Disability, Digital Financial Services and Financial Inclusion: Evidence from Rwanda

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Disability, Digital Financial Services and Financial Inclusion: Evidence from Rwanda

By

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Abstract

Persons with disabilities have disproportionately lower levels of access to financial and other services globally, resulting in lower socio-economic status relative to the general population. This study uses a mixed methods approach to quantify and explain the disability divide in Rwanda's financial services. Using Probit models, the probabilities of accessing, owning and using digital platforms, financial accounts and products, and financial services are estimated while Tobit models are used to estimate the value of financial transactions. Probit and Tobit estimates are complemented by propensity score matching (PSM) as a robustness check. The results indicate that persons with disabilities are significantly less likely to own a mobile phone, computer and Internet or even use those owned by someone else. Ownership rates of mobile money and bank accounts, automated teller machine (ATM), credit cards, and usage of mobile and Internet banking are also lower among persons with disabilities. The usage of financial services – saving, remittances, credit and insurance – is also lower among persons with disabilities at the extensive margin (probability of usage) and intensive margin (value of transactions). A further finding is that, conditional on having a disability, females are less financially included related to males. The findings carry key implications regarding the need to boost financial inclusion for persons with disabilities to achieve overall equality as stipulated in Sustainable Development Goal (SDG) 10. Among others, there is need for interventions to raise digital and financial literacy among persons with disabilities and develop innovative products that appeal to the financial needs and difficulties of this vulnerable group in general and women with disabilities in particular.

Keywords: *Financial inclusion; Digital financial services; Disability; Rwanda*

JEL codes: *G20, D14, O12, O16, J14*

1. Introduction

Financial inclusion plays a central role in development through poverty and vulnerability reduction (Jalilian and Kirkpatrick, 2005; Vitenu-Sackney and Songli, 2020; Dawood and Pratama, 2019; Demirguc-Kunt et al., 2015), mobilization of funds for investment (Dupas and Robinson, 2013), facilitation of international remittance flows (Chuc et al., 2022; Aga and Martinez Peria, 2014), among other development pathways. However, a considerable proportion of the world's poor have no access to these basic financial services, including 1.4 billion people globally who have no bank accounts (Demirgüç-Kunt et al., 2022). The lack of access to affordable financial services, which is a result of both demand- and supply-side hindrances, limits the ability of many poor people to smoothen consumption and undertake productive investments (Dupas and Robinson, 2013).

Persons with disabilities (PWDs) face exceptional challenges in accessing and effectively using (digital) financial services and as a result face disproportionately lower rates of financial inclusion (Santoso, 2023). For example, persons with physical and visual disabilities often find it difficult to physically travel to financial service providers to access services, a challenge that is often compounded by the urban concentration of financial service providers. In addition, the blind face challenges of reading and comprehending documents related to various financial services. Such challenges are exacerbated by discrimination and stereotypes by some financial service providers who occasionally deny this customer segment access to certain services, especially credit. According to the Centre for Financial Inclusion, about 80-85% of adults with disabilities have the capacity to use financial services. However, this vulnerable and marginalized group constitute only 0.5% of the client base of microfinance institutions, despite being 15% of the population in developing countries as estimated by the World Health Organization (WHO). The reluctance of financial service providers to expand their service offerings and means of delivery continues to be a stumbling block for potential clients with disabilities (Jiya et al., 2022). The absence of sign language interpreters and Braille signage implies inability by persons with certain types of disabilities to comprehend the services offered by financial institutions. This renders this marginalized group unable to use the respective services and, in turn, could deter them from effectively smoothening consumption, alleviating poverty and engaging in productive activities. The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) was established to advise member states

on the design and implementation of disability inclusion principles and initiatives (United Nations, 2006). However, disability inclusion is inadequately considered in development policies of Sub-Saharan African countries. A study by Lang et al. (2019) reviewed several policies and found them not to reach even 50% inclusion. This jeopardizes the realization of Goal 10 of the Sustainable Development Goals (SDGs) and social inclusion aspiration of Agenda 2063 of the African Union.

In Rwanda, disability inclusion is increasingly being recognized in national and local government policies and plans. Nonetheless, a wide gap still exists in the financial sector as 25% of adults with disabilities were financially excluded in 2020 compared to only 7% of the population without disabilities. This study is quite relevant as it delves deep into the extent and root causes of differences in financial inclusion for persons with and without disabilities. As no such comprehensive study has been conducted to the best of the author's knowledge, the paper yields information to inform evidence-based policy interventions meant to address demand and supply-side constraints to effective financial inclusion of persons with disabilities as one of the pathways to achieving inclusive sustainable development.

The main objective of the study is to comprehensively examine the differences in access to and usage of conventional and digital financial services between persons with and without disabilities. The study intends to identify the challenges, opportunities and recommendations to make the country's financial sector more disability inclusive.

The study presumes that there are structural, market, product and other demand- and supply-side constraints that keep persons with disabilities away from accessing and effectively utilizing financial services. The study hence hypothesizes that ***persons with disabilities have lower levels of access to and usage of financial services due to idiosyncratic challenges on the demand and supply sides of the financial sector***. To test the hypothesis, three research questions are explored in the study:

(i) To what extent does disability account for differences in individuals' access to and usage of conventional and digital financial services?

(ii) What should be done to address demand-side constraints and induce persons with disabilities to use (digital) financial services?
(iii) How can the supply of (digital) financial services be increased/improved for greater access and usage among persons with disabilities?

The rest of the paper is organized as follows. Section 2 reviews existing literature on disability, financial inclusion and digital financial services. This is followed by background information on the same in the context of Rwanda in Section 3 while Section 4 elaborates the methodology. Empirical results are presented in Section 5 while Section 6 concludes the paper and provides policy implications and recommendations.

2. Literature review

The definition of financial inclusion is quite broad and covers issues of availability, access and usage of affordable financial services. The fundamental definition, however, focuses on access to accounts in bank and non-bank financial institutions, a definition that is widely used in the existing literature on the topic (Demirgüç-Kunt et al., 2022). The literature on the disability-financial inclusion-DFS nexus is categorized into three strands. The first literature strand concerns studies that examine the demand and supply-side determinants of financial inclusion (Munyegera and Matsumoto, 2016; 2018; Prina, 2015). Among the major supply-side factors is the distance to service points, where long distances have been found to impose high opportunity and transportation costs especially in rural communities given the relative urban concentration of financial institutions (Munyegera and Matsumoto, 2016; 2018). In Rwanda, the average time to reach a bank was 21 minutes for the three districts of Kigali City, much lower than over 40 minutes for other districts outside Kigali (NISR, 2020). Financial inclusion is further influenced by the level of interest rates and bank innovations (Oyelami et al., 2017) and availability of paved roads and Internet infrastructure (Siddik et al., 2016). Demand-side factors include but are not limited to income (Tinta et al., 2022; Oyelami et al., 2017; Sanderson et al., 2018; Soumare et al. 2016; Zins and Weil, 2016), education and literacy levels (Oyelami et al., 2017). Using the World Bank's Global Findex database for 37 Sub-Saharan African countries, Zins and Weil (2016) found financial inclusion rates to be higher among richer and older African males with higher levels of education. Other demand-side determinants include attitudes that influence an individual's decision to use certain financial services (Han and Sherraden, 2009), employment status, marital status, household size, and degree of trust in financial institutions (Soumare et al., 2016).

The second literature strand examines the extent of social inclusion in (digital) financial services. What is widely discussed among these studies is the existence of a gender divide in access to and usage of traditional and digital financial services. Studies in this strand specifically reveal that the rates of financial inclusion are lower among females relative to males (Adegbite and Machethe, 2020; Fanta and Mutsonziwa, 2016; Swamy, 2014; Lotto, 2022). Empirical evidence from Sub-Saharan Africa points to an eight percentage point gender gap in usage of fintechs, part of it being attributed to differences in attitudes such as willingness to use new financial technologies (Chen et al., 2023). However, despite the existing gender gap in fintech

usage, fintech development plays a crucial role in narrowing the gender gap in financial inclusion, especially if coupled with targeted policies (Yeyouomo and Asongu, 2022).

Another social dimension of gaps in financial inclusion is disability, albeit scanty empirical evidence on the same. Available evidence indicates that persons with disabilities have disproportionately lower levels of financial inclusion relative to the general population without disabilities (Deng and Meng, 2013). Empirical evidence also reveals that persons with disabilities not only have lower rates of overall financial inclusion but are more likely to be denied credit or granted credit of lower amounts, particularly for those with vision and cognitive disabilities (Wann and Burke-Smalley, 2022). The demand-side drivers of disability-based differences in financial inclusion include low levels of financial literacy, communication barriers, and high rates of unemployment (Jiya et al., 2022). Such demand-side constraints are closely interconnected with supply-side limitations. For example, the reluctance of financial institutions in Malawi to provide innovative and disability-friendly financial products is partly blamed on low socio-economic status of this vulnerable group, in addition to lack of adaptive technologies (Jiya et al., 2022). Given that long distance is cited as a key supply-side constraint to financial inclusion (Munyegera and Matsumoto, 2016), the physical limitations of persons with disabilities could critically hamper their decision to seek and use financial services. This is exacerbated by the physical inaccessibility of infrastructure/premises of financial institutions. Persons with disabilities also face disproportionately lower rates of access to, awareness and usage of mobile devices (Aranda-Jan et al., 2020), which could translate into lower rates of using digital financial services. This is despite the fact that persons with disabilities are actually capable of using digital services (Aranda-Jan et al., 2020). This implies that the right set of interventions could trigger digital financial services to bridge the disability gap in financial services. Indeed, digital technologies provide persons with disabilities with a range of channels – voice, text, video – through which to access and use services and hence reduce communication barriers (Raja, 2016). Given that the financial inclusion of persons with disabilities is partly constrained by communication barriers and long distances to service providers, digital financial technologies could ease these constraints and go a long way in promoting financial inclusion for this disadvantaged group.

The available literature on social inclusion in financial services has critical gaps. Firstly, the literature is both scanty and focused on developed countries with limited coverage of Africa. Secondly, the available evidence on Africa relied on qualitative approaches without a comprehensive mixed-methods examination of the extent and drivers of the disability gap (Jiya et al., 2022). To the best of the author's knowledge, there is no empirical study that examines differential rates of access to and usage of (digital) financial services by disability type in Rwanda. This study attempts to contribute to this discourse and narrow the literature gap by comprehensively examining the extent, drivers and potential remedies to the differences in financial inclusion in Rwanda by disability status, leveraging on quantitative data from the FinScope Survey and qualitative data from key informant interview.

3. Disability, financial inclusion and DFS in Rwanda's context

In Rwanda, financial inclusion is at the centre of the national development agenda. 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 (MINECOFIN, 2018). The strategic plan intends to address some of the sector challenges, including low saving rates due to poor savings culture and low incomes, limited access to banking products particularly in rural areas, limited ability of financial institutions to provide low-income financial products and limited capacity to mobilize long-term financing due to the infancy of capital markets. Nonetheless, the sector remains dynamic and several achievements have so far been realized.

The FinScope Report of 2020 indicates that 93% of the adult population have access to either formal or informal financial services, indicating almost a two-fold increase from only 48% in 2008 (NISR, 2020). However, the rates of ownership of formal financial services – particularly access to a bank account – remain lower. 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 through mobile money. Only 17% of adults either have or use insurance products, although 88% are covered by the community-based health insurance scheme – Mutuelle de Sante. Persons with disabilities are one of the most vulnerable groups with levels of financial inclusion (75%) lower than among the general population – 93% (NISR, 2020).

Rwanda ratified the United Nations Convention on the Rights of Persons with Disabilities in 2008, two years after its establishment. Following this ratification, the country's legal framework was revised and several ministries mainstreamed their disability strategies for the better inclusion of persons with disabilities. One of the key milestones is a partnership between UNDP and the National Bank of Rwanda (NBR), established in 2020 to advance access to finance for persons with disabilities. Besides, government and non-government stakeholders have emphasized promoting the inclusion and equity of persons with disabilities in various sectors – including finance. Platforms such as the Disability Coordination Forum (DCF), non-government organizations such as the National Union of Disability Organizations in Rwanda (NUDOR), Cristian Bling Mission (CBM), UNDP, among others, and government

institutions such as the National Council for People with Disabilities (NCPD) have launched several campaigns to promote the well-being of this vulnerable group.

In 2013, NCPD developed the disability mainstreaming guidelines to guide the integration of disability inclusion in national, sector and local government policies and plans. The disability monitoring information system (DMIS) was also developed to regularly monitor disability-disaggregated development indicators in the country. The National Policy on Persons with Disabilities and Four-year Strategic Plan (2021-2024) of the Ministry of Local Government (MINALOC) targets supporting 1,000 persons with disabilities to access financial services as a means of empowering them to create their own jobs (MINALOC, 2021). However, despite these commendable efforts so far, persons with disabilities still face lower levels of access to and usage of financial services as is the case with several other services. This paper assesses the status of financial inclusion for persons with disabilities in Rwanda, highlights supply- and demand-side challenges/constraints, opportunities and makes recommendations to promote a disability-inclusive financial sector in the country.

4. Methodology and data

Understanding differences in access to and usage of (digital) financial services between persons with and without disabilities requires comprehensive examination of the magnitude of the differences based on quantitative indicators and qualitative examination of their drivers. To achieve this dual goal, this 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 disability dimension of financial inclusion and DFS. This paper measures the differences between persons with and without disabilities in financial inclusion in terms of both access to and usage of (digital) financial accounts and services. Three approaches are used for this purpose; descriptive analysis reveals the magnitude of the gap by presenting differences in access to and usage of financial accounts and services between persons with and without disabilities; regression analysis measures the causal effect of disability status on financial access and usage; and qualitative analysis delves deep into the drivers of the observed disability-based differences in financial services.

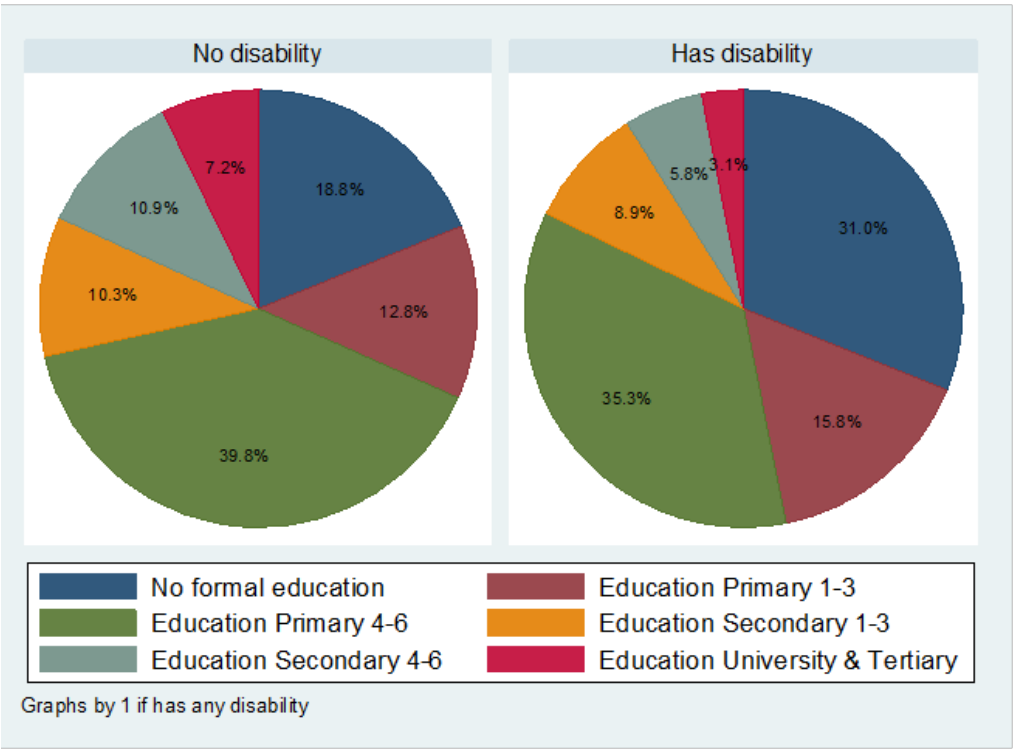
Descriptive analysis of secondary qualitative data (FinScope)

Descriptive analysis relied on secondary quantitative data obtained from the 2020 wave of the FinScope survey, which was used to measure the disability-disaggregated levels of access to and usage of (digital) financial services in Rwanda. The survey was conducted between September and November 2019 by the Centre for Economic and Social Studies (CESS) in partnership with the National Institute of Statistics of Rwanda (NISR) and with funding from FinMark Trust (FMT). It is the most comprehensive survey on financial inclusion in the country, covering 12,480 individuals with several socio-economic, financial inclusion and digital financial services modules. The analysis is divided into two parts. The first part of the analysis is descriptive and provides the status of (digital) financial inclusion for persons with and without disabilities as calculated from the data. The second quantitative approach entails regression analysis to examine the factors that determine adoption and usage of (digital) financial services with emphasis on the disability status of

Finscope survey respondents. Out of the 12,480 respondents covered by the survey, 2,039 (16.3%) reported having some form of disability, including 284 (2.3%) blind people, 970 (7.8%) persons with physical disabilities in legs and arms and 785 (6.3%) with other categories of disabilities.

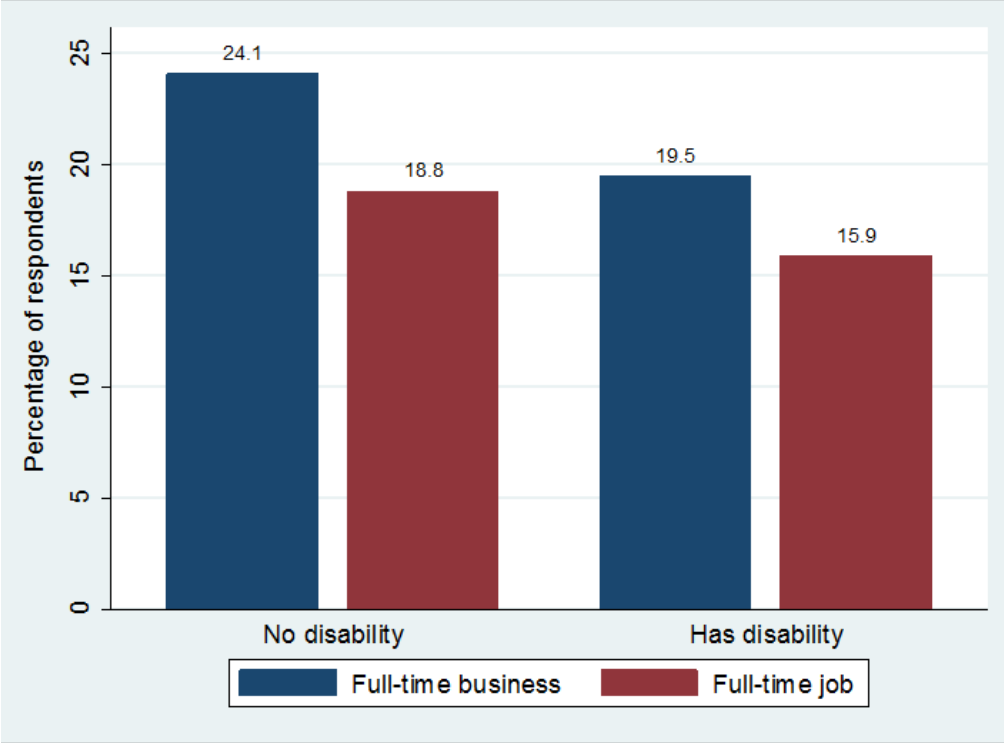
Figure 2 reveals that a larger proportion of persons with disabilities have no formal education relative to non-disabled counterparts. Additionally, the proportions of individuals with primary, secondary and tertiary levels of education are much lower among persons with disabilities compared to those without disabilities. The lower levels of education attainment could indeed constrain access to labour market and other economic opportunities by this vulnerable group. As depicted in Figure 3, a smaller share of persons with disabilities either have a full-time job or are engaged in full-time business relative to non-disabled individuals.

Figure 2: Level of education by disability status of respondent



Source: Author's illustration based on FinScope 2020 data

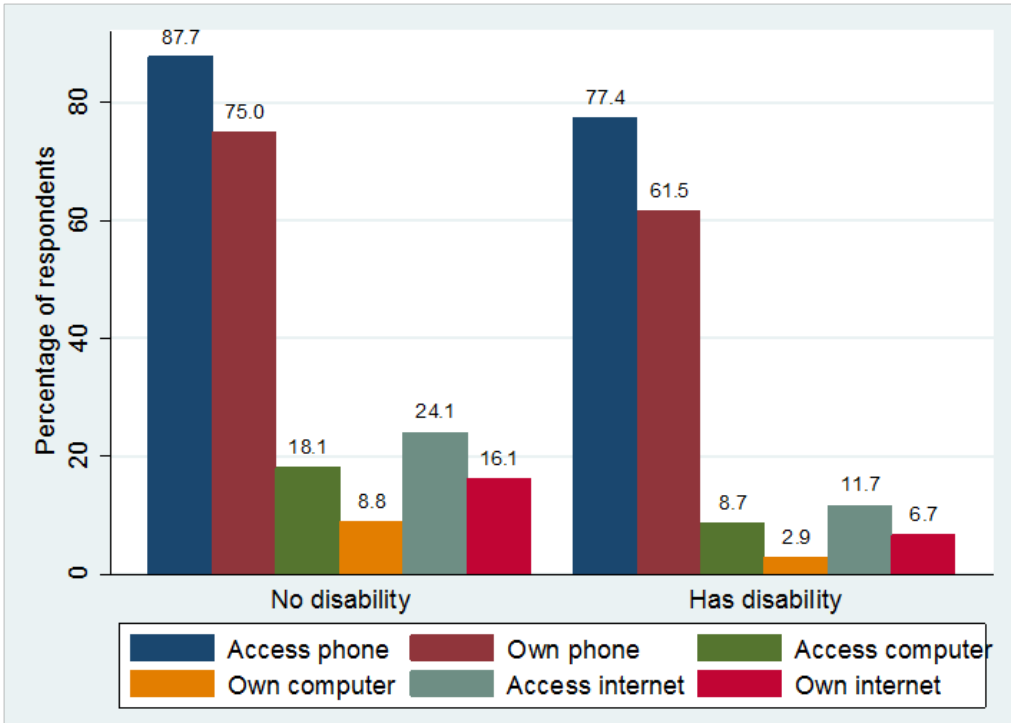
Figure 3: Participation in full-time job or business by disability status of respondent



Source: Author's illustration based on FinScope 2020 data

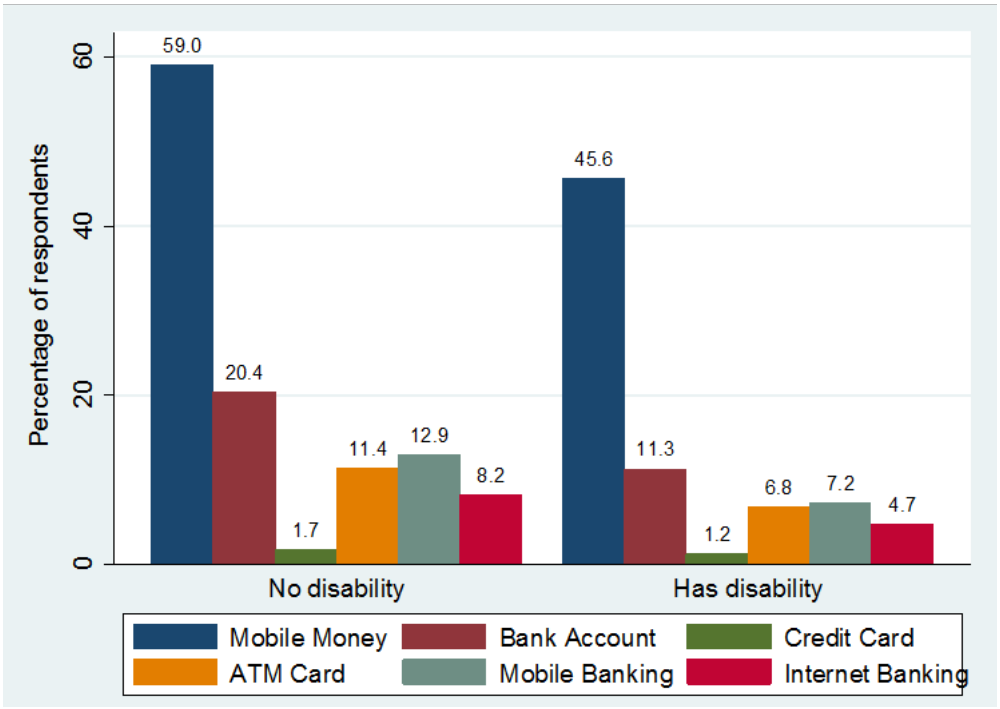
Regarding ownership of and access to digital platforms, Figure 4 indicates that smaller proportions of persons with disabilities either have a mobile phone, computer and Internet or access those owned by someone else compared to persons without disabilities. It is important to note that these digital platforms are crucial for the adoption and usage of digital financial services. As such, the lower level of access to these platforms among persons with disabilities could be a limiting factor to their effective usage of digital financial services, exacerbating the disability divide in financial inclusion. Figure 5 further shows that ownership of financial products and accounts differs between persons with and without disabilities. To be precise, bank account ownership is twice as high among persons without disabilities relative to those with disabilities. Similarly, the rates of ownership of a mobile money account, credit and ATM cards and usage of mobile banking and Internet banking are lower among persons with disabilities compared to those without disabilities.

Figure 4: Ownership of digital platforms by disability status of respondent



Source: Author's illustration based on FinScope 2020 data

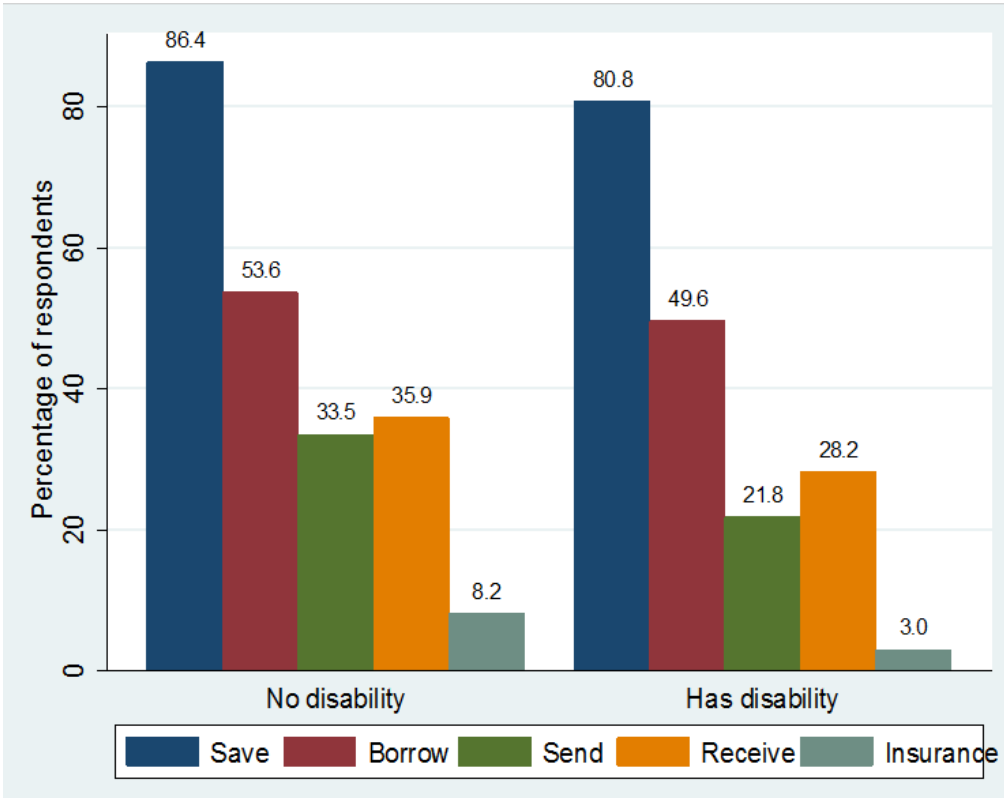
Figure 5: Ownership of financial products and accounts by gender of respondent



Source: Author's illustration based on FinScope 2020 data

With regard to access to financial services, a smaller proportion of individuals with disabilities reported having saved, sent/received remittances and being covered by private medical insurance (Figure 6). These observations are confirmed by summary statistics in Table 3, which reveal that the differences in the means of key demographic and financial indicators of individuals with and without disabilities are significant at the one percent level, with a few exceptions. As depicted in Table 3, 11% of adult persons with disabilities have a bank account compared to 20% among persons without disabilities. In other words, bank account ownership for persons with disabilities is only slightly above half the rate for persons without disabilities. With regard to mobile money, 45% of persons with disabilities have an account, compared to 59% for the general population without disabilities (constituting a difference of 14 percentage points). For Internet banking, the usage propensity is 4.7% and 8.2% for persons with and without disabilities, amounting to a difference of 3.5 percentage points. In other words, the usage rate for persons with disabilities is only 57% (4.7/8.2) of that for persons without disabilities. Finally, for mobile banking, the respective usage rates are 7.2% and 12.9% for persons with and without disabilities, amounting to a difference of 5.7 percentage points.

Figure 6: Usage of financial services by disability status of respondent



Source: Author's illustration based on FinScope 2020 data

Table 3: Summary statistics disaggregated by disability status of respondent

	Have Disability		No Disability		Disability-No Disability
Variable	**Mean**	**SD**	**Mean**	**SD**	
Household size	4.514	2.090	4.443	1.969	0.071
Age of respondent	47.37	18.27	40.59	15.08	6.78***
1 if owns bank account	0.113	0.316	0.204	0.403	-0.091***
1 if have mobile money account	0.456	0.498	0.590	0.492	-0.134***
1 if has credit card	0.0118	0.108	0.0171	0.130	-0.0053*
1 if has ATM card	0.0682	0.252	0.114	0.318	-0.0458***
1 if has internet banking	0.0471	0.212	0.0815	0.274	-0.0344***
1 if has mobile banking	0.0716	0.258	0.129	0.335	-0.0574***
1 if access mobile phone	0.774	0.418	0.877	0.328	-0.103***
1 if own mobile phone	0.615	0.487	0.750	0.433	-0.135***
1 if access computer	0.0873	0.282	0.181	0.385	-0.0937***
1 if own computer	0.0289	0.168	0.0881	0.283	-0.0592***
1 if access internet	0.117	0.321	0.241	0.428	-0.124***
1 if own internet	0.0667	0.250	0.161	0.368	-0.0943***
1 if has private medical insurance	0.023	0.004	0.082	0.003	0.052***
1 if saved via mobile money	0.125	0.331	0.213	0.409	-0.088***
1 if sent remittances in past 6 months	0.218	0.009	0.335	0.005	0.117***
1 if received remittances in past 6 months	0.282	0.010	0.339	0.005	0.078***
Amount saved via main channel	28,815	273,217	66,160	894,989	-37345***
Amount saved via mobile money	4,080	33,240	27,750	784,436	-23670
1 if borrowed in past 12 months	0.496	0.500	0.536	0.499	-0.04*
Amount borrowed previously (/000)	3,433	58,510	3,544	59,430	-111
1 if has primary education	0.690	0.463	0.811	0.391	0.122***
1 if has secondary education	0.179	0.383	0.285	0.451	0.106***
1 if has university/tertiary education	0.031	0.173	0.072	0.259	0.041***
1 if engaged in full-time employment	0.159	0.366	0.188	0.391	0.029***
Number of observations	2,039		10,441		

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

Empirical strategy

Adoption of financial accounts, products and services

This section explores the determinants of digital platforms (mobile phone, computer and Internet), ownership of bank and mobile money accounts, usage of financial products (credit and ATM cards, mobile and Internet banking) and usage of financial services (savings, borrowing, remittances and insurance) within six months prior to the FinScope survey. These outcome variables are binary in nature, taking the value

of 1 if an individual reported owning, accessing or using the respective product or service and 0 otherwise. Separately, for each of the binary outcome variables, the adoption probability was estimated using Probit regression models. An individual's decision to adopt a particular product or use a financial service is modelled as a latent variable y_i^*, which depends on a set of determining factors as follows:

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

Where $Disability_{id}$ is a binary indicator equal to one if individual i residing in province d has any form of disability, 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 is, however, unobservable and only the outcome (adoption decision) is observed. The outcome, however, can be deduced from the value of the latent variable as expressed in equation (2):

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

The outcome variable of interest is a binary indicator taking a value of one if an individual used a particular service. $\mathbf{X_1, X_2, \ldots, X_k}$ in equation (1) represent the factors that determine the probability of an individual using the respective financial product and service within six months prior to the FinScope survey. The covariates included in the model are as follows: 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 are 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 (Ameen and Willis, 2018; Mumporeze and Prieler, 2017). The inclusion of age is motivated by the view that younger people are generally more tech-savvy (Niehaves and Plattfaut, 2011). Education is considered to have an enhancing effect on income (Baum et al., 2013) and digital literacy (Nikou et al., 2022; Marsh, 2021) both of which are considered prerequisites for affordability and capacity to operate digital financial products and services. The main parameter of interest for this study is ɣ, which estimates the effect of disability status on the decision to use a particular financial product and service, controlling for other observable characteristics of the respondents.

Other included covariates based on existing literature include rural/urban residence status (Simatele and Maciko, 2022), household size (Munyegera and Matsumoto, 2016; 2018). The inclusion of province is based on country context; the FinScope 2020 report

reveals critical differences by province in terms of physical access to financial services, which influences usage of financial services. For example, while residents of Kigali City reported spending 22 minutes to access a bank branch, the corresponding time was 50 minutes for residents of Southern Province, 49 minutes for Western Province and 48 minutes for Eastern and Northern provinces.

Intensity of financial service usage (value of transactions)

Besides the possibility of having lower rates of usage of financial services (extensive margin), persons with disabilities could indeed have lower transaction amounts of the respective financial services compared to the general population. The intensity of using financial services was estimated in using Tobit models, where the outcome variables (estimated separately) are the amounts of financial services transacted by an individual within six months prior to the FinScope survey. The choice of Tobit models is motivated by the fact that a considerable number of FinScope respondents reported having zero transactional values, rendering linear models such as OLS inappropriate. The association between the amounts of financial service transactions and socio-economic, demographic and geographical covariates is expressed in equation 3.

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

where superscript *h* represents the respective types of financial services (savings, credit, and remittance) and the continuous outcome variable *ServiceAmount* represents transactional values of the respective services. V is an error term and other covariates remain as earlier described in the Probit model in the preceding sub-section.

Collection and analysis of qualitative data

Qualitative data was collected to complement the findings of descriptive and regression analysis, mainly meant to seek explanations to the observed patterns of quantitative results. The diverse range of stakeholders that were interviewed enhanced a comprehensive assessment of the financial market–demand, supply and policy/regulatory aspects–and players, technologies, platforms and products and how these play a role in the financial inclusion/exclusion of persons with disabilities.

Qualitative information was collected through key informant interviews (KIIs) using semi-structured questionnaires administered to different categories of stakeholders: (i) government institutions, particularly NCPD; (ii) development partners e.g. UNDP, MasterCard Foundation, etc; (iii) organizations of persons with disabilities (OPDs) including their umbrella organization, the National Union of Disability Organizations in Rwanda (NUDOR); and (iv) a cross-section of financial institutions. Respondents from the respective categories of organizations were selected purposively based

on their respective roles, knowledge and experience related to disability inclusion – and/or financial inclusion of persons with disabilities. Keen attention was paid to ensuring the appropriate coverage of persons with disabilities with different types of disabilities (physical disabilities, albinism, psycho-social disabilities, visual and hearing impairments).

Table 2: Structure of stakeholder consultations / primary data collection

Stakeholder category	Required information	Sampling technique	Method and tool
Representatives from Organizations of Perons with Disabilities (OPDs), National Union of Disability Organizations in Rwanda (NUDOR), and other organizations of persons with disabilities	• Programmes and interventions to support persons with disabilities to access services and improve their general well-being • Advocacy for financial inclusion of persons with different types of disabilities • Prioritization of persons with disabilities in funding • Potential role of DFS in promoting financial inclusion among PWDs • Challenges related to access to and utilization of various services by persons with different types of disabilities • Recommendations for better disability-inclusive policy making and programming	Purposive sampling based on availability of programmes to support persons with disabilities and knowledge of subject	Key Informant Interviews (KIIs) using semi-structured questionnaires
Government institutions, particularly NCPD.	• Policy and regulatory frameworks to promote the socio-economic inclusion of persons with disabilities, with specific emphasis on their financial inclusion • Implementation of disability-related SDGs and CRPD with links to financial inclusion and digital financial services	Purposive sampling based on knowledge of issues of disability and (digital) financial inclusion	Key Informant Interviews (KIIs) using semi-structured questionnaires

continued next page

Table 2 Continued

Stakeholder category	Required information	Sampling technique	Method and tool
Development partners	• Ongoing partnership arrangements for joint programmes with government and OPDs • Gaps and opportunities for future programming on disability inclusion in (digital) financial services	Purposive sampling based on knowledge of issues of disability and (digital) financial inclusion	Key Informant Interviews (KIIs) using semi-structured questionnaires
Financial institutions including commercial banks, MFIs, SACCOs, etc	• Available financial products with emphasis on those meant for vulnerable people including persons with disabilities and the poor • Existing and/or planned initiatives to bring financial services closer to persons with disabilities • Challenges, opportunities and recommendations to make financial services more disability-inclusive	Purposive sampling based on knowledge of issues of disability and inclusion	Key Informant Interviews (KIIs) using semi-structured questionnaires

Thematic analysis was used to analyze qualitative data, specifically following the six-step procedure of Braun and Clarke (2006). Upon completion of the data collection exercise, 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 qualitative data substantially complemented quantitative (descriptive and/or regression) analysis by eliciting perspectives, opinions, viewpoints and experiences of different individuals and institutions regarding the financial ecosystem and financial inclusion for persons with disabilities.

5. Results and discussion

This section presents the main econometric results from Probit and Tobit models, with robustness checks using PSM and Oaxaca-Blinder decomposition of the disability gap in (digital) financial inclusion. The econometric results are supplemented by qualitative findings from KIIs, especially in explaining the drivers of the observed differences in financial inclusion between persons with and without disabilities.

Econometric results

Ownership of and access to digital platforms

The propensity and intensity of usage of (digital) financial services depends on the level of access to digital devices and infrastructure that are a prerequisite to performing digital financial transactions. If persons with disabilities have lower levels of access to mobile phones, computers and the Internet, their ability to use save, borrow, send and receive remittances and pay insurance premiums digitally could be constrained as well. To explore the potential disability digital divide, Table 4 presents marginal effects from Probit regressions of ownership of and access to a mobile phone, computer and Internet. The estimates reveal that having a disability is associated with a significantly lower likelihood of owning each of the digital platforms (columns 1-3) and using those owned by someone else (columns 4-6). It is noteworthy that physical, visual, mental and other impairments could substantially constrain the ability of individuals to effectively use digital devices and the Internet (Jaeger, 2022; Glencross et al., 2021; Dobransky and Hargittai, 2016; Sachdeva et al., 2015; Scanlan, 2022) and yet such digital platforms are crucial in terms of self-expression, advocacy and networking among this vulnerable groups of people (Chadwick et al., 2013). Some studies have presented evidence on the relatively lower levels of digital literacy and Internet skills among persons with disabilities (Hargittai et al., 2019) while others have attributed the phenomenon to education systems that do not adequately cater for special education needs of persons with disabilities, especially in developing countries (Srivastava et al., 2015; Mizunoya et al., 2016). In Rwanda, there are existing efforts to promote inclusive education curriculum. However, effective implementation is hampered by financial and human resource constraints (Talley and Brintnell, 2016). These issues translate into lower access to quality education and compromising learning outcomes among children with disabilities (UNDP, 2021).

Besides disability, ownership of and access to digital platforms is influenced by age, household size, geographical location and level of education. The adoption probability of digital platforms is non-linear, increasing with age and then decreasing. This indicates that although relatively older individuals are more likely to use digital platforms, the propensity to use decreases when individuals surpass a certain age bracket. This is in line with previous literature revealing that the older generation is quite less likely to access and use mobile phones, computer and the Internet, a finding shared by previous literature (Hargittai et al., 2019). With regard to household size, individuals residing in larger households are significantly more likely to own and/or access a mobile phone, computer and Internet, presumably due to higher opportunities for peer learning and sharing among household members (Carpenter and Buday, 2007). The enabling effect of education is also quite vivid, as individuals with upper primary, secondary and tertiary levels of education are systematically and significantly more likely to own a mobile phone, computer and Internet. The pathways of this effect could be either through higher affordability due to higher income among more educated individuals (Turčínková and Stávková, 2012) or higher rates of digital, financial and overall literacy required to operate digital platforms among the more educated persons (Park and Nam, 2014).

The likelihoods of owning and accessing digital platforms are significantly lower among female individuals relative to males, corroborating findings from existing studies mentioning the presence of a gender digital divide in developing countries (Acilar and Sæbø, 2021; Qazi et al., 2021). Geography plays a further crucial role as individuals in urban locations have a higher likelihood of owning and accessing a mobile phone, computer and Internet. Some possible explanations include the relatively poor quality of phone network connections and Internet coverage in rural areas of developing countries such as Rwanda, which could hinder the adoption and usage of digital platforms (Prieger, 2013).

Table 4: Determinants of access to and ownership of digital financial infrastructure: Probit

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Ownership of digital platforms			Usage of digital platforms		
	Phone	Computer	Internet	Phone	Computer	Internet
1 if has any disability	-0.0449***	-0.0123***	-0.0268***	-0.0389***	-0.0236***	-0.0433***
	(0.0111)	(0.00274)	(0.00557)	(0.00769)	(0.00726)	(0.00904)
1 if female	-0.0624***	-0.00439*	-0.0242***	-0.0329***	-0.0318***	-0.0492***
	(0.00785)	(0.00226)	(0.00459)	(0.00520)	(0.00555)	(0.00709)
Age	0.0158***	0.00120***	0.00264***	0.00725***	0.00357***	0.00310**
	(0.00136)	(0.000414)	(0.000823)	(0.000833)	(0.000990)	(0.00127)
Age squared	-0.000182***	-1.10e-05**	-3.90e-05***	-8.21e-05***	-4.59e-05***	-5.64e-05***
	(1.44e-05)	(4.62e-06)	(9.65e-06)	(8.50e-06)	(1.14e-05)	(1.47e-05)
Household size	0.0193***	0.00123**	0.00247**	0.00986***	0.00342**	0.00669***
	(0.00218)	(0.000550)	(0.00110)	(0.00146)	(0.00136)	(0.00174)
Urban vs Rural	0.121***	0.0440***	0.104***	0.0541***	0.139***	0.194***
	(0.00804)	(0.00349)	(0.00554)	(0.00552)	(0.00620)	(0.00734)
Education Primary 1-3	0.0908***	0.0102	0.0662***	0.0381***	0.0530***	0.0881***
	(0.00986)	(0.00949)	(0.0191)	(0.00602)	(0.0178)	(0.0208)
Education Primary 4-6	0.210***	0.0294***	0.0979***	0.0950***	0.109***	0.146***
	(0.00919)	(0.00733)	(0.0130)	(0.00620)	(0.0128)	(0.0150)
Education Secondary 1-3	0.201***	0.0894***	0.248***	0.0855***	0.256***	0.326***
	(0.00730)	(0.0197)	(0.0282)	(0.00488)	(0.0250)	(0.0254)
Education Secondary 4-6	0.239***	0.231***	0.453***	0.104***	0.453***	0.565***
	(0.00622)	(0.0311)	(0.0310)	(0.00446)	(0.0268)	(0.0234)
Education Univ. and Tertiary	0.252***	0.570***	0.737***	0.113***	0.698***	0.757***
	(0.00503)	(0.0398)	(0.0253)	(0.00361)	(0.0234)	(0.0172)
Southern Province	-0.210***	-0.0172***	-0.0756***	-0.147***	-0.0788***	-0.143***
	(0.0237)	(0.00260)	(0.00521)	(0.0223)	(0.00641)	(0.00828)
Western province	-0.164***	-0.0237***	-0.0679***	-0.132***	-0.0771***	-0.127***
	(0.0241)	(0.00267)	(0.00498)	(0.0228)	(0.00622)	(0.00823)
Northern province	-0.204***	-0.0209***	-0.0657***	-0.151***	-0.0919***	-0.138***
	(0.0259)	(0.00240)	(0.00431)	(0.0256)	(0.00523)	(0.00693)
Eastern Province	-0.126***	-0.0206***	-0.0840***	-0.118***	-0.0895***	-0.147***
	(0.0237)	(0.00242)	(0.00476)	(0.0222)	(0.00579)	(0.00760)
Observations	12,480	12,480	12,480	12,480	12,480	12,480

Robust standard errors in parentheses. Asterisks ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively. Ownership refers to having digital platforms that are personally owned by the respondent while access refers to usage of other platforms owned by someone else.

Ownership of accounts and financial products

In this section, the ownership of financial products and accounts is discussed. Table 5 reveals that the probabilities of owning bank and mobile money accounts are significantly lower among persons with disabilities relative to the general population (columns 1 and 2). Similarly, persons with disabilities are significantly less likely to own ATM cards (column 4) and use mobile and Internet banking (columns 5 and 6). The finding is in line with previous studies that found financial inclusion in general and account ownership in particular to be lower among persons with disabilities (Gupta and Misra, 2021; Deng and Meng, 2013; Jiya et al., 2022). People with mental illness have also been reported to find difficulties in savings, and that prohibitive fees bar them from using bank accounts (Harper et al., 2018). Qualitative evidence from Malawi indicates that commercial banks are reluctant to extend financial services to persons with disabilities, citing low literacy rates, unemployment, communication barriers and lack of adaptive technologies (Jiya et al., 2022). There is also evidence of discrimination among financial institutions as a constraint to microfinance access for persons with disabilities (Sarker, 2020). Qualitative responses from key informant interviews indicated that the main factors behind the relatively lower rates of financial inclusion among persons with disabilities in Rwanda include lower education attainment levels, which translates into lower financial and digital literacy), physical inaccessibility of premises of most financial service providers, low incomes and high rates of unemployment, which imply low affordability of financial products and services. Stakeholders further mentioned discrimination and negative attitude of financial institutions as one respondent for example mentioned; “I went into the banking hall and the customer care staff told me that that day was not a begging day”.

Gender is another key determinant of financial accounts ownership, where females are significantly less likely to have bank and mobile money accounts, ATM and credit cards and use mobile and Internet banking. This is in agreement with previous studies highlighting a gender divide in financial inclusion especially in developing countries (Kairiza et al., 2017; Botric and Broz, 2017; Swamy et al., 2014; Fanta and Mutsonziwa, 2016). The effect of education on the adoption of financial accounts and products is paramount; individuals with primary through tertiary education are significantly more likely to own mobile money and bank accounts, own credit and ATM cards and use mobile and Internet banking relative to those with no formal education. The constraining effect of rural residence is also clear as individuals living in rural areas and other provinces besides Kigali have significantly lower probabilities of owning financial accounts and products. This corroborates earlier studies that found financial access to be limited in rural areas where the distance to and distribution of service providers are critical concerns (Simatele and Maciko, 2022). Empirical evidence from Uganda further shows that long distances pose transport and opportunity costs that deter rural smallholder households from accessing and using mobile money and other financial services (Munyegera and Matsumoto, 2016; 2018). This is in addition to the already prohibitive fees associated with operating bank accounts (Prina, 2015).

Table 5: Ownership of accounts and financial products: Probability

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	MoMo A/C	Bank A/C	Credit Card	ATM Card	M-Banking	I-Banking
1 if has any disability	-0.0310***	-0.0285***	-0.00118	-0.0109	-0.0208***	-0.0109**
	(0.0112)	(0.00877)	(0.00262)	(0.00681)	(0.00704)	(0.00546)
1 if female	-0.0598***	-0.0553***	-0.00386**	-0.0162***	-0.0192***	-0.0207***
	(0.00829)	(0.00673)	(0.00194)	(0.00500)	(0.00534)	(0.00417)
Age	0.0101***	0.0135***	0.000648**	0.00727***	0.00570***	0.00504***
	(0.00153)	(0.00117)	(0.000303)	(0.000895)	(0.000961)	(0.000721)
Age squared	-0.000136***	-0.000122***	-4.94e-06	-7.24e-05***	-5.15e-05***	-4.75e-05***
	(1.74e-05)	(1.31e-05)	(3.30e-06)	(1.01e-05)	(1.09e-05)	(8.11e-06)
Household size	0.00147	-0.00102	0.000759*	-0.000209	0.00180	0.00123
	(0.00211)	(0.00165)	(0.000436)	(0.00123)	(0.00132)	(0.000993)
Urban vs Rural	0.0825***	0.137***	0.00845***	0.0562***	0.0638***	0.0425***
	(0.00860)	(0.00694)	(0.00212)	(0.00538)	(0.00570)	(0.00452)
Education Primary 1-3	0.138***	0.0817***	0.00204	0.0191	0.0268**	0.0360***
	(0.0183)	(0.0182)	(0.00491)	(0.0120)	(0.0131)	(0.0120)
Education Primary 4-6	0.181***	0.142***	0.00874**	0.0497***	0.0587***	0.0459***
	(0.0139)	(0.0132)	(0.00400)	(0.00926)	(0.00996)	(0.00843)
Education Secondary 1-3	0.280***	0.285***	0.0153**	0.113***	0.124***	0.106***
	(0.0207)	(0.0235)	(0.00755)	(0.0173)	(0.0182)	(0.0173)
Education Secondary 4-6	0.328***	0.433***	0.0294***	0.192***	0.213***	0.150***
	(0.0210)	(0.0237)	(0.0101)	(0.0202)	(0.0210)	(0.0196)
Education Univ. and Tertiary	0.268***	0.649***	0.0449***	0.320***	0.362***	0.223***
	(0.0244)	(0.0217)	(0.0140)	(0.0255)	(0.0260)	(0.0249)
Southern Province	-0.223***	-0.0940***	-0.00629***	-0.0439***	-0.0625***	-0.0323***
	(0.0106)	(0.00831)	(0.00235)	(0.00651)	(0.00648)	(0.00515)
Western Province	-0.205***	-0.122***	-0.00723***	-0.0476***	-0.0701***	-0.0406***
	(0.0107)	(0.00759)	(0.00238)	(0.00653)	(0.00630)	(0.00494)
Northern Province	-0.221***	-0.108***	-0.00569**	-0.0468***	-0.0702***	-0.0312***
	(0.00940)	(0.00726)	(0.00248)	(0.00639)	(0.00589)	(0.00511)
Eastern province	-0.198***	-0.0788***	-0.00349	-0.0252***	-0.0469***	-0.0217***
	(0.0106)	(0.00829)	(0.00250)	(0.00691)	(0.00666)	(0.00530)
Observations	12,480	12,480	12,480	12,480	12,480	12,480

Robust standard errors in parentheses. Asterisks ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively. Ownership refers to having digital platforms that are

Table 6 presents further analysis on the determinants of adoption of financial accounts and products, with disability status disaggregated into the various types of disability. As clearly observed from the table, adoption patterns differ by type of disability, confirming the heterogeneous nature of this marginalized group. For example, being blind and having other forms of disability – including psycho-social disability – are key inhibitors to mobile money adoption (column 1) while physical and other forms of disability significantly limit adoption of bank accounts (column 2) and mobile banking (column 5). Overall, those with other forms of disabilities seem to be the most disadvantaged group as their adoption likelihood is significantly lower for most of the accounts and products relative to the persons without disabilities.

Table 6: Disability status and the ownership of financial accounts and products: Probit

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	MoMo A/C	Bank A/C	Credit Card	ATM Card	M-Banking	I-Banking
Disability: Blind	-0.0618**	-0.0157	0.00575	0.00281	-0.00247	-0.000103
	(0.0261)	(0.0232)	(0.00819)	(0.0189)	(0.0191)	(0.0152)
Disability: Legs/arms	-0.0160	-0.0275**	-0.00155	-0.0118	-0.0218**	-0.000903
	(0.0156)	(0.0120)	(0.00349)	(0.00928)	(0.00942)	(0.00794)
Disability: Other	-0.0384**	-0.0325**	-0.00295	-0.0139	-0.0246**	-0.0256***
	(0.0165)	(0.0126)	(0.00359)	(0.00999)	(0.0101)	(0.00674)
1 if female	-0.0600***	-0.0553***	-0.00383**	-0.0162***	-0.0191***	-0.0206***
	(0.00829)	(0.00673)	(0.00194)	(0.00500)	(0.00534)	(0.00415)
Age	0.0101***	0.0135***	0.000661**	0.00729***	0.00573***	0.00509***
	(0.00153)	(0.00117)	(0.000301)	(0.000894)	(0.000962)	(0.000719)
Age squared	-0.000136***	-0.000122***	-5.10e-06	-7.26e-05***	-5.19e-05***	-4.81e-05***
	(1.74e-05)	(1.31e-05)	(3.28e-06)	(1.01e-05)	(1.09e-05)	(8.08e-06)
Household size	0.00146	-0.00102	0.000758*	-0.000213	0.00180	0.00122
	(0.00211)	(0.00165)	(0.000435)	(0.00123)	(0.00132)	(0.000989)
Urban Vs. Rural	0.0825***	0.137***	0.00845***	0.0562***	0.0638***	0.0426***
	(0.00860)	(0.00694)	(0.00211)	(0.00538)	(0.00570)	(0.00452)
Education Primary 1-3	0.138***	0.0817***	0.00201	0.0190	0.0268**	0.0358***
	(0.0183)	(0.0182)	(0.00489)	(0.0120)	(0.0131)	(0.0120)
Education Primary 4-6	0.181***	0.142***	0.00873**	0.0497***	0.0585***	0.0456***
	(0.0139)	(0.0132)	(0.00399)	(0.00925)	(0.00996)	(0.00840)
Education Secondary 1-3	0.281***	0.285***	0.0152**	0.113***	0.124***	0.105***
	(0.0207)	(0.0235)	(0.00752)	(0.0173)	(0.0182)	(0.0173)
Education Secondary 4-6	0.328***	0.433***	0.0292***	0.192***	0.213***	0.149***
	(0.0210)	(0.0237)	(0.0101)	(0.0202)	(0.0210)	(0.0196)

continued next page

Table 6 Continued

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	MoMo A/C	Bank A/C	Credit Card	ATM Card	M-Banking	I-Banking
Education Univ & Tertiary	0.268***	0.649***	0.0447***	0.319***	0.362***	0.222***
	(0.0244)	(0.0217)	(0.0139)	(0.0255)	(0.0260)	(0.0248)
Southern province	-0.223***	-0.0942***	-0.00636***	-0.0440***	-0.0627***	-0.0326***
	(0.0106)	(0.00831)	(0.00234)	(0.00651)	(0.00648)	(0.00512)
Western province	-0.205***	-0.122***	-0.00727***	-0.0477***	-0.0703***	-0.0408***
	(0.0107)	(0.00760)	(0.00237)	(0.00653)	(0.00630)	(0.00491)
Northern province	-0.221***	-0.108***	-0.00573**	-0.0469***	-0.0704***	-0.0314***
	(0.00940)	(0.00725)	(0.00247)	(0.00638)	(0.00588)	(0.00507)
Eastern province	-0.198***	-0.0790***	-0.00352	-0.0253***	-0.0471***	-0.0219***
	(0.0106)	(0.00828)	(0.00250)	(0.00691)	(0.00665)	(0.00527)
Observations	12,480	12,480	12,480	12,480	12,480	12,480

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

Usage of financial services

This section presents the determinants of usage of financial services estimated using Probit regression models where several dependent variables take the value of 1 if an individual reported having used a service within six months prior to the survey and 0 otherwise. Estimation results presented in Table 7 indicate that, keeping other factors constant, having a disability reduces the probability of saving by four percentage points while the respective probabilities for borrowing, receiving/sending remittances and insurance reduce by magnitudes ranging from one to six percentage points. The results corroborate previous literature highlighting lower financial access and usage among persons with disabilities (Peprah et al., 2022). Existing evidence further reveals that despite the fact that persons with disabilities have the capacity to use financial services (Aranda-Jan, 2020), few initiatives have been developed to incentivize this potential customer segment to do so (Jiya et al., 2022). Even in advanced economies such as the USA, empirical evidence reveals that persons with disabilities are less able to access mainstream financial services and in turn resort to alternative ones such as payday loans, prepaid debit cards, pawn shops, auto title lenders, and rent-to-own stores (McGarity and Caplan, 2019). The table also reveals that the gender effect is only significant in the case of sending and receiving remittances and marginally significant in the case of savings. The enabling effect of education level and the constraining effects of rural location are also significant, with similar explanations as presented in earlier sub-sections.

Table 7: Determinants of usage of financial services: Probit

Variables	(1)	(2)	(3)	(4)	(5)
	Saving	Borrowing	Sending	Receiving	Insurance
1 if has any disability	-0.0279***	-0.00154	-0.0469***	-0.0163	-0.0116***
	(0.00867)	(0.0127)	(0.0119)	(0.0123)	(0.00279)
1 if female	-0.00977	0.00655	-0.0752***	-0.0218**	0.00280
	(0.00611)	(0.00929)	(0.00887)	(0.00900)	(0.00222)
Age	0.0166***	0.0270***	0.0227***	0.0119***	0.00301***
	(0.000911)	(0.00167)	(0.00167)	(0.00148)	(0.000497)
Age squared	-0.000160***	-0.000293***	-0.000245***	-0.000118***	-2.84e-05***
	(9.49e-06)	(1.84e-05)	(1.88e-05)	(1.62e-05)	(5.71e-06)
Household size	0.000560	0.00894***	0.00201	0.00195	0.00271***
	(0.00166)	(0.00241)	(0.00226)	(0.00231)	(0.000570)
Urban vs Rural	0.00526	-0.0125	0.115***	0.112***	0.0297***
	(0.00625)	(0.00967)	(0.00902)	(0.00922)	(0.00324)
Education Primary 1-3	0.0540***	0.102***	0.125***	0.0783***	0.0357**
	(0.00770)	(0.0158)	(0.0186)	(0.0176)	(0.0147)
Education Primary 4-6	0.101***	0.128***	0.188***	0.174***	0.0441***
	(0.00751)	(0.0132)	(0.0141)	(0.0137)	(0.00900)
Education Secondary 1-3	0.0951***	0.167***	0.315***	0.292***	0.157***
	(0.00640)	(0.0171)	(0.0201)	(0.0190)	(0.0282)
Education Secondary 4-6	0.107***	0.146***	0.435***	0.382***	0.405***
	(0.00597)	(0.0179)	(0.0188)	(0.0184)	(0.0396)
Education Univ. and Tertiary	0.121***	0.159***	0.537***	0.393***	0.656***
	(0.00537)	(0.0203)	(0.0184)	(0.0206)	(0.0388)
Southern Province	-0.0532***	-0.0526***	-0.225***	-0.204***	0.00648
	(0.0156)	(0.0178)	(0.0126)	(0.0138)	(0.00406)
Western Province	-0.0828***	-0.0700***	-0.185***	-0.157***	0.00357
	(0.0167)	(0.0182)	(0.0132)	(0.0146)	(0.00423)
Northern Province	-0.0878***	-0.0934***	-0.214***	-0.239***	0.0165***
	(0.0183)	(0.0190)	(0.0119)	(0.0126)	(0.00588)
Eastern Province	-0.0859***	-0.0963***	-0.199***	-0.184***	0.0110**
	(0.0168)	(0.0178)	(0.0127)	(0.0139)	(0.00445)
Observations	12,480	12,480	12,480	12,480	12,480

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

Further analysis disaggregated by disability type (Table 8) reveals that usage of financial services differs by type of disability. For example, whereas adults with all types of disability are significantly less likely to use private medical insurance (column 5), only the blind and those with disabilities in the legs and arms have lower likelihoods of saving (column 1).

Table 8: Disability status and the usage of financial services: Probit

Variables	(1)	(2)	(3)	(4)	(5)
	Saving	Borrowing	Sending	Receiving	Insurance
Disability: Blind	-0.0516**	0.0393	-0.0442	0.00370	-0.0173***
	(0.0227)	(0.0306)	(0.0299)	(0.0303)	(0.00403)
Disability: Legs/arms	-0.0288**	-0.0165	-0.0313*	-0.00585	-0.0111***
	(0.0120)	(0.0173)	(0.0163)	(0.0170)	(0.00352)
Disability: Other	-0.0193	0.00269	-0.0655***	-0.0356*	-0.00824*
	(0.0131)	(0.0191)	(0.0171)	(0.0183)	(0.00431)
1 if female	-0.00976	0.00660	-0.0753***	-0.0218**	0.00276
	(0.00611)	(0.00929)	(0.00886)	(0.00900)	(0.00222)
Age	0.0165***	0.0270***	0.0228***	0.0120***	0.00298***
	(0.000912)	(0.00167)	(0.00167)	(0.00149)	(0.000491)
Age squared	-0.000159***	-0.000294***	-0.000245***	-0.000119***	-2.80e-05***
	(9.49e-06)	(1.84e-05)	(1.88e-05)	(1.62e-05)	(5.64e-06)
Household size	0.000573	0.00898***	0.00197	0.00193	0.00270***
	(0.00166)	(0.00241)	(0.00226)	(0.00231)	(0.000570)
Urban vs Rural	0.00507	-0.0125	0.115***	0.112***	0.0296***
	(0.00625)	(0.00967)	(0.00902)	(0.00923)	(0.00325)
Education Primary 1-3	0.0540***	0.102***	0.125***	0.0781***	0.0352**
	(0.00770)	(0.0158)	(0.0186)	(0.0176)	(0.0145)
Education Primary 4-6	0.101***	0.128***	0.188***	0.173***	0.0438***
	(0.00750)	(0.0132)	(0.0141)	(0.0137)	(0.00889)
Education Secondary 1-3	0.0952***	0.167***	0.315***	0.292***	0.156***
	(0.00639)	(0.0171)	(0.0201)	(0.0190)	(0.0280)
Education Secondary 4-6	0.107***	0.146***	0.435***	0.382***	0.404***
	(0.00596)	(0.0179)	(0.0189)	(0.0184)	(0.0393)
Education Univ & Tertiary	0.121***	0.159***	0.537***	0.393***	0.656***
	(0.00535)	(0.0203)	(0.0184)	(0.0206)	(0.0387)
Southern province	-0.0527***	-0.0528***	-0.225***	-0.205***	0.00666
	(0.0156)	(0.0178)	(0.0126)	(0.0138)	(0.00406)
Western province	-0.0822***	-0.0705***	-0.186***	-0.158***	0.00371
	(0.0167)	(0.0182)	(0.0132)	(0.0146)	(0.00423)
Northern province	-0.0872***	-0.0936***	-0.215***	-0.240***	0.0167***
	(0.0182)	(0.0190)	(0.0119)	(0.0126)	(0.00589)
Eastern province	-0.0856***	-0.0965***	-0.200***	-0.184***	0.0110**
	(0.0168)	(0.0178)	(0.0127)	(0.0139)	(0.00445)
Observations	12,480	12,480	12,480	12,480	12,480

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

Intensity of financial service usage (value of financial service transactions)

This sub-section finally presents the effect of disability on the amount of financial service transactions, estimated using Tobit to indicate the disability divide in financial inclusion at the intensive margin. The results presented in Table 9 highlight clearly the significantly lower amounts of savings in general (column 1) and mobile money-based savings (column 2). The effect of other covariates are quite similar to the results presented in earlier sections. In separate analysis (results unreported to save space), the interaction effect between disability and gender dummies is significant only in the case of amount borrowed. This indicates that females with disabilities borrow significantly lower amounts relative to males with disabilities. This necessitates sensitivity in designing measures to boost financial inclusion among persons with disabilities as a heterogeneous group, recognizing the unique challenges of women with disabilities.

Table 9: Determinants of value of financial service transaction: Tobit

Variables	(1)	(2)	(3)	(4)
	Log (Amount Saved)	Log (Amount Saved MM)	Log (Amount Borrowed)	Log (Amount Sent)
1 if has any disability	-0.435***	-1.557***	0.773	-1.137***
	(0.0971)	(0.476)	(0.700)	(0.333)
1 if female	-0.290***	-2.471***	-2.520***	-1.678***
	(0.0682)	(0.306)	(0.466)	(0.218)
Age	0.192***	0.208***	0.256**	0.494***
	(0.0133)	(0.0686)	(0.106)	(0.0464)
Age squared	-0.00180***	-0.00393***	-0.00454***	-0.00532***
	(0.000143)	(0.000806)	(0.00125)	(0.000518)
Household size	0.869***	0.831**	1.461***	1.330***
	(0.0756)	(0.360)	(0.549)	(0.255)
Urban vs Rural	-0.0292	-0.00587	0.0521	0.0144
	(0.0188)	(0.0802)	(0.123)	(0.0572)
Education Primary 1-3	0.587***	3.191***	2.991***	3.180***
	(0.0712)	(0.331)	(0.523)	(0.237)
Education Primary 4-6	0.793***	0.326	-1.055**	1.511***
	(0.0668)	(0.313)	(0.482)	(0.220)
Education Secondary 1-3	0.845***	3.463***	1.865*	3.316***
	(0.130)	(0.681)	(1.079)	(0.473)
Education Secondary 4-6	1.534***	5.406***	4.825***	5.113***
	(0.106)	(0.570)	(0.875)	(0.385)

continued next page

Table 9 Continued

Variables	(1)	(2)	(3)	(4)
	Log (Amount Saved)	Log (Amount Saved MM)	Log (Amount Borrowed)	Log (Amount Sent)
Education Univ. and Tertiary	2.112***	7.939***	6.934***	7.862***
	(0.138)	(0.672)	(1.038)	(0.465)
Southern Province	2.823***	10.02***	7.772***	10.29***
	(0.139)	(0.659)	(1.052)	(0.446)
Western Province	3.780***	7.463***	5.621***	11.93***
	(0.143)	(0.774)	(1.178)	(0.457)
Northern Province	-1.127***	-9.540***	-9.477***	-5.420***
	(0.106)	(0.478)	(0.675)	(0.332)
Eastern Province	-1.097***	-7.808***	-13.57***	-4.187***
	(0.115)	(0.488)	(0.776)	(0.349)
Constant	-1.290***	-8.744***	-10.42***	-5.643***
	(0.122)	(0.536)	(0.787)	(0.390)
Sigma	3.630***	11.87***	13.65***	9.576***
	(0.0358)	(0.115)	(0.285)	(0.0850)
Observations	12,480	12,480	12,480	12,480

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

Robustness checks

The results presented so far in earlier sections reveal that persons with disabilities have disproportionately lower levels of access to and usage of financial services. However, it is possible that the underlying differences among individuals with and without disabilities rather than disability status per se could account for the observed differences in financial inclusion. To better attribute the observed financial inclusion differences to disability, propensity score matching (PSM) models are estimated for all the outcome variables. The advantage of PSM is that it allows for the creation of a counterfactual group for comparison of outcomes between treatment and control groups for observational studies without prior randomization (Rosenbaum and Rubin, 1985). For this study, disability is considered as a treatment variable and a counterfactual is created for comparison with persons without disability. This facilitates effective comparison of outcomes only for persons with and without disabilities that share similar observable characteristics; that is, the covariates presented in earlier sections. Ultimately, if the two compared groups have similar attributes that could influence access to and usage of financial services, then differences in financial inclusion can be more confidently attributed to disability rather than confounding factors. Nearest neighbour matching (NNM) is used as a matching algorithm, comparing outcomes for pairs of persons with and without disabilities that have the closest resemblance proxied by the propensity score (the estimated probability of being treated).

The results of the matching exercise are presented in Table 10, further confirming the effect of disability on the various measures of financial access and usage after catering for the potential confounding effect of observed heterogeneity among persons with and without disabilities. To assess the effectiveness of the matching exercise, Table 11 presents the results of the covariate balance test to assess the resemblance of persons with and without disabilities before and after matching. The results reveal that the matching algorithm was generally successful in comparing outcomes of comparable persons with and without disabilities; that is, those with similar observable characteristics. Overall, matching reduced the confounding bias of observable heterogeneity for most covariates (averagely 72% in the last column). Also, P-values for mean differences indicate that after matching, the null hypothesis for the similarity of the two groups cannot be rejected. Overall, PSM substantially reduced the bias of estimating the disability effect using earlier presented non-matching models by smoothing out prior differences in observable characteristics between persons with and without disabilities that would otherwise confound the estimated disability effect.

Table 10: Disability and financial access and usage: PSM

Outcome variable	Disability vs No disability
Own mobile phone	-0.0417***
	(0.0125)
Own computer	-0.0332***
	(0.00810)
Own Internet	-0.0346***
	(0.0106)
Access mobile phone	-0.0398***
	(0.0102)
Access computer	-0.0387***
	(0.0119)
Access Internet	-0.0576***
	(0.0119)
Have MoMo A/C	-0.0250*
	(0.0145)
Have bank A/C	-0.0564***
	(0.0108)
Have credit card	-0.00351
	(0.00305)
Have ATM card	-0.0318***
	(0.00899)
Use mobile banking	-0.0375***
	(0.00961)
Use Internet banking	-0.0231***
	(0.00765)

continued next page

Table 10 Continued

Outcome variable	Disability vs No disability
Saving	-0.0362***
	(0.0107)
Borrowing	0.00747
	(0.0149)
Sending remittances	-0.0541***
	(0.0138)
Receiving remittances	-0.0354**
	(0.0141)
Insurance	-0.0308***
	(0.00744)
Log (amount saved)	-0.444***
	(0.0649)
Log (amount saved MM)	-0.396***
	(0.108)
Log (amount borrowed)	0.0900
	(0.0766)

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

Table 11: Covariate balance test before and after matching

Variables	Mean difference before matching			Mean difference after matching			Absolute bias reduced
	Dis-ability	No dis-ability	P-Value	Dis-ability	No dis-ability	P-Value	(%)
Female	0.617	0.578	0.000	0.617	0.623	0.652	82.5
Household size	4.514	4.443	0.141	4.515	4.451	0.334	11.4
Age of respondent	47.37	40.59	0.000	47.37	47.24	0.810	40.5
Urban	0.381	0.496	0.000	0.381	0.364	0.271	85.4
Education Primary 1-3	0.158	0.128	0.000	0.158	0.145	0.239	55.8
Education Primary 4-6	0.353	0.398	0.000	0.353	0.355	0.896	95.7
Education Secondary 1-3	0.089	0.103	0.055	0.089	0.093	0.664	71.9
Education Secondary 4-6	0.058	0.109	0.000	0.058	0.055	0.635	93.3
Education Univ. and Tertiary	0.031	0.072	0.000	0.031	0.032	0.788	96.4
Southern Province	0.282	0.264	0.087	0.282	0.303	0.139	15.1
Western Province	0.290	0.222	0.000	0.290	0.291	0.945	98.6
Northern Province	0.165	0.167	0.854	0.165	0.161	0.735	136.2
Eastern Province	0.203	0.239	0.000	0.203	0.186	0.178	54.7
R-squared			0.047				0.001
Mean bias			8.9				1.3

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).

Key drivers of the disability-based differences in financial inclusion and DFS

(i) ***Low levels of digital and financial literacy:*** According to qualitative information collected through key informant interviews, the low levels of both digital and financial literacy among persons with disabilities are some of the key drivers of their disproportionately lower levels of financial inclusion and DFS. Part of the literacy gap stems from differences in formal education access between children with and without disabilities, with the former having difficulty accessing inclusive education, which limits their learning outcomes. Some respondents further mentioned that available programmes meant to equip people with financial and digital skills use approaches, logistics and materials that are unfriendly to persons with disabilities.

(ii) ***Limited knowledge and awareness of financial products:*** Some respondents highlighted the low levels of knowledge and awareness among persons with disabilities regarding financial products and services as being partly behind the relatively lower rates of financial inclusion among this marginalized group. This is exacerbated by language and communication barriers as financial service menus are offered in formats not easily comprehensible to persons with certain types of disabilities. For example, while persons with visual impairments require audio display of services in the banking halls of financial service institutions, these are largely unavailable, leaving potential clients stranded.

(iii) ***Unfriendly documentation and requirements:*** It was found out through KIIs that majority of financial institutions have service request forms in languages and formats that persons with disabilities cannot complete. Other service providers have prohibitive requirements. For example, one respondent mentioned that there is a financial institution that allegedly refuses to acknowledge signatures of persons with visual impairments.

(iv) ***Lack of collateral to access formal credit:*** Collateral is one of the principal requirements for credit access especially for traditional financial institutions such as banks. However, persons with disabilities generally lack land titles, buildings and other valuable assets that are admissible as collateral, which limits their access to formal credit.

(v) ***Low access to digital devices:*** Performing a digital financial transaction such as mobile money, mobile banking and Internet banking requires access to a digital device such as a mobile phone, computer and/or Internet. Unfortunately, persons with disabilities have lower rates of ownership of these devices, partly due to lower affordability associated with lower incomes, which reduces their chance of adopting DFS.

(vi) ***Negative attitudes among financial service providers:*** Respondents mentioned that a considerable number of staff at financial service institutions have stereotypes of persons with disabilities whom they still perceive as beggars. One respondent mentioned that a bank client with a disability stepped into the banking hall and was greeted with a statement from a bank official: "Excuse me, today is not a begging day. You will come back on a begging day". Other service providers generally perceive persons with disabilities as economically unproductive and hence lack capacity to repay loans, which limits the willingness to extend formal credit to this group. The overall poor quality of customer service discourages many persons with disabilities from using financial products and services.

(vii) ***Physical inaccessibility:*** It was also revealed from key informant interviews that persons with disabilities are burdened by long distances traveled to physically access premises of financial service providers, especially in remote and rural areas. Additionally, while at the premises, the premises are quite inaccessible as they lack disability-friendly physical accessibility facilities such as ramps, elevators, special toilets (among others), which discourages persons with disabilities.

(viii) ***Limited disability mainstreaming in national policies:*** Some respondents attributed the limited disability inclusion in financial services to the low level of disability mainstreaming in financial inclusion and other development policies. Respondents expressed concern that this limits interventions that would address the specific financial inclusion challenges for persons with disabilities during policy implementation.

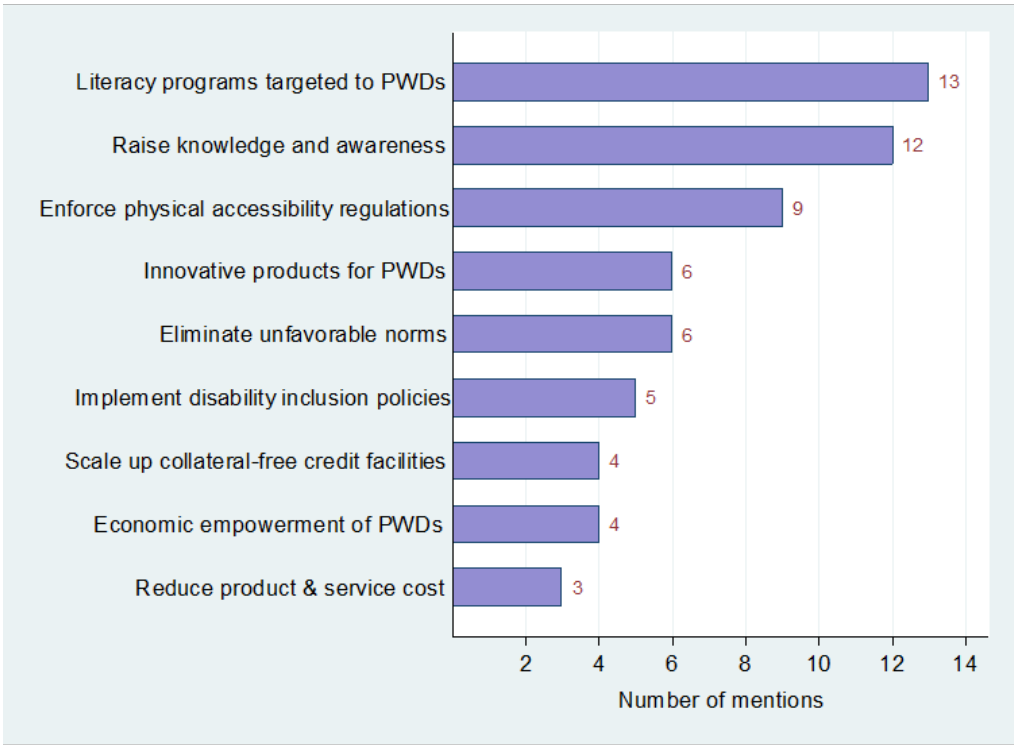
(ix) ***Low incomes:*** Persons with disability generally have low incomes, which translates into limited affordability of certain financial products and services. Part of this problem stems from the relatively lower rates of employment and limited access to credit to start and expand businesses.

(x) ***Limited disability-friendly financial products:*** It was mentioned by respondents that financial institutions are slow at developing financial products tailored to the special challenges and financial needs of persons with disabilities. Some respondents further highlighted that for those involved in business, a high degree of informality comes with irregular incomes for which financial service providers ought to develop special funding facilities, which is often not the case.

Recommendations to promote financial inclusion and DFS for persons with disabilities

Figure 7 provides an overview of key recommendations made by stakeholders during key informant interviews to address disability-based differences in financial inclusion and DFS. The detailed recommendations are elaborated in the subsequent narratives.

Figure 7: Stakeholder recommendations to promote financial inclusion and DFS for PWDs



(i) ***Invest in disability-friendly digital and financial literacy programmes:*** Discussions with sector stakeholders revealed potential merit in partnerships between government and non-government stakeholders to embark on joint capacity building programmes to promote digital, financial and overall literacy of persons with disabilities. The programmes could comprehensively cover financial management and related topics, and offer practical guidance on how to maneuver menus of financial products and operate digital devices for financial transactions. The capacity building interventions ought to adopt a disability-friendly approach in terms of both training venues and dissemination channels and logistics, including simultaneous sign language translation for the deaf and braille reading machines for visually impaired people. Some stakeholders recommended blending financial education into the inclusive

education curriculum for persons with disabilities, an initiative that could be championed by the Ministry of Education (MINEDUC) and the National Council of Persons with Disabilities (NCPS). Others suggested that financial institutions work closely with the government and financial institutions work closely with the National Union of Disability Organizations in Rwanda (NUDOR) and its 13 member organizations, including financial and digital literacy in the latter's routine programming for their members.

(ii) ***Increase awareness among persons with disabilities:*** Given that limited knowledge of financial products and services among persons with disabilities is partly due to language and communication barriers, financial institutions ought to explore innovative campaign ideas to explain the functionalities of their products and services among persons with disabilities as a means to securing their uptake and usage. Responses from stakeholder engagements revealed the need for financial and payment service providers to scale up their outreach initiatives to cover organizations of persons with disabilities to understand their financial capacity and needs and popularize available financial products and services. Some stakeholders suggested that the government works with financial institutions and organizations representing persons with disabilities to produce summaries of key policies on financial inclusion and DFS and disseminate them through various media channels in a manner that is inclusive of persons with disabilities, for example sign language on televisions for persons with hearing impairments, braille text for the blind, among others. Finally, to ease information constraints, organizations of persons with visual impairments recommended the National Bank of Rwanda to provide adequate awareness on changes in the financial sector, including newly introduced bank notes that are difficult to recognize and distinguish (for example 500 RWF and 1,000 RWF notes).

(iii) ***Simplify documentation and processes of financial institutions:*** To improve user experience, respondents urged financial institutions to simplify their documents and processes to make them understandable by persons with disabilities. This includes shortening forms, designing forms in braille language for the visually impaired customers, developing apps to embed audio-visual features in service menus, and adopting innovative approaches for audio-visual display of services in banking halls. Scaling up the use of biometric technology was also suggested so that financial institutions can better serve persons with certain types of disabilities, for example the visually impaired. Additionally, stakeholders urged financial institutions to reduce the bureaucracy associated with their processes to encourage people with disabilities to uptake and use financial services. Some stakeholders found it helpful for financial institutions to hire persons with disabilities, to the extent possible, and include disability-friendly customer care training for all staff.

(iv) ***Explore collateral-free credit facilities:*** Some sector experts recommended partnership between financial government institutions to address the collateral constraints to credit access among persons with disabilities. Examples of such remedies include scaling up establishing and/or scaling up government guarantee schemes as a means of de-risking financial institutions' lending to this marginalized group of people. There are existing facilities implemented through the Business Development Facility (BDF), whose scale and scope needs to be increased to cover more persons with disabilities, especially in rural areas. Some stakeholders urged financial institutions such as mobile network operators (MNOs) to scale up access to mobile credit facilities for persons with disabilities who are under-represented in formal credit partly due to collateral limitations.

(v) ***Multi-stakeholder campaigns to promote access to digital devices:*** Several campaigns have so far been conducted in Rwanda to collect mobile phones for poor households. Some sector experts believe these campaigns could be scaled up, prioritizing persons with disabilities as this would be a first step to boosting their DFS adoption.

(vi) ***Campaigns to break disability stereotypes among financial institutions:*** A country-wide, multi-stakeholder campaign is needed to change the negative image of persons with disabilities who are traditionally perceived as beggars. For financial institutions, big data analytics would help reveal the savings potential of persons with disabilities and create a strong case for designing savings products for them. For existing customers, examining loan repayment rates would demystify perceived risk issues while business data analytics would reveal profitability of certain businesses owned by persons with disabilities and hence trigger more credit granted to them. The success of this relies upon relevant capacity building in big data analytics for staff of financial and payment service providers, necessitating support from government and donor institutions. Finally, some respondents recommended financial institutions to employ persons with disabilities with a twin objective of easing communication and increasing confidence among similar potential clients.

(vii) ***Strictly enforce the building code for physical accessibility:*** Rwanda has a building code, which every property developer has to adhere to as they seek a construction permit. Sector experts urged the National Bank of Rwanda in partnership with Rwanda Housing Authority and the National Council for Persons with Disabilities to strictly enforce the building code among financial institutions as this would ease physical access to financial service centres by persons with disabilities. Although respondents acknowledge the cost implications of installing ramps, disability-friendly toilets, among other

physical accessibility facilities, they suggest mandatory establishment of these in the headquarter institutions at basic, and scale them up gradually over time in other branches across the country. For augmented access to services, respondents suggested that Automatic Teller Machines (ATMs) be installed in convenient locations, at appropriate heights accessible to people with disabilities and equipped with braille language and audio messages to ease transactions especially by blind customers. To further ameliorate the physical accessibility challenge, respondents suggested that financial institutions scale up agent banking coupled with initiatives such as reaching out to persons with disabilities – either individually or within their respective groups – to collect savings and ease the burden of trekking to financial service centres. This would go a long way in reducing the financial access barriers for persons with disabilities and reducing differences in financial inclusion between persons with and without disabilities.

(viii) ***Mainstream disability inclusion in national policies:*** Several policies exist, meant to promote financial inclusion, digital financial services and overall national development. Sector experts believe there is need for greater disability mainstreaming of these policies to guide specific interventions and document best practices meant to promote financial inclusion among persons with disabilities. For example, the National Skills Development and Employment Promotion Strategy would be disability-mainstreamed to promote employability and business management skills for persons with disabilities, in turn augmenting their capacity to adopt and use digital and traditional financial services. Respondents further urged the National Bank of Rwanda to draft guidelines and regulations and document best practices in delivery of financial services to persons with disabilities to enhance benchmarking on what constitutes good service delivery for this marginalized group.

(ix) ***Develop financial products that suit financial needs and challenges of persons with disabilities:*** It is imperative for financial institutions to understand the challenges amidst potential of persons with disabilities and design innovative products tailored to the special needs of this group. A customer-centric approach and leveraging data analytics to understand the suitable products that match this group's financial potential and behaviour were recommended as a steppingstone to developing disability-friendly financial products.

(x) ***Invest in disability-disaggregated data for evidence-based interventions:*** Interviews with sector experts revealed that some sector stakeholders are quite oblivious to the existing disability differential in financial inclusion and DFS. To this effect, respondents recommended comprehensive and regular studies to gather and disseminate disability-disaggregated indicators of financial inclusion and DFS to trigger and guide evidence-based interventions to promote

disability equality. Joint funding for regular updates of the disability monitoring information system (DMIS) indicators and implementation of the M&E framework of the National Disability Policy were also recommended, with emphasis on financial inclusion and DFS-related indicators at the local (e.g., district) and national levels.

(xi) ***Leverage digital platforms to boost financial inclusion of persons with different types of disabilities:*** Interviews with stakeholders, including organizations of persons with disabilities, expressed optimism in the role of DFS in addressing disability-based differences in financial inclusion. This is mainly because, with DFS, it does not require users to physically travel to financial service providers to perform financial transactions. What needs to be done to ensure DFS address financial inclusion constraints for this marginalized group is to devise innovative channels for service delivery. Suggested innovations include installing audio and voice recognition features in phone-based menus of mobile and Internet banking for persons with visual impairments; adapted virtual keyboards for those with physical disabilities; telecommunication relay services for those with hearing impairments; among others. Implementing these would require investment in infrastructure by financial institutions, MNOs and government, with ultimate potential to raise the financial inclusion of persons with different types of disabilities.

6. Conclusion and policy implications

Persons with disabilities have often been reported to have lower socio-economic status relative to the public, including being disproportionately excluded from financial and other services. In this study, the differences in access to and usage of financial services are explored using a mixed-methods approach and a combination of Probit, Tobit and propensity score matching techniques. The results reveal critical differences by disability status in terms of ownership of and access to digital platforms (mobile phone, computer and Internet) and associated financial services (savings, borrowing, remittances and insurance). Results further show that the disability effect on financial inclusion is heterogeneous; females with disabilities have significantly lower levels of financial inclusion relative to their male counterparts with disabilities. The key drivers of the disability-based differences in Rwanda's financial sector include but are not limited to physical inaccessibility as most financial service providers do not have disability-friendly premises; communication barriers, driven partly by lack of sign language and Braille at financial service centres; discrimination by financial institutions, some of which perceive persons with disabilities as beggars and incapable of making financial transactions; and lower rates of incomes and employment, which constrain affordability of financial products and services; and lower levels of education, which translate into lower rates of both financial and digital literacy. The study makes several contributions to the existing literature on disability, financial inclusion and digital financial services. Firstly, it quantifies the disability divide in financial inclusion and DFS, where empirical evidence has been lacking especially in developing countries, and the discourse was largely dominated by anecdotal evidence particularly for Africa. Secondly, previous studies have examined the disability divide in financial inclusion mainly at the extensive margin, looking at determinants of access to accounts and products. This study has delved deeper into the intensive margin by exploring disability-based differences in value of financial service transactions.

The disability inequality in financial inclusion implies critical challenges in achieving the 10th Sustainable Development Goal and overall inclusive development in Rwanda. The findings of the study carry critical implications regarding the need to augment the country's education system, emphasizing inclusive education curriculum to enhance literacy among persons with disabilities. The national policy on persons with disabilities sets clear non-discriminatory principles. However, their implementation needs to be strengthened and expanded to financial institutions. Disability mainstreaming further needs to be an integral component of and mainstreamed into national and local government and sector-specific planning and budgetary processes in line with the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD). Affirmative action to promote disability inclusion in Rwanda, as has been the case with gender equality and women empowerment, has potential to narrow socio-economic inequalities and facilitate the realization of SDG 10 and overall inclusive development.

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Appendix

Appendix 1: List of sample questions for stakeholders

Part 1: Representatives of organizations of persons with disabilities (OPDs)	
Q1	What programmes are in place to boost financial inclusion and digital financial services among PWDs?
Q2	What digital financial services are most commonly used by persons with disabilities?
Q3	To what extent do you consider the financial system of Rwanda inclusive of persons with disabilities?
Q4	How often and which approach do you use to advocate for the financial inclusion of persons with disabilities?
Q5	What are the main challenges limiting persons with disabilities from using (digital) financial services?
Q6	What would you recommend to be done to make the financial sector more disability-inclusive?
Part 2: Policy and regulatory institutions, local and international NGOs	
Q1	What key policies/strategies/programmes/projects are in place to promote inclusive financial services?
Q2	Highlight the main flagship policies/strategies/programmes/projects intending to boost financial inclusion for PWDs?
Q3	For regulators [NBR, RURA]: Is there any regulatory requirement for FSPs to design inclusive financial products?
Q4	How can digital financial technology be leveraged to promote the financial inclusion of PWDs?
Q5	Please share some success stories of a policy/regulation/programme/project that boosted financial inclusion for PWDs
Part 3: Financial service providers (FSPs)	
Q1	Do you have financial products that are designed for vulnerable people, e.g. PWDs?
Q2	Are there initiatives to promote awareness and financial literacy among vulnerable people such as PWDs?
Q3	Do you have success stories of PWDs who are effectively using your services for personal, business reasons?
Q4	What are the key challenges in your effort to design financial products for vulnerable people like PWDs?
Q5	Are your premises easily accessible to PWDs in general?
Q6	Do you normally extend preferential treatment to PWDs e.g. no standing in queues?
Q7	What avenues are you exploring to leverage digital platforms to enhance financial inclusion of PWDs?

Appendix 2: 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	United Nations Entity for Gender Equality and Women Empowerment (UN Women)	International organization
19	Christian Blind Mission (CBM)	International organization
20	United Nations Capital Development Fund (UNCDF)	International organization

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