these would likely lead to one being included more in DFS. The Fairlie decomposition technique was used to decompose the gender gap in the use of DFS, including the contributions of the various variables across the DFS indicators. The level of education was the major consistent factor that brought about the gender differences in DFS inclusivity, with its contribution at an average of 16% across all the digital financial services indicators considered in this study. Telephone ownership ranked high in the explained differences in DFS_Savings and DFS_Account.

A qualitative approach using KIIs sought to evaluate the policy landscape in order to establish how policies contributed to gender gap in DFS inclusivity. Thematic areas revealed that indeed there are gaps in policy that contribute to gender differences in DFS, thereby affecting gender inclusivity. The main themes that emerged were gender neutral policies that do not consider gender issues and the commitment by the government to intentionally grow the digital infrastructure in order to increase inclusivity. The DFS providers also had many innovative policies that encourage participation of low-income earners and women, encouraging DFS uptake.

Based on these findings several policy implications and recommendations can be drawn. First, strengthening the regulatory frameworks governing DFS will improve the uptake of DFS across all gender groups in Kenya. The regulations should be clear and supportive enough to promote innovation, protect consumers and foster a competitive environment. Regulators should work with various DFS providers to develop appropriate guidelines and standards that address issues related to customer protection, disclosure, comparative disclosure, data privacy and interoperability among various DFS platforms and providers. Regulators should fully implement existing regulations. The Central Bank of Kenya should move to fully licence and regulate all digital credit lenders (DCLs) in the country. The Office of Data Protection Commissioner (ODPC) should increase sensitization and awareness efforts on data protection. These regulations will encourage gender inclusion in DFS since many borrowers, particularly women, will be protected by these regulations.

Second, the consumer led approach to designing DFS products and policies should be adopted. The introduction of a government DFS credit lending platform, the “hustler fund” needs continuous review of policy framework based on consumer insights on use. This approach should be adopted by other DFS providers. DFS providers should develop products tailored specifically for women since this will attract women and may boost more inclusivity of women where such cultural norms exist.

Third, it is important to address infrastructure gaps and promote affordable connectivity in Kenya as a whole. To fully utilize DFS, one requires access to reliable and affordable Internet connectivity. The stakeholders in DFS should prioritize investing in expansion of Internet coverage, particularly in rural and underserved areas in Kenya. Furthermore, efforts should be geared towards promotion of affordable data plans and mobile devices such as feature phones which have long-lasting batteries. This will ensure that individuals can afford to access and use many DFS.

Finally, education plays an important role in encouraging uptake of and bridging the gender gap in DFS. The government through the universal education policy should ensure that all citizens acquire basic education, which includes digital skills. People from under-developed areas may lack the knowledge and skills to effectively use DFS platforms. The stakeholders should provide training programmes on digital skills and mobile technology usage. This will enable people to confidently navigate and utilize DFS platforms. Stakeholders should invest in comprehensive financial literacy programmes to educate the general public on the benefits, risks and operations of DFS. By improving financial literacy and digital skills, individuals can make informed decisions, mitigate risks and fully access the benefits of DFS. This will boost growth of the digital economy that includes the DFS ecosystem.

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Appendices

Appendix A: Determinants of DFS inclusion in Kenya: Logic model coefficients

Variables	DFS_Savings	DFS_Credit	DFS_Accounts	DFS_Others
	Coefficients	Coefficients	Coefficients	Coefficients
Residence, Rural	0.100**	-0.2956***	0.0202	-0.1203**
	(0.042)	(0.0419)	(0.0713)	(0.0480)
Gender, Female	-0.058	-0.2836***	-0.1366**	-0.1322***
	(0.039)	(0.0394)	(0.0640)	(0.0449)
Age	0.019***	0.0856***	0.0794***	0.0055
	(0.007)	(0.0096)	(0.0098)	(0.0079)
Age2	-0.000***	-0.0012***	-0.0008***	0.0001*
	(0.000)	(0.0001)	(0.0001)	(0.0001)
Marital Status, Married	0.071	0.1036**	0.5629***	0.1837***
	(0.053)	(0.0518)	(0.0848)	(0.0595)
Marital Status, Divorced	-0.029	0.1707**	0.3117**	0.0083
	(0.080)	(0.0807)	(0.1267)	(0.0956)
Marital Status, Widowed	-0.266***	0.2269**	0.4237***	0.1865*
	(0.082)	(0.0957)	(0.1300)	(0.1006)
Education, Primary Education	0.477***	1.0819***	0.6150***	0.6649***
	(0.056)	(0.0928)	(0.0822)	(0.0939)
Education, Secondary Education	0.660***	1.3810***	0.9842***	1.0830***
	(0.066)	(0.0970)	(0.1046)	(0.0993)
Education, Technical Education	0.715***	1.5002***	1.4591***	1.4504***
	(0.095)	(0.1122)	(0.1860)	(0.1154)
Education, University Education	0.575***	1.4566***	1.9282***	2.0096***
	(0.114)	(0.1242)	(0.2804)	(0.1307)

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Appendix A Continued

Variables	DFS_Savings	DFS_Credit	DFS_Accounts	DFS_Others
	Coefficients	Coefficients	Coefficients	Coefficients
Income, Low Income	0.061	0.1238*	-0.3857*	-0.7245***
	(0.083)	(0.0747)	(0.2046)	(0.0819)
Occupation, Farming	0.247***	0.0480	-0.1001	0.0659
	(0.058)	(0.0702)	(0.0883)	(0.0758)
Occupation, Salaried	0.271***	0.1052	0.4872***	1.0573***
	(0.077)	(0.0740)	(0.1454)	(0.0795)
Occupation, Casual	0.087	0.1304**	0.1938**	0.0254
	(0.055)	(0.0622)	(0.0848)	(0.0706)
Occupation, Business & Investment	0.611***	0.3348***	0.5624***	0.4494***
	(0.065)	(0.0663)	(0.1086)	(0.0725)
Occupation, Retired	-0.086	0.4872**	0.9602**	1.1394***
	(0.207)	(0.2387)	(0.4569)	(0.2167)
Internet Frequency, Daily	0.589***	0.6392***	-0.0082	1.2250***
	(0.061)	(0.0538)	(0.1089)	(0.0597)
Internet Frequency, Weekly	0.370***	0.5007***	-0.2140*	0.7832***
	(0.070)	(0.0656)	(0.1213)	(0.0726)
Internet Frequency, Monthly	0.556***	0.7170***	-0.4841*	0.4053**
	(0.163)	(0.1503)	(0.2526)	(0.1750)
Internet Frequency, Less often	0.596***	0.5914***	0.4464***	0.6454***
	(0.088)	(0.0776)	(0.1614)	(0.0897)
Documents, Passport, ID & Alien ID	1.581***	1.4395***	3.0228***	2.0536***
	(0.091)	(0.1346)	(0.1039)	(0.2249)
Phone, Own	2.590***	2.0858***	3.8818***	1.0699***
	(0.066)	(0.1235)	(0.0677)	(0.1076)
Disability, Yes	-0.134**	-0.0943	0.0259	0.1126
	(0.058)	(0.0676)	(0.0901)	(0.0688)
Financial Literacy, Literate	-0.244***	-0.0139	0.0494	0.2501***
	(0.042)	(0.0416)	(0.0708)	(0.0477)
Region, Central	-0.172	0.0981	-0.9360***	-0.7231***
	(0.141)	(0.1166)	(0.3072)	(0.1282)
Region, Coast	-0.658***	0.2785**	-0.7628**	-0.7229***
	(0.138)	(0.1147)	(0.3055)	(0.1284)
Region, Eastern	-0.855***	-0.0112	-0.6673**	-1.0599***
	(0.134)	(0.1113)	(0.3012)	(0.1245)
Region, North Eastern	-1.340***	-1.8744***	-0.5608*	-2.2503***
	(0.151)	(0.2086)	(0.3200)	(0.2025)

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Appendix A Continued

Variables	DFS_Savings	DFS_Credit	DFS_Accounts	DFS_Others
	Coefficients	Coefficients	Coefficients	Coefficients
Region, Nyanza	0.050	0.3670***	-0.7349**	-0.5980***
	(0.138)	(0.1121)	(0.3026)	(0.1245)
Region, Rift Valley	-0.522***	0.1691	-1.0974***	-1.0095***
	(0.132)	(0.1073)	(0.2971)	(0.1200)
Region, Western	0.196	0.7263***	-0.6883**	-0.6594***
	(0.146)	(0.1194)	(0.3105)	(0.1328)
Observations	18,671	18,671	18,671	18,671
Pseudo R2	0.2269	0.1928	0.5116	0.2573
Log Likelihood	-9637.8549	-8805.8639	-4441.609	-7350.382

Notes: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Appendix B: Determinants of DFS inclusion in Kenya: Multivariate probit model coefficients

Variables	DFS_Savings	DFS_Credit	DFS_Accounts	DFS_Others
	Coefficients	Coefficients	Coefficients	Coefficients
Residence, Rural	0.0575**	-0.1796***	0.0183	-0.0657**
	(0.0249)	(0.0250)	(0.0348)	(0.0272)
Gender, Female	-0.0297	-0.1604***	-0.0786**	-0.0688***
	(0.0228)	(0.0235)	(0.0315)	(0.0253)
Age	0.0089**	0.0409***	0.0396***	0.0031
	(0.0040)	(0.0053)	(0.0049)	(0.0043)
Age ²	-0.0001***	-0.0006***	-0.0004***	0.0001*
	(0.0000)	(0.0001)	(0.0000)	(0.0000)
Marital Status, Married	0.0451	0.0818***	0.2486***	0.1181***
	(0.0309)	(0.0310)	(0.0417)	(0.0337)
Marital Status, Divorced	-0.0057	0.1150**	0.1625**	0.0080
	(0.0470)	(0.0480)	(0.0635)	(0.0532)
Marital Status, Widowed	-0.1555***	0.1453***	0.1995***	0.1208**
	(0.0486)	(0.0551)	(0.0653)	(0.0555)
Education, Primary Education	0.2876***	0.5749***	0.3178***	0.3430***
	(0.0339)	(0.0479)	(0.0421)	(0.0477)
Education, Secondary Education	0.3954***	0.7546***	0.4958***	0.5809***
	(0.0394)	(0.0510)	(0.0522)	(0.0515)
Education, Technical Education	0.4320***	0.8397***	0.6956***	0.8188***
	(0.0557)	(0.0616)	(0.0848)	(0.0623)
Education, University Education	0.3555***	0.8062***	0.8578***	1.1370***
	(0.0663)	(0.0696)	(0.1187)	(0.0717)

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Appendix B Continued

Variables	DFS_Savings	DFS_Credit	DFS_Accounts	DFS_Others
	Coefficients	Coefficients	Coefficients	Coefficients
Income, Low Income	0.0322	0.0763*	-0.1417	-0.4193***
	(0.0481)	(0.0450)	(0.0896)	(0.0475)
Occupation, Farming	0.1565***	0.0239	-0.0457	0.0221
	(0.0346)	(0.0405)	(0.0445)	(0.0416)
Occupation, Salaried	0.1589***	0.0737*	0.2122***	0.6212***
	(0.0444)	(0.0441)	(0.0683)	(0.0458)
Occupation, Casual	0.0634*	0.0847**	0.0883**	0.0109
	(0.0327)	(0.0363)	(0.0427)	(0.0391)
Occupation, Business&Investment	0.3571***	0.2053***	0.2680***	0.2515***
	(0.0377)	(0.0391)	(0.0533)	(0.0409)
Occupation, Retired	-0.0278	0.2138	0.3980*	0.6474***
	(0.1235)	(0.1367)	(0.2209)	(0.1248)
Internet Frequency, Daily	0.3354***	0.3877***	0.0145	0.7196***
	(0.0352)	(0.0327)	(0.0523)	(0.0345)
Internet Frequency, Weekly	0.2216***	0.2985***	-0.0960*	0.4461***
	(0.0412)	(0.0397)	(0.0580)	(0.0421)
Internet Frequency, Monthly	0.3178***	0.4443***	-0.2645**	0.2512**
	(0.0936)	(0.0903)	(0.1189)	(0.0999)
Internet Frequency, Less often	0.3485***	0.3539***	0.1895**	0.3575***
	(0.0501)	(0.0470)	(0.0762)	(0.0514)
Documents, Passport, ID & Alien ID	0.9021***	0.7660***	1.6266***	0.9945***
	(0.0522)	(0.0694)	(0.0566)	(0.1012)
Phone, Own	1.5669***	1.1330***	2.2058***	0.5359***
	(0.0367)	(0.0589)	(0.0359)	(0.0513)
Disability, Yes	-0.0683**	-0.0564	-0.0053	0.0628
	(0.0340)	(0.0390)	(0.0454)	(0.0383)
Financial Literacy, Literate	-0.1391***	-0.0059	0.0030	0.1454***
	(0.0248)	(0.0247)	(0.0349)	(0.0269)
Region, Central	-0.0877	0.0549	-0.4644***	-0.4198***
	(0.0785)	(0.0706)	(0.1396)	(0.0742)
Region, Coast	-0.3667***	0.1526**	-0.3249**	-0.4391***
	(0.0773)	(0.0696)	(0.1395)	(0.0746)
Region, Eastern	-0.4812***	-0.0060	-0.3201**	-0.6106***
	(0.0749)	(0.0675)	(0.1369)	(0.0720)
Region, North Eastern	-0.7801***	-0.9940***	-0.2394	-1.2397***
	(0.0856)	(0.1072)	(0.1466)	(0.1084)

continued next page

Appendix B Continued

Variables	DFS_Savings	DFS_Credit	DFS_Accounts	DFS_Others
	Coefficients	Coefficients	Coefficients	Coefficients
Region, Nyanza	0.0447	0.1983***	-0.2949**	-0.3693***
	(0.0767)	(0.0681)	(0.1381)	(0.0723)
Region, Rift Valley	-0.2923***	0.0906	-0.5265***	-0.5795***
	(0.0736)	(0.0653)	(0.1348)	(0.0696)
Region, Western	0.1254	0.4240***	-0.2503*	-0.3875***
	(0.0813)	(0.0723)	(0.1432)	(0.0769)
Observations	18,671			
Wald chi ²	13550.02			
Log likelihood	-29341.512			
Correlation matrix	$\begin{bmatrix} 1 & .2230 & .5035 & .2356 \\ .2230 & 1 & .2986 & .2705 \\ .5035 & .2986 & 1 & .2327 \\ .2356 & .2756 & .2327 & 1 \end{bmatrix}$			

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

Likelihood ratio test of correlation coefficients $\rho_{12} = \rho_{13} = \rho_{14} = \rho_{23} = \rho_{24} = \rho_{34} = 0$:
 chi²= 1811.48 prob > chi2 = 0.0000



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