STATUS AND DETERMINANTS OF FINANCIAL INCLUSION AMONG RURAL HOUSEHOLDS: AN EMPIRICAL ANALYSIS

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Abstract

Several empirical studies have evaluated financial inclusion (FI) at the national level globally. However, limited research exists on household-level FI in Northeast India using a standardized index. This study uses primary data collected from rural households in the Barak Valley region of Assam to assess the level of FI and identify its determinants. the Composite Financial Inclusion Index (CFII) is constructed using multiple dimensions like availability, usage, and quality as prescribed by the Reserve Bank of India (RBI). Binary variables are used to represent qualitative information for the construction of CFII and living standards. A logistic-transformed linear regression model is utilized to identify the key factors that drive FI among rural households. The study found that the level of FI among select rural households is low compared to the national average figure reported by RBI in 2022. The study further identifies income, education, standard of living, and profession as significant determinants of FI among rural households. However, demographic variables like religion have no impact on FI. Policymakers and regulators could use this finding to develop tailored policies. The limited number of household surveys conducted in a small geographical area of the region restricts the generalization of these findings.

Keywords: Financial Inclusion, Living Standard, Income, Barak Valley, Assam, Primary Data

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1. INTRODUCTION

Over the last decade, an increasing number of empirical studies have highlighted the pivotal role of financial inclusion (FI) in augmenting household income and eradicating poverty and income inequality. However, despite the growing number of empirical studies worldwide, there is a persistent need to identify the key determinants of FI in rural households in India, particularly in the Barak Valley region of Assam. While previous studies have primarily concentrated on investigating the status of FI and its impact on economic growth in India, empirical studies have yet to delve into the micro-

level factors contributing to its success. To that end, this study is uniquely designed to evaluate the level of FI among rural households and to identify the significant factors that affect the degree of FI in the Barak Valley region of Assam, using comprehensive household-level datasets. Studies claimed that the availability of banking and financial services that low-income families and small and medium-sized businesses may use would significantly boost their likelihood of making future purchases and would result in FI (Kim et al., 2018). Li (2018) further states that the ease of access to the financial markets has a number of advantages for the welfare of less privileged households. Also, FI may effectively enhance the distribution of financial resources for inadequate government programs and lower the cost of waiting, travelling, and other expenditures by encouraging digitalized payments and transactions.

However, FI in India is less than in other emerging economies. According to the Global Findex Database Report (Demirgüc-Kunt et al., 2022), India's FI score is 44.58, which is much lower than that of other emerging nations. The Northeast India lags much behind other regions (Das & Guha, 2015). According to the CRISIL's (2018) report, except Tripura and Sikkim, all the other states in the northeast region are among the bottom 10 in terms of financial inclusiveness. Assam's level of FI is 47.9, which is far below the national average. Additionally, the FI score of the districts of the Barak Valley region is even lower than the state average. These statistics highlight the need for greater efforts towards improving FI in the region.

Moreover, the Assam Human Development Report in 2014 (OKD Institute of Social Change and Development, 2014) reveals a considerable level of deprivation in terms of consumption, asset ownership, and other dimensions of living standards in Assam, particularly in the Barak Valley region. When it comes to FI, the underprivileged segment of society, such as low-income rural households, should be given particular attention. In contrast to rural regions, providing financial services has not been as problematic in urban areas. People from underdeveloped or rural areas need competent banking and financial services in order to benefit from modernization (Lal, 2017).

The importance of FI in fostering economic growth is acknowledged both conceptually and empirically. Providing underprivileged individuals with affordable financial services such as savings accounts, credit, and payment options can significantly impact their economic prospects. By enabling them to invest in their businesses and improving their ability to manage their finances, such as paying bills on time or saving for the future, they can generate income and grow their businesses. This, in turn, leads to increased investment and economic growth (Afolabi, 2020; Demirgüc-Kunt & Klapper, 2013). FI can also reduce financial risks for unbanked and underbanked people, protect savings, and smooth consumption (Sotomayor et al., 2018; Yah & Chamberlain, 2018). Therefore, FI fosters overall economic growth, narrows the income gap, and eradicates poverty (Adedokun & Ağa, 2021; Honohan, 2004). Moreover, it is essential to assess the role of FI in improving the social well-being of households in the Barak Valley region. According to Ofosu-Mensah Ababio et al. (2021), low FI is primarily caused by low living standards, poor health, high levels of illiteracy, and lack of freedom and well-being. So, it is important to take measures to improve people's standard of living and provide financial education programs to increase the FI level of the country. So far, from the existing literature is concerned, we have found that there is a dearth of systemic studies concentrating on FI from the perspective of the rural households of the Barak Valley region as well, and very few systematic studies have been found that assessed the relationship between FI and standard of living. Against this backdrop, the present study aims to investigate the relationship between FI and the standard of living among the rural households of the Barak Valley region of Assam.

This study has contributed significantly to the empirical literature on FI among rural households in the Northeast region. Firstly, it is the first study to construct the Composite Financial Inclusion Index (CFII) suggested by the Reserve Bank of India (RBI). This index provides a comprehensive measurement of FI levels at the rural household level in the region. Secondly, the study highlights the low level of FI among rural households in the Barak Valley region of Assam. This region is also deprived of various social aspects, such as education and healthcare, making the need for FI even more pressing. Thirdly, unlike earlier studies that only considered account ownership, this study has examined multiple dimensions of FI, including access, usage, and quality. This approach provides a more in-depth understanding of FI. Fourthly, the study uses a logistic-transformed linear regression model to identify significant factors responsible for FI among rural households in the Barak Valley region of Assam. This approach provides more robust results. The study can serve as a wake-up call for regulators and practitioners to address the low FI in the region and promote financial literacy and inclusion. The study suggests a comprehensive approach is necessary to improve rural households' income, education, and living standards. This includes developing rural infrastructure, establishing vocational training centres and schools, providing farmers with access to modern farming techniques, promoting crop diversification, facilitating access to credit, ensuring quality healthcare services, and encouraging entrepreneurship.

The rest of the paper is structured as follows. Section 2 reviews the relevant literature. Section 3 discusses the methodology adopted in this study. Section 4 narrates the results and discussion. Section 5 provides the conclusion and recommendations.

2. LITERATURE REVIEW

2.1. Concept of financial inclusion

Lenka (2021) examines the financial sector in terms of two key concepts: financial development (which includes financial depth and liquidity) and financial access (e.g., FI). Financial development aims to eliminate information asymmetry, promote market inclusivity, stimulate competition, and reduce transaction costs in financial systems by combining financial innovation with institutional development (Ibrahim & Alagidede, 2017). It explains how financial markets

and institutions are expanding and how foreign capital flows help to lower the costs of information, transactions, and enforcement. On the other hand, FI aims to provide affordable, accessible, and reliable financial services to underbanked and unbanked individuals, which can significantly impact the economy (Sarma, 2015; Siddik et al., 2019). It is imperative to note that a nation can achieve financial development despite the possibility of a significant proportion of its populace not utilizing formal financial services. This highlights that financial development is not solely determined by the number of individuals using formal financial services. Other crucial factors, such as the efficiency of the financial system, the accessibility of financial products, and the regulatory framework, play a vital role in determining financial development (Lenka, 2021; Sarma, 2008). Despite being two related concepts, financial development, and FI are distinct from each other. Both of these concepts foster economic growth in different ways (Li & Wong, 2018). FI has been defined in several ways in the existing literature without a definite consensus (Akileng et al., 2018; Demirgüc-Kunt et al., 2017; Nguyen, 2021). However, the primary focus of FI is to ensure universal access to formal financial services (Sarma & Pais, 2011). Providing sustainable financial services to underprivileged segments reduces poverty and promotes economic growth. Financial services must be accessible to all, regardless of socioeconomic status, and designed to meet unique individual and community needs (Andrianaivo & Kpodar, 2011; Sarma, 2008).

Savings, insurance, credit, and payment are listed as examples of financial services in most studies (Ghosh & Ghosh, 2014). However, the quality of services, ease of access to facilities, and use of digital technologies are also considered important (Ozili, 2018). Financial exclusion is associated with challenges in obtaining access to various financial services, such as insurance, savings, credit, and banking. Factors contributing to FI or exclusion include inflation, bank concentration in banking, credit, saving and insurance, self-exclusion, illiteracy, adverse demographic and geographic conditions, per capita income, and internet access (Sinclair, 2001). Poverty and social exclusion are the primary causes of financial exclusion. Financial access becomes a barrier for marginalized and disadvantaged populations that lack access to social amenities or education (Bernheim et al., 2015). Therefore, FI is crucial in determining economic progress and has gained significant attention from scholars and policymakers. The concept has become globally recognized due to its potential to create opportunities for individuals and communities that the traditional banking system has underserved. Therefore, FI is a crucial tool for fostering economic growth and reducing poverty.

2.2. Status of financial inclusion

Since 2000, the concept of FI has gained popularity due to its impact on reducing poverty, which is crucial for any nation's economic prosperity. The World Bank Group recognizes FI as an essential enabler in reducing extreme poverty. Because of the advantages mentioned above, FI has become more important and has been adopted as an instrument for policymakers to fight poverty. According to World Bank (2022) report FI has been identified as an enabler for 7 of the 17 United Nations' Sustainable Development Goals (SDGs). These SDGs include removing poverty (SDG 1), reducing hunger and ensuring food security (SDG 2), promoting good health and well-being (SDG 3), fostering quality education (SDG 4), promoting gender equality (SDG 5), encouraging shared economic growth (SDG 8), and supporting innovation and sustainable industrialization (SDG 9). In order to promote the well-being of individuals, particularly in light of the COVID-19 outbreak in Africa, FI, through digital financial services, can be an effective approach to reducing community-based transmission (Ifedoria et al., 2022). However, this objective can be challenging to achieve for the weakest and most vulnerable segments of society without their active participation in the formal financial system. As a result, the agenda includes a comprehensive set of objectives to advance social justice and foster inclusive and participatory decision-making for all. To achieve the SDGs, it is crucial to include everyone in society, regardless of their socioeconomic status, which will ultimately enhance people's standard of living (Maity, 2023a). Governments, researchers, and economic observers recognize FI as a vital instrument for alleviating poverty, promoting economic growth, creating employment, and enhancing people's welfare and standard of living (Abimbola et al., 2018).

However, globally, 1.7 billion adults do not have access to a bank account, and about half of the unbanked people are women in poor households in rural areas (Demirgüc-Kunt et al., 2022). Research reveals that lack of account ownership among the adult population is the root cause of the lack of FI (Demirgüc-Kunt et al., 2017). Owning formal bank accounts is sometimes difficult and expensive for low-income people and households (Karlan et al., 2016; Soumaré et al., 2016). In light of the same, the Government of India has taken initiatives like *Pradhan Mantri Jan Dhan Yojana* (PMJDY) to make essential financial services, such as basic savings and deposit accounts, easily accessible to all citizens of the country at an affordable cost. The introduction of PMJDY in 2014 resulted in the opening of 420 million bank accounts as of 2021, with women holding 53.26% of those accounts. However, empirical findings documented that 55% of accounts held by women are inactive in India, signifying the existence of a gender gap (Pinto & Arora, 2021). In 2021, 76% of the global population had an account with a formal financial organization, such as a credit union, a microfinance institution, or a mobile money service provider. Account ownership increased from 50% of the population to 76% from 2011 to 2021 (Demirgüc-Kunt et al., 2022). It boosted FI in India among marginalized sections of society, including women. However, the mere opening of a bank account does not ensure the effective use of financial services as an account serves only as the primary gateway to the formal banking and financial systems. Despite a positive increase in account ownership and usage, only around half of the adults in emerging countries could access extra funds within 30 days if faced with an unforeseen expenditure. With the advent of mobile phones and the internet, the world has witnessed a transformation in people's lifestyles,

work culture, and communication patterns. This progress has also paved the way for addressing the problem of financial exclusion. In underdeveloped nations, digital financial services that operate via mobile devices have brought about a revolution in the financial sector by providing access to the financially underprivileged and marginalized individuals who were previously excluded from the mainstream financial system (Andrianaivo & Kpodar, 2011; Kim et al., 2018). By filling the existing financial infrastructure gaps, mobile devices have considerably improved FI by enabling access to banking services (Chatterjee, 2020). For example, the world's most popular mobile-based banking service, M-Pesa (Jack & Suri, 2014). Developing nations must use mobile technology, well-designed financial products and revenue models, low-cost transactional platforms, and a favourable regulatory framework to attract unbanked people into the formal financial net (Mas & Radcliffe, 2011). Sustainable economic growth and positive wealth creation are made possible through inclusive finance (Dahiya & Kumar, 2020; Kim et al., 2018; Sethi & Acharya, 2018; Lenka & Sharma, 2017). FI has been recognized as a critical instrument for fostering economic growth and lowering poverty.

While exploring the level of FI in Northeast India, Bhanot et al. (2012) pointed out that the level of FI in Northeast India is very low. Assam's level of FI is below average (Bharadwaj, 2020). According to the Economic Survey of Assam, in 2022, 31.98% of people in Assam live below the poverty level (Government of Assam, 2022). Borgohain (2016) found that Assam, mainly rural Assam, has experienced difficulties in all three dimensions: usage, availability, and access, resulting in lower FI (Maity & Sahu, 2022).

2.3. Determinants of financial inclusion

Financial inclusion is important for the inclusive growth of any nation. FI has been related in previous research as a tool for inclusive growth. FI is a matter of great concern for both developed and developing countries. Examining the determinants of FI is crucial since FI is said to be the cornerstone of the financial industry's development, which significantly contributes to economic growth. A large number of studies have been found that identified and examined the various determinants of FI abroad as well as in India. Lotto (2018) examined the determinants of FI in Tanzania and found that the important variables influencing FI are gender, education, age, and income. Malik et al. (2021) found that FI's fastest-growing component is banking services, followed by penetration and usage. While identifying the determinants of FI, Chithra and Selvam (2013) found that among the socioeconomic factors, income, literacy, and population were significantly correlated with the degree of FI. Deposit and credit penetration strongly linked FI among the banking variables. However, there was no significant correlation between the credit-deposit ratio, investment ratio, and FI.

Bapat and Bhattacharya (2016) mentioned that the family type, present savings, age, and number of family members are the crucial determinants of FI. They also found that present savings positively affect FI, while family type, age, and family members negatively influence FI. Another study conducted by Kuri and Laha (2011) revealed that increased awareness of essential banking services, diversification of the rural non-farm sector, efforts to increase literacy among rural residents, and an increase in household assets are essential factors that have a significant impact on creating an environment that makes it easier to remove barriers to FI. Sahoo et al. (2017) mentioned that significant drivers of FI among tribal people were the number of years of schooling acquired by the head of the family, the size of privately held land, the household's total annual income, and engagement in the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). Kandari et al. (2021) concluded that FI was primarily measured by having a bank account, using a credit card, and using mobile banking. According to the study conducted by Raichoudhury (2020), the most significant factors influencing FI are generally income, infrastructure, and opportunities for employment. In a study, Bathula and Gupta (2021) revealed that workforce participation, income, and education significantly determine formal savings. Age and formal saving have a non-linear relationship. Positive relationships exist between formal saving and higher income, higher education levels, and workforce involvement. The study conducted by Dar and Ahmed (2021) demonstrated that several factors, including gender, age, education, and income, significantly affect the various FI indicators. These factors also have a significant impact on informal borrowing and saving. According to Salgotra et al. (2021), FI has a considerable relationship with education, health, and standard of living. FI is also crucial for raising people's standard of living. FI is also crucial for raising people's standard of living. Barik et al. (2019) also demonstrated that FI is crucial for raising people's standard of living. In this connection, several researchers such as Ranabhat et al. (2022), Ofori-Abebrese et al. (2020), Nandru et al. (2021), Audi et al. (2019), and Sakyi-Nyarko et al. (2022) have highlighted the positive and significant impact of FI on the social and economic wellbeing of households. FI also helps to minimize social exclusion (Maity, 2023a). Formal banking services provide access to and use of financial services, ultimately leading to inclusive growth and improvements in the socioeconomic position of vulnerable households. Vaidya et al. (2018) revealed that the percentage of literate people and population density in different districts of Himachal Pradesh significantly impact the degree of FI. Kumar Vaid et al. (2020) concluded that reach, acceptance, accessibility, availability, technology, financial knowledge, trust, and income all positively and significantly affect FI. In another study, Nandru et al. (2016) mentioned that several factors, including population size, gender distribution, branch penetration, and credit-to-deposit penetration ratio, significantly affect how well the FI initiative is implemented in South Indian states. According to the study conducted by Ozili (2018), financial innovation, poverty levels, financial sector stability, economic conditions, financial literacy, and regulatory frameworks that differ by nation all impact FI.

Assam, which occupies 2.8% of the nation's total land area and has a population of 2.57%, is situated in the nation's Northeastern region. Assam has always lagged behind the national average in

most FI metrics, and the difference between the national and state averages is growing over time. So, it is essential to identify the factors that influence FI in Assam. In this connection, various studies have been conducted to identify the determinants of FI in North East India as well as in Assam. The study conducted by Dutta et al. (2023) revealed that education is a crucial determinant affecting FI. Bhanot et al. (2012) pointed out that education, income, awareness, and knowledge about financial services are the important factors influencing FI in that region.

3. DATA AND METHODOLOGY

3.1. Sample design

The present study has been carried out considering the relevant data collected from household-level primary sources. The data was collected through questionnaires from rural households in the Barak Valley region. The Barak Valley region has three districts: Cachar, Karimganj, and Hailakandi. These three districts of Barak Valley are considered for the study because this region is lagging behind in terms of literacy rate as per the Assam Human Development Report (OKD Institute of Social Change and Development, 2014), which is one of the most important aspects for the overall development of any region and FI is considered as an important means for poverty eradication across the world. Moreover, according to the Assam Human Development Report (OKD Institute of Social Change and Development, 2014), there is considerable deprivation in consumption, asset ownership, and other dimensions of standards of living in Assam, particularly in the Barak Valley region. Also, understanding the status and determinants of FI facilitates effective strategies for expanding access, overcoming barriers, and promoting rapid and cost-effective delivery of financial services. The selection of the district is grounded in the reasons mentioned above.

The sample includes 212 respondents. The collected responses have been used to analyze the data. The final analysis was conducted based on the responses recorded in the questionnaire (n = 212).

Table 1. Demographic profile of the respondent

Profile	*Parameter*	*Frequency*	*Percentage (%)*
Religion	Hindu = 1, Muslim = 0	146	69%
		67	31%
Profession	Business = 1, Service = 2, Agriculture = 3, Daily wage = 4	48	22%
		44	21%
		74	35%
		47	22%
Education	Up to 9, More than 9	110	52%
		103	48%
Monthly income	Lower income = Up to Rs.21000, Higher income = More than Rs.21000	157	74%
		56	26%

Source: Authors' elaboration.

Table 1 summarises the demographic information collected from the survey respondents. The survey gathered details about their religion, profession, education, and monthly income. Most of the respondents were from rural areas in the Barak Valley region. The survey revealed that most respondents were Muslim (61%), while a significant number were Hindu (39%). Most respondents were engaged in agriculture (35%). The survey also found that most respondents had received education up to an average of 9 years (52%). The average monthly income of the respondents was Rs.21000. The data indicates that 74% of the respondents earned up to Rs.21000 monthly, while 26% earned more than Rs.21000.

3.2. Variable of the study

The researchers performed a logistic-transformed linear regression model, considering one response variable and five explanatory variables. This statistical analysis aimed to identify the relationship between the response variable and exploratory variables and to determine the degree to which the independent variables accounted for the variance in the dependent variable. The logistic transformation allowed for modelling a binary outcome variable, making it possible to estimate the probability of an event occurring based on the values of the independent variables. The response variable in the regression model is the CFII, calculated based on RBI methodology and is bounded between 0 and 1. Therefore, the linear regression model cannot be applied since the response variable is non-linear. So, we have transformed the response variable into a logistic form in *Ln[CFII / (1 – CFII)]*, and out of five exploratory variables, one variable, such as religion, is a dummy value where we have assigned "1" for Hindu religion and "0" for Muslim.

3.2.1. Response variable

In the current research, the CFII is utilized as a crucial metric for measuring the level of FI. This index is considered a dependent variable in the analysis and helps identify the factors contributing to FI. The CFII is constructed by following the RBI methodology. According to RBI methodology, CFII computation should encompass three significant parameters: usage, access, and quality, with different weightage attributed to each. Several related sub-dimensions are evaluated for each parameter. While developing the CFII, the highest weightage is given to usage parameters (45%), followed by access parameters (35%), and the quality aspect (20%). Usage parameter is constructed by taking the indicators like having a bank account or post office account, having a health or life insurance policy, visiting a bank account at least once a month, having a fixed

deposit in a bank or post office account, having recurring deposit account or systematic investment plan, getting government subsidies or benefit through direct benefit transfer, having any pension policy, taking loans and advances from the bank, making digital payments, transferring funds through internet banking, associated with self-help group (Yes = 1, No = 0 for all indicators). Access parameter is constructed by indicators like having smartphones with an internet connection, having any unified payments interface (UPI) apps, availability of bank branches in nearby locality, availability of microfinance institutions (MFI) branches in nearby locality, availability of automatic teller machines or customer service point in nearby locality, visiting of bank or insurance agent in nearby locality, convenience of visiting bank during office hours (Yes = 1, No = 0 for all indicators). Similarly, the quality aspect is constructed by taking the indicators like charging extra bank charges for issuing debit or credit cards, fixed deposit interest more than savings accounts, and post office providing banking services to customers (Yes = 1, No = 0 for all indicators). The ultimate value of CFII is between 0 and 1, with one representing total FI and zero representing complete financial exclusion among the target population. As a result, a comprehensive index-based FI assessment would help the policymakers in policy formulation, keeping track of the outcomes of government policies and programs related to FI, making necessary changes to its policies sensitive to actual needs, and focusing on lagging areas of FI so that special efforts may be made.

3.2.2. Exploratory variables

The living standard index (*LSI*) is computed following the methodology established by the Multidimensional Poverty Index (MPI) of the National Institution for Transforming India (NITI Aayog), Government of India. The standard of living is constructed by taking the weighted average of several non-financial indicators like cooking fuel type (liquefied petroleum (LPG) gas = 1, Firewood = 0), sanitation facility (Kacha = 0, Pakka = 1), drinking water facilities (Purified = 1, Raw = 0), housing type (Kacha = 0, Pakka = 1), electricity availability (Yes = 1, No = 0) and some other parameters related to health, education and child education like availability of adequate medical facility (Yes = 1, No = 0), presence of regular cash income (Yes = 1, No = 0), availability of child education (Yes = 1, No = 0). After that, the average value has been taken as the living standard index.

Religion (*Relg*) is a dummy value; we assigned "1" for Hindu and "0" for Muslim.

The education (*LnEdu*) is the total years of schooling is another independent variable considered for the analysis of the study. Thereafter, to normalize the absolute value, researchers have taken the log value of income.

The income (*LnInc*) is calculated in rupees based on the monthly family income of the respondent. Thereafter, to normalize the absolute value, researchers have taken the log value of income.

Profession of the respondents is considered for the analysis of the study where Business = 1, Service = 2, Agriculture = 3, and Daily wage = 4.

The measures of the above variables are summarised in Table 2.

Table 2. Definitions of the variables

Variables	*Symbol*	*Type*	*Measurement*
Composite Financial Inclusion Index	*Ln[CFII / (1 – CFII)]*	Dependent	Usage = 45%, Access = 35%, Quality = 20%
Living Standard Index	*LSI*	Independent	Cooking fuel type (LPG gas = 1, Firewood = 0), sanitation facility (Kacha = 0, Pakka = 1), drinking water (Purified = 1, Raw = 0), housing type (Kacha = 0, Pakka = 1), electricity availability (Yes = 1, No = 0) non-availability of medical facility (Yes = 0, No = 1), absence of cash income (Yes = 0, No = 1), non-availability of child education (Yes = 0, No = 1)
Religion	*Relg*		Hindu = 1, Muslim = 0
Education	*LnEdu*		Total years of schooling
Profession	*Profession*		Business = 1, Service = 2, Agriculture = 3, Daily wage = 4
Income	*LnInc*		Natural logarithm of monthly income Amount in Indian rupees

Source: Authors' elaboration.

3.3. Research methodology

The present analysis uses two different types of models to comprehensively analyse the data. The descriptive analysis model explores and reveals the information in the data by calculating percentages and averages. In contrast, the econometric model, specifically a logistic-transformed linear regression model, is utilized to identify the key factors that drive FI among rural households. This approach enables us to understand the data better and draw meaningful conclusions.

$$Ln[CFII/(1-CFII)] = \alpha + \beta_1 LnInc + \beta_2 LSI + \beta_3 LnEdu + \beta_4 Relg + \beta_5 Profession + \mu_i \quad (1)$$

where, α is the intercept term in the model, β_i is the slope coefficient of the ith independent variable and μ_i is the random disturbance term ($i = 1, 2, 3 \ldots 212$). *Ln[CFII / (1 – CFII)]* is a dependent variable in the regression model.

4. RESULTS AND DISCUSSION

As part of our study, we have utilized univariate descriptive statistics to analyse the distribution of the variables included. The results of our analysis are presented in Table 3, which indicates that the overall CFII score has an average of 0.49. This score suggests that the level of FI among selected rural households is lower (49.42) compared to the national average (56.6) reported by RBI in 2022. Our aim is to bring attention to the low FI levels among rural households of the Barak Valley region of Assam and encourage policymakers to take necessary measures to improve access to financial

services and resources in these communities. The standard deviation is 0.20, which indicates disparities among rural households regarding the CFII. The mean income (*LnInc*) value is 21.35, and the standard deviation is 5.23, indicating high disparities among the sample households in terms of income. The mean value of the level of education (*LnEdu*) is found to be 8.82 years of schooling among the sample respondents, and the value of standard deviation is 2.94, which also indicates high disparities in the level of education among the sample respondents of the Barak Valley region. The *LSI* mean value is 0.49, which indicates that the standard of living index of the Barak Valley region is moderate, and the standard deviation is 0.25, indicating disparities among the rural households of Barak Valley in terms of standard of living. It is important to note that the skewness values indicate that the distribution of variables is not significantly skewed. This information is crucial as it strongly implies that the data adheres to a normal distribution, making it easier to analyse and draw confident conclusions.

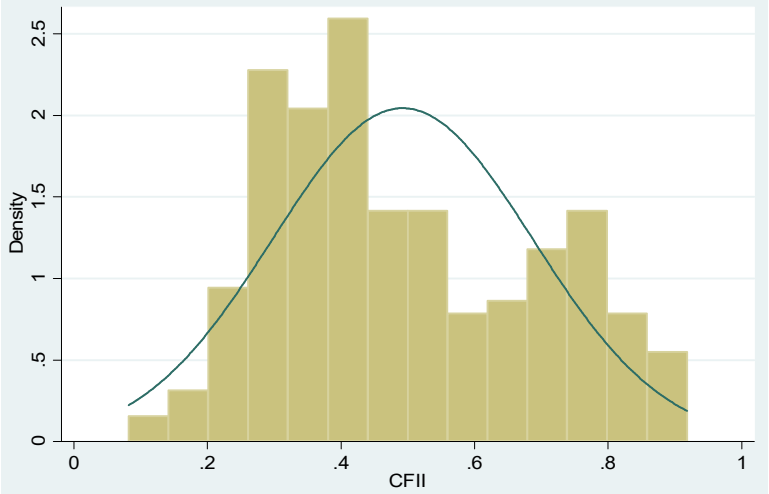
Table 3. Descriptive statistics

Measure	*CFII*	*Income*	*Education*	*LSI*
Mean	0.49	21.35	8.82	0.49
Median	0.45	15	9	0.88
Mode	0.77	15	8	1
Std. dev.	0.20	5.23	2.94	0.25
CV	0.40	0.24	0.33	0.51
Skewness	0.42	5.23	-0.64	-0.40

Note: CV — Coefficient of variation.
Source: Authors' elaboration.

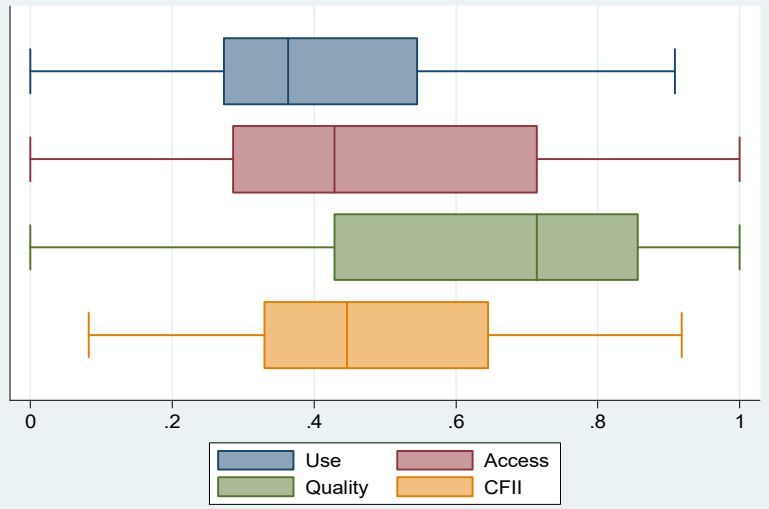
Figure 1 represents the CFII histogram, which shows that the data set is neither positively skewed nor negatively skewed. This indicates that the CFII distribution tends to follow the normal distribution.

Figure 1. Histogram of CFII



Source: Authors' elaboration using Stata 13.0.

Figure 2. Boxplot of CFII and its sub-dimensions



Source: Authors' elaboration using Stata 13.0.

In Figure 2, we use boxplots to comprehend better the CFII distribution, including its three sub-dimensions: uses, access, and quality. The CFII boxplot shows that the dispersion of the CFII is less than that of its sub-dimensions. This demonstrates that the distribution of the composite score for FI is

more stable across the sample respondents than its sub-dimensions. However, as indicated by the positioning of the median within the boxes, the distribution is not symmetric for all measures of CFII, including composite measures such as CFII. Figure 2 also reveals a difference in access, usage and quality dimensions of FI among the respondents. However, Figure 2 reports zero outliers across all measures of the CFII.

Table 4. Logistic transformed linear regression model result

Variable	*Coefficient*	*Sd. error*	*t-statistics*	*p-value*	*VIF*
LnInc	0.5128319	0.1004781	5.10	0.000*	1.54
LSI	0.9252377	0.1867704	4.95	0.000*	1.20
LnEdu	0.7475759	0.089048	8.40	0.000*	1.12
Relg	0.135365	0.092178	1.47	0.143	1.02
Profession	-0.1564093	0.0479105	-3.26	0.001*	1.47
Constant	-3.365176	0.4314963	-7.80	0.000*	
Dependent variable = *Ln[CFII / (1 – CFII)]* Number of observations = 212			F-statistics = 48.79 (5,207) Probability = 0.0000*		
R-squared = 0.5409			Adjusted R-squared = 0.5299		
Breusch–Pagan/Cook–Weisberg test for heteroskedasticity			Probability > Chi^2 = 0.6797		
Skewness/Kurtosis tests for normality			Probability > Chi^2 = 0.1419		

*Note: * Significance at a 1% level. VIF — variance inflation factor.*
Source: Authors' elaboration.

The logistic transformed linear regression analysis has provided valuable insights into the relationship between the dependent variable and the independent variables (see Table 4). The results show that the model can explain 52.99% of the variation in the dependent variable, which is a significant proportion. This suggests that the model is a good fit for the data and can be used to make accurate predictions. Furthermore, the F-statistics value of 48.79 indicates that the model is statistically significant at a 1% significance level, lending further credence to its usefulness in predicting the dependent variable. The regression analysis findings demonstrate that income (*LnInc*) is statistically significant at a 1% level of significance and it shows a positive relationship with FI. This implies that a higher income level is associated with a higher level of FI. The finding from the present investigation is in line with several other national and international studies (Lotto, 2018; Chithra & Selvam, 2013; Raichoudhury, 2020; Sahoo et al., 2017; Bathula & Gupta, 2021; Dar & Ahmed, 2021; Kumar Vaid et al., 2020; Bhanot et al., 2012). The standard of living index (*LSI*) also positively impacts FI and is statistically significant at a 1% significance level. This means that *LSI* positively influences FI. The findings from the present investigation are consistent with several other national and international studies (Ozili, 2018; Salgotra et al., 2021). The explanatory variable education (*LnEdu*) is found to be statistically significant at a 1% level of significance, and it shows a positive association with the dependent variable. This indicates that education positively influences FI, which indicates that a higher level of education is associated with a higher level of FI. The finding of the present study is consistent with the various national and international studies (Lotto, 2018; Chithra & Selvam, 2013; Kuri & Laha, 2011; Sahoo et al., 2017; Dar & Ahmed, 2021; Salgotra et al., 2021; Vaidya et al., 2018; Dutta et al., 2023; Bhanot et al., 2012). The variable profession is statistically significant but shows a negative impact on FI. This implies that the profession has a negative influence on FI. However, the demographic factor, like religion, is statistically insignificant, indicating that it does not influence FI.

To check the Normality of the data set, we have conducted skewness/kurtosis tests for normality, and at a 5% level of significance, we have accepted the null hypothesis (H_0). We conclude that the data set also follows a normal distribution. The data set is also found to be free from multicollinearity, as reflected by the VIF values of the explanatory variables in Table 4. The VIF values of all the explanatory variables are below 10, which indicates the absence of multicollinearity among the explanatory variables. For our data set, we also checked the severity of the heteroscedasticity problem by conducting the Breusch–Pagan/Cook–Weisberg test. The test result in the above table confirms the absence of heteroskedasticity. H_0 assumes the constant variance at a 5% level of significance, we have accepted the H_0 and concluded that the error term is constant, which indicates the data set is free from the problem of heteroskedasticity.

5. CONCLUSION

Financial inclusion has become increasingly important in the last decade for augmenting household income, reducing poverty, and promoting income equality. However, there is a need to identify the key determinants of FI in rural households in India, particularly in the Barak Valley region of Assam. This study aims to evaluate the level of FI among rural households and to identify the significant factors contributing to its success using comprehensive household-level data sets. The researchers collected primary data and used the CFII to measure FI, which considers factors such as availability, usage, and quality, as prescribed by the RBI. Binary variables were used to represent qualitative information for the construction of CFII and to assess living standards. The study found that the level of FI was low (49.42) among the selected rural households compared to the national average (56.6) reported by RBI in 2022. The study found that income, education, living standard index, and profession significantly positively impact FI among rural households in the study area. This suggests that policymakers and the government should pay close attention to improving income levels, education, and living standards in the Barak Valley region of Assam to build a financially inclusive

society. However, demographic variables like religion did not significantly influence FI. Despite various initiatives by central and state governments to improve financial inclusiveness across the country, this finding reveals that the rural area of the Barak Valley region still needs to catch up due to low income, lack of education, and poor living standards. The Barak Valley region of Assam needs more work to build a financially inclusive society.

In order to improve the income, education, and living standards of rural households, a comprehensive approach is required. This entails developing crucial rural infrastructure, such as roads, electricity, and water supply, to facilitate economic activities and improve living conditions. Additionally, establishing vocational training centres and schools to enhance rural residents' skills and education levels can improve their employability and income potential. Providing farmers with access to modern farming techniques, high-quality seeds, and fertilizers can increase agricultural productivity while promoting crop diversification and value addition can help boost income. Facilitating access to credit and financial services for rural households can help them invest in businesses, education, and healthcare. Ensuring quality healthcare services are accessible in rural areas can further improve health outcomes and reduce medical expenses. Finally, encouraging entrepreneurship by providing training, mentorship, and access to markets for rural entrepreneurs can create employment opportunities and increase income levels. The findings of this study are expected to provide valuable insights into the factors that enable or inhibit FI in rural India, thus informing policymakers and stakeholders on how to promote FI in the region. Therefore, policymakers and regulators may find this finding helpful in developing customized policies to enhance FI in the studied area. It is important to note that the limited number of household surveys conducted in a small geographical area of the Barak Valley region of Assam constrains the generalization of these findings.

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APPENDIX. QUESTIONNAIRE

Demographic information

1. Please write your name (household head): _____

2. Please select your gender:

☐ Female ☐ Male

3. Please mention your religion:

☐ Hindu ☐ Muslim

4. Please write your age (in a complete year as of January 1, 2024): _____

5. Please write your level of education (year of schooling): _____

6. Please select your family type:

☐ Joint family (more than two generations living together)
☐ Nuclear family (two generations living together)

7. Family size (number of family members): _____

8. Please select the major source of household income:

☐ Agriculture/horticulture
☐ Daily wage
☐ Business
☐ Service

9. Please mention the average monthly household income (in Rs.000): _____

Usage of financial products and services

Components	*Particulars*	*Yes*	*No*
U1	Do you have any account in the bank/post office?		
U2	Do you have any insurance policy (life/health/general)?		
U3	Do you visit the bank/ATM at least once a month?		
U4	Do you have any fixed deposits in the bank/post office?		
U5	Do you have any recurring deposit account/SIP?		
U6	Are you getting government subsidies/benefits through DBT?		
U7	Do you have any pension policy like APY?		
U8	Have you taken any loans and advances from the bank?		
U9	Do you make digital transactions like GPay/PhonePe?		
U10	Do you transfer funds through Internet banking?		
U11	Are you associated with SHG?		

Note: ATM — automatic teller machine, SIP — systematic investment plan, DBT — direct benefit transfer, SHG — self-help group, APY — Atal Pension Yojana, formerly known as Swavalamban Yojana is a government-backed pension scheme in India, primarily targeted at the unorganized sector.

Access to financial products and services

Components	*Particulars*	*Yes*	*No*
A1	Do you have a smartphone with an internet connection?		
A2	Do you have UPI apps (GPay/PhonePe/Paytm, etc.)		
A3	Is there any bank branch available in your locality?		
A4	Is there any MFI branch in your locality?		
A5	Is there any ATM/customer service point in your locality?		
A6	Is there any insurance/bank agent visiting your locality?		
A7	Can you visit the bank during office hours at a convenient cost?		

Note: UPI — unified payments interface, MFI — microfinance institutions, ATM — automatic teller machine.

Quality/financial literacy (do you know?)

Components	*Particulars*	*Yes*	*No*
Q1	Bank takes extra charges for issuing debit/credit cards?		
Q2	Interest on fixed deposit is more than saving accounts?		
Q3	Does the post office also provide banking services to customers?		
Q4	Interest on a bank loan is less than the interest charged by local money lenders?		
Q5	Bank provides compound interest on fixed deposits?		
Q6	Investments in mutual funds are subject to market risk?		
Q7	There are different savings/insurance/loan schemes under (SSY, APY, PMMY, etc.)?		

Note: SSY — Girl Child Prosperity Account (Sukanya Samriddhi Yojana), is a Government of India-backed saving scheme targeted at the parents of girl children. The scheme encourages parents to build a fund for the future education of their female child. APY — Atal Pension Yojana, formerly known as Swavalamban Yojana is a government-backed pension scheme in India, primarily targeted at the unorganized sector. PMMY — Pradhan Mantri Mudra Yojana is a flagship scheme of the Government of India. The scheme facilitates micro credit/loans up to Rs.10 lakhs to income-generating micro-enterprises engaged in the non-farm sector in manufacturing, trading or service sectors including activities allied to agriculture such as poultry, dairy, beekeeping, etc.

Living standard

1. What do you use mostly for daily cooking at home?

☐ LPG gas ☐ Firewood ☐ Electric

2. Sanitation facilities:

☐ Kacha ☐ Pakka

3. Types of drinking water supply:

☐ Purified ☐ Raw

4. Type of house:

☐ Kacha ☐ Pakka

5. Is there a proper electricity supply in your house?

☐ Yes ☐ No

6. Have you gone without medicine or medical treatment for the last year?

☐ Yes ☐ No

7. Have you gone without cash income for last year?

☐ Yes ☐ No

8. Did you have to keep your child away from school because of no money to pay school fees or did she/he have to support the family?

☐ Yes ☐ No