

Socio-economic determinants of digital financial inclusion in SAARC countries

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Abstract

Purpose – The purpose of this study is to examine the effects of individuals' socio-economic factors on digital financial inclusion in the South Asian Association for Regional Cooperation (SAARC) countries.

Design/methodology/approach – This study employs a quantitative research methodology following secondary data gathered from the World Bank. This study employs the Tobit and logistic regression models on the Global Findex Survey data comprising SAARC countries. In this study, a total of six indicators were considered for the development of a digital finance index.

Findings – The findings substantiate significant effects of socio-economic characteristics in the adoption of digital financial services in SAARC countries. This study reveals that digital financial inclusion remains low in SAARC countries, and a gender gap exists in digital financial services. Additionally, the levels of low education and income, unemployment and rural areas contribute to the deterioration in SAARC countries. The findings further prove that the impact of individuals' socio-economic characteristics varies across SAARC economies, implying regional differences.

Research limitations/implications – The present study examines the determinants of digital financial inclusion by focussing exclusively on six socio-economic characteristics of individuals. Secondly, the present study did not account for the impact of digital finance inclusion on individuals' socio-economic well-being. This study also did not consider the barriers to accessibility and usage of digital financial inclusion. Besides, this study only considers a single period to identify socio-economic determinants of digital financial inclusion in SAARC countries.

Practical implications – Practitioners should improve the accessibility of digital financial services for individuals regarding the ownership of debit and credit cards and mobile money accounts. Besides, practitioners should also facilitate the execution of payments and the receipt of services through card-based, internet-based, and mobile-based financial transactions in remote areas. Furthermore, the findings underscore the necessity for broader participation of financial institutions and financial technology service providers in rural areas, owing to geographical inequities that lead to the financial exclusion of the marginalised rural individuals in SAARC countries compared to urban residents. This gap can be realised through a robust support system, sufficient technology infrastructure and competitive user fees. Besides, financial institutions are anticipated to consider users' satisfaction and easy operational processes while developing new products and services.



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Originality/value – This study develops a digital finance index comprising six indicators and examined the effect of socio-economic factors, including demographic factors, on DFI in South Asian countries. Based on the author's knowledge, a scarcity of studies has been considered to measure DFI and the effects of socio-economic and demographic factors in the South Asian region, collectively.

Keywords Digital finance, Digital financial inclusion, Digital finance index, SAARC countries, South Asian countries, Mobile financial services, Mobile money accounts, Any digital payments, Buying online

Paper type Research article

Introduction

The rapid integration of digital technologies into the financial sector holds significant potential to advance financial inclusion, particularly by improving access to and the utilisation of financial services among underserved populations (Khera *et al.*, 2022; Mpofu, 2024). Digital financial services, facilitated by financial technology, provide access to conventional financial services through digital channels encompassing mobile money, debit and credit cards, online transactions, online bill payments, and digital transactions (Ghosh and Chaudhury, 2022; Morgan, 2022). These services enable overcoming several challenges, such as information asymmetry, cost, and geographical barriers (providing services in rural and remote areas), and include the unbanked population in the financial system (Khera *et al.*, 2022; Suri and Jack, 2016), driven by the penetration of smartphones and internet connections (Gomber *et al.*, 2017). The United Nations acknowledged this potential by incorporating SDGs (Target 8.10) for both digital and traditional inclusion indicators (Khera *et al.*, 2022; Mishra *et al.*, 2024; Murshed *et al.*, 2023). Mobile money and digital payment services (such as Apple Pay, Alipay, etc.) have enhanced the accessibility and efficiency of financial transactions (Morgan, 2022). The amount of digital payment has increased significantly, especially in developing nations, where these platforms provide financial services to individuals without access to conventional banking (Demirgüç-Kunt *et al.*, 2018, 2022). Nevertheless, digital financial inclusion is slowly progressing in developing countries (Mpofu, 2024).

Globally, South Asia is one of the most densely inhabited regions, harbouring approximately a quarter of the global population (Alliance for Financial Inclusion, 2024). Access to institutional financial services is essential for the economic advancement of these populations, especially for the underserved and vulnerable groups, including women, aged people, and the rural impoverished. Despite significant advancements in financial accessibility, South Asia still has, arguably, the largest unbanked population in the world (World Bank, 2022). Thus, South Asian countries have experienced significant growth, driven by the development of mobile money penetration and participation of the unbanked population (Murshed *et al.*, 2023). According to a report, most South Asian countries consider digital finance an essential instrument for achieving financial inclusion (Alliance for Financial Inclusion, 2024). Despite the progress in digital finance, a significant gap still persists in the participation of women and rural individuals in South Asia (Asian Development Bank, 2017). Besides, socio-cultural factors and a lack of education are critical barriers in relevance to digital financial inclusion (Alliance for Financial Inclusion, 2024; World Bank, 2020). Although many studies have investigated digital financial inclusion at a regional level, there is a paucity of studies on country-specific socio-economic facets that have persuaded the adoption of digital financial services throughout South Asia. It is apparent that education levels, income inequality, and residential and employment patterns exhibit substantial variation across Afghanistan, Bangladesh, India, Nepal, Pakistan, and Sri Lanka; yet, most studies point to South Asia as a generally similar region (Demirgüç-Kunt *et al.*, 2018; Morgan, 2022; Murshed *et al.*, 2023). In addition, studies have shown how gender biases, low education level, and rural residential status – due to lack of technology and digital literacy – discourage the adoption of digital financial inclusion (Ali and Ghildiyal, 2023; Demirgüç-Kunt *et al.*, 2022; Liu *et al.*, 2021; Mishra *et al.*, 2024; Suri and Jack, 2016). This gap reflects the lack of comprehension of how distinct socio-economic factors in each nation influence the adoption and level of digital financial inclusion. Previous studies focused on identifying influencing factors for digital finance in a single country, such as Bangladesh (Chowdhury and Miraz, 2024), Indonesia

(Widyastuti *et al.*, 2024), Pakistan (Razzaq *et al.*, 2024), and India (Ali and Ghildiyal, 2023). These studies merely looked at gender disparities as the primary explanatory variable (Razzaq *et al.*, 2024) and either used a single factor (Ali and Ghildiyal, 2023) or aggregate indicators (Widyastuti *et al.*, 2024) to measure digital finance. However, very few studies have considered cross-country research, especially for the nations that comprise the South Asian Association for Regional Cooperation (hereinafter SAARC) nations. In order to close this gap, the current study looks at the socio-economic factors that influence the incorporation of digital finance in SAARC nations, while taking regional variations into account. In addition, the study examined the digital finance index related to six indicators: online bill payments and purchases, debit and credit cards, mobile money accounts, and any digital payment. Furthermore, this study analysed the digital finance index across the nations that are members of the SAARC, illustrating the regional variations in socio-cultural factors that affect the incorporation of digital banking.

Aligned with existing research recommendations concerning the determinants of digital financial inclusion (Mishra *et al.*, 2024; Sant'Anna and Figueiredo, 2024) at the regional level (Roy and Patro, 2022), this study seeks to identify the socio-economic factors influencing digital financial inclusion across SAARC countries and to conduct comparative analyses among the member nations. The findings may inform policymakers of the SAARC countries to design target-based policies that mitigate digital financial biases in the region (Roy and Patro, 2022). As regards the findings, policymakers may redesign their existing promotional measures to enhance digital financial inclusion. The structure of this study begins with an overview of the background, followed by a comprehensive review of relevant literature. Subsequently, the research outlines the data sources and methodological approach, presents the empirical results, and provides an in-depth analysis. The study concludes with a summary of key findings and a discussion of their implications.

Literature review

Theoretical background

According to Ozili (2018), financial inclusion theory clarifies that financial services are available to everyone, including the unbanked and underprivileged segments. It also clarifies the inexpensive delivery of financial services and goods to disadvantaged and low-income populations (Dev, 2006; Widyastuti *et al.*, 2024). It mainly discusses how financial inclusion helps marginalised people into the financial industry, enabling them to access and utilise official financial services and products (Allen *et al.*, 2016; Widyastuti *et al.*, 2024). Technology developments and the COVID-19 disruptions continued to improve financial inclusion by digitalising banking for the unbanked and marginalised people (Tay *et al.*, 2022). People are increasingly using various digital financial services to suit their needs due to the financial systems' use of cutting-edge technologies (Widyastuti *et al.*, 2024). In particular, the introduction of financial technology significantly accelerated a change in the financial paradigm by creating more accessible and reasonably priced tools to facilitate the usage of financial services and products (Daud and Ahmad, 2023). Accordingly, digital finance inclusion is the process of providing a variety of digital financial services – such as online and mobile banking, debit and credit cards, and digital payments – to those who are marginalised, disadvantaged, and banked or unbanked (Ozili, 2018).

The Technology Acceptance Model (TAM) proposed by Davis (1986) underlines the significance of perceived usefulness and ease of use in determining whether individuals are likely to adopt and regularly use technological innovations like mobile banking or digital payment platforms (Mishra *et al.*, 2024). On the other hand, the Systems Theory of Financial Inclusion stresses the role of established systems – such as the financial system, social structures, or economic frameworks – in achieving outcomes related to financial inclusion (Ozili, 2020). This theory further explains that a major change at the system level (replacing traditional financial services with digital ones, for instance) does not automatically result in changes at the sub-system level since it necessitates transformations in those sub-systems. Consequently, digital financial inclusion, as an emerging framework, has the potential to boost the functioning of its associated

sub-systems (financial, social, and economic), while the effectiveness and efficiency of these sub-systems play a crucial role in determining the success or failure of the digital financial inclusion agenda (Ozili, 2020). From the perspective of Systems Theory, merely having a financial system that provides user-friendly and beneficial digital financial services for everyone is insufficient for achieving higher levels of financial inclusion. It also takes into account the economic factors affecting individuals, such as their employment status and income distribution, which influence their needs and willingness to adopt digital financial services. Additionally, Widyastuti *et al.* (2024) emphasised the significance of social and demographic factors, such as education level, living situation, gender, and age, that influence how individuals recognise the usefulness and user-friendliness of digital financial services (including mobile and online banking, debit and credit cards, and digital payments). Consequently, this study contends that an individual's socio-economic conditions play a vital role in the adoption of digital financial services.

Socio-economic status and digital financial inclusion

Socio-economic status is an assessment combining various economic and social factors to determine an individual's or group's position in society. The socio-economic status of individuals is a complex concept that involves their resources, including income, education level, gender, age, and employment (Antonoplis, 2023; Belmi *et al.*, 2020; Dubois *et al.*, 2015). In patriarchal societies, disparities related to gender and age pose significant challenges to digital financial inclusion. Women frequently confront greater barriers to accessing financial services due to legislative limitations and societal norms (Demirgüç-Kunt *et al.*, 2018; Hossain *et al.*, 2025; Kulkarni and Ghosh, 2021). A recent investigation by Razzaq *et al.* (2024) identified notable gender disparities concerning financial inclusion and the utilisation of digital financial services in Pakistan. In contrast, Widyastuti *et al.* (2024) reasserted that gender had an insignificant impact on the adoption of digital financial services in Indonesia. Consequently, different age demographics, including both younger and older individuals, may face distinct obstacles in embracing digital finance. Widyastuti *et al.* (2024) discovered a significantly negative relationship between age and digital finance, suggesting that older adults are more likely to be excluded from financial inclusion in the digital realm. Following these discussions, the subsequent hypothesis is suggested:

- H1. Demographic factors (gender and age) have a significant influence on the adoption of digital financial services.

Meanwhile, education empowers individuals to understand how to use digital products and services, and recognise their value (Ba and Dieng, 2025; Mubarak *et al.*, 2020). Higher levels of education correlate with a better understanding of technology and its applications in financial transactions, leading to enhanced engagement with financial services (Lusardi and Mitchell, 2014). Studies by Mothobi and Kebotsamang (2024) along with Ba and Dieng (2025), indicated that educational attainment drives the differences in Fintech adoption across African nations. Nevertheless, individuals residing in rural areas repeatedly face limited access to financial services compared to those in urban settings, due to challenges such as distance from financial institutions and insufficient infrastructure (Ba and Dieng, 2025; Beck *et al.*, 2007). Therefore, cash continues to be the dominant form of transaction in numerous rural regions (Zelizer, 2021). As reported by Mishra *et al.* (2024) and Ba and Dieng (2025), people in rural environments are less likely to adopt digital financial services compared to their urban counterparts. Given these circumstances, the following hypothesis is put forward:

- H2. Social factors (education and residential status) have a significant effect on the adoption of digital financial services.

Income serves as a key factor influencing digital finance inclusion due to its strong association with consumption and savings (Widyastuti *et al.*, 2024). Typically, individuals with higher incomes have greater access to digital financial services (Ali and Ghildiyal, 2023; Ghosh and Chaudhury, 2022; Girón *et al.*, 2022; Widyastuti *et al.*, 2024). According to Gumilar *et al.* (2024) and Ba and Dieng (2025), differences in income have a significant effect on the

assimilation of digital financial services. This notation is supported by the fact that individuals with low incomes often cannot afford smartphones and internet access. Similarly, employment status plays an essential role in digital financial inclusion, as employed individuals tend to engage in more financial transactions than those unemployed (Ali and Ghildiyal, 2023). Thus, the following hypothesis is put forward:

H3. Economic status significantly impacts the adoption of digital financial services.

Based on the above discussions and hypotheses, the research framework is developed and presented in Figure 1.

Methodology

Data

To achieve objectives, this study aimed to estimate digital financial inclusion and socio-economic determinants of digital financial inclusion for eight SAARC countries in 2022. Due to the lack of data for various variables, this study was confined to six countries, excluding Bhutan and the Maldives. The data relevant to the adoption of digital financial services and the socio-economic statuses of individuals were derived from the Global Findex Database (The World Bank, 2022), which is the most comprehensive database for digital financial inclusion in the world. The data are collected through a collaboration with the Gallup World Poll, funded by the Bill & Melinda Gates Foundation. The Global Findex survey data is derived from interviews with around 150,000 adults across over 140 countries, carried out from 19th June 2021 to 26th February 2023. This study focuses on micro-level data comprising 8,009 adults in six South Asian countries.

Dependent variable(s)

As presented in Table 1, the digital finance index (Digi_index) is the dependent variable used in this study. It is a composite index that forms information on six indicators of accessibility and usage of digital financial services. In the prior studies on digital finance inclusion, the scholars gradually utilised composite indices to weigh their progress (Elouaouri and Ibourk, 2024; Ghosh and Chaudhury, 2022). This study incorporates appropriate variables considering the post-COVID-19 data to exemplify the sub-indicators of digital financial inclusion precisely. This research developed a digital finance index (Equation 1) by employing six indicators that effectively capture various aspects of digital financial inclusion, utilising the same methodology as the UNDP for creating the HDI (United Nations Development Programme, 2010). It is a composite index that evaluates the mean scores by normalising each indicator. It is calculated using the geometric mean of all the indicators.

$$DFI_i = \frac{X_i - MIN(X_i)}{MAX(X_i) - MIN(X_i)} \quad (1)$$

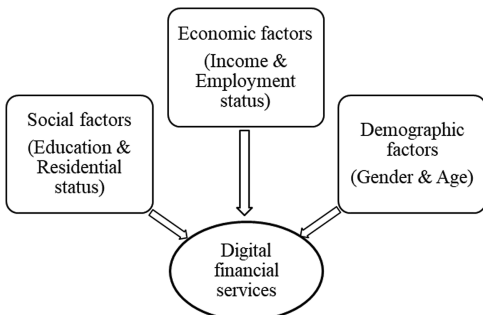


Figure 1. Research framework. Source: Figure by authors

Table 1. Variable descriptive statistics

Variable	Description	Freq.	Mean	Std. Dev.
<i>Socio-economic characteristics</i>				
Digi_index	Digital finance index	8,009	0.15	0.22
Gender	1 if the respondent is female, 0 otherwise	8,009	0.5	0.5
Age and Age ²	Physical age of the individual	8,008	35.66	14.392
Educ	1 if completed primary or less, 2 completed secondary, 3 completed tertiary or more	8,009	1.56	0.617
Inc q	Within-economy household income quintile; 1 first 20%, 2 s 20%, 3 third 20%, 4 fourth 20%, 5 richest 20%	8,009	3.20	1.425
Emp_in	1 if the respondent is currently employed, 0 otherwise	8,009	0.55	0.49
Urban_city	1 if the respondent lives in the urban area, 0 otherwise	7,004	0.47	0.499
<i>Sub-indicators of the digital financial inclusion index</i>				
Debit card	1 if the respondent has a debit card, 0 otherwise	8,009	0.24	0.429
Credit card	1 if the respondent has a credit card, 0 otherwise	4,275	0.08	0.278
Buy online	Made bill payments online using the Internet	8,009	0.09	0.292
Utility bill	1 if the respondent made regular payments for electricity, water, or trash collection in the past year, 0 otherwise	3,156	0.14	0.344
Account mob	1 if the respondent used mobile money services to pay bills or to send or receive money in the past year, 0 otherwise	8,009	0.11	0.309
Anydigpayment	1 if the respondent makes or receives any digital payment, 0 otherwise	8,009	0.36	0.479
Note(s): Freq. = observation; Std. Dev. = standard deviation				
Source(s): World Bank (2022), Authors' own				

Where X_i represents the indicator, MIN and MAX present the minimum and maximum values of the indicator, respectively, and DFI_i is the index that was computed by aggregating the sub-indicators. This study assesses digital financial inclusion using a composite index alongside six individual indicators. These indicators serve as dependent variables and are categorised into two dimensions: access, which is measured by mobile money account ownership, debit card holders, and credit card holders, and usage is captured through online purchases, online utility bill payments, and engagement in any form of digital payment.

Independent variables

Socio-economic factors are treated as independent variables in this study. Based on the Findex database, the socio-economic factors referred to in this study comprise age, gender, education, income level, employment status, and residential status. Table 1 presents the compiled socio-economic variables that offer insights into digital financial inclusion at various levels.

Empirical estimations

In line with the objectives of this study, two statistical estimations are utilised, namely, logistic and Tobit regression models (Equations 2 and 3). Given that all sub-indicators of digital finance inclusion are dichotomous (binary), and independent variables are a combination of categorical and binary, the logistic regression model (Equation 2), therefore, is appropriate to gauge the effect of socio-economic characteristics on digital financial services (Ali and Ghildiyal, 2023; Ghosh and Chaudhury, 2022; Nandru et al., 2024). Logistic regression is typically used when the dependent variable consists of two possible outcomes (for instance, yes or no) (Amin et al., 2025). It yields to odds ratios that are straightforward to interpret, and it can accommodate several independent variables, whether they are binary, continuous, or categorical. This study employed a Tobit regression model (Eq. 3) for the digital finance index which is formed by a composite index of digital financial services. This model is appropriate

when the values of dependent variables fall between 0 and 1 (Amore and Murtinu, 2021; Ghosh and Chaudhury, 2022; Tobin, 1958).

$$\text{IN_DFI}_i^k = \alpha + \beta_1 \text{Gender}_i + \beta_2 \text{Age}_i + \beta_3 \text{Age}_i^2 + \beta_4 \text{Educ}_i + \beta_5 \text{Inc_q}_i + \beta_6 \text{Emp_in}_i + \beta_7 \text{urban_city}_i + \epsilon_i \quad (2)$$

Where IN_DFI_i^k denotes each indicator of digital finance indicator whose value is binary and $k = 1, 2, \dots, 6$; a total of six logistic regressions are performed to assess six dependent variables, such as mobile money account, debit card holder, credit card holder, buy online, pay utility bills online, and any digital payment. In the equation, α is an intercept, each β implies the regression coefficient, “ i ” denotes a given socio-economic characteristic, and ϵ refers to the error term.

$$\text{Digi_index}_i = \alpha + \beta_1 \text{Gender}_i + \beta_2 \text{Age}_i + \beta_3 \text{Age}_i^2 + \beta_4 \text{Educ}_i + \beta_5 \text{Inc_q}_i + \beta_6 \text{Emp_in}_i + \beta_7 \text{urban_city}_i + \epsilon_i \quad (3)$$

Where digi_index denotes the measurement of the digital finance index, whereas α is an intercept, each β implies the regression coefficient of the independent variable, “ i ” denotes a given socio-economic characteristic, and lastly, ϵ refers to the error term.

Results and discussion

Estimation of digital financial inclusion in SAARC countries

Figure 2 displays the estimation of digital financial inclusion in each of the SAARC countries. The graphical results indicate an average of 14% of composite digital financial inclusion in SAARC countries. Sri Lanka manifested the dominant possession by exposing the region’s highest inclusion index (31%), followed by India and Bangladesh. However, Afghanistan had the lowest position, followed by Pakistan and Nepal. This graph illustrates that South Asian countries still have lower digital financial inclusion. The findings demonstrated the diversity and discrepancy in digital financial inclusion among SAARC countries. These discrepancies are likely exaggerated due to various degrees of digital infrastructure, policies, and institutional embeddedness. Sri Lanka has prominently improved their digital finance

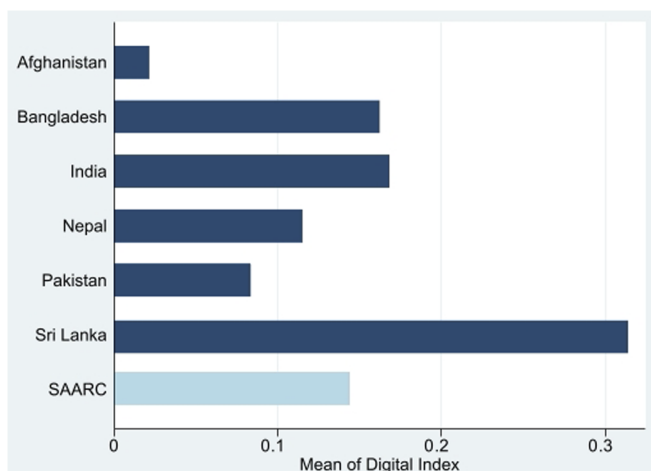


Figure 2. Digital financial inclusion index in SAARC countries. Source: Figure by authors

inclusion through national efforts such as “Digital Sri Lanka 2030”, which profoundly develops broadband infrastructure, optimises wireless broadband usage, enhances connectivity through public-private partnerships, and invests in digital skills development (Ministry of Technology, 2024). Similarly, India’s national flagship programme “Digital India” is consistently improving citizens’ lives through widespread access to mobile connectivity, developing broadband highways, digital governance, and public internet accessibility (Ministry of Electronics & IT, 2024). Bangladesh, another SAARC nation, has also improved its digital financial inclusion through the national programme “Digital Bangladesh” (Chowdhury, 2021). On the other hand, other SAARC nations, such as Afghanistan, Pakistan, and Nepal, comparatively have low digital financial inclusion, which suggests encountering challenges in the implementation of national programmes such as digital infrastructure and/or inadequate policies. The current findings imply that the extent and robustness of specific country policy and strategy are crucial in shaping the effectiveness of digital financial services. So, public investments and national strategies in digital infrastructure are crucial in promoting digital financial activities and encouraging inclusion (Demirgüç-Kunt *et al.*, 2022).

Determinants of DFI indicators in SAARC countries

Table 2 presents the socio-economic determinants of digital financial services such as mobile money accounts, credit and debit card ownership, buying online, paying utility bills online, and making any digital payment. The results demonstrated that females are less likely to have mobile money accounts (-0.632^{***}), debit cards (-0.535^{***}), credit cards (-0.632^{***}), buying online (-0.621^{***}), paying utility bills online (-0.386^{***}), and making any digital payments (-0.372^{***}) compared to males in SAARC countries. This finding is supported by past studies such as Ali and Ghildiyal (2023), Chowdhury and Miraz (2024), and Razzaq *et al.* (2024), which have found that females in India, Bangladesh, and Pakistan are less likely to adopt digital financial services. The restricted access to and use of digital financial services by women hinders their capacity to make choices about their financial well-being, obstructing their overall potential and perpetuating gender inequalities in SAARC countries. Further, age and age² also suggest a significant influence in adopting digital financial services, namely, debit card ownership, buying online, and making any digital payment in SAARC countries. The results indicate that as people age, they are less likely to possess debit cards and engage in online purchases, which aligns with the research conducted by Ali and Ghildiyal (2023), Widyastuti *et al.* (2024), and Chowdhury and Miraz (2024). Older adults may face various challenges in adopting digital financial services, including a lasting preference for traditional transaction methods and shortcomings in digital literacy, trust, and skills (Demirgüç-Kunt *et al.*, 2022).

The level of education among individuals emerges as a significant determinant of digital financial inclusion. The estimated coefficients indicate that higher educational attainment substantially increases the likelihood of adopting various forms of digital finance in SAARC countries. These include mobile money accounts, debit and credit card usage, online purchasing behaviour, online utility bill payments, and participation in any form of digital transaction. In line with this observation, Ali and Ghildiyal (2023), Ba and Dieng (2025), and Chowdhury and Miraz (2024) demonstrated the crucial role of education in promoting digital financial inclusion in SAARC nations. The findings further highlighted that individuals residing in urban areas exhibit a positive and significant influence in adopting digital financial services. This issue is largely due to insufficient infrastructure, particularly in terms of roadways and electrical supply, which obstructs the establishment and efficient operation of mobile money agents (Ba and Dieng, 2025; Chowdhury and Miraz, 2024). However, as to utility bills and credit card ownership, individuals’ residential status failed to identify significant impacts in SAARC countries. This observation can be ascribed to insufficient network coverage, which presents a substantial obstacle to providing digital financial services in rural regions (Ba and Dieng, 2025). This situation underscores the essential disparities in digital financial inclusion among the living environments, both urban and rural.

Table 2. Determinants of digital finance services in SAARC

Variable	Digital financial services					
	Debit card	Credit card	Buy online	Utility bill	Account mob	Any digital payment
<i>Gender</i>						
Female	−0.535*** (−0.066***)	−0.632*** (−0.030***)	−0.621*** (−0.039***)	−0.386*** (−0.041***)	−0.632*** (−0.056***)	−0.372*** (−0.071***)
<i>Age</i>						
Age	0.102*** (0.013***)	0.045 (0.0023)	0.060*** (0.0039***)	0.012 (0.0013)	0.019 (0.0017)	0.021** (0.0041**)
Age ²	−0.001*** (−0.0001***)	−0.001 (−0.0001)	−0.001*** (−0.0001***)	−0.001 (−0.0001)	−0.001 (−0.0001)	0.001 (0.0001)
<i>Education</i>						
Secondary	0.905*** (0.112***)	0.838*** (0.0378***)	0.960*** (0.0554***)	1.011*** (0.0999***)	1.142*** (0.0981***)	0.829*** (0.163***)
Tertiary	2.090*** (0.345***)	1.152*** (0.061***)	2.100*** (0.196***)	1.969*** (0.272***)	1.976*** (0.232***)	1.703*** (0.365***)
<i>Income</i>						
Second Quintile (20%)	0.045 (0.005)	0.231 (0.009)	0.205 (0.0102)	0.444* (0.0392*)	0.265* (0.0211*)	0.011 (0.00199)
Third Quintile (20%)	0.160 (0.0164)	0.284 (0.0115)	0.162 (0.00791)	0.408 (0.0356*)	0.270* (0.0215*)	−0.013 (−0.0024)
Fourth Quintile (20%)	0.666*** (0.0796***)	0.404 (0.0173)	0.469** (0.0259***)	0.473* (0.0422**)	0.351** (0.0288**)	0.319*** (0.0612***)
Fifth Quintile (20%)	0.918*** (0.117***)	0.705*** (0.0346***)	0.972*** (0.0656***)	0.915*** (0.0950**)	0.570*** (0.0506**)	0.368*** (0.0711**)
<i>Employment</i>						
In the workforce	0.504*** (0.0614***)	0.572*** (0.0268***)	0.385*** (0.0247***)	0.146 (0.0155)	0.281*** (0.0253***)	0.410*** (0.0779***)
<i>Residential status</i>						
Living in an urban area	0.151** (0.0186**)	0.046 (0.0024)	0.316*** (0.018***)	0.113 (0.012)	0.488*** (0.0445***)	0.287*** (0.0544***)
Observations	7,003	3,351	7,003	2,640	7,003	7,003
Pseudo R ²	0.152	0.077	0.150	0.112	0.121	0.089
Log-likelihood	−2783.283	−673.339	−1669.932	−946.653	−2186.081	−3931.531
Wald $\chi^2(7)$	807.49***	98.11***	501.17***	210.84***	534.84***	663.25***

Note(s): Marginal effects in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' own

Nevertheless, income is a critical determinant of all digital financial services, positing only individuals in the fifth-income quintile show significant influence on using all digital financial services, while individuals in the fourth-income quintile are significantly influenced to have mobile money accounts, debit cards, purchase online, and make any digital payments. This outcome appears to be similar to the research conducted by [Ba and Dieng \(2025\)](#) and [Widyastuti et al. \(2024\)](#), which indicated that people with higher incomes frequently use mobile phones to manage their accounts, conduct payments, transfer money to different accounts, shop online, and invest in financial products. At the same time, the result also confirms that employment significantly and positively influences the use of digital financial services, except for paying utility bills online. This outcome aligns with the work of [Berguiga and Adair \(2024\)](#) and [Chowdhury and Miraz \(2024\)](#), who emphasise the use and regular application of digital financial services by employed individuals.

Determinants of digital finance inclusion in SAARC countries

This study employs Tobit regression models for aggregate data on SAARC countries as well as individual countries to demonstrate the assessment of the digital finance index and its determinants in each country. Table 3 presents the results of Tobit regression for the composite digital finance index for SAARC countries and individual countries except for Bhutan and the Maldives. Demographic characteristics and socio-economic factors, such as gender (specifically female), age and its non-linear effect (age^2), educational attainment at both secondary and tertiary levels, income (particularly individuals in the fourth and fifth income quintiles), employment status, and residential location, are found to be significant determinants of digital financial inclusion in SAARC countries. These variables collectively influence individuals' access to and usage of digital financial services, highlighting the multifaceted nature of financial inclusion in the region. The results signify that gender plays a substantial role in digital finance inclusion. In comparison with males,

Table 3. Determinants of digital finance index for SAARC countries

Variable	DFI SAARC	India	Bangladesh	Pakistan	Sri Lanka	Nepal	Afghanistan
<i>Gender</i>							
Female	−0.045***	−0.040***	−0.091***	−0.050***	−0.037***	−0.061***	−0.012**
<i>Age</i>							
Age	0.004***	0.005***	0.001	0.004**	0.005*	0.004**	0.002***
Age ²	−0.001***	−0.001***	−0.001	−0.001*	−0.001**	−0.001**	−0.001***
<i>Education</i>							
Secondary	0.082***	0.089***	0.045***	0.051***	0.120***	0.082***	0.021***
Tertiary	0.248***	0.250***	0.228***	0.168***	0.241***	0.298***	0.112***
<i>Income</i>							
Second Quintile (20%)	0.006	0.006	0.023	−0.008	0.013	0.007	−0.005
Third Quintile (20%)	0.005	0.010	0.039**	−0.010	0.013	0.001	−0.002
Fourth Quintile (20%)	0.031***	0.052***	0.051***	0.006	0.067***	0.048***	−0.006
Fifth Quintile (20%)	0.063***	0.135***	0.030	0.009	0.152***	0.091***	0.009
<i>Employment</i>							
In the workforce	0.036***	0.051***	0.037***	0.047***	0.069***	0.009	−0.004
<i>Residential status</i>							
Living in the urban area	0.026***	0.023***	−0.018	0.039***	nil	0.005	0.013***
Observations	7,003	3,000	1000	1001	1005	1000	1002
Pseudo R ²	−0.745	13.488	−0.301	−0.319	−1.392	−0.621	−0.074
Log-Likelihood	1726.658	385.189	289.721	422.734	209.051	364.598	1382.262
χ ²	1474.585	832.067	134.106	204.571	243.299	279.412	189.415

Note(s): Bhutan and Maldives are excluded due to insufficient observation. Data on Urban_city is unavailable for Sri Lanka; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source(s): Authors' own

females are falling behind in their participation in digital finance, as indicated by the significantly negative and statistically significant gender coefficients for both the SAARC region and each of its countries. Indeed, among the SAARC countries, the females of Afghanistan and Pakistan are least likely to have digital financial inclusion, followed by Sri Lanka and India, whereas females of Bangladesh are most likely to be included in digital finance, as substantiated by the differing magnitude of the coefficients. This finding further emphasised the regional variations in the impact of gender on digital finance inclusion. Therefore, the overall findings indicate that the gender gap persists in many South Asian nations, hindering digital finance inclusion, consistent with previous evidence ([Alliance for Financial Inclusion, 2024](#); [The World Bank, 2022](#)).

Age further showed a significant positive effect, while age² posited a negative effect on digital finance inclusion, confirming the lower likelihood of using digital financial services with increasing age of individuals. Nevertheless, this positive relationship seems to hold true for a certain age limit after which, with the increase of the age of the people, their likelihood of digital financial inclusion tends to decrease, and this inverse relationship is justified by the negative and statistically significant coefficients of the squared age variable for the overall SAARC. However, this phenomenon is not significant for Bangladesh, Pakistan, and Sri Lanka. Age is significant for Pakistan, while age² is not, but it is significant for Sri Lanka, while age is not. This suggests that Sri Lankan individuals gradually lose the propensity to adopt digital financial services. Meanwhile, it can be noted that age has a weak inverse-U-shaped impact on the likelihood of digital financial inclusion for the SAARC countries, as indicated by the close to zero magnitudes of the coefficients. Similarly, the differences in the findings highlight the regional disparities among SAARC countries, emphasising how individuals' perspectives vary based on age and digital finance in various countries.

Concurrently, individuals' education level significantly influences digital finance inclusion in SAARC countries. By observing the coefficients for secondary and tertiary education levels, digital finance inclusion increases with the increasing higher education level. It proposes that as educational attainment rises, an individual's inclination towards digital financial inclusion also grows, and this positive correlation holds for the entire SAARC region as well as for each member country, consistent with the findings of studies conducted in individual SAARC nations ([Ali and Ghildiyal, 2023](#); [Chowdhury and Miraz, 2024](#)). The significant positive coefficients for the people getting secondary education indicate their greater inclination to digital financial inclusion compared to those having primary education. However, the higher positive coefficients in the case of tertiary education imply that, for the SAARC countries, more educated people are more likely to get included in digital finance compared to people having both primary and secondary education. Henceforth, the results further show that urbanisation substantially impacts this probability of being included in digital finance for the overall SAARC, indicating that urban people have a greater possibility of digital financial inclusion since the estimated result presents a positive and significant coefficient. People living in urban regions are more likely to embrace digital financial services compared to those in rural areas, as indicated by previous research by [Ba and Dieng \(2025\)](#) and [Chowdhury and Miraz \(2024\)](#). However, the residential status of individuals from Bangladesh and Nepal does not significantly influence digital financial inclusion.

Individuals' income level also influences the acceptance of digital financial services in SAARC countries, while the fourth-income quintile and fifth-income quintile showed positive and significant effects on digital finance inclusion. The largest positive and statistically significant coefficients for the higher-income quintiles indicate that wealthier people are more likely to participate in digital financial inclusion compared to the low-income quintiles. This phenomenal effect is possessed by India, Sri Lanka, and Nepal. More precisely, individuals in the lower income quintiles (second and third quintiles) have an insignificant impact on the likelihood of digital financial inclusion, as specified by the insignificant coefficients, except for Bangladesh. However, the third- and fourth-income quintiles are significant in Bangladesh, while income has no significant effect in Pakistan and Afghanistan. These results indicate the

differences in how individuals' income levels impact the extent of digital financial inclusion in SAARC nations. Nevertheless, employment status further plays a significant role in individuals' inclusion in digital finance in SAARC countries. Rationally, people who are employed generally possess a more sophisticated understanding of digital finance inclusion, leading to greater participation in digital finance (Berguiga and Adair, 2024; Chowdhury and Miraz, 2024). The positive and statistically significant coefficients associated with the employment variable for the SAARC region as a whole, and for individual member countries, excluding Afghanistan and Nepal, demonstrate alignment with the theoretical rationale. This suggests that higher employment levels are positively correlated with increased digital financial inclusion, likely due to increased access to digital infrastructure, greater financial literacy, and improved economic agency among the employed population. The findings underscore the role of employment not only as a driver of economic growth but also as a facilitator of inclusive digital financial ecosystems across the region.

The overall results indicated that demographic and socio-economic factors play a significant role in digital financial inclusion, and the extent of their impact varies across different regions. Thus, South Asian countries still struggle with the gender gap, education, age differences, income inequality, unemployment, and urbanisation regarding increasing digital finance inclusion, which highlights past evidence (Alliance for Financial Inclusion, 2024; Asian Development Bank, 2020). Given the above scenarios, individuals are more likely to have digital financial services when they are young males, have higher education, live in urban areas, and earn a higher income (Ali and Ghildiyal, 2023; Ghosh and Chaudhury, 2022; Nandru *et al.*, 2024). The prospect of adopting digital financial services is reduced if one is older, female, less educated, and has a lower income. However, this study proved that the impact of individuals' socio-economic conditions varies across regional differences within SAARC countries.

Robustness test

This study also accounts for potential heteroskedasticity using robust standard errors to check if the baseline findings (the Logit and Tobit regression outcomes) are not determined by the homoskedasticity violations. This study re-analysed the Logit and Tobit regression using robust standard errors to address potential heteroskedasticity. The empirical findings of the robustness test for determinants of digital finance services (Table A1 in Appendix 1) presented consistent results with baseline models for all the variables. Similarly, the robustness findings (Table A2 in Appendix 2) for the determinants of the digital finance index posited similar results with baseline models, except for Age², which demonstrated a significant impact in Pakistan in the latter robustness test.

Conclusion and implications

Conclusion

This study largely aimed to thoroughly examine the progress of digital financial inclusion in SAARC nations. Additionally, it is intended to explore how socio-economic factors and demographic traits of individuals impact digital financial inclusion. This study also developed a digital financial inclusion index for six SAARC countries in 2022 using Global Findex survey data. The findings suggest that the socio-economic elements and demographic traits of individuals play a crucial role in shaping digital financial inclusion across SAARC countries, though the impact varies from one nation to another. It can be posited that individuals with higher education foster digital entrepreneurial activities and expand employment opportunities. These developments contribute to narrowing gender and income disparities while simultaneously enhancing individuals' capacity to engage with digital financial services. As a result, individuals are more likely to participate in digital financial ecosystems, thereby promoting broader digital financial inclusion.

Implications

The findings demonstrated a low level of digital financial inclusion in SAARC countries, which offers significant insights for both policymakers and practitioners to comprehend the accessibility and usage of digital financial services in SAARC countries. The adoption of digital financial services is uniform among females and lower- and middle-income groups. Besides, the rural-urban residential status is a crucial determinant of digital finance inclusion, since rural inhabitants face challenges in accessing and utilising digital finance services due to income discrepancies and lower education levels between rural and urban regions. This study suggests that public-private partnerships can accelerate the level of digital financial inclusion in SAARC countries.

Implications for policymakers. The findings emphasise the necessity of strategic investments in digital infrastructure, financial literacy programs, and inclusive regulatory frameworks to improve digital financial inclusion (DFI) across SAARC nations. Countries like Sri Lanka and India have initiated ambitious programs, such as “Digital Sri Lanka”, “Digital India” and “Digital Bangladesh” to enhance access and efficiency in digital finance; nevertheless, other SAARC nations in the area continue to function under more fragmented or fundamental policy frameworks. The findings can assist policymakers in Afghanistan, Pakistan, and Nepal in unveiling deficiencies in their current programmes and incorporating effective strategies and plans from more developed regional counterparts to bridge the digital divide.

The findings further underscore the importance of factors such as the alleviation of the gender gap, educational level, income level disparities, workforce participation, and the urban-rural residential gap in promoting digital financial inclusion in South Asian countries. These results underline the necessity of precise policies and programs to enhance access to education and employment opportunities and heighten income levels for these communities to achieve greater digital financial inclusion. The results highlight the importance of customised policies and initiatives that tackle women’s multifaceted challenges in accessing and utilising financial services. This may involve efforts to increase women’s educational and employment opportunities and initiatives aimed at challenging cultural norms and behaviours that hinder women’s financial autonomy. Addressing challenges associated with digital financial services can be potentially achieved through digital financial literacy initiatives. To enhance awareness of the benefits offered by digital financial services and reduce reluctance towards innovative financial technology, it is crucial to advocate for financial education, particularly in rural regions. Policymakers must come forward with successful approaches targeting digital literacy campaigns, particularly with access to mobile money accounts, debit and credit cards, and using digital payments for purchasing, selling, and paying utility bills, since these initiatives might significantly reduce demand-side obstacles to digital financial inclusion. Therefore, policymakers are supposed to build a strategic framework that offers appropriate credit schemes exclusively for small and medium enterprises that are designed digitally. Policymakers’ initiatives would convert SAARC countries from a paper-based economy to a cash-dependent framework into a cashless society, promoting digital financial services and prioritising the security issues in digital transactions. In addition, SAARC governments should increase investment in digital infrastructure, particularly in rural regions. It can collaborate with digital finance service providers and network providers to provide the necessary infrastructure in rural, remote, and urban regions. This would widen internet connectivity and decrease the expenses associated with accessing digital financial services. Eventually, the advancement of digital financial products and distribution channels is expected to evolve in tandem with supply-side initiatives designed to support the achievement of the UN SDGs by 2030. This movement reflects a strategic alignment between technological innovation and inclusive development objectives, emphasising the role of digital finance in reducing inequalities, fostering economic resilience, and promoting sustainable growth.

Implications for practitioners. Practitioners should improve the accessibility of digital financial services for individuals regarding mobile money accounts and the ownership of debit

and credit cards, as well as facilitate the execution of payments and receipt of services through card-based, internet-based, and mobile-based financial transactions. Besides, the findings highlight the necessity for broader participation of financial institutions and financial technology service providers in rural areas, owing to geographical inequities that lead to the financial exclusion of the marginalised rural individuals in SAARC countries relative to urban residents. This gap can be realised through a robust support system, sufficient technology infrastructure, and competitive user fees. Also, financial institutions are anticipated to consider users' satisfaction and easy operational processes while developing new products and services.

Limitations and suggestions for future studies

Despite all the positive implications stated above, this research may have several limitations that can assist future researchers in conducting further investigations. This study analysed the factors influencing digital financial inclusion by concentrating exclusively on six socio-economic attributes of individuals. Secondly, the current study failed to consider the influence of digital financial inclusion on individuals' socio-economic well-being. This study did not comprehensively address the hindrances to accessibility and use of digital financial inclusion, and exclusively examined a single period to ascertain the socio-economic factors of digital financial inclusion in SAARC nations.

Therefore, this study suggests further investigation of the barriers that individuals encounter in accessing and using digital financial services. Further studies may examine the obstacles encountered by digital financial service providers, especially in developing nations. Moreover, future studies may establish a digital financial inclusion index by examining demand-side variables, notably, accessibility, availability, quality, and use of digital financial services, facilitating comparisons among nations globally. In addition, a comparative study can be carried out to observe the shifts in progress and determinants of digital financial inclusion in SAARC countries.

Table A1. Robustness test for logit model

Variable	Debit card	Credit card	Buy online	Utility bill	Account Mob	Any digital payment
<i>Gender</i>						
Female	−0.535***	−0.632***	−0.621***	−0.386***	−0.632***	−0.372***
<i>Age</i>						
age	0.102***	0.045	0.060***	0.012	0.019	0.021**
age2	−0.001***	−0.001	−0.001***	−0.000	−0.001	0.001
<i>Education</i>						
Secondary	0.905***	0.838***	0.960***	1.011***	1.142***	0.829***
Tertiary	2.090***	1.152***	2.100***	1.969***	1.976***	1.703***
<i>Income</i>						
Second Quintile (20%)	0.045	0.231	0.205	0.444*	0.265*	0.011
Third Quintile (20%)	0.160	0.284	0.162	0.408	0.270*	−0.013
Fourth Quintile (20%)	0.666***	0.404	0.469**	0.473*	0.351**	0.319***
Fifth Quintile (20%)	0.918***	0.705**	0.972***	0.915***	0.570***	0.368***
<i>Employment</i>						
In the workforce	0.504***	0.572***	0.385***	0.146	0.281***	0.410***
<i>Residential status</i>						
Living in an urban area	0.151**	0.046	0.316***	0.113	0.488***	0.287***
Constant	−4.694***	−4.764***	−4.836***	−3.204***	−3.719***	−2.415***
Observations	7,003	3,351	7,003	2,640	7,003	7,003
Pseudo R^2	0.152	0.077	0.150	0.112	0.121	0.089
Log-likelihood	−2783.283	−673.339	−1669.932	−946.653	−2186.081	−3931.531
Wald $\chi^2(7)$	797.558	111.015	508.797	212.357	544.481	699.414

Note(s): ***<0.01; **<0.05**Source(s):** Authors' own

Appendix 2

Table A2. Determinants of digital finance index for SAARC countries

Variable	SARRC	India	Bangladesh	Pakistan	Sri Lanka	Nepal	Afghanistan
<i>Gender</i>							
Female	−0.045***	−0.040***	−0.091***	−0.050***	−0.037***	−0.061***	−0.012**
<i>Age</i>							
Age	0.004***	0.005***	0.001	0.004**	0.005*	0.004**	0.002***
age2	−0.001***	−0.001***	−0.001	−0.001**	−0.001**	−0.001**	−0.001***
<i>Education</i>							
Secondary	0.082***	0.089***	0.045***	0.051***	0.120***	0.082***	0.021***
Tertiary	0.248***	0.250***	0.228***	0.168***	0.241***	0.298***	0.112***
<i>Income</i>							
Second Quintile (20%)	0.006	0.006	0.023	−0.008	0.013	0.007	−0.005
Third Quintile (20%)	0.005	0.010	0.039**	−0.010	0.013	0.001	−0.002
Fourth Quintile (20%)	0.031***	0.052***	0.051***	0.006	0.067***	0.048***	−0.006
Fifth Quintile (20%)	0.063***	0.135***	0.030*	0.009	0.152***	0.091***	0.009
<i>Employment</i>							
In the workforce	0.036***	0.051***	0.037***	0.047***	0.069***	0.009	−0.004
<i>Residential status</i>							
Living in the urban area	0.026***	0.023***	−0.018	0.039***	0.034	0.005	0.013***
_cons	−0.040***	−0.065**	0.143***	−0.052	0.039***	−0.019	−0.022*
Observations	7,003	3,000	1000	1001	209.051	1000	1002
Pseudo R ²	−0.745	13.488	−0.301	−0.319	.z	−0.621	−0.074
Log-Likelihood	1726.658	385.189	289.721	422.734		364.598	1382.262
χ ²	1474.585	832.067	134.106	204.571	243.299	279.412	189.415
Note(s): ***<0.01; **<0.05							
Source(s): Authors' own							

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