Environment and Social Psychology (2024) Volume 9 Issue 1
doi: 10.54517/esp.v9i1.1955

Research Article

The relationship between financial inclusion and women's empowerment in rural Bangladesh: The moderating effect of agent banking

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ABSTRACT

The importance of financial inclusion (FI) for women's empowerment (WE) has been demonstrated in recent studies. However, it still needs to be determined how FI might assist women in gaining power. The purpose of this research is to learn how financial institutions (FIs) interact with women's empowerment through agent banking (AB) (WEs). Using a quantitative research design—The study includes 408 women residing in rural Bangladesh. As demonstrated, agent banking moderates the favorable effect of financial inclusion on economic and social empowerment, suggesting that this effect is indirect. These results suggest that financial inclusion strengthens women's power when financial institutions prioritize the development of agent banking. Despite the importance of expanding access to banking services, more is needed to increase women's empowerment if institutions adopt agent banking practices.

Keywords: financial inclusion; agent banking; women empowerment; rural areas

1. Introduction

Women's empowerment has become a global issue in recent years, with numerous seminars, conferences, and gatherings held regularly in major cities and minor communities worldwide[1]. Women's empowerment is now widely acknowledged and vital for economic development, political stability, and social transformation. Together with specialists and academics, leaders from around the globe offer their voices to this effort[2]. Women's empowerment seeks to give them more power to make decisions in their best interests[3]. Through overt instrumentalist logic, the international donor community shaped development thinking regarding women's empowerment in Bangladesh during the 1970s and 1980s[4]. It has led to the belief that the women's empowerment agenda is solely the work of international donors rather than the political parties, women's groups, and national NGOs operating on the ground[5]. Because females make up over half of Bangladesh's population, it is safe to say that their economic situation is steadily growing more favorable. In terms of a country's long-term economic prosperity and success, empowering women is about more than just maintaining the fundamental rights granted by the constitution and international accords[6]. According to Hossain[7], women in Bangladesh, a developing nation with a Muslim majority in the "typical patriarchal belt", have made great strides regarding access to education, healthcare, and the workforce in the recent two decades. Several different

ARTICLE INFO
Received: 31 July 2023 | Accepted: 8 September 2023 | Available online: 29 November 2023

CITATION
Sohrab T, Idris F, Sulaiman N. The relationship between financial inclusion and women's empowerment in rural Bangladesh: The moderating effect of agent banking. *Environment and Social Psychology* 2024; 9(1): 1955. doi: 10.54517/esp.v9i1.1955

groups and organizations claim to be working toward empowering women by implementing various programs and policies, and they often play a significant role in national political traditions and development discourses[8]. Given the preceding, the government of Bangladesh has consistently poured vast sums of money into a wide variety of initiatives aimed at empowering and educating women to contribute more to society[9,10].

However, compared to other developing and developed nations, the rates of women's labor force participation and secondary education in Bangladesh (36.4%–78.3%) need to be higher. For example, women's labor force participation and secondary education in Malaysia, Indonesia, Nepal, Maldives, Myanmar, Philippines, Singapore, Sri Lanka, and Thailand range from about 51.3% to 85.4%, 53.8% to 90%, 81.5% to 83.3%, 46.2% to 71.3%, 47.1% to 88.6%, 61.9% to 105.3%, 33.6% to 116.5%, and 58.8% to 116.5%, respectively[11].

Moreover, the prevalence of early marriage and rape cases in Bangladesh is alarmingly high at 15.5–9.8 percent, relative to other developing and developed countries. To provide only a few examples, the rates of child marriage and rape cases in Malaysia, India, Indonesia, Nepal, the Maldives, Myanmar, the Philippines, Singapore, Sri Lanka, and Thailand range from around 0.1% to 6.8%; from 0% to 3.0%; from 1.9% to 2.6%; from 2.2% to 6.3%; and from 0% to 6.7%[11]. Many experts are concerned about Bangladesh's low level of female empowerment compared to other nations, which is a serious issue. It is also urgent that academic scholars pay attention as they must immediately provide knowledge that can be used to address the crisis.

Scholars debate the role of financial inclusion, also known as accessibility, availability, quality, penetration, and use of official financial products and services, in improving living conditions for both men and women as it is thought to be a facilitator of women's empowerment[12,13]. Consequently, financial inclusion entails more than closing the gender gap in the sector. It empowers women by increasing their financial autonomy, bargaining power, and self-esteem while decreasing their risk exposure. Besides, it enhances women's livelihoods and fosters a more just and sustainable future for everyone[12]. Furthermore, it gives women more economic power by improving their purchasing power, control over loans, income and savings, and ability to invest and avoid risks[14]. Despite the inconsistent findings of recent research on the current field, compelling reasons exist to prioritize this issue for both instrumental and intrinsic motivations. At the same time, there is evidence that women's empowerment increases when they have access to financial resources[6,15–19]. However, some studies have discovered an inconsistent relationship between financial inclusion and women empowerment[20,21]; while Neaime and Gaysset[22] found that financial inclusion has no discernible effect on poverty. These contradictory findings could be explained by geographical differences or population size across the nations studied. Furthermore, most of this research has focused solely on the effects of microcredit on women. Microcredit is just one component of financial inclusion.

Additionally, some researchers have focused on a different perspective of dimensions to measure the effects of financial inclusion in empowering women[23–25]. For instance, Badullahewage[26] investigated financial inclusion and women's economic empowerment in Northern Sri Lanka, measuring financial inclusion through microfinance and then focusing solely on economic empowerment to measure women's empowerment. In contrast, Bhatia and Singh[27] examined empowering women through financial inclusion, calculating financial inclusion as a whole and dividing women empowerment into three dimensions: economic, social, and political. Meanwhile, Hendriks[17] investigated the impact of financial inclusion on women's economic empowerment. They did not, however, combine the conceptions of access, usage, and quality as aspects of financial inclusion; instead, they concentrated solely on one dimension of economic empowerment. Thus, research on financial inclusion (access, usage, and quality) about economic and social charges must be more extensive[19]. According to Siddik[19], future studies should investigate these three characteristics (access, usage, and quality) of women's empowerment.

The influence of financial inclusion factors (access, usage, and quality) in the Bangladeshi context has also received limited investigation. Ahamed and Mallick[28], Sarma[29–31] emphasized that the three dimensions of measuring financial inclusion include: (i) access to financial services; (ii) usage of financial services; (iii) the quality of the products and the service delivery. These are among the most important dimensions compatible with developing and emerging countries. Furthermore, these dimensions are fully compatible with the G20 financial inclusion indicators[32]; the lack of research on the three aspects of financial inclusion—access, usage, and quality—is a fundamental problem for this study, considering the limited studies conducted in Bangladesh. As a result, in-depth research in a single country, such as Bangladesh, is required to determine the links between access, usage, quality, and women's empowerment. Once trust has been established, the government and policymakers may implement measures to increase women's empowerment and accelerate the country's inclusive growth.

Shafi et al.[33] added that banks have trouble conducting operations globally due to the coronavirus pandemic. The Asian Development Bank forecasts that the banking sector's revenue will decline to approximately $489 billion in 2021[34]. Thus, the inconsistencies among the variables affecting women's empowerment must be ascertained to determine whether or not certain influences are related to the effect of one variable on another[35,36]. Therefore, this study examines the effects of agent banking as a moderator on the relationship between financial inclusion (access, usage, quality) and women empowerment (economic and social empowerment). Due to this, the agent banking solution rescues traditional banks and financial institutions from this predicament[37]. In another study, Ong'era and Omagwa[38] posited that agent banking provides various services, including convenient money deposits and withdrawals, loan management, fund transfers, and account inquiries.

Simultaneously, the lack of adequate research on this area in developing countries implies that there is a need for more research to examine specific variables to determine the real reasons that improve women's empowerment economically and socially[22,39–41]. In line with this, the academic problem at the heart of the knowledge gap is how financial service providers view their responsibility for rural development and achieving economic and social empowerment. Therefore, the present study is conducted to fill the research gap on the effect of financial inclusion and agent banking on women's empowerment in rural Bangladesh.

The study's significance lies in bridging the knowledge gap surrounding the relationship between financial inclusion and women's empowerment in rural Bangladesh. Its innovation stems from its novel approach of examining the moderating effect of agent banking, employing a quantitative methods research design, and contextualizing its findings within the rural Bangladeshi setting. The study's outcomes have the potential to inform policies and practices that promote women's empowerment through tailored financial inclusion strategies, with a focus on agent banking.

The remaining sections of the manuscript are organized, wherein the next team reviews the literature and develops the hypotheses. Section 3 and Section 4 deal with methodology and findings, discussion and implications in Section 5, and finally, limitations of the study in Section 6.

2. Literature review and hypotheses development

2.1. Financial inclusion and women empowerment

Financial inclusion is a term that has made a strong case for itself in recent years in the economic arena in general and banking in particular[42,43]. In its simplest form, it provides financial and banking services to the greatest number of citizens, particularly low-income individuals, and attracts them to the banking sector[44]. Financial inclusion is the process through which all segments of society and vulnerable people, especially those with low incomes, have access to adequate economic goods and services at a fair price fairly and transparently through structured, organized players[45]. It entails greater comprehension, awareness, and ability to utilize those financial products and services. Bruhn and Love[46] argued that financial inclusion significantly minimizes poverty, especially for the most vulnerable people, as the basic needs of this group of people, such as housing, education, and health, can be met. Financial inclusion refers to the timely provision of financial services at a reasonable price to many vulnerable groups, such as weaker sections, disadvantaged groups, and low-income groups[47,48]. It does not mean the opening of saving accounts only but also includes providing insurance[49], credit services[50], and financial advice[51]. According to Ocasio[52], a significant portion of families in Bangladesh are excluded from the scope of financial services—several economic sectors, including the financial industry, aid women's empowerment. The financial industry benefits the economy by cutting transaction and information costs, mobilizing savings, reducing risk, and promoting specialization[53]. Moreover, Demirgüç-Kunt et al.[54] and Ghatak[55] claimed that the financial sector is capable of supplying borrowers with a choice of high-quality, low-risk financial products, which would eventually accelerate women's empowerment and economic growth.

According to Belayeth Hussain et al.[16], George and Thomachan[56], Hendriks[17], Hussain and Jullandhry[18], Qasim et al.[6], Siddik[19], Yaumidin et al.[57] financial inclusion is strongly correlated with women empowerment, this relationship exists because a good financial inclusion enables efficient mobilization of economic resources, which results in increased productivity and motivates the women to be empowered and seek their rights. Financial inclusion is a critical component of economic activity that enhances financial services and related systems[58], encourages the development of updated and advanced financial products[59], and new financial institutions[60]. Additionally, it has resulted in regulatory changes and a shift in social perceptions[61]. Progress in financial sectors, including the development of capital markets and banking industries, has the potential to foster financial inclusion[62]. Similarly, Badullahewage[26] demonstrated that when discussing financial inclusion for women's empowerment, it is clear that microfinance plays a significant role in empowering women in poor nations. More so, Succena[63] argued that empowerment is a strong term that should carry the weight it does, including credit and saving programs used to accomplish this goal. As a result, there is a perceived need for additional financial institutions to participate in such projects.

Ibtasam et al.[64] have established that in resource-constrained nations, a lack of financial participation harms women's economic empowerment and opportunity to better their conditions. Hendriks[17] posited that financial inclusion significantly impacts millions of women's lives and livelihoods globally and is a key tenet of its strategy for women's economic empowerment. Moreover, Yaumidin et al.[57] concluded that women's participation in microfinance improves their status within the household through: (I) increased access to independent income; (II) increased control over how savings and credit are used; (III) increased capacity to contribute productive assets to the household economy. Additionally, Siddik[19] asserted that financial inclusion empowers individuals and families, particularly women and people with low incomes and that strong economic systems benefit entire countries, as well; financial inclusion improves women's income, purchasing power, level of living, and role in the family. Similarly, in their study, Tiwari[65] interviewed a group of women and found that many urban women had accounts with many banks, including those from lower economic strata. They could identify with women's challenges when using conventional financial institutions.

Likewise, previous researchers emphasized that women's access to financial products and services is critical for development, poverty reduction, and gender equality. Increased financial inclusion and access for women, tailored to their specific requirements, boost their chances of contributing to women's empowerment and improving access to health and educational resources. Additionally, Sarma[31] demonstrated the existence of a bidirectional causal relationship between access to banking services and women empowerment. Sanjaya[66] discovered that financial inclusion through microcredit programs significantly improves lower-income individuals' social and economic standing. Hannig and Jansein[67] argued that granting low-income people access to formal financial institutions' deposits can assist families in managing their financial vulnerabilities brought on by the crisis, diversify their funding sources away from financial institutions, and lessen shocks throughout world crises.

On the other hand, Seven and Coskun[68] argued that while financial development promotes economic progress, it does not necessarily help those with low incomes, especially women, in developing nations since financial inclusion does not considerably reduce poverty. According to Neaime and Gaysset[22], financial inclusion has no discernible effect on poverty. It can either benefit or harm financial stability. Demirguc-Kunt et al.[69] discovered that financial institutions in developing countries face greater financial exclusion than those in developed countries. Khan[70] established a non-linear relationship between financial inclusion and financial stability. When financial institutions attempt to recruit lower-income groups by decreasing lending terms, financial inclusion may lower loan criteria, negatively affecting financial stability. Dupas et al.[39] discovered that extending banking services does not enhance financial strength. It must be followed by decreased borrowing prices for the lower-middle class, increased service quality, or lost trust. Based on the literature review proving that financial inclusion promotes women's empowerment, this study is interested in investigating this relationship in rural areas of Bangladesh for the following reasons. More than 40% of the adult population is denied access to financial services, lending credence to the idea that financial institutions contribute nothing to women's empowerment in Bangladesh. Second, a sizable proportion of Bangladesh's rural population and females are financially excluded. Thirdly, while the authorities implemented a national financial inclusion strategy and other measures, they concurrently imposed a tax on banking transactions[19,71]. Based on the literature, the following hypotheses are developed:

- H1: Financial inclusion (Access) significantly influences women's empowerment (social) in Bangladesh.
- H2: Financial inclusion (Access) significantly influences women's empowerment (economic) in Bangladesh.
- H3: Financial inclusion (Usage) significantly influences women's empowerment (social) in Bangladesh.
- H4: Financial inclusion (Usage) significantly influences women's empowerment (economic) in Bangladesh.
- H5: Financial inclusion (Quality) significantly influences women's empowerment (social) in Bangladesh.
- H6: Financial inclusion (Quality) significantly influences women's empowerment (economic) in Bangladesh.

2.2. The moderating effect of agent banking

The relationship between financial inclusion and women empowerment is supported theoretically by several previous studies. Several studies have revealed that financial inclusion positively and significantly impacts women's empowerment[6,16–19]. Some studies have found inconsistent associations between financial inclusion and women empowerment[20,21] while Neaime and Gaysset[22] found that financial inclusion has no discernible impact on poverty. Therefore, finding new variables to improve this limitation interest's researchers Moghavvemi et al.[72]. Drawing on Baron and Kenny[35], a moderating variable should be considered when empirical findings offer inconsistent results. A moderator variable influences the relationship between two variables. It can be used to identify whether variations in the effects of the predictor on the criterion depend on the moderator's value or level. According to underpinning theories and literature reviews in the financial sector, agent banking might influence the relationship between different constructs[73]. This study uses agent banking as a moderating variable on the relationship between financial inclusion and women empowerment in Bangladesh.

Agent banking is the practice of providing limited-scale banking and financial services to the underserved community through active agents working under a legally binding agency agreement as opposed to a teller or cashier. While executing financial transactions, an establishment's owner acts as the bank's agent. These retailers are increasingly employed as crucial global financial inclusion distribution platforms. Moreover, according to Feirdous et al.[74], Agent Banking alludes to a new age in financial institutions, boosting consumer access and profitability. Agent banking systems are the most cost-effective alternative for transactional accounts with modest balances and frequent transactions.

Furthermore, Chiteili[75] posited that agent banking operations are a competitive strategy due to the procedures in place, technological advancements, and regulations implemented by agents and commercial banks. Siddiquiei[76] concluded that agent banking represents a significant opportunity to increase banks' popularity. This service establishes a distinct epoch for accessible banks and financial institutions. Furthermore, Benazir Rahman[77] demonstrated that the growing volume of agency services boosts bank profits, as each transaction carries a fee, contributing to the development of the financial sector. However, Rahman[78] suggests that banks may motivate consumers by providing a range of cost-saving services that are advantageous to both the banks and the clients. The benefits include reduced maintenance costs, closer proximity to the customer's residence, reduced transportation costs, shorter queues, inter- and intra-bank transfers, and enhanced accessibility for those previously frightened in branches, such as the poor and illiterate. Furthermore, the availability of cash flow, geographic coverage, affordability, and the security of agent banking services all contribute favorably and significantly to financial inclusion, making it the most effective method of promoting financial inclusion and women empowerment.

According to Ivatury et al.[79], the high costs of employing bank branches and other bank-based delivery channels to offer financial services to low-income people are a major impediment to this effort. Financial institutions may offer saving services in an economically viable manner by lowering fixed costs and encouraging users to use the service more frequently, producing more money. Additionally, as CGAP[80] demonstrates, agent banking is an excellent approach to providing low-income individuals with their first access to banking services by utilizing existing retail infrastructure while keeping pricing low. Agent banking prices, bill payment through agent banking, and financial services knowledge among the rural population are all positively correlated with one another, as is the case according to the study by Nisha et al.[81]. The research proves that using agents to provide banking services is a reliable and trustworthy way to bring banking services to previously unbanked communities. The report also highlights the significance of agent banking in providing financial services to people experiencing poverty in rural areas and fostering long-term growth. Agents now provide financial capacity interventions such as account opening, withdrawal and deposit services, loan repayments, payment and transfer processing, phone recharge, and e-money, as discovered by previous researchers. It was also been suggested that continual on-site monitoring and in-store training are required to guarantee agents are flexible, consistently branded, and following defined business processes. Muasya and Kerongo[82], the advent of agency banking has increased financial literacy among the unbanked, such as information on the importance of having a bank account to make deposits, saving excess cash for future use, and also becoming aware of the existence of various financial service providers who offer unique products to meet the diverse needs of their clientele". Financial inclusion for low-income people and current bank clients, especially in rural areas, is a priority for Bangladesh Bank. Hence the central bank has chosen this additional route. To ensure the proposed delivery channel's safety, security, and soundness, the Bangladesh Bank has drafted Agent Banking Guidelines that permit banks to engage in agent banking. Based on that, this study suggests the following hypotheses:

- H7: Agent banking moderates the relationship between Financial Inclusion (Access) and social empowerment in Bangladesh.
- H8: Agent banking moderates the relationship between Financial Inclusion (Access) and economic empowerment in Bangladesh.
- H9: Agent banking moderates the relationship between Financial Inclusion (Usage) and social empowerment in Bangladesh.
- H10: Agent banking moderates the relationship between Financial Inclusion (Usage) and economic empowerment in Bangladesh.
- H11: Agent banking moderates the relationship between Financial Inclusion (Quality) and social empowerment in Bangladesh.
- H12: Agent banking moderates the relationship between Financial Inclusion (Quality) and economic empowerment in Bangladesh.

Thus, the proposed conceptual model will be as per **Figure 1**:

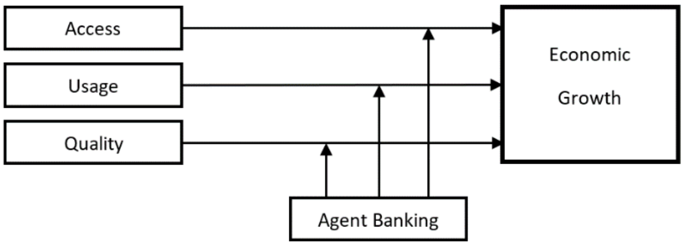

Figure 1. The conceptual model.

3. Methodology

3.1. Design

This study employs a quantitative research design to investigate the complex relationships between financial inclusion, women's empowerment, and the moderating effect of agent banking in rural Bangladesh. The study integrates the principles of partial least squares structural equation modeling (PLS-SEM) to assess the hypothesized relationships and interactions among the latent and observed variables.

3.2. Sample and procedure

According to World Bank data from 2019, women comprise 50% of Bangladesh's population. Around 65% of Bangladesh's total population lives in villages, where agriculture is most households' primary food source and income. Although women and girls make up most of the world's poorest billion, 81 million are Bangladeshis. They are often the most marginalized and poorest of the poor because of their limited access to resources, economic vulnerability, and subordination within patriarchal societies due to socioeconomic inequality[83]. The target demographic for this study is women aged 25 to 40 in rural Bangladeshi areas, namely; Dakshin Sakuchia, Hazirhat, Monpura, and Uttar Sakuchia. Thirty-seven thousand people make up the study's population. As a result, the sample size for this study was established using the method proposed by Krejcie and Morgan[84]. As a result, 250 represents the sample size for a population of 37000. Evidence has shown that non-response issues may arise during the data collection, which was determined using Krejcie and Morgan's table. In addition, Alreck and Settle[85] urged researchers to choose larger sample sizes to produce accurate results because a smaller sample size than initially anticipated may lead to sampling error. To overcome this challenge; the calculated sample size was doubled to account for potential sampling errors that could arise during the sampling procedure[86]. Then, 500 questionnaires were distributed to the potential informants via email. After several telephone and email reminders, 408 usable responses were received (with a response rate of 81.6%).

3.3. Measures

In this investigation, a questionnaire survey was employed to gather data to evaluate the suggested model's associations. The metrics for this study were developed after analyzing the literature above. The process began with the development of an English-language questionnaire. It was then translated into Bangla and back into English to alleviate concerns regarding the accuracy of the measurements. Sixteen measures were used, adapted, and modified from Cámara and Tuesta[87] and Sharma[88]. Likewise, agent banking was measured using ten items adopted and adapted from Semahegne[89]; Mahmood and Sarker[90]; Malek et al.[91,92] Chude and Chude[93]; Achugamonu et al.[94]; Khalid et al.[95]. The dimensions of women empowerment (economic empowerment and social empowerment) were investigated using ten items adopted from Malhotra et al.[96]; Biswas and Kabir[97]; Malhotra and Schuler[98]; Schuler et al.[99]; Anyanwu et al.[100]; Semahegne[89]; Yadav and Saxena[101]; Bhatia and Singh[102].

3.4. Statistical analysis and results

The Partial Least Squares Structural Equation Modeling (PLS-SEM) approach was employed for data analysis, as proposed by Hair et al.[103]. PLS-SEM has a variety of traits that make it popular in management research. Given that it exhibits more statistical power than the covariance-based PLS-SEM[104] when used with small sample sizes and complex models[105]. It is reasonable, given that there were 500 instances in the sample size for the present research.

The suggested PLS-SEM model is evaluated in this study in two parts[106]. Initially, a reliability test was conducted to assess the internal consistency of scale items. Confirmatory factor analysis was then used to examine the concept validity, including convergent validity and discriminant validity (CFA). According to Hair et al.[107], convergent validity is attained when all items are statistically significant and have loadings of 0.70 or above, while the consistency reliability (CR) and Cronbach's alpha (α) must be over 0.70. The average variance extracted (AVE) must be higher than the 0.50 generally recognized cut-off value[107]. Second, the structural model was examined, and the model's R2, effect size, and predictive usefulness were assessed. Finally, bootstrapping was performed to validate the model.

Following the exclusion of ten items (A7, A8, A9, U15, U16, Q24, Q21, Q26, Q22, AB33) with loading below 0.70, **Table 1** demonstrates that all remaining items were loaded for a particular construct if the loading on this construct was higher than the other constructs (as shown in **Figure 2**), thereby confirming the construct's validity.

Table 1. Loadings and cross loadings.

	Access	Agent banking	Economic empowerment	Quality	Social empowerment	Usage
A1	0.873	0.066	0.649	0.608	0.584	0.553
A2	0.847	0.047	0.631	0.602	0.544	0.517
A3	0.829	0.037	0.567	0.590	0.515	0.552
A4	0.783	0.052	0.487	0.644	0.584	0.635
A5	0.701	0.087	0.482	0.576	0.542	0.575
A6	0.575	0.063	0.312	0.434	0.348	0.390
AB28	0.041	0.759	0.114	0.046	0.114	0.052
AB29	0.055	0.597	0.067	0.037	0.087	−0.006

Table 1. (*Continued*).

	Access	Agent banking	Economic empowerment	Quality	Social empowerment	Usage
AB30	0.062	0.766	0.135	0.016	0.118	0.008
AB31	0.058	0.556	0.000	0.022	0.107	−0.023
AB32	0.053	0.743	0.064	0.070	0.099	0.039
AB35	0.033	0.794	0.083	0.000	0.091	0.033
AB36	0.071	0.687	0.080	0.061	0.088	0.027
EE40	0.570	0.142	0.841	0.549	0.661	0.516
EE41	0.588	0.099	0.900	0.544	0.573	0.515
EE42	0.563	0.070	0.725	0.543	0.748	0.557
EE38	0.597	0.096	0.899	0.526	0.570	0.502
Q17	0.645	0.136	0.596	0.836	0.573	0.597
Q18	0.632	0.051	0.577	0.839	0.537	0.586
Q19	0.580	−0.003	0.512	0.796	0.508	0.593
Q20	0.604	0.004	0.512	0.805	0.555	0.611
Q23	0.573	0.051	0.486	0.783	0.546	0.562
Q25	0.566	−0.019	0.440	0.780	0.502	0.556
Q27	0.409	0.033	0.292	0.529	0.373	0.414
SE43	0.479	0.109	0.541	0.510	0.724	0.570
SE44	0.493	0.163	0.537	0.455	0.806	0.572
SE45	0.497	0.121	0.513	0.537	0.794	0.583
SE46	0.546	0.085	0.572	0.519	0.743	0.550
SE47	0.570	0.068	0.725	0.525	0.742	0.544
U10	0.589	0.017	0.498	0.621	0.548	0.794
U11	0.531	0.031	0.523	0.569	0.548	0.738
U12	0.529	0.047	0.459	0.534	0.589	0.775
U13	0.490	0.038	0.413	0.526	0.552	0.773
U14	0.464	−0.024	0.428	0.471	0.536	0.666

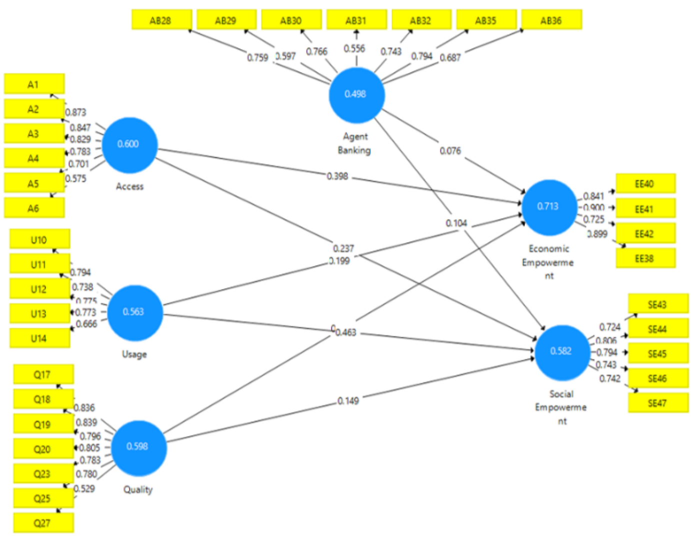

Figure 2. Measurement model.

Also, the findings from the convergent validity study, presented in **Table 2**, demonstrated strong convergent validity, with all CR values falling between 0.865 and 0.911 and Cronbach's alpha values ranging from 0.805 to 0.885. Moreover, the AVEs were all within the advised ranges, ranging from 0.498 to 0.713.

Table 2. Convergent validity analysis.

Construct	CA	CRs	AVE
Access	0.863	0.899	0.600
Usage	0.805	0.865	0.563
Quality	0.885	0.911	0.598
Agent banking	0.831	0.872	0.500
Economic empowerment	0.863	0.908	0.713
Social empowerment	0.819	0.874	0.582

According to discriminant validity, the value of the inter-correlations across constructs must be less than the value of the square root of one construct's AVE[108]. A construct must be capable of capturing more variance among its elements than it does among those included in the model. The square roots of the AVE for each construct are greater than their corresponding inter-correlations, as seen in **Table 3**.

Table 3. Discriminant validity analysis.

Construct	Y1	Y2	Y3	Y4	Y5	Y6
Access (Y1)	0.775	-	-	-	-	-
Agent banking (Y2)	0.074	0.705	-	-	-	-
Economic empowerment (Y3)	0.689	0.121	0.844	-	-	-
Quality (Y4)	0.747	0.050	0.642	0.773	-	-
Social empowerment (Y5)	0.678	0.143	0.758	0.668	0.763	-
Usage (Y6)	0.696	0.030	0.621	0.728	0.740	0.751

Model fit is evaluated for CFA to validate the measurement. Once the model fit is done, the path models among the latent variables are assessed. Based on **Tabel 2** convergent validity with a value of 0.805–0.885 and **Table 3**, discriminant fact with a value of 0.705–0.844 is fulfilling the criteria of the fit index, namely 0.70 or above[107]. Heterotrait-Monotrait (HTMT) was the second approach to the validity of discriminants. Compared to Fornell Larcker, this approach is the superior strategy. HTMT values must be below 0.90, according to Henseler et al.[109]. For this study, the upper threshold value was less than 0.90, which complies with the discriminant validity. Therefore, the validity and reliability evaluations so validate the measurement model.

The next stage is to confirm that the structural model is valid if the calculation model is in place. According to Chin[110] , the structural model provides a conceptual foundation for a set of structural equations that evaluate the inner route model. The following key metrics were utilized to evaluate the structural model in this study: Coefficient of determination (R^2) for endogenous variable, effect size (f^2), prediction relevance (Q^2), and multicollinearity (inner VIF), path coefficient (β)[105].

The coefficient of determination (R^2) was calculated to determine whether the suggested model is appropriate and validate the study hypotheses. According to Chin[111], this coefficient exhibits three levels of prediction (0.10 is weak, 0.33 is moderate, and 0.67 is substantial). The results show that FI and AB may account for 53.3% and 61.8% of the variance in economic and social empowerment, respectively, within the significant range.

Table 4. R-square result.

Construct	R square	R square adjusted
Economic empowerment	0.533	0.528
Social empowerment	0.618	0.614

The following criterion assesses the effect size (f^2), which is complementary to R^2, where it examines the effect sizes of the impacts of specific latent variables on the dependent latent variables[110]. The impact size was computed by using f^2. The value between 0.00 and 0.15 indicates a small-scale effect, whereas the values between 0.15 and 0.35 show a medium effect, while the values above 0.35 suggest a significant impact[112]. Hence, the effect size of economic empowerment and access, usage, and quality are 0.132, 0.035, and 0.030, respectively, and the effect size of social license and permit, use, and quality is 0.057, 0.234, and 0.021, respectively. The effect sizes (f^2) are tabulated in **Table 5**.

Table 5. Effect sizes of the latent variables.

Construct	Y3	Y5
Access (Y1)	0.132	0.057
Agent banking (Y2)	0.012	0.028
Economic empowerment (Y3)	-	-
Quality (Y4)	0.030	0.021
Social empowerment (Y5)	-	-
Usage (Y6)	0.035	0.234

A blindfolding test measured the (Q^2) value and yielded the model's predictive relevance. The model evaluates a good match and strong statistical significance when the Q^2 values exceed zero[107]. **Table 6** displays the Q^2 value of financial inclusion, which is 0.375 for EE and 0.363 for SE, indicating that the model has adequate predictive accuracy.

Table 6. Predictive quality of the model.

Construct	SSO	SSE	$Q^2 = 1 - \text{SSE/SSO}$
Economic empowerment	1608.000	1005.230	0.375
Social empowerment	2010.000	1280.771	0.363

Lastly, the PLS-SEM method and Bootstrapping in smart PLS-SEM were used to evaluate the hypothesized associations (as shown in **Figure 3**). 500 samples were employed, with several cases equivalent to the observation of 402 as stated by Hair et al.[107]. The path coefficient, *t*-values, and bootstrapping findings are provided in **Table 7** as follows.

Table 7. Hypotheses testing.

H	Path coefficient for direct effect	Original sample (O)	Sample mean (M)	ST	*T* values	*P* values
H1	Access ≥ SE	0.236	0.220	0.053	4.423	0.000
H2	Access ≥ EcE	0.397	0.388	0.059	6.753	0.000
H3	Usage ≥ SE	0.436	0.450	0.056	7.836	0.000

Table 7. (*Continued*).

H	Path coefficient for direct effect	Original sample (O)	Sample mean (M)	ST	*T* values	*P* values
H4	Usage ≥ EcE	0.177	0.183	0.062	2.868	0.005
H5	Quality ≥ S E	0.192	0.186	0.059	3.230	0.002
H6	Quality ≥ EcE	0.231	0.229	0.058	3.987	0.000

Notes: *T*-values > 1.96* ($p < 0.05$); *t*-values > 2.58** ($p < 0.01$); bootstrapping based on n = 600 subsamples.

When a link between an independent variable and a dependent variable changes due to the value of a moderator variable, this is known statistically as moderation[113]. Moderating variables is also necessary to determine if two variables relate similarly across groups. A moderating model often focuses on "when" or "for whom" a variable substantially explains or influences an outcome variable[114]. The findings show that agent banking moderates the relationship between financial inclusion (access, usage, and quality) and women's empowerment (economic and social empowerment), as illustrated in **Table 8**.

Table 8. Hypotheses testing.

H	Path coefficient for the moderating effect	Original sample (O)	Sample mean (M)	ST	*T* values	*P* values
H7	Access*AB ≥ SE	0.108	0.099	0.052	2.059	0.041
H8	Access*AB ≥ EcE	0.078	0.086	0.059	1.320	0.189
H9	Usage*AB ≥ SE	−0.184	−0.170	0.066	2.775	0.006
H10	Usage*AB ≥ EcE	−0.122	−0.119	0.059	2.063	0.041
H11	Quality*AB ≥ SE	0.158	0.147	0.058	2.694	0.008
H12	Quality*AB ≥ EcE	0.125	0.114	0.072	1.738	0.084

Notes: *T*-values > 1.96* ($p < 0.05$); *t*-values > 2.58** ($p < 0.01$); bootstrapping based on n = 500 subsamples.

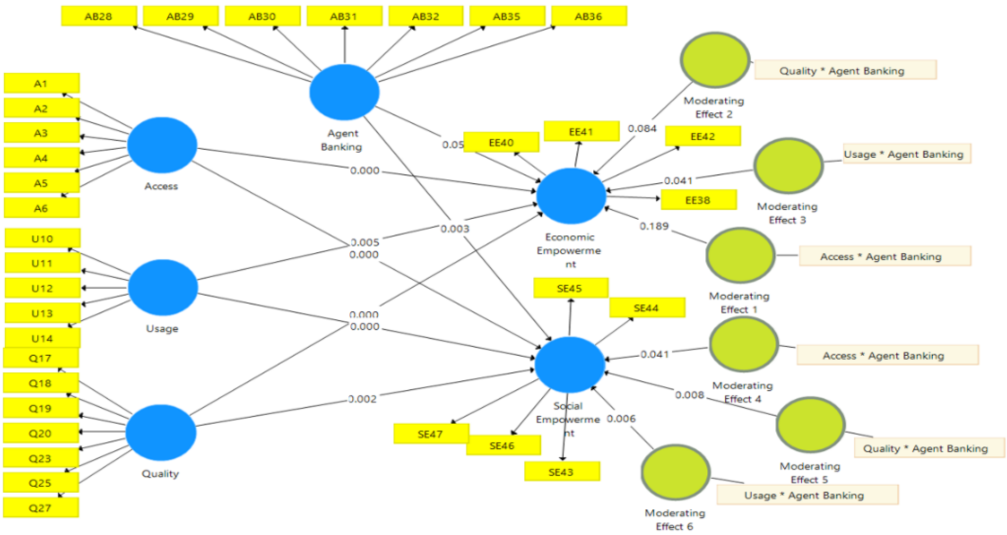

Figure 3. Structural model.

4. Discussion and implications

It is the first empirical research examining the relationship between FI, AB, and EE. The recent findings add to the body of literature on sustainability by employing an empirical methodology with practical and theoretical implications and opening up new topics for future study.

4.1. Theoretical implications

This study generally discovered empirical support for the theoretical connections suggested in the research framework. The six key direct and important indirect hypotheses and the research's academic contribution are listed below. Past studies on the linkage between financial inclusion and women empowerment reported mixed results[20,21]. Meanwhile, some other studies revealed consistent findings between financial inclusion and women empowerment[6,17–19].This current study was motivated by the recommendations from Moghavvemi et al.[72], which suggested a moderating variable to be included in determining the relationship between the two variables, namely financial inclusion and women's empowerment. Specifically, the moderating variable chosen in this study is agent banking. Besides the addition of a moderating variable, this current study was also conducted in a rural Bangladesh area which has not received much attention from previous studies as posited by previous researchers: Belayeth Hussain et al.[16], Hussain and Jullandhry[18], George and Thomachan[56], Hussain and Haque[57], where most studies on the same variables were conducted in the US or other developed countries. Considering the suggestions from Barasa & Lugo[15], Hendriks[17], Siddik[19], Bangladesh was chosen as it is a developing country, and limited studies have been done on the effect of financial inclusion on women's empowerment in this region. Therefore, this study bridges the gap in the current field of research outside the western nation. Consequently, South Asian nations want to go a long way toward raising the prominence of country-based research in the subject under consideration. More precisely, this study backs up the claims made by Duflo, E.[115], Yaya et al.[116], and Yount et al.[117] that women empowerment may lead to competitive advantage and long-term survival, hence enhancing economic growth through the implementation of financial inclusion.

As mentioned earlier, agent banking is selected as a moderating variable in this study as it is crucial in ensuring the successful implementation of financial inclusion, consequently empowering women in rural Bangladesh. In other words, ineffective agent banking and its incompatibility with financial inclusion goals may have unfavorable outcomes.

Finally, the study presents empirical data to support the theories of public good, labor market theory, and agency theory. The general good idea contends that providing formal financial services to the entire population and maintaining unrestricted access to finance for everyone should be considered public goods for the benefit of all community members. Individuals cannot be barred from utilizing formal financial services as a public benefit, and people cannot be barred from having access to financial services[61]. This theory includes all members of society irrespective of gender, economic status, or position. Everyone should be given equal opportunity to access all financial services and perform transactions.

Furthermore, financial service providers, such as financial institutions, will endure the expense of providing financial services as a sunk cost of doing banking business. As a result, according to this view, financial inclusion as a "public benefit" is free and has no cost to consumers of formal financial services. Moreover, the fundamental assumption of labor market theory is that female employees are over-represented in some industries and occupations. Women typically earn less than male laborers and hold lesser status and influence. In line with the labor theory, the participation of women in social production. Only with the formation of public ownership of the means of production and the elimination of the exploitation of one man by another are the emancipation of women and their complete equality with men feasible[118]. The findings in this example suggest that when financial inclusion (access, usage, and quality) is incorporated into and absorbed through agent banking, women in rural regions will learn the knowledge, confidence, and life skills required to navigate and adapt to an ever-changing environment. Applying this strategy not only assists women in reaching their potential but also breaks intergenerational cycles of poverty and disadvantage. In summary, this study discovered empirical evidence that women empowerment could be described by aligning two strategies, financial inclusion, and agent banking, within the premises of labor market theory, agency theory, and public good theory.

4.2. Practical implications

The results of this study show how context-specific requirements, issues, and priorities must be addressed to facilitate women's agency regarding financial inclusion. This research has provided a comprehensive knowledge of women's empowerment and the effects of financial inclusion in women's lives. This holistic understanding will guide relevant stakeholders, including researchers, banks, development practitioners, and policymakers, to examine the contribution of financial inclusion to women's empowerment. The findings of this study have identified that women's context-specific challenges of accessing and using financial inclusion and agent banking can neutralize the positive impacts in their lives. The following considerations from the study will contribute to localizing the SDGs, particularly SDG5, to help achieve gender equality and empower women and girls through financial inclusion and agent banking-supported empowerment and development initiatives.

Moreover, the results of this research will contribute new insights into the development of competitiveness for women in Bangladesh. Thus, the study's empirical significance can be summarized in three ways. First, stakeholders and policymakers in various governments, particularly in Bangladesh, can strengthen women's empowerment efforts by better understanding what promotes women's empowerment. Second, if a positive correlation between financial inclusion and women empowerment is established, efforts to expand financial access, usage, and quality may be increased. According to Mehrotra and Yetman[119,120], financial inclusion's impact may be contingent on how monetary the MDGs implement access efforts. Thus access efforts are critical and may be enhanced. It is supported by Chibba[121] and Demirguc-Kunt et al.[69], who demonstrated in their study that access to financial services enables the poorest and most vulnerable members of society to escape poverty and contributes to social inequality reduction.

Finally, this research outcome will be used by developing countries in general, and Bangladesh in particular, to combat excessive poverty, as specified by global development institutions, as an excellent strategy for reducing poverty by including the excluded segment of informal financial services via an efficient market-based solution. Simeon et al.[122] concluded in a study of Mexican households that reducing financial exclusion is critical for women's empowerment. They asserted that households with bank accounts consume more, accumulate more assets, and are likelier to complete high school. The ability to open a bank account or obtain a bank card positively correlates with income, education, and wealth in most transition economies[123].

5. Limitations

The study used a self-reported methodology to collect data from women aged 25 to 40 in rural Bangladesh. While this approach facilitated data collection, it introduced the potential for systematic bias. This bias might arise when the same respondents provide information on independent and dependent variables, possibly affecting the accuracy and reliability of the findings. The study's findings are specific to the surveyed group of women in the selected rural areas of Bangladesh. It restricts the generalizability of the results to a broader context, such as urban areas or other regions. The text mentions that the research design followed established practices in management research, referencing specific authors and works. It suggests a degree of adherence to existing frameworks, potentially limiting the exploration of novel approaches or viewpoints. While the study emphasizes the significance of women's perspectives in assessing banks' conduct, it must explicitly address potential limitations arising from this singular focus. A broader perspective might provide additional insights into the study's subject matter. The text suggests various avenues for future research, including comparative studies between rural and urban Self-Help Groups (SHGs) and an analysis of the impacts of governmental and financial institution strategies. While these suggestions are insightful, they also indicate that the current study needs to cover these areas in depth. The text hints at exploring the relationships between financial literacy, financial inclusion, financial capability, and investment behavior. However, this potential avenue remains to be explored in the current study, leaving gaps in the analysis. The study primarily focuses on women in rural areas and needs to delve deeper into the financial capability of urban residents, particularly professionals. It limits the study's ability to provide a comprehensive picture of economic empowerment across different population segments.

Author contributions

Conceptualization, TS and FI; methodology, TS, FI and NS; software, TS; validation, TS, FI and NS; formal analysis, TS; investigation, TS; resources, TS and FI; data curation, TS, FI and NS; writing—original draft preparation, TS; writing—review and editing, TS, FI and NS; visualization, TS, FI and NS; supervision, FI and NS; project administration, TS, FI and NS. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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