Gender, Digital Financial Services and Financial Inclusion: Empirical Evidence from Rwanda

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Working Paper DFSP-CCS-006

AFRICAN ECONOMIC RESEARCH CONSORTIUM
CONSORTIUM POUR LA RECHERCHE ÉCONOMIQUE EN AFRIQUE

Bringing Rigour and Evidence to Economic Policy Making in Africa

Gender, Digital Financial Services and Financial Inclusion: Empirical Evidence from Rwanda

By

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AERC Working Paper DFSP-CCS-006
African Economic Research Consortium, Nairobi
July 2024

THIS RESEARCH STUDY was supported by a grant from the African Economic Research Consortium. The findings, opinions and recommendations are, however, those of the author and do not necessarily reflect the views of the Consortium, its individual members or the AERC Secretariat.

Published by: The African Economic Research Consortium
P.O. Box 62882 - City Square
Nairobi 00200, Kenya

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Abstract

Rwanda has distinguished itself in terms of efforts to promote gender equality and women's empowerment. However, some distinctive gender-based socio-economic differences remain that are worthy of policy attention. This study examined the gender differences in access to and usage of financial services and products in Rwanda using the FinScope survey of 2020. Probit regression models were used to estimate the propensity of ownership and access to digital platforms and the likelihood of using financial services. Results showed that women significantly lag behind men in terms of adoption of mobile phones, computers and the Internet. Similarly, they are less likely than men to own bank and mobile money accounts, which further translates into reduced propensity to save, and to receive and send remittances. Using Tobit regression models, the study revealed gender differences in financial inclusion at the intensive margin, that is, the amount of money saved, borrowed and sent in remittances was significantly lower among females than among males. Propensity score matching was used as a robustness check that further confirmed the negative gender effect on financial access and usage. The results imply that strategies to promote financial inclusion and digital financial services (DFS) ought to pay special attention to the specific challenges that limit women from adopting digital platforms, and from accessing and effectively using financial services to ensure greater gender equality and inclusive sustainable development in the country.

Key words: *financial inclusion, digital financial services, gender, Rwanda.*

JEL codes: *G20, D14, O12, O16, J16*

1. Introduction

Background

Access to financial services like saving, money transfer, insurance and credit has enormous potential to shape people's livelihoods through poverty and vulnerability reduction (Jalilian and Kirkpatrick, 2005; Demirgüç-Kunt et al., 2015; Mohammed et al., 2017; World Bank, 2022; Koomson et al., 2020; Dogan et al., 2022). A well-developed financial sector also facilitates international financial flows (Odugbesan et al., 2020) and the mobilization of funds for investment (Dupas and Robinson, 2009; Lu et al., 2021). According to the World Bank, financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs—transactions, payments, savings, credit and insurance—delivered in a responsible and sustainable way (World Bank, 2022).

However, most of the world's poor have no access to these basic financial services (Dupas and Robinson, 2009; Demirgüç-Kunt et al., 2022). Women, the poor and less educated are disproportionately more excluded from the formal financial sector. The Global Findex report of 2021 indicates that 24% of the adult population globally and 29% in developing countries have no bank accounts (Demirgüç-Kunt et al., 2022). Of the 1.4 billion people without a bank account globally, 740 million are women, representing approximately 13% of adult women as compared to 11% of unbanked adult men (Demirgüç-Kunt et al., 2022). The ability of poor people to smoothen consumption and generate funds for investment is constrained by the lack of access to basic financial services (Dupas and Robinson, 2009).

Women are specifically left behind in (digital) financial inclusion in many developing countries, particularly in Africa (Swamy, 2014; Fanta and Mutsonziwa, 2016; Adegbite and Machethe, 2020). This is due to, among other factors, cultural norms, lower levels of income and less access to knowledge and information on (digital) financial products. These challenges often render women more financially excluded with and disproportionately lower levels of access to digital and conventional financial services. The positive trend of digital financial services (DFS) on the continent, however, promises to change the status quo, driven by, among others, rapid expansion in mobile network coverage and mobile cellular

subscriptions. The growing uptake of mobile money services in Africa provides hope for greater financial inclusion; 33% of adult Africans reported having a mobile money account in 2021, a figure much higher than the global average of 10% in the same year (Demirgüç-Kunt et al., 2022). In Rwanda, financial inclusion almost doubled from 48% of the adult population in 2008 to 93% in 2020 and the overall gender gap narrowed from 4 percentage points in 2016 to 1 percentage point. According to the FinScope 2020 survey (NISR, 2020). However, a 7 percentage point gap remains in formal financial services as 74% of women were formally financially included compared to 81% of men.

In order to better guide and direct policies to promote DFS, understanding the status, progress and ecosystem of DFS in the country is an essential initial step. The lack of comprehensive empirical analysis of gender differentials in financial inclusion and DFS in Rwanda discounts evidence-based efforts—including policy initiatives and product development—meant to narrow the gender gap in the country's financial sector. The few available studies explore the extent of the gender gap but do not delve into its root causes. This study attempted to bridge the knowledge gap by empirically examining the determinants of adoption and usage of digital and conventional financial services through a gender lens (focusing on reasons behind women's relative lack of access). The main objective of this study was to undertake a comprehensive examination of the gender differences in access to and utilization of (digital) financial services in Rwanda and make evidence-based recommendations to narrow the gender divide in the country's financial sector and DFS. The specific objectives of the study were:

- To assess the gender differences in access to and utilization of (digital) financial services.
- To examine the determinants of uptake and usage of digital financial services.
- To identify barriers to financial inclusion and digital financial services among women.

Available evidence indicates that women lag behind men with regards to usage of digital technologies, which is attributed in part to lower levels of self-esteem and confidence, education, income and heavy domestic responsibilities (Mumporeze and Prieler, 2017). Additionally, women in the country have lower rates of mobile phone ownership (Blumenstock and Eagle, 2010) and financial literacy, owing to differences in socio-demographic and psychological factors like education, happiness, depression and openness (Grohmann and Schoofs, 2021). Against this background, this study hypothesized that: women have generally lower levels of access to (digital) financial services due to lower incomes, less access to information and cultural norms, among other demand and supply-side constraints. The

hypothesis was verified by attempting to answer the following research questions using a mixed-methods approach:

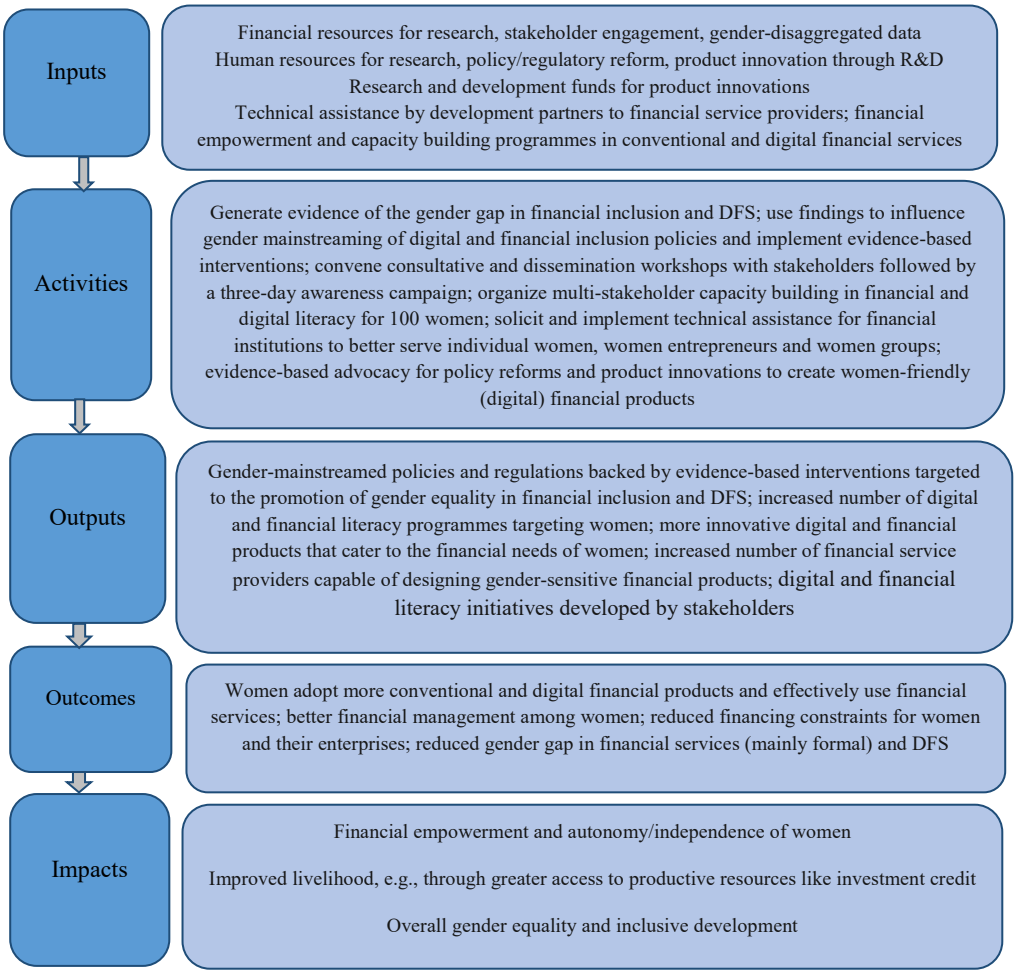
- To what extent are women left behind in the (digital) financial services space?
- What factors limit women from effectively utilizing (digital) financial services?
- What can be done to narrow the gender divide in Rwanda's financial sector?

The rest of the paper is organized as follows. Sub-section 1.2 elaborates the structure of a digital payments ecosystem and Section 2 presents the key literature related to the topic and discusses the theory of change adopted by the study. Section 3 presents the study objectives; research questions and hypothesis and the empirical strategy is elaborated in Section 4. Section 5 presents and discusses the main results, and the last section provides concluding remarks and policy implications.

Theory of change

This study proposed a theory of change meant to ensure no woman is left behind in the digital finance and financial inclusion drive. Through continuous engagement of government and non-government stakeholders along the study's value chain, evidence and awareness that will result will trigger concerted effort to promote gender inclusion in digital and mainstream financial services. This was based upon the assumption that through consultations and discussions, the respective stakeholders would realize the idiosyncratic challenges of women and their potential as a market segment for digital financial services (DFS). Through evidence-based policy and regulatory frameworks and interventions, policy stakeholders will create an enabling environment for women to access and effectively use (digital) financial services. Leveraging this environment and understanding the potential of women as a source of underexploited market opportunity, private innovators will make innovative digital financial products that address the specific financial needs and realities of women. Through continuous stakeholder engagements, efforts by state and non-state actors will be directed towards building the capacity of women to use DFS, followed by investments in women-friendly digital finance technologies. Knowledge and awareness-raising will further trigger behavioural change among women to realize their digital potential. Ultimately, with a better policy and regulatory environment, innovative technologies and products friendly to female users and greater stakeholder emphasis on the gender dimension of DFS, more women will adopt and effectively use digital and mainstream financial services.

Figure 1: Theory of change: promoting gender equality in (digital) financial services



The financial inclusion and DFS landscape in Rwanda

In Rwanda, financial sector development is at the centre of development policy. The Financial Sector Development Strategic Plan (2018–2024) emphasizes broadening, deepening and developing the financial sector to accelerate economic growth, efficient allocation of resources and improved wealth creation. This is synergetic to the Rwanda National Payment System—Towards a Cashless Rwanda (2018–2024), which aims to modernize and digitize different levels of payments as the country pursues a more cashless economy. The National Strategy for Transformation (NST1, 2017–2024) emphasizes promoting both financial inclusion and DFS. Priority Area 5 of the strategy envisions increasing savings and investments to present Rwanda as a financial hub, with a target on expanding gross domestic savings as a share of gross domestic product (GDP) from 10% in 2017 to 23% in 2024. The strategy further sets a target of increasing

the share of payments done electronically from 26.9% to 80% of GDP between 2017 and 2024. These policy efforts complement earlier initiatives like the establishment of the Rwanda Integrated Payment Processing System (RIPPS) in 2011 to quicken inter-bank transactions through real time gross settlement (RTGS) and automated clearing house (ACH). The introduction of mobile declaration and digital payment of taxes and public fees in 2014 was a move meant to promote payments efficiency, enhance transparency and boost the overall development of person-government (P2G) and business-to-government (B2G) electronic payments in the country.

The policy efforts to promote financial inclusion and DFS are gradually paying off: the share of electronic payments increased to 54% from 26% (against a target of 80%). According to the FinScope survey, the proportion of the adult population with access to formal and informal financial services almost doubled from 48% in 2008 to 93% in 2020 (NISR, 2020). The report further indicates four main financial services that are used by the population: saving and investment; borrowing and credit; remittances; and insurance and risk mitigation. The report further indicates that 86% of the adult population in the country saved money in the 12 months preceding the survey while 76% borrowed money over the same period. Regarding remittances, 45% of adults sent money, 83% of which was sent using formal platforms—mostly mobile money. Only 17% of adults either have or use medical insurance products, although 88% are generally covered by community-based insurance, namely Mutuelle de Santé. Despite generally high rates of financial inclusion, only 35% of the adult population in the country have a bank account while 38% use mobile money services. The overall gender gap in financial inclusion narrowed from four percentage points in 2016 to one percentage point in 2020. However, women have lower rates of formal financial inclusion (74%) than men (81%) while ownership of transactional accounts was 62% among women, lower than the 71% for men. Additionally, a smaller proportion of women owned a bank account (15% vs 24%) and mobile money account (51% vs 64%). As presented in the descriptive analysis section, the proportion of females who saved and sent remittances in the year preceding the FinScope 2020 survey was smaller than the corresponding proportion for male counterparts. As the levels of financial inclusion expand, so does the share of consumer transactions conducted digitally or through cashless channels. Financial institutions are increasingly providing innovative products that either directly link to or share financial information with mobile wallets to enable faster and more convenient payments that do not require the use of physical cash.

All in all, while the overall levels of financial inclusion have risen tremendously and the gender gap has narrowed in Rwanda, formal inclusion and DFS access and usage remain lower among women than among their male counterparts. This warrants a comprehensive examination of the gender differentials in the use patterns for different types of financial products and services, the challenges and opportunities and recommendations to further promote gender equality in all types of conventional and DFS. This paper provides this required evidence base, which could stimulate action by policy and non-policy stakeholders to devise evidence-based initiatives to further promote gender-inclusive financial services.

2. Literature review

Financial inclusion is a widely researched topic, with several studies assessing trends and patterns of uptake and utilization of financial products and services. Digital financial services, however, have not been as widely discussed, given their relatively newer deployment compared to mainstream financial inclusion. Although the definition of financial inclusion is broad and covers issues of availability, access and usage of affordable financial services, the fundamental definition focuses on access to accounts in bank and non-bank financial institutions (Demirgüç-Kunt et al., 2022), a definition that has been largely adopted by existing literature. Moreover, studies largely focus on account ownership and/or access to banking services such as credit and savings and ignore other services such as insurance (Lotto, 2020). Some previous studies have attempted to reduce the multidimensionality of financial inclusion by constructing indexes with a continuum of values with zero representing complete exclusion and one denoting complete inclusion (Sarma, 2008). In this study, the existing literature on financial inclusion and DFS is divided into four main strands. The first literature strand comprises studies that explore the supply and demand-side determinants of (and constraints to) financial inclusion. Demand-side constraints include low incomes, implying limited affordability of financial products (Balliester Reis, 2021). These challenges are exacerbated by the high cost of financial services, especially those offered by traditional service providers like banks and the long distances to service providers (Prina, 2015; Munyegera and Matsumoto, 2016, 2018). Additionally, limited collateral is a key constraint to formal credit access (Moyo and Sibindi, 2022), which, for women, is exacerbated by cultural norms like land titles being written in men's names (Nairan, 2009). Personal traits and cultural norms also have an influence on people's perception of their financial lives (Demirgüç-Kunt et al., 2022). Other demand-side constraints include low levels of literacy and trust, especially among poor and first-time users of DFS, and informality and lack of documentation (Pazarbasioglu et al., 2020).

Among the supply-side constraints is the lack of innovative financial products that address the specific needs and requirements of various customer segments (Yawe and Prabhu, 2015; Munyegera and Matsumoto, 2018; Cull et al., 2021). In many developing countries, financial institutions lack the prerequisite product development practices that would propel financial sector broadening and deepening to address customer needs (Iheanachor et al., 2021). In some countries, this is exacerbated by the lack

of policy and regulatory support needed to drive financial inclusion and DFS. Long distances to service points and geographical barriers further imply high opportunity and transportation costs, especially in rural communities (Munyegera and Matsumoto, 2016, 2018; Pazarbasioglu et al., 2020). In Rwanda, the average time to reach a bank was 21 minutes for the 3 districts of Kigali City, much lower than over 40 minutes for other districts outside Kigali (NISR, 2020). Other supply-side limitations include high cost and cumbersome documentation associated with some formal financial service providers like banks (Allen et al., 2016). This is compounded by limited digital infrastructure—such as technology, security, delivery logistics, etc.—especially in developing countries, which is a key driver of inter-country differences in uptake of DFS (Demirgüç-Kunt et al., 2022).

The second literature strand entails studies that describe pathways through which financial inclusion and DFS contribute towards economic development. Commonly cited pathways include facilitation of global financial flows like foreign direct investments (Odugbesan et al., 2020); poverty reduction and income generation (Mohammed et al., 2017; Koomson et al., 2020;); facilitation of remittance flows for consumption smoothing and vulnerability reduction (Jack and Suri, 2014; Munyegera and Matsumoto, 2016); and raising funds for investment and investment diversification (Dupas and Robinson, 2013; Lu et al., 2021). Empirical evidence from Kenya reveals that the country's most popular mobile money service, M-Pesa, reduces reliance on informal saving mechanisms, increases the propensity to being banked and reduces the prices of competing funds transfer channels (Mbiti and Weil, 2015). A key takeaway from these studies is that the lack of access to basic financial services restricts one's ability to engage in productive sectors and smoothen consumption for resilient livelihoods (Dupas and Robinson, 2013).

The third literature strand comprises studies that examine the gender gap in access to and utilization of (digital) financial services, with females reported to lag behind their male counterparts (Swamy, 2014; Fanta and Mutsonziwa, 2016; Adegbite and Machethe, 2020). Women are indeed underrepresented in formal financial services like credit partly because of lower levels of literacy and access to assets and unfavourable cultural norms, forcing women to rely on informal alternatives (Demirguç-Kunt et al., 2018). Empirical evidence from East Africa shows that women lag behind men in terms of access to financial services and that the financial sector's inability to cover most of the population accounts for the unexpectedly weak link between financial sector development and economic growth in some countries like Tanzania (Lotto, 2022). Finally, studies in the fourth literature strand examine the potential role of digital financial technologies in driving financial inclusion. These studies reveal that the rapidly expanding financial technologies (fintechs) are boosting financial inclusion, especially in sub-Saharan Africa (Durai and Stella, 2019; Demir et al., 2022). Mobile money is particularly driving financial inclusion even in countries with traditionally low levels of access to financial services (Donovan, 2012; Munyegera and Matsumoto, 2018; Amoah et al., 2020). Moreover, DFS present a potential opportunity to narrow the gender gap in financial inclusion that is highly prevalent in many African countries.

Indeed, countries with higher levels of mobile money account ownership have been reported to face smaller gender gaps in financial inclusion (Kim, 2022). This observation points to the urgent need for policy and regulatory measures coupled with product innovations and investments to boost women's financial inclusion and access to DFS.

The existing literature has key gaps, including focusing on account ownership and ignoring gender differences in usage of financial services at the extensive and intensive margins. The studies also largely focus on assessing the extent of the gender gap without a thorough qualitative investigation into its root causes to complement the quantitative observations. Moreover, most studies focus on developed countries with limited emphasis on Africa in general and Rwanda in particular. Some studies on Rwanda—for example (Mumporeze and Prieler, 2017)—applied a qualitative approach and hence lack the quantitative magnitude of the gender gap in the country's financial sector. To narrow the literature gap, this study used a mixed-methods approach to examine the gender differences in conventional and DFS in Rwanda, focusing on access and usage at both extensive and intensive margins.

3. Methodology and data

The study adopted a mixed-methods approach, combining analysis of secondary quantitative data from the FinScope 2020 survey and primary qualitative data collected through key informant interviews to gather insights from state and non-state stakeholders about the gender dimension of financial inclusion and DFS.

The quantitative part of this study relied on data from the 2020 FinScope survey. The data were used to measure the gender-disaggregated levels of access to and usage of (digital) financial services in Rwanda. The survey was conducted between September and November 2019, by the Center for Economic and Social Studies (CESS) in partnership with the National Institute of Statistics of Rwanda (NISR) and with funding from FinMark Trust (FMT). To date, it is the most comprehensive survey on financial inclusion in the country, covering12,480 individuals randomly selected from 158,386 who were initially listed from 780 villages. The survey covered detailed socio-economic, financial inclusion and DFS modules. The analysis was divided into two parts. The first part of the analysis was descriptive and provided the status of (digital) financial inclusion for men and women as calculated from the data. The second quantitative approach entailed regression analysis to examine factors that determine adoption and usage of (digital) financial services. The key outcome and independent variables used in the regressions are defined in Appendix A.

Gender and the adoption of digital platforms and financial products

Probit models were estimated to determine the likelihood of adopting digital platforms, owning accounts and using various financial services. The choice of probit was based on the binary nature of the outcome variables, taking the value of one if an individual reported having or using a product or service and zero otherwise. Three different levels of binary outcome variables were estimated. The first set included ownership of digital platforms (mobile phone, computer and Internet) and access to those owned by someone else. The second set of outcomes was ownership of bank and mobile money accounts, ATM and debit cards, as well as mobile and Internet banking. The third and final set included adoption of financial services (saving, remittances, credit and insurance).

An individual's decision to adopt a particular product or use a financial product of service was modelled as a latent variable y_i^* which in turn depends on a set of determining factors as follows:

$$y_{id}^* = \beta_0 + \beta_1 X_{1id} + \beta_2 X_{2id} + \cdots + \beta_k X_{kid} + \gamma Female_{id} + \varepsilon_{id} \quad (1)$$

Where $Female_i$ is a binary indicator equal to one if individual *i* residing in province *d* is female, and zero otherwise. $X_1, X_2, \ldots, X_k$ represent other independent variables or factors that determine the value of the latent variable. The latent variable was, however, unobservable and only the outcome (adoption decision) was observed. The outcome, however, can be deduced from the value of the latent variable as expressed in Equation 2:

$$\boldsymbol{y_i} = \begin{cases} 1 \; if \; \boldsymbol{y_i^*} > 0 \\ 0 \; otherwise \end{cases} \quad (2)$$

The outcome variable of interest is a binary indicator taking a value of one if an individual used a particular service. $\boldsymbol{X_1, X_2, \ldots, X_k}$ in Equation 1 represents the factors that determine the probability of an individual using the respective financial product and service within six months before the FinScope survey. The covariates included in the model were: age of the respondent, measured in number of complete years since birth; education level, which is a categorical variable with cases for primary 1–3, primary 4–6, secondary 1–3, secondary 4–6, and university and tertiary; household size, measured as number of individuals living in the household; a dummy variable for rural/urban residence status and a categorical variable for province of residence (Kigali City, Northern Province, Southern Province, Eastern Province and Western Province). The variables were based on intuition, logic and usage by previous literature. Gender has been included in previous studies, arguing that women face various impediments that limit their (digital) financial access and usage (Mumporeze and Prieler, 2017; Ameen and Willis, 2019). The inclusion of age is motivated by the notion that younger people are generally more tech-savvy (Niehaves and Plattfaut, 2011). Education, however, is considered to have an enhancing effect on income (Baum et al., 2013) and digital literacy (Marsh, 2021; Nikou et al., 2022) both of which are considered prerequisites for affordability and capacity to operate digital products. The main parameter of interest for this study was which estimates the effect of gender on the decision to use a particular financial product and service, controlling for other observable characteristics of the respondents.

Gender and the value of financial service transactions

At the intensive margin, this section examines the extent to which gender influences the amount of money an individual saved via their favourite channel and via mobile money and amount borrowed six months before the FinScope survey. Each

financial service—saving, mobile money-based savings and amount borrowed—was estimated separately using tobit regression models. The use of tobit was motivated by the censored nature of the dependent variables; for respondents who made financial transactions, the amount of the respective transactions was observed. However, for those who made no transactions, the value of transactions that they would have made were not observed and were grouped as zero. With this limited information dependent variable (LIDV), the use of ordinary least squares (OLS) would otherwise produce biased results. The relationship between the values of financial service transactions and socio-demographic and geographical covariates is expressed in Equation 3.

$$ServiceAmount_{id}^{h} = Max\{0, \gamma^{h} Gender_{id} + \beta'^{h} X_{id} + \lambda^{h} Prov_{d} + V_{id}^{h} \quad (3)$$

Where superscript *h* represents the respective types of financial services (saving, credit, remittance and insurance) and the continuous outcome variable represents transactional values of the respective services. $Prov$ represents provincial dummies of residence and *V* is an error term. Other covariates remained as earlier described in the probit setting. As a robustness check, probit and tobit regression results were complemented by propensity score matching (PSM) which controls for the confounding effect of observable heterogeneity among male and female respondents (details are presented in the robustness check subsection of results).

Primary qualitative data collection

Based on the findings from the document review and secondary quantitative data analysis, any additional information gaps were bridged through key informant interviews targeted to different stakeholders in the public, private and civil society sectors. The selection of respondents was mainly purposive, identifying individuals in various institutions who were directly involved in different functions related to financial inclusion, DFS and gender affairs. The information collected from this exercise helped concretize the findings of the desk-based activities and seek stakeholders' insights on the challenges and recommendations to promote financial inclusion and DFS in Rwanda with specific emphasis on women. The detailed structure of the primary data collection exercise is elaborated in Appendix B.

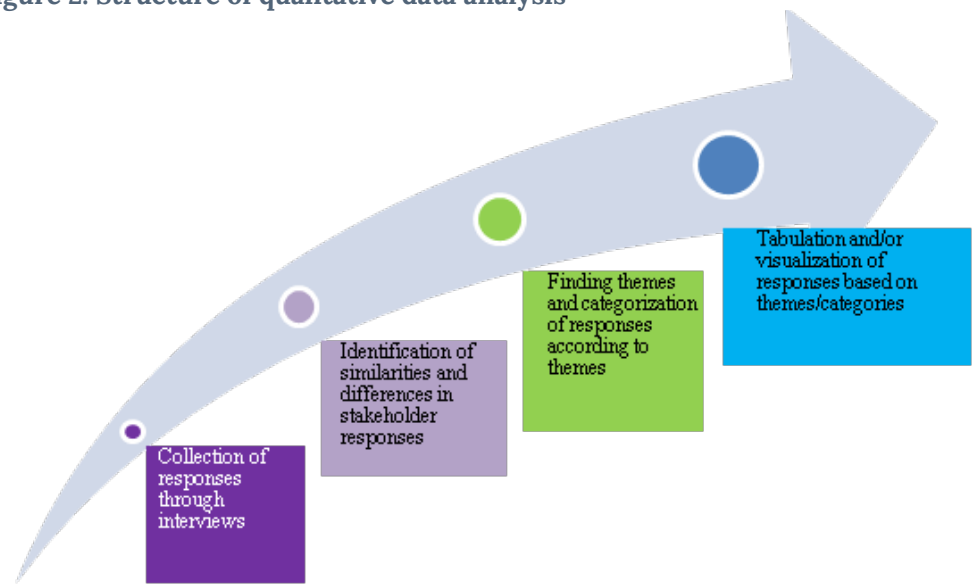
Analysis of primary qualitative data

The structure of the qualitative data analysis based on the stakeholder responses is summarized in Figure 2. Once the data collection exercise was complete, responses were examined in detail to identify similarities and differences, code responses, develop themes along which to characterize the subject matter, and finally tabulate

and/or visualize the responses according to the established themes. The overall qualitative analysis plan followed the method of Braun and Clarke (2006) which is a presented as a simple six-step procedure as follows:

- **Step 1: Familiarization:** The text responses were read thoroughly, and any audio recordings transcribed to familiarize with the stakeholder responses (data) regarding the gender gaps in financial inclusion and DFS.
- **Step 2: Coding:** Sections of the data/responses were highlighted to develop shorthand labels or codes that describe the content of the data.
- **Step 3: Generating themes:** The established codes were examined to identify patterns from which themes would be generated. The themes represent more broadly grouped or categorized codes that carry similar or closely related information.
- **Step 4: Reviewing the themes:** The themes were scrutinized to ascertain how accurately they represent the data/responses. Where necessary, modifications were made to improve data representation.
- **Step 5: Defining and naming themes:** This entailed clearly indicating what each theme in the final list of themes represents and exactly how it helps to understand the underlying data/responses.
- **Step 6: Representation and writing:** The data were then tabulated and visualized based on the established themes to better illustrate and summarize the responses. The final task was to write the findings, clearly making sense of the responses in line with the topic.

Figure 2: Structure of qualitative data analysis



Source: Adapted from Braun and Clarke (2006)

4. Results

Descriptive statistics

This section presents the summary statistics from the FinScope 2020 data, disaggregated by gender of the respondents. Table 1 and Figure 3 reveal notable differences between male and female respondents along demographic, socio-economic and financial inclusion indicators. Female respondents were generally older and resided in larger households. Table 2 and Figure 3 further show that a bigger proportion of females had no formal education as compared to their male counterparts. By symmetry, the proportion of respondents who accomplished upper primary, secondary and tertiary levels of education was much lower among females relative to males. The descriptive statistics further reveal a smaller proportion of females involved in full-time employment and business as compared to male counterparts. Although this could reflect fewer opportunities available to women and girls, it is also plausible that household responsibilities limit them from fully leveraging available labour market opportunities (Samtleben and Müller, 2022).

Table 1: Summary statistics disaggregated by gender of respondent

	Female		Male		Mean Diff
Variables	**Mean**	**SD**	**Mean**	**SD**	**(Female-Male)**
Household size	4.343	1.987	4.611	1.982	-0.268***
Age of respondent	42.29	16.28	40.88	15.18	1.41***
1 if owns bank account	0.152	0.359	0.240	0.427	-0.088***
1 if have mobile money account	0.512	0.500	0.648	0.478	-0.136***
1 if has credit card	0.0132	0.114	0.0206	0.142	-0.0074***
1 if has ATM card	0.0914	0.288	0.127	0.333	-0.0356***
1 if has Internet banking	0.0606	0.239	0.0973	0.296	-0.0367***
1 if has mobile banking	0.102	0.303	0.144	0.351	-0.042***
1 if access mobile phone	0.834	0.372	0.898	0.303	-0.064***
1 if own mobile phone	0.685	0.465	0.789	0.408	-0.104***
1 if access computer	0.138	0.345	0.205	0.404	-0.067***
1 if own computer	0.0641	0.245	0.0987	0.298	-0.0346***

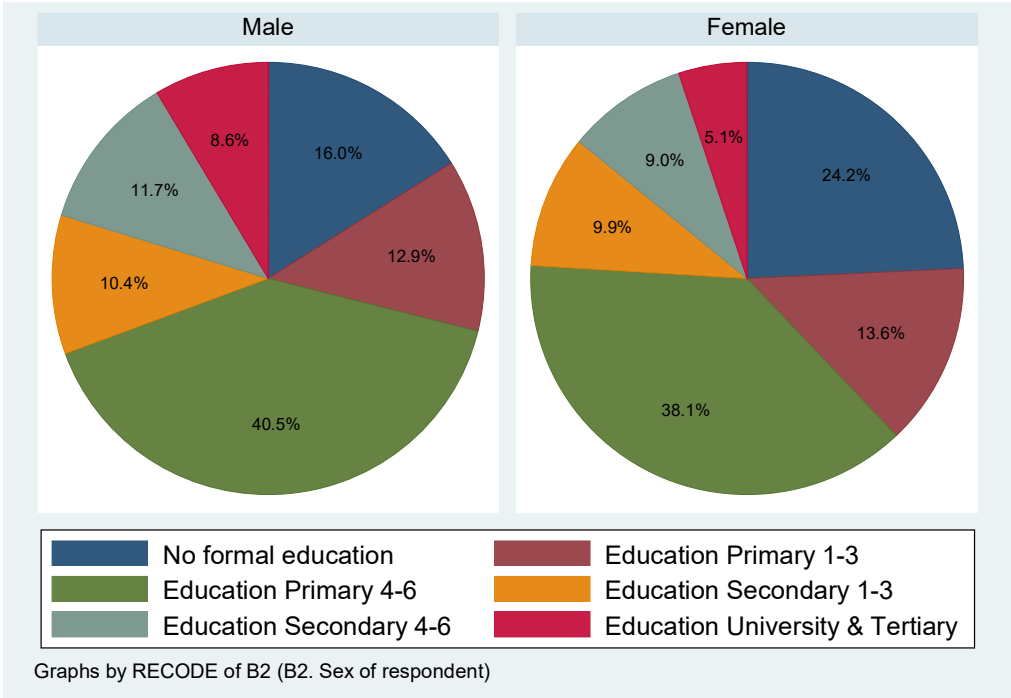
continued next page

Table 1 Continued

	Female		Male		Mean Diff
Variables	**Mean**	**SD**	**Mean**	**SD**	**(Female-Male)**
1 if has Internet	0.186	0.389	0.270	0.444	-0.084***
1 if own internet	0.120	0.325	0.182	0.386	-0.062***
1 if has private medical insurance	0.065	0.003	0.085	0.004	0.020***
1 if saved via mobile money	0.168	0.374	0.241	0.428	-0.073***
1 if sent remittances in past 6 months	0.272	0.005	0.377	0.007	0.105***
1 if received remittances in past 6 months	0.325	0.005	0.377	0.007	0.051***
Amount saved via main channel	36,340	302,887	93,194	1,225,000	-56854
Amount saved via mobile money	7,781	65,277	46,499	1,110,000	-38718***
1 if borrowed in past 12 months	0.524	0.499	0.538	0.499	-0.014
Amount borrowed previously (/000)	3,567	59,620	3,469	58,790	98
Number of observations	7,290		5,190		

Note: ***, ** and * indicate significance of mean difference at the 1%, 5% and 10% levels respectively

Figure 3: Level of education by gender of respondent



Source: Author's illustration based on FINSCOPE 2020 data

Results in Table 1 further reveal differences in access to mobile phones: while 79% of male respondents reported owning a mobile phone, the corresponding rate among females was only 69%. The propensities of computer and Internet ownership were also lower among females than males. The findings indicated individuals could access mobile phones, computers and Internet owned by someone else. However, the access rate was also much lower among females than male respondents. These platforms are a prerequisite for conducting digital and electronic financial transactions. For example, a mobile phone is required to conduct mobile money and mobile banking transactions and Internet banking requires an Internet connection via a smartphone, computer or related device. The disproportionately lower levels of access to digital platforms among females could therefore imply reduced potential for them to adopt and use digital and electronic financial services and consequently create or worsen the gender divide in financial inclusion and DFS.

Another observation from Table 1 is the significant gender differences in the amount of money saved via mobile money. The average amount saved by males six months before the survey was almost six times higher than the corresponding average for females. No significant differences by gender were recorded with regard to amount saved via the respondent's main or favourite channel. However, the huge standard deviation (relative to the mean) is indicative of high variation among individuals regarding saving amount.

With regard to financial access, table 1 shows significant differences between men and women. While 24% of male adults had a bank account, only 15% of females did, constituting a difference of 9 percentage points. In other words, the bank account access rate for females was only 62% (15/24) of that for male counterparts. The proportion of females in the sample who used mobile money was also lower (51%) than that of males (64%), amounting to a gender difference of 7 percentage points. Females also had lower propensities to use Internet banking (6% versus 9.7%) and mobile banking (10% versus 14%). Another way to illustrate the gender gap in access to financial services is that, although females constituted 58% of the study sample, they accounted for only 47% of bank account holders, 52% of mobile money account holders, 47% of Internet banking users and 50%of mobile banking users. This represents a gender access gap of 6 percentage points for mobile money, 8 percentage points for mobile banking and 11 percentage points for bank accounts and Internet banking.

Econometric results

This section presents the econometric results from probit and tobit regressions estimating the effect of gender and other covariates on several measures of financial inclusion and DFS.

Ownership and usage of digital platforms

The first part of the econometric results focuses on factors that determine ownership of and access to digital platforms deemed to facilitate DFS and financial inclusion, namely mobile phone, computer and Internet. These were estimated separately using probit models, given that the outcome variable in each case is a binary indicator for whether or not an individual owns the respective platform or accesses one that is owned by someone else. In other words, for either ownership or access, the binary variable takes the value of one if an individual owns or accesses the platform and zero otherwise. Table 2 presents the marginal effects from the probit regressions, representing factors that determine the likelihood of an individual owning or accessing a mobile phone, computer and Internet.

As Table 2 reveals, females were significantly less likely to own all three digital platforms (columns 1–3). For example, the likelihood of phone ownership was six percentage points lower among females than that of their male counterparts (column 1). Similarly, the probability of accessing digital platforms owned by someone else was also lower among females and the difference was statistically significant at the 1% level (columns 4–6). This finding corroborates observations from existing literature that highlight presence of a gender digital divide (Papastergiou and Solomonidou, 2005; Li and Kirkup, 2007; Gray et al., 2017; Mumporeze and Prieler, 2017; Ameen and Willis, 2019; Omotoso et al., 2020). In Rwanda, Blumenstock and Eagle (2010) found that women were less likely to own mobile phones and more likely to use shared ones or those owned by someone else.

Age is also a key determinant of the adoption of digital platforms, with its effect being non-linear as indicated by the significant coefficient of the squared age variable. In other words, the probabilities of owning and accessing a mobile phone, computer and Internet first increased with age up to a certain level, after which the age effect became negative. This finding implies that the rate digital technology adoption is higher among the relatively younger and mid-age individuals but declines among the older respondents. This is partially in line with results from previous literature that identified the younger generation as being more tech-savvy than the older generation (Niehaves and Plattfaut, 2011).

Individuals residing in larger households in terms of number of members were more likely to own and use a mobile phone, computer and Internet. Although the mechanism through which household size influences technology adoption was unclear, it is plausible that more household members could present diversified opportunities for device sharing and peer learning about digital platforms. Findings further revealed that the probabilities of owning and accessing a mobile phone, computer and Internet were augmented by the level of education completed by an individual (Table 2). In other words, the higher the education level, the more likely an individual was to own a digital platform or access one owned by someone else. For example, individuals who accomplished primary 1–3 were nine percentage points

more likely to own a mobile phone than those with no formal education (column 1). The education effect was even stronger, as individuals with upper primary, secondary and tertiary levels of education were even much more likely to own a mobile phone relative to their counterparts without any formal education. The same observation was true when considering ownership of and access to computers and Internet (Table 2).

Three possible explanations exist for the enabling effect of education level. First, the level of education enhances literacy (including digital literacy), which is crucial to operating a digital device such as a mobile phone and a computer, and using the Internet (Yu et al., 2017; Marsh, 2021; Nikou et al., 2022). Second, there is potential for an indirect effect of education through income. In other words, higher levels of education are associated with higher income (Baum et al., 2013), which in turn enhances affordability of digital platforms. The third possible explanation is that individuals with higher levels of education could be more engaged in economic activities such as jobs and business that rely on digital connectivity (Bartik et al., 2020).

Geographical factors also influenced the ownership of and access to digital platforms. Individuals residing in other provinces were significantly less likely to own and access all three digital platforms relative to residents of Kigali City. Likewise, urban dwellers had a higher probability of owning and using mobile phones, computers and the Internet than were rural residents. Several factors could account for this geographical divide, including limited and poor Internet connectivity in rural areas (Budnitz and Tranos, 2022), lower digital literacy and poor phone network coverage, among others. In Africa, lower Internet usage in rural areas is attributed to lower levels of Internet coverage and standards of living (Frankfurter et al., 2020).

Table 2: Determinants of access to and ownership of digital financial infrastructure: Probit

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Ownership of digital platforms			Access to digital platforms		
	Phone	Computer	Internet	Phone	Computer	Internet
1 if female	-0.0630***	-0.00473**	-0.0247***	-0.0336***	-0.0322***	-0.0499***
	(0.00785)	(0.00231)	(0.00461)	(0.00522)	(0.00556)	(0.00711)
Age	0.0161***	0.00131***	0.00287***	0.00749***	0.00376***	0.00345***
	(0.00136)	(0.000421)	(0.000826)	(0.000837)	(0.000988)	(0.00127)
Age squared	-0.000187***	-1.27e-05***	-4.25e-05***	-8.61e-05***	-4.89e-05***	-6.19e-05***
	(1.44e-05)	(4.71e-06)	(9.68e-06)	(8.53e-06)	(1.13e-05)	(1.47e-05)
Household size	0.0187***	0.00114**	0.00220**	0.00933***	0.00318**	0.00617***
	(0.00217)	(0.000557)	(0.00110)	(0.00146)	(0.00136)	(0.00174)
Urban vs rural	0.122***	0.0454***	0.106***	0.0556***	0.140***	0.196***
	(0.00803)	(0.00353)	(0.00558)	(0.00554)	(0.00621)	(0.00735)
Education primary 1–3	0.0909***	0.0101	0.0669***	0.0382***	0.0529***	0.0881***
	(0.00987)	(0.00958)	(0.0192)	(0.00606)	(0.0178)	(0.0208)

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Table 2 Continued

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Ownership of digital platforms			Access to digital platforms		
	Phone	Computer	Internet	Phone	Computer	Internet
Education primary 4–6	0.211***	0.0301***	0.0996***	0.0962***	0.110***	0.148***
	(0.00918)	(0.00744)	(0.0131)	(0.00621)	(0.0129)	(0.0150)
Education secondary 1–3	0.201***	0.0907***	0.250***	0.0860***	0.258***	0.327***
	(0.00729)	(0.0198)	(0.0283)	(0.00489)	(0.0251)	(0.0254)
Education secondary 4–6	0.240***	0.236***	0.459***	0.105***	0.456***	0.568***
	(0.00621)	(0.0312)	(0.0309)	(0.00445)	(0.0267)	(0.0232)
Education univ. & tertiary	0.253***	0.576***	0.741***	0.114***	0.700***	0.759***
	(0.00503)	(0.0394)	(0.0250)	(0.00361)	(0.0232)	(0.0170)
Southern Province	-0.212***	-0.0177***	-0.0765***	-0.150***	-0.0792***	-0.144***
	(0.0237)	(0.00265)	(0.00524)	(0.0225)	(0.00641)	(0.00830)
Western Province	-0.168***	-0.0246***	-0.0693***	-0.136***	-0.0781***	-0.128***
	(0.0241)	(0.00273)	(0.00500)	(0.0230)	(0.00620)	(0.00821)
Northern Province	-0.206***	-0.0215***	-0.0666***	-0.154***	-0.0923***	-0.139***
	(0.0259)	(0.00245)	(0.00434)	(0.0258)	(0.00523)	(0.00694)
Eastern Province	-0.127***	-0.0212***	-0.0850***	-0.119***	-0.0899***	-0.148***
	(0.0237)	(0.00247)	(0.00478)	(0.0223)	(0.00579)	(0.00761)
Pseudo R-squared	0.2031	0.4117	0.3885	0.1592	0.3487	0.3680
Observations	12,480	12,480	12,480	12,480	12,480	12,480

Note: Robust standard errors in parentheses. ***, ** and * indicate significance at 1%, 5% and 10% levels respectively

Ownership of accounts and digital products

In this section, the determinants of ownership of accounts and digital products are presented as estimated using probit models. The outcome variable in each case is a binary, it took the value of one if a respondent of the FinScope survey reported owning a mobile money account, bank account, ATM card, credit card or used mobile banking and Internet banking, and zero otherwise. The marginal effects from the probit regressions are presented in Table 3. As in the results presented in the preceding sub-section, females lagged behind in ownership of mobile money and bank accounts (columns 1 and 2), ATM and credit cards (columns 3 and 4) and usage of mobile and Internet banking (columns 5 and 6).

The findings corroborate those from existing literature that confirm a gender divide in financial inclusion and DFS. For example, empirical evidence from Tanzania revealed that women are significantly less likely to access formal accounts of financial institutions than their male counterparts (Lotto, 2022). A critical gender gap in financial access has also been reported even in African countries like Botswana and

Swaziland, which have relatively high rates of financial inclusion, forcing women to rely more on informal accounts to manage their finances (Fanta and Mutsonziwa, 2016). Additionally, Table 3 illuminates the enhancing role of education in the adoption of financial accounts and products, and the mechanisms are presumed to be similar to those explained in the previous section. In addition, it is also plausible that the level of education influences the type of economic activities and labour market operations individuals engage in, including the possibility that more educated individuals engage in activities that may require account ownership (for example account-based salary payment for employed persons). This is more so in the post-COVID era when the potential for telework was heightened, especially for individuals with higher skills and education (López-Igual and Rodríguez-Modroño, 2020; Tavares et al., 2020). Qualitative responses from stakeholder engagements indicated that there is a still a critical gender gap in Rwanda's education sector, which translates into lower levels of general literacy, and financial and digital literacy among women. This indeed constrains women's ability to effectively use (digital) financial services. The probability of adopting accounts was also influenced by location, where urban residents were significantly more likely to have mobile money and bank accounts, own ATM and credit cards, and to use mobile and Internet banking. Financial services are generally urban-centred, especially in the case of developing countries like Rwanda, presenting a strong case for urban–rural disparities in financial access and usage. Rural residents often travel long distances to access financial service providers. This is associated with transport and opportunity costs that deter potential rural users of financial services (Munyegera and Matsumoto, 2016).

Table 3: Ownership of accounts and usage of digital financial products: Prob

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	MoMo A/C	Bank A/C	Credit Card	ATM Card	M-Banking	I-Banking
1 if female	-0.0602***	-0.0557***	-0.00388**	-0.0164***	-0.0195***	-0.0209***
	(0.00829)	(0.00674)	(0.00195)	(0.00500)	(0.00535)	(0.00418)
Age	0.0103***	0.0137***	0.000656**	0.00736***	0.00584***	0.00513***
	(0.00152)	(0.00117)	(0.000302)	(0.000894)	(0.000960)	(0.000720)
Age squared	-0.000140***	-0.000125***	-5.07e-06	-7.38e-05***	-5.38e-05***	-4.88e-05***
	(1.74e-05)	(1.31e-05)	(3.29e-06)	(1.01e-05)	(1.08e-05)	(8.09e-06)
Household size	0.00109	-0.00136	0.000746*	-0.000356	0.00157	0.00112
	(0.00211)	(0.00165)	(0.000436)	(0.00124)	(0.00132)	(0.000994)
Urban vs Rural	0.0836***	0.138***	0.00851***	0.0567***	0.0646***	0.0429***
	(0.00860)	(0.00695)	(0.00213)	(0.00538)	(0.00570)	(0.00452)
Education primary 1–3	0.138***	0.0821***	0.00204	0.0192	0.0270**	0.0361***
	(0.0183)	(0.0182)	(0.00491)	(0.0120)	(0.0131)	(0.0120)
Education primary 4–6	0.182***	0.143***	0.00880**	0.0502***	0.0596***	0.0464***
	(0.0139)	(0.0132)	(0.00400)	(0.00926)	(0.00997)	(0.00844)

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Table 3 Continued

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	MoMo A/C	Bank A/C	Credit Card	ATM Card	M-Banking	I-Banking
Education secondary 1–3	0.281***	0.287***	0.0154**	0.114***	0.126***	0.106***
	(0.0207)	(0.0235)	(0.00757)	(0.0174)	(0.0183)	(0.0173)
Education secondary 4–6	0.330***	0.437***	0.0295***	0.194***	0.216***	0.152***
	(0.0210)	(0.0237)	(0.0101)	(0.0202)	(0.0211)	(0.0197)
Education univ. & tertiary	0.271***	0.652***	0.0452***	0.322***	0.366***	0.226***
	(0.0243)	(0.0215)	(0.0140)	(0.0255)	(0.0260)	(0.0249)
Southern Province	-0.223***	-0.0945***	-0.00632***	-0.0441***	-0.0630***	-0.0326***
	(0.0106)	(0.00831)	(0.00236)	(0.00651)	(0.00648)	(0.00516)
Western Province	-0.206***	-0.123***	-0.00728***	-0.0481***	-0.0710***	-0.0411***
	(0.0107)	(0.00755)	(0.00237)	(0.00650)	(0.00627)	(0.00492)
Northern Province	-0.221***	-0.108***	-0.00571**	-0.0470***	-0.0707***	-0.0315***
	(0.00939)	(0.00724)	(0.00248)	(0.00638)	(0.00588)	(0.00511)
Eastern Province	-0.198***	-0.0793***	-0.00352	-0.0254***	-0.0474***	-0.0219***
	(0.0106)	(0.00828)	(0.00250)	(0.00691)	(0.00666)	(0.00530)
Pseudo R-squared	0.1182	0.2641	0.0714	0.1386	0.1532	0.1246
Observations	12,480	12,480	12,480	12,480	12,480	12,480

Note: Robust standard errors in parentheses; ***, ** and * indicate significance at 1%, 5% and 10% levels respectively

Usage of financial services

In this section, the propensity to use financial services (savings, credit, remittances and insurance) is presented. Table 4 presents the probit marginal effects indicating determinants of the probability that an individual saved (column 1), borrowed (column 2), sent remittances (column 3), received remittances (column 4) and was covered by private medical insurance (column 5). Public medical insurance (mutuelle de santé) was not included in this measure, as ownership rates were quite high, which would compromise the power of probit estimates. Furthermore, mutule de santé provides basic but not comprehensive medical cover. For each financial service considered, the outcome variable is a binary indicator for whether or not an individual used the respective service within six months before the FinScope survey.

The results revealed that females were significantly less likely to send and receive remittances. The likelihood of saving was also lower among females than among males, albeit with an insignificant coefficient. The results further revealed that gender does not significantly influence the probability of borrowing and being covered by private medical insurance. With regard to borrowing, this finding is contrary to earlier evidence on the gender gap in access to formal credit (Lotto, 2022). While the findings corroborate those of Aterido et al. (2013), who found no significant gender difference

in access to insurance and credit in sub-Saharan Africa, they contradict evidence of a significant gender divide in health insurance access in China (Zhou et al., 2021). The high rates of coverage of public health insurance in Rwanda could partially explain the insignificant gender gap in access to private medical insurance. In other words, women and girls in Rwanda who cannot afford private insurance have the option of relying on mutuelle de santé, which provides them with some basic cover, discounting the need to adopt private insurance. Qualitative findings from key informant interviews conducted as part of this study revealed that unfavourable cultural norms such as the high prevalence of unpaid care work restricts women from engaging in economic activities, a phenomenon that restricts their financial capabilities. Discussions further revealed relative reluctance of some financial service providers to offer certain services, particularly credit, to women due to misconception of inability to repay.

Table 4: Determinants of usage of financial services: Prob

Variables	(1)	(2)	(3)	(4)	(5)
	Saving	Borrowing	Sending	Receiving	Insurance
1 if female	-0.00996	0.00653	-0.0758***	-0.0220**	0.00263
	(0.00611)	(0.00929)	(0.00886)	(0.00900)	(0.00224)
Age	0.0167***	0.0270***	0.0231***	0.0120***	0.00314***
	(0.000912)	(0.00166)	(0.00167)	(0.00148)	(0.000498)
Age squared	-0.000163***	-0.000294***	-0.000250***	-0.000120***	-3.03e-05***
	(9.46e-06)	(1.83e-05)	(1.88e-05)	(1.61e-05)	(5.72e-06)
Household size	0.000185	0.00892***	0.00143	0.00174	0.00264***
	(0.00166)	(0.00240)	(0.00226)	(0.00231)	(0.000574)
Urban vs Rural	0.00626	-0.0125	0.117***	0.112***	0.0307***
	(0.00624)	(0.00966)	(0.00901)	(0.00921)	(0.00326)
Education primary 1–3	0.0541***	0.102***	0.125***	0.0784***	0.0363**
	(0.00771)	(0.0158)	(0.0185)	(0.0176)	(0.0148)
Education primary 4–6	0.102***	0.128***	0.190***	0.174***	0.0451***
	(0.00750)	(0.0132)	(0.0141)	(0.0137)	(0.00912)
Education secondary 1–3	0.0954***	0.167***	0.316***	0.293***	0.159***
	(0.00639)	(0.0171)	(0.0201)	(0.0190)	(0.0285)
Education secondary 4–6	0.108***	0.147***	0.438***	0.383***	0.411***
	(0.00593)	(0.0179)	(0.0188)	(0.0183)	(0.0396)
Education univ. & tertiary	0.122***	0.159***	0.539***	0.394***	0.662***
	(0.00533)	(0.0202)	(0.0182)	(0.0205)	(0.0385)
Southern Province	-0.0547***	-0.0526***	-0.226***	-0.204***	0.00633
	(0.0157)	(0.0178)	(0.0126)	(0.0138)	(0.00409)
Western Province	-0.0853***	-0.0701***	-0.188***	-0.158***	0.00272
	(0.0168)	(0.0182)	(0.0131)	(0.0146)	(0.00421)

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Table 4 Continued

Variables	(1)	(2)	(3)	(4)	(5)
	Saving	Borrowing	Sending	Receiving	Insurance
Northern Province	-0.0889***	-0.0935***	-0.215***	-0.239***	0.0161***
	(0.0183)	(0.0190)	(0.0119)	(0.0126)	(0.00586)
Eastern Province	-0.0866***	-0.0963***	-0.200***	-0.184***	0.0108**
	(0.0168)	(0.0178)	(0.0127)	(0.0139)	(0.00448)
Pseudo R-squared	0.0757	0.0390	0.1668	0.1080	0.3636
Observations	12,480	12,480	12,480	12,480	12,480

Note: Robust standard errors in parentheses; ***, ** and * indicate significance at 1%, 5% and 10% levels respectively

Value of financial service transactions

The values of financial service transactions undertaken by respondents six months before the FinScope survey are presented in Table 5. Estimated using tobit regression models, the results indicate the usage of financial services at the intensive margin as opposed to the extensive margin presented in the preceding section. In other words, the results presented in this section reflect intensity (transactional value) rather than propensity (adoption propensity) of borrowing and saving, including specific saving via mobile money. Unfortunately, the transactional values of the other financial services (remittances and insurance) are not available in the FinScope survey.

As was the case at the extensive margin, a gender gap exists at the intensive margin; the log-transformed values of amount saved and borrowed within six months before the survey were significantly lower among females. The finding of a negative gender effect partially corroborates that of Munyegera and Matsumoto (2016) who found a negative but rather insignificant effect of gender on the financial behaviour of households in Uganda. The findings are, however, in line with those of Lotto (2022), who found females borrowed less than their male counterparts in Tanzania.

Table 5: Determinants of value of financial service transaction: Tobit

Variables	(1)	(2)	(3)	(4)
	Log (amount saved)	Log (among saved MM)	Log (amount borrowed)	Log (amount sent)
1 if female	-0.466***	-2.598***	-2.617***	-1.940***
	(0.0679)	(0.304)	(0.465)	(0.217)
Age	0.255***	0.283***	0.330***	0.620***
	(0.0132)	(0.0625)	(0.0980)	(0.0440)
Age squared	-0.00247***	-0.00478***	-0.00524***	-0.00671***
	(0.000142)	(0.000751)	(0.00118)	(0.000502)

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Table 5 Continued

Variables	(1)	(2)	(3)	(4)
	Log (amount saved)	Log (among saved MM)	Log (amount borrowed)	Log (amount sent)
Household size	0.00202	0.00643	0.131	0.0482
	(0.0185)	(0.0787)	(0.119)	(0.0557)
Urban vs Rural	0.579***	3.207***	2.838***	3.205***
	(0.0720)	(0.330)	(0.521)	(0.237)
Education primary 1–3	0.899***	3.500***	1.897*	3.396***
	(0.131)	(0.680)	(1.080)	(0.474)
Education primary 4–6	1.681***	5.552***	4.887***	5.357***
	(0.107)	(0.568)	(0.871)	(0.385)
Education secondary 1–3	2.162***	8.007***	6.920***	7.992***
	(0.140)	(0.672)	(1.038)	(0.467)
Education secondary 4–6	2.977***	10.18***	7.720***	10.62***
	(0.141)	(0.659)	(1.048)	(0.447)
Education univ. & tertiary	4.119***	7.729***	5.485***	12.55***
	(0.143)	(0.770)	(1.170)	(0.454)
Southern Province	-1.174***	-9.596***	-9.429***	-5.506***
	(0.109)	(0.479)	(0.675)	(0.335)
Western Province	-1.131***	-7.888***	-13.47***	-4.261***
	(0.117)	(0.488)	(0.774)	(0.352)
Northern Province	-1.225***	-8.724***	-10.33***	-5.533***
	(0.124)	(0.535)	(0.785)	(0.393)
Eastern Province	-1.022***	-6.189***	-8.511***	-4.687***
	(0.114)	(0.460)	(0.664)	(0.338)
Sigma	3.681***	11.89***	13.66***	-18.29***
	(0.0364)	(0.116)	(0.284)	(1.058)
Constant	0.607*	-11.09***	-19.83***	9.641***
	(0.321)	(1.450)	(2.367)	(0.0850)
Observations	12,480	12,480	12,480	12,480

Note: Robust standard errors in parentheses; ***, ** and * indicate significance at 1%, 5% and 10% levels respectively

Robustness checks

The previous results indicate significant differences by gender with regard to ownership of digital platforms, accounts and financial products as well as usage of financial services. However, there is a possibility that the observed differences could be a result of other underlying differences among individuals besides their gender. Indeed, descriptive and summary statistics revealed critical differences between female and male respondents of the FinScope survey, along key demographic,

financial and other characteristics that could confound the estimated gender effect on access to and usage of financial products and services. This challenge is circumvented in this section by estimating propensity score matching (PSM) as robustness check to complement the earlier presented probit and tobit results. The PSM estimation technique establishes a counterfactual comparison group that helps in comparing outcomes for relatively similar groups along observable characteristics (Rosenbaum and Rubin, 1985). The approach therefore enables comparison of outcomes for males and females who share similar observable characteristics. Given that outcomes are compared only for pairs of female and male respondents with similar characteristics that could influence financial inclusion, any observed differences in the values of outcome variables could be attributed to gender rather than observable heterogeneity (differences in other covariates).

The results presented in Table 6 confirm the results presented in the earlier sub-section, indicating a significant and consistently negative effect of gender on the adoption of digital technologies and accounts and usage of financial services. This hence confirms a causal link between gender and financial inclusion that is robust to potential confounding effect of observed heterogeneity. In other words, the gender effect persists even after controlling for existing differences in observable characteristics between males and females.

Table 6: Gender and financial access and usage: PSM

Outcome variable	Female vs Male
Own mobile phone	-0.0563***
	(0.00877)
Own computer	-0.0104**
	(0.00483)
Own Internet	-0.0283***
	(0.00642)
Access mobile phone	-0.0358***
	(0.00716)
Access computer	-0.0300***
	(0.00665)
Access Internet	-0.0423***
	(0.00737)
Have MoMo A/C	-0.0543***
	(0.00924)
Have bank A/C	-0.0517***
	(0.00755)
Have credit card	-0.00254
	(0.00293)

continued next page

Table 6 Continued

Outcome variable	Female vs Male
Have ATM card	-0.0132**
	(0.00616)
Use mobile banking	-0.0217***
	(0.00651)
Use Internet banking	-0.0206***
	(0.00537)
Saving	-0.0146*
	(0.00753)
Borrowing	-0.000376
	(0.0106)
Sending remittances	-0.0644***
	(0.00926)
Receiving remittances	-0.0173*
	(0.00976)
Insurance	0.000745
	(0.00488)
Log (amount saved)	-0.392***
	(0.0441)
Log (amount saved MM)	-0.491***
	(0.0779)
Log (amount borrowed)	-0.179***
	(0.0496)

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels respectively

Table 7 presents the results of the covariate balance test, which is meant to indicate the effectiveness of the matching exercise. As presented earlier in the descriptive statistics, the Table reveals significant pre-matching differences among females and males along key variables that were used as covariates in the regressions. The P-values for the mean differences between females and males were less than 0.05 for most of the variables, indicating that the null hypothesis that the means of the respective variables are similar is rejected at the 5% significance level. However, after matching, most P-values were higher than 0.05, indicating the relative similarity of females and males whose outcomes were compared during matching. Failure to account for prior gender differences along key characteristics could lead to estimation bias as the gender effect is potentially capturing the effect of other underlying observable differences between the two groups. The last column of Table 7 shows that a considerable percentage of this bias was reduced by the matching exercise, hence increasing the attributability of the outcome differences to gender rather than confounding factors.

Table 7: Covariate balance test before and after matching

VARIABLES	Mean before matching			Mean after matching			Bias reduction
	Female	Male	P-value	Female	Male	P-value	(%, absolute)
Household size	4.34	4.16	0.000	4.34	4.33	0.855	97.8
Age of respondent	42.3	40.88	0.000	42.3	41.6	0.009	50.6
Urban	0.47	0.48	0.228	0.472	0.478	0.466	44.9
Education primary 1–3	0.14	0.13	0.240	0.136	0.125	0.037	60.7
Education primary 4–6	0.38	0.40	0.008	0.381	0.390	0.269	61.9
Education secondary 1–3	0.099	0.103	0.398	0.099	0.096	0.558	37.7
Education secondary 4–6	0.900	0.117	0.000	0.090	0.093	0.473	87.2
Education univ. & tertiary	0.051	0.086	0.000	0.051	0.053	0.527	93.3
Pseudo R-squared	0.013			0.002			
Mean bias	5.1			2.5			

Note: A small pseudo R-squared after matching indicates goodness of the matching technique (Sianesi, 2004). The effectiveness of the matching exercise is further revealed by an absolute mean bias that is less than five (Rosenbaum and Rubin, 1985)

Oaxaca–Blinder decomposition of the gender gap in financial inclusion

This section is devoted to the decomposition of the observed gender gap in ownership of financial products and accounts and in the usage of financial services. The rationale behind this decomposition is to ascertain the extent to which the observed differences in outcome indicators of financial inclusion are attributable to differences between males and females with regards to the observed characteristics (explanatory variables in the respective models). In other words, the outcome variables could be either a result of differences in the observed characteristics (constituting the explained part of the decomposition) or other random factors that are not accounted for by the included explanatory variables (constituting the unexplained part of the decomposition).

Tables 8 and 9 present the decomposition results for ownership of financial products and accounts and usage of financial services respectively. In the case of ownership of accounts and products, the explained component accounted for a relatively smaller proportion of the overall observed gender difference, while the biggest proportion of the gender gap was due to other factors that cannot be explained by the model. With regard to usage of financial services, however, the explained part accounted for the biggest proportion of the observed gender gap. Finally, in both cases, age and education level were the major mediating factors for the explained gender gap, implying that differences in the age and education levels of female and male respondents were the key factors responsible for the greatest proportion of the observed gender gap in both financial account ownership and usage of financial services.

Table 8: Ownership of accounts and financial products: Oaxaca–Blinder

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	MoMo A/C	Bank A/C	Credit Card	ATM Card	M-Banking	I-Banking
Male	0.326***	0.240***	0.0206***	0.127***	0.144***	0.0973***
	(0.00651)	(0.00593)	(0.00198)	(0.00463)	(0.00487)	(0.00412)
Female	0.244***	0.152***	0.0132***	0.0914***	0.102***	0.0606***
	(0.00504)	(0.00421)	(0.00134)	(0.00338)	(0.00355)	(0.00280)
Difference	0.0815***	0.0873***	0.00745***	0.0360***	0.0412***	0.0367***
	(0.00823)	(0.00728)	(0.00238)	(0.00573)	(0.00603)	(0.00498)
Explained	0.0280***	0.0355***	0.00252***	0.0182***	0.0204***	0.0143***
	(0.00330)	(0.00415)	(0.000681)	(0.00229)	(0.00262)	(0.00182)
Unexplained	0.0535***	0.0518***	0.00493**	0.0178***	0.0208***	0.0223***
	(0.00759)	(0.00606)	(0.00225)	(0.00513)	(0.00539)	(0.00448)
Age	-0.0117***	-0.0218***	-0.000988	-0.0119***	-0.0103***	-0.00864***
	(0.00355)	(0.00485)	(0.000768)	(0.00297)	(0.00276)	(0.00232)
Age squared	0.0167***	0.0205***	0.000528	0.0123***	0.00998***	0.00802***
	(0.00418)	(0.00430)	(0.000876)	(0.00293)	(0.00272)	(0.00228)
Household size	0.000773	-0.000990	0.000227	-0.000977	-9.19e-05	0.000358
	(0.000865)	(0.000719)	(0.000265)	(0.000619)	(0.000634)	(0.000549)
Urban vs Rural	0.000739	0.00158	9.30e-05	0.000653	0.000748	0.000454
	(0.000630)	(0.00132)	(8.76e-05)	(0.000550)	(0.000628)	(0.000386)
Education primary 1–3	-0.000739	-0.000391	2.06e-05	-8.73e-05	-4.78e-05	-0.000255
	(0.000643)	(0.000347)	(4.15e-05)	(0.000107)	(9.59e-05)	(0.000230)

continued next page

Table 8 Continued

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	MoMo A/C	Bank A/C	Credit Card	ATM Card	M-Banking	I-Banking
Education primary 4–6	0.00326**	0.00283**	0.000143	0.00131**	0.00116**	0.00109**
	(0.00129)	(0.00111)	(0.000133)	(0.000548)	(0.000507)	(0.000459)
Education secondary 1–3	0.00102	0.00105	3.09e-05	0.000470	0.000387	0.000376
	(0.00122)	(0.00125)	(5.01e-05)	(0.000564)	(0.000468)	(0.000452)
Education secondary 4–6	0.00682***	0.00980***	0.000709**	0.00489***	0.00508***	0.00368***
	(0.00158)	(0.00213)	(0.000290)	(0.00114)	(0.00120)	(0.000902)
Education univ. & tertiary	0.00614***	0.0195***	0.00144***	0.0100***	0.0111***	0.00779***
	(0.00128)	(0.00276)	(0.000481)	(0.00160)	(0.00174)	(0.00132)
Southern Province	0.00273	0.00162	0.000140	0.000808	0.00128	0.000700
	(0.00247)	(0.00147)	(0.000155)	(0.000750)	(0.00117)	(0.000653)
Western Province	0.00263	0.00196	0.000195	0.000865	0.00127	0.000779
	(0.00219)	(0.00164)	(0.000185)	(0.000742)	(0.00107)	(0.000670)
Northern Province	0.000417	0.000276	2.79e-05	0.000129	0.000216	0.000102
	(0.00214)	(0.00141)	(0.000144)	(0.000663)	(0.00111)	(0.000522)
Eastern Province	-0.000849	-0.000446	-4.87e-05	-0.000179	-0.000317	-0.000132
	(0.00220)	(0.00116)	(0.000130)	(0.000468)	(0.000823)	(0.000346)
Observations	12,480	12,480	12,480	12,480	12,480	12,480

Note: Robust standard errors in parentheses; ***, ** and * indicate significance at 1%, 5% and 10% levels respectively

Table 9: Determinants of usage of financial services: Oaxaca–Blinder

Variables	(1)	(2)	(3)	(4)	(5)
	Saving	Borrowing	Sending	Receiving	Insurance
Male	0.870***	0.538***	0.377***	0.376***	0.0852***
	(0.00468)	(0.00693)	(0.00673)	(0.00673)	(0.00388)
Female	0.844***	0.524***	0.272***	0.325***	0.0649***
	(0.00425)	(0.00585)	(0.00522)	(0.00549)	(0.00289)
Difference	0.0254***	0.0147	0.105***	0.0513***	0.0203***
	(0.00632)	(0.00907)	(0.00852)	(0.00869)	(0.00483)
Explained	0.0155***	0.0222***	0.0417***	0.0319***	0.0245***
	(0.00217)	(0.00290)	(0.00404)	(0.00364)	(0.00269)
Unexplained	0.00984	-0.00743	0.0629***	0.0194**	-0.00425
	(0.00664)	(0.00907)	(0.00763)	(0.00813)	(0.00357)
Age	-0.0278***	-0.0385***	-0.0260***	-0.0156***	-0.00836***
	(0.00620)	(0.00841)	(0.00591)	(0.00424)	(0.00222)
Age squared	0.0293***	0.0447***	0.0298***	0.0171***	0.00765***
	(0.00603)	(0.00879)	(0.00610)	(0.00444)	(0.00208)
Household size	0.000136	0.00238**	0.000399	0.000505	0.00114**
	(0.000675)	(0.000980)	(0.000838)	(0.000880)	(0.000509)
Urban vs Rural	4.47e-05	-0.000149	0.000972	0.00101	0.000374
	(0.000114)	(0.000201)	(0.000819)	(0.000853)	(0.000318)
Education primary 1–3	-0.000651	-0.000786	-0.000842	-0.000399	-0.000110
	(0.000571)	(0.000692)	(0.000729)	(0.000372)	(9.87e-05)
Education primary 4–6	0.00288**	0.00303**	0.00428**	0.00359**	0.000614**
	(0.00116)	(0.00125)	(0.00167)	(0.00142)	(0.000255)
Education secondary 1–3	0.000646	0.000677	0.00131	0.00114	0.000314
	(0.000773)	(0.000815)	(0.00156)	(0.00136)	(0.000376)
Education secondary 4–6	0.00442***	0.00391***	0.0110***	0.00934***	0.00619***
	(0.00106)	(0.00111)	(0.00239)	(0.00207)	(0.00138)
Education univ. & tertiary	0.00598***	0.00570***	0.0168***	0.0116***	0.0168***
	(0.00101)	(0.00131)	(0.00244)	(0.00185)	(0.00241)
Southern Province	0.000349	0.000682	0.00223	0.00218	-9.28e-05
	(0.000333)	(0.000654)	(0.00202)	(0.00197)	(0.000168)
Western Province	0.000398	0.000664	0.00198	0.00171	-6.35e-05
	(0.000352)	(0.000600)	(0.00166)	(0.00144)	(0.000155)
Northern Province	6.27e-05	0.000163	0.000356	0.000410	-3.36e-05
	(0.000322)	(0.000836)	(0.00183)	(0.00210)	(0.000174)
Eastern Province	-0.000216	-0.000310	-0.000644	-0.000639	6.75e-05
	(0.000560)	(0.000806)	(0.00167)	(0.00166)	(0.000182)
Observations	12,480	12,480	12,480	12,480	12,480

Note: Robust standard errors in parentheses; ***, ** and * indicate significance at 1%, 5% and 10% levels respectively

Qualitative findings

A combination of evidence from both quantitative and qualitative analysis led to a summary of actionable recommendations that would reduce or close the gender gap in traditional and DFS in Rwanda. The qualitative results presented in this subsection are drawn from key informant interviews administered using semi-structured questionnaires to representatives of 21 institutions. These included government institutions (5), private financial service providers (5), local non-governmental organizations (NGOs) (8), and international organizations (3). Of the 21 institutions, 11 had males as their main respondents; females represented 10 institutions.

Constraints to women's financial inclusion

1. ***Low levels of digital and financial literacy.*** Sector experts highlighted that women generally have lower levels of digital and financial literacy, which some respondents partly attributed to the gender gap in formal education. The low literacy levels translate to limited ability of women to navigate financial product menus, manage funds appropriately, and operate digital devices used in making electronic payments. Some respondents mentioned "technophobia", which they described as lack of confidence in using digital technology for financial transactions. For example, it was revealed that women, especially older ones, hand their phones to mobile money agents to perform transactions for them, which increases the risk associated with their digital transactions.

2. ***Limited knowledge and awareness of financial products.*** Besides the lower levels of financial and digital literacy, key informant interviews revealed that women have generally lower levels of access to information and are less aware of available financial product and services, especially those offered by traditional financial institutions such as banks. Some respondents mentioned the disproportionate burden of unpaid care work as keeping women preoccupied with household chores and hence oblivious to the available financial products and services.

3. *Inadequacy of women-friendly financial products.* While rates of traditional and digital financial inclusion have increased in Rwanda, some sector experts believe financial institutions are slow at designing financial products tailored to women's financial needs. A high degree of informality and its associated irregular incomes are some of the highlighted issues that financial service providers need to consider in designing appropriate products for women.

4. ***Lack of collateral to access formal credit.*** Traditionally, collateral is one of the main requirements by formal financial institutions to extend credit to seeking clients. Discussions with key informants revealed that such collateral as land titles,

building and other tangible assets often required by banks are less commonly owned by women relative to men, leaving a gender wedge in access to formal credit.

5. ***Low access to digital devices.*** Respondents mentioned that women have lower rates of ownership of digital devices, which was also corroborated by the quantitative analysis results (both descriptive and regression analysis). Specifically, women were less likely to own a computer, mobile phone and have access to Internet services and as such, they had lower rates of mobile and Internet banking usage, which heavily rely on these devices. Some respondents referred to cultural barriers as a limiting factor. Traditionally, where these devices are available in a household, their usage is dominated by men and boys at the expense of women and girls.

6. ***Risk aversion and limited exposure of women.*** Some sector experts believe women are risk averse and are less willing than men to take financial services with high risk, for example formal credit. Others reported limited exposure and business experience among women as a key hindrance, constraining their connectivity with financial service providers and ultimately reducing the extent of borrowing and usage of other financial services.

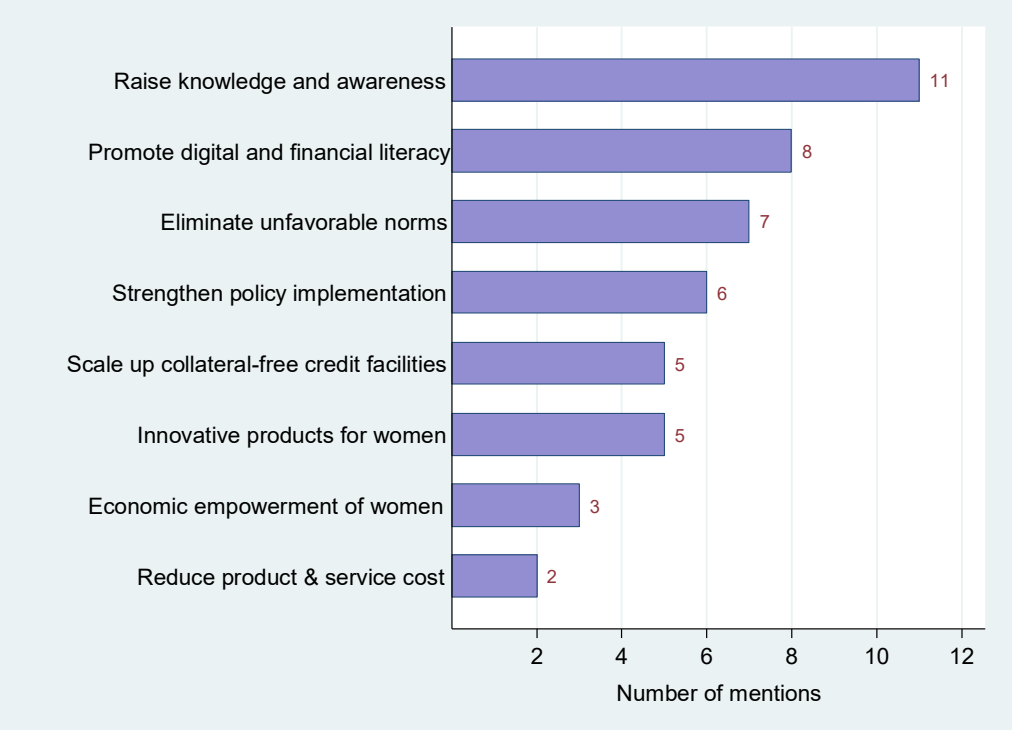
7. ***Negative attitudes among financial service providers.*** Respondents mentioned that while some women are willing to take formal credit and are indeed quite loyal in terms of repayment, some financial institutions perceive women as a high-risk customer segment and hence limited credit is granted to them.

8. ***Inadequate coordination of women's financial inclusion initiatives.*** It was also revealed from key informant interviews that while state and non-state institutions have initiatives that promote financial inclusion for women, these are inadequately coordinated and are characterized by duplication, with minimal tangible impacts.

What can be done to close the gender gap in financial inclusion

The key recommendations made by stakeholders to narrow the gender gap in access to and usage of traditional and DFS are presented in Figure 4, followed by a detailed description of all recommendations. The recommendations, which also mirror and are based upon the key challenges mentioned by stakeholders, are presented in order of relative importance, starting from the need to further boost knowledge and awareness to reduction of product and service cost. In between are other recommendations like breaking cultural barriers; strengthening the implementation of gender-inclusive policies; scaling up collateral-free credit facilities for women; and developing innovative products and economic empowerment initiatives for women.

Figure 4: Stakeholder recommendations to promote financial inclusion & DFS for women



1. ***Promote digital and financial literacy for women and girls.*** It is imperative that financial service providers in partnership with government and NGOs embark on joint capacity-building programmes to promote digital, financial and overall literacy targeting women and girls. The programmes could comprehensively cover financial management and related topics and offer practical guidance on how to manoeuvre menus of financial products and operate digital devices for financial transactions. There were suggestions integrating financial education into the formal education curriculum and including it as a key programming priority for women's groups. One suggestion that arose during the discussions was that the Gender Monitoring Office (GMO) could support women's organizations in designing and implementing digital and financial literacy programmes and curricula for women in partnership with and with technical assistance from financial and payment service providers.

2. ***Increase awareness campaigns targeting women.*** Financial institutions ought to proactively reach out to women to popularize available financial products and services and minimize the prevailing information gaps. Some respondents urged financial institutions to scale up their outreach programmes to target individual women and women's organizations in an attempt to popularize their respective financial products and services and their functionality.

3. ***Develop financial products that suit women's needs.*** With regard to credit, sector stakeholders find it helpful for financial institutions to develop credit instruments that are women-friendly, for example by easing collateral requirements and exploring government guarantee schemes for credit facilities targeting women and female entrepreneurs. Scaling up existing government guarantee schemes to reach out to more women in both urban and rural locations would indeed go a long way towards de-risking lending to women and women-owned enterprises by financial service providers. For women borrowers, special initiatives are needed to empower them in effective and profitable investment of borrowed money.

4. ***Campaigns to change mindset of financial institutions.*** A countrywide, multi-stakeholder campaign is needed to showcase women's financial potential, which could trigger a mindset change among financial service providers who currently perceive women as high-risk borrowers. One stakeholder suggested designing a capacity-building programme on data analytics for financial institutions, which could help them undertake gender-disaggregated analyses of customer data to ascertain patterns of loan repayment and default rates to disentangle perceived from actual risk of lending to women.

5. ***Campaigns to break cultural barriers.*** According to qualitative responses from stakeholder consultations, closing the gender gap in Rwanda's financial sector further requires initiatives to ease the cultural norms such as unpaid care work that restrict women's engagement in economic activities and hence constrain their financial capabilities. Multi-stakeholder campaigns are also needed to break male dominance in access to and usage of digital devices at the household level, preaching cooperation as opposed to competition for the devices as a means of maximizing joint financial benefits by women and men. Some experts find merit in engaging men and boys as agents of change to support women and girls, including granting them freedom of account ownership and transaction, voluntarily sharing digital devices and family collateral whenever necessary and possible, which could be championed by NGOs. For example, financial institutions and the government could work with Rwanda Men's Resource Centre (RWAMREC) to include financial inclusion elements into their programmatic approach to gender equality and transforming negative masculinity.

6. ***Cultivate networks for women's peer learning and exposure.*** Some respondents suggested establishing platforms that promote women's peer learning and exchange of ideas regarding financial management, available sources of funding for them and their businesses, among other relevant knowledge. This, according to respondents, could be supplemented by multi-stakeholder support to connect women networks to financial institutions.

7. ***Establish a central coordinating body for women's financial inclusion initiatives.*** In order to address the alleged poor coordination of existing initiatives, some respondents suggested designating a central body—for example the Gender Monitoring Office (GMO) or National Women's Council (NWC)—mandated with coordinating all women's financial inclusion interventions by government institutions, private sector and civil society organizations. This is anticipated to produce triple benefits of reducing duplication of interventions, identifying prevailing gaps to be prioritized and maximizing the impact of well-targeted interventions.

8. ***Investing in gender-disaggregated data for evidence-based interventions.*** Interviews with sector experts revealed that some sector stakeholders were unaware of the existing gender gap in access to and usage of both digital and financial services. In this regard, they recommend comprehensive and regular studies to gather and disseminate gender-disaggregated indicators of financial inclusion and DFS to trigger and guide evidence-based interventions to narrow the gender gap therein. In this regard, some stakeholders suggested a gender thematic report on financial inclusion and DFS to be produced as part of the forthcoming (2023) FinScope survey.

5. Conclusion and policy implications

The study explored the determinants of access to and usage of financial services, including DFS in Rwanda, using a combination of probit and tobit regression models with propensity score matching (PSM) as a robustness check. The main results of the study corroborate previous evidence on the existence of a gender divide in financial inclusion and in access to and utilization of DFS. To be precise, female respondents of the FinScope survey were significantly less likely to own and access a mobile phone, computer and Internet, and to save, borrow, and send or receive remittances at the extensive and intensive margins. The key drivers of the gender gap in financial inclusion and DFS in Rwanda included low rates of financial literacy, lack of collateral to access formal credit, lack of financial products tailored to women's financial needs, limited awareness and information access regarding financial products, inadequate coordination of women's financial inclusion programmes, among others. The results carry key policy implications with regard to the promotion of financial inclusion, DFS, and gender equality and women empowerment. First, the fact that women have lower access to and usage of digital platforms such as mobile phones, computers and Internet could reflect not only their limited affordability but also other underlying constraints like lower rates of digital literacy that need policy attention. Second, the lower rates of ownership of accounts and financial products and usage of financial services could be indicative of lower financial literacy rates in addition to limited financial capacity to save, borrow (and hence repay credit) and send remittances. This warrants targeted capacity-building interventions for women in the areas of digital, financial and overall literacy. Additionally, lower credit among women could reflect limited collateral and unfavourable socio-cultural norms, both of which issues are corroborated by qualitative results. This necessitates scaling up government guarantee schemes for credit facilities targeting women and female entrepreneurs and nation-wide campaigns to break cultural rigidities. This could go a long way towards enhancing financial inclusion, DFS and women's empowerment in a country with uncontested passion and policy committed to promoting gender equality and a cashless economy. Overall, addressing barriers to women's access to and usage of traditional and DFS could be a crucial tool to alleviate poverty and achieve gender equality, greater financial inclusion and inclusive sustainability, ultimately maintaining the country's established track record of high economic growth and women empowerment.

References

Adegbite, O.O. and C.L. Machethe. 2020. "Bridging the financial inclusion gender gap in smallholder agriculture in Nigeria: An untapped potential for sustainable development". *World Development*, 127: 104755.

Allen, F., A. Demirguc-Kunt, L. Klapper and M.S.M. Peria. 2016. "The foundations of financial inclusion: Understanding ownership and use of formal accounts". *Journal of financial Intermediation*, 27: 1–30.

Ameen, N. and R. Willis. 2019. "Towards closing the gender gap in Iraq: understanding gender differences in smartphone adoption and use". *Information Technology for Development*, 25(4): 660–85.

Amoah, A., Korle, K., & Asiama, R. K. (2020). Mobile money as a financial inclusion instrument: what are the determinants?. *International journal of social economics, 47*(10), 1283–1297.

Aterido, R., T. Beck and L. Iacovone. 2013. "Access to finance in Sub-Saharan Africa: is there a gender gap?" *World Development*, 47: 102–20.

Balliester Reis, T. (2022). Socio-economic determinants of financial inclusion: An evaluation with a microdata multidimensional index. *Journal of International Development, 34*(3), 587–611.

Bartik, A.W., Z.B. Cullen, E.L. Glaeser, M. Luca and C.T. Stanton. 2020. "What jobs are being done at home during the COVID-19 crisis? Evidence from firm-level surveys". NBER Working Pager No. w27422. National Bureau of Economic Research (NBER), Cambridge, MA, USA.

Blumenstock, J. E., & Eagle, N. (2012). Divided we call: disparities in access and use of mobile phones in Rwanda. *Information Technologies & International Development, 8*(2), pp-1.

Braun, V. and V. Clarke. 2006. "Using thematic analysis in psychology". *Qualitative Research in Psychology,* 3(2): 77–101.

Budnitz, H. and E. Tranos. 2022. "Working from home and digital divides: Resilience during the pandemic". *Annals of the American Association of Geographers*, 112(4): 893–913.

Cull, R., A. Demirguc-Kunt and J. Morduch. eds. 2021. *Banking the world: empirical foundations of financial inclusion*. MIT Press.

Demir, A., V. Pesqué-Cela, Y. Altunbas and V. Murinde. 2022. "Fintech, financial inclusion and income inequality: a quantile regression approach". *The European Journal of Financ*e, 28(1): 86–107.

Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2022). The Global Findex Database 2021: *Financial inclusion, digital payments, and resilience in the age of COVID-19*. World

Bank Publications.

Demirguc-Kunt, A., L. Klapper, D. Singer and S. Ansar. 2018. *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*. World Bank Publications. Washington, D.C.: The World Bank.

Demirgüç-Kunt, A., l.f. Klapper, D. Singer and P. Van Oudheusden. 2015. "The Global Findex Database 2014: measuring financial inclusion around the world". *World Bank Policy Research Working Paper No*. 7255. The World Bank, Washington, D.C., USA. Doi: 10.1596/1813-9450-7255.

Dogan, E., M. Madaleno and D. Taskin. 2022. "Financial inclusion and poverty: evidence from Turkish household survey data". *Applied Economics*, 54(19): 2135–47.

Donovan, K. 2012. "Mobile money for financial inclusion". *Information and Communications for Development,* 61(1): 61–73.

Dupas, P. and J. Robinson. 2013. "Savings constraints and microenterprise development: Evidence from a field experiment in Kenya". *American Economic Journal: Applied Economics*, 5(1): 163–92.

Dupas, R., & Robinson, J. (2009). Savings Constraints and Microenterprise Development: Evidence from a Field Experiment.„. *NBER Working Paper Series, 14693*.

Durai, T. and G. Stella. 2019. "Digital finance and its impact on financial inclusion". *Journal of Emerging Technologies and Innovative Research,* 6(1): 122–27.

Fanta, A. B., & Mutsonziwa, K. (2016). Gender and financial inclusion. FinMark Trust.-2016.-Policy Research Paper, 1(1). Gray, T.J., J. Gainous K.M. Wagner. 2017. "Gender and the digital divide in Latin America". *Social Science Quarterly*, 98(1): 326–40.

Grohmann, A. and A. Schoofs. 2021. "Financial literacy and intra-household decision making: Evidence from Rwanda". *Journal of African Economies*, 30(3): 225–50.

Iheanachor, N., I.O. Umukoro and O. David-West. 2021. The role of product development practices on new product performance: Evidence from Nigeria's financial services providers. *Technological Forecasting and Social Change*, 164: 120470.

Jack, W. and Suri, T., 2014. Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. *The American Economic Review,104*(1), pp.183-223. Doi: 10.1257/aer.104.1.183.

Jalilian, H. and C. Kirkpatrick. 2005. "Does financial development contribute to poverty reduction?" *Journal of Development Studies*, 41(4): 636–56.

Kim, K. 2022. "Assessing the impact of mobile money on improving the financial inclusion of Nairobi women". *Journal of Gender Studies*, 31(3): 306–22.

Koomson, I., R.A. Villano and D. Hadley. 2020. "Effect of financial inclusion on poverty and vulnerability to poverty: Evidence using a multidimensional measure of financial inclusion". *Social Indicators Research*, 149(2): 613–39.

Li, N. and G. Kirkup. 2007. "Gender and cultural differences in Internet use: A study of China and the UK". *Computers & Education*, 48(2): 301–17.

López-Igual, P. and P. Rodríguez-Modroño. 2020. "Who is teleworking and where from? Exploring the main determinants of telework in Europe". *Sustainability*, 12(21): 8797.

Lotto, J. 2022. Understanding financial inclusion in East Africa: How does Tanzania compare?" *International Journal of Finance & Economics*, 27(1): 1075–84.

Lu, X., J. Guo and H. Zhou. 2021. "Digital financial inclusion development, investment

diversification, and household extreme portfolio risk". *Accounting & Finance*, 61(5): 6225–61.

Marsh, E. 2021. "Understanding the effect of digital literacy on employees' digital workplace continuance intentions and individual performance". In *Research anthology on digital transformation, organizational change, and the impact of remote work* (pp. 1638–1659). IGI Global.

Mbiti, I., & Weil, D. N. (2011). *Mobile banking: The impact of M-Pesa in Kenya* (No. w17129). National Bureau of Economic Research.

Mbiti, I. and D.N. Weil. 2015. "Mobile banking: The impact of M-Pesa in Kenya". In S. Edwards, S. Johnson, D.N. Weil, eds., *African successes, Volume III: Modernization and Development*. University of Chicago Press.

Mohammed, J.I., L. Mensah and A. Gyeke-Dako. 2017. "Financial inclusion and poverty reduction in Sub-Saharan Africa". *African Finance Journal*, 19(1): 1–22.

Moyo, B. and A.B. Sibindi. 2022. "Does bank competition affect credit access in sub-Saharan Africa? Evidence from World Bank informal firms surveys". *Journal of African Business,* 23(1): 180–98.

Mumporeze, N. and M. Prieler. 2017. "Gender digital divide in Rwanda: A qualitative analysis of socioeconomic factors". *Telematics and Informatics*, 34(7): 1285–93.

Munyegera, G.K. and T. Matsumoto. 2016. "Mobile money, remittances, and household welfare: panel evidence from rural Uganda". *World Development*,79: 127–37. doi: 10.1016/j.worlddev.2015.11.006.

Munyegera, G.K. and T. Matsumoto. 2018. "ICT for financial access: Mobile money and the financial behavior of rural households in Uganda". *Review of Development Economics*, 22(1): 45–66.

FinScopeFinScopeNikou, S., M. De Reuver and M.M. Kanafi. 2022. "Workplace literacy skills—how information and digital literacy affect adoption of digital technology". *Journal of Documentation*, 78(7): 371–91.

NISR (National Institute of Statistics of Rwanda). 2020. FinScope Rwanda 2020. At chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.bnr.rw/fileadmin/user_upload/2020_Rwanda_FinScope.pdf

Odugbesan, J.A., G. Ike, G. Olowu, G. and B.N. Adeleye. 2020. "Investigating the causality between financial inclusion, financial development and sustainable development in Sub-Saharan Africa economies: The mediating role of foreign direct investment". *Journal of Public Affairs*, e2569.

Omotoso, K.O. and J. Adesina and O.G. Adewole. 2020. "Exploring gender digital divide and its effect on women's labour market outcomes in South Africa". *African Journal of Gender, Society & Development*, 9(4): 85.

Papastergiou, M. and C. Solomonidou. 2005. "Gender issues in Internet access and favourite Internet activities among Greek high school pupils inside and outside school". *Computers & Education*, 44(4), 377–93.

Pazarbasioglu, C., A.G. Mora, M. Uttamchandani, H. Natarajan, E. Feyen and M. Saal. 2020. Digital financial services. *World Bank*, 54. Retrieved from: https://pubdocs.worldbank.org/en/230281588169110691/Digital-Financial-Services.pdf

Prina, S. 2015. "Banking the poor via savings accounts: Evidence from a field experiment". *Journal*

of Development Economics, 115: 16–31.

Rosenbaum, P.R. and D.B. Rubin. 1985. "Constructing a control group using multivariate matched sampling methods that incorporate the propensity score". *The American Statistician*, 39(1): 33–8.

Samtleben, C. and K.U. Müller. 2022. "Care and careers: Gender (in) equality in unpaid care, housework and employment". *Research in Social Stratification and Mobility*, 77: 100659.

Sarma, M. 2008. Index of financial inclusion . Working Paper No. 215. Indian Council for Research on International Economic Relations (ICRIER), New Delhi

Sianesi, B. 2004. "An evaluation of the Swedish system of active labor market programs in the 1990s". *Review of Economics and Statistics*, 86(1): 133–55.

Swamy, V. 2014. "Financial inclusion, gender dimension, and economic impact on poor households". *World Development*, 56: 1–15.

Tavares, F., Santos, E., Diogo, A., & Ratten, V. (2021). Teleworking in Portuguese communities during the COVID-19 pandemic. *Journal of Enterprising Communities: people and places in the global economy*, 15(3), 334-349. World Bank. (2022). Financial Inclusion is a Key Enabler to Reducing Poverty and Boosting Prosperity. Retrieved from: https://www.worldbank.org/en/topic/financialinclusion/overview

Yawe, B. and J. Prabhu. 2015. "Innovation and financial inclusion: A review of the literature". *Journal of Payments Strategy & Systems*, 9(3): 215–28.

Yu, T.K., M.L. Lin and Y.K. Liao. 2017. "Understanding factors influencing information communication technology adoption behavior: The moderators of information literacy and digital skills". *Computers in Human Behavior*, 71: 196–208.

Zhou, M., S. Zhao and Z. Zhao. 2021. "Gender differences in health insurance coverage in China". *International Journal for Equity in Health*, 20(1): 1–13.

Appendix A: Key outcome and independent variables and their measurement

Variable	Definition/measurement	Expected sign
Age	Age of respondent in years	Positive
Female	Female dummy equal 1 if an individual is female and zero if male	Negative
Household size	Number of members living in a household to which the respondent belongs	Ambiguous
Urban vs rural	Urban dummy equal 1 if an individual respondent resides in an urban area; 0 otherwise	Positive
Education level: Primary 1–3	One of five cases of a categorical education variable representing individuals who completed between levels 1–3 of primary education. Regression coefficients interpreted in comparison with individuals without formal education	Positive
Education level: Primary 4–6	One case of a categorical education variable for those who completed primary 4–6 levels of formal education. Regression coefficients interpreted in comparison with individuals without formal education	Positive
Education level: Secondary 1–3	One case of the categorical education variable for individuals with secondary 1–3 education attainment. Regression coefficients interpreted in comparison with individuals without formal education	Positive
Education level: Secondary 4–6	One case of the categorical education variable for individuals with secondary 4–6 education attainment. Regression coefficients interpreted in comparison with individuals without formal education	Positive
Education level: University/ Tertiary	One case of the categorical education level for individuals with university and other tertiary levels of education attainment. Regression coefficients interpreted in comparison with individuals without formal education	Positive
Province	Categorical variable with 5 cases (Kigali City, Western Province, Southern Province, Eastern Province and Northern Province). Kigali City is the reference case with which estimates of the other provinces are compared	Negative for all other provinces relative to Kigali City

Appendix B: Structure of the primary data collection exercise

S/N	Stakeholder category	Required information	Data collection method/tools	Sampling technique
1	**Government institutions** National Bank of Rwanda Ministry of Finance and Economic Planning National Institute of Statistics of Rwanda Ministry of ICT	• Policies and strategies in place to boost (digital) financial inclusion • Trends of (digital) financial inclusion indicators • Challenges (so far) in boosting digital financial inclusion for women • Opportunities, challenges and recommendations regarding leveraging digital financial services for greater financial inclusion of women	Key informant interviews using semi-structured questionnaires and examination of any relevant documents	Purposive sampling based on official's knowledge, experience and duties within the respective institution
2	**International organizations (development partners)** UNDP, UNCDF, MasterCard Foundation, UN Women	• Funding instruments, past/ongoing/ planned programmes, interventions and strategies to boost (digital) financial inclusion for women • Opportunities, challenges and recommendations for greater inclusion of women in digital financial services	Key informant interviews using semi-structured questionnaires and examination of any relevant documents	Purposive sampling based on official's knowledge, experience and duties within the respective institution
3	**Private sector** PSF (ICT Chamber) Financial institutions Payment service providers, Fintechs, etc.	• Innovative (digital) financial products on the market and how they could suit women's needs • Experience (including opportunities and challenges) developing (digital) financial products for women's financial inclusion	• Key informant interviews using semi-structured questionnaires • Focus group discussions for players in a similar category	Purposive sampling based on official's knowledge, experience and duties within the respective institution
4	**Other stakeholders** Access to Finance Rwanda (AFR), civil society, faith-based and other organizations	• General insights on the opportunities, challenges and recommendations to boost (digital) financial inclusion among women	Focus group discussions with selected individual women and women representatives	A combination of purposive and snowball sampling

Appendix C: Sample questions for discussion during stakeholder consultations

Part 1: Government institutions (policy and regulatory bodies)	
Q1	What policies and regulations are in place to promote financial inclusion and digital financial services?
Q2	To what extent are the policies/regulations gender-mainstreamed?
Q3	What government interventions have been implemented recently, ongoing or planned to promote gender inclusion in digital financial services?
Q4	To what extent do monitoring and evaluation (M&E) frameworks in national policies capture gender-disaggregated data on digital financial services?
Q5	What can be done better or differently to enhance women's access to and effective usage of digital financial services?
Part 2: Private sector (financial institutions, payment service providers, mobile network operators)	
Q1	Do you observe (are you aware of) gender-based differences in usage patterns of DFS by gender?
Q2	Are you aware of gender-based differences in preferences for and capacity to use digital financial services?
Q3	Do you have digital financial products that target women and girls? If not, would you consider providing innovative digital financial products for women?
Q4	What can be done (by different stakeholders) to promote gender inclusion in digital financial services?
Part 3: Development partners and local non-profit organizations including women's organizations	
Q1	What are the key challenges that limit women from accessing and effectively using digital financial services?
Q2	Do you have funding programmes and/or interventions specifically targeting women's (digital) financial inclusion?
Q3	What can be done (by different stakeholders) to promote gender inclusion in digital financial services?

Appendix D: List of institutions covered by key informant interviews

S/N	Name of institution	Category of institution
1	National Bank of Rwanda (NBR)	Government
2	Ministry of Finance and Economic Planning (MINECOFIN)	Government
3	Gender Monitoring Office (GMO)	Government
4	National Women's Council (NWC)	Government
5	National Council for Persons with Disabilities (NCPD)	Government
6	I&M Bank	Private financial institution
7	Bank of Kigali	Private financial institution
8	Urwego Bank	Private financial institution
9	Cogebanque	Private financial institution
10	Umutanguha Microfinance	Private financial institution
11	National Union of Disability Organizations in Rwanda (NUDOR)	Local NGO
12	Profemmes Twese Hamwe	Local NGO
13	Rwanda Union of Little People (RULP)	Local NGO
14	Rwanda Union of the Blind (RUB)	Local NGO
15	Organization for Integration and Promotion of People with Albinism (OIPPA)	Local NGO
16	Rwanda Ex-Combatants and Other People with Disabilities Organization (RECOPDO)	Local NGO
17	Troupes Personae Hand Twuzuzanye (THT)	Local NGO
18	Access to Finance Rwanda (AFR)	Local NGO
19	United Nations Entity for Gender Equality and Women Empowerment (UN Women)	International organization
20	Christian Blind Mission (CBM)	International organization
21	United Nations Capital Development Fund (UNCDF)	International organization

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