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Microfinance and Poverty Reduction in Assam: Uncovering the Nexus between Access to Credit and Household Well-being

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Abstract

This study investigates the impact of microcredit access on income and multidimensional poverty in rural Assam, India. Employing a quasi-experimental design and collecting primary data, the study utilises the probit model for empirical analysis. The findings indicate that equivalence factors influence individual welfare levels. Moreover, households receiving microcredit from semiformal and informal sources exhibit a higher incidence of poverty. Informal borrowers experience a more significant poverty gap compared to semiformal borrowers. However, the study does not find statistically significant evidence to confirm a poverty impact from pooled and formal credit sources. The prevalence of income and multidimensional poverty among semiformal and informal borrowers suggests that these individuals rely on borrowing to finance their children's education and medical expenses. This points to a failure of the government's universal education and health policies to uplift vulnerable segments of society. The study recommends providing credit facilities exclusively for productive economic activities to rural residents, accompanied by adequate market linkages.

Keywords: Rural Credit; Income Poverty; Multidimensional Poverty Index; Probit Model; Assam; India

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Introduction

The importance of a robust and efficient financial sector in driving economic growth and development has been widely acknowledged (Sehrawat and Giri, 2016; Hartarska et al., 2015; Kendall, 2012; Arestis et al., 2010; Patrick, 1966). Providing credit access to vulnerable individuals enhances economic efficiency and promotes equal economic opportunities (Demirguc-Kunt and Levine, 2009) and contributes to increasing income levels through expanded employment opportunities (Bruhn and Love, 2014). However, the complex nature of credit services often necessitates government intervention, especially in strategically important sectors. As a response, many developing countries established governmental banking institutions in the 1940s and 1950s. However, these policies have faced criticism due to inefficiencies, moral hazards, and adverse selection within the banking sector. In the late 1970s and early 1980s, the concept of microfinance emerged to address the need for financial services for the unbanked population. The term 'microfinancing' originated in the 1970s with the founding of Grameen Bank in Bangladesh by Muhammad Yunus, who formalised the approach in 1976, shaping the modern microfinance sector. Despite claims by microfinance programs to reach millions of impoverished individuals globally (Das and Guha, 2019; Gravesteijn et al., 2015), the effectiveness of microfinance in poverty reduction remains debated. Some argue that microfinance stimulates income generation activities, reducing poverty (Lacalle-Calderon, 2019; Robinson, 2001; Von Pischke, 1991). However, Coleman's (1999) study on the microcredit program in Thailand found limited impact on rural people's income, consumption, and savings, highlighting the need for further investigation into the role of microfinance in poverty eradication. In Assam, a state located in Northeast (NE) India, over 95% of households are excluded from formal financial sources (Das, 2015), with a significant proportion being small and marginal farmers. Assam's Financial inclusion is lower than the national average (Maity and Sahu, 2022). The state predominantly relies on informal finance and traditional community-based organisations (Sharma, 2011; Singh, 2009, 2011; Sharma and Matthews, 2009; Das and Choubey, 2015).

Over the course of several decades, extensive efforts have been made to examine the relationship between credit access and poverty reduction within various country contexts. In addition to income, non-monetary factors such as health and education play a significant role in enhancing living standards and breaking the cycle of poverty. However, most existing studies on this issue are predominantly focused on specific countries, with limited literature available at the state or regional level. Moreover, unlike previous research primarily concentrating on a single credit source, this study separately investigates three distinct credit sources (formal, semiformal, and informal). [1] Furthermore, in contrast to prior studies that primarily examine income poverty, the current research incorporates non-monetary factors, including health and education, by incorporating ten multidimensional poverty index (MPI) indicators. [2] As a result, this study possesses a broader scope and stands out by

[1] Informal finance encompasses all transactions, loans, and deposits that occur outside the purview of the central monetary authority's regulations. Conversely, activities subject to regulation are referred to as formal finance. The term 'semiformal' is used to describe the intermediate range between formal and informal finance. Semiformal activities may be partially regulated by government agencies through licensing or supervision, and they may maintain some connections with the formal financial system. For the purposes of this study, formal sources of finance include institutions such as the State Bank of India, Assam Grameen Bikash Bank, Canara Bank, Syndicate Bank, ICICI Bank, Punjab National Bank, United Bank of India, UCO Bank, Union Bank, Indusben Bank, Central Bank, Allahabad Bank, and Apex Bank. Semiformal sources encompass Self-Help Groups (SHGs) and MFIs such as Bandhan and ASOMI, while informal sources consist of money lenders and private savings groups.

[2] The Global Multidimensional Poverty Index (MPI) was jointly developed in 2010 by the Oxford Poverty & Human Development Initiative and the United Nations Development Programme. Unlike traditional income-based measures,

using micro data specific to Assam, a significant state in the NE region of India. Consequently, it addresses existing gaps in the literature and holds critical policy implications. The ongoing debate regarding the relationship between credit access and poverty reduction remains inconclusive. This study endeavours to contribute to this debate by providing new evidence of a NE state of India. The primary objective of this study is to assess the impact of credit access on standard income and multidimensional poverty in rural Assam. Throughout this analysis, the study addresses two critical questions:

- How does credit access influence the standard income among rural households in Assam?
- How is participation in microfinance programmes associated with the reduction of multidimensional poverty in rural Assam? Hence, the present paper offers a comprehensive coverage of these important aspects.

The remaining part of the study is structured as follows. It begins with the literature review; then it goes on to discuss the methodology, data and econometric models. Following this, it presents empirical results and the discussion of the study. The final section discusses the policy implications.

Literature Review

Numerous researchers have conducted studies to investigate the association between credit access and poverty, resulting in conflicting arguments in the existing empirical literature. Robinson (2001) and Von Pischke (1991) argued that microfinance reduces poverty by creating income-generation opportunities for the poor. This is perhaps because expanding credit supply improves welfare and supports the existence of binding liquidity constraints (Karlan and Zinman, 2009). Using propensity score matching, Imai and Arun (2008) revealed that access to microfinance in India reduces poverty as measured by the MPI. The study posited that achieving this outcome is conceivable through vigilant monitoring of loan utilisation and the crucial enhancement of productivity. Such measures are particularly important in aiding impoverished individuals to break free from the cycle of poverty and shield themselves against various unforeseen shocks. Although Khaki and Sangmi (2017) underscored that access to credit elevates living standards and has the potential to alleviate multidimensional poverty in the Kashmir Valley, the findings of this study indicated that microfinance programme participation does not lead to a reduction in deprivations in the 'education' dimension. Studies by Pati (2017) and Khandker (2003, 2005) further supported this claim, demonstrating that participation in microfinance programs increases per capita income, expenditure, and household net worth. Recent research has contributed to the ongoing debate by examining the impact of microfinance on poverty alleviation in specific contexts. It was found that the government-sponsored self-help group (SHG)— for instance, the bank linkage programme in Bodoland, Assam, had a positive impact on the monthly income, employment days, and financial inclusion level of participants in the SHGs compared to a control group of non-participants (Maity and Sarania, 2017). However, in Baruah's (2012) study, it was observed that loans offered by SHGs to their members were generally inadequate to lift them out of poverty. Moreover, the loans were primarily used for consumption, with some going towards current productive activities, but there were limited instances of capital investments. Further, Roy (2011) found that Assam's microfinance institutions (MFIs) reached only 1.30% of the total population and 3.77% of the poor, considerably lower than the national average of

the MPI incorporates various dimensions to assess poverty. It utilises ten indicators, namely child mortality, nutrition, years of schooling, school attendance, cooking fuel, toilet access, water access, electricity access, floor quality, and asset ownership. These indicators are assigned different weights, with child mortality, nutrition, years of schooling, school attendance having a weight of 1/6 each, and cooking fuel, toilet access, water access, electricity access, floor quality, and asset ownership having a weight of 1/18 each. A household is considered "multidimensionally poor" if the cumulative weighted deprivations amount to 1/3 or more (OPHI, 2018).

5%. Nevertheless, the author noted that within the policy context of Assam, this outreach growth was satisfactory. It has been contended that the absence of access to formal financial institutions, NE states of India has given rise to informal systems aligned with local socio-economic structures and needs, as documented by Moulick (2008). These informal systems encompass traditional institutions like Marup in Manipur, Sanchoi Samities in Assam, Village Development Board in Nagaland, Village Darbar in Meghalaya, and Kebong in Arunachal Pradesh, all deeply rooted in regional culture (Sharma and Mathews, 2009).

Additionally, there are institutions such as Namghars and Pujaghars in Assam, Singlups in Manipur, and Maharis in Meghalaya, as highlighted by Moulick (2008). These institutions form an integral part of the local community, actively engaged in governance and providing community services, such as financial assistance to their members. Economically disadvantaged individuals favour these institutions due to their adaptability, dependability, convenience, and low transaction costs, making them easily accessible (Sharma, 2011).

While microfinance has shown positive outcomes, it is crucial to consider studies highlighting adverse effects and the need for appropriate policies to address poverty among borrowers (Bateman and Chang, 2009; Dichter, 2005). In their research, Khandker and Samad (2013) observed that microfinance loans had a modest yet statistically significant impact on diminishing poverty levels within the group of microcredit recipients. However, their study raised questions regarding the enduring sustainability of income and consumption improvements resulting from microcredit access. According to a study conducted by Crepon et al. (2015), involvement in microfinance in Morocco was observed to amplify opportunities for income generation through self-employment activities, as demonstrated in a randomised controlled study. However, it concurrently led to a decline in income derived from casual labour. Furthermore, Banerjee et al. (2015) underlined that microfinance initiatives in urban India may not substantially augment income; instead, they tend to result in increased spending on durable goods. According to Chikwira et al. (2022), the global experience with microfinancing indicates that MFIs may not be well-suited for poverty reduction. Likewise, Hickson (2001) asserted that MFIs still have a considerable distance to attain poverty reduction objectives effectively. While most MFIs aspire to assist impoverished individuals, they frequently fall short of serving the extremely poor.

Additionally, it was argued that a majority of MFIs primarily cater to the 'upper poor' rather than reaching the very poor. Also, Tembo (2003) highlighted concerns that valuable aid funds may be diverted to untested and non-viable microfinance programmes instead of being directed toward crucial activities such as education and health. Studies that found no positive impact of microfinance on poverty argue that while it is necessary, microfinancing alone is insufficient for poverty alleviation (Enisan and Oni, 2012). Samer et al. (2015) showed that although microfinance is touted as an effective tool for poverty eradication and socio-economic development, its impact is still questioned and varies across countries, differentiating between urban and rural areas.

Thus, a considerable number of empirical studies have examined the role of microfinance in poverty alleviation. However, there is no consensus in the literature regarding the impact of microfinance on poverty reduction. This raises questions about whether the recent surge in microfinance could potentially contribute to an increase in poverty, warranting further investigation. The literature discussed above highlights a limited number of studies specific to India's NE states, particularly studies that use micro-level data. Therefore, the current study's main focus is to evaluate the relationship between credit access and the reduction of income and multidimensional poverty across different credit sources in Assam.

Methodology

In this study, it was essential to include primary sources to guarantee a comprehensive and

reliable dataset. The primary data was collected through a field survey conducted in the Lower Brahmaputra Valley of Assam.[3] The study area encompassed multiple districts and development blocks, illustrated in Figure 1. A multistage sampling technique was employed to gather primary data. In the first stage, three districts, namely Nalbari, Barpeta, and Baska, were purposively selected from the eight districts in the Lower Brahmaputra Valley. Considering the existing literature on high concentration of microfinance activities and poor financial inclusion, the three aforesaid districts were selected (Sharma, 2011; Das, 2015).

This concentration indicates these districts' significance in microfinance operations. It suggests that studying them would provide valuable insights into the dynamics of microfinance in the region. However, as mentioned above, a significant number of people in these three districts were excluded from the formal banking sector (Das, 2015). At the same time, the presence and active functioning of traditional community-based organisations and village savings groups were observed in these districts. In the second stage, two development blocks were chosen from each district, resulting in a total of six development blocks. In the third stage, twelve villages were selected to represent diverse socio-economic conditions, with two villages chosen from each development block. Finally, 240 households were randomly selected for interviews, selecting twenty households selected from each village. To minimise potential selection bias, a quasi-experiment household design was adopted for primary data collection. The households were categorised into four groups, as presented in Table 1, to account for different credit sources and borrowing behaviours.

Table 1: Treatment and Control Groups across Credit Sources

Credit Sources	Treatment Group	Control Group
Pooled	Borrowers of all credit sources	Non-borrowers
Formal	Borrowers who borrowed majority amount from formal sources in last three years	Semiformal and informal borrowers, and non-borrowers
Semiformal	Borrowers who borrowed majority amount from semiformal sources in last three years	Formal and informal borrowers, and non-borrowers
Informal	Borrowers who borrowed majority amount from informal sources in last three years	Formal and semiformal borrowers, and non-borrowers

Source: Authors' own Development Based on Literature

[3] The selection of the Lower Brahmaputra Valley of Assam as a study area can be justified based on the findings of previous literature, which indicate an immense concentration of informal and semiformal microfinance institutions in this region. The cited works by Sharma and Mathews (2009), Das (2011, 2015), and Sharma (2011) provide evidence supporting this observation. The presence of a significant concentration of informal and semiformal microfinance institutions suggests that there is a thriving microfinance sector in the Lower Brahmaputra Valley. Considering the abundance of informal and semiformal microfinance institutions in the region, it is reasonable to expect a large number of borrowers using these credit sources. The availability of such financial services often attracts individuals who may not have access to traditional banking channels or who find it more convenient to approach microfinance institutions for their financial needs. Studying the Lower Brahmaputra Valley of Assam allows researchers to explore the dynamics of microfinance in a region where it is particularly prevalent. It provides an opportunity to understand the impact of these credit sources on the local economy, the livelihoods of borrowers, and the overall financial landscape of the region.

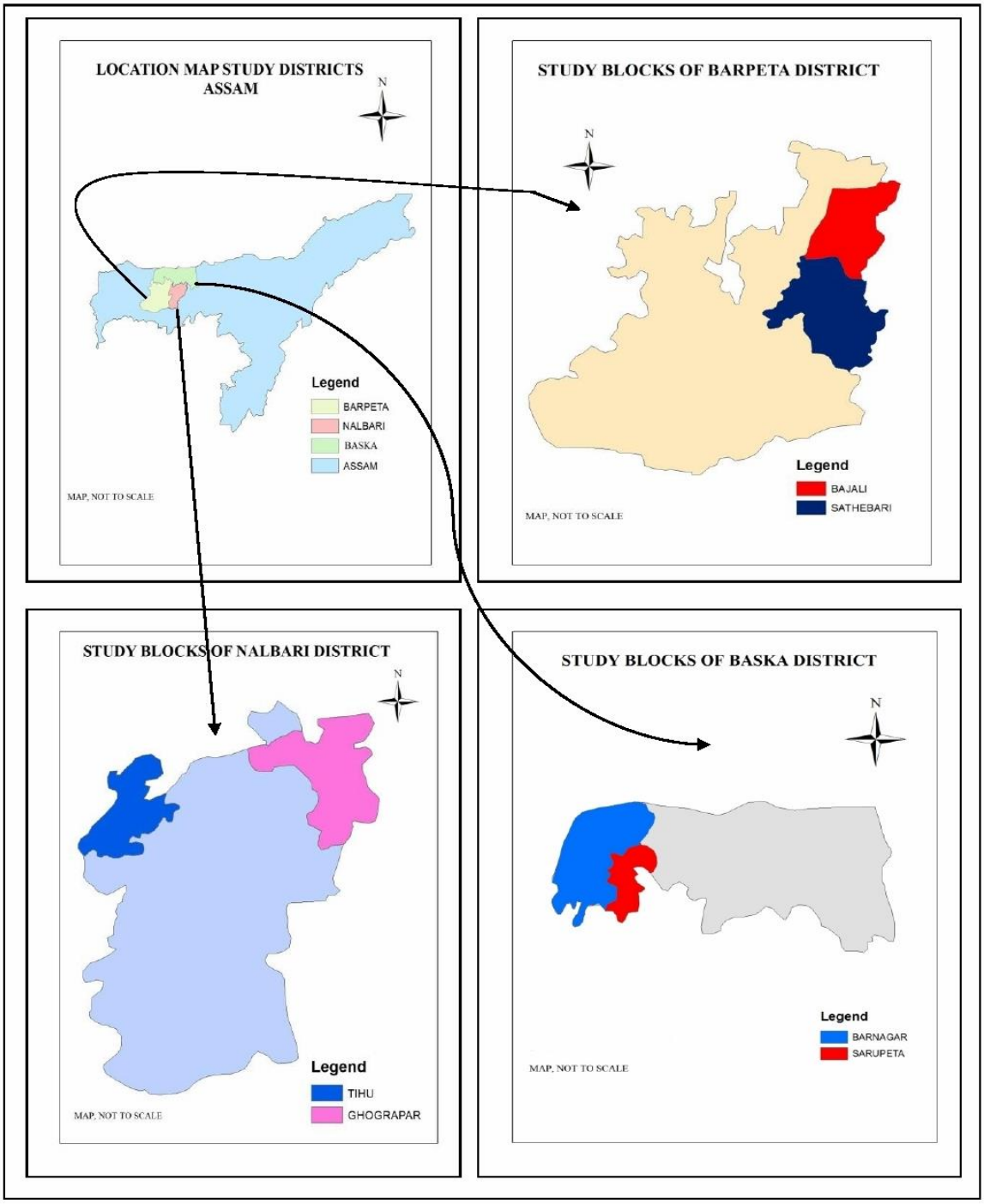

Figure 1: Map of the Study Area showing the sample districts and development blocks, Assam
Source: Author's Own Development

Description of Variables and Descriptive Statistics

This study's selection of explanatory variables was based on a comprehensive review of existing theoretical and empirical literature regarding impact analysis. Table 2 provides a detailed description of the variables, including their notation, definition, expected sign, and the rationale for their inclusion. Among the 240 households surveyed, it was observed that 88% of households had borrowed money from various credit sources. Furthermore, 26%, 34.6%, and 27.5% of households had borrowed most of their loan amounts in the last three years from formal, semiformal, and informal sources, respectively.

Table 2: Description of the Explanatory Variables Included in the Study			
Explanatory Variables	**Notation**	**Definition**	**Expected Sign**
Whether Borrowers	**$WPRC_j$**	**Dummy: This dummy variable indicates whether individuals have borrowed money from any sources in the last three years. It takes a value of 1 if they have borrowed and 0 if they have not. The coefficient associated with this variable indicates whether being a borrower increases or decreases the probability of severe deprivation compared to non-borrowers.**	**+/-**
Majority Borrowed from Formal Sources	**$WMABF_j$**	**Dummy: This dummy variable identifies whether the majority of the borrowed amount has come from formal sources in the last three years. It takes a value of 1 if formal sources contribute the majority of the borrowed amount and 0 otherwise. The coefficient associated with this variable shows whether borrowing predominantly from formal sources affects the probability of severe deprivation.**	**+/-**
Majority Borrowed from Semiformal Sources	**$WMABSF_j$**	**Dummy: This dummy variable indicates whether the majority of the borrowed amount comes from semiformal sources in the last three years. It takes a value of 1 if semiformal sources contribute the majority of the borrowed amount and 0 otherwise. The inclusion of this dummy variable enables to investigate the relationship between borrowing from semiformal sources and the likelihood of severe deprivation.**	**+/-**
Majority Borrowed from Informal Sources	**$WMABI_j$**	**Dummy: This dummy variable represents whether the majority of the borrowed amount has come from informal sources in the last three years. It takes a value of 1 if informal sources contribute the majority of the borrowed amount and 0 otherwise. Including this dummy variable allows to examine the association between borrowing from informal sources and the severity of deprivation.**	**+/-**
Source: Author's own Development Based on Literature			

Model Building for Probit Estimation

To analyse the impact of microcredit program participation on both standard income and multidimensional poverty, it is assumed that the program has a more significant effect on relatively better-off households. Hence, a Probit model is employed to examine the relationship between the severity of deprivation and the impact of microcredit program participation on income and multidimensional poverty. The Probit model is a statistical method used to analyse binary dependent variables, where the outcome variable can take only two possible values, typically represented as 0 and 1. In the context of the present study, the Probit model is used to examine the relationship between the severity of deprivation (represented by the variable HBIMDPj) and the impact of microcredit program participation on income and

multidimensional poverty. The Probit estimation equation is as follows:

$$HBIMDP_j = \alpha_j + H_j¥ + V_j$$

In this equation, $HBIMDP_j$ represents the binary dependent variable, which is the severity of deprivation. The severity of deprivation is measured using either income poverty criteria or the MPI criteria. H_j is a continuous variable representing the logarithmic form of the amount of credit received through the microcredit program. This variable captures the extent of microcredit program participation by measuring the magnitude of credit received by each household. V_j represents the error term or the unobserved factors that affect the severity of deprivation.

To examine income poverty, the study utilises two criteria: the poverty line defined by the Planning Commission of India (PL_1) in 2014 (Press Information Bureau, 2014) and the World Bank international poverty line (PL2) based on Purchasing Power Parity (Baah et al., 2022). [4] The poverty line sets a threshold value for per capita consumption expenditure or income, below which individuals or households are considered to be in poverty. For the analysis based on the PL_1, the study uses income per capita as a proxy for household food expenditure. This means that the income per capita variable is assumed to reflect the level of food expenditure, and poverty is determined based on whether the income per capita falls below the poverty line. Additionally, the study employs the MPI criteria to estimate the social well-being of households. The MPI captures multiple dimensions of poverty beyond income, such as education, health, and living standards, providing a more comprehensive measure of deprivation. By applying the Probit model, the study aims to assess the relationship between microcredit program participation (represented by H_j) and the severity of deprivation ($HBIMDP_j$) for different poverty criteria, PL_1 and MPI. The coefficients estimated in the Probit model can help determine the impact of microcredit program participation on income poverty and multidimensional poverty while considering the influence of other factors (represented by α_j and V_j) that may affect the severity of deprivation. The Probit model is suitable for analysing binary dependent variables, such as participation in a microcredit program or not. In this study, the dependent variable, representing the severity of deprivation, is also binary (deprived or not deprived). Hence, the Probit model is justified for examining the relationship between microcredit programme participation and the severity of the deprivation.

Criteria for Determining Per Capita Income

Two different equivalence scales are used to better understand the variations in consumption expenditure based on the age of household members. Equivalence scales are a method employed in economics to adjust income or expenditure measures for differences in household composition (Zarazua, 2007). They consider the household's size and composition when comparing income or consumption levels across different households.

Table 3 presents the details of the two equivalence scales used in the study. The first equivalence scale is based on the work of Rothbarth (1943) and is denoted as Equivalence Factor One. It calculates the equivalence factor (ES_n) for each household by considering the number of adults (M_n) aged 18 to 65 and the number of children (K_n) in the household. The value of the parameter α is set to 1 in this scale. Additionally, the parameter μ varies based on the age range and gender of household members, with different values assigned to boys and girls in different age groups, as well as men and women aged 65 years and above. The second equivalence scale, Equivalence Factor Two, was developed by Wagstaff and Van

[4] Average exchange rate of 2019-20 is taken while converting dollars into rupees.

Doorslaer (2003). It also considers the number of adults and children in the household to calculate the equivalence factor (ES_n), but the value of α is fixed at 0.75 for all households. Children in this scale are defined as those aged less than 14 years. Employing these equivalence scales ensures a fair comparison of household incomes by adjusting for the differences in household composition. By applying these scales, the researchers aim to capture the varying needs and consumption patterns of households with different age structures.

Table 3: Equivalence Scale

Equivalence Scale	Parameters of Equivalence Scale	Value of the Parameters
Equivalence Factor One: Equivalence scale adopted by Rothbarth (1943)	**$ES_n = (M_n + \mu K_n)^{\alpha}$** **$ES_n$ = equivalent factor for household 'n'** **M_n = number of adults (age 18 to 65)** **K_n= number of children in household 'n'**	**α = 1** **μ = 0.661 and 0.609 respectively, for boys and girls, in the age range of 0-5 years** **μ = 0.750 and 0.664 respectively, for boys and girls, in the age range of 6-12 years** **μ = 0.633 and 0.635 respectively, for boys and girls, in the age range of 13-18 years** **μ = 0.553 and 0.570 respectively, for men and women, in the age range of 65 years and more**
Equivalence factor two: Equivalence scale developed by Wagstaff and Van Doorslaer (2003)	**$ES_n = (M_n + \mu K_n)^{\alpha}$**	**n and α = 0.75** **Children are indicated as those aged < 14 years**

Source: Author's Own Development Based on Literature

Results and Discussion

Table 4 presents the distribution of households' per capita income across different equivalence factors and credit sources.[5] It is evident that the per capita income varies depending on the equivalence factor used. Specifically, per capita income based on equivalence factor two is higher than the simple average per capita income and per capita income based on equivalence factor one for all credit sources. This finding suggests that using the simple average per capita income may lead to an overestimation of deprivation or poverty in society. These results align with previous studies, such as by Garner et al. (2002), which emphasised the importance of considering demographic and equivalence scale factors when comparing household inequality. Researchers like Borah et al. (2016) and Blaylock (1991) also argued for adjusting income and equivalence weights to reduce biases in estimating deprivation.

Focusing on the per capita income of treatment households, it is observed that households relying on formal sources have higher per capita income compared to those relying on semiformal and informal sources for both equivalence factors. Moreover, control households exhibit higher per capita income in both equivalence factors than their respective treatment households for both semiformal and informal sources. These findings suggest that participation in microcredit programmes from

[5] In the current study, the components of household income include agriculture income, self-employment income, wage labour, government assistance, non-farm activities, remittances, rental income, and miscellaneous income encompassing sources such as government grants, non-governmental organisation support, gifts, and other ad hoc sources of income.

formal sources positively affects per capita income, while households relying on semiformal and informal sources experience lower per capita income.

Table 4: Distribution of households' income across equivalence factors (Amount in INR)

Household Income (p/m)	Pooled		Formal		Semiformal		Informal	
	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
Average Household Income	8017.86	10943.4	7338.98	19769.84	12547.78	6921.69	11750	7575.76
Average Per Capita Income	1813.09	1989.87	1473.51	3362.02	2273.72	1393.31	2173.67	1430.3
Equivalent One Per Capita Income	1966.79	2195.87	1624.07	3700.51	2488.88	1564.33	2402.54	1553.81
Equivalent Two Per Capita Income	2620.18	3089.65	2214.18	5340.66	3515.73	2125.31	3369.12	2153.68

Source: Authors' estimation based on field survey

Table 5 explores the depth of poverty and the poverty gap among households across different credit sources. The incidence of poverty, measured as the percentage of households with per capita income below the stated poverty line (equivalence one), is highest among borrowers of semiformal and informal sources compared to borrowers of formal sources for both poverty lines. Furthermore, the burden of poverty gap, which represents the average shortfall of per capita income compared to the poverty line, is more significant among informal borrowers compared to semiformal borrowers. The findings indicate that borrowers who rely on formal sources, such as banks and regulated financial institutions, have higher average financial needs, with an amount of INR350.14 per month required to escape poverty. This suggests that formal financial institutions are able to provide larger loan amounts or financial assistance to address the specific needs of borrowers classified as poor. On the other hand, borrowers from semiformal sources, require an average of INR164.02 per month to escape poverty. This indicates that borrowers accessing credit from semiformal sources may have lower financial needs compared to those relying on formal sources. However, it is important to note that these borrowers still benefit from the support and services provided by semiformal entities, such as group savings, financial training, and social support systems, which contribute to their poverty reduction efforts. The findings indicate that borrowers from informal sources, such as money lenders and private savings groups, require an average of INR316.51 per month to lift themselves out of poverty. This implies that individuals relying on the informal sector for credit face significant financial challenges in overcoming poverty. These findings highlight the differential impact of credit sources on poverty reduction, with formal sources appearing to be more effective in reducing poverty.

Table 6 presents an analysis of the incidence of multidimensional poverty among households based on different credit sources. The findings reveal that borrowers from semiformal and informal sources exhibit a higher burden of multidimensional poverty than those borrowers from formal sources. Specifically, borrowers from informal sources face the highest level of multidimensional poverty. These results underscore the significance of considering diverse dimensions of poverty beyond income alone. It highlights that different credit sources can have distinct impacts on overall well-being and quality of life, emphasising the need to address multiple dimensions of poverty in poverty reduction strategies.

Overall, the results indicate that formal microcredit programmes have a positive impact on household income and poverty reduction. At the same time, reliance on semiformal and informal sources may hinder economic well-being and exacerbate poverty. The implications of these findings underline the importance of promoting access to formal microcredit programs while implementing targeted

interventions to address the specific needs of vulnerable households. Policymakers and practitioners should prioritise measures aimed at expanding the reach and effectiveness of formal microcredit programs. In addition, customised interventions should be developed to support households that rely on semiformal and informal credit sources, addressing their unique challenges and providing alternative avenues for economic empowerment.

Table 5: Incidence of Income Poverty among Households across Credit Sources and Poverty Lines

Poverty Lines	Incidence of Poverty	Pooled		Formal		Semiformal		Informal	
		Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
Planning Commission Poverty Line	Below Poverty Line (%)	32.14	19.34	26	6.3	20.4	21.7	17.8	28.8
	Poverty Gap (%)	10.61	5.03	6.89	2.29	6.75	3.66	4.28	9.38
	Depth of Poverty (in INR)	321.26	252.85	257.77	350.14	322.05	164.02	233.69	316.51
World Bank Poverty Line	Below Poverty Line (%)	92.9	76.4	91.5	41.3	70	92.8	74.1	89.4
	Poverty Gap (%)	54.89	39.94	50.04	18.22	37.59	48.24	38.45	50.20
	Depth of Poverty (in INR)	56.75	50.18	52.48	42.39	51.89	49.93	49.78	53.94
Observations		28	212	177	63	157	83	174	66

Source: Author's Estimation based on Field Survey

Table 6: Incidence of Multidimensional Poverty among Households across Credit Sources

Poverty Criteria	Pooled		Formal		Semiformal		Informal	
	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
Multidimensional Poverty (%)	42.9	44.3	54.2	15.9	38.2	55.4	39.1	57.6
Observations	28	212	177	63	157	83	174	66

Source: Author's Estimation based on Field Survey

Table 7 presents the results of the analysis on the effect of microcredit programme participation on the probability of staying in income poverty. The dependent variable in this analysis is binary, indicating whether the household's per capita income falls below the poverty line defined by the Planning Commission of India and the World Bank. It provides coefficients and significance levels for different variables associated with various credit sources. For borrowers from pooled sources, the coefficient of the variable $WPRC_j$ exhibits a negative effect on the probability of remaining in poverty according to the World Bank poverty line. Similarly, borrowers from formal sources negatively affect the probability of staying in poverty, as indicated by the negative coefficient of the variable $WMABF_j$. However, these results are statistically significant only for borrowers from pooled and formal sources, suggesting a more substantial impact of microcredit program participation on poverty reduction in these cases. This highlights the importance of promoting and expanding access to formal microcredit programs to enhance poverty reduction efforts. Policymakers and practitioners should strengthen formal microcredit institutions and ensure they reach vulnerable households effectively. On the other hand, borrowers from semiformal sources show a negative effect on the probability of staying in poverty, as indicated by the negative coefficient of the variable $WMABSF_j$. However, this result is not statistically significant, implying that the

impact of microcredit program participation on poverty reduction for borrowers from semiformal sources may not be conclusive based on the available data.

Interestingly, the coefficient of the variable $WMABI_j$, representing access to informal credit sources, is statistically significant and positive. This suggests that borrowers relying on informal sources are more likely to remain in poverty. This finding implies that borrowers from informal sources may face greater vulnerability due to their involvement in unproductive economic activities, which could contribute to their continued poverty status. These results highlight the differentiated impacts of microcredit programme participation on poverty reduction across different credit sources. While borrowers from pooled and formal sources experience a decrease in the probability of staying in poverty, borrowers relying on informal sources face a higher likelihood of remaining in poverty. These findings emphasise the importance of understanding the nuances of credit sources and tailoring interventions to address the specific challenges faced by borrowers from different sources to poverty alleviate poverty effectively.

Table 7: Effect of Credit Access on the Probability of Staying in Income Poverty

Poverty Lines	Variables	Pooled	Formal	Semiformal	Informal
Planning Commission of India Poverty Line	**$WPRC_j$**	-0.13 (0.09)	--	--	--
	$WMABF_j$	--	-0.20 (0.05)	--	--
	$WMABSF_j$	--	--	-0.01* (0.06)	--
	$WMABI_j$	--	--	--	**0.11* (0.06)**
	Pseudo R^2	0.01	0.05	0.00	**0.07**
	Log Likelihood	-121.70	-116.31	-122.79	**-121.15**
World Bank Poverty Line	**$WPRC_j$**	-0.16* (0.06)	--	--	--
	$WMABF_j$	--	-0.50* (0.07)	--	--
	$WMABSF_j$	--	--	-0.22 (0.05)	--
	$WMABI_j$	--	--	--	**0.15* (0.05)**
	Pseudo R^2	0.02	0.25	0.07	**0.03**
	Log Likelihood	-123.01	-94.07	-116.50	**-121.78**
Observations		**240**	**240**	**240**	**240**

Note: *Significance at 10 percent, **Significance at 5 percent and ***Significance at 1 percent; Figures in parentheses represent robust standard errors.

The findings related to the Planning Commission of India's poverty line in Table 7 reveal that the coefficients for access to pooled and formal credit sources show negative effects on the probability of staying in poverty, but these results are not statistically significant. On the other hand, the coefficient for access to semiformal credit sources demonstrates a statistically significant negative effect, indicating a lower probability of staying in poverty for borrowers from semiformal sources. These findings align with previous studies by Khandker

(2003), Karlan and Zinman (2010), Das and Guha (2019), and Khandker (1998), which emphasise the positive role of microfinance program participation in reducing extreme poverty. However, it is important to note that some studies, such as Dichter (2005) and Bateman and Chang (2009), have highlighted the negative effects of microfinance programme participation on poverty reduction. The divergent findings suggest the need for a cautious interpretation of the results and further research to understand the underlying factors contributing to these disparities.

Table 8 presents the results of the analysis examining the effect of microcredit program participation on the probability of staying in multidimensional poverty, using a poverty criterion where the MPI is greater than or equal to 33 (Alkire et al., 2020). It also provides coefficients and significance levels for different variables associated with various credit sources.

Table 8: Effect of Participation in the Microcredit Programme on the Probability of Staying at Multidimensional Poverty

Poverty Criteria	Variables	Pooled	Formal	Semiformal	Informal
Multidimensional Poverty Index ≥ 33	$WPRC_j$	-0.01** (0.09)	--	--	--
	$WMABF_j$	--	-0.38* (0.06)	--	--
	$WMABSF_j$	--	--	0.17* (0.07)	--
	$WMABI_j$	--	--	--	0.18* (0.07)
	Pseudo R^2	0.00	0.09	0.02	0.02
	Log Likelihood	-164.71	-149.62	-161.47	-161.41
Observations		240	240	240	240

Note: *Significance at 10 percent, **Significance at 5 percent and ***Significance at 1 percent; Figures in parentheses represent robust standard errors
Source: Authors' own estimation

For borrowers from pooled and formal credit sources, the coefficients are statistically significant and negative in relation to the multidimensional poverty criteria. This suggests a lower probability of staying in multidimensional poverty for borrowers from pooled and formal sources. These findings indicate that microcredit program participation from these sources contributes to reducing multidimensional poverty among borrowers. In contrast, the coefficient for access to semiformal credit sources produces a positive result, indicating a higher probability of staying in multidimensional poverty for borrowers from semiformal sources. This suggests that borrowers relying on semiformal credit sources may face greater challenges in escaping multidimensional poverty compared to non-participants. The reasons behind this positive effect could be related to the limitations or characteristics of the semiformal credit sources and the associated economic activities of the borrowers.

Furthermore, the coefficient for access to informal credit sources is statistically significant and positive. This implies a higher likelihood of staying in multidimensional poverty for borrowers relying on informal credit sources. These results indicate that borrowers from informal sources may experience greater vulnerability and difficulties in overcoming multidimensional poverty, possibly due to informal credit sources' limited support and opportunities. Studies have emphasised the positive impact of microfinance programme participation on reducing multidimensional poverty among borrowers (Irmai and Arun, 2008; Khaki and Sangmi, 2017). These studies highlight the importance of considering multiple dimensions of poverty beyond income and the potential benefits of microfinance programs in addressing various aspects of well-being.

Overall, the results from Table 7 and Table 8 indicate that microcredit program participation can affect the probability of staying in income and multidimensional poverty, depending on the specific credit sources. Formal sources of credit appear to be more effective in reducing both income and multidimensional poverty, while

semiformal and informal sources may not yield the same level of positive impact.

Conclusion and Policy Implication

The current study aims to assess the impact of participation in credit programmes on both standard income poverty and multidimensional poverty, which serves as a social well-being indicator of the state of Assam, India. To mitigate the issue of selection bias, primary data is collected through a quasi-experimental design. The Probit model is employed for empirical analysis. To measure income poverty among borrowers, the study utilises the poverty lines established by the Planning Commission of India and the World Bank. Additionally, the multidimensional poverty index is employed to evaluate the social well-being indicators of borrowers. Two equivalence factors are used to estimate household per capita income, demonstrating that these factors influence household income. Consequently, the conventional measurement of per capita income may either underestimate or overestimate the level of vulnerability experienced by individuals.

The findings reveal that borrowers from semiformal and informal sources exhibit higher poverty incidence levels. Furthermore, informal borrowers bear a greater poverty gap burden than semiformal borrowers. However, the present study does not discover statistically significant evidence to confirm a poverty impact stemming from pooled and formal credit sources. The heightened prevalence of income and multidimensional poverty among borrowers from semiformal and informal sources suggests that borrowing may be utilised to finance children's education and medical expenses. This observation highlights the inadequacy of government policies for universal education and healthcare in addressing the needs of vulnerable populations. Moreover, borrowers from semiformal and informal sources may acquire loans for economic activities that prove unproductive or unprofitable due to the absence of proper market linkages in rural areas.

To address these issues, the study recommends providing credit facilities exclusively for productive economic activities to rural individuals with appropriate market linkages. However, it is important to note that this approach places considerable discretion on banking stakeholders, potentially disempowering disadvantaged individuals. Therefore, an alternative solution entails designing the banking structure in collaboration with community-based organisations situated in rural areas. Aside from credit access, other explanatory variables may influence the likelihood of remaining in poverty, and this limitation should be explored in future research.

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Ethical Approval and Conflict of Interest

All necessary permissions were obtained before initiating data collection. And I declare that I have no conflict of interest.

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The data will be made available on request.