Financial Inclusion and Financial Behavior: Empirical Evidence from an Emerging Economy

Aslam Mahmud*

Abstract

This empirical paper investigates the impact of financial inclusion through formal account ownership on the financial behavior of the adult population in Bangladesh, utilizing micro-data from the World Bank Global Findex Database 2021. To address potential selection bias and ensure robust causal inference, the study applies propensity score matching (PSM) and inverse probability weighted regression adjustment (IPWRA) techniques, both of which are widely used quasi-experimental econometric techniques. The results of the study reveal that formal account ownership serves as a critical mechanism for shifting savings and borrowing towards formal financial institutions. Nonetheless, the evidence suggests that ensuring mere access to formal account ownership is insufficient to fully replace informal financial practices, underscoring the need for understanding and effective use of formal financial services. The application of alternative matching algorithms produces consistent results, therefore, reinforces the validity and robustness of the main findings. Further analysis reveals significant gender heterogeneity, indicating that formal account ownership significantly enhances women's access to formal credit, potentially through more favorable lending policies for women. Additionally, education-based heterogeneity reveals that financial inclusion substantially increases formal savings among disadvantaged individuals with limited or no education. This study makes an important contribution to the empirical literature on financial inclusion by providing robust evidence on its behavioral effects in an emerging economy context. The findings of the study offer important policy implications and advocate for policies and interventions aimed at expanding access to formal financial services while also paying attention to in-depth financial literacy to reduce dependence on informal finance and promote economic empowerment.

Keywords: Financial inclusion, Account ownership, Financial behavior, Propensity score matching, Emerging economy

1. Introduction

Ensuring financial inclusion of the adult population has emerged as a key priority of development policy in emerging countries. The United Nations emphasizes access to formal financial services in 5 of its 17 Sustainable Development Goals (SDGs), which aim to be implemented by 2030 (Osborn et al., 2015). Although financial inclusion is getting more and more attention from policymakers in the developing world, a significant portion of the adult population remains out of the reach of formal financial services.

* Assistant Professor, Department of Finance and Banking, Faculty of Business Administration, Jatiya Kabi Kazi Nazrul Islam University, Mymensingh, Bangladesh. ORCID ID: https://orcid.org/0009-0006-1369-2466

Bangladesh is a developing country in South Asia, with a population of more than 180 million. The country is struggling to ensure financial inclusion and literacy for its vast population. Without access to formal financial services of the adult population is unlikely to benefit from the demographic dividend, the country is currently enjoying (Thomas et al., 2023). According to the Bangladesh Bureau of Statistics (BBS) report, more than 72 percent of the population who are aged fifteen and above don't have accounts with formal financial institutions (Bangladesh Bureau of Statistics, 2023).

The theoretical bases that link financial inclusion to household welfare may be drawn from several economic frameworks. Resource theory and household bargaining models claim that access to formal financial services enhances individual agency and decision-making power within households (McElroy & Horney, 1981; Thomas, 1990). Sen's (1999) capability approach offers an important theoretical basis, claiming that financial inclusion expands the range of expenditure choices to promote welfare in life, and therefore enhances human capabilities. These theoretical frameworks recommend that formal financial access should bring fundamental changes in the pattern of household savings and borrowing behavior.

Empirical evidence shows that financial inclusion enhances employment (Doornik et al., 2021), investment in physical and mental health (Dobbie & Gillespie, 2010), safe water and sanitation (Cavoli et al., 2023), and empowers women and reduces income inequality (Dutkiewicz & Ellis, 2018; Li, 2018).

Importantly, the mechanism through which financial inclusion exerts its positive social and economic effects is through its impact on financial behavior (Pitt & Khandker, 1998; Banerjee et al., 2015; Fitriadi et al., 2025; Pokharel & Maharjan, 2024; Alrasyid & Sultan, 2024; Shi et al., 2025). Financial inclusion literature identifies that transaction costs reduction, discipline in savings behavior, consumption smoothing, and investment as a result of greater access to credit, and an enhanced level of financial literacy act as mechanisms through which financial inclusion may affect financial behavior (Dupas & Robinson, 2013; Ashraf et al., 2010).

Bangladesh, an emerging economy, presents a compelling case for studying the effects of financial inclusion on financial behavior. Although the country has been advancing fast in poverty reduction and gender equality over the past few decades, its level of financial inclusion is well below the world average (World Bank Global Findex Database, 2021). Recognizing this challenge, the government and the central bank of the country have taken numerous financial inclusion initiatives, including no-frills accounts for farmers, school banking programs, agent banking, and mobile financial services, among others (Bangladesh Bank, 2023). These policy initiatives provide a natural setting for examining the impact of financial inclusion on individual financial behavior using quasi-experimental methods.

Despite growing literature on financial inclusion, there is limited empirical evidence on its causal impact on individuals' financial behavior in an emerging economy context. Several studies explored the role of fintech, specifically mobile financial services, internet banking, and agent banking, and identified its important role in expanding financial inclusion in

Bangladesh (Howlader & Halder, 2025; Akhter & Khalily, 2017; Himel et al., 2021; Barua et al., 2025). However, very few studies explored the behavioral dimension of access to formal financial services. Notably, in Bangladesh, a significant portion population continues to pursue informal finance despite having access to formal financial institutions (Islam et al., 2015; Akter, 2016). Therefore, this study addresses this critical gap by examining how financial inclusion influences financial behavior.

This study adds to the financial inclusion literature in numerous ways. Firstly, the study employs quasi-experimental methods to establish causal relationships between financial inclusion and savings and borrowing behavior that addresses selection bias concerns, which inflicts many of the existing studies. Secondly, the study provides evidence of the substitution effects of financial inclusion as it offers choices between formal and informal channels. Thirdly, the study provides empirical evidence from Bangladesh, an emerging economy that is continuously making efforts to bring its population under the umbrella of financial inclusion. Finally, the study uses comprehensive and reliable survey data that allows for a detailed analysis of financial behavior.

The study answers the following research questions: Does financial inclusion drive a shift in household financial behavior from informal to formal financial system? Is the basic form of financial inclusion, i.e., formal account ownership, enough to replace informal finance? Does any heterogeneity exist in the effects of financial inclusion on financial behavior across gender and educational status?

2. Theoretical Framework and Literature Review

This section discusses the theoretical foundation of the financial behavioral impact of financial inclusion, empirical support of the nexus, the status of financial inclusion in Bangladesh, and finally, the development of hypotheses and a conceptual framework.

2.1 Theoretical Foundations

Several theoretical frameworks provide the base of the association between financial inclusion and individual financial behavior. The economics of transaction cost claims that formal financial institutions offer low-cost savings and borrowing opportunities compared to informal alternatives (Williamson, 1981). The economies of scale obtained, regulatory protections, and standardized procedures followed by formal financial institutions result in lower transaction costs associated with financial services.

The alteration of financial behavior through financial inclusion can also be explained with the insights from behavioral economics. According to the mental accounting theory proposed by Thaler & Shefrin (1981), individuals treat money differently based on its source and intended use. Financing through formal financial institutions establishes specific financial goals and facilitates mental accounting. Similar to the mental accounting theory, the commitment device theory proposed by Strotz (1955) suggests that savings through formal financial accounts can help individuals overcome present bias and target long-term financial goals.

The permanent income hypothesis by Friedman (1957) indicates the role of formal financial services through financial inclusion in improving consumption smoothing capabilities. Access to formal financial institutions offers access to credit funds during income shortfalls and improved savings options during excess income. Empirical support for this mechanism has been found in numerous developing country contexts (Dupas & Robinson, 2013; Prina, 2015).

2.2 Empirical Evidence on the Effects of Financial Inclusion on Financial Behavior

Although a huge number of studies examine the impact of financial inclusion intervention on economic and social factors (Pitt & Khandker, 1998; Khandker, 2005; Banerjee et al., 2015). Very few studies pay attention to the behavioral impacts of financial inclusion, which is a prerequisite to all other favorable outcomes (Lusardi & Tufano, 2015; Söderberg, 2012).

Research has identified the nexus of savings tendency and broader financial inclusion interventions. Dupas & Robinson (2013) studied the impact of financial inclusion intervention on savings behavior in Kenya and found that providing savings accounts to vendors in Kenyan markets increased investment in health and enabled households to cope with unforeseen health shocks. Ashraf et al. (2010) showed evidence from the Philippines that commitment savings among households could enhance investment in preventive health care and family planning. However, Fungáčová and Weill (2015) showed that formal account ownership in China was related to higher savings rates but limited borrowing activities. On the contrary, a study by Allen et al. (2016) revealed that both savings and borrowing behaviors were strongly correlated with formal account ownership across various countries, although the confusion about causality still remains.

The literature exploring financial inclusion and financial behavior provides strong evidence that the relationship is significantly moderated by the understanding of how to use formal financial services-i.e., financial literacy (Ocansey & Manu, 2025; Shi et al., 2025; Goyal & Kumar, 2021; Ingale & Paluri, 2022; Kumar, 2025; Molina-García et al., 2022). These studies highlight the need for digital financial literacy, more targeted financial education, particularly in emerging economies. Moreover, demographic factors, including age, gender, education, income, employment, residential status, and access to digital infrastructure, significantly influence individuals' financial behavior and their integration into formal financial systems (Widyastuti et al., 2024; Baker, 2019; Beatrice et al., 2021).

2.3 Financial Inclusion in Bangladesh: Status and Policy Initiatives

The revolution in Bangladesh's financial inclusion landscape is the establishment of microcredit in the 1970s. Some of the world's largest microfinance institutions operate in Bangladesh, including Grameen Bank, BRAC, and ASA (Mahjabeen, 2008). However, some studies criticized traditional microfinance for its high interest rates, limited poverty impact, and women's empowerment (Karim, 2011; Banerjee et al., 2015). Ensuring financial inclusion is not only a developmental necessity but a moral responsibility of a developing country like Bangladesh. According to the World Bank Global Findex database 2021, a notable portion of the Bangladeshi population, specifically 47 percent of individuals aged 15 and above, do not have access

to formal financial services in terms of account ownership. Among adult residents, 43.46 percent of females utilize formal financial services, whereas 62.86 percent of males have access to such services.

Nevertheless, a diverse network of financial service providers, including 61 banks with over 11,000 branches, 35 non-bank financial institutions, 731 MFIs, and 13 mobile financial service (MFS) providers, is actively working to enhance access to formal financial services.
The Bangladesh Bank, the central bank of Bangladesh, has taken several innovative initiatives in the pursuit of financial inclusion of the huge unbanked population (Financial Inclusion Report Bangladesh, 2023), including:

Farmers' BDT 10 accounts— Bangladesh Bank, the central bank of Bangladesh, took initiatives to make it easy for farmers to open a No-frills Accounts (NFA) at any scheduled bank with BDT 10 only (less than a cent).

School banking— Under these schemes, students aged below 18 can open a bank account with a minimum deposit of BDT 100. This school banking No-frills Accounts promotes savings practices among students, ensures their financial literacy, and participation in economic activities.
Working / street children banking— schedule banks and Non-government Organization (NGOs) under the direction of Bangladesh Bank, providing the facilities of opening No-frills Accounts (NFA) to working or street children with a minimum deposit of BDT 10.

Agent Banking — Agent banking provides modern banking facilities to the unbanked population in remote areas of Bangladesh.

Mobile financial services (MFS) — Mobile financial services (MFS) are one of the fintech innovations that play a crucial role in advancing financial inclusion in Bangladesh. With an off-branch network, MFS has reached the remote corner of Bangladesh.

Small and medium enterprises (SMEs) financing and agricultural credit— Due to the pivotal role of these sectors in the economic growth of Bangladesh, Bangladesh Bank has formulated a target-based credit scheme for the SME sector, "SMEs Credit Policy and Programme" and "Agricultural and Rural Credit Policy" for timely credit service to the farmers.

Digital Nano Loan— This facility provides access to funds without visiting the bank branch and troublesome paperwork, completely through the digital channel.
Besides these initiatives, Payment Systems Digitization, Financial Awareness Building programs, Women Entrepreneurs Development Unit (WEDU), and Dedicated Refinance Scheme for Women are crucial initiatives for financial inclusion, among others taken by Bangladesh Bank.

2.4 Hypotheses Development and Conceptual Framework

Based on the above theoretical and empirical discussion, the following hypotheses have been developed:

H1: Financial inclusion has a positive influence on individual participation in formal savings mechanisms.

H2: Financial inclusion has a positive influence on individual engagement with formal borrowing channels.

H3: The relationship of financial inclusion and financial behavior varies significantly by gender and level of education.

H4: Financial inclusion serves as a substitute for informal financial practices by promoting the use of formal savings and borrowing instruments.

Hence, Figure 1 presents the conceptual framework of the study as follows:

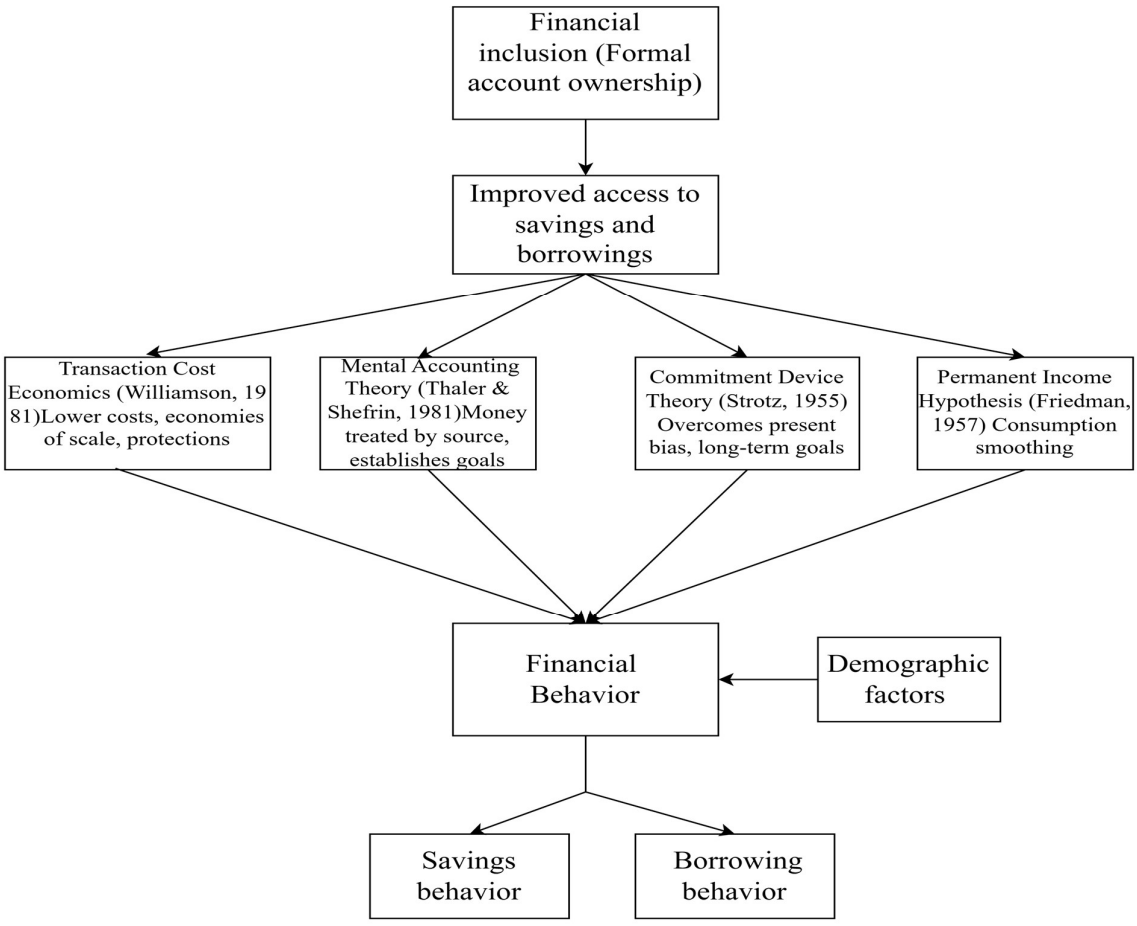

Figure 1: Conceptual framework of financial inclusion and financial behavior relationship
Source: Author's preparation

3. Materials and Methods

3.1 Data Sources

This study utilizes microdata from the 2021 Global Findex survey for Bangladesh with a sample of 1000 respondents, conducted by the World Bank in collaboration with Gallup. The Global Findex is the world's most comprehensive database on financial inclusion, covering over 140 countries and based on nationally representative surveys of adults aged 15 and above.

3.2 Demographic Profile of the Respondents

Table 1 shows the demographic profiling of the respondents. Of the total respondents, 47.7 percent are male, and 52.3 percent are female, ensuring gender diversity. 58.2 percent of the samples have no access to a formal account, 88.4 percent have no formal savings, and 90.3 percent have no formal credit. The within-household income quintile categorizes the households into five quintiles, of which 18 percent of the households constitute the poorest 20 percent quintile, and 23.3 percent households constitute the richest 20 percent quintile. 77.3 percent of the households have received remittances in the past 12 months. 47.5 percent of the respondents have completed primary or less, 48.7 percent have completed secondary, and only 3.80 percent have completed a tertiary level of education or more. The out-of-workforce respondents constitute 51 percent of the sample, and in in-workforce respondents constitute 49 percent of the sample. This approximately equal in and out of workforce percentage might be since females have traditionally been inactive in the workforce. The mean age of the respondent is 36.098 years

Table 1: Demographic profile of the respondents

Financial inclusion	Formal account	No	582 (58.2%)
		Yes	418 (41.8%)
	Formal savings	No	884 (88.4%)
		Yes	109 (10.9%)
		Don't know	6 (0.6%)
		Refused	1 (0.1%)
		No	903 (90.3%)
	Formal credit	Yes	90 (9.0%)
		Don't Know	5 (0.5%)
		Yes	418 (41.8%)
		Refused	2 (0.2%)
Income	Household income quintiles	Poorest 20%	180(18.0%)
		Second 20%	192 (19.2%)
		Middle 20%	196 (19.6%)
		Fourth 20%	200 (20.0%)
		Richest 20%	232 (23.2%)
Individual Characteristics	Gender		
		Male N	477 (47.7%)
		Female N	523 (52.3%)
	Education level	Completed primary or less	475 (47.5%)
		Secondary	487 (48.7%)
		Completed tertiary or more	38 (3.80%)
	Employment	Out of the workforce	510 (51.0%)
		In workforce	490 (49.0%)
	Rural-Urban	Rural	260 (26.0%
		Urban	740 (74.0%)
	Internet access	Yes	220 (22.0%)
		No	775 (77.5%)
	Age	N	1000
		Mean	36.098
		Standard Deviation	14.508

Source: World Bank Findex Database 2021

3.3 Variable Definitions

The outcome variables of the study are the four different dimensions of financial behavior: formal savings, informal savings, formal borrowing, and informal borrowing. The key explanatory variable is financial inclusion, operationalized as formal account ownership. This

measure captures the first and most fundamental dimension of financial inclusion, as account ownership is a prerequisite for most other formal financial services. Control variables include demographic characteristics (age, gender), socioeconomic status (education level, income quintile, employment status), geographic location (urban-rural residence), and technology access (internet access). These variables are chosen based on theoretical considerations and empirical evidence from previous studies on financial inclusion determinants. Table 2 presents the dependent variables, treatment variables, and covariates.

Table 2: Definitions of variables

Variables	Definition
Dependent variables	
Formal savings	Savings at a financial institution using a formal account (1 = makes formal savings during the last 1 year, 0 = no formal savings last 1 year)
Informal savings	Savings at an informal savings club (1 = makes informal savings during last 1 year, 0 = no informal savings last 1 year)
Formal borrowings	Borrowings from a financial institution using a formal account (1 = makes formal borrowing during the last 1 year, 0 = no formal borrowing last 1 year)
Informal borrowings	Borrowings from an informal source (1 = makes informal borrowings during last 1 year, 0 = no informal borrowings last 1 year)
Treatment variable	
Formal account	Account at a formal financial institution (1 = have an account at a formal financial institution, 0 = otherwise)
Covariates	
Age	Age of respondent (expressed in years)
Male	Dummy for sex of the respondent (1 = male, 0 = female)
Education	Level of education of the respondents (1 = completed primary education or less, 2 = completed secondary education, 3 = completed tertiary education or more)
Income quintile	Level of income status of the respondents (1 = poorest, 2 = poorer, 3 = middle class, 4 = richer, 5 = richest)
Employment status	Dummy for employment status (1 = employed, 0 = otherwise)
Urban-rural	Residential status of respondents (1 = urban, 0 = rural)
Internet access	Dummy for access to internet (1 = having access to internet, 0 = otherwise)

3.4 Empirical Strategy

The aim is to measure the difference in the magnitude of usage of formal and informal finance between the treatment and control groups attributed to financial inclusion, other things held constant. To ascertain the causal effect of financial inclusion on household financial behavior, households that are financially included are considered the treatment group, and those that are not financially included are considered the control group. The basic equation is as follows:

$$\boldsymbol{Y_i = \beta_0 + \beta_1 FI_i + \beta_2 X_{ij} + \varepsilon_i} \quad (1)$$

Where Y_i represents the financial behavior of individual i, i.e, usage of formal and informal savings and borrowings, FI_i is a binary treatment variable indicating whether individual i is financially included or not, and β_1 is the coefficient that estimates the average treatment effect on the treated. X_{ij} is a vector of control variables that includes age, employment status, marital status, education, and rural-urban. ε_{it} is the error term.

Analyzing this kind of observational data using an ordinary least squares (OLS) model with a dichotomous indicator of treatment does not yield the desired results. In such a case, the error term will be correlated with the independent variables, and the model will generate a biased estimate of the treatment effect. The inference about the causal relationship between two variables (internal validity, Shadish et al., 2002) often encounters different types of threats. The central challenge in estimating the causal effects of financial inclusion is selection bias. Individuals who choose to open formal financial accounts may differ systematically from those who do not in ways that also affect their financial behavior. Simple correlation analysis or ordinary least squares regression would conflate the causal effect of financial inclusion with these pre-existing differences. The randomized clinical trial (RCT) (Fisher et al., 1966) is being considered as the "gold standard" in causal inference studies. However, this is not always possible, ethical, or even desirable. To address this challenge, the study employs two complementary quasi-experimental approaches following Hussen & Mohamed (2023) and Nwokoye et al. (2020): propensity score matching (PSM) (Rubin, 1977; Rosenbaum & Rubin, 1983) and inverse probability weighted regression adjustment (IPWRA) (Wooldridge, 2010). The IPWRA estimator is doubly robust, meaning it provides consistent estimates if either the propensity score model or the outcome models are correctly specified (Robins et al., 2007; Imai et al., 2012). Therefore, the IPWRA method is especially valuable for quasi-experimental studies where model specification uncertainty exists. Both the PSM and IPWRA methods assume the conditional independence principle, which states that conditional on observed characteristics, assignment of treatment (formal account) is independent of potential outcomes.

4. Results and Discussion

4.1 Descriptive Statistics

Table 3 displays the descriptive statistics of the treatment variable, dependent variables, and covariates. It is shown that only 5.6% of respondents, on average involved in formal savings during the past year, compared to 8.9% who used informal savings clubs. Borrowing behavior

shows a different trend where, on average, 15.6% of the respondents borrowed formally and 4.5% borrowed informally during the past year. The descriptive statistics of financial accounts show that only 38% of respondents had formal accounts on average, indicating substantial financial exclusion. While formal savings and borrowings were utilized only by 5.6% and 15.6% on average, respectively, indicating relatively low engagement with formal financial institutions. The mean value of males (41.2%) shows that the sample is comparatively balanced by gender. The average age of respondents is approximately 37 years. Education levels average around category 1.57 on a 1 to 4 scale, indicating, on average, most of the respondents are in between primary and secondary level education. Income is centered around the third quintile. Most of the respondents are from urban areas (74%), though only 22.1 % have internet access on average.

Table 3: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Formal account	1000	0.38	.486	0	1
Formal savings	999	.056	.23	0	1
Informal savings	996	.089	.285	0	1
Formal borrowings	1000	.156	.363	0	1
Informal borrowings	1000	.045	.207	0	1
Age	1000	36.897	15.342	15	90
Male	1000	.412	.492	0	1
Education	1000	1.574	.526	1	4
Income quintile	1000	3.001	1.395	1	5
Employment status	1000	.421	.494	0	1
Urban-rural	1000	.74	.439	0	1
Internet access	995	.221	.415	0	1

4.2 Determinants of Financial Inclusion

Table 4 shows probit regression results that investigate the determinants of financial inclusion. The results reveal that gender, education, urban residence, and internet access are positively associated with formal account ownership. However, age and income appear to be insignificant determinants, revealing that age or income does not constrain financial inclusion in Bangladesh. The need for digital infrastructure and technology-enabled financial inclusion strategies for the expansion of financial inclusion is indicated by the positive significance of internet access.

Table 4: Probit regression results

	Have a formal account	Have a formal account	Have a formal account
Age	-0.0011	-0.0007	0.0023
	(0.0029)	(0.0029)	(0.0031)
Male	0.3114***	0.2400**	0.1909**
	(0.0840)	(0.0945)	(0.0965)
Education	0.3901***	0.3822***	0.3129***
	(0.0841)	(0.0845)	(0.0885)
Income quintile		0.0482	0.0168
		(0.0296)	(0.0306)
Employment status		0.1529*	0.1416
		(0.0928)	(0.0940)
Urban-rural			0.2404**
			(0.0965)
Internet access			0.4458***
			(0.1093)
Constant	-1.0176***	-1.2018***	-1.3650***
	(0.2029)	(0.2202)	(0.2353)
Observations	1,000	1,000	995

Notes: This table illustrates the correlation between financial inclusion and the covariates: age, education, employment status, income quintile, internet access, male, and urban-rural. The data is sourced from the 2021 Global Findex microdata for Bangladesh. Financial inclusion indicates an account at a formal financial institution. The robust standard errors are reported in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

4.3 Matching Quality Assessment

Successful implementation of PSM requires high-quality matches between treated and control groups. Figure 2 displays propensity score distributions by treatment status, showing

substantial overlap between groups. The common support region encompasses the vast majority of observations, with only minimal trimming required.

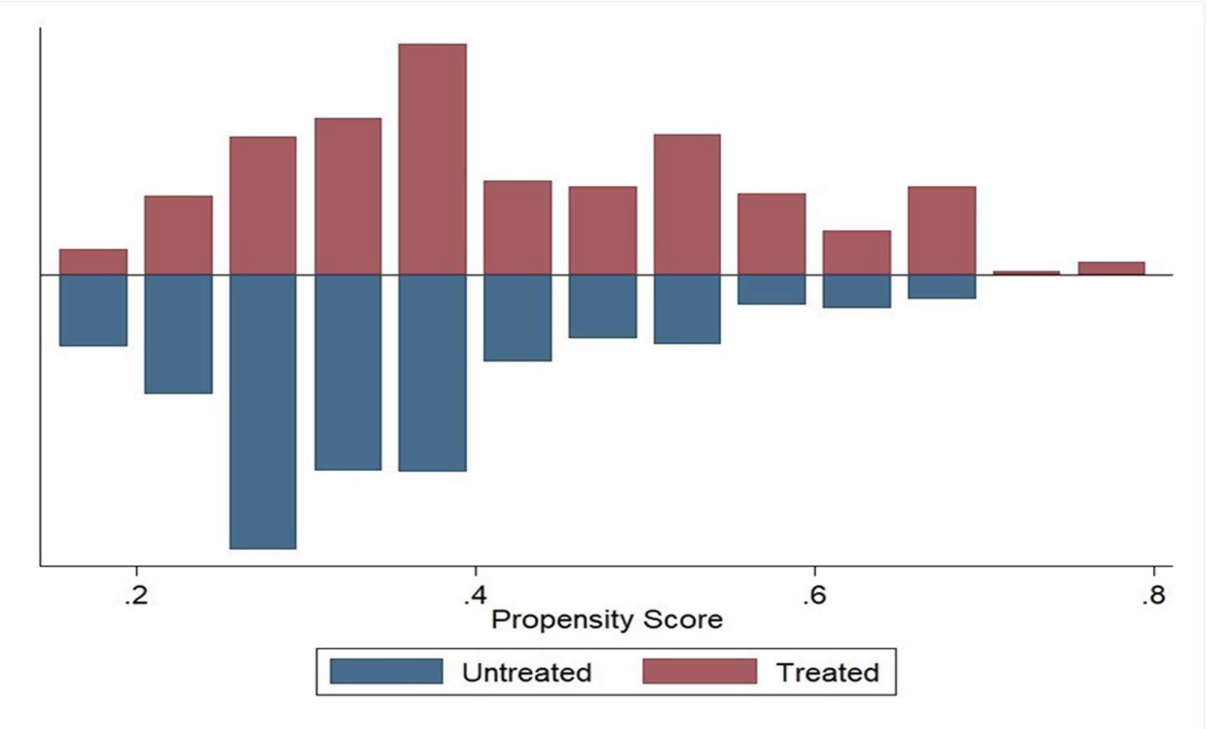

Figure 2: Propensity score of the treated and control group

Table 5: Balancing Property

	Mean			**t-test**	
	Treated	**Control**	**%bias**	**t**	**p>t**
Age	35.889	34.732	7.6	1.100	0.272
Male	0.488	0.512	-4.900	-0.650	0.513
Education	1.687	1.658	5.6	0.790	0.430
Income quintile	3.125	3.103	1.5	0.200	0.838
Employment status	0.491	0.477	2.7	0.360	0.716
Urban-rural	0.785	0.822	-8.600	-1.280	0.200
Internet access	0.329	0.324	1.3	0.160	0.877

Table 5 presents detailed balance statistics after matching. All covariates show excellent balance, with standardized biases below 10% and no statistically significant differences between treatment groups. The mean age difference between treated and control groups is minimal (35.9

vs. 34.7 years, p = 0.272). Similarly, other key variables, including education, income quintile, and employment status, show no significant differences after matching.

Figure 3 visualizes covariate balance through standardized percentage bias plots. All variables fall within acceptable bias ranges (±10%), confirming successful matching. Figure 4 shows the propensity scores before and after matching. These diagnostics provide confidence in the quality of our identification strategy and the validity of subsequent treatment effect estimates.

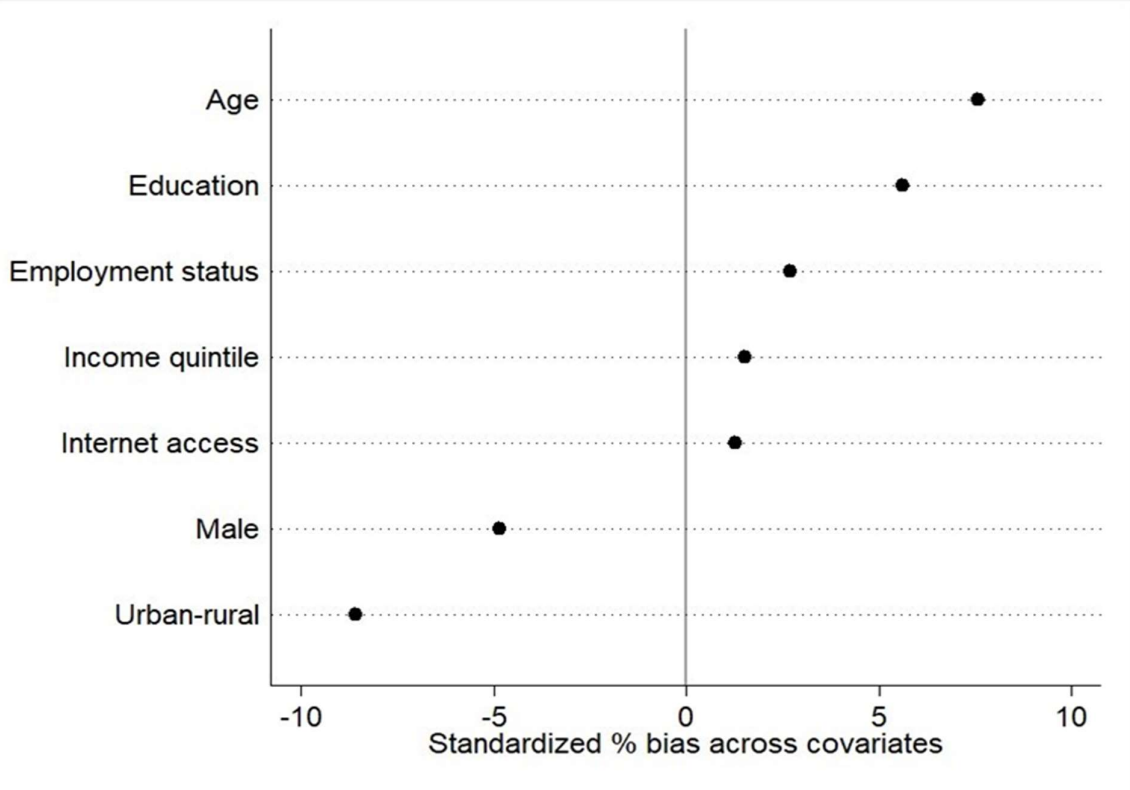

Figure 3: Standardized percentage bias across covariates

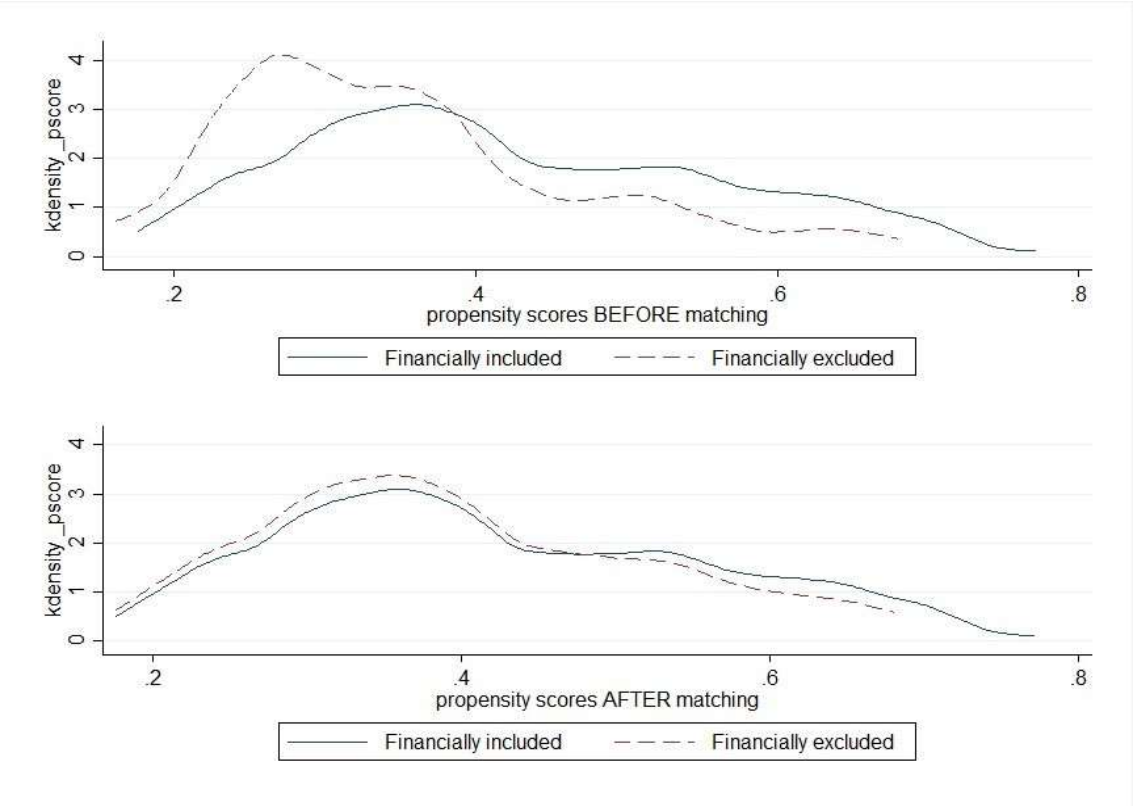

Figure 4: Propensity scores before and after matching

4.4 Main Results:

Table 6 presents our main results comparing OLS, PSM, and IPWRA estimates of financial inclusion effects. The consistency of results across methods strengthens confidence in our findings and suggests that selection bias, while present, does not fundamentally alter the key conclusions.

4.4.1 Formal Financial Services

Financial inclusion has strong positive effects on formal financial service usage. PSM estimates indicate that having a formal account increases the probability of formal savings and formal borrowing. IPWRA estimates are quite similar in magnitude. The large effect sizes suggest that formal account ownership serves as a gateway to broader financial service usage, consistent with theoretical predictions about reduced transaction costs and improved access.

4.4.2 Informal Financial Services

Contrary to simple substitution hypotheses, financial inclusion also increases informal financial service usage, though with smaller effect sizes. PSM estimates show a significant increase in informal savings and informal borrowing (though not statistically significant). IPWRA estimates are similar, indicating a significant increase in both informal savings and informal borrowing. These findings suggest that formal and informal financial services may be complements rather than substitutes, at least in the short term.

Table 6: Effects of financial inclusion

	OLS	PSM-Exact Matching	IPWRA
Formal savings	0.1025***(0.0153)	0.1140***(0.0174)	0.1035***(.0181)
Informal savings	0.0802***(0.0192)	0.0688** (0.0327)	0.0794***(0.0215)
Formal borrowings	0.1092***(0.0242)	0.0906***(0.0350)	0.1099***(0.0256)
Informal borrowings	0.0445***(0.0140)	0.0247(0.0236)	0.0442***(0.0152)

Notes: (1) Standard errors are reported in parentheses. (2) All models control for age, gender, education, income quintile, employment status, urban-rural residence, and internet access. (3) ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

4.5 Robustness Checks

The study conducts several robustness checks to validate our main findings, with results presented in Tables 7-9.

4.5.1 Alternative Matching Algorithms

Table 7: Effects of financial inclusion with alternative matching algorithms

	Kernel Matching	Stratification Matching	Nearest neighbor matching
Formal savings	0.103***(0.014)	0.102***(0.011)	0.110 *** (0.005)
Informal savings	0.081***(0.023)	0.079***(0.017)	0.084***(0.028)
Formal borrowings	0.111***(0.009)	0.114***(0.027)	0.104***(0.028)
Informal borrowings	0.044***(0.016)	0.043***(0.019)	0.038***(0.034)

Notes: (1) Standard errors are reported in parentheses. (2) All models control for age, gender, education, income quintile, employment status, urban-rural residence, and internet access. (3) ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 7 presents treatment effect estimates using three different matching algorithms: kernel matching, stratification matching, and nearest neighbor matching. The results demonstrate remarkable consistency across methods, confirming the robustness of our main findings.

For formal savings, treatment effects range from 10.2 to 11.0 percentage points across the three methods, all significant at the 1% level. Similarly, formal borrowing effects range from 10.4 to 11.4 percentage points. Informal savings effects are also consistent, as are informal borrowing effects. The stability of estimates across matching algorithms suggests that our results are not driven by methodological choices and strengthens confidence in the causal interpretation.

4.5.2 Gender Heterogeneity

Table 8 investigates gender related heterogeneity in the financial inclusion and financial behavior nexus, applying PSM with the exact matching technique. The results reveal that gender is a factor determining how financial inclusion affects financial behavior. It is shown that the treatment effect is substantially larger for males compared to females for formal savings. This gender gap in formal savings may indicate women's lower financial autonomy and income, which acts as a persistent barrier for women's access to formal financial services. Surprisingly, the pattern changes for formal borrowing. Financial inclusion significantly increases the female formal borrowings, while the effect for males is negligible and statistically insignificant. This striking gender difference in formal borrowing indicates that formal accounts for women may be particularly intended to get access to credit with favorable loan policies tailored particularly for women. However, the results show that even after having a formal account, woman tends to adopt informal channels for more savings, while informal borrowing effects are smaller and only significant for males.

Table 8: Gender heterogeneity of the effects of financial inclusion (PSM-Exact Matching)

	Male	**Female**
Formal savings	0.125***(0.028)	0.067**(0.026)
Informal savings	0.101**(0.047)	0.096***(0.032)
Formal borrowings	0.010 (0.050)	0.119***(0.043)
Informal borrowings	0.043**(0.022)	0.030 (0.026)

Notes: (1) Standard errors are reported in parentheses. (2) All models control for age, education, income quintile, employment status, urban-rural residence, and internet access. (3) ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

4.5.3 Educational Heterogeneity

Table 9 shows the heterogeneous impact of financial inclusion on financial behavior by educational level, which compares individuals with primary education or less to those with secondary education or more. The results reveal that financial inclusion effects vary significantly by education level. For formal savings, less-educated individuals show larger treatment effects compared to more educated individuals. This suggests that financial inclusion may be particularly beneficial for disadvantaged groups with less or no education who face greater barriers to formal financial access. Less-educated individuals may experience larger gains because they have fewer alternative channels for formal savings. However, for informal financial services, the

pattern is reversed or shows no effect for less-educated groups. Informal savings and borrowing effects are only significant for individuals with secondary education or more, suggesting that more educated individuals may continue to access informal finance despite having a formal source. Formal borrowing shows smaller effects overall and is only significant for the more educated group, possibly reflecting credit constraints or risk aversion among less-educated individuals even after obtaining formal accounts.

Table 9: Educational heterogeneity of the effects of financial inclusion (PSM-Exact Matching)

	Primary or less	**Secondary or more**
Formal savings	0.133***(.030)	0.090***(0.023)
Informal savings	0.060(.036)	0.066**(0.035)
Formal borrowings	0.058(.054)	0.092**(0.092)
Informal borrowings	0.030(.031)	0.051**(0.021)

Notes: (1) Standard errors are reported in parentheses. (2) All models control for age, gender, income quintile, employment status, urban-rural residence, and internet access. (2) ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

5. Discussion

The study presents empirical evidence of how financial inclusion affects financial behavior among the adult population in Bangladesh. The consistency of results across various alternative algorithms of propensity score matching, as well as the use of the inverse probability weighted regression adjustment method, reinforces the causal effect of formal account ownership on savings and borrowing behavior.

The findings of the study are consistent with the theory of transaction cost economics proposed by Williamson (1981). The study findings also align with behavioral finance frameworks proposed by Thaler & Shefrin (1981). Aligned with the view of these theories, the study suggests that formal accounts reduce transaction costs and provide commitment mechanisms that bring savings discipline.

However, financial inclusion also stimulates informal financial activities, challenging simple substitution hypotheses that access to formal financial services substitutes for informal finance. The reason is that the usage dimension of financial inclusion is substantially lower than the usage dimension of financial inclusion. While 38% of the adult population have access to a formal account, 5.6% and 15.6% have formal savings and borrowings. As demonstrated by Grohmann & Menkhoff (2018), while having a formal account at a bank or other financial institutions satisfies the access to financial services dimension of financial inclusion, financial literacy plays a critical role in determining the use of financial services dimension of financial inclusion. The findings are consistent with the idea that cultural and social norms influence attitudes towards informal financial services (Mishra et al., 2024). These findings resonate as

Dupas and Robinson (2013) stated that formal savings accounts complement rather than substitute existing financial strategies in contexts where informal systems offer unique benefits, easy accessibility, and flexibility.

The heterogeneity analysis by gender and education reveals important policy suggestions. Women who have formal account experience larger increases in formal borrowing, while men benefit more from formal savings. This heterogeneity in financial behavior among males and females is consistent with the view of Ashraf et al. (2010) that formal financial access can enhance women's empowerment through credit access in particular. They also highlighted that persistent social and economic barriers limit women's savings autonomy and savings capacity. Additionally, the findings of gender heterogeneity of the behavioral impact of financial inclusion are also supported by Sen's (1999) capability approach. According to Sen's (1999) capability approach, financial inclusion expands women's economic agency, although institutional and social barriers remain.

The financial inclusion and financial behavior relationship changes according to education level. Financial inclusion of individuals with less or no education shows a larger increase in formal savings, indicating financial inclusion may serve as an equalizing mechanism for the disadvantaged groups. However, for formal borrowing, financial inclusion shows limited effects for less-educated adults, indicating that account ownership alone does not overcome all credit constraints. As people with higher education have better employment opportunities and income (Riddell & Song, 2011; De & Lee, 2002), they have better access to formal borrowings. This part of the results particularly echoes Prina's (2015) findings that formal accounts benefit marginalized populations but require complementary interventions to maximize impact.

6. Conclusion

This study examines how financial inclusion influences the financial behavior of the adult population in Bangladesh. Utilizing quasi-experimental methods, the study demonstrates that ownership of formal financial accounts leads to meaningful increases in both formal savings and formal borrowing. These results are consistent across multiple estimation strategies, reinforcing the causal explanation of the findings as well as mitigating concerns related to selection bias and model dependence.

The positive and significant impact of financial inclusion on the usage of formal savings and borrowing facilities suggests that account ownership acts as an active catalyst for change in savings and borrowing behavior. However, access to a formal account promotes formal savings and borrowing but doesn’t substitute informal finance, as also demonstrated in the study by Allen et al. (2016).

From a policy standpoint, the findings support the strategic importance of expanding formal financial access as part of a broader development agenda. The study also calls for deepening financial literacy and understanding of the usage of formal financial services to get the full advantage of formal financial infrastructure and substitute informal finance. The savings and borrowing instruments in the formal financial system should be made more attractive and easier

to access. The observed gender and educational disparities call for targeted financial inclusion policies. Gender-sensitive financial products, community-based outreach, and simplified financial services tailored to less-educated populations could amplify the developmental impact of financial inclusion efforts (Prina, 2015; Hasan & Islam, 2016). Additionally, the findings of our study call for emphasizing the role of mobile money and fintech innovations in overcoming traditional barriers to access to formal financial services. The strong association between internet access and account ownership emphasizes the role of the digital financial service infrastructure as an inclusion lever (Allen et al., 2016).

However, the study also has some limitations. The study is limited in its ability to assess long-term behavioral transformations due to its cross-sectional nature of the data. Unobserved heterogeneity cannot be entirely ruled out, though the use of a quasi-experimental design improves causal inference. Furthermore, the Bangladesh-specific context may limit generalizability.

Acknowledgement: The author wishes to express his profound appreciation to Dr. Yuhao Yang, Associate Professor, Research Institute of Economics and Management, Southwestern University of Finance and Economics, Sichuan, China, for his erudite guidance and meticulous supervision throughout this research endeavor.

Conflicts of Interest: The author declares no conflict of interest.

References

Akhter, N., & Khalily, B. (2017). Impact of mobile financial services on financial inclusion in Bangladesh. *Institute for Inclusive Finance and Development (InM), Working Paper*, *52*, 1-26.

Akter, S. (2016). Overview of financial inclusion in Bangladesh. *The Journal of the Study of Modern Society and Culture*, *63*(12), 225-255.

Allen, F., Demirgüç-Kunt, A., Klapper, L., & Peria, M. S. M. (2016). The foundations of financial inclusion: Understanding ownership and use of formal accounts. *Journal of Financial Intermediation*, *27*, 1-30.

Alrasyid, H., & Sultan. (2024). Financial behavior of the millenial generation: financial literacy, financial intelligence, financial inclusion. *Journal of Applied Sciences in Accounting, Finance, and Tax*, *7*(1), 15–22.

Ashraf, N., Karlan, D., & Yin, W. (2010). Female empowerment: Impact of a commitment savings product in the Philippines. *World Development*, *38*(3), 333-344.

Baker, H. K., Kumar, S., Goyal, N., & Gaur, V. (2019). How financial literacy and demographic variables relate to behavioral biases. *Managerial Finance*, *45*(1), 124-146.

Bangladesh Bureau of Statistics. (2023). Household Income and Expenditure Survey-2022. Government of Bangladesh.

Banerjee, A., Duflo, E., Glennerster, R., & Kinnan, C. (2015). The miracle of microfinance? Evidence from a randomized evaluation. *American Economic Journal: Applied Economics*, *7*(1), 22-53.

Beatrice, V., Murhadi, W. R., & Herlambang, A. (2021). The effect of demographic factors on behavioral biases. *Jurnal Siasat Bisnis*, *25*(1), 17-29.

Barua, D., Akber, S. M., Akter, R., & Khan, M. R. (2025). Financial inclusion through agent banking in Bangladesh: Opportunities and challenges. *International Journal of Research in Business and Social Science*, *14*(1), 65-73.

Cavoli, T., Gopalan, S., Onur, I., & Xenarios, S. (2023). Does financial inclusion improve sanitation access? Empirical evidence from low-and middle-income countries. *International Journal of Water Resources Development*, *39*(5), 724-745.

Dobbie, L., & Gillespie, M. (2010). The health benefits of financial inclusion. Report for NHS Greater Glasgow and Clyde.

Dupas, P., & Robinson, J. (2013). Why don't the poor save more? Evidence from health savings experiments. *American Economic Review*, 103(4), 1138-1171.

Dutkiewicz, M. (2018). *Women's Economic Empowerment and the G20 Agenda*. Asia-Pacific Issues, (135), 1-4. https://www.eastwestcenter.org/sites/default/files/private/api135.pdf

Fisher, R. A. (1966). The design of experiments (Vol. 21). Springer.

Fitriadi, D. C., Jhoansyah, D., & Nurmala, R. (2025). The influence of digital finance, financial literacy, and financial inclusion on debt behavior of millenials. *Al-Kharaj: Journal of Islamic Economic and Business*, *7*(1).

Friedman, M. (1957). A Theory of the Consumption Function. Princeton University Press.

Fungáčová, Z., & Weill, L. (2015). Understanding financial inclusion in China. *China Economic Review,* 34, 196-206.

Goyal, K., & Kumar, S. (2021). Financial literacy: A systematic review and bibliometric analysis. *International Journal of Consumer Studies*, *45*(1), 80-105.

Grohmann, A., Klühs, T., & Menkhoff, L. (2018). Does financial literacy improve financial inclusion? Cross country evidence. *World Development*, *111*, 84-96.

Hasan, M. R., & Islam, M. E. (2016). Financial Inclusion Index at district levels in Bangladesh: A distance-based approach. Bangladesh Bank Working Paper No. 1603.

Himel, M. T. A., Ashraf, S., Bappy, T. A., Abir, M. T., Morshed, M. K., & Hossain, M. N. (2021). Users' attitude and intention to use mobile financial services in Bangladesh: An empirical study. *South Asian Journal of Marketing*, *2*(1), 72-96.

Howlader, S., & Halder, P. (2025). Fintech's impact on financial inclusion through mobile financial services in Bangladesh. *Millennial Asia*, 09763996251356998.

Hussen, M. S., & Mohamed, M. A. (2023). Impact of financial inclusion on household welfare in Ethiopia. *Future Business Journal*, 9(1), 67.

Imai, K. S., Gaiha, R., Thapa, G., & Annim, S. K. (2012). Microfinance and poverty—a macro perspective. *World Development*, 40(8), 1675-1689.

Ingale, K. K., & Paluri, R. A. (2022). Financial literacy and financial behaviour: A bibliometric analysis. *Review of Behavioral Finance*, *14*(1), 130-154.

Islam, A., Nguyen, C., & Smyth, R. (2015). Does microfinance change informal lending in village economies? Evidence from Bangladesh. *Journal of Banking & Finance*, *50*, 141-156.

Karim, L. (2011). Microfinance and its discontents: Women in debt in Bangladesh. University of Minnesota Press.

Khandker, S. R. (2005). Microfinance and poverty: Evidence using panel data from Bangladesh. *The World Bank Economic Review*, 19(2), 263-286.

Kumar, R. (2025). Global trends and research patterns in financial literacy and behavior: A bibliometric analysis. *Management science advances*, *2*(1), 1-18.

Li, L. (2018). Financial inclusion and poverty: The role of relative income. *China Economic Review*, 52, 165-191.

Lusardi, A., & Tufano, P. (2015). Debt literacy, financial experiences, and overindebtedness. *Journal of Pension Economics & Finance*, *14*(4), 332-368.

Mahjabeen, R. (2008). Microfinancing in Bangladesh: Impact on households, consumption and welfare. *Journal of Policy Modeling*, 30(6), 1083-1092.

McElroy, M. B., & Horney, M. J. (1981). Nash-bargained household decisions: Toward a generalization of the theory of demand. *International Economic Review*, 22(2), 333-349.

Mishra, D., Kandpal, V., Agarwal, N., & Srivastava, B. (2024). Financial inclusion and its ripple effects on socio-economic development: a comprehensive review. *Journal of Risk and Financial Management*, *17*(3), 105.

Molina-García, A., Diéguez-Soto, J., Galache-Laza, M. T., & Campos-Valenzuela, M. (2023). Financial literacy in SMEs: A bibliometric analysis and a systematic literature review of an emerging research field. *Review of Managerial Science*, *17*(3), 787-826.

Nwokoye, E. S., Igbanugo, C. I., & Dimnwobi, S. K. (2020). International migrant remittances and labour force participation in Nigeria. *African Development Review*, 32(2), 125-137.

Ocansey, E. O., & Manu, V. (2025). The relationship between financial literacy and financial behavior: A systematic literature review. *Journal of Economics, Finance and Accounting Studies*, *7*(4), 101-116.

Osborn, D., Cutter, A., & Ullah, F. (2015). Universal sustainable development goals. Understanding the transformational challenge for developed countries, Report, London: Stakeholder Forum.

Pitt, M. M., & Khandker, S. R. (1998). The impact of group-based credit programs on poor households in Bangladesh: Does the gender of participants matter? *Journal of Political Economy*, *106*(5), 958-996.

Pokharel, J., & Maharjan, I. (2024). Financial behavior of generation Z and Millennials. *Journal of Emerging Management Studies*, *1*(2), 148-170.

Prina, S. (2015). Banking the poor via savings accounts: Evidence from a field experiment. *Journal of Development Economics*, 115, 16-31.

Rahman, M. M. (2020). Financial inclusion for poverty alleviation: The role of Islamic finance in Bangladesh. In Enhancing Financial Inclusion through Islamic Finance (pp. 17-50). Springer.

Robins, J., Sued, M., Lei-Gomez, Q., & Rotnitzky, A. (2007). Comment: Performance of double-robust estimators when "inverse probability" weights are highly variable. *Statistical Science*, *22*(4), 544-559.

Roodman, D., & Morduch, J. (2014). The impact of microcredit on the poor in Bangladesh: Revisiting the evidence. *Journal of Development Studies*, *50*(4), 583-604.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, *70*(1), 41-55.

Rubin, D. B. (1977). Assignment to treatment group on the basis of a covariate. *Journal of Educational Statistics*, *2*(1), 1-26.

Sen, A. (1999). Development as Freedom. Oxford University Press.

Sen, K. K., Karmaker, S. C., Hosan, S., Chapman, A. J., Uddin, M. K., & Saha, B. B. (2023). Energy poverty alleviation through financial inclusion: Role of gender in Bangladesh. Energy, 282, 128452.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). Quasi-experiments: interrupted time-series designs. *Experimental and quasi-experimental designs for generalized causal inference*, 171-205.

Shi, W., Ali, M., & Leong, C. M. (2025). Dynamics of personal financial management: a bibliometric and systematic review on financial literacy, financial capability and financial behavior. *International Journal of Bank Marketing*, *43*(1), 125-165.

Söderberg, I. L. (2012). Gender stereotyping in financial advisors' assessment of customers. *Journal of Financial Services Marketing*, *17*(4), 259.

Strotz, R. H. (1955). Myopia and inconsistency in dynamic utility maximization. *The Review of Economic Studies*, *23*(3), 165-180.

Thaler, R. H., & Shefrin, H. M. (1981). An economic theory of self-control. *Journal of Political Economy*, *89*(2), 392-406.

Thomas, C., Vipulkumar, N. M., & Rani, I. (2023). Demographic dividend and customer satisfaction of banks in India. In B. Alareeni & I. Elgedawy (Eds.), *AI and business, and innovation research: Understanding the potential and risks of AI for modern enterprises*, (pp. 241-250), vol 440. Springer, Cham. https://doi.org/10.1007/978-3-031-42085-6_20 .

Thomas, D. (1990). Intra-household resource allocation: An inferential approach. *Journal of Human Resources*, *25*(4), 635-664.

Van Doornik, B., Gomes, A., Schoenherr, D., & Skrastins, J. (2024). Financial access and labor market outcomes: Evidence from credit lotteries. *American Economic Review*, *114*(6), 1854-1881.

Widyastuti, U., Respati, D. K., Dewi, V. I., & Soma, A. M. (2024). The nexus of digital financial inclusion, digital financial literacy and demographic factors: Lesson from Indonesia. *Cogent Business & Management*, *11*(1), 2322778.

Williamson, O. E. (1981). The economics of organization: The transaction cost approach. *American Journal of Sociology*, *87*(3), 548-577.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). MIT Press.

Corresponding author contact info:
Aslam Mahmud, Email: mahmud@jkkniu.edu.bd