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Access to Credit and Economic Well-Being of Rural Households: Evidence from Eastern India

Anjani Kumar, Ashok K. Mishra, Vinay K. Sonkar, and Sunil Saroj

We evaluate the impact of access to credit on rural households' per capita annual income using an endogenous switching regression approach, an increasingly popular method of tackling the selection bias issue in impact analyses. Using a large survey of rural households in eastern India, we find that access to credit is strongly associated with rural households' socioeconomic and demographic characteristics. Additionally, access to credit increases rural households' economic well-being; nonborrower rural households would benefit the most from access to credit. Access to credit affects recipients heterogeneously, implying that credit policies should be adaptable to different rural household groups.

Key words: endogenous switching regression, per capita household income, formal credit, informal credit, social safety net, welfare

Introduction

Credit is a crucial instrument for rural development. A number of studies (e.g., Binswanger and Khandker, 1995; Carter, 1989; Carter and Wiebe, 1990; Feder et al., 1990; Pitt and Khandker, 1996, 1998; Khandker and Faruquee, 2003; Guirkingner, 2008; Awotide et al., 2015; Narayanan, 2016; Luan and Bauer, 2016; Kumar et al., 2017) have shown that access to appropriate credit sources has been instrumental in reducing poverty and enhancing rural households' income. Recognizing the importance of the rural sector in the national economy, the government of India has taken several initiatives to strengthen the rural credit system.¹ The government's rural credit policy focuses on two approaches: (i) increasing credit flow to rural sectors by expanding outlets of formal financial institutions and (ii) providing credit at more favorable terms through various measures, including region-specific strategies, varying rates of interest, and nationalization of banking procedures.

These initiatives had a positive impact on the flow of agricultural credit (Ghosh, 2005; Golait, 2007; Kumar, Singh, and Sinha, 2010; Mohan, 2006; Hoda and Terway, 2015; Kumar et al., 2015), and the ratio of agricultural credit to agricultural gross domestic product increased from 10% in 1999–2000 to about 43% in 2016–2017 (Government of India, Ministry of Finance, 2018). However, nearly half of the rural population still have no access to credit services (Kumar et al., 2017). Limited access to credit reduces investment in micro and small enterprises, productive activities,

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¹ 70% of Indians live in rural areas (Akoijam, 2013).

manufacturing, and economic activities and decreases output (Udry, 1994). Finally, lack of credit is regarded as one of the important reasons that poor households remain poor (Collins et al., 2009). Rural credit, therefore, remains at the center of policy discourse in India.

While the problem of rural credit is vital for India in general, it is particularly relevant to the predominantly agrarian eastern region of the country (eastern Uttar Pradesh, Bihar, and Jharkhand states). Considered one of the most backward regions of the country, eastern India is characterized by a continuing vicious circle of low input–low output agriculture and a large rural population, with about 80% of the population residing in rural areas. Inadequate access to credit is one of the most critical constraints in increasing agricultural productivity in the region (Joshi and Kumar, 2017). In 2016–2017, the flow of institutional credit to Bihar was about Rs. 24,000/ha compared to Rs. 98,000/ha in Himachal Pradesh, Rs. 78,000/ha in Punjab, and Rs. 69,000/ha in Tamil Nadu.

Several explanations for the lower flow of credit in the resource-poor eastern region of India have been stressed in the literature (e.g., Kumar, Singh, and Sinha, 2010; Kumar et al., 2015). Micro and small enterprises have little or no credit history; financial intermediaries have to make an effort to initiate enterprises into the formal credit system. As a result, we observe a low absorption capacity for credit in the eastern region of India (Kumar et al., 2015). Since the lack of credit is regarded as a significant constraint to improving Indian rural households' livelihoods and economic well-being, it is hypothesized that extending credit facilities that target rural households would have a positive impact on households' welfare (such as increasing households' income, consumption, or both).

This study has two objectives. First, we identify factors influencing rural households' decisions to acquire credit. Second, we assess the impact of credit on rural families' economic well-being—specifically, on per capita household income—using an endogenous switching regression (ESR) approach to account for sample selection bias (Lokshin and Sajaia, 2004). This study contributes to the literature on the role of credit in rural households' economic well-being. We estimate a household's decision to borrow money as a selection process in which the expected higher income drives households' decisions to borrow. Our approach analyzes both the determinants and the impact of credit on household income. Finally, unlike other studies, we use a large household survey conducted in 2018 in three eastern states of India (Bihar, eastern Uttar Pradesh, and Jharkhand) to estimate our empirical model.

Empirical Framework

To estimate the impact of access to credit on economic welfare, we use per capita annual household income (PCAHI) as the indicator of households' economic welfare.² Income has been widely used as a proxy for household welfare in previous studies (see Wetterberg, 2007; Li, Gan, and Hu, 2011; Arouri, Nguyen, and Youssef, 2015; Kumar et al., 2017), but identifying the causal effects of access to credit on the potential outcome indicator is complex. The problem arises from endogeneity bias, and it is hard to observe the counterfactual (i.e., the outcome indicator for the rural household if the household had not availed itself of credit). Further, an individual rural household may choose whether to access credit; those that access credit are likely to be different from rural households that do not. Therefore, the precise estimation of impacts necessitates controlling for both observable and unobservable characteristics through a random selection of individuals or households for treatment. In the absence of random experiments, selection bias may persist, as observed and unobserved characteristics of individuals or rural households may affect the probability of access to credit (treatment) as well as per capita annual household income (outcome indicator). Several methods have been proposed and used in the literature to deal with these issues, ranging from instrumental variable (IV) methods to experimental and quasi-experimental methods. To estimate the empirical model, we employ an ESR framework, which addresses the endogeneity problem by estimating the selection and outcome equations simultaneously using the full information maximum likelihood

² Household income is total net income across sources, including cash and in-kind payments.

(FIML) method (Lokshin and Sajaia, 2004; Wossen et al., 2017; Mishra et al., 2018; Kumar et al., 2018). We specify the selection equation for a credit borrower as

$$(1) \quad B_i^* = \mathbf{X}_i\alpha + \delta_i \text{ with } B_i = \begin{cases} 1 & \text{if } B_i^* > 0 \\ 0 & \text{otherwise} \end{cases}.$$

A rural household will opt to be a borrower of credit ($B_i = 1$) if $B^* > 0$, where B^* represents the expected benefits of being a borrower compared to being a nonborrower,³ and \mathbf{X} represents a vector of variables that determine a rural household’s ability to borrow credit, including the rural household’s and individual characteristics, such as age of head of household (HH), educational attainment of HH, household size, land size, awareness about direct cash transfer (DCT) programs and loan-waiver schemes, assets and livestock index, and source of income. Based on the results of the selection function, we then specify two regime equations that explain the outcome of interest (PCAHI). The relationship between a vector of explanatory variables, \mathbf{X} , and the outcome variable, Y , can be represented by $Y = f(\mathbf{X})$. Specifically, the two regimes are represented as follows:

$$(2) \quad \text{Regime 1: } Y_{1i} = \mathbf{X}_{1i}\beta_1 + \varepsilon_{1i} \text{ if } B_i = 1,$$

$$(3) \quad \text{Regime 2: } Y_{2i} = \mathbf{X}_{2i}\beta_2 + \varepsilon_{2i} \text{ if } B_i = 0,$$

where Y_i is the outcome of interest (i.e., PCAHI) in regimes 1 and 2 and X_i is a vector of explanatory variables, as discussed previously. Finally, the error terms are assumed to have a trivariate normal distribution, with 0 mean and covariance matrix. If the estimated covariances between δ and ε (ρ_1 and ρ_2 , respectively) are statistically significant, then the rural household’s borrowing and the PCAHI are correlated. The ρ_1 and ρ_2 are the transformation of the correlation between the errors from the equation (3). Using this method, we find evidence of endogenous switching and reject the null hypothesis that sample selectivity bias was absent. This model is defined as a “switching regression model with endogenous switching” (Maddala and Nelson, 1975). It is important to use selection instruments in this model. Note that the selection of instrumental variables should directly affect the decision to borrow but not the outcome variable. In this study, we used distance to the bank from a village as a selection IV. This distance may affect access to credit and may not influence the outcome. We establish the admissibility of the instruments by performing a simple falsification test: If a variable is a valid selection instrument, it will affect rural households that borrowed credit but not the outcome variable of those without credit.

Estimation of Average Treatment Effects

In addition to using the ESR model, we calculate the rural household’s conditional expectations for annual household income and per capita annual household income in the four cases:

$$(4a) \quad E(Y_{1i}|B_i = 1) = \left[\sum_{Mi=1} (X_{1i}\beta_1 + \sigma_{1n}\gamma_i) \right] / N_1,$$

$$(4b) \quad E(Y_{2i}|B_i = 0) = \left[\sum_{Mi=0} (X_{2i}\beta_2 + \sigma_{2n}\gamma_i) \right] / N_0,$$

$$(4c) \quad E(Y_{2i}|B_i = 1) = \left[\sum_{Mi=1} (X_{1i}\beta_2 + \sigma_{2n}\gamma_i) \right] / N_1,$$

$$(4d) \quad E(Y_{1i}|B_i = 0) = \left[\sum_{Mi=0} (X_{2i}\beta_1 + \sigma_{1n}\gamma_i) \right] / N_0,$$

³ This includes rural households that applied for credit but did not receive it.

Table 1. Treatment and Heterogeneity Effect—Decision Stage, Eastern India, 2018

Transitional Heterogeneity	Decision Stage		Treatment Effects
	Borrower	Nonborrower	
Borrower	(a) $E(Y_{1i} B_i = 1)$	(c) $E(Y_{2i} B_i = 1)$	TT
Nonborrower	(d) $E(Y_{1i} B_i = 0)$	(b) $E(Y_{2i} B_i = 0)$	TU
Heterogeneity effects	BH ¹	BH ²	TH

Notes: (a) and (b) represent observed expected outcome indicators; (c) and (d) represent counterfactual expected outcome indicators. Y_{1i} = Outcome indicators if rural households borrowed loan; Y_{2i} = Outcome indicators if rural households did not borrow money. $B_i = 1$ if rural households borrowed money, 0 otherwise. TT indicates the effect of the treatment (i.e., rural households borrowed loan) on the treated (i.e., rural households did not borrow loan). TU indicates the effect of the treatment (i.e., borrowed loan) on the untreated (i.e., did not borrow loan). BH¹ is the effect of base heterogeneity for rural households that borrowed loan ($i = 1$), and not associated with the borrowed loan ($i = 2$). TH = (TT – TU) (i.e., transitional heterogeneity).

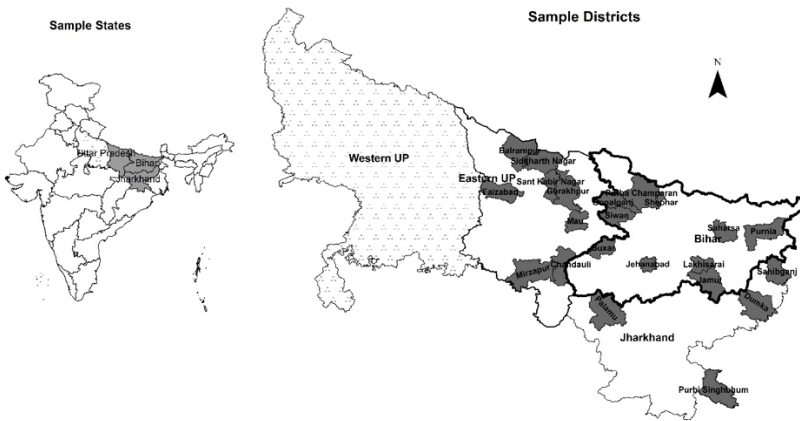


Figure 1. Sample States and Districts, Eastern India, 2018

Notes: UP indicates Uttar Pradesh.

where N_1 and N_0 are the number of observations for $B_i = 1$ and $B_i = 0$, respectively, and the details are given in Table 1. Cases (a) and (b) in Table 1 represent the actual expectations observed in the sample, while cases (c) and (d) represent the counterfactual expected outcomes. Following Heckman, Tobias, and Vytlacil (2001), we calculate the effect of the treatment “borrowed credit” on the treated (TT) as the difference between cases (a) and (c), which represents the impact of credit on the outcome variable of rural households that borrowed money. Similarly, the difference between cases (d) and (b) represents the effect of the treatment on the untreated (TU) for the rural households that did not borrow money. Additionally, we estimate the heterogeneity effect, base heterogeneity, for rural households that borrowed money as the difference between cases (a) and (d) (Carter and Milon, 2005). For rural households that did not borrow money, we define the effect of base heterogeneity as the difference between cases (c) and (b). Finally, we examine the transitional heterogeneity (TH)—namely, whether the effect of borrowed money on the outcome variable is larger or smaller for rural households that borrowed money than for those that did not in the counterfactual case (i.e., the difference between TT and TU).

Data

This study is based on primary data collected in 2018 from three eastern states of India: Bihar, Jharkhand, and eastern Uttar Pradesh. The total sample size is 2,643, including 1,200 from Bihar (45.40%), 960 from eastern Uttar Pradesh (36.32%), and 483 from Jharkhand (18.27%). The number of sample households in each state was allocated proportionally to the rural population in that state;

Bihar has the highest rural population among the surveyed states. We randomly selected ten districts from Bihar, eight districts from eastern Uttar Pradesh, and four from Jharkhand (see Figure 1). From each district, we then randomly selected two blocks; from each block, we randomly selected two villages. Finally, we randomly selected 30 households from each village for the survey. The survey collected information on household characteristics, resource endowment, access to credit from various sources, and awareness of technological and social developments.

Descriptive Statistics

Table 2 reports the descriptive statistics of the key variables used in this study. The average household has about seven members, and the average household head is about 50 years old. About 75% of the rural households are engaged in farming, with an average operational land holding of 0.70 hectares (ha). About 96% of the rural households are headed by males, and the majority of the respondents are literate (59%). “Other backward caste” accounts for 57% of the rural households, followed by scheduled caste and scheduled tribe (27%) and general caste (17%).⁴ About 82% of the rural households possess ration cards, and nearly every rural household has a bank account.⁵ However, Table 2 reveals that rural households are less likely (only 4%) to buy crop insurance. Approximately 28% of sample households receive remittance income. About 73% of the rural households are aware of the direct benefit transfer (DBT) scheme,⁶ and only 6% of rural households are actively associated with a political party. Average per capita household income is about Rs. 22,857 annually.

Table 2 further reports the differences in means of selected variables between borrowers and nonborrowers. These differences help explain variations in access to credit. Table 2 shows that borrowers are relatively younger, more aware of financial processes, and politically more active and tend to have larger farms, higher livestock assets, and better access to social safety nets (Mahatma Gandhi National Rural Employment Guarantee Act [MGNREGA]). The mean differences are statistically significant for our outcome indicators. For instance, borrowers have significantly higher PCAHI compared to nonborrowers. The results in Table 2 cannot be used to make inferences about the impact of access to credit on rural households’ economic well-being without controlling for other confounding factors.

Sources and Attributes of Credit

Our sample consists of 2,643 rural households from the eastern region of India (eastern Uttar Pradesh, Bihar, and Jharkhand). About 50% of the households in the sample had borrowed money during the 2 years preceding the survey year. Among borrowing households, 49% had borrowed from formal sources and 51% had borrowed from informal sources. The average amount of borrowing is Rs. 24,593 per household; of which 57% was from formal sources and 43% from informal sources (Table 3).⁷ Borrowing households received an average credit of Rs. 51,465 per household, with credit

⁴ “Other backward caste” includes castes that are socially and educationally disadvantaged. “Scheduled caste” and “scheduled tribe” includes designated groups of historically disadvantaged indigenous people in India. The terms are recognized in the Constitution of India, and the various groups are designated in one of the categories. Since independence, scheduled castes and scheduled tribes were given reservation status, guaranteeing political representation. “General caste” includes groups of people who do not qualify for any of the affirmative action schemes operated by the government of India (excludes scheduled castes, scheduled tribes, and other backward classes).

⁵ Ration cards are official documents issued by state governments in India to poor or eligible families so that they can buy subsidized food grains (wheat, rice).

⁶ To reduce fraud or duplication of payments and ensure accurate targeting of beneficiaries, in 2013 the government of India launched the direct benefit transfer program, which transfers subsidies directly to people through their bank accounts.

⁷ Formal agencies include co-operatives, regional rural banks, scheduled commercial banks, nonbanking financial institutions, self-help groups, micro-finance institutions, and other government agencies. Informal sources include moneylenders, friends, relatives, traders/shopkeepers, employers, and others.

Table 2. Descriptive Statistics of Sample Rural Households, Eastern India, 2018

	Mean			Overall Mean
	Borrower	Nonborrower	Difference	
Per capita annual household income (Rs.)	23,858.80	21,941.10	1,917.70***	22,857.50
Gender (1 = male)	0.97	0.95	0.02*	0.96
Household size (number)	6.98	7.02	-0.04	7.00
Average age of head of household (years)	48.85	50.78	-1.94***	49.86
Operational land holding (ha)	0.82	0.60	0.22***	0.70
Social group				
Scheduled caste (= 1 if yes; 0 otherwise)	0.22	0.20	0.02	0.21
Scheduled tribe (= 1 if yes; 0 otherwise)	0.06	0.05	0.00	0.06
Other backward caste (= 1 if yes; 0 otherwise)	0.55	0.58	-0.03	0.57
General (= 1 if yes; 0 otherwise)	0.17	0.16	0.01	0.17
Religion				
Hindu (= 1 if yes; 0 otherwise)	0.88	0.89	-0.01	0.88
Muslim (= 1 if yes; 0 otherwise)	0.12	0.11	0.01	0.11
Christian (= 1 if yes; 0 otherwise)	0.00	0.00	0.00	0.00
Household head, education				
No school (= 1 if yes; 0 otherwise)	0.41	0.42	-0.01	0.41
Middle school (= 1 if yes; 0 otherwise)	0.26	0.29	-0.03	0.28
High school (= 1 if yes; 0 otherwise)	0.19	0.18	0.01	0.19
Intermediate (= 1 if yes; 0 otherwise)	0.08	0.06	0.02	0.07
Bachelor's degree and above (= 1 if yes; 0 otherwise)	0.05	0.05	0.00	0.05
Type of ration card				
National Food Security (NFS) ration card (= 1 if yes; 0 otherwise)	0.79	0.76	0.03	0.77
Antyodaya/Annapurna card (= 1 if yes; 0 otherwise)	0.06	0.04	0.02**	0.05
No ration card (= 1 if yes; 0 otherwise)	0.16	0.20	-0.04***	0.18
Bank-related information				
Bank account (= 1 if yes; 0 otherwise)	0.99	0.99	0.01	0.99
Savings account (= 1 if yes; 0 otherwise)	1.00	1.00	-0.00*	1.00
Open under Jan Dhan Yojana (= 1 if yes; 0 otherwise)	0.42	0.32	0.09***	0.37
Made transaction (= 1 if yes; 0 otherwise)	0.80	0.84	-0.04	0.82
No. of bank accounts (= 1 if yes; 0 otherwise)	3.20	2.89	0.31***	3.04
Aadhar card (= 1 if yes; 0 otherwise)	0.99	0.99	0.00	0.99
Linked with bank account (= 1 if yes; 0 otherwise)	0.99	0.99	0.00	0.99
Heard of DCT scheme (= 1 if yes; 0 otherwise)	0.79	0.67	0.12***	0.73
Political party member (= 1 if yes; 0 otherwise)	0.07	0.05	0.02**	0.06
Heard about MGNREGA (= 1 if yes; 0 otherwise)	0.93	0.91	0.02*	0.92
Got work under MGNREGA (= 1 if yes; 0 otherwise)	0.19	0.17	0.02	0.18
Income sources				
Farming (= 1 if yes; 0 otherwise)	0.79	0.71	0.08***	0.75
Livestock (= 1 if yes; 0 otherwise)	0.70	0.61	0.10***	0.65
Fisheries (= 1 if yes; 0 otherwise)	0.01	0.00	0.00*	0.00

Continued on next page...

Table 2. – continued from previous page

	Mean			Overall Mean
	Borrower	Nonborrower	Difference	
Income sources (continued)				
Agricultural wage labor (= 1 if yes; 0 otherwise)	0.23	0.22	0.01	0.22
Nonfarm (wage) income (= 1 if yes; 0 otherwise)	0.49	0.51	−0.03	0.50
Salary/contractual (= 1 if yes; 0 otherwise)	0.08	0.11	−0.03*	0.10
Business (= 1 if yes; 0 otherwise)	0.21	0.16	0.05**	0.19
Pension (= 1 if yes; 0 otherwise)	0.13	0.16	−0.03*	0.15
Remittance (= 1 if yes; 0 otherwise)	0.28	0.28	0.00	0.28
Crop insurance (= 1 if yes; 0 otherwise)	0.07	0.01	0.06***	0.04
Assets index				
Poor (= 1 if yes; 0 otherwise)	0.33	0.33	0.00	0.33
Medium (= 1 if yes; 0 otherwise)	0.33	0.34	−0.01	0.33
Rich (= 1 if yes; 0 otherwise)	0.34	0.32	0.02	0.33
Livestock index				
Poor (= 1 if yes; 0 otherwise)	0.39	0.30	0.09***	0.34
Medium (= 1 if yes; 0 otherwise)	0.39	0.40	−0.01	0.39
Rich (= 1 if yes; 0 otherwise)	0.23	0.30	−0.07	0.26
Sources of technical advice and information related to farming practices				
Other farmers/relatives (= 1 if yes; 0 otherwise)	0.30	0.24	0.06***	0.27
Seed/input dealer (= 1 if yes; 0 otherwise)	0.29	0.19	0.10***	0.24
Government org. (= 1 if yes; 0 otherwise)	0.04	0.03	0.01	0.03
Media (= 1 if yes; 0 otherwise)	0.03	0.02	0.01	0.03

Notes: Rs. = Indian rupees; NFS = national food security; DCT = direct cash transfer; MGNREGA = Mahatma Gandhi National Rural Employment Guarantee Act.

Table 3. Distribution of Borrowing and Amount Borrowed, Eastern India, 2018

State	Average Amount of Borrowing (Rs./household)								
	Distribution of Borrowing Households (%)			Borrowing Households			All Households		
	Nonborrower	Formal	Informal	Formal	Informal	Total	Formal	Informal	Total
Bihar	48.4	23.0 (44.6)	28.6 (55.4)	50,764 (100.0)	26,995 (53.2)	50,764 (100.0)	11,647 (46.8)	13,228 (53.2)	24,875 (100.0)
Eastern UP	58.0	21.6 (51.6)	20.4 (48.4)	63,771 (100.0)	18,719 (29.4)	63,771 (100.0)	18,002 (70.6)	7,480 (29.4)	25,482 (100.0)
Jharkhand	36.1	33.8 (53.0)	30.1 (47.0)	36,510 (100.0)	16,703 (45.7)	36,510 (100.0)	11,967 (54.3)	10,091 (45.7)	22,058 (100.0)
Average	49.5	24.6 (48.7)	25.9 (51.3)	29,295 (56.9)	22,169 (43.1)	51,465 (100.0)	13,999 (56.9)	10,594 (43.1)	24,593 (100.0)

Notes: In the 2nd and 3rd columns, numbers in parentheses indicate the percentage of total borrowing households. In all other columns, numbers in parentheses are the percentage borrowers using formal and informal sources of information. UP indicates Uttar Pradesh; Rs. indicates Indian rupees.

Table 4. Disaggregated Sources of Credit and Interest Rates, Eastern India, 2018

Source of Credit	Share (%)	Annual Interest Rate (%)
Formal sources	48.70	13.00
Public/govt. bank	57.77	9.28
Regional rural bank	12.98	10.09
Private bank	2.83	24.89
Self-help groups	14.30	19.88
Micro-finance institutions	8.39	20.18
Private finance company	3.13	25.47
Cooperative bank	0.52	5.80
Informal sources	51.30	29.00
Money lender	57.49	39.19
Friends or relatives	40.71	8.26
Agricultural trader	1.48	13.53
Commission agents	0.32	36.00

amounts varying by state, from Rs. 36,510 in Jharkhand to Rs. 63,771 in eastern Uttar Pradesh (Table 3). Among formal sources, public-sector commercial banks were the dominant players, providing 58% of formal credit, followed by self-help groups (14.3%), regional rural banks (13%), and micro-financial institutions (8.4%). Private-sector commercial banks, private-sector finance companies, and co-operatives provided the remaining 7% of the formal credit to the rural households in eastern India (Table 4). Moneylenders (57.5%) were the largest source of informal credit. Friends and relatives, who usually do not charge interest or charge lower interest rates, provided 41% of informal loans in the study area.

Agricultural traders and commission agents account for a negligible share of informal credit in our sample. Formal and informal credit providers charged interest rates of about 13% and 29%, respectively, but these rates varied significantly (Table 4). For instance, co-operatives charged average interest rates of 5.8%, while private commercial banks and private financial companies charged as high as 25%. Self-help group and micro-finance institution interest rates hovered around 20%. Among informal sources, money lenders charged the highest annual interest rates (39%), followed by commission agents (36%) and friends and relatives (8.3%). In general, rural households use credit for multiple purposes, including farming and nonfarming investments, household consumption expenditures, education, medical treatment, and housing expenses. The highest proportion of informal credit (31%) was used for medical treatment.

Results and Discussion

Determinants of Access to Credit

Table 5 presents the parameter estimates of factors affecting rural households' access to credit. The dependent variable takes a value of 1 if the rural household borrowed money, and 0 otherwise. The bottom of Table 5 shows model fit; statistics such as LR χ^2 , p -value, and pseudo- R^2 statistics are encouraging, and the rate of correct classification is estimated to be about 47%. The results show that credit access is strongly associated with rural households' socioeconomic and demographic characteristics. Access to credit is positively and significantly influenced by the size of the operational landholding, awareness of loan-waiving schemes and

Table 5. Determinants of Access to Credit for Rural Households, Eastern India, 2018 (N = 2,641)

Variables	Probit Coefficient	Marginal Effect dy/dx
Age (years)	−0.439*** (0.120)	−0.157*** (0.042)
Household size (number)	0.035 (0.056)	0.012 (0.020)
Other backward caste ^{a,b}	−0.129* (0.070)	−0.046* (0.025)
General caste	0.032 (0.103)	0.011 (0.037)
Household head education (years)	−0.089 (0.105)	−0.032 (0.037)
Access to social-safety-net card ^{b,c}	0.127* (0.075)	0.045* (0.027)
Operational land (hectare)	1.140*** (0.378)	0.407*** (0.133)
Loan-waiving scheme ^b	0.210*** (0.068)	0.075*** (0.024)
Direct cash transfer ^b	0.193*** (0.059)	0.069*** (0.021)
Have Pradhan Mantri Fasal Bima Yojana ^b	0.005 (0.059)	0.002 (0.021)
Received MGNREGA ^{b,d}	0.095 (0.061)	0.034 (0.022)
Association with any political party ^b	0.171 (0.125)	0.061 (0.044)
Share of nonfarm income	−0.019 (0.022)	−0.007 (0.008)
Income from remittances ^b	0.056 (0.069)	0.02 (0.025)
Have Prime Minister Jan Dhan Yojana account ^b	0.208*** (0.053)	0.074*** (0.018)
Seek technical advice or information on farming practices from any source ^{b,e}	0.249*** (0.065)	0.089*** (0.023)
Have livestock ^b	0.139** (0.060)	0.050** (0.021)
Constant	−1.599* (0.926)	
District fixed effects	Yes	
Log pseudo-likelihood	−1,650.45	
Correctly classified	47.37	

Notes: Single, double, and triple asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. Robust standard errors are in parentheses.

^aBase group is scheduled caste and scheduled tribe.

^bDenotes dummy variables.

^cIncludes National Food Security ration card and Antyodaya/Annapurna ration card.

^dRefers to Mahatma Gandhi National Rural Employment Guarantee Act.

^eSources of technical advice and information related to farming practices include other farmers/relatives, seed/input dealer, government organizations, and media.

DCT schemes, having a Prime Minister Jan Dhan Yojana (PMJDY) account,⁸ households seeking information from any source, having livestock, and access to a social safety net card (such as National Food Security ration card and Antyodaya/Annapurna ration card). However, access to credit is negatively influenced by households belonging to a backward caste and the age of the head of the household. These findings are consistent with the literature (Kumar et al., 2015, 2017).

Impact of Credit on Annual Household Income

Table 6 reports the parameter estimates of the ESR model estimated by FIML procedures. The results of the outcome equation that assesses the impact of credit access on PCAHI are shown in columns 2 and 3. Column 4 reports the selection equation that represents the determinants of access to credit. Column 5 provides the parameter estimates of the impact of access to credit on PCAHI using ordinary least squares (OLS) regressions. The OLS approach suggests that there is a significant difference between the PCAHI of rural households that borrowed money and those of nonborrowing rural households. The coefficient of the borrower dummy variable is positive but statistically insignificant. However, using the OLS approach will lead to biased and inconsistent estimates since the OLS approach assumes that credit is exogenously determined even though such borrowing is endogenously determined.

Further, the OLS-derived estimates do not account for structural differences between the outcome variable (PCAHI) of rural households that borrowed money and those that did not. To correct for these weaknesses, the results presented in columns 2–3 of Table 6 report estimates obtained from the ESR procedure. The estimated coefficients of correlation (ρ_j) for both regime functions are negative and statistically insignificant, indicating that selection is potentially exogenous. Nevertheless, we find differences between the PCAHI coefficients of borrowing and nonborrowing rural households, indicating the presence of heterogeneity in the sample. The educational attainment of the head of the household and the share of nonfarm income had a positive and significant effect on the PCAHI for nonborrowing rural households (regime 2). Access to social-safety-net cards, income received from remittances, and PMJDY accounts had a negative and significant effect on the outcome variable (PCAHI). However, in the case of borrowing rural households (regime 1), rural households belonging to general caste, educational attainment, awareness about DCT programs, and share of nonfarm income had a positive and significant effect on PCAHI.

Treatment Effect

Table 7 presents the treatment effect of access to credit on PCAHI under actual and counterfactual conditions. Cells (a) and (b) represent the expected values of the outcome variables. The expected value for PCAHI for rural households that borrowed money was lower than that for nonborrowing rural households. This simple comparison, however, could be misleading in attributing the effect of access to credit on PCAHI of borrowing and nonborrowing rural households. Column 4 presents the treatment effects of PCAHI for borrowing rural households. Expected PCAHI is about Rs. 21,181 for rural households that borrowed money and about Rs. 21,449 for nonborrowing rural households.

In counterfactual case (c) in Table 7, rural households that borrowed money would have PCAHI of about Rs. 3,301 (i.e., about 19%) lower than if they had not borrowed money. In counterfactual case (d), rural households that did not borrow would have PCAHI of about Rs. 845 (i.e., about 4%) more than if they had borrowed money. These results imply that access to credit (or borrowing money) significantly increases the economic well-being (measured by PCAHI) of rural households

⁸ Pradhan Mantri Jan Dhan Yojana, launched on August 15, 2014, is a National Mission on Financial Inclusion, which has an integrated approach to bring about comprehensive financial inclusion and provide banking services to all households in the country.

Table 6. Parameter Estimates of Endogenous Switching Regression, Rural Households, Eastern India, 2018 (N = 2,641)

Variable	Endogenous Switching Regression			OLS Regression (rural households)
	Borrower = 1 (rural households borrowed money)	Borrower = 0 (rural households did not borrow money)	Probit Regression Borrower = 1; 0 otherwise (rural households)	
	1	2	3	4
Borrower (1 = yes, 0 = otherwise)				0.001 (0.022)
Age (ln)	0.024 (0.088)	-0.098 (0.074)	-0.411*** (0.121)	-0.057 (0.053)
Other backward caste ^{a,b}	0.036 (0.036)	-0.042 (0.039)	-0.098 (0.070)	-0.007 (0.028)
General caste ^b	0.114** (0.057)	0.052 (0.056)	0.015 (0.103)	0.079* (0.043)
Education in years (ln)	0.227*** (0.056)	0.208*** (0.054)	-0.102 (0.105)	0.219*** (0.037)
Any social-safety-net card ^{b,c}	-0.072 (0.050)	-0.093** (0.043)	0.121 (0.076)	-0.070** (0.031)
Farm size (ln)	-0.037 (0.287)	-0.335 (0.273)	1.257*** (0.383)	-0.08 (0.203)
Loan-waiving scheme ^b	0.008 (0.045)	-0.018 (0.037)	0.214*** (0.069)	0.009 (0.025)
Direct cash transfer ^b	0.099** (0.049)	0.046 (0.041)	0.207*** (0.058)	0.073** (0.029)
Have Pradhan Mantri Fasal Bima Yojana ^b	0.029 (0.034)	0.018 (0.033)	0.002 (0.059)	0.024 (0.024)
Received MGNREGA ^{b,d}	0.015 (0.044)	-0.028 (0.042)	0.08 (0.064)	0.007 (0.029)
Seek technical advice or information related to farming practices ^{b,e}	-0.058 (0.047)	-0.061 (0.043)	0.242*** (0.066)	-0.054* (0.031)
Member of political party ^b	-0.039 (0.057)	-0.06 (0.077)	0.157 (0.126)	-0.031 (0.044)
Share of nonfarm income (ln)	0.098*** (0.014)	0.154*** (0.015)	-0.011 (0.021)	0.125*** (0.011)
Income from remittance ^b	-0.005 (0.037)	-0.079** (0.036)	0.064 (0.070)	-0.046* (0.025)
Have Jan Dhan Yojana account ^b	0.005 (0.043)	-0.108*** (0.032)	0.198*** (0.053)	-0.046** (0.021)
Have livestock ^b	-0.031 (0.049)	-0.008 (0.037)	0.134** (0.061)	-0.016 (0.030)
Share of households borrowing money at block level (%)			0.026*** (0.003)	
Constant	8.934*** (0.763)	10.068*** (0.650)	-3.255*** (0.971)	9.293*** (0.499)
District fixed effects		Yes		Yes
Σ	-0.652*** (0.053)	-0.601*** (0.064)		
ρ	-0.07 (0.353)	-0.202 (0.206)		
R^2				0.140

Notes: Single, double, and triple asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. Robust standard errors are in parentheses. The dependent variable is per capita annual household income (PCAHI). OLS indicates ordinary least squares. ^aBase group is scheduled caste and scheduled tribe.

^bDenotes dummy variables.

^cIncludes National Food Security ration card and Antyodaya/Annapurna ration card.

^dRefers to Mahatma Gandhi National Rural Employment Guarantee Act.

^eSources of information include other farmers/relatives, seed/input dealer, government organizations, and media.

Table 7. Treatment and Heterogeneity Effects, Eastern India, 2018

Per Capita Household Income	Borrower 1	Nonborrower 2	Treatment Effect 3	Change (%) 4
Borrower	(a) 21,181	(c) 17,880	TT = 3,301***	18.5
Nonborrower	(d) 22,294	(b) 21,449	TU = 845***	3.9
Heterogeneity effect	BH ₁ = -1632	BH ₂ = -701	TH = 2,456***	

Notes: Single, double, and triple asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. BH_i is the effect of base heterogeneity for rural households that borrowed loan ($i = 1$), and not associated with borrowed loan ($i = 2$). TT is the effect of the treatment (i.e., rural households borrowed loan) on the treated (i.e., rural households did not borrow loan). TU is the effect of the treatment (i.e., borrowed loan) on the untreated (i.e., did not borrow loan). TH = (TT - TU) (i.e., transitional heterogeneity).

Table 8. Heterogeneity Treatment Effect of Borrowing Rural Households, Eastern India, 2018 (N = 1,122)

Variables	Coefficient	Standard Error
Age (ln)	0.890***	(0.071)
Other backward caste ^{c,d}	0.590***	(0.044)
General ^c	0.558***	(0.055)
Education in years (ln)	0.369***	(0.041)
Have social-safety-net cards ^{a,c}	0.037	(0.043)
Cultivable land in hectares (ln)	0.006***	(0.182)
Heard of loan-waiving scheme ^c	0.152***	(0.040)
Direct cash transfer ^c	0.355***	(0.036)
Heard about PMFBY ^c	0.091***	(0.026)
Received MGNREGA ^c	0.280***	(0.043)
Association with political party ^c	0.016	(0.043)
Share of nonfarm income (ln)	-0.176***	(0.016)
Income from remittance ^c	0.483***	(0.036)
Have PMJDY account ^c	0.619***	(0.040)
Seek technical advice or information related to farming practices from any source ^{b,c}	-0.071**	(0.033)
Have livestock ^c	-0.208***	(0.038)
Constant	-0.514	(0.565)
District fixed effect	Yes	
R ²	0.712	

Notes: Single, double, and triple asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. Robust standard errors are in parentheses. PMFBY indicates Pradhan Mantri Fasal Bima Yojana. MGNREGA indicates the Mahatma Gandhi National Rural Employment Guarantee Act. PMJDY indicates Pradhan Mantri Jan Dhan Yojana.

^aIncludes National Food Security ration card and Antyodaya/Annapurna ration card.

^bSources of information on farming practices and technical advice include other farmers/relatives, seed/input dealer, government organizations, and media.

^cDenotes a dummy variable.

^dBase group is scheduled casts and scheduled tribes.

in the eastern region of India. Additionally, the TH effect is positive; that is, the effect of access to credit on PCAHI is significantly larger for rural households that borrowed money relative to nonborrowing rural households. The last row of Table 7, which adjusts for potential heterogeneity in the sample, shows that rural households that borrowed money would have significantly more PCAHI than nonborrowing rural households in counterfactual (c). This highlights that here are some important sources of heterogeneity that make borrowers “better economically” than nonborrowing rural households. Nevertheless, rural households that borrowed money are still better off than nonborrowing rural households in eastern India. Finally, counterfactual case (d) shows that if the nonborrowing rural households had borrowed money, they would have higher PCAHI than the rural households that borrowed money.

Heterogeneous Impact of Credit

The previous results on the average treatment effect on the treated (ATT) of access to credit highlighted the important role that credit access may play in rural livelihoods and economic well-being. However, the estimated ATT of access to credit can differ among types of rural households. Capturing the differential effect of access to credit is therefore important for targeting individual households as well as for designing “best-fit” credit delivery models instead of a “one-size-fits-all” approach. Table 8 presents the heterogeneous treatment effect of borrowing households across rural household characteristics.

Following Verhofstadt and Maertens (2015) and Wossen et al. (2017) we employ OLS regression and use the ATT of PCAHI (log) as the dependent variable. Parameter estimates in Table 8 reveal that heterogeneous effects are very high. We find that most variables (except access to social-safety-net cards and membership in a political party) have a positive and significant impact on PCAHI for borrowing households. However, share of nonfarm income, seeking technical advice and information related to farming practices from any source (other farmers/relatives, seed/input dealers, government organizations, and media), and households with livestock have a negative and statistically significant impact on PCAHI for borrowing households. A plausible explanation could be that additional sources of income, like nonfarm income and livestock,⁹ could be used to relax the credit constraint. In other words, rural households rely on off-farm income and income from livestock for consumption expenditures rather than borrowing money.

Summary and Conclusions

Improved rural development in India could have a considerable impact on Eastern India’s overall socioeconomic condition. Despite consistent growth in the national economy, rural development faces several challenges, especially in eastern India, including widespread poverty. To make credit schemes effective for the poor, it is essential to identify factors that influence rural households’ access to credit as well as how credit affects rural households’ economic well-being. This study investigated factors affecting rural households’ access to credit and the impact of credit on recipients’ incomes.

We conducted a unique survey of three eastern states (eastern Uttar Pradesh, Bihar, and Jharkhand), which we chose as our focal area because the region has low educational attainment, low levels of income, and the highest incidence of poverty in the country. Most of the rural population in the region is hampered by low income growth, limited employment opportunities, and limited access to credit schemes. Policy makers, researchers, and institutions have expressed increasing concern that eastern India is in a disadvantageous position for poverty reduction compared to other regions of the country. Our results show that access to credit is strongly associated with rural households’ socioeconomic and demographic characteristics.

We draw three main conclusions from the results of this study. First, rural households with access to credit (i.e., that have borrowed money) have systematically different attributes than the rural households that do not (i.e., have not borrowed money). These differences represent sources of variation between the two groups (borrowers and nonborrowers). Second, access to credit increases PCAHI. Interesting patterns emerge when we analyze this result for the two types of rural households: Rural households with access to credit tended to have higher PCAHI than those without access to credit in the counterfactual case. Rural households with access to credit have some attributes (e.g., unobserved skills) that allow them to be more productive and enjoy higher incomes (or well-being). Interestingly, we found that the impact of access to credit on PCAHI is smaller for rural households with access to credit than the impact would have been for rural households without access to credit, in the counterfactual case, if they had had such access. It seems that, while both

⁹ Under the liquidity constraint, rural households could sell their livestock and use the money to fund consumption.

groups of rural households would benefit from the implementation of policies encouraging access to credit, rural households without access to credit would benefit the most from achieving access to credit.

Finally, access to credit affects recipients heterogeneously, implying that credit policies should be adaptable to different rural household groups. This study supports differential approaches for different categories of households rather than a “one-size-fits-all” approach. Access to the credit market can offer the necessary financial resources to allow households to adopt new technologies and acquire inputs that are better suited to increasing the productivity and efficiency of self-employed individuals. In our study, the significant impact of credit on rural households’ economic well-being demonstrates the potential influence of credit programs on India’s rural economic development. Policy makers should design and provide incentives to establish a supportive regulatory environment in which the credit sector can achieve sustainable development. For instance, it would be appropriate to legally permit nonfinancial institutions—including self-help groups and other co-operative entities—to enter the rural credit market. This would expand nonfinancial institutions’ ability to raise funds for their lending businesses and expand the reach of their funds in improving economic well-being and supporting sustainable economic development in eastern Indian.

This study is subject to a few limitations and provides insights for further research. Since the study is based on cross-sectional data, it was not possible to analyze the dynamic of household resources and access to credit over time. To that end, longitudinal studies are needed to assess the long-term effects of access to credit on rural households’ economic well-being. Further, the scope of the impact of access to credit was limited, due to data availability, to one indicator of rural households’ economic well-being (per capita annual household income). Future studies could use additional indicators of household welfare, including labor allocation, poverty rates, and consumption expenditures on both durables and nondurables.

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