Assessing the Impact of Digitalization and Digital Payments in Advancing Financial Inclusion

Waqas Shair[1] [iD], Farhat Jabeen[2], Muhammad Bilal Zafar[3], Rizwan Ul Hassan[4]

[1] Senior Lecturer, School of Economics & Finance, Minhaj University Lahore, Pakistan. Email: waqasshair689@gmail.com
[2] Assistant Professor, Punjab Higher Education Department, Pakistan. Email: farhateshaal@gmail.com
[3] Postdoctoral Fellow, Faculty of Social Sciences & Humanities, University of Technology Malaysia, Malaysia.
  Email: bilalezafar@gmail.com
[4] Lecturer, The Lahore ALMA, Lahore. Email: rizwanulhassan78@gmail.com

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ABSTRACT

This study seeks to investigate the impact of digital resource accessibility and digital payment on financial inclusion in South Asia. The scope of this examination covers accessibility and utilization dimension of the financial inclusion. The accessibility in terms of account ownership and utilization in terms of formal savings and formal borrowing. The study uses Global Findex database 2021 and employs a Logistic regression model given the binary nature of the outcome variables. The aftermaths of the regression model suggest that age, gender, education, wealth and employment status significantly influence the indicators of financial inclusion. Findings indicate that access to mobile phone and internet has higher likelihood of financial inclusion in terms of owing a bank account, formal savings and formal borrowing. Moreover, engagement of individuals with digital payment systems like credit cards, debit cards, or making or receiving payment digitally correlates strongly with higher likelihood of financial inclusion. The findings of the study have implications in underscoring the importance of tailored policies that support financial inclusion.

1.   Introduction

In contemporary economies, particularly within developing economies, the expansion of digital resources and financial technologies like digital payments plays a pivotal role in driving societal and economic development. Despite the recognized importance of these technologies, substantial disparities persist in access to and utilization of digital financial services across different demographics. These disparities could hinder the broader goal of financial inclusion, which is integral to economic independence and societal growth. The payment processing solutions market is expected to grow at 12.18% between 2022 and 2027, reaching USD 63.48 billion (Technavio, 2023). The factors contributing to this growth include contactless payment adoption, e-commerce sales, internet penetration, and financial inclusion. These solutions facilitate efficient financial transactions by enabling collaboration between merchants and customers, enhancing transactional flow (Jain & Seth, 2023; Saleem, Shair, ul Hassan, & Iftikhar, 2024; Statista, 2023). Digitalization has the potential to improve financial inclusion by making

services more accessible and affordable. However, its impact has been limited, despite banks' efforts to improve financial penetration. The COVID-19 pandemic has highlighted gaps in access to financial services, and the rise in internet and smartphone users presents opportunities for increased digital transactions (Fu & Mishra, 2022).

FinTech implementation in the banking industry is continually rising, which has led to automation in a variety of financial tasks (Jain & Seth, 2023). Digital financial inclusion has been a key policy factor for the past decade in developing countries, with payments banks playing a significant role in achieving this goal (Pandey, Kiran, & Sharma, 2022; Pretorius, Wang, & Buitendag, 2022). These banks aim to enhance digital financial inclusion by providing accessible services for low-income households and small businesses. Although initially unsuccessful in profitability due to infrastructural costs, payments banks are expected to play a larger role in achieving financial inclusion (Ali & Ghildiyal, 2023). The low adoption rate is not only due to supply-side barriers but also to demand-side factors or taxes. The factors like the perceived lack of customers wanting to pay digitally and concerns about mobile payment records increasing tax liability suggest that lowering costs is unlikely to increase digital payment adoption (Ligon, Malick, Sheth, & Trachtman, 2019). Digital financial services' ecosystem emerged organically (Iheanachor, Umukoro, & Yela Aránega, 2023), and the growth in digital financial inclusion is only in the depth of use, not coverage (Lin, Chen, & Yan, 2023).

The digital financial inclusion has sustainable outcomes including reduces household carbon emissions, mainly due to coverage and digitization (Zhou, Zhang, & Li, 2023), and ICT utilization significantly impacts green growth and it enhances agricultural green productivity by facilitating land transfer, promoting green development through sound infrastructure and strict credit policies (Shen, Guo, & Zhang, 2023). Digital financial inclusion promotes economic growth (Saqib et al., 2023) and urban green economic efficiency, and it has a spatial spillover effect, inhibiting improvement in adjacent regions (Zhu, Ma, & Du, 2023). There is a positive relationship between cashless payments, including card & e-money, credit transfer, and cheque, and the real GDP of G7 countries in the long run (Noman, Maydybura, Channa, Wong, & Chang, 2023).

Digital financial inclusion significantly positively impacts green innovation, driven by its depth of use and digitalization. It alleviates capital misallocation and improves financial efficiency, promoting green innovation (Li, Sun, Gao, & Cheng, 2023). Digital economy enhances urban resilience; integrating technology, innovation, and resilience is crucial for sustainable development (Saqib, Duran, & Ozturk, 2023). Women now play a more significant economic role in decision-making due to access to digital financial services (Mabrouk, Bousrih, Elhaj, Binsuwadan, & Alofaysan, 2023). Bank digitalization positively impacts financial inclusion, promoting sustainable growth and diversification in risk aversion behavior. The vulnerable groups are benefiting from financial inclusion, which in turn benefits banks' sustainable development. Digital finance also boosts innovation and entrepreneurship levels, promoting economic vitality.

The government attention to the digital economy positively impacts enterprise digital transformation through fiscal expenditures, digital financial inclusion, industrial agglomeration, and firm nature (Jin & Pan, 2023). Because of governmental regulations, customer expectations, a cashless society, digitalization, globalization, innovation, and other factors, the fintech industry is fast growing (Arora & Madan, 2023; Shair, Hussain, Asif, & Niamat, 2024). Despite this, countries differ in Fintech and financial inclusion due to public policies, IT development, and population openness. Economic policy measures can increase financial inclusion through Fintech facilities and digitization of financial products (Apostu, Panait, Vasile, Sharma, & Vasile, 2023). Recent years have seen an increase in digital financial inclusion, while there are still big inequalities based on income and vulnerable groups, especially in developing nations (Shair, Tayyab, ul Hassan, & Iftikhar, 2024).

There are different studies related to digitalization and financial including focusing on different countries and regions (Ali & Ghildiyal, 2023; Iheanachor et al., 2023; Ligon et al., 2019; Lin et al., 2023; Pandey et al., 2022; Pretorius et al., 2022; Saqib et al., 2023; Shen et al., 2023; Zhou et al., 2023; Zhu et al., 2023), but there is dearth of empirical research considerably focusing the South Asia, specially. The literature is on the determinants of the digital divide (see: (Shair, Tayyab, Nawaz, & Amjad, 2023; Shair, Waheed, Kamran, & Kubra, 2022; Shair, Zahra, Tayyab, & Kubra, 2022), however, a comprehensive exemption of the digitalization and digital payments is scant.

Hence, this study aims to assess the impact of digitalization and digital payment usage on financial inclusion in South Asia empirically. The findings of the study underscore the importance of tailored policies that support financial inclusion, particularly targeting the young and employed segments of the population.

2. Methodology

The objective of the study is to examine the impact of digitalization and digital payments on the financial inclusion. The outcome variable in this setting is dichotomous qualitative variable which can be estimated by using the Logit model. The baseline econometric model is as follow:

$$z = \mathbf{x}' \beta + u \tag{1}$$

where z is a dependent variable defined as 'yes' if individual reported having of financial account, 'no' if dissatisfied; $\mathbf{x}$ is the vector of covariates; β is the vector of regression coefficients; u is the error term, assumed to follow a standard logistic distribution. We shall also use equation 1 for the formal savings and formal borrowing.

Here is the equation for the basic logit model:

$$Logit(P(Y = 1|X)) = \log(\frac{P(Y = 1|X)}{1 - P(Y = 1|X)}) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k \tag{2}$$

Here $Logit$ is the log-odds function, representing the logarithm of the odds of $Y = 1$. The description the outcome variable and other covariates have been presented in the Table 1.

3. Data and Descriptive analysis
3.1. Data source

The study uses Global Findex Database 2021 for the empirical analysis. The data sourced from the website of World Bank. The current round of Findex consist of 128,000 individuals from 123 countries. The current round of Findex collect data from six economies of South Asia and did not collect data from Bhutan and Maldives. The sample size for the South Asia comprises 8009 individuals.

3.2. Descriptive analysis

The descriptive statistics of the variables used in the study presented in Table 2. In the sample, 57 per cent individuals responded owning a financial account at bank, 14.3 per cent having formal saving, and 10.6 per cent having formal borrowing. In the sample, 1 out of 4 individuals did not own a mobile phone, while 40 per cent own mobile phone and 35 per cent own mobile phone and use internet. 36 per cent of the individuals made or receive digital payment, 11.4 per cent have debit card, and only 3 per cent have credit card. The average age of the individual is 36-year-old, 60 per cent of the individuals are from the urban area, while 50 per cent are females in the sample, and 35 per cent individuals are form the low income or lower middle-income group. 55 per cent individuals are participating in the labor. Only 7 per cent

induvial is having tertiary education, while 50 per cent participants responded either no education or primary education.

Table 1
Definition of the Variables

Variable	Definition of the variables
Account	It is a binary variable, coded 1 if respondent holds a formal banking account, 0 otherwise.
Saving	It is a binary variable, coded 1 if respondent holds saving in formal banking sector, 0 otherwise.
Borrowing	It is a binary variable, coded 1 if respondent borrowed money from the formal sector, 0 otherwise.
Independent variable	
Age	It is a continuous variable, comprising the age of the person in years.
Age-squared	It is a continuous variable, measured by taking the square of the age for the non-linear association.
Urban	It is a binary variable, coded 1 if respondent is from urban area, 0 otherwise.
Female	It is a binary variable, coded 1 if respondent is female, 0 otherwise.
Income	It is an ordinal categorical variable comprising five income quantiles. The income quantile ranges from the income1 to income5 following the individual from bottom 20 per cent to upper 20 per cent in the income distribution.
Employment	It is a binary variable, coded 1 if respondent is participating in labor, 0 otherwise.
Education	It is an ordinal categorical variable comprises the primary, secondary and tertiary education. It consists of three dummy variables with one base category.
Digitalization	It is a multinomial categorical variable, coded 1 if individuals not having mobile, 2 if having mobile, 3 if having mobile and internet.
Digital payment	It is a binary variable coded 1 if individual make or receive digital payments, 0 otherwise.
Debit card	It is a binary variable coded 1 if individual used the debit card, 0 otherwise.
Credit card	It is a binary variable coded 1 if individual used the credit card, 0 otherwise.

Table 2
Descriptive Statistics

Variable	Whole sample	Account (Yes)	Saving (Yes)	Borrowing (Yes)
	Mean/proportion	Mean/proportion	Mean/proportion	Mean/proportion
Account	0.57		0.97	0.8
Saving	0.143	0.244		0.294
Borrowing	0.106	0.15	0.219	
No mobile & internet	0.244	0.172	0.086	0.144
Mobile	0.404	0.365	0.261	0.403
Internet	0.353	0.464	0.653	0.453
Digital payment	0.358	0.581	0.725	0.578
Debit card	0.114	0.2	0.344	0.211
Credit card	0.032	0.056	0.113	0.088
Age	35.657	36.848	36.401	37.412
Urban	0.593	0.64	0.692	0.636
Female	0.5	0.463	0.445	0.494
Poorest	0.171	0.156	0.07	0.144
Lower middle income	0.173	0.168	0.131	0.19
Middle income	0.194	0.179	0.142	0.182
Upper middle income	0.212	0.217	0.226	0.213
Upper income	0.25	0.28	0.431	0.271
Employed	0.555	0.625	0.696	0.7
Primary or no education	0.504	0.408	0.24	0.403
Secondary education	0.429	0.495	0.625	0.532
Tertiary education	0.068	0.096	0.134	0.065

In the sample of individuals having financial account, 24 per cent have formal savings, while 15 per cent have formal borrowings. Amongst individuals owning a financial account, the higher proportion of individuals (about 46%) have mobile and internet usage, 58 per cent made or receive digital payment, 22 per cent and 6 per cent having use of debit card and credit card respectively.

In the sample of individuals having formal savings, 22 per cent have formal borrowings. Amongst individuals responded of having formal savings, the proportion of individuals have mobile and internet usage soared to 65 per cent. Likewise, 72.5 per cent made or receive digital payment, 34 per cent and 11 per cent having use of debit card and credit card respectively.

4.   Results and discussion
4.1.   Digitalization and financial inclusion

The marginal effects of the Logit model is presented in the Table 3. The estimates suggest that outcome of the digitalization has statistically significant and positive impact on the financial inclusion. For instance, the individual who own a mobile phone is 7 per cent more likelihood of having a financial account than an individual without mobile phone. While an individual who won a mobile phone and also use internet is 29 per cent more likelihood of having a financial account than an individual without mobile phone. The coefficient of age suggests that an increase in age is positively associated with likelihood of having a financial account. The negative sign of the age-squared indicates the presence of threshold; before the threshold the likelihood of having a financial account increases and after the threshold, an increase in age is associated with lower the likelihood of having a financial account. An individual from urban area is 11 per cent more likelihood of having a financial account. A female has 5 per cent more likelihood of having a financial account than the male. Notably, the socio-economic status has insignificant impact on the likelihood of having a financial account. A person who is participating in labour is 11 per cent more likelihood of having a financial account than a person who is not participating in labour. An individual with secondary and tertiary education has 16 per cent and 24 per cent more likelihood of having a financial account than a person with no or primary education.

The marginal effects of Logit model in the formal savings suggest that individual who own a mobile phone is 4.2 per cent more likelihood of having a formal savings than an individual without mobile phone. On the other hand, an individual who won a mobile phone and also use internet is 15 per cent more likelihood of formal savings than an individual without mobile phone. The coefficient of age suggests that an increase in age is positively associated with likelihood of formal savings. The negative sign of the age-squared indicates the presence of threshold; before the threshold the likelihood of formal savings increases and after the threshold, an increase in age is associated with lower the likelihood of formal savings. An individual from urban area is 5 per cent more likelihood of formal savings. A female has 3 per cent more likelihood of formal savings than the male. An increase in socio-economic status from lower-middle-income to upper income group is associated with 6.8 per cent to 13.6 more likelihood than the lower income group. A person who is participating in labour is 4 per cent more likelihood of formal savings vis-à-vis a person who is not participating in labour. An individual with secondary and tertiary education has 8 per cent and 12 per cent more likelihood of formal savings than a person with no or primary education.

The marginal effects of Logit model on the formal borrowings suggest that individual who own a mobile phone is 3 per cent more likelihood of having a formal borrowing than an individual without mobile phone. On the other hand, an individual who won a mobile phone and also use internet is 6.5 per cent more likelihood of formal borrowings than an individual without mobile phone. The coefficient of age suggests that an increase in age is positively associated with likelihood of formal borrowings. The area of individual and socio-economic status is insignificant. A female has 3 per cent more likelihood of formal borrowings than the male. A person who is

participating in labour is 5 per cent more likelihood of formal borrowings vis-à-vis a person who is not participating in labour. An individual with secondary has 3.7 per cent more likelihood of formal borrowings than a person with no or primary education.

Table 3
Estimates of Logit Model on the Impact of Digitalization on Financial Inclusion

Variables	Financial account	Savings	Borrowings
Mobile	0.0741***	0.0420***	0.0343***
	(0.0151)	(0.0125)	(0.0104)
Mobile & internet	0.291***	0.154***	0.0648***
	(0.0160)	(0.0164)	(0.0129)
Age	0.0125***	0.00260**	0.00939***
	(0.00205)	(0.00118)	(0.00132)
Age-squared	-6.62e-05***	-5.45e-06	-9.79e-05***
	(2.42e-05)	(1.41e-05)	(1.63e-05)
Urban	0.110***	0.0489***	0.00842
	(0.0124)	(0.00636)	(0.00661)
Female	0.0457***	0.0306***	0.0297***
	(0.0134)	(0.00711)	(0.00699)
Lower middle income	0.0248	0.0681***	0.0218*
	(0.0201)	(0.0191)	(0.0126)
Middle income	-0.0286	0.0520***	0.00203
	(0.0201)	(0.0174)	(0.0112)
Upper middle income	0.00617	0.0883***	0.00363
	(0.0196)	(0.0183)	(0.0111)
Upper income	-0.0120	0.136***	0.00106
	(0.0199)	(0.0189)	(0.0108)
Employed	0.106***	0.0406***	0.0498***
	(0.0131)	(0.00729)	(0.00707)
Secondary education	0.155***	0.0814***	0.0370***
	(0.0134)	(0.00898)	(0.00793)
Tertiary education	0.242***	0.116***	-0.00215
	(0.0201)	(0.0209)	(0.0140)
Observations	7,945	7,914	7,921

Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

4.2. Digital payments and financial inclusion

The marginal effects of the Logit model is presented in the Table 4. The estimates suggest that outcome of the digital payments has statistically significant and positive impact on the financial inclusion. For instance, who responded that he/she made or received payments digitally has 53 per cent more likelihood of having a financial account than a person who never received or paid digitally. A person who responded made or received digital payment has 15.6 per cent more likelihood of having a formal savings than a person who never received or paid digitally. Moreover, a person who responded made or received digital payment has 8.4 per cent more likelihood of formal borrowings than a person who never received or paid digitally.

Individuals made or received digital payment are more likely to use formal financial services like access to bank account, formal savings and borrowing. This inclination is driven by increased financial inclusion as digital payments provide trust and familiarity with these services which enhance comfort of individuals with financial products. Additionally, digital transactions help build a credit history, easing the path to formal borrowing. The convenience, improved financial literacy, and incentives offered by digital payment systems further encourage the adoption of more comprehensive financial services.

In the Table 4, the model 4 and 5 suggests that an individual who responded the use of debit card is 17.4 per cent more likelihood of formal savings and 7 per cent more likelihood of formal borrowings than a person without debit card. Likewise, model 6 and 7 suggests that an

individual who responded the use of credit card is 18 per cent more likelihood of formal savings and 13 per cent more likelihood of formal borrowings than a person without credit card. Credit or debit card holders are typically more inclined to engage in formal savings and borrowing. This is because having a card usually means they are already integrated into the formal financial system, fostering smoother access to additional banking products like loans and savings accounts.

Card usage helps build a credit history, enhancing credit scores and making users more appealing to lenders. The convenience of accessing banking services both physically and online, along with the financial literacy gained from managing these cards, boosts users' capability and comfort in managing their finances. Trust in financial institutions grows with card usage, encouraging further engagement with their products. Additionally, rewards and incentives linked to card usage, such as cashback and lower loan rates, further entice users to utilize more of their bank's services, promoting a deeper engagement with formal financial mechanisms.

Table 4
Estimates of Logit Model on the Impact of Digital Payments on Financial Inclusion

Variables	(1) Financial Account	(2) Savings	(3) Borrowings	(4) Savings	(5) Borrowings	(6) Savings	(7) Borrowings
Age	0.0114***	0.00204*	0.00897***	0.00197	0.00933***	0.00237*	0.00937***
	(0.00228)	(0.00110)	(0.00125)	(0.00120)	(0.00131)	(0.00122)	(0.00132)
Age-squared	-8.77e-05***	-1.26e-05	-9.84e-05***	-3.86e-06	-9.94e-05***	-9.58e-06	-0.000100***
	(2.77e-05)	(1.30e-05)	(1.52e-05)	(1.43e-05)	(1.61e-05)	(1.45e-05)	(1.63e-05)
Urban	0.134***	0.0473***	0.00728	0.0447***	0.00424	0.0515***	0.00570
	(0.0136)	(0.00604)	(0.00638)	(0.00667)	(0.00668)	(0.00663)	(0.00670)
Female	0.0501***	0.0271***	0.0278***	0.0247***	0.0254***	0.0208***	0.0253***
	(0.0139)	(0.00675)	(0.00672)	(0.00735)	(0.00692)	(0.00737)	(0.00697)
Lower middle income	0.0224	0.0622***	0.0218*	0.0674***	0.0220*	0.0683***	0.0231*
	(0.0207)	(0.0179)	(0.0122)	(0.0190)	(0.0125)	(0.0192)	(0.0126)
Middle income	-0.0144	0.0575***	0.00370	0.0614***	0.00312	0.0630***	0.00409
	(0.0207)	(0.0172)	(0.0110)	(0.0183)	(0.0112)	(0.0185)	(0.0114)
Upper middle income	-0.0110	0.0843***	0.000654	0.0910***	0.00275	0.107***	0.00639
	(0.0206)	(0.0174)	(0.0105)	(0.0186)	(0.0111)	(0.0194)	(0.0113)
Upper income	-0.0161	0.142***	-0.000751	0.145***	-0.000966	0.173***	0.00577
	(0.0204)	(0.0188)	(0.0103)	(0.0196)	(0.0108)	(0.0204)	(0.0110)
Employed	0.0857***	0.0333***	0.0452***	0.0433***	0.0519***	0.0490***	0.0530***
	(0.0139)	(0.00701)	(0.00685)	(0.00751)	(0.00700)	(0.00755)	(0.00703)
Secondary education	0.128***	0.0807***	0.0309***	0.106***	0.0434***	0.122***	0.0470***
	(0.0134)	(0.00830)	(0.00737)	(0.00889)	(0.00767)	(0.00889)	(0.00765)
Tertiary education	0.211***	0.115***	-0.0106	0.156***	0.00214	0.209***	0.0102
	(0.0198)	(0.0206)	(0.0125)	(0.0238)	(0.0146)	(0.0252)	(0.0151)
Digital payment	0.532***	0.156***	0.0838***				
	(0.00924)	(0.00900)	(0.00788)				
Debit card				0.174***	0.0692***		
				(0.0160)	(0.0129)		
Credit card						0.181***	0.127***
						(0.0284)	(0.0255)
Observations	7,994	7,960	7,967	7,953	7,960	7,960	7,967

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

5.   Conclusion

This study seeks to investigate the impact of digital resource accessibility and digital payments on financial inclusion. The scope of the study encompasses the aspects of financial inclusion related to the accessibility and utilization of banking services, including account ownership, formal saving behaviors, and formal borrowing practices. Using data from the Global Findex database 2021, this analysis spans several South Asian countries. The analysis employs a Logit regression model to assess the determinants of financial inclusion. Findings indicate that demographic factors such as gender, education, age, area, wealth, and employment status significantly influence financial inclusion. Moreover, access to digital resources has positive impact on the likelihood of owing a financial account, financial savings, and formal borrowings. Likewise, usage of debit card and credit card increase the likelihood of formal savings and formal borrowings.

In the evolving narrative of financial inclusion, emphasize digital access and literacy, particularly in underserved areas, as ownership of mobile phones and internet use are clear catalysts for financial inclusion. The digital divide must be bridged not just through technology but with targeted financial literacy programs, especially in secondary and tertiary education levels. The current income levels are not sufficiently supporting the spread of financial inclusion, necessitating a range of measures to shift the impact of income towards enhancing financial inclusion. Tailor financial products for an aging population, and bolster financial outreach in rural settings. The employed individuals are more inclined towards financial participation, underscoring the need for job creation and economic growth as pillars of financial policy. Lastly, the potent mix of technology and finance suggests a strong push for wider adoption of debit and credit cards, supported by a regulatory framework that champions security and fosters trust.

Authors' Contribution
Waqas Shair: Originated the study concept, managed data analysis, applied statistical methods, and visualized data.
Farhat Jabeen: Spearheaded data collection, helped write the methodology and results sections of the manuscript, designed the research, coordinated the project, and integrated theoretical models.
Muhammad Bilal Zafar: Conducted the literature review and established the theoretical basis.
Rizwan Ul Hassan: Offered technical expertise on digital payment systems, interpreted study findings in light of current technology, and refined the manuscript's conclusions and policy recommendations.

Conflict of Interests/Disclosures
The authors declared no potential conflict of interest w.r.t the article's research, authorship and/or publication.

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