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Abstract

Sound policies provide a formal framework for interaction between economic agents engaged in the production, distribution, exchange and consumption of goods and services. The transition to digital finance requires policies that spur innovation and promote competition while protecting agents to enhance confidence in the financial system and financial inclusion. Uganda has enacted a set of laws, regulations, policies and guidelines to regulate digital financial services (DFS). This study examined the impact of digital finance policies on financial inclusion coupled with the gender and rural/urban dimension using the treatments effects model and key informant interviews (KIIs). The findings showed that digital finance policies enhance financial inclusion for both men and women, largely driven by the uptake of mobile money services. Individuals with financial awareness use DFS such as online banking, mobile wallets and agent banking, but are cognizant of risk of fraud. Further, rural dwellers were less likely to access digital finance than were their urban counterparts. The KII confirmed that indeed DFS has enhanced access and usage of financial services. The other drivers of financial inclusion cited were costs, convenience and FinTech innovations. However, gender disparity existed, with rural women being the most disadvantaged. This requires public policy to provide infrastructure where the private sector has no incentives, review distortionary taxes, enhance financial literacy and mitigation of cybercrime.

1. Introduction

Uganda's payment systems have witnessed a revolution with the advent of FinTech, supported by policy thrust and competition among financial institutions to provide various cashless payment options. Although Uganda does not have an umbrella digital finance policy per se, since 2009 the country has had several laws, regulations and policies that govern digital finance. Digital finance policies and sound regulation provide a medium for transformational innovations and usage of digital finance services (DFS). At the dawn of the millennium, it was envisaged that increased access to financial services among poor households would facilitate development as part of private sector strategy to stimulate economic growth and poverty reduction (Olalere et al., 2021). Financial inclusion[3] strategies have been designed to increase availability and information on opportunities to access financial services to consumers at all levels. Under this strategic approach, initiatives, such as microfinance, village banks, mobile/Internet and agent banking products, were utilized to allow individuals and businesses to access appropriate, affordable financial services suitable for their needs. However, the issue of disparity in distribution and access remains a challenge among developing countries.

Recent advancements in information and communication technology (ICT), innovations and their applications to DFS have provided new channels for increased access to financial services in developing countries with underdeveloped financial infrastructure. A good example is the adoption of mobile money in Uganda in 2009, which dramatically improved access to financial services for more than a million people (Sebudde, 2017). Indeed, Uganda's digital finance ecosystem is dominated by mobile money transactions - a medium that has facilitated increased access to financial services in most sub-Saharan African countries (Konte and Tetteh, 2023). Uptake of other DFS, such as cards, point of sale and Internet banking, have however remained low largely due to poor infrastructure and network challenges, low level of awareness among the population and risk adverseness of some service providers.

Digital finance policy has contributed to the growth of FinTech which has created various products to facilitate financial inclusion (Mawejje and Lakuma, 2017; Alliance for Financial Inclusion, 2019). Sound policy is believed to enhance confidence and uptake of financial services. Indeed, DFS and policies are believed to provide several benefits to consumers, businesses, service providers, intermediaries and the government. These include, increased access to finance services to financially

vulnerable and rural households, relatively lower transaction costs for financial intermediaries and FinTech. Ozili (2018) provided insightful discussion on the key issues associated with digital finance and financial inclusion. Operationally, the lockdown occasioned by the Covid-19 pandemic in 2020 to 2021 provided a valuable opportunity to test the suitability of DFS to handle customers' transaction needs and for governments to remit funds to vulnerable households. Despite progress with policies and regulatory frameworks, digital financial products development and rollouts, studies on the nexus between digital finance policies and financial inclusion remain scanty and inconclusive.

The past two decades have witnessed a rapid increase in interest in DFS and inclusion from both academics and policy-makers (Khera, et al., 2021; Chinoda and Kapingura, 2023; Konte and Tetteh, 2023). The need to streamline innovations and uptake have facilitated the design of policies to protect stakeholders in the digital finance ecosystem and facilitate interoperability. Even though the pace of adoption has been slower than that of its peers, Uganda has made significant progress in the provision of DFS through the rollout of national identification which is a requirement for acquiring a mobile phone sim card in addition to formulation of laws and regulations required for the growth of the digital finance industry. For example, mobile money was launched in March 2009, and biometric identification, data protection policy and agency banking in 2017 albeit much later when compared with Kenya due to delays in enactment of the necessary legislations. The National Payments Systems Act, 2020, with associated 2021 regulations, are intended to promote the safety and efficiency of digital payment systems in Uganda. These policies have continued to enhance confidence required for access and adoption of DFS which is expected to ultimately improve the levels of financial inclusion (Ozili, 2018; Kandpal and Mehrotra, 2019). However, there have been some counter-intuitive policies that have hindered the growth of DFS, for example, the 0.5% tax on mobile money withdrawals introduced in 2018 (Katusiime, 2021). This research goes beyond the taxation issues to empirically examine digital finance policies and their influence on uptake of financial services and inclusion.

The questions that often arise are: What is the impact of digital finance policies on financial access and inclusion? Are financial policy changes driven by digital innovations? A better understanding of these issues will assist policy-makers to assess whether digital finance policies are compatible with sustained growth in the level of inclusion. The result from this study provides crucial input into the formulation of a digital finance policies framework that facilitates financial inclusion, which contributes to the achievement of Sustainable Development Goals (SDG). This research extends the empirical discussions on digital finance policies and their impact on financial inclusion to Uganda. It utilizes a rich household-level data set from the Financial Capability Survey, 2020 (Bank of Uganda, 2021) to examine whether the enacted digital finance policies have enhanced the level of financial inclusion. In addition, qualitative information from the key informant interviews (KIIs) targeting policy-makers, financial institutions, other private entities involved, FinTechs, think-tanks

and international organizations were used to gain deep insights on digital finance policy, industry developments and implications for financial inclusion. Given that Uganda has witnessed a high adoption rate of DFS, it provides an interesting case study. Indeed, the relationship between policy intervention and outcomes tends to be country-specific since policies are tailored to suit local conditions. The objective of this study was to examine the impact of digital finance policies on financial inclusion. The study also investigates the extent to which gender influences the uptake of DFS and financial inclusion using treatments effects model supplemented with in-depth analysis from KIIs.

Our findings are summarized as follows. First, we found evidence that digital finance policies enhance financial inclusion for both men and women. Access to mobile phone improves the likelihood of inclusion for both men and women through uptake of mobile money services. Second, individuals who were aware of digital finance risk used online banking services and were financially aware, were more likely to have access to DFS. Third, individuals in rural areas were less likely to have access to digital finance than those in urban areas. The KIIs confirmed that indeed DFS has enhanced access and usage of financial services in areas not covered by commercial banks. The other drivers of DFS and financial inclusion included cost of services, convenience, and growth in FinTech innovations. However, the results from the KIIs indicated that there was gender disparity, with rural women being the most disadvantaged. These issues require public policy to harmonize DFS, legal and regulatory framework, enact competition law, review distortionary taxes and protection of consumers from fraud.

The rest of the paper is organized as follows. Section 2 provides the background to the study and Section 3 provides a concise discussion of the literature. Section 4 details the data and empirical approach used in this study. Section 5 presents the results and discussions and finally, the conclusion and policy implications are provided in Section 6.

2. Background

In Uganda, formal financial inclusion has more than doubled since 2009, increasing from 28% in 2009 to 58% in 2018 (Alliance for Financial Inclusion, 2019). The growth is largely attributed to adoption of DFS, mainly mobile money. The Ministry of Finance, Planning and Economic Development (MoFPED) and the Bank of Uganda (BOU) are the lead agencies involved in the integration of the payments systems and digital finance policies with support from the Alliance for Financial Inclusion (AFI). The roll-out of DFS is part of the measures to enhance the levels of financial inclusion. Consistent with this goal, Uganda has developed a set of digital policies based on international best practices but tailored to suit local conditions. These policies promote the growth of DFS with measures intended to protect the interest of all agents involved.

The digital transformation in Uganda can be traced back to the introduction of automated teller machines (ATM) in 1997. The transition was achieved when manual (non-digital) processes were replaced with electronic methods that exploit the advance in communications and technology. The real shift began when a no-objection letter was issued by the BOU to Uganda's first mobile money provider - MTN. In the first month following the launch, MTN Uganda registered 11,016 accounts - an indication of the strong demand for mobile money services. In the same year, Uganda enacted the National Information Technology Authority Act and the second mobile money service provider, Airtel (formerly Zain), entered the mobile money services market. Several activities were initiated, including licensing an aggregator, utility bills payment applications, e-commerce, integration with Interswitch for ATM cash-out, mobile wallets, introduction of mobile saving products, agency banking and a host of legal, institutional, and regulatory frameworks to strengthen confidence in the system. The enactment of the National Payment Systems Act 2020 and related regulation has streamlined the institutional arrangement for managing innovations and supervision of the sub-sector. The issues of digital finance policies, DFS and financial inclusion have continued to draw attention from academics and policymakers.

The concepts and benefits of DFS and evolution of payment systems continue to receive increased attention in the literature. Ozili (2018) defined DFS as financial services delivered through mobile phones, personal computers, the Internet or financial cards linked to reliable digital payment platforms/systems. According to Bank of Uganda (2021), DFS can be defined as financial operations using digital technology, including electronic money, mobile financial services, online financial

services, i-teller and branchless banking, delivered through either banks or non-bank financial institutions. DFS comprise various monetary transactions such as deposits, credits, withdrawals, transfers of money and other financial products and services, including payment for goods and services, and access to pensions. The DFS include non-transactional services such as viewing personal financial information through digital devices and access to clients' information with regard to service providers.

In turn, Uganda's National Financial Inclusion Strategy 2017–2022 defines financial inclusion as access to and usage of affordable and quality financial services which helps to ensure a person's financial security (Government of Uganda, 2017; Alliance for Financial Inclusion, 2019). Similarly, the United Nations defines financial inclusion as the sustainable provision of affordable financial services that bring the poor into the formal economy (UN, 2016). It involves increasing the number of individuals that have access to formal financial services, which comprise regulated financial institutions, FinTech and communication service providers. It increases opportunities for all agents to participate in economic activities, through financial intermediation and development policy efficacy. Even though there is no consensus on a working definition of DFS, most agree that it encompasses all products and financial services that are transmitted through electronic or information technology platforms without physical interactions between the individuals involved. Mawejje and Lakuma (2017) and Ebong and Babu (2021) argued that mobile money services have emerged as the main channel for digital financial transactions and product development in Uganda.

The DFS have continued to transform the financial sector, especially in developing countries which have had limited financial outreach due to infrastructure challenges. According to Mawejje and Lakuma (2017), the introduction of mobile money services in Uganda in 2009 helped expand formal financial services to populations that were previously excluded. In fact, the FinScope survey 2013 indicated that 56% of adults were using mobile money services with the transaction value amounting to UGX3.6 trillion by 2012 (Economic Policy Research Centre, 2013). In most countries where the cost of financial services is high, digital finance has increased transaction efficiency to enable economic agents access affordable, convenient and secure financial services. Olalere et al. (2021) observed that digital finance innovations play critical roles in economic growth and development by facilitating international trade, stimulating financial inclusion, empowering remittance and stirring financial efficiency. Competition with these entities could force traditional banks to reduce the cost of their services, creating long-term benefits for the consumers. The enhanced efficiency promises to boost gross domestic product (GDP) by providing convenient platforms for savings and evaluation of credit for firms and households. Holding financial resources in accessible platforms is likely to enhance financial intermediation, facilitate economic activities and ultimately stability. The expansion of economic activities is likely to translate into higher fiscal revenue and facilitate the transmission of monetary policy to the real economy. To harness these benefits, the government has enacted several laws and regulations to protect agents involved in the DFS ecosystem and the public (Alliance for Financial Inclusion, 2019). The canon principles for the design of digital

finance policy should be aimed at boosting confidence in the system and harnessing financial inclusion to improve economic welfare.

Financial inclusion provides several benefits to households and policymakers. First, it provides low-income households with a secure medium to save for future goals, enhancing planning and mitigating the impact of income shocks and emergencies (Ozili, 2018). The savings deposits in formal financial institutions provide resources for intermediation and an asset base for distressed financial institutions. Cihak et al. (2016) suggested that, at the macro-level, a high level of financial inclusion is believed to positively contribute to the transmission of monetary policy and enhance financial stability by reducing procyclicality risk. This works through the higher deposits mobilized from large numbers of small savers included in the financial system, which increases the size of the deposits available to banks for intermediation while simultaneously reducing dependency on debt financing which tends to be more expensive and volatile. The questions that arise for policymakers are: Do digital finance policies lead to higher levels of financial inclusion?[4] What are the transmissions channels and their strengths in the digital ecosystem?

3. Literature review

Digital financial services have been thought to drive improvement in access to financial services and inclusion (Konte and Tetteh, 2023). It is argued (Abel, Mutandwa and Le Roux. 2018; Anane and Nie 2022; Dereje, 2023;) that DFS facilitated by technological innovation in the financial sector or FinTech, have become an important driver of financial inclusion in developing countries that had underdeveloped infrastructure for the branch network of traditional brick-and-mortar banking system. According to Barajas et al. (2020), this has spurred a rapid increase in interest in financial inclusion among academics, think-tanks and policymakers. They argued that structural issues and policy-related factors, such as encouraging banking competition or channelling government payments through banks, play important roles and provide the potential macro and micro-economic benefits that can be derived from greater financial inclusion. Moreover, Gibson et al. (2015) argued that limited access to bank branches excludes over one billion people from accessing financial services in developing countries using agent liability in Kenya, Fiji and Malawi.

Theoretically, digital financial innovation can stimulate financial inclusion if related policies are conducive and well implemented. Several studies (Anakpo, Xhate, and Mishi, 2023; Al-Smadi, 2023;) have argued that there is a link in which increased digital finance policy may enhance financial inclusion and that inclusions promote innovation of digital finance products. The World Bank (2014) stated that digital finance holds an enormous opportunity for greater financial inclusion and expansion of basic services, suggesting that nearly 50% of people in developing countries own a mobile phone. Further, they argued that digital finance is a powerful means to expand access beyond financial services to other sectors, including agriculture, transportation, water, health, education and clean energy, which can contribute to economic growth and development. Similarly, using a cross-sectional instrument variable procedure, Khera et al. (2021) showed that the exogenous component of digital financial inclusion is positively associated with growth in GDP per capita over the period 2011–2018, which suggests that digital financial inclusion can accelerate income growth. They argued that the impact could work through reverse causality where growth in economic activities increases demand for financial services, digital financial innovations, utility and enactment of related policies. Similarly, Chinoda and Kapingura (2023) used the two-step system generalized method of moments on data from sub-Saharan Africa for the period 2014 to 2020 to show that digital financial inclusion has a significant

positive relationship with bank stability (z-score) and a negative relationship with non-performing loans. They suggested that policymakers should ensure digital financial literacy for all since it feeds into bank stability and reduces bank insolvency.

In terms of the transmission of the impact of digital finance policies to financial inclusion, the literature considers gender and rural/urban characteristics of the agents as important attributes. First, the gender dimension focuses on women's inclusion in the usage of financial services and is broadly recognized as a key driver of women's participation in economic activities and of household well-being. This in turn could lead to more robust economic growth and social transformation, as well as the growth of well-diversified financial systems. The importance of enhancing women's financial inclusion is well documented in Cabeza-García, Del Brio and Oscanoa-Victorio (2019) at both macroeconomic and microeconomic levels with the implications of the various social dynamics. The compelling case for increasing women's financial inclusion calls for a closer examination of what financial authorities, both regulators and supervisors, can offer within their mandates to contribute substantively to this important public policy goal (TC, 2018). In general, women are considered more trustworthy, and they have strong persistence once they have adopted a system.

The rural/urban dimension can best be observed in developing countries. Most studies along this dimension have focused on opportunity cost of access to traditional versus digital financial services. A case in point is Ji et al. (2021) that used data from China over the period 2014–2018 to examine the impact of inclusive digital finance on the urban–rural income gap based on the theory of financial exclusion. They assessed the transmission and established that digital finance has an impact on economic agents through alleviation of financial exclusion, widening financing channels and helping residents who have an entrepreneurial spirit to start their own businesses. This leads to job creation and raising of the incomes of rural residents, which reduces the urban–rural income gap. Their findings suggest that: (1) digital inclusive finance can significantly converge the urban–rural income gap; (2) among the dimensions of digital inclusive finance, only the breadth of coverage can significantly reduce the urban–rural income gap, while the effects of depth of use and digitalization were not significant; (3) digital inclusive finance can alleviate the urban–rural income gap through the transmission mechanism of promoting residents' entrepreneurship; and (4) the worse the regional economic development and education, the better the effect of digital inclusive finance on the urban–rural income gap.

Turning to the experience of Uganda, the existing empirical evidence focused on financial inclusion through DFS, ignoring the contribution of policies to inclusion. In fact, Ebong and Babu (2021) used the rate of change approach to analyse the growth momentum in banking and mobile money channels in Uganda and suggested that banks must innovate to increase their contribution towards enhancing financial inclusion. However, one of the main limitations of their study was that it focused purely on the traditional banking services, ignoring that fact that banks have transitioned into providing digital services that are linked to mobile money. Uganda's FinScope 2018 report indicated that 78% (14.4 million) of Ugandan adults are financially included,

meaning that only 22% (4.2 million) are financially excluded (FSD Uganda, 2018). In addition, FinScope 2018 indicates that from the adults included, about 58% (10.8 million) have taken up formal financial services. These findings suggest that a build-up of innovative products, services or distribution strategies coupled with a supportive regulatory environment are required to enhance the level of financial inclusion. The National Payments Systems Act 2020 and the related Regulation 2021 are formulated to balance between mitigating the risk to users, which arises from the uptake of financial services, and innovation, including cross-border transactions.

In general, digital finance policies have continued to evolve. However, only a few studies have focused on the impact of digital finance policies on financial inclusion using micro-level panel data sets. Instead, macro-econometric studies that have examined drivers of DFS and their impact are common. An example is the study by Katusiime (2021) which found that, in the short run, mobile money usage is positively affected by inflation while financial innovation, exchange rate, interest rates and mobile money tax have a negative effect on mobile money usage in Uganda. Our research makes two contributions to the literature on digital finance policies and financial inclusion in Uganda. First, the study examined the impact of policies and focused on Uganda where the issue of digital finance policies, DFS and financial inclusion has received little attention. The study also examined the data-rich microeconomic dimension to the literature on digital finance policies and inclusion (Mawejje and Lakuma, 2017; Ebong and Babu, 2021). Second, a method to gain insights from key informants to supplement information from the empirical analysis and to draw in-depth information on policy issues from specialists was used. The two approaches provide evidence-based policy guidance.

4. Data and empirical approach

Data

The study used both quantitative and qualitative data from surveys to examine the impact of digital finance policy on inclusion in Uganda. In the first stage, the econometric analysis used the financial capability survey 2020 data to examine the impact of digital finance policies on financial inclusion (Bank of Uganda, 2021). In the second stage, the information from the KIIs was employed to enhance the empirical results and draw policy proposals.

Quantitative data

The data used in this study is based on information from the financial capability survey 2020 database (Bank of Uganda, 2021). This survey collects individual information at the household level on demographic characteristics, income sources, digital connectivity, financial strategies applied by adults, uptake of financial services, digital payment services and the overall level of financial inclusion. We used the survey information and international definition to compute the financial inclusion index and financial capability. The variables used in this analysis are described in Table 1.

Table 1: Variable description

Variable	Description
Financial Inclusion Index (FII)	The level of financial inclusion is measured using an index, which falls in the range between 0 and 1 based on the OECD framework 2015 (OECD, 2018) for estimating financial inclusion. The index includes savings, loans, investments, insurance and retirement. The closer the index is to 1 the more financially included.
Digital finance	Digital finance is considered a dummy variable, with 1 if an individual has access to digital finance and 0 otherwise. This is based on a selection of products accessed digitally by respondents.
Age	The age of the individual interviewed
Job	Dummy variable of 1 if the respondent is employed, 0 otherwise
Mobile phone	Dummy equal 1 if the respondent owns a mobile phone, 0 otherwise
Rural dummy	Dummy variable of 1 if the individual lives in a rural area and 0 for urban area

continued next page

Table 1 Continued

Variable	Description
Financial capability	Dummy variable of 1 if financial capability index >50, 0 otherwise. Financial capability index ranges from 0 to 100 based on the OECD framework 2015 (OECD, 2018). The index considers financial knowledge/ skills, attitudes and behaviours.
Digital security	Dummy 1 if an individual is aware of digital risk, 0 otherwise.
Information on product	Dummy 1 if information used to make decisions on usage of product was from financial advisor /financial institution, 0 otherwise.
Smart phone	Dummy1 if mobile phone is a smart phone, 0 otherwise.
Online transactions	Dummy 1 if makes bank transactions online or uses a digital application (App), 0 otherwise.
Gender dummy	Dummy 1 if female and 0 for male.

Qualitative approach-key informant interviews

The KII give insights into evolution of digital finance policies, and their impact on financial inclusion. This qualitative information from key stakeholders is required to enrich the empirical analysis and inform the policy recommendations. The KII targeted a sample of 11 entities comprising policymakers in government institutions, financial institutions, private sector, FinTechs, think-tanks and international organizations. The focus was to assess their perceptions on the digital financial policies and their contribution to financial inclusion. The key informant interview guide used in this study is provided in Appendix A.

The Empirical approach

This study examined the impact of digital finance policies on financial inclusion using a treatments effects model. In practice, to investigate such relationships, most studies employ either probit or logit models (Abel et al., 2018; Zins and Weill, 2016), or panel data methods. There are also groups of authors that consider the use of surveys (Oshora et al., 2021; Abel et al., 2018). Similarly, the literature on development finance also measures digital finance as a binary variable, for example, Demetriades and Law (2005).

The financial capability survey of 2020 (Bank of Uganda, 2021), which is similar to the FinScope surveys (Economic Policy Research Centre, 2013; FSD Uganda, 2018), which contains the most recent information gathered from households all over Uganda was used for quantitative analysis. Given that the capability survey did not specifically capture questions on digital finance policy and that Uganda in particular does not have an umbrella digital finance policy, this study used access to digital finance as a proxy for digital finance policies that exist. Our argument was that as digital finance policies are formed, we should see enhanced access to DFS and therefore a rise in

financial inclusion. We examined the question of whether access to digital finance services leads to higher levels of financial inclusion or vice versa. This question clearly depicts that there is an issue of endogeneity that cannot be ignored by simply using a probit model, as is often done in the literature.

This study therefore employed a treatments effects model that corrects for endogeneity introduced by the selection bias, following Kasekende et al. (2016). The treatment effects model is estimated in two steps. The first step is the probability of access to digital finance. The utility from digital finance policies was unobservable, and therefore was measured as $Digital_i^*$, but we observed the dummy variable, Digital, which captures the access to digital finance. Once the selection was done, the outcome treatment model was estimated using full information maximum likelihood. The model is specified as follows:

$$FII_i = \propto Digital_i + \boldsymbol{X_i'}\beta + \varepsilon_i \quad (1)$$

$$Digital_i^* = \boldsymbol{S_i'}\gamma + \delta \boldsymbol{Z_i} + v_i \quad (2)$$

$$Digital = \begin{cases} 1 \; if \; Digital_i^* > 0 \\ 0 \; if \; Digital_i^* \leq 0 \end{cases} \quad (3)$$

Equation 1 depicts the determinants of financial inclusion (outcome equation) and Equation 2 shows the determinants of digital finance (treatment equation) which follows a probit model. The variable FII denotes the financial inclusion index while Digital is a dummy variable for digital finance. This captures whether the individual has had access to digital finance and α is the treatment effect on financial inclusion. $\boldsymbol{X_i}$ is the vector of covariates that include age, age squared, job, mobile phone, rural dummy and financial capability (i.e., index comprised knowledge, skills and attitudes in financial behaviours); the parameter β is the corresponding coefficients; and ε_i and v_i are stochastic error terms.

These determinants are indeed similar to those in the literature (see, Dereje (2023) that include gender, age, education, employment, government transfers, mobile phone, distance from financial institutions and cost of opening an account. Similarly, Abel, Mutandwa and Le Roux. 2018 considered age, sex, education, distance from the bank, household head in financial services, income, internet and financial literacy, and Mhlanga and Denhere (2020) only included gender, race, age, marital status, total salary, and the highest level of education. While our choice of variables was guided by the literature, it was also limited to the variables available in the survey data set used. Another limitation perhaps is the fact that we do not have a panel data set that would be more informative. S is a vector of exogenous variables that influences the probability of an individual having access to digital finance as well as financial inclusion, which includes rural dummy and financial capability. In other words, $\boldsymbol{S_i}$ is

a subset of the $\boldsymbol{X_i}$ covariates. To cater for the endogeneity problem in the treatments model, we included a vector $\boldsymbol{Z_i}$ as our exclusion restriction. This implies that $\boldsymbol{Z_i}$ has an impact on the probability of access to digital finance but does not influence financial inclusion and therefore it is not included in the outcome equation. The exclusion variables include digital security, information on product, smart phone and access to online banking services. The variables used in explaining digital finance were also guided by the literature. For example, Anane and Nie (2022) included economic status, education level, gender, age, residence, region, life expectancy, awareness, security and self-efficacy.

5. Results, discussion and policy recommendations

Regression results

The summary statistics of the variables used, depicted in Table 2, are categorized into full sample (2,910), male (1,531) and female (1,379) to determine which gender drives the digital finance inclusion in the data set. On average, the survey results revealed that there were more financially included males than females with higher financial capability, higher access to digital finance and access to mobile phones as indicated by the mean differences across gender.

The regression results in Table 3 indicate that indeed, access to digital finance services enhances financial inclusion. This is true even when the data was categorized into male and female in the outcome equation. The sign and the significance of the control variables are as expected with exclusion of the rural dummy. We start by controlling for age, age squared, having a job and mobile phone in Equation 1. Then we controlled for the rural dummy and financial capability in Equation 2 and Equation 3 respectively. We replicated the three equations for the female and male samples as well. The findings showed that financial inclusion improves with age. However, the variable age squared, though significant, was equivalent to zero. In addition, age was not significant for women although it was highly significant for men.

As expected, individuals who were employed (i.e., have jobs) were more financially included for the full sample. In addition, having a job was statistically significant for women which implies that employment contributes to enhancing financial inclusion. Surprisingly, the estimate showed that having a job was not significant for men. Another surprising result was that individuals who live in the rural areas were more financially included than their urban counterparts. For males, this variable is not significant. This was true even when we controlled for financial capability. As expected, having a mobile phone enhanced financial inclusion. This was true for females but not significant for males. Financial capability was significant for all the sample equations. Indeed, the male coefficient was larger than that of the female, which could imply that financial capability plays a bigger role in enhancing financial inclusion for males than for females.

Table 2: Summary statistics

	Full sample				Female				Male				T-tests
	Count	Mean	Min	max	Count	Mean	Min	Max	Count	Mean	Min	Max	Mean difference (Gender)
Financial inclusion	2,910	0.35	0	1	1,379	0.33	0.0	1.0	1,531	0.36	0.0	0.9	0.266***
Digital finance	2,910	0.44	0	1	1,379	0.42	0.0	1.0	1,531	0.45	0.0	1.0	0.278
Age	2,910	40.63	16	100	1,379	39.03	16.0	100.0	1,531	42.07	16.0	97.0	3.0363***
Age2	2,910	1882.31	256	10000	1,379	1754.63	256.0	10000.0	1,531	1997.31	256.0	9409.0	242.678***
Job	2,910	0.92	0	1	1,379	0.89	0.0	1.0	1,531	0.94	0.0	1.0	0.053***
Rural dummy	2,910	0.7	0	1	1,379	0.67	0.0	1.0	1,531	0.72	0.0	1.0	0.550***
Financial capability	2,910	0.6	0	1	1,379	0.56	0.0	1.0	1,531	0.64	0.0	1.0	0.080***
Digital security	2,910	0.77	0	1	1,379	0.76	0.0	1.0	1,531	0.78	0.0	1.0	0.002
Information on product	2,910	0.15	0	1	1,379	0.13	0.0	1.0	1,531	0.17	0.0	1.0	0.039**
Mobile phone	2,910	0.68	0	1	1,379	0.64	0.0	1.0	1,531	0.72	0.0	1.0	0.080***
Smart phone	2,910	0.16	0	1	1,379	0.15	0.0	1.0	1,531	0.16	0.0	1.0	0.011
Online transactions	2,910	0.04	0	1	1,379	0.03	0.0	1.0	1,531	0.04	0.0	1.0	0.013*

Notes: *p<0.10, **p<0.05 and ***p<0.01 shows that the coefficient is significant at 10%, 5% and 1% respectively

Table 3: The impact of digital finance on financial inclusion

	Full sample			Female sample			Male sample		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Outcome equation: Financial inclusion									
Digital finance	0.437***	0.450***	0.315***	0.429***	0.444***	0.358***	0.441***	0.454***	0.284***
	-0.022	-0.022	-0.028	-0.032	-0.031	-0.048	-0.032	-0.032	-0.033
Age	0.003***	0.003***	0.003**	0.000	0.000	-0.001	0.007***	0.006***	0.006***
	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Age squared	-0.000***	-0.000**	-0.000**	0.000	0.000	0.000	-0.000***	-0.000***	-0.000***
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Job	0.047***	0.044***	0.039***	0.073***	0.071***	0.065***	0.004	0.000	-0.002
	-0.014	-0.014	-0.013	-0.017	-0.017	-0.016	-0.024	-0.024	-0.022
Mobile phone	0.017**	0.021**	0.016*	0.018*	0.024**	0.021*	0.016	0.018	0.01
	-0.008	-0.008	-0.008	-0.011	-0.011	-0.011	-0.012	-0.012	-0.012
Rural dummy		0.048***	0.036***		0.049***	0.043***		0.046***	0.028**
		-0.011	-0.01		-0.015	-0.015		-0.016	-0.013
Financial capability			0.113***			0.076***			0.145***
			-0.009			-0.015			-0.012
Constant	0.03	-0.004	0.014	0.078**	0.039	0.052	0.001	-0.029	-0.014
	-0.027	-0.028	-0.029	-0.037	-0.038	-0.041	-0.041	-0.042	-0.042

continued next page

Table 3 Continued

	Full sample			Female sample			Male sample		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment Equation: Digital Finance									
Digital security~	0.625***	0.602***	0.812***	0.573***	0.550***	0.675***	0.672***	0.650***	0.925***
	-0.062	-0.061	-0.067	-0.084	-0.081	-0.105	-0.093	-0.093	-0.09
Information product~	0.219***	0.213***	0.291***	0.197***	0.191**	0.230***	0.223***	0.216***	0.338***
	-0.052	-0.051	-0.062	-0.076	-0.074	-0.085	-0.072	-0.07	-0.086
Rural dummy	-0.117***	-0.271***	-0.264***	-0.145**	-0.303***	-0.303***	-0.098*	-0.242***	-0.236***
	-0.04	-0.053	-0.055	-0.057	-0.076	-0.078	-0.057	-0.073	-0.078
Smart phone~	0.233***	0.224***	0.293***	0.212***	0.205***	0.219**	0.257***	0.248***	0.375***
	-0.053	-0.052	-0.063	-0.081	-0.079	-0.09	-0.072	-0.071	-0.09
Online transactions~	0.429***	0.416***	0.538***	0.385**	0.372**	0.446**	0.456***	0.445***	0.591***
	-0.103	-0.101	-0.128	-0.179	-0.175	-0.199	-0.122	-0.119	-0.17
Financial capability	0.418***	0.415***	0.086	0.417***	0.411***	0.187**	0.423***	0.422***	-0.009
	-0.038	-0.037	-0.052	-0.055	-0.054	-0.075	-0.054	-0.052	-0.074
Constant	-0.877***	-0.745***	-0.763***	-0.813***	-0.680***	-0.679***	-0.934***	-0.807***	-0.818***
	-0.062	-0.072	-0.076	-0.088	-0.102	-0.116	-0.087	-0.102	-0.103
No. of observations	2910	2910	2910	1379	1379	1379	1531	1531	1531
Log Pseudo-Likelihood	-1178.375	-1168.303	-1108.668	-515.503	-510.209	-496.987	-651.873	-647.444	-595.166

Note: *p<0.10, **p<0.05 and ***p<0.01 show that the coefficient is significant at 10%, 5% and 1% respectively; standard errors in parentheses; and ~ represents the exclusion restrictions

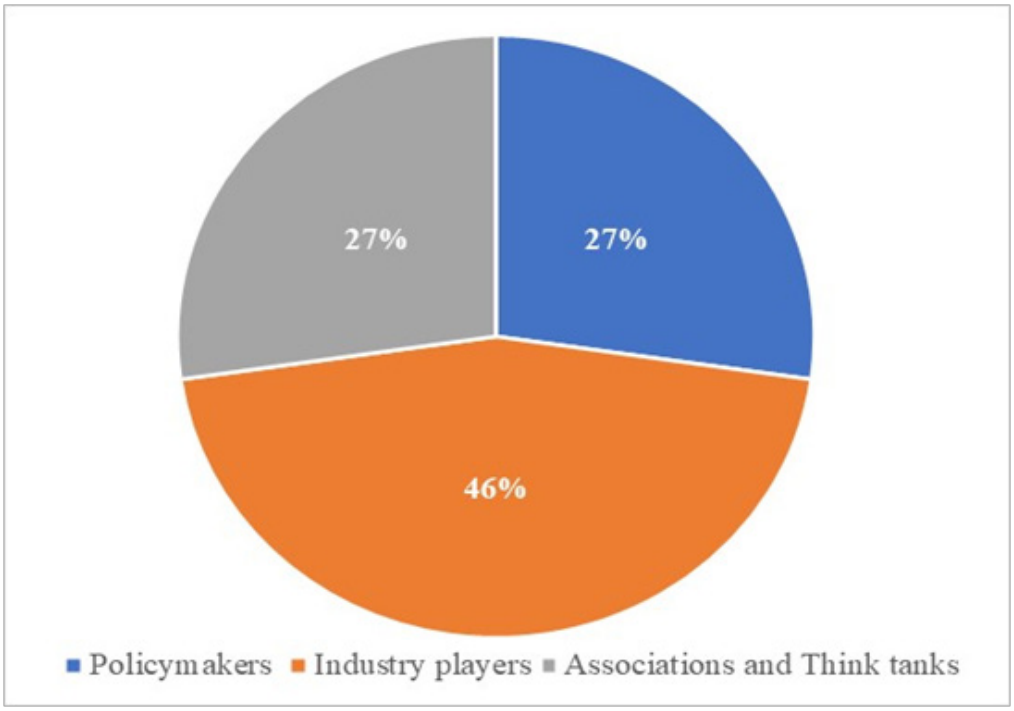
The determinants of digital finance are explained in the treatment equation depicted in Table 3. The estimates indicated that individuals who were aware of digital risk (digital security), obtained their information on usage of the products or services from a financial institution or a financial advisor, had a smart phone, did online banking transactions, were financially knowledgeable (a key attribute for financial capability) and were more likely to have access to DFS. This was true for both males and females. The results also indicated that individuals that resided in rural areas were less likely to access digital finance services than those that lived in urban areas. This seems logical given the fact that most digital financial services are found in urban areas.

Key informant interviews findings

Introduction

The KIIs provide insights and understanding drawn from experience, perspectives and opinions from experts in their respective fields with senior decision-making responsibilities in the DFS industry. A total of 11 semi-structured interviews were conducted with informants from across the DFS in Uganda (see, Appendix B). Interviewees were approached directly following an environmental scan of the DFS industry or a recommendation by the experts interviewed. The distribution of the roles in the DFS are illustrated in Figure 1, which shows that most interviewees were direct players in the DFS industry[5].

Figure 1: Key informant category representation



The interviews were conducted online or in person in October 2022. The themes and questions were pre-specified (in some cases shared with respondents before the scheduled interviews), with an in-depth probe on emerging issues made during the interviews. All interviews were transcribed and documented before the qualitative exploratory analysis. The findings from the KII are presented based on the pre-specified themes and categorization into sub-themes. The information presented in this section reflects the perceptions and opinions of participants.

Role in the digital finance space

Key informants were drawn from regulators/policymakers, the private sector (including FinTechs) and international organizations. They indicated that their roles include, reviewing risk exposure on financial products, approving products based on policy criteria, handling issues of fraud, ensuring sufficient capital base to mitigate risks, regulation of the markets to ensure stability, provision of mobile money services, enrolment of users, advertising, providing platforms for FinTech and other innovators, facilitating savings in floats or mobile wallets, providing consultancy to finance service providers, conducting research on growth and access to credit, policy oversight and coordination of the activities of FinTechs.

Financial inclusion

In terms of the contribution of DFS to financial inclusion in Uganda, the key informants indicated that DFS has enhanced service access to areas/sections of the population that were not covered by traditional banking institutions, promoted inclusion through mobile money products (viz. mobile wallets, digital credits, etc.), and facilitated increased digital transactions through peer-to-peer (P-to-P), peer-to-business (P-to-B), and peer to government (P-to-G), and vice versa. Most participants indicated that DFS drives utilization of financial services such as databases for credit assessments, facilitates cross-border remittances and drives investments[6].

The factors that have contributed to the growth of digital finance inclusion were considered as: affordability of the DFS services compared to cash based systems; easy access to mobile money and agency banking service centres; a centralized automated clearing system; and an enabling policy framework, for example, the Mobile Money Guidelines 2013 and the National Payments Systems Act 2020 that facilitates evolution of banking services to DFS and growth in FinTechs or TechFins. Furthermore, informants indicated that DFS had enabled innovation beyond the traditional approach of provision of financial services by tapping into the unbanked sections of the population who would have otherwise been excluded. DFS was able to penetrate this population largely due to a conducive policy environment, and IT innovations and strategies. The other factors include progressive foresight of policy

makers to permit DFS products into the Ugandan market (e.g., mobile money in 2009) with just a set of operating guidelines rather than an enabling legal and regulatory framework. However, informants noted that some of the DFS products were not as strictly regulated as those provided by banking institutions, making them preferred to the traditional services.

Despite the exponential growth in uptake, the key informants indicated that the contribution of DFS to financial inclusion was limited by low access to the handsets or gadgets due to the cost. Although telecommunication operators have tried to subsidize the cost of these products for their customers, the informants argued that the cost remains high largely due to taxes imposed on mobile phone devices and accessories. In addition, they noted that the level of literacy and awareness remains low among Uganda DFS consumers, particularly on available Apps or products and their use. Other challenges arise from difficulty in provision and replacement of national identification cards (IDs), a key requirement for registration for mobile money transactions[7]. The key informants argued further that the initial capital outlay involved in the provision of services under the current mode were high, making it prohibitive for start-up FinTech firms to enter the DFS industry. This is coupled with the unequal treatment in Uganda's financial market, whereby withdrawal charges and requirements for trustees of DFS are not applicable to similar services provided by the banking institutions.

Although digital Apps could provide solutions, the low penetration of smart devices and the high cost of Internet services have hindered their uptake and usage. Furthermore, the delay the implementation of digital identification and limited delegation of policymaking in Uganda (for example, even small changes in policy have to go through Parliament) creates delays and can affect innovations. In addition, high fees and charges on cross-network transactions have prevented growth of P-to-P services, despite policies on interoperability. The high fees, coupled with cyber risk, digital fraud and reversal of digital transactions have led to most DFS payments being concluded over the counter or cash out. Similarly, most DFS lenders do not have access to Credit Reference Bureau information to assess their customers like the financial intermediaries supervised by Bank of Uganda[8]. The other reasons cited for the slow uptake were the low levels of digital literacy, and poor communication network and Internet infrastructure, especially in remote rural areas. The poor network makes even services using unstructured supplementary service data (USSD) on the global system for mobile communications (GSM) protocol inaccessible in some cases to send text messages or receive confirmation of transactions.

Gender dimension

Turning to gender, the key informants indicated that the factors that contributed to high DFS uptake among women included the fact that they are more reliable users of financial services than men. The other factors cited included growing awareness among women's groups and the initiatives that take services to women, especially those in rural areas. The informants suggested that digital financial literacy and provision of social transfers through digital payments channels were more appropriate for women.

The informants identified numerous challenges that hinder women's access to digital financial services. Key among them were the social norms on ownership among a section of the population who believe that men should control household finances even where women conduct the bulk of economic activities, especially in rural areas. Such societies exhibit large gender disparity where women are treated as second-class citizens. Despite the reduction in the gender gap, according to the latest Global Findex 2021 (Demirgüç-Kunt, et al., 2022), the society remains patriarchal with males as heads of households, so women are not free to use financial services. This social norm is exacerbated by the low levels of financial literacy and lack of awareness of women's empowerment, which hinder their uptake of DFS or their participation in meaningful economic activities.

The challenge of social norms is compounded by low income available for savings among women who carry the burden of feeding the family. The relatively low levels of education, especially among rural women, impede their access to income because they are underpaid or have no financial resources to establish their own businesses. Therefore, access to DFS is not a forefront priority for most women engaged in subsistence farming and/or other small-scale economic activities.

In terms of DFS access, the stringent identification requirements for KYC at registration of sim-cards hinder uptake for women and the youth. This is aggravated by the fact that, in most cases, the phone is only accessible through the husband who handles most of the business issues on behalf of the family. Further, in cases where women have overcome such hurdles, their access to the digital finance space remains low, largely due to limited digital saving products designed for women. The informants noted that Uganda has fewer DFS savings products than other countries in the region, such as Kenya.

Rural/urban

The findings from the KIIs indicated that DFS has stimulated access to financial services in rural areas through technological innovations and improved quality of connectivity. Technological advances have reduced the cost of delivery of financial services to rural finance entities that are unable to access the brick-and-mortar banking system. An example is the advent of mobile money in 2009 which provided a seamless transaction platform irrespective of the location of parties involved. The idiosyncratic liquidity challenge to rural entities require investment in P-to-P and P-to-B services to reduce demand for cash to redeem float, which will make DFS more relevant for rural transactions[9]. Moreover, informants observed that the relatively high costs of banking services and the elimination of transport cost (i.e., push factor) have encouraged the uptake of DFS in rural areas. On the credit side, the uptake of DFS is stimulated by reputational lending, whereas banks are less likely to lend to rural customers due to the cost of collateral verification.

Although the push factors and increased innovations are spreading DFS, there are still enormous challenges hindering DFS uptake among rural entities that informants believed require urgent redress. Key among these is the poor connectivity due

to infrastructural challenges to provide clear signals particularly in remote hilly areas. Thus, one requires sophisticated equipment to access the network and yet taxes have pushed up the cost of gadgets, making them too expensive for rural dwellers. In some cases, even the GSM and the USSD technology which are the cornerstone for mobile money services, are inaccessible. Similarly, the poor network connectivity and unstable power supply affect the quality of Internet services. These infrastructure challenges are compounded by the bad road network in some areas, which hinders access to these facilities when there is need for repairs. Although the Uganda Revenue Authority has simplified the process, the requirement for an entity registering as an agent to possess a Tax Identification Number (TIN) is challenging given the need for Internet connectivity. The TIN challenge has created a situation where agents in rural areas are few, creating liquidity challenges for over-the-counter withdrawals. This situation could affect confidence in DFS. Another emerging issue has been IT fraud in form of phone theft, conmen, mobile money pin codes swap and transaction reversals that tend to target illiterate users of DFS. Rural users are more likely to fall prey given that they cannot afford the tedious and costly process of reversing fraudulent transactions in form of facilitation of investigations and tracking down culprits. Other challenges that are peculiar to the rural populace include low incomes due to high unemployment or underemployment, coupled with the low crop yields responsible for the poverty situation to persist. The high level of poverty among the population makes it difficult for these individuals to afford DFS, so they prefer to hold cash. In addition, the dependency problems perpetuate poverty persistence and unless fundamental drivers are addressed, the transition to DFS is likely to remain slow among rural entities.

The informants provided a set of recommendations to enhance DFS uptake and usage in rural areas. First, there is increased awareness of availability and benefits of DFS and financial literacy, focusing on personal finance management. This can be encouraged by deliberate government policy to promote investment in communications infrastructure and the latest technology, especially in places where the private sector does not have incentive. Similarly, enforcement of interoperability on shared and/or centralized infrastructure to facilitate transactions across networks is expected to reduce service costs. The key informants argued for these measures, supplemented with a price discrimination mechanism pegged on user location and use history as a platform to reduce relative Internet cost and foster rural usage. However, this is only plausible if FinTech firms deliberately move to rural areas to facilitate the digital transition by leveraging available technology. The cost-effectiveness of FinTech spread will require a conducive investment environment characterized by low tax regimes, subsidies and an enabling regulatory framework. Public policy should, in their view, be supportive of small and medium-sized enterprises (SME) involved in the provision of DFS and agency banking services in rural areas. The other issues for policy consideration are the tax regime on access to mobile phones, the need for DFS to evolve from the current mobile money-based solutions to payment platforms with products that work for use case or needs of people. In addition, Uganda can take

advantage of the ongoing implementation of the Parish Development Model (PDM) initiatives to support the establishment of DFS centres at the parish level that will facilitate access and promote business activities.

Legal, regulatory and policy environment

The key informants considered the current legal and regulatory environment in Uganda to be conducive despite the absence of a unified policy framework for DFS. They argued that the flexibility and/or discretion with which the policies have been applied to DFS have facilitated investments and innovations. Traditionally, Uganda has had a large informal economy with a share of the population excluded from the money economy. Scientific innovation through DFS and artificial intelligence (AI) are gradually making it possible to identify and monitor the activities of these agents, which can be useful for implementation of monetary and fiscal policies. The policy environment has been supportive of financial innovations and promotion of DFS.

The informants indicated that policies that have stimulated uptake of DFS include the enactment of the National Payments Systems Act 2020 and the accompanying regulations in 2021. The legal and institutional framework has empowered the Central Bank to license entities, provide a regulatory sand box and regulate activities of DFS providers. These policies provide for infrastructure sharing among communication companies (e.g., MTN and Airtel sharing towers) and banks sharing a platform through agency banking and Interswitch for ATM transactions. These measures are bound to promote digital financial literacy. The policy environment has continued to improve; for example, the national identification system has facilitated the implementation of KYC requirements for mobile money and agency banking products, which reduces room for fraud. Similarly, the policy has enabled financial institutions operating in Tier 4 and above to benefit from provision of micro-credit through the DFS platform[10]. The other policy drivers of DFS uptake in Uganda include the data protection policy, financial inclusion strategy and its roll-out, tax reforms and the impact of the Covid-19 pandemic. The lockdown occasioned by the pandemic enhanced the uptake and usage of DFS since the restrictions limited agents from accessing services of traditional financial institutions. The switch in service platform, coupled with evolution of technology has stimulated the growth of DFS, even though access to the necessary gadgets and network connectivity remains a challenge.

Uganda has enacted the National Payments Law and Regulation and developed several policy guidelines. However, considerable constraints were highlighted that require urgent attention to enhance uptake of DFS and financial inclusion in general. Major considerations are required on taxation of mobile money withdrawals (i.e., 0.5% value) which increases the cost of DFS especially since similar tax regimes are not applied to services of banks and agency banking services. For example, entities are allowed to make up to three cash withdrawals in commercial banks without surcharge while ATM transaction charges are fixed. This makes the tax on such services discriminatory. A policy intervention to reduce or eliminate taxes on mobile money

withdrawals would spur DFS uptake. Similarly, taxes on devices (i.e., smartphone) makes it difficult to purchase these gadgets for the poor. Some informants argued that the current taxation regime is harmful to the growth of DFS given that it was designed around goods and therefore may not appropriately address the needs of service providers.

Turning to subscription and localization of DFS entities, the Uganda Communication Commission (UCC) directive for entities to operate from fixed addresses as service centres is likely to limit spread of DFS services to rural areas. Similarly, the proposal of the National Information Regulatory Authority (NIRA) that Ugandans should pay fees for issuance and/or replacement of national identification of UGX.200,000[11] is likely to adversely affect the low-income groups from possession of NIN to meet the KYC requirements at registration.

In the policy design, respondents observed that there is excessive delegation of legislation and policy-making to politicians in Uganda rather than to subject matter experts as is practised elsewhere. They suggested that DFS policies should be forward-looking (i.e., cyber security, outsourcing etc.) and should incorporate appropriate measures to mitigate emerging risks on the DFS platform. Policy should address the issues of risk aversion by instituting mitigation measures to counteract fraud to promote DFS penetration. The current risk of fraud is likely to reverse the gains in DFS uptake if not addressed. There is therefore need for sound policies to harness digital finance policies that support investment in digital amenities in order to reduce over-the-counter transactions and provide quality data for evidence-based policy formulation.

Turning to FinTech services, the key informants indicated that it was inevitable for policies to adjust to fit with the ecosystem to promote the uptake of FinTech services. The financial sector and communications regulators had adopted a hands-off approach that provided FinTech with gaps and grow their businesses. The informants noted that with continued technological evolution, opportunities exist for FinTech innovators to expand through skills transfers. For this to flourish, however, the government needs to maintain an accommodative regulatory environment when handling issues of FinTech firms (for example, the Central Bank and/or Uganda Communications Commission (UCC)) that allowed DFS products in 2009 to operate with a set of guidelines until a substantial policy was instituted). Recent innovations, the fast-changing digital environment, the Sun-box policy framework, and the enactment of the National Payments Systems Act 2020 with its accompanying clauses have promoted the uptake of DFS provided by FinTech.

However, several factors constrain the uptake of FinTech, notably the current regulatory framework that tends to treat FinTechs like well-established commercial banks. An example is the requirements for FinTech to have their own data centre, which is rather costly given the capital outlay for most FinTech start-ups. Furthermore, Uganda does not have a specific legal and regulatory framework for FinTech activities. This has resulted in a situation where these entities have had to adhere to many policies and requirements spread across various regulatory agencies. This lack

of a unified regulatory framework is costly for FinTech operations and is likely to perpetuate fraud if not addressed. In terms of human capital, informants indicated that the country has few high-tech workers. The industry is still relatively small and has infrastructure limitations, making most tech companies prefer to establish operations in Kenya.

Even though the policy environment and regulations have evolved, they have stifled innovation and adoption of certain products. For example, the law prohibits crypto-currency or crypto-asset transactions without clear guidelines and these are not backed by government. Similarly, in the financial sector there are regulatory limitations, for example, commercial banks cannot freely collaborate with FinTech to rollout products without permission from the Central Bank. Related to this are the regulatory requirements on cite capital and anti-competition practices, which make it difficult for FinTech to thrive in the Ugandan market. From a business angle, most FinTech firms are established by IT specialists who may have limited exposure to operating a financial institution or communication business. They are therefore likely to face challenges with compliance to regulatory requirements in running their businesses.

Discussion and policy recommendations

Consolidate digital finance policies and regulations under one entity: The findings from the KII indicated that the exiting legal framework has gaps and there is no unified regulatory and policy framework to guide DFS activities. These require government intervention to enact an umbrella law and regulation policies for digital finance that promote rather than constrain financial innovations to enhance inclusion. This should be combined with the strategy on financial literacy to increase awareness on products, services, governing laws, and regulations with a focus on DFS and related policies. For digital finance policies to enhance the uptake of DFS and financial inclusion, there is need for deliberate efforts by the government to invest in public awareness campaign to popularize the DFS and data protection policies, available products and consumer protection initiatives already in place. There is need to review the curriculum at different levels of the education system to cover issues of financial innovation at an early stage, and investment in FinTech to facilitate competition that will lead to cost reductions.

Improve network connectivity and reliability: The level of infrastructure development and network connectivity remains an impediment to the rollout of DFS, particularly in rural areas. Similar infrastructure challenges have been cited as one of the reasons for the low penetration of banking services. There is need to invest in DFS infrastructure since localization of mobile money agents or agent banking can dramatically reduce the cost of delivering financial services, particularly in sparsely populated remote areas. Moreover, this would not only reduce explicit costs but promote inclusion by reducing the opportunity cost of time lost in travelling and waiting in urban-based financial institutions. This issue came to the fore in the

Financial Capability survey 2020, which revealed that at least 15% of unbanked adults cited the distance to financial institutions as the main reason for their exclusion (Bank of Uganda, 2021). Fundamentally, the success of DFS will rest on the quality and reliability of connectivity to the pool of agents (often small-scale retailers) who connect clients in remote areas to urban centres to initiate or complete transactions. Alternatively, government should enforce policies that encourage collaboration between infrastructure developers, communications service providers and financial institutions involved in the provisions of DFS to lower service costs. These interventions are likely to promote both access and usage of DFS.

Enhance financial literacy particularly DFS: One outcome that is clear from both the KIIs and the treatment effect analysis is that rural women require more financial awareness about personal financial management to take advantage of DFS, given their level of exclusion. A country-wide financial literacy programme should be rolled-out and implemented through either the curriculum to build cohorts with the requisite financial knowledge, attitude and behaviours coupled with a tailor-made awareness programme for adults. In addition, there is need to design policies that promote innovations and provision of DFS tailored to the needs specific to customer categories. This could encompass provision of incentives that target low-income earners, women and the youth to obtain mobile devices and access Internet data at reasonable costs. To enhance DFS uptake among women, informants suggested free access to national identification number (NIN) and development of a national address system. The finance sector should develop a credit identifier linked to NIN with traceable geographical locations to reduce information asymmetry and facilitate growth of digital credits among women. There is a need for economic empowerment of women by bringing them to the forefront of financial services through socio-economic groups. For example, formation of women's saving groups is likely to promote financial literacy and inclusion through P-to-P networks and the learning needed for DFS uptake.

Review the taxes on DFS: The current tax regime was identified to have adverse implications on access, uptake and usage of DFS. The taxes on electronic gadgets increased their cost for consumers, which limits their access, especially for the poor. In addition, imposition of taxes on mobile money withdrawals is discriminatory and counter-intuitive to promoting DFS. Even though taxes on financial services is one of the sources of fiscal revenue, they need to be reviewed with the objective of limiting the impact on the poor, who bear a relatively larger burden. There is need for collaboration between government and communication companies to provide cheaper avenues through subsidies for low-income consumers to enable adults obtain mobile phones.

Strengthen cyber security: The informants noted that the risk of fraud deters P-to-P and B-to-P usage of DFS, in particular mobile money services. There is need to enforce strict legislations and penalties on offenders to eliminate the vice. In addition, there is a need to tailor DFS toward specific customer needs with strong cyber security for users. To achieve their potential, DFS policies and regulations should encourage inclusiveness, while being cognizant of fraud and emerging cyber risks. For example, the licensing and regulatory framework should provide minimum distance between agent banking centres and branches of financial institutions to decongest DFS providers from urban areas. In addition, there is a need to extend risk-based supervision and anti-money-laundering policy requirements to FinTech firms and DFS providers.

6. Conclusions

Sound digital finance policies are crucial ingredients for enhancing confidence in the financial system access, usage, and ultimately, financial inclusion. The increased digital finance innovation driven by the FinTech revolution has provided opportunities that have eased access to financial services country-wide at a relatively lower cost than encountered in the traditional banking system. The increased level of financial inclusion observed over the last 10 years could be attributed to this development. In fact, since 2000, Uganda has achieved several milestones with formulation and enactment of DFS policies and implementation since, 2000. The latter could explain the increased uptake and usage of innovative financial services to perform basic transactions. Despite the progress, empirical evidence to guide policy interventions is scanty and inconclusive. Yet effective policy formulation and implementation require insights and quantified impact of digital finance policies on financial inclusion in Uganda. This research used both quantitative treatment effects model and qualitative data from KIIs to provide empirical evidence on the impact of digital finance policies on inclusion.

The treatment effects model was estimated using a two-stage approach on cross-section data from Uganda's Financial Capability Survey 2020 (Bank of Uganda, 2021). The findings, based on full information maximum likelihood, revealed that digital finance policies enhanced financial inclusion for both men and women. Controlling for age, the results indicate that the level of financial inclusion improves by age although by a small magnitude. Men were found to be more financially capable than women. Mobile phone ownership enhances financial inclusion for both men and women. Turning to digital finance services, the results showed that individuals who are aware of digital finance risk, possess smart phone, use online banking services and are financially knowledgeable are more likely to have access to DFS. This result is true for both males and females. Furthermore, the findings suggest that individuals in rural areas are less likely to have access to digital finance than their urban counterparts. This difference could be attributed low awareness on digital finance policies among rural households as well as poor connectivity.

The qualitative findings from the KIIs indicated that indeed DFS has enhanced access and usage of financial services in areas not covered by commercial banks. The increased uptake of DFS has promoted financial inclusion through mobile wallets and their use for P-to-P, P-to-B, P-to-G and B-to-G transactions, and vice-versa. In addition to

the digital finance policies, the other factors that were considered to have contributed to DFS uptake and inclusion included affordability of DFS services, convenient access to mobile money and the increase in agency banking service points. Relatedly, the growth in FinTech innovations has increased product range, ability to transfer digital savings and credit products, improved identification, consumer protection measures, and data protection policies. Informants, however, observed that disparity remains in the distribution of the uptake of DFS and digital finance inclusion with women and rural communities disadvantaged due to limited knowledge and access. Despite the progress, the informants indicated that several challenges remain, ranging from low access to gadgets, the level of digital finance literacy, the impact of the current tax regime, low income due to prevalence of poverty in some areas, underdeveloped communication infrastructure, access to NIN required for KYC at registration, lack of initial capital investments for the companies, unfair competitive advantage in the market, delays in policy formulation, lack of interoperability and digital fraud to social norms. Addressing these issues require public policy interventions.

The four key policy issues from the key informants were: (i) government should formulate a unified law and harmonize policies for regulation of all entities involved in DFS; (ii) the need for a national competition law, not just for financial services but for all economic activities; (iii) the need to review some of the current tax policies and their implementation; and (iv) measures to deal with cyber fraud. Addressing these issues will facilitate Uganda's growth into a FinTech innovations hub that will foster the growth of DFS and enhance financial inclusion.

Notes

1. Financial inclusion encompasses providing individuals and businesses with access to savings systems, loans or credits insurance and other financial services.

2. The causality between digital finance policy and financial inclusion could be two-way or bi-directional. An empirical determination of the direction and strength of causality requires further investigation.

3. The policymakers are drawn from the central bank and communications regulators. The industry players include the mobile network operators (MNOs) or telecommunication companies and FinTech firms. The association comprises umbrella bodies in DFS and the think-tanks comprise those involved in advocacy for the DFS and financial inclusion.

4. Participants indicated that DFS drives investments by encouraging savings, accessing credit, and facilitating investments in debt (i.e., bills and bonds) and equity securities.

5. As a means to reduce fraud, customers registering for mobile money and agency banking have to provide their national identification number (NIN) and copy of the card to comply with the know your customer (KYC) requirements.

6. Currently the financial intermediaries supervised by the Bank of Uganda are: Tier 1 comprising 25 commercial banks; Tier 2 with 4 credit institutions; and Tier 3 entities with 4 microfinance deposit-taking institutions. These financial institutions have access to borrower historical credit information from the Credit Reference Bureau database.

7. Informants indicated that due to network connectivity and liquidity risks, most customers tend to cash-out their float when they are planning to carry-out business transactions in rural areas.

8. The Tier 4 Microfinance Institutions and Money Lenders Act, 2016 that categorize financial institutions in this category into: savings and credit cooperatives (SACCO), non-deposit taking microfinance institutions (MFIs), self-help groups, community-based microfinance institutions and money lenders.

9. The UGX.200,000 fee is equivalent to USD.52.36 using the official opening selling rate of UGX/USD=3,819.42 quoted on 25th January 2024.

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Appendices

Appendix A: Key informant interview guide

AERC-BMGF Research Project
Digital Finance Policy and its impact on Financial Inclusion in Uganda
Key Informant Interview Guide

Instruction: Read out the below Introduction and Consent statement script verbatim (*word for word as written below*).

This key informant interview is conducted by one of the Researcher(s) and/or a well-trained enumerator(s). Please ask and record response(s) to the question(s) that are relevant to each stakeholder. The questions are semi-structured to guide the conversation with respondent and should be elaborated as and when the needs arise. One can ask follow-up question(s) to gain more insights and prob key issues.

A. Introduction

A.1. Interviewer Introduction
Hello, Sir/Madam.
My name is ……., I am a Researcher conducting this investigation on the impact of Digital Finance Policy on financial inclusion in Uganda that is part of the AERC regional policy project.

A.2. Background to this interview
You have been selected to participate in this informant discussion because of your role/ experience/ contribution to issues related to policies on digital finance policy/ digital

finance operations/ financial inclusion issues. Our interaction will take a short-term and will focus on your insights into these issues, how gender can be mainstreamed and impact of the digital finance policy on inclusion of the socio-economic categories.

Sound digital finance policy is believed to facilitate efficient interaction between the government, financial services providers, and consumers, which could enhance confidence and uptake among these agents. The recent digital finance revolution has transformed the way economic agents transact and store economic value (i.e., e-money). However, the impact of digital finance policy might have differing effects on the various socio-economic categories like gender, rural/urban, age, income, employment, and level of formal education attainment. The information from this discussion is intended to supplement the results of the quantitative analysis to inform public policies and other future interventions.

B. Personal identification and Consent

B.1. Interviewee personal identification information

a. Name:……...…Gender:……..
b. Institution affiliation:……..Address:…….....
c. Position……..Contact(s)…….....
d. Years of experience with digital policies and/or financial inclusion: ……

B.2. Interviewee consent to participate

Yes ⬭ Proceed with interviews) No ⬭ (Note reason for refusal and stop)

C. Interview Question Guide

C.1. Digital Finance Role:

1. What is your Role in the Digital Finance Ecosystem?

C.2. Financial Inclusion:

2. How has digital finance contributed to financial inclusion?
3. What factors have contributed to digital financial inclusion?
4. What factors have limited the reach of digital financial inclusion?

C.3. Gender

5. What factors influence the uptake of digital finance by women?
6. What can we do to stimulate the use of digital finance by women?

C.4. Rural/Urban Areas

5. What factors influence the uptake of digital finance by women?
6. What can we do to stimulate the use of digital finance by women?

C.5. Policy

10. What policies have stimulated the uptake of digital finance?
11. What policies have constrained the uptake of digital finance?
12. What factors and policies are promoting the uptake of FinTechs?
13. What factors and policies are constraining the uptake of FinTechs?

C.6. Future

14. How do you see the future? Where do you see the opportunities and challenges?

Appendix B: List of key stakeholders interviewed

APPENDIX Table B1: Key InformaNts-Digital Finance Policy	
A	Government
B	Commercial banks
C	Private sector including FinTechs
D	Donors/International organisations
E	Economic & Policy Think-Tank

Mission

To strengthen local capacity for conducting independent,
rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

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