



Moderating Role of Technology Self-Efficacy on Fintech Usage and Digital Financial Inclusion of Women in Rural Uganda

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ABSTRACT

Digital financial inclusion (DFI) especially among rural women remains a significant challenge in Uganda. Despite the potential benefits of fintech's, limited technology self-efficacy (TSE) among rural women hampers their effective usage. This study examined how TSE influences the relationship between fintech usage and DFI among these women. Data were gathered via a structured questionnaire from 384 women vendors in Mbale main market, employing an explanatory, quantitative, cross-sectional design. Using hierarchical regression and Hayes PROCESS Macro V 4.0, the study assessed both direct relationships and the moderating effect of TSE. Results indicate that both fintech usage and TSE positively impact DFI, with TSE significantly enhancing the association between fintech usage and DFI. Based on these findings, the study recommends that policymakers support fintech adoption through targeted education programs to improve TSE among rural women. Additionally, user-friendly interfaces and supportive systems are crucial in overcoming technological barriers and boosting confidence. However, limitations include the study's cross-sectional approach, focus on women vendors in a specific district, and potential social desirability bias. Future research should consider longitudinal studies, cultural aspects of fintech adoption, and mixed-methods data collection to deepen understanding of the variables.

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ARTICLE INFO

Received: August 6, 2024

Reviewed: October 22, 2024

Accepted: November 2, 2024

Published: November 4, 2024

Keywords:

Fintech usage

Technology self-efficacy

Digital financial inclusion



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Introduction

In recent years, digital financial inclusion (DFI) has gained significant global attention as it holds the potential to improve the lives of financially excluded and underserved populations (Aziz & Naima, 2021). Traditional avenues for financial inclusion, such as commercial banks, are undergoing transformation due to evolving consumer preferences and technological advancements. Financial institutions are increasingly

embracing fintech innovative applications such as mobile money, online accounts, and electronic payments to provide modern banking services through alternative channels (Compendium SDG Survey, 2018). These digital financial services (DFS) support sustainable and inclusive growth by delivering affordable, innovative financial products to poor and vulnerable groups (Aziz & Naima, 2021). The potential of digital financial solutions lies in their ability to bridge the gap between the financially excluded and the formal financial sector, promoting financial inclusion and economic empowerment. Despite the global push for digital financial inclusion, gender disparities persist, particularly in Africa. Women remain overrepresented among the unbanked, with fewer women holding bank accounts than men, except in countries like South Africa (World Bank's Findex, 2022). For instance, only 32% of women utilize digital payment methods, compared to 56% of men (Alter & Yontcheva, 2015). Gender disparities in access to financial services are evident, with fewer women holding accounts in commercial institutions (EPRC survey, 2023). Promoting women's financial inclusion is crucial because providing them with access to DFS can lead to greater economic empowerment and development.

In Uganda, the challenge of women's digital financial exclusion is particularly acute, with approximately five million unbanked women. The male-dominated nature of the fintech industry exacerbates this issue, as technology is often perceived as an industry primarily for men (Kawooya, 2023). To address this gender disparity, fintech companies and banks have invested in products and services focused on women, such as village saving groups in Savings and Credit Cooperative Organizations (SACCOs). Additionally, organizations offer training to ensure that women can effectively utilize DFS, highlighting the importance of both men and women having access to these services for true financial inclusion (Kawooya, 2023). Locally, Uganda has made strides in digital financial inclusion through the use of fintech. Platforms such as MTN Uganda's mobile money service (MoMo) and Airtel Money have played pivotal roles in bridging the gap in financial access. These platforms offer user-friendly interfaces accessible via basic mobile phones, enabling millions of Ugandans to save, send and receive funds, obtain credit, and engage in financial transactions (Kawooya, 2023). The ease of use and affordability of these services have significantly empowered individuals, especially women in rural areas, to manage their finances and improve their economic well-being. The fintech revolution in Uganda has fostered financial inclusion, promoting the growth of small and medium enterprises (SMEs), digital payments, and remittances (Financial sector deepening Uganda, 2018).

However, while fintech offers great promise in enhancing digital financial inclusion, it can also exacerbate inequalities by creating new barriers. For instance, the assumption that individuals will find digital platforms useful and be willing to adopt them can leave vulnerable populations behind (Ebong & Babu, 2021). To ensure that fintech benefits are widely enjoyed, it is crucial to address challenges such as digital literacy and access to technology, where TSE becomes vital. TSE refers to an individual's belief in their ability to effectively use technology (Bandura, 1997). Rural women with high TSE are more likely to adopt fintech tools, leading to greater digital financial inclusion (Ebong & Babu, 2021). However, the moderating influence of TSE on the relationship between fintech usage and DFI, especially among women in Uganda, remains underexplored.

This study aimed to examine the moderating role of TSE in the relationship between fintech usage and DFI among market women in rural Uganda. By addressing this research gap, the study contributes to the existing literature and provides valuable insights for both theory and practice by proposing effective strategies to promote digital financial inclusion for women in Uganda. From a theoretical perspective, it aimed to enhance the understanding of the moderating role that TSE plays in the relationship between fintech usage and DFI, addressing a significant gap in the current literature. By providing empirical evidence on how TSE influences women's engagement with fintech, the study contributes to the broader discourse on gender disparities in financial inclusion and the role of technology in addressing these challenges using Technology acceptance Model (TAM). From a practical standpoint, the findings are expected to inform policymakers, financial institutions, and fintech companies on effective strategies to promote DFI among market women in Mbale, emphasizing the importance of enhancing TSE through targeted digital literacy programmes and awareness

campaigns, through the design of more inclusive fintech products and services that cater specifically to women's needs, thus fostering economic empowerment and reducing the gender gap in financial access.

The structure of the remaining portion of the paper delves into the theoretical framework, literature review, outlines the research hypotheses, details the methodology, presents analysis and results, deliberates the findings, and concludes by considering the implications, limitations, and potential areas of investigation for future studies.

Literature Review

Theoretical Underpinning

The foundation of this research is built on two primary theories: the Technology Acceptance Model (TAM) developed by Davis et al., (1989) and the Social Construction of Technology (SCOT) proposed by Pinch and Bijker (1984). TAM investigates the behavioral intentions surrounding the adoption and use of information systems, linking technology adoption to factors such as perceived usefulness, ease of use, attitudes, and intended behaviors. It provides a framework to understand why individuals choose to adopt or reject new technologies.

On the other hand, the SCOT theory emphasizes that societal factors significantly shape the development, adoption, and interpretation of technology. According to Pinch and Bijker, technology is not a neutral force but is instead influenced by social, cultural, and economic contexts. Truckenbrod (1993) adds to this discussion by highlighting that computing and technology fields are socially constructed in ways that often exclude women, leading to marginalized contributions and diminished participation. This exclusion is driven by societal norms and institutional structures, rather than biological differences, making it clear that underrepresentation of women in technology is a societal issue.

In the context of fintech, these societal influences are evident. Despite the growing availability of digital financial solutions, such as mobile money platforms and digital savings groups, women's engagement with these services remains limited. The male-dominated nature of the fintech industry and the perception that these technologies are primarily designed for men perpetuate this exclusion. As a result, societal norms and biases continue to reinforce the digital gender divide, where fewer women than men actively use digital financial services. This underscores the importance of addressing both technological barriers and social factors to promote digital financial inclusion for women.

Digital Financial Inclusion (DFI)

The concept of DFI has been looked at by various scholars and institutions, each presenting different definitions that highlight its multifaceted nature. At its core, DFI refers to the strategic deployment of cost-effective digital methodologies aimed at delivering affordable and sustainable formal financial services to marginalized populations that have historically been excluded from such services. This articulates that the primary objective of DFI is to enhance access to formal financial services for these underserved groups (The World Bank, 2018). The United Nations Secretary-General's Special Advocate for Inclusive Finance for Development (UNSGSA, 2018) emphasizes that DFI is fundamentally about providing financial services through digital channels to populations lacking access to conventional financial offerings thus, DFI encompasses the leveraging of digital technologies to render formal financial services more accessible, affordable, and pertinent to individuals who have been systematically overlooked by traditional financial systems. Moreover, the implications of DFI extend beyond mere access; they encompass the broader goal of improving the financial well-being and economic opportunities of marginalized individuals. As articulated by the International Monetary Fund (IMF, 2019), this can be effectively achieved through the utilization of digital tools such as mobile banking applications and online financial platforms. These innovations facilitate not only

the provision of financial services but also the empowerment of individuals, enabling them to participate more fully in the economic landscape.

Uganda's digital financial inclusion is showcased through various innovative platforms and services that have successfully brought previously excluded populations into the formal financial sector. A notable illustration is MTN Mobile Money, which enables users to transfer funds, settle bills, and access savings and credit facilities using their mobile devices. This service has been particularly impactful in rural areas, where conventional banking infrastructure is often scarce. Similarly, Airtel Money provides comparable features and has facilitated person-to-person transactions, allowing users to conduct business without the need for a traditional bank account. Furthermore, programs such as Village Savings and Loan Associations have incorporated digital technologies, enabling women in rural Uganda to more effectively manage their savings and loans through mobile-based platforms (Kawooya, 2023; Financial sector deepening Uganda, 2018).

Fintech Usage

Fintech, a term derived from "financial technology," refers to the innovative integration of technology within the financial services (FS) industry. This integration aims to enhance the efficiency, accessibility, and user experience of financial products and services. As articulated by Kim et al., (2016), fintech represents a rapidly evolving sector that leverages information technology to improve the overall effectiveness of the financial system. The Financial Stability Board (FSB) defines it as "technology-enabled innovation in financial services," which captures the expansive scope of the sector (Chen et al., 2021). This definition encompasses a diverse array of financial services, including payments, deposits, lending, market provisioning, capital raising, insurance, and investment management. The versatility of fintech is further underscored by its association with startups, established IT companies, and traditional financial institutions, all of which utilize technological advancements to deliver financial services (Bouaziz & Sghari, 2020; Mulyk & Oliinyk, 2021).

Fintech innovations have significantly influenced financial inclusion, particularly for marginalized groups, by providing accessible and cost-effective financial services. Key innovations such as mobile payment systems, blockchain-based solutions, and digital banking platforms have emerged to reduce the cost of delivering financial services and expand their accessibility, especially in remote areas lacking traditional banking infrastructure (Ebirim & Odonkor, 2024). Mobile money services, a prominent type of fintech innovation, have facilitated access to financial services through mobile devices for numerous unbanked individuals worldwide (Senyo & Osabutey, 2020). These services empower individuals by enabling peer-to-peer transactions and facilitating micro-lending practices (Ebirim & Odonkor, 2024). Additionally, blockchain technology has enhanced transparency and security, encouraging higher utilization rates among underserved populations (Ebirim & Odonkor, 2024).

Scholars have highlighted various dimensions of fintech, emphasizing aspects such as the emergence of startups, the introduction of new technologies, innovative business models, and the ongoing digitalization of financial services (Chuen & Teo, 2015; Moosa, 2022). By harnessing cutting-edge technology, fintech aims to deliver transformative financial products and services that not only meet the evolving needs of consumers but also foster greater inclusivity within the financial ecosystem (Chuen & Teo, 2015). Thus, fintech represents a significant paradigm shift in how financial services are conceived, delivered, and experienced in the modern economy.

Technology Self-efficacy (TSE)

The concept of Technology Self-Efficacy (TSE) refers to individuals' confidence in their ability to effectively engage with and utilize technology. This construct plays a pivotal role in influencing the acceptance and integration of technology within educational environments (Belluomini, 2016). TSE encompasses the belief that individuals possess the skills necessary to navigate and interact with various technologies encountered in

their daily lives. As a newly conceptualized framework, TSE accurately reflects the complexities of the contemporary technological landscape (Correia, Compeau & Thatcher, 2016). The multifaceted nature of TSE is underscored by its dimensions, which encompass the specificity of the technology in question and the nature of the tasks involved (Gupta & Bostrom, 2019).

In the context of mobile banking, performance expectancy and effort expectancy emerge as significant determinants influencing users' intentions to adopt mobile banking applications (Rahman et al., 2024). Users especially the marginalized groups are more likely to embrace these applications when they perceive them as user-friendly and advantageous for managing their finances. Furthermore, perceived ease of use and perceived usefulness are critical factors that directly affect consumers' intentions to adopt mobile banking technology (Zhang et al., 2018). These elements contribute to enhancing users' confidence in their ability to utilize mobile banking applications effectively.

Empirical Review

Fintech Usage and DFI

The transformative potential of financial technology (fintech) in enhancing financial inclusion has gathered significant scholarly attention in recent years. This literature review synthesizes existing empirical studies examining fintech dynamics, particularly mobile money, in promoting financial inclusion across various contexts. Findings from Museba et al., (2021) indicate that mobile money adoption is significantly influenced by the increasing penetration of mobile devices and the critical need for financial access among unbanked populations. The study revealed that mobile money facilitates financial transactions and positively impacts sustainable development goals (SDGs), specifically in advancing gender equality, promoting decent work and economic growth, and reducing inequalities. These findings suggest that fintech, particularly mobile money, is advancing financial inclusion in Uganda, thereby expanding economic participation for previously marginalized groups (Museba et al., 2021).

Broadening the scope beyond Uganda, a study across 36 African countries by Alhassan and Yengeni (2022) corroborates the positive effects of fintech on financial inclusion. This research underscores that mobile accounts have a more substantial impact on financial inclusion than digital payments from traditional bank accounts. Utilizing a two-stage analytical framework, the study first constructed a financial inclusion index using Principal Component Analysis (PCA) and subsequently applied panel data regression to assess the influence of various fintech proxies on financial inclusion. The findings highlight the critical role of mobile financial services in bridging the financial access gap for underserved populations across the continent (Alhassan & Yengeni, 2022).

Further empirical support comes from Chitimira and Torerai (2023), who investigated the impact of digital financial services, particularly mobile money, in Zimbabwe and South Africa. Their research shows that mobile financial services have created new opportunities for impoverished individuals to engage with formal payment systems. By enabling unbanked individuals to access financial services via mobile phones, fintech has broadened financial inclusion, allowing greater participation in financial markets and other formal economic activities. This shift not only enhances individual economic agency but also contributes to broader economic development in these countries (Chitimira & Torerai, 2023).

While fintech presents promising avenues for enhancing financial inclusion, several challenges persist. Mader et al., (2022) conducted a study on mobile money taxation in Kenya, Uganda, and Malawi, highlighting the political nature of fintech regulation and its potential implications for the effectiveness of financial inclusion initiatives. The authors argue that without supportive regulatory frameworks, the transformative potential of fintech may be undermined, thereby necessitating a concerted effort to develop policies that facilitate rather than hinder financial access. The integration of fintech solutions has markedly improved access to financial

services for underserved populations (Asif et al., 2023). Their research emphasizes the democratizing effect of Digital Financial Services (DFS), which have empowered individuals historically marginalized from conventional banking systems. The increasing engagement of rural communities within the formal financial sector illustrates the positive ramifications of fintech on financial inclusion. The disruptive nature of fintech fundamentally alters traditional financial institutions, payment systems, and consumer behavior, fostering a more inclusive financial landscape (Rai et al., 2019).

In alignment with these findings, Alrabei et al., (2022) provide empirical evidence supporting the assertion that a direct correlation exists between fintech usage and the reduction of socioeconomic disparities in financial access. Their research specifically addresses class and rural demographics, indicating that the shift towards DFS not only democratizes access to financial services but also facilitates active participation in the formal economy. This participation catalyzes economic growth and development, reinforcing the necessity of fintech in contemporary financial ecosystems. In light of the challenges associated with fintech adoption, there is a pressing need for innovative strategies and collaborative efforts to enhance digital financial inclusion. Persmoe and Sandvik (2018), highlight that traditional banking institutions are increasingly recognizing the potential of partnerships with fintech companies as a means to drive innovation and broaden outreach to underserved populations. The agility, customer-centric approach, and disruptive technologies characteristic of fintech innovations are reshaping the financial landscape and challenging established banking models. This paradigm shift presents stakeholders with a unique opportunity to reassess traditional approaches to financial inclusion. In line with the above literature, the following hypothesis is what we put forth:

H1: Fintech usage is positively related to digital financial inclusion

TSE and DFI

The intersection of technology self-efficacy (TSE) and digital financial inclusion (DFI) has garnered increasing attention in recent years, particularly as fintech services proliferate across various demographics and regions. TSE, defined as an individual's belief in their capability to effectively utilize technology, plays a crucial role in shaping user interactions with fintech platforms. This literature review synthesizes existing research on TSE and its implications for DFI, with a focus on the behaviors and attitudes of different consumer segments, notably younger generations and populations in developing regions. Research indicates that a robust sense of TSE is positively correlated with the propensity to engage with fintech services. Lee (2021) highlights that younger individual, particularly those belonging to Generation Z in China, exhibit a heightened confidence in their technological capabilities, which subsequently influences their willingness to adopt fintech solutions. This demographic's familiarity with digital technologies enhances their engagement with fintech, suggesting that TSE is a critical factor in the uptake of these services. The implications of TSE extend beyond mere usage; individuals with higher TSE are more likely to embrace technological innovations, as demonstrated in the foundational work of Compeau and Higgins (1995). Their study elucidates that individuals who perceive themselves as technologically competent are more inclined to explore and adopt new technologies, reinforcing the notion that self-efficacy is a determinant of technology adoption.

Moreover, Hong et al., (2014) provides empirical support for the relationship between TSE and user confidence in navigating digital platforms. Their findings reveal that individuals possessing strong TSE are more adept at downloading and utilizing various applications, which is particularly relevant in the context of fintech services that require users to perform specific tasks on mobile devices. TSE, therefore, is not only a predictor of technology usage but also a facilitator of user engagement with complex financial applications. The broader implications of TSE extend into discussions of financial inclusion, particularly in developing regions where access to digital financial services is often hindered by technological barriers. Evans (2015) underscores the significant positive effects of internet access and adult literacy on financial inclusion in Africa, suggesting that TSE is intricately linked to these factors.

As individuals become more literate in digital technologies, their confidence in using fintech services increases, thereby enhancing their financial inclusion. This correlation is particularly pertinent in regions where traditional banking services are limited, and mobile technology offers a viable alternative for financial transactions. The rapid adoption of mobile money services in countries like Uganda further illustrates the importance of TSE in promoting financial inclusion. Ebong and George (2021) argue that the swift penetration of mobile money in Uganda serves as a catalyst for financial inclusion, emphasizing that individuals' ability to effectively utilize mobile technology is crucial. This highlights the role of TSE in enabling users to navigate mobile financial platforms, ultimately contributing to broader economic participation. The following hypothesis is put out in light of the literature review:

H2: Technology self-efficacy is positively related to digital financial inclusion

Moderating Role of TSE

Although fintech has been adopted by financial institutions across a wide range of wealth management services, existing research lacks clarity regarding the factors influencing customers' intentions to continue using these services (Ryu, 2018). Recent studies have emphasized a strong correlation between fintech usage and digital financial inclusion (DFI), indicating that fintech solutions are instrumental in providing access to digital financial services for traditionally marginalized populations (Shiau et al., 2020; Asif et al., 2023; Koefer et al., 2024). Nevertheless, despite the clear advantages of fintech, its effectiveness in fostering financial inclusion varies significantly, with individual differences particularly technology self-efficacy (TSE) playing a crucial role in moderating these outcomes (Shiau et al., 2020).

Fintech innovations have revolutionized the financial landscape by providing accessible, affordable, and user-friendly financial services. The rapid expansion of fintech has contributed to breaking down barriers that have historically hindered access to financial services for underserved populations. As noted by Asif et al., (2023) and Koefer et al., (2024), fintech solutions encompass a range of services, including mobile banking, peer-to-peer lending, and digital wallets, which collectively enhance financial accessibility. These services are especially critical for individuals who lack access to traditional banking systems, thereby promoting a more inclusive financial environment. However, the mere existence of fintech solutions is not sufficient to guarantee digital financial inclusion. The effectiveness of these technologies is contingent upon various factors, among which TSE plays a crucial role. TSE refers to an individual's belief in their ability to effectively utilize technology to achieve specific goals (Bandura, 1986). This self-belief influences how individuals' approach and interact with technology, thereby affecting their willingness to learn and adapt to new digital tools.

TSE significantly impacts individuals' engagement with fintech solutions. Research indicates that individuals with high TSE are more likely to adopt and regularly utilize digital financial services (DFS) due to their confidence in navigating technological tools (Venkatesh & Bala, 2008). This confidence leads to greater satisfaction and trust in fintech services, subsequently enhancing their overall financial inclusion. Conversely, individuals with low TSE may perceive substantial barriers when using fintech, leading to limited engagement with these services and, consequently, restricted access to financial resources (Ajzen, 1991).

The relationship between TSE and the effectiveness of fintech usage in promoting DFI has been substantiated by various studies. For instance, Davis (1989) posits that technology self-efficacy can enhance the positive impact of fintech on DFI by bridging the digital divide. This assertion is further supported by Lee (2021), who emphasizes that individuals with a robust sense of TSE can significantly improve the effectiveness of financial applications and fintech services. By fostering a belief in one's ability to utilize technology, TSE can amplify the positive outcomes associated with fintech usage, thereby promoting greater financial inclusion.

From the above literature reviewed the following hypothesis is put forth:

H3: TSE strengthens the positive relationship between Fintech usage on digital financial inclusion

Built on the reviewed literature, the model presented was developed to guide this study

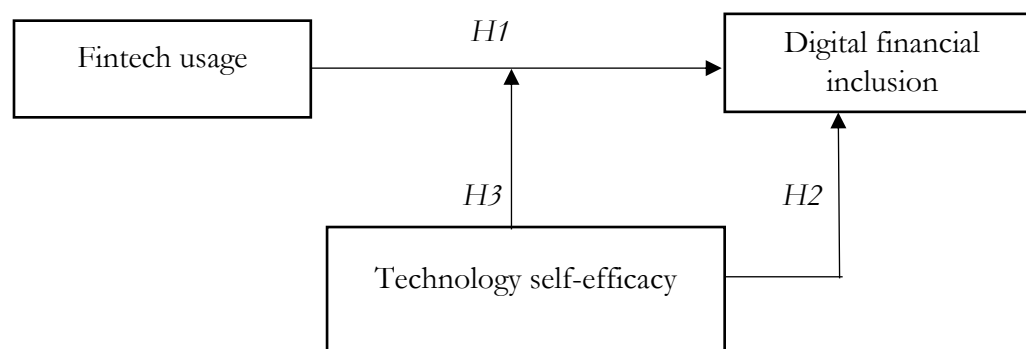


Figure 1: Conceptual framework

Methodology

The study was conducted in Mbale District, selected due to its rural status as one of the least financially included populations of vulnerable women at risk of digital financial exclusion. The study population comprised 179,594 women above 10 years of age residing in this district, as reported by the Uganda Bureau of Statistics (UBOS, 2022). A sample size of 384 participants was determined to be appropriate for this study, following the methodology outlined by Krejcie and Morgan (1970). The sample determination table was utilized because it provides a statistically robust, straightforward, and widely accepted approach for determining a sample size from a known population. This method considers the population size, desired confidence level, and margin of error, ensuring a representative sample that is feasible for implementation in large populations. Such rigor enhances the reliability of the study's findings while optimizing resource allocation (McCall, 1994). The study employed an explanatory design utilizing a quantitative cross-sectional survey approach.

To capture a representative spectrum of perspectives from respondents within the selected district, simple random sampling was employed to select individual women participating in the Mbale Central Market. The market was selected due to its high concentration of economic activities in the district, which has resulted in a significant number of women working there. This method was particularly appropriate given the predominance of women among the market vendors, who are significantly impacted by the ongoing digital transformation. To ensure the accuracy of the data collected and to prevent duplicate responses, each selected vendor was assigned a unique identification number, which was utilized throughout the data collection process. Ultimately, a total of 384 responses were successfully gathered from female vendors in the Mbale District Central Market, providing a robust dataset for analysis.

The questionnaire was pre-tested to ensure the validity and reliability of the items included, thereby enhancing the quality of the data collected. Cronbach's alpha was utilized to assess reliability, and the results indicated that all items were retained as they exceeded the threshold of 0.7 (Creswell, 2006 and Hair et al., 2016). It consisted four distinct sections: demographic information, fintech usage, TSE, and DFI. The items in the questionnaire were presented on a 5-point Likert scale to collect replies from the respondents. We chose this scale because of its simplicity, clarity, and versatility (DeVellis, 2003; Likert, 1932; Johns, 2010). The demographic information included age, marital status, degree of education, type of business, and years of involvement in the market, which were measured on a nominal scale. This study utilized validated measures adapted from the existing scales. TSE was measured using the scale developed by Compeau and Higgins (1995), which comprises 10 items that assess a person's confidence in using technology. Fintech usage was measured using a scale developed by Asif et al., (2023) that includes items related to the frequency and extent of fintech

usage. Finally, DFI was measured using a scale developed by Koefer et al., (2024) that includes items related to access to financial services and financial well-being.

The data were analyzed using SPSS version 26. Descriptive statistics, including means and standard deviations, were computed to describe the characteristics of the sample and the variables under study. Correlation analysis was employed to examine the relationships between the variables. A multiple regression analysis was conducted to assess the moderating effect of Technological Self-Efficacy (TSE) on the relationship between fintech usage and digital financial inclusion (DFI). Statistical significance was set at a p-value of less than 0.05.

To investigate the moderating role of TSE, the researcher utilized the PROCESS macro version 4.0 (Hayes, 2018), following the guidelines established by Aiken and West (1991). Their recommended five-step procedure for testing moderation was implemented as follows: As recommended by the literature, the mean values of the variables of interest were centered to reduce potential multicollinearity issues that could arise in regression analyses. The researcher then tested whether the moderator variable (TSE) had a significant effect on the dependent variable (DFI). Interaction terms were calculated by multiplying the independent variable (fintech usage) by the moderator variable (TSE). The interaction term was required to yield a non-zero value. The moderating effect of TSE on the relationship between the independent and dependent variables was tested in the presence of control variables. In accordance with the findings of Preacher, Curran, and Bauer (2006), the presence of a moderating effect would be confirmed if the variance explained (R^2) in the dependent variable significantly increased when the interaction between the independent and moderator variables was included, compared to the model with only direct effects.

Ethical considerations were considered during the research process. Before completing the questionnaire, all participants were appropriately educated and provided consent. They were kept updated of the privacy and anonymity of their responses. The collected data served exclusively for the research objectives and were stored securely. The study was carried out in compliance with the laws and ethical standards.

Results and Discussion

Preliminary Analysis

Usable data were inspected for missing values, and it was discovered that there were five cases with random patterns, as suggested by Enders (2022), these were removed entirely. In addition, a statistical test for Common Method Variance (CMV) was performed because all data were simultaneously collected from a single source at the same time. The outcomes of Harman's one-factor test showed that the variance was limited due to the first factor accounted for 21.1% of the overall variation, which is less than the advised cut off point 50%, as stated by Hair et al., (2010). Therefore, the final sample for analysis consisted of 375 cases.

Descriptive Statistics and Correlation Analysis

The descriptive statistics' results indicate that the mean values for fintech usage, TSE, and DFI are 3.94, 3.97 and 2.71, respectively. These findings suggest that, on average, the study participants reported relatively high levels of fintech usage and TSE, while the level of DFI was somewhat lower. The standard deviations for fintech usage, TSE, and DFI are 0.30, 0.33 and 0.24, respectively. These values indicate considerable variability in the responses for each variable. The wide range of responses indicates diverse experiences and perceptions of fintech usage, TSE, and DFI.

Correlation analysis revealed significant positive relationships between fintech usage and both technology self-efficacy and digital financial inclusion. These findings suggest that individuals with higher levels of fintech usage are more likely to have higher levels of TSE and DFI. This implies that fintech usage may play

a vital role in enhancing individuals' confidence in using technology and their access to DFS. The positive correlation between the TSE and DFI further supports the notion that individuals with higher self-efficacy in using technology are more likely to have greater access to DFS.

The validity and reliability results for the variables measured in this study are strong overall, reflecting the soundness of the data collected. The validity, measured through correlation coefficients, indicates that the constructs are well-defined and consistent across the sample. Fintech (1) has the highest validity at .982, followed by DFI (3) at .934, and TSE (2) at .891, suggesting that these variables are accurately capturing the intended constructs. In terms of reliability, all three variables exhibit acceptable levels, with DFI (3) showing the highest reliability at .895, indicating strong internal consistency. Fintech (1) and TSE (2) follow with reliabilities of .847 and .763, respectively. These values suggest that the measures are consistently replicable and trustworthy across different instances of data collection. Overall, the high validity and reliability scores support the robustness of the measurement instruments used in the study.

Table 1: Descriptive statistics and correlation

Variable	Min	Max	Mean	SD	Validity	Reliability	1	2	3
Fintech usage (1)	2.05	4.13	3.94	0.30	.982	.847	1		
TSE (2)	2.14	4.17	3.97	0.33	.891	.763	.312**	1	
DFI (3)	2.01	3.02	2.71	0.24	.934	.895	.327**	.370**	1

Note: N=375, **p< 0.01

Source: Primary data

Hierarchical Regression Analysis

Hierarchical multiple regression models were employed to evaluate the exceptional influence of each predictor variable and test the hypotheses of the direct effect relationships (H1 and H2). These models enable a structured investigation of the association between predictor and outcome variables. The analysis's findings are shown in Table 2 displays the outcomes of the regression models. This approach allows the identification of the individual impact of each predictor variable and offers insights into the direct effects being examined. By utilizing this methodology, this study aimed to gain a more profound understanding of the relationships between the predictor and outcome variables.

According to the findings of the hierarchical regression analysis in Model 1, education level, age, type of business, marital status, and years of experience in the market were non-significant predictors. In Model 2, Fintech usage was added as an independent variable, and the findings showed that Fintech usage had a significant positive relationship with digital financial inclusion ($\beta = 0.369$, $t = 5.720$, $p < 0.001$), indicating that individuals who use Fintech services are more prone to digitally included financially than those who do not use Fintech services. In Model 3, technology self-efficacy was added, which also had a significant positive relationship with digital financial inclusion ($\beta = 0.395$, $t = 5.98$, $p < 0.001$), signifying that individuals with advanced levels of self-efficacy in using technology are more likely to be digitally financially included than those with lower levels.

The R^2 value increased in Model 1 from 0.04 to 0.251 in Model 2, demonstrating that the addition of fintech usage explained a substantial amount of 25.1 % of the variance in DFI. The R-squared change from Model 2 to Model 3 was 0.278, indicating a 27.8% of the variance in DFI. The results are in Table 2.

Table 2: Hierarchical regression analysis

Dependent Variable: Digital financial Inclusion						
Variable	Model 1		Model 2		Model 3	
	Beta	t	Beta	t	Beta	t
Age,	0.05	0.07	0.08	0.16	0.09	0.17
Type of business	0.13	0.02	0.02	0.05	0.03	0.05
Marital status	0.07	0.14	0.06	0.12	0.06	0.14
Educational level	0.14	0.18	0.09	0.19	0.04	0.09
Years of experience in the market	0.06	0.12	0.01	0.02	0.08	0.18
Fintech usage			.369**	5.720		
Technology self -efficacy					.395***	5.98
R ²		0.04		0.255		0.413
R ² change		0.04		0.251		0.278
F.		0.27		27.993		41.741
Sig.		0.713		0.000		0.000

N=375 ***p>0.001, **p< 0.01, *p<0.05,

Source: Primary data

Moderating Analysis

The main objective of this study is to examine the moderating influence of TSE on the association between fintech usage and DFI. To assess the moderating effects, the researchers used the Hayes process macro v4.0 (Model 4), which is renowned for its capacity to produce dependable outcomes. This analysis adhered to the moderation conditions (Aiken & West, 1991). The regression analysis model comprised several independent variables, with the DFI serving as the dependent variable. The constant displayed a significant intercept of 4.764, suggesting a strong baseline effect. The coefficients of age, type of business, marital status, educational level, and years of experience in the market indicate that these variables have minimal and statistically insignificant effects on DFI. Fintech usage has a coefficient of 0.365, indicating that it significantly enhances DFI. The TSE also had a significant positive effect, with a coefficient of 0.382.

Table 3: Moderation Regression Analysis

Dependent Variable: Digital financial Inclusion					
Model 1: Technology self –efficacy					
	Coef	t	LLC1	ULC1	
Constant		4.764	200.01	4.093	4.632
Age		0.001	0.090	2.038	-3.031
Type of business		0.021	0.086	-3.091	4.092
Marital status		0.052	0.080	3.012	-3.931
Educational level		0.071	0.071	-2.010	3.942
Years of experience in the market		0.092	0.032	-3.016	6.033
Fintech usage		.365***	6.000	0.981	1.092
Technology self -efficacy		.382***	6.040	4.091	2.980
Fintech usage*Technology Self -Efficacy		.197*	2.830	7.321	8.310
R ²	0.381				
F	5.461				

Note: N=375 *p<0.05, **p< 0.01, ***p>0.001,

Source: Primary data

In this model, the interaction term between fintech usage and TSE has a coefficient of 0.197 and a t-value of 2.830 (* $p < 0.05$), indicating that TSE positively and significantly moderates the relationship between fintech usage and DFI. This finding suggests that individuals with higher technology self-efficacy experience a stronger positive impact of fintech usage on DFI. The model's R-squared value is 0.381, accounting for approximately 38.1% of the variance in DFI, while an F-statistic of 5.461 indicates overall statistical significance as indicated in table 3. The significant moderating role of Technology Self-Efficacy (TSE) is further examined through the shape of the moderation graph (Jose, 2013). The mod graph in *Figure 2* shows that the simple slope lines are not parallel, confirming the presence of a moderating effect of TSE on the relationship between Fintech usage and Digital Financial Inclusion (DFI).

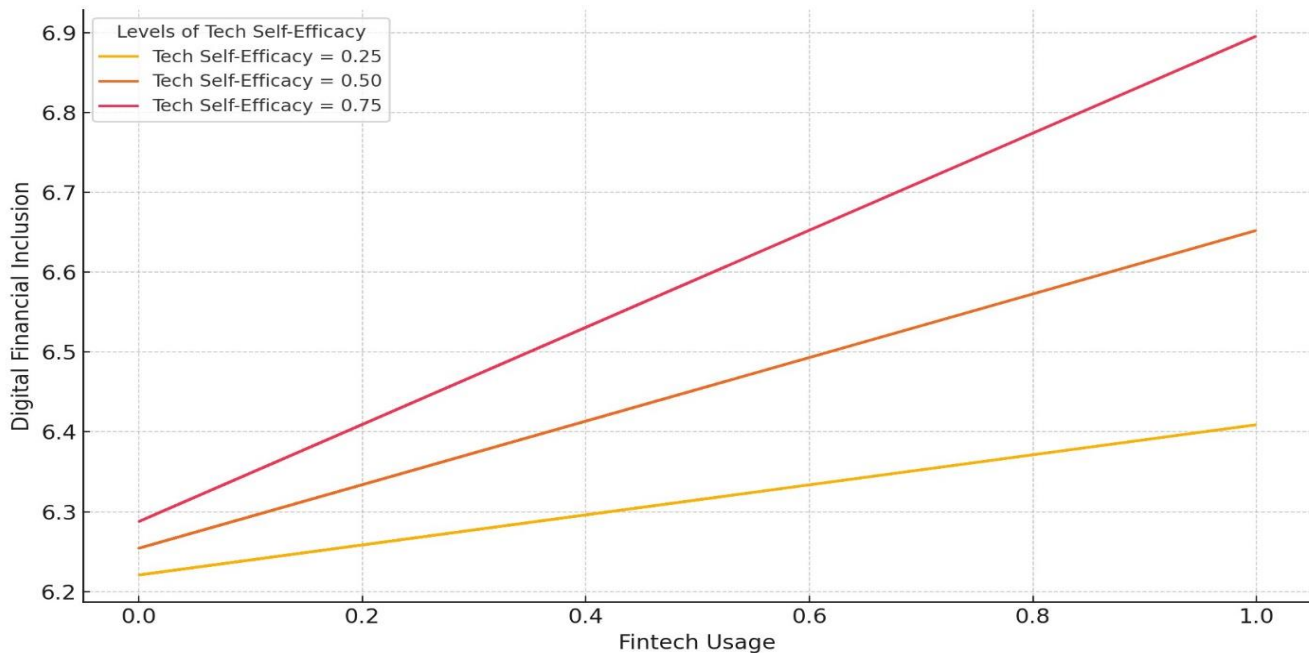


Figure 2: Mod graph showing the moderating effect of Technology self-efficacy on the relationship between Fintech usage and Digital Financial Inclusion

Discussion

The outcomes of this study provide significant insights into the link between fintech usage, TSE, and DFI for women in Uganda. The outcomes support the first hypothesis (H1) that fintech usage is associated with DFI. A regression study showed a substantial positive correlation between the DFI and Fintech use suggesting that women who utilize Fintech services are likely to be digitally financially included than those who do not use Fintech services. These outcomes exhibit consistency with those of preceding studies. This highlights the positive impact of fintech usage on expanding financial services to underserved populations (Melubo and Masau, 2020; Abdu & Adem, 2021; Asif et al., 2023).

Similarly, the second hypothesis (H2), that TSE is associated with DFI, is supported. Regression analysis showed a significant positive relationship between TSE and DFI. This shows that women with advanced levels of confidence in using technology are more likely to be digitally financially included compared to those with lower levels of self-efficacy. These outcomes are in line with previous research proposing that individuals with advanced levels of TSE embrace technological advancements (Anane et al., 2022; Enebeli-Uzor et al., 2023).

Furthermore, the third hypothesis (H3) that TSE moderates the relationship between fintech usage and DFI is supported. The moderation analysis revealed that TSE positively and significantly moderates the relationship between fintech usage and DFI. This suggests that individuals with a higher TSE experience a stronger positive impact of fintech usage on DFI. These outcomes emphasize the importance of the TSE in determining the effectiveness of fintech usage in promoting DFI.

Conclusion

This research sheds light on the important role of fintech usage and technology self-efficacy in promoting digital financial inclusion for rural women in Uganda. The findings highlight the need for focused efforts that enhance TSE and promote the adoption of fintech usage among women in rural areas. Policymakers, financial institutions, and organizations should focus on enhancing TSE and promoting fintech usage to help close the gender gap in DFI and empower women economically.

Implications

Findings have several inferences for theory and practice. From a theoretical viewpoint, this work adds to the body of knowledge by emphasizing the role of fintech usage and TSE in promoting DFI. It builds upon earlier findings by examining the moderating effect of TSE on the connection between fintech usage and DFI, specifically for women in rural Uganda. This study integrates the TAM and SCOT theory to deepen the understanding of factors influencing DFI, highlighting how technology and user perceptions shape fintech usage.

From a practical standpoint, these outcomes have consequences for policymakers, financial institutions, and organizations involved in promoting DFI. First, policymakers and regulators should devise strategies to encourage fintech usage and enhance TSE among rural women through targeted education programs can help women better understand and utilize fintech services, thereby increasing their TSE and designing user-friendly interfaces and providing adequate support systems can help overcome initial barriers and build rural women's confidence in using financial technologies.

Financial institutions should collaborate with fintech companies to develop user-friendly platforms and services tailored to rural women's needs. This could involve designing interfaces that are culturally sensitive. Additionally, organizations should invest in initiatives that enhance TSE among rural women, such as training programs and mentorship opportunities.

Limitation and Areas for Future Research

This study had some limitations. First, the cross-sectional design restricts the ability to infer causal relationships, suggesting that future research should adopt a longitudinal approach to address this constraint. Second, the study's focus on women vendors in the rural Mbale market limits the generalizability of the findings to other populations or cultural contexts. Third, the unique sociocultural context of Uganda, including varying levels of trust in digital systems, community-based financial practices such as village savings and loan associations, and social norms regarding technology use, may significantly influence fintech usage thus digital financial inclusion. Future research should investigate how these cultural factors shape individuals' willingness to adopt and engage with fintech usage. Lastly, the use of self-reported data was subjected to social desirability bias. To mitigate this, future studies could incorporate objective measures or employ mixed-methods approaches to enhance the robustness of data collection.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author, RM upon reasonable request.

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