

"A man is  
great by  
deeds, not by  
birth"

-Chanakya

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**Does knowledge empower? A story of debt literacy and credit usage in rural  
consumer finance**

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# Does knowledge empower? A story of debt literacy and credit usage in rural consumer finance<sup>1</sup>

## Abstract

We study the role of debt literacy as an empowerment device in accessing credit in rural India. We use primary data collected from 600 rural households in the state of Kerala in India, that include measures of credit usage and debt literacy drawn from the literature. Using Instrumental Variable regressions, we find a positive and significant effect of debt literacy on credit usage. We find similar results in subsamples comprising of agricultural households and female respondents. This finding is in contrast with prior studies that found a negative relation between debt literacy and debt. Our finding that individuals with higher debt literacy tend to hold more debt underscores the importance of debt literacy in their ability to avail of credit. We obtain similar findings when we repeat the analysis with a national level dataset and use treatment effects based on inverse probability weighting with regression adjustment. Our findings could help financial institutions to use debt literacy training as a part of responsible lending and could also inform the design of financial education policies to address the informational and capability limitations of households.

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**Keywords:** household finance, financial inclusion, financial decisions, financial literacy, credit usage, rural consumers

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## **1. Introduction**

We study the effect of debt literacy (Lusardi & Tufano, 2015) on credit usage of rural households in a developing country. Institutional and market driven changes like financial innovation and democratisation of credit over the past 25 years have led to structural changes in the financial landscape of households in countries across the globe (Dyanan et al., 2006). Expansion of financial opportunities has been identified as a key factor behind the economic security of households during this transition period (Dyanan, 2009). This expansion of the financial basket has necessitated policy attention towards the financial knowledge of individuals who are now in greater charge of their financial wellbeing due to reasons such as the transition in pension systems from defined benefit (DB) to defined contribution (DC) in many countries (Gamble et al, 2015; Guiso & Sodini, 2013). The financial crisis of 2007-08 also underscored the importance of household financial decisions, especially in the domain of credit (Brown et al., 2013; Büyükkarabacak & Valev, 2010; Dyanan, 2009). Financial literacy has been identified as an important driver of financial behaviors such as stock market participation, retirement planning, saving and indebtedness (Lusardi & Mitchell, 2007, 2011a; Lusardi & Tufano, 2015; Van Rooij et al., 2011). The importance of financial knowledge has been highlighted by studies on the effects of financial education or training on financial behavior (Bruhn et al., 2014; Carpena et al, 2019; Cheung et al., 2014; Fernandes et al., 2014; Kaiser et al., 2021; Kaiser & Menkhoff, 2017).

In this paper, we explore the case of credit, which is the most common financial service in a developing country once financial inclusion is attained. The dramatic rise in household debt in recent decades and its important consequences for short run and long run economic growth have been addressed in prior research (André, 2016; Lombardi et al., 2017). While debt is useful for smoothing consumption paths, beyond a certain point it can create financial pressure on vulnerable families (Brown & Taylor, 2008). Gathergood (2012) and Lusardi and Tufano (2015) showed that poor debt literacy is associated with higher debt burden. Debt literacy is the ability to make simple decisions regarding debt by applying basic knowledge about interest compounding to financial choices (Lusardi & Tufano, 2015).

Our contention is that debt literacy may act as an empowerment device in rural areas of a developing country where there has been a transition in the consumer finance landscape due to financial inclusion. (Xu & Zia, 2012) have noted that the implications of financial literacy might differ in developed and developing countries due to considerable differences in financial outreach. As opposed to the developed country case, where financial literacy plays a role in consumer protection, developing countries may exhibit an empowering role of financial literacy in increasing access to and usage of financial services. We provide evidence for the empowering role of debt literacy of individuals in their levels of credit usage mostly from formal sources. Our analysis is based on primary data collected from a rural part of India which experienced a transformation in the institutional landscape due to increase in financial inclusion. Access to financial services is not a hindrance in this region but the institutional challenge has moved on to the effectiveness of financial inclusion and its determinants. We assess the extent of credit usage by measuring the debt-asset ratio<sup>2</sup> of individuals. The data was hand-collected from 600 households across 3 districts of rural Kerala – a southern state of India. The state of Kerala attained 100 percent financial inclusion in 2014, thereby providing a unique setting where we can explore the aforementioned phenomenon for the hitherto under-studied segment of rural households.

Our study makes the following four contributions. First, there is scant literature on factors influencing consumer credit in developing countries like India particularly after an increase in the levels of financial inclusion.<sup>3</sup> We explore the factors influencing credit behavior in the changed institutional context with new participants in the formal financial system. Our developing country focus makes it natural to study the case of rural households. Secondly, the concept of debt literacy has been scarcely explored in the

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<sup>2</sup> We constructed a measure of respondent level debt-asset ratio by dividing the total outstanding debt (from all sources) held by the respondent with the asset of the household (to standardize the measure). To calculate the value of assets, we considered the total value of agriculture produce, household articles like movables, consumer durables, gold and other physical investments like livestock, capital/ equipment etc.

<sup>3</sup> Most studies on India have focused on informal finance because of the poor financial inclusion levels prevailing earlier (Bell, 1990; Swaminathan, 1991; Jeromi, 2007). Pradhan (2013) noted that around two fifths of the rural households depend on informal credit, pointing at the further scope of financial inclusion in rural areas. However, there exists scant literature on the credit behavior of households in developing countries after a transition to financial inclusion as this is a relatively new phenomenon in these countries.

context of developing countries.<sup>4</sup> This underscores the need for assessing the debt literacy levels of rural households which we do for the first time in the literature. Thirdly, ours is the first study to examine the linkage between the levels of credit usage and debt literacy in a developing country context. Specifically, we attempt to answer the research question, how does debt literacy influence the credit usage of rural households? Finally, in contrast with prior evidence for developed countries, we find that debt literacy enables borrowers to take more debt in the context of a recent transition in the household financial landscape.

Our results show that debt literacy levels are low in our sample with less than one third of the respondents exhibiting a basic understanding about interest compounding. Estimates from Ordinary Least Squares (OLS) regressions suggest that debt literacy is positively associated with the extent of credit usage in the case of the entire sample as well as for specific groups such as agricultural households and females. To address potential endogeneity concerns, we use financial exposure and family influence as instruments for debt literacy. Our identification strategy is based on the absence of any direct influence of financial exposure or family influence on current credit usage, other than through debt literacy. The instruments are validated by Hansen J-statistics and F-statistics from the first stage regression. Based on the Instrumental Variable-Two Stage Least Squares (IV-2SLS) regressions, we find that the positive relationship between credit usage and debt literacy is statistically significant for the entire sample. In addition, when we separately analyse the agricultural households and females, we find a similar positive and significant influence of debt literacy on the credit usage.

We also show that the results based on our primary data are supported by an analysis of an all-India data-set of 40,327 households conducted by India's leading rural financial institution, NABARD (National Bank for Agriculture and Rural Development). We confirm the robustness of this result by using inverse probability weighting with regression adjustment (IPWRA) as an alternative estimation

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<sup>4</sup> An exception is Cole et al (2009) who explored the case of Indonesia and India to show that there is correlation between financial literacy and demand for financial services. Gaurav and Singh (2012) also studied financial and debt literacy (of farmers in the state of Gujarat in India) but did not consider the implications for financial behavior.

method. We also conduct sensitivity analysis to rule out any hidden bias in the results due to missing unobservables. The findings from our study underscore the importance of debt literacy in the ability to avail of credit. Hence it contributes to a better understanding of the role of debt literacy of rural households in a region that has achieved financial inclusion. In the rest of the paper, we describe the background of the study (section 2), the data and methodology (section 3), the empirical estimation (sections 4 to 6) and concluding remarks (section 7).

## **2. Background**

Academic literature has strongly argued that a country's financial sector development facilitates economic growth (Demirgüç-Kunt & Maksimovic, 1998; King & Levine, 1993; Rajan & Zingales, 1998). Financial inclusion is another transformation happening around the world as a result of liberalisation of credit markets and many new financial inclusion initiatives after the UN declared 2005 as the International Year of micro credit followed by the World Bank's thrust on 'Finance for All' since 2008. Efforts to promote financial inclusion in developing countries have witnessed a massive scale up in the past decade. As a result of this, the Global Findex Database has recorded an increase in the share of banking population from 51 percent in 2011 to around 69 percent in 2017 (an increase of about 1.2 billion accounts) (Demirguc-Kunt et al., 2018). Among developing countries, the case of India deserves special mention as a front runner in setting a new institutional context of high levels of financial inclusion (55 percent of the global share) (Demirguc-Kunt et al., 2018). With the roll out of national level initiatives for financial inclusion like Swabhimaan scheme<sup>5</sup> in 2011 and PMJDY scheme<sup>6</sup> in 2014 to improve financial inclusion in the country, around 322.5 million bank accounts were opened for the

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<sup>5</sup> Swabhimaan is a campaign by the Union Government and the Indian Banks Association to bring the underprivileged segments of India into the ambit of formal banking by leveraging modern technology. Source: *NABARD All-India Rural Financial Inclusion Survey 2016–2017*. National Bank for Agriculture and Rural Development Department of Economic Analysis and Research. Retrieved from NABARD website: [https://www.nabard.org/auth/writereaddata/tender/1608180417NABARD-Repo-16\\_Web\\_P.pdf](https://www.nabard.org/auth/writereaddata/tender/1608180417NABARD-Repo-16_Web_P.pdf)

<sup>6</sup> Pradhan Mantri Jan Dhan Yojana is a national mission for financial inclusion announced by the Prime Minister of India in 2014 to ensure a bank account for every household in the country. Source: Pradhan Mantri Jan Dhan Yojana, Department of Financial Services, Ministry of Finance, Government of India. URL: <https://pmjdy.gov.in/> (accessed 29 June 2021)

unbanked population in India over the last decade. Innovative digital financial infrastructure like India stack has significantly improved the pace of this progress (IMF, 2021)<sup>7</sup>. As a major boost to the government's efforts in improving the financial access of citizens, two states (Kerala and Goa) along with three Union Territories (Chandigarh, Puducherry and Lakshadweep) became the first in the country to achieve 100 percent financial inclusion, defined as having at least one bank account per household, according to the Ministry of Finance in November 2014<sup>8</sup>.

Once financial inclusion is achieved by ensuring the supply of financial services, a natural question to examine is whether there are any demand side factors that would help to sustain the usage of financial services by the newly banked population. Previous research has documented the role of several factors that influence the debt levels of households mostly in the context of developed countries with well-developed financial markets, particularly in the aftermath of the sub-prime mortgage crisis of 2008 (Brown et al., 2013; Büyükkarabacak & Valev, 2010). Disney and Gathergood (2013) showed that individuals with low levels of financial literacy are less likely to invest in improving their awareness of the credit market. Gathergood (2012) showed that lack of self-control and poor financial literacy are associated with loan delinquency and debt burden. Lusardi and Tufano (2015) showed that individuals with lower debt literacy tend to use high-cost credit instruments. French and McKillop (2016) found that money management skills of low-income households are associated with lower indebtedness.

In the case of India, Jeromi (2007) observed that the incidence of indebtedness in rural areas of Kerala was 39 percent in 2002 as compared to the national average of 27 percent. In our sample of rural households of Kerala, 56 percent of the households had outstanding debt. Hence, it is crucial to study the debt literacy of these households as debt illiteracy has been identified to be costly and welfare reducing (Lusardi & Tufano, 2015). We chose to specifically assess debt literacy which is a component

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<sup>7</sup> Carrière-Swallow et al (2021) Report by International Monetary Fund (IMF) titled "Stacking Up Financial Inclusion Gains In India" URL: <https://www.imf.org/external/pubs/ft/fandd/2021/07/india-stack-financial-access-and-digital-inclusion.htm> (accessed on 05 November 2021).

<sup>8</sup> ENS Economic Bureau (2014, November 15). Two states, three UTs achieve 100% inclusion in Jan Dhan. URL: <https://indianexpress.com/article/business/business-others/two-states-three-uts-achieve-100-inclusion-in-jan-dhan/> (accessed on 29 June 2021).

of the broader financial knowledge. Though there are several measures to assess financial literacy in general, there are comparatively fewer measures which focus specifically on credit or debt related knowledge. We use the debt literacy questions introduced by Lusardi and Tufano (2015). These questions were used by Gathergood (2012) to measure financial literacy in the UK. In addition, these questions have been validated in the context of rural India by Gaurav and Singh (2012). We slightly modified the questions from Lusardi and Tufano (2015) to suit the Indian context, based on Gaurav and Singh (2012) as well as a few pilot interviews that we conducted before the main survey (the questions are explained in section 3.4). These questions intend to assess the knowledge about the power of interest compounding, regarding interest payments on outstanding debt, time value of money and the skills of comparing payment options. The number of correct responses is considered to be a respondent's debt literacy.

To the best of our knowledge, there is no existing study on the impact of debt literacy on the levels of credit usage of rural borrowers after a change in the institutional arrangement in the household credit markets. Given this backdrop, we explore the case of rural Kerala in India which could act as a benchmark for other developing countries. Some of the unique features of the state, other than being among the first to achieve complete financial inclusion, is its reputation as a model state for its achievements in social and economic development (Chathukulam & Tharamangalam, 2021). The state has the highest Human Development Index (HDI) in India while also being among the top 12 states in terms of per capita income. Kerala, which is known for being a pioneer in land reforms through the Kerala Land Reforms Act of 1969, has a unique agricultural sector with highly fragmented and small size holdings (Bandyopadhyay, 1986; Besley & Burgess, 2000; Radhakrishnan, 1981). These features of Kerala make the study's setting relevant as financial inclusion and economic development at the national level is fast improving due to various schemes and programs of the Indian government and the lessons from Kerala could serve as useful policy inputs for India as well as other developing countries.

### **3. Data and Methodology**



As there is no secondary data available for India to examine our research question, we depend on primary data hand-collected by us from three villages across different districts of Kerala.

### 3.1. Sample

Kerala has a lower share of agricultural households than the rest of the country<sup>9</sup>. To get a nationally representative sample of the rural population, we purposefully selected the villages in our study that would give us a sample consisting of rural households who primarily engage in agriculture. In each of the three districts (viz. Kozhikode, Wayanad and Idukki), we identified a ward in consultation with the Panchayati Raj Institution (PRI)<sup>10</sup> to represent the district. These three wards represent rural regions in Kerala which is supported by the fact that they belong to the 'Village Panchayats', not municipalities or any higher versions of local administrative units. The percentage of agricultural households in our sample is 46.5 percent which bears resemblance to the rest of India.

The first ward was chosen from Kozhikode district (ward No. 9 – Aanayodu, of Koodaranji Village Panchayat). The second ward is from Wayanad district (ward No. 12 - Karinkanikkunnu in Muttil Village Panchayat). The third ward belongs to Idukki district (ward No. 4 – Pathumuri in Kumily Village Panchayat). 200 households were selected from each ward giving us a total sample size of 600. The sample coverage of the study is described in Table 1. Based on their reported main source of income, the households are divided into agricultural households (AHHs) and non-agricultural households (NAHHs). The households are evenly represented in the two categories in the overall sample even while some districts have more agricultural than non-agricultural families.

Table 1  
Sample coverage of the study (Number of households by category)

AHHs	NAHHs	Undisclosed

<sup>9</sup> As per the National Sample Survey Organization's 'Situation Assessment Survey of Agricultural Households' of 2013, Kerala had the lowest share of agricultural households in its rural population. While the percentage of agricultural households in rural households for all-India was 57.8 percent, it was only 27.3 percent for Kerala.

<sup>10</sup> PRI is the local self-government of villages in rural India within which a ward is the smallest administrative unit.

District	Marginal	Small	Others		
Kozhikode†	33	22	5	132	8
Wayanad†	88	13	4	72	23
Idukki †	78	14	3	75	30
Total	199	49	12	279	61

Note: Following the National Sample Survey Organization's definition, 'Marginal' refers to landholding less than 1 hectare, 'Small' refers to landholding between 1–2 hectares, and 'Others' refers to landholding of more than 2 hectares. † Kozhikode-Aanayodu ward in Koodaranji Village Panchayat, † Wayanad- Karinkanikkunnu ward in Muttill Village Panchayat, † Idukki- Pathumuri ward in Kumily Village Panchayat. AHHs denotes agricultural households, NAHHs denotes non-agricultural households, Undisclosed denotes those households which did not reveal main source of income or land size.

### 3.2. Data Collection

The primary data was hand-collected through direct interview method from 600 households residing in the three selected wards (based on systematic samples drawn from the official voters list prepared by the Chief Election Commissioner of Kerala). A detailed questionnaire (available at request) was used that covers basic demographic information as well as information about household financial behavior and debt literacy. Language checks were done to ensure consistency between the English and Malayalam (the local language of the survey) versions in accordance with Behling and Law (2000). The field visits for data collection were conducted during the period from May 2017 to August 2017 and all the financial information in respect of the credit usage was collected as on 31<sup>st</sup> March 2017.

The questionnaire was pre-tested in a few rural households in two different districts of Kerala. Based on the experience and feedback from this pilot study, the questionnaire was then improved and finalised. Then the final questionnaire was used to collect data from the three selected wards with the help of

Kudumbashree<sup>11</sup> workers who acted as the field staff for data collection. In each ward, we met the PRI representatives to organize training sessions for the field staff to familiarise them with the questionnaires. After the training sessions, questionnaires were distributed among the field staff whom we guided in the data collection by accompanying each one of them to the first few households to ensure that the survey is conducted properly. After hand-holding the field staff till they became familiar with the entire questionnaire, the remaining data was then collected by them by visiting the rest of the households in each ward. Since it was mostly the female members of the households who were available during these visits that happened during the day, the share of women among the respondents turned out to be 73.4 percent. In addition to our interaction with the field staff and some of the respondents, detailed discussions were also held with people's representatives and other administrative functionaries to understand ground-level realities in respect of credit usage and financial behavior.

### 3.3. Credit usage

The data revealed that 73.26 percent of the rural households hold at least one outstanding debt at the time of the survey. This debt level is higher than the national figure of 31.4 percent for the rural households in the country as per the latest All-India Debt and Investment Survey (AIDIS 2012)<sup>12</sup>. The incidence of debt is higher even when compared with the recent data from the NABARD All-India Rural Financial Inclusion Survey (NAFIS 2016-17)<sup>13</sup> which reported that 47.4 percent of the rural households in India are holding debt. More importantly, of the total AHHs in our sample, 69.23 percent are indebted, and of the NAHHs, 56.63 percent have outstanding debt. These levels are also higher

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<sup>11</sup> Kudumbashree is the flagship poverty eradication and women empowerment program of the government of Kerala and is managed by a community network of low-income women across the state.

<sup>12</sup> All-India Debt and Investment Survey (AIDIS) is a decennial survey conducted by the National Sample Survey Office. The latest available round of this national survey is AIDIS(2012). Source: *Key Indicators of Debt and Investment in India, NSS 70th Round 2013, December 2014*. National Sample Survey Office, Ministry of Statistics and Program Implementation (MOSPI). Retrieved from MOSPI website: [http://www.mospi.gov.in/sites/default/files/publication\\_reports/KI\\_70\\_18.2\\_19dec14.pdf](http://www.mospi.gov.in/sites/default/files/publication_reports/KI_70_18.2_19dec14.pdf)

<sup>13</sup> *NABARD All-India Rural Financial Inclusion Survey 2016–2017*. National Bank for Agriculture and Rural Development Department of Economic Analysis and Research. Retrieved from NABARD website: [https://www.nabard.org/auth/writereaddata/tender/1608180417NABARD-Repo-16\\_Web\\_P.pdf](https://www.nabard.org/auth/writereaddata/tender/1608180417NABARD-Repo-16_Web_P.pdf)

compared to the national figures of 45.94 percent of cultivator households and 28.85 percent of non-cultivator households according to AIDIS 2012 and 52.5 percent of AHHs and 42.8 percent of NAHHs as per NAFIS 2016-17. We observed that commercial banks are the most important credit source for rural households in Kerala as they account for 32 percent of the loans followed by cooperative banks (21 percent) and Regional Rural Banks (19 percent). 77 percent of the loans are from formal institutional sources which is higher than what has been seen for other states of India. This is in line with the achievement of financial inclusion in Kerala ahead of most other states of India.

Table 2 presents the distribution of loans taken by the sample households. The figures reveal that formal sources of credit dominate in the sample and there are very few households who have loans only from informal sources (0.77 percent for AHHs and 2.15 percent for NAHHs). There is not much difference between the AHHs and NAHHs in terms of the choice of loan source. 16.15 percent of AHHs had at least one loan from a Non-Banking Financial Company (NBFC) or a Microfinance Institution (MFI) while the corresponding figure for NAHHs was 12.9 percent. 15.38 percent of AHHs had at least one Self Help Group (SHG) loan while the corresponding figure for NAHHs is 12.9 percent. However, the percentage of AHHs with loans from informal sources only (0.77 percent) is quite low as compared with the percentage of NAHHs with loans from informal sources only (2.15 percent). This means that AHHs are less dependent on only informal sources of loans compared with NAHHs, possibly due to the prevalence of crop loans which are available from formal institutions. Indeed, the overall share of households with sole dependence on informal loans is very low (1.48 percent).

Table 2  
Sources of loans taken by agricultural and non-agricultural households

Households with loan from Formal sources		Households	Households
At least one loan from a formal source	Out of which, at least one NBFC/MFI loan	Out of which, at least one SHG loan	with loans from informal sources only
			without loans

AHHs	180 (68.97 percent)	42	40	2	(0.77 percent)	79 (30.27 percent)
NAHHs	158 (56.63 percent)	36	36	6	(2.15 percent)	115 (41.22 percent)
Total	338 (62.59 percent)	78	76	8	(1.48 percent)	194 (35.93 percent)

*Notes:* Figures in parenthesis refer to share to total households in that category. This is for those who have reported the source of loans as well as their main source of income.

The mean household debt of AHHs in our sample is Rs. 219,425 while in case of NAHHs, mean debt outstanding is Rs. 178,843.<sup>14</sup> Thus, AHHs have a higher level of debt than NAHHs which is in accordance with the national level pattern observed in AIDIS 2012 and NAFIS 2016-17. However, these debt levels are quite high compared to the average amount of debt per household at the national level i.e. Rs. 70,589 for cultivator households and Rs. 25,741 for non-cultivator households as per AIDIS 2012 and also in comparison with the recent figures from NAFIS 2016-17 (Rs. 104,602 for AHHs and Rs. 76,731 for NAHHs). This indicates a higher dependence on debt by rural households in Kerala than in other parts of India. This could be an outcome of the high level of financial inclusion in this part of India leading to easy credit conditions even for rural households.<sup>15</sup>

In Table 3 we compare the average debt levels of AHHs as per the size of land holding. It can be noted that the category of small farmers (land holding between 1-2 hectares) has the highest average debt of Rs. 299,469 followed by marginal farmers (land holding less than 1 hectare) at Rs. 204,669. Others (land holding of more than 2 hectares) have the lowest average debt of Rs. 154,333. It seems therefore that small farmers (rather than marginal) are the ones holding more debt and the larger farmers are the least indebted. However, a comparison based on the average debt per hectare of land operated shows

<sup>14</sup> INR refers to Indian Rupees and 1 USD equaled INR 64.8 on 31<sup>st</sup> March 2017.

<sup>15</sup> As regards the purpose of credit, we found that AHHs, whether from formal or informal sources, have mainly borrowed for productive purposes such as crop cultivation and investment in farm related activity (through agricultural term loan). However, for the others, the main purpose of taking a loan is housing, irrespective of whether the loan is from a formal or an informal source.

the marginal farmers with a mean debt of Rs. 444,933 (and median debt of Rs. 326,087) per hectare of land are more indebted compared with other categories of households given their respective sizes of land.

Table 3  
Average loan size of AHHs by size of land holding

Category	Mean debt (in Rs.)		Median debt (in Rs.)	
	Per household	Per ha. of land operated	Per household	Per ha. of land operated
Marginal	204669	444933	150000	326087
Small	299469	215445	263500	189568
Others	154333	37369	170000	41162
All AHHs	219425	36693	182500	30518

#### 3.4. Debt literacy

Based on the debt literacy questions adopted from Lusardi and Tufano (2015), we now assess the responses to understand the extent of financial knowledge exhibited by the respondents. The first question, measuring interest compounding, is as follows: Suppose you owe Rs. 1000 to a bank and the interest rate you are charged is 20% per year compounded annually. If you did not pay anything off, at this interest rate, how many years would it take for the amount you owe to double?

- (i) 2 years.
- (ii) Less than 5 years.
- (iii) 5 to 10 years.
- (iv) More than 10 years.
- (v) Do not know.
- (vi) Prefer not to answer

In this question, anyone who knows about the compounding of interest would correctly answer that the number of years taken for an amount of Rs. 1000 to double at the rate of 20% compound interest is less than 5 years. Table 4 reveals that only 28.1 percent of the respondents answered this question correctly.

Table 4  
Debt literacy assessment

Answers to		Answers to		Answers to	
Question 1	Percentage	Question 2	Percentage	Question 3	Percentage
		Less than 5			
2 years	17.45%	years	13.73%	Option (a)	53.77%
Less than 5					
years		Between 5		Option (b)-	
(Correct)	28.10%	and 10 years	11.44%	(Correct)	8.41%
		Between 10		They are the	
5 to 10 years	10.47%	and 15 years	5.11%	same	21.37%
		Never, you			
		will continue			
More than 10		to be in debt			
years	6.98%	(Correct)	38.38%	Do not know	13.31%
				Prefer not to	
Do not know	32.29%	Do not know	27.46%	answer	2.10%
Prefer not to		Prefer not to			
answer	4.71%	answer	3.87%		1.05%

The evidence is consistent with the reported levels of low debt literacy in prior studies (Lusardi & Mitchell, 2007; Lusardi & Tufano, 2015). However, the percentage of correct responses to this question in our sample (28.1 percent) is much lower when compared to these studies (e.g. 35.9 percent reported by Lusardi and Tufano (2015)). The percentage of respondents who chose ‘do not know’ is 32.3 percent

in our sample which is higher than 18.3 percent reported by Lusardi and Tufano (2015). This is a cause for concern as previous studies (Lusardi & Mitchell, 2011a, 2011b; Lusardi & Tufano, 2015; Van Rooij et al., 2011) have reported that respondents who answered ‘do not know’ exhibit the lowest levels of financial knowledge. Skagerlund et al. (2018) showed that numeracy as well as emotional attitude towards numbers could significantly influence the financial literacy of individuals. In other words, people who are not numerate would exhibit difficulty in grasping percentages required to answer the question on interest compounding. Overall, it is disquieting that high levels of financial inclusion do not seem to have resulted in a satisfactory level of knowledge about interest compounding in the rural areas. Limited knowledge about interest compounding may pose difficulties in the new institutional set-up of easy availability of credit for the rural households post financial inclusion.

Moving to the second question which looks at the financial knowledge regarding the interest payments on the outstanding debt, the results in Table 4 show a slightly better picture. The exact question is as follows: You borrow Rs. 3000 from a moneylender. You pay a minimum payment of Rs. 30 each month. At an annual percentage rate of 12% (or 1% per month), how many years would it take to eliminate your debt if you made no additional new charges?

- (i) Less than 5 years.
- (ii) Between 5 and 10 years.
- (iii) Between 10 and 15 years.
- (iv) Never, you will continue to be in debt.
- (v) Do not know.
- (vi) Prefer not to answer.

38.4 percent of the respondents answered correctly (similar to 35.4 percent in Lusardi and Tufano (2015) ) that payment of interest alone would not lead to decline in the principal amount and the debt if managed this way would become perpetual. This result is significant as it offers certain cues regarding the widespread shift in debt sources from informal to formal sources of credit. Rural households in Kerala seem to be aware of the dangers of ‘interest alone repayment’ which is often practised by several



informal moneylenders to keep their clients debt ridden for a lifetime. However, the 27.5 percent responses of 'do not know' indicate that there is room for improvement as sustainable repayment modes are now available in the context of easy institutional credit. This is higher than 21.7 percent 'do not know' responses reported by Lusardi and Tufano (2015).

In the third question, we assess the knowledge regarding time value of money and how skillful the respondents are in comparing different payment options available. We also sought to understand the preference for fixed payments which is a common feature in many of the debt repayment options. Meier and Sprenger (2010) argued that such preferences could reflect the behavioral biases of people regarding lack of self-control. The exact question is as follows: You purchase an appliance that costs Rs. 1000. To pay for this, you are given the following two options:

- (a) Pay 12 monthly instalments of Rs. 100 each.
- (b) Borrow at a 20% annual interest rate and pay back Rs. 1200 a year from now.

Which is the more advantageous offer?

- (i) Option (a).
- (ii) Option (b).
- (iii) They are the same.
- (iv) Do not know.
- (v) Prefer not to answer.

The responses in Table 4 show that there is widespread bias regarding the time value of money. Only a very small fraction of respondents (8.4 percent) chose the cheaper option (similar to 6.9 percent reported by Lusardi and Tufano (2015)) whereas a significantly higher proportion (53.8 percent) chose the costly option associated with an Annual Percentage Rate of 35 percent as opposed to 20 percent in the 'correct' option (higher compared to 40.6 percent reported by Lusardi and Tufano (2015)). These skewed results are consistent with the findings of Stango and Zinman (2009) who also documented the prevalence of systematic bias among people. While 21.4 percent of the respondents thought that both options were

the same indicating a lack of knowledge regarding time value of money, 13.3 percent answered that they ‘do not know’. Overall, it is evident that there is significant underestimation of the cost of borrowing which could be due to behavioral biases or a lack of budgeting habit.

To summarize, debt literacy levels among the rural households in Kerala are mostly similar to the findings from previous studies and a majority of them are found to be holding debt. Only a small fraction of the sample is aware of the power of interest compounding (28.1 percent) and the pattern of interest payments on outstanding loans (38.3 percent). Majority of the respondents (53.8 percent) chose to use a costly mode of repayment which is of concern.

### 3.5. Characteristics of Debt literacy

The number of correct answers given by a respondent to the above three questions is assigned as the person’s debt literacy score (DLScore) that ranges from 0 to 3. In order to better understand the characteristics of debt literacy, we analyzed its distribution based on gender, land holding size and type of household. The gender-based distribution in Table 5 shows that 49.3 percent of females have the lowest level of debt literacy score indicated by score of 0 compared to around 44.4 percent of males. It is interesting to note that even at the highest level of debt literacy score, there is female representation shown by 1.1 percent. Though the findings need to be weighed in the light of a majority of the sample consisting of female respondents, there seems to be scope for financial training to improve the debt literacy of females to promote their financial security (Bucher-Koenen et al., 2017; Lusardi & Mitchell, 2008).

Table 5  
Distribution of debt literacy by gender

	DLScore= 0	DLScore= 1	DLScore= 2	DLScore= 3
Female	49.32%	32.81%	16.74%	1.13%
Male	44.38%	37.50%	17.50%	0.63%

The distribution of DLScore based on type of household (as per main source of income) in Table 6 shows that 54.3 percent of NAHHs have the lowest level of debt literacy indicated by a score of 0 compared to around 39.9 percent of AHHs. In addition, AHHs have a higher representation in the category of highest level of debt literacy as shown by 1.2 percent scoring 3 correct answers. These findings might indicate that AHHs who are usually the beneficiaries of various government sponsored welfare schemes appear to have developed better knowledge of handling the available credit options.

Table 6  
Distribution of debt literacy by type of household

	DLScore= 0	DLScore= 1	DLScore= 2	DLScore= 3
NAHHs	54.25%	30.79%	14.08%	0.88%
AHHs	39.85%	38.31%	20.69%	1.15%

The land size-based distribution in Table 7 shows that among marginal landholders, most of them (47.4 percent) have the lowest level of debt literacy score indicated by a score of 0. Among small landholders, 43.3 percent scored 0 and for others, the figure is 66.7 percent. In addition, it is interesting to note that a small section of the marginal landholders (1.17 percent) exhibits high levels of debt literacy. The findings suggest that there is potential to raise the debt literacy of marginal landholders through appropriate awareness building or training.

Table 7  
Distribution of debt literacy by land size

	DLScore=			
	DLScore= 0	DLScore= 1	2	DLScore= 3
Marginal	47.37%	34.70%	16.76%	1.17%
Small	43.33%	35.00%	21.67%	0.00%
Others	66.67%	16.67%	16.67%	0.00%

Did not reveal	72.73%	27.27%	0.00%	0.00%
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#### 4. Effect of Debt literacy on Credit Usage

We now examine the role of debt literacy in determining the extent of credit usage in the rural households. We analyze the relation between credit usage (measured by a respondent's debt-asset ratio) and debt literacy through different estimation methods.

##### 4.1 OLS regression

Our specification for the OLS regression is as follows:

$$DA_i = \beta_0 + \beta_1 DL_i + \beta_2 X_i + \varepsilon_i$$

where, DA is debt-asset ratio (denotes the level of credit usage), DL is debt literacy (measured by the debt literacy score) and X denotes the control variables (age, household size, gender, education, marital status, location (village of residence)). Given that our primary data on debt contains outliers, we winsorize (Cox, 2006) the debt-asset ratio by  $p=0.015$  (fraction of observations to be modified in each tail with an acceptable range between 0 and 0.5) and report the regression results in Table 8. The results were similar at higher and lower levels of winsorization (e.g. for  $p = 0.012, 0.013, 0.014, 0.016, 0.017$  etc.). We use robust standard errors for our statistical inference throughout the analysis.<sup>16</sup>

Table 8  
The effect of debt literacy on credit usage of the full sample, OLS

	With DL only	With main controls	With age square	With gender and marital status
VARIABLES	Model 1	Model 2	Model 3	Model 4
Debt literacy	1.053* (0.553)	1.202** (0.543)	1.164** (0.542)	1.103** (0.554)
Age		-0.0174	0.231*	0.177

<sup>16</sup> We also tried cluster standard errors and found similar results. However, we faced difficulties in obtaining instrument validity tests with cluster standard errors, therefore we prefer to report robust standard errors in the results.

		(0.0277)	(0.132)	(0.143)
Age squared			-0.00254*	-0.00218
			(0.00130)	(0.00135)
Education		-0.0657	-0.0780	-0.0980
		(0.0999)	(0.0984)	(0.101)
Household size		-0.398*	-0.376*	-0.395*
		(0.207)	(0.202)	(0.203)
Dummies for location		Included	Included	Included
Dummies for gender				Included
Dummies for marital status				Included
Constant	1.669***	5.574**	-0.0270	1.769
	(0.399)	(2.585)	(3.477)	(3.965)
Observations	339	337	337	337
R-squared	0.018	0.035	0.041	0.048
F	3.63*	1.98*	1.84*	2.29**

Notes: The table reports regression estimates with debt-asset ratio (DA) of the respondents as the dependent variable. Robust standard errors are shown in parentheses. Model 1 shows the two-variable regression of DA on debt literacy. In Models 2-4, we have included controls for age, education, household size and location. Model 3 tests for non-linear effects of age and Model 4 contains dummies representing gender and marital status categories. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

We find that debt literacy is a significant determinant of the level of usage of credit i.e. individuals with higher debt literacy seem to be availing of higher levels of debt (after controlling for other socio-economic factors that may be associated with indebtedness). This implies that those with higher levels of debt literacy are able to enjoy better access to credit while those with poor debt literacy are unable to get enough loans. This positive relationship between debt literacy and the level of debt held by an individual is somewhat contradictory to the evidence from developed countries. Lusardi and Tufano (2015) found that American borrowers with lower levels of debt literacy reported higher debt load. Gathergood (2012) (2012) analyzed UK households to show that poor debt literacy is associated with higher over-indebtedness. However, it is important to note two important differences in our study. First, Gathergood (2012) and Lusardi and Tufano (2015) considered the subjective debt load which is a self-reported measure, we have considered an objective measure of debt level in our study which is the level

of credit availed by the respondent. Second, the positive relationship in our study could imply that debt literacy empowers rural borrowers to get more loans from banks and other formal sources of credit. Those individuals who are debt literate could successfully complete all the necessary procedures associated with availing credit from these formal sources which involve several official formalities. However, individuals with poor debt literacy are unable to avail higher levels of credit even when the supply is available due to the institutional changes brought about by financial inclusion.

Next, we analyzed the relationship between debt literacy and credit usage of respondents from agricultural households and non-agricultural households separately. Interestingly, we find that only in case of agricultural households the positive relationship remains significant even though only at a 10 percent level. Table 9 reports the regression results in the case of agricultural households while the results for the non-agricultural sub-sample are not reported to save space (but are available on request). This finding points towards the need for policy attention on improving the debt literacy of farmers to help improve their usage of credit options available to them.

Table 9  
The effect of debt literacy on credit usage of agricultural households, OLS

VARIABLES	With DL only	With main controls	With age square	With gender and marital status
	Model 1	Model 2	Model 3	Model 4
Debt literacy	1.479* (0.773)	1.436** (0.723)	1.438* (0.740)	1.364* (0.741)
Age		-0.0112 (0.0390)	-0.0154 (0.174)	-0.162 (0.267)
Age squared			4.34e-05 (0.00161)	0.00126 (0.00233)
Education		0.0660 (0.104)	0.0664 (0.101)	0.0484 (0.102)
Household size		-0.0340 (0.262)	-0.0346 (0.255)	-0.118 (0.258)
Dummies for location		Included	Included	Included
Dummies for gender				Included

Dummies for marital status	Included			
Constant	0.728 (0.477)	0.809 (2.686)	0.904 (4.547)	5.388 (7.501)
Observations	177	177	177	177
R-squared	0.047	0.050	0.050	0.063
F	3.66*	0.90	0.77	1.17

Notes: The table reports regression estimates with debt-asset ratio (DA) of the respondents as the dependent variable. Robust standard errors are shown in parentheses. Model 1 shows the two-variable regression of DA on debt literacy. In Models 2-4, we have included controls for age, education, household size and location. Model 3 tests for non-linear effects of age and Model 4 contains dummies representing gender and marital status categories. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

We also checked the relationship between credit usage and debt literacy based on the gender of respondents in our sample. A sub-sample comprising of the female respondents exhibited a positive and significant relationship (at 10 percent level) between debt literacy and credit usage (see Table 10), but there seemed to be no significant relationship in the case of males (results for the male sub-sample are not reported but are available on request). One of the reasons for this finding could be the differences in the returns to education between males and females. Schultz (2002) showed that for women, the marginal returns to schooling tends to exceed that of men, especially in countries where women are often less educated. It is likely that the higher returns to education of women carries over to their positive and significant effect of debt literacy in rural India where females are less educated.

Table 10  
The effect of debt literacy on credit usage of females, OLS

VARIABLES	With DL only	With main controls	With age square	With Marital status
	Model 1	Model 2	Model 3	Model 4
Debt literacy	1.205* (0.665)	1.510** (0.701)	1.452** (0.697)	1.444** (0.702)
Age		-0.0333 (0.0342)	0.295** (0.148)	0.266* (0.155)
Age squared			-0.00348** (0.00140)	-0.00317** (0.00142)
Education		-0.0876 (0.116)	-0.107 (0.112)	-0.114 (0.113)

Household size		-0.480*	-0.465*	-0.466*
		(0.269)	(0.265)	(0.271)
Dummies for location		Included	Included	Included
Dummies for marital status				Included
Constant	1.364***	6.916**	-0.177	0.591
	(0.413)	(2.925)	(4.178)	(4.388)
Observations	245	243	243	243
R-squared	0.025	0.048	0.058	0.058
F	3.28*	1.67	2.07**	1.73*

Notes: The table reports regression estimates with debt-asset ratio (DA) of the respondents as the dependent variable. Robust standard errors are shown in parentheses. Model 1 shows the two-variable regression of DA on debt literacy. In Models 2-4, we have included controls for age, education, household size and location. Model 3 tests for non-linear effects of age and Model 4 contains dummies representing marital status categories. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

Though these regression results provide evidence of a positive relationship between debt literacy and credit usage, it is important to address potential endogeneity concerns with the debt literacy variable (Fernandes et al., 2014; Jappelli & Padula, 2013). Endogeneity of debt literacy would mean that there is a possibility of reverse causality by which debt literacy could be influenced by the usage of credit. Moreover, missing unobservables could influence both debt literacy and credit usage thereby rendering our estimates biased. Endogeneity is a threat to infer policy relevant causal effects (Papies et al., 2017) as it makes regression results unreliable. The ideal solution to overcome endogeneity is to conduct randomized experiments which is beyond the scope of our study due to practical challenges of high costs and ethical issues. Another standard approach to deal with endogeneity is instrumental variables (IV) regression (Papies et al., 2017) which we consider next.

#### *4.2 Instrumental variable regression*

Previous research has shown that financial exposure could be considered as an instrument for debt literacy. The major proxies used in the literature for financial exposure are background training in economics (Lusardi & Mitchell, 2007; Van Rooij et al., 2011), financial education (Kimball &



Shumway, 2010) and economic education (Fernandes et al., 2014). Another important variable considered as an instrument for debt literacy is family influence. In the literature, family influence is mostly captured through proxies like role of parents as financial socialisation agents (Van Campenhout, 2015), experiences of siblings and parents (Van Rooij et al., 2011), family background (Behrman et al., 2012) and knowledge of parents (Fernandes et al., 2014). In our study, we use financial exposure of the respondent along with the household head's education and age (as proxies for family influence) as instruments for debt literacy of the respondents.

We choose a proxy for financial exposure to suit the context of our specific sample of rural households in a financially included region. We consider exposure to formal credit options as a measure of financial exposure and assess it by checking whether the respondent has heard about credit cards (but not used it). As hearing about credit cards is not a choice exercised by the respondent but is likely to be caused by exogenous factors, this variable qualifies as an instrument for the debt literacy of the respondent. Hearing about credit cards can influence debt literacy as innovative formal credit options like a Kisan Credit Card (KCC)<sup>17</sup>, which provides term loans for agriculture, is one of the major instruments for availing institutional credit by the rural population in a financially included region (Kumar et al., 2011).

For the next instrument, we consider household head's age and education for capturing family influence. For the case of respondents who are themselves household heads since the former can be considered as the decision makers, these two instrumental variables (household head's age and education) take the value of zero. Our identification strategy is based on financial exposure and family background impacting credit usage only through the channel of debt literacy. In our analysis we assess the validity of these instruments using suitable tests.

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<sup>17</sup> Kisan Credit Cards (KCCs) launched in India initially in 1998-99 is considered as one of the innovative credit delivery mechanisms introduced to promote financial inclusion in rural regions. These are improving the rates of take up as the levels of financial inclusion is increasing in rural regions. KCCs are often seen as one of the important instruments to improve the flow of institutional credit to support agricultural activities in rural regions in India (Kumar et al, 2011).

Table 11 shows the instrumental variable regression results along with the tests for instrumental validity. In the case of the full sample, we observe that the coefficient of debt literacy is positive in all of the models and statistically significant (at 10 percent) in most of the models (except model 4)<sup>18</sup>. This throws light on the empowering role of debt literacy on the credit usage of rural households in a financially included region. Using Hansen J test, we check for over identifying restrictions under the null hypothesis that all instruments are uncorrelated with error. As the null hypothesis is not rejected in all the models (the p-values for the Hansen J-statistic for IV-2SLS are not less than 0.05), our instruments are valid. We also find that the F-statistics from the first stage regressions exceed the commonly accepted threshold of 10 (Staiger & James, 1997), indicating that the instruments are not weak.

Table 11  
The effect of debt literacy on credit usage of the full sample, IV

VARIABLES	With instrument s only	With major controls	With age square	With gender and marital status
	Model 1	Model 2	Model 3	Model 4
Debt literacy	3.451* (1.940)	2.938** (1.393)	2.376* (1.342)	1.657 (1.618)
Age		-0.0115 (0.0287)	0.205 (0.137)	0.167 (0.139)
Age squared			-0.00223 (0.00137)	-0.00203 (0.00134)
Education		-0.0765 (0.106)	-0.0841 (0.103)	-0.0986 (0.101)
Household size		-0.441* (0.231)	-0.405* (0.217)	-0.401* (0.210)
Dummies for location		Included	Included	Included
Dummies for gender				Included

<sup>18</sup> In Model 4, when we include a dummy for gender, the coefficient of debt literacy remains positive but not statistically significant. We analyse the sub-sample of females separately in section 4.3 to understand the relationship between debt literacy and credit usage for women.

Dummies for marital status				Included
Constant	-0.267 (1.444)	4.457* (2.666)	-0.159 (3.570)	1.584 (3.945)
Observations	335	334	334	334
Hansen J Statistic	1.050	0.465	0.759	0.678
First stage F Statistic	207.19***	69.08***	68.99***	67.27***

Notes: The table reports regression estimates with debt-asset ratio (DA) of the respondents as the dependent variable. Robust standard errors are shown in parentheses. Model 1 shows the two-variable regression of DA on debt literacy. In Models 2-4, we have included controls for age, education, household size and location. Model 3 tests for non-linear effects of age and Model 4 contains dummies representing gender and marital status categories. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

In Table 12 we present the IV regression results for respondents belonging to agricultural households. Here we observe a positive and significant effect of debt literacy on credit usage. This implies that policies to improve the debt literacy of agricultural households such as by imparting training can help them avail formal sources of credit being disbursed through various schemes like priority sector lending and other subsidized loans for agriculture sector like the Kisan Credit Card. Our findings also have lessons for financial institutions as they could use debt literacy as a factor for improving their credit appraisal. We also test for over identifying restrictions using the Hansen J-statistic and the first stage F-statistic. Results shown in Table 12 confirm that the instruments used in our analysis are valid.

Table 12  
The effect of debt literacy on credit usage of agricultural households, IV

VARIABLES	With instrument s only Model 1	With major controls Model 2	With age square Model 3	With gender and marital status Model 4
Debt literacy	2.951** (1.338)	3.009*** (1.149)	3.307** (1.333)	2.876** (1.430)
Age		-0.000153 (0.0418)	-0.0932 (0.195)	-0.207 (0.269)
Age squared			0.000967 (0.00193)	0.00183 (0.00244)
Education		0.0728 (0.111)	0.0823 (0.111)	0.0650 (0.108)
Household size		-0.00988 (0.267)	-0.0188 (0.268)	-0.0914 (0.263)
Dummies for location		Included	Included	Included

Dummies for gender				Included
Dummies for marital status				Included
Constant	-0.556 (1.039)	-1.275 (3.115)	0.503 (4.925)	4.563 (7.694)
Observations	176	176	176	176
Hansen J Statistic	2.207	1.846	1.649	0.941
First stage F Statistic	98.14***	54.68***	47.51***	50.72***

Notes: The table reports regression estimates with debt-asset ratio (DA) of the respondents as the dependent variable. Robust standard errors are shown in parentheses. Model 1 shows the two-variable regression of DA on debt literacy. In Models 2-4, we have included controls for age, education, household size and location. Model 3 tests for non-linear effects of age and Model 4 contains dummies representing gender and marital status categories. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

#### 4.3 The case of female borrowers

In the case of female respondents, we considered membership in group activities as an alternative instrument for debt literacy instead of financial exposure. From the field experience, we observed the importance of group membership as a result of the success of microfinance programs that involve group lending. The literature provides evidence that there is a significant role of group participation in developing women's agency (Sanyal, 2009). Because of the near exclusive focus of microfinance programs on women, especially in developing countries, an increase in women's confidence in their capabilities can be witnessed through their increased mobility and peer interactions (Pitt et al., 2006; Sanyal, 2009). In our primary survey, we measure membership score as the number of groups that a female respondent participates in, such as SHGs/ JLGs, Farmers' club, Cooperative society, Milk cooperative society, Other producers' organizations, MGNREGA<sup>19</sup> and BPL<sup>20</sup> cards. Using IV-2SLS estimation shown in Table 13, we find that the relationship between debt literacy and credit usage

<sup>19</sup> MGNREGA is The Mahatma Gandhi National Rural Employment Guarantee Act, considered as one of the largest rural development programs in the world. It is India's flagship social protection policy which aims at enhancing the livelihood security of rural population by guaranteeing 100 days of wage employment in a financial year to households with adult members willing to do unskilled manual work (Esteves et al. 2013; Carswell & De Neve, 2014)

<sup>20</sup> BPL card is Below the Poverty Line card issued by the Indian government to households at the bottom of the pyramid that are eligible for certain benefits like subsidized food, housing and self-employment activities (Alkire & Seth, 2013)

remain positive and significant (at 10 percent) for females in our study. Hansen J-statistic confirms the validity of the instruments used in our models.<sup>21</sup>

The above finding for female respondents has important policy lessons for developing countries where female headship of a family is known to be negatively related to the use of financial services (Pitt & Khandker, 2002). Our finding of a positive effect of debt literacy on credit usage could also indicate the enabling role played by SHGs and other government schemes to empower women which could be helping them to leverage their debt literacy to avail of credit. An implication of this result is that in order to overcome the low usage of financial services by women, policies should focus on improving the debt literacy of females.

Table 13  
The effect of debt literacy on credit usage of females, IV

VARIABLES	With instruments only	With major controls	With age square	With gender and marital status
	Model 1	Model 2	Model 3	Model 4
Debt literacy	4.195* (2.520)	6.172* (3.193)	4.794 (2.955)	5.093* (2.924)
Age		-0.0383 (0.0416)	0.185 (0.184)	0.173 (0.187)
Age squared			-0.00235 (0.00186)	-0.00228 (0.00189)
Education		-0.158 (0.137)	-0.151 (0.126)	-0.155 (0.127)
Household size		-0.735* (0.429)	-0.646* (0.371)	-0.651* (0.378)
Dummies for location		Included	Included	Included
Dummies for marital status				Included

<sup>21</sup> We failed to obtain the F-statistic from the first stage regression for the robust standard errors option in the estimation, therefore we used the F-statistic obtained without robust standard errors. This F-statistic value reported in Table 13 is less than the threshold of 10 mentioned earlier but is statistically significant.

Constant	-0.971 (1.781)	7.130** (3.631)	2.216 (4.882)	2.558 (4.991)
Observations	241	240	240	240
Hansen J statistic	5.642	2.317	2.447	2.158
First stage F statistic	2.31**	4.57***	4.18***	3.73***

Notes: The table reports regression estimates with debt-asset ratio (DA) of the respondents as the dependent variable. Robust standard errors are shown in parentheses. Model 1 shows the two-variable regression of DA on debt literacy. In Models 2-4, we have included controls for age, education, household size and location. Model 3 tests for non-linear effects of age and Model 4 contains dummies representing marital status categories. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

## 5. Comparison with an All-India Sample

In order to assess the generalizability of our results, we repeat our analysis with an all-India dataset. While there is no nationally representative secondary data-set on debt literacy, we compare our results with a national level survey on rural households- the NABARD All-India Rural Financial Inclusion Survey (NAFIS). There are certain limitations of this comparison as NAFIS does not contain information on all the control variables available in our primary data, particularly detailed information on debt literacy. But NAFIS has the advantage of providing all-India data from 2016-17 covering a sample of 1.88 lakh persons from 40,327 agricultural and non-agricultural rural households<sup>22</sup> across all the 29 states of the country. Though this national survey does not contain information on debt literacy, a score on financial knowledge was available for us to use as a proxy for debt literacy.

Financial knowledge was assessed in NAFIS by questioning the respondents about their basic understanding of risk and return, and inflation based on three questions. A correct response was given a score of 1 and incorrect responses were given a score of 0. We calculated a combined score for each respondent by adding the scores from the three questions. Hence the total score varies from 0 to 3. As we are considering this financial knowledge score as a proxy for debt literacy in the all-India dataset, we refer to it as debt literacy hereafter for consistency. We constructed a measure of respondent level

<sup>22</sup> Though there are 40,327 households in the sample, we could consider only 32,352 in our study as data on all variables are not available for all the households in the dataset.

debt-asset ratio<sup>23</sup> by dividing the sum total of the debt held by the financial respondent with the asset of the household to standardize the ratio. We included most of the assets for computing the ratio that we used earlier in our primary data<sup>24</sup>.

We assessed the impact of debt literacy on credit usage by using Instrumental variable regression. However, among the instruments that we used in the analysis of our primary survey viz. financial exposure (FE) and family influence, we found that inclusion of FE renders the set of instruments invalid (as per the Hansen J test) in the analysis of the all-India dataset. Therefore, we drop FE from our list of instruments and consider age and education of household head as the two instruments representing family influence. One possible reason why FE worked as an instrument in the Kerala sample is that in a region with 100 percent financial inclusion, FE is more likely to be a determinant of debt literacy, particularly because our measure of FE mainly captured the exposure to formal financial instruments such as credit cards. However, in the all-India case, levels of formal financial exposure may be low in many rural regions where financial inclusion has not yet been fully achieved. This may explain why FE does not show up as a relevant instrument for debt literacy of individuals in the all-India sample.

The control variables in the IV-2SLS regression are age, education, location (state of residence) and gender. The estimated results reported in Table 14 reveal that even in the all-India dataset, there is a positive and statistically significant relationship between debt literacy and credit usage. The instrument validity checks show that our instruments are valid (except in Model 1 which shows only a two-variable relationship without any controls). Notably, the positive effect of debt literacy on credit usage is significant here for the full sample like in the case of our primary survey. Therefore, for an all-India sample also, we are able to show that those respondents from rural India with higher debt literacy seem to be having higher levels of debt.

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<sup>23</sup> To handle outliers, we winsorize (Cox, 2006) the debt-asset ratio by  $p=0.18$  (fraction of observations to be modified in each tail, within the acceptable range of 0 to 0.5).

<sup>24</sup> These are the total value of the produce sold, Investments in Livestock, Investment in Farm machine/irrigation equipment, Equipment for non-farm business, any other investment in physical assets, Expenditure on purchase of movables and consumer durables.

Table 14

The effect of debt literacy on credit usage of the full sample\_all-India, IV

VARIABLES	With instruments only	With major controls	With age square	With gender
	Model 1	Model 2	Model 3	Model 4
Debt literacy	11.28** (5.458)	72.37*** (16.44)	70.94*** (17.11)	99.99*** (38.78)
Age		-0.0165 (0.0300)	0.0600 (0.174)	-0.0286 (0.265)
Age squared			-0.000815 (0.00181)	0.000186 (0.00277)
Dummies for education		Included	Included	Included
Dummies for location		Included	Included	Included
Dummies for gender				2.637 (2.053)
Constant	-18.43 (11.79)	-152.5*** (37.07)	-150.8*** (37.25)	-218.8** (87.28)
Observations	32,352	32,352	32,352	32,352
Hansen J statistic	539.933***	3.733	3.854	2.524
First stage F statistic	1.97*	66.11***	64.58***	63.30***

Notes: The table reports regression estimates with debt-asset ratio (DA) of the respondents as the dependent variable. Robust standard errors are shown in parentheses. Model 1 shows the two-variable regression of DA on debt literacy. In Models 2-4, we have included controls for age, education, household size and location. Model 3 tests for non-linear effects of age and Model 4 contains dummies representing gender categories. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

Coming to the group of agricultural households (see Table 15), we find a positive and statistically significant relationship between credit usage and debt literacy in the all-India survey. This is similar to the finding from the primary survey for Kerala.

Table 15

The effect of debt literacy on credit usage of agricultural households \_all-India, IV

VARIABLES	With instruments only	With major controls	With age square	With gender
	Model 1	Model 2	Model 3	Model 4
Debt literacy	9.454** (3.677)	8.276*** (2.200)	7.577*** (2.207)	6.126** (2.663)
Age		0.00562 (0.00697)	0.0448 (0.0335)	0.0543* (0.0305)
Age squared			-0.000402	-0.000487



Dummies for education		Included	(0.000331) Included	(0.000297) Included
Dummies for location		Included	Included	Included
Dummies for gender				Included
Constant	-19.20** (7.954)	-15.95*** (4.998)	-15.20*** (4.737)	-11.84** (5.976)
Observations	11,853	11,853	11,853	11,853
Hansen J statistic	20.622***	6.757	7.325	9.911**
First stage F statistic	1.39	24.07***	23.51***	23.06***

Notes: The table reports regression estimates with debt-asset ratio (DA) of the respondents as the dependent variable. Robust standard errors are shown in parentheses. Model 1 shows the two-variable regression of DA on debt literacy. In Models 2-4, we have included controls for age, education, household size and location. Model 3 tests for non-linear effects of age and Model 4 contains dummies representing gender categories. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

Next, we analyzed the case of females in the all-India survey using membership in Joint Liability Groups as a proxy for membership score that was used as an instrument in the case of our primary survey. The IV-2SLS regression results are shown in Table 16. As in the Kerala case, we find that a positive and significant relationship between credit usage and debt literacy in most of the models. Though model 1 shows a negative relation (in the absence of important controls like education), the direction of the relationship turns positive once we include the dummies for education levels. As education is negatively associated with debt levels in our sample, ignoring education in Model 1 may have led to its role showing up through the coefficient of debt literacy score as negative.<sup>25</sup> However, once we control for education, the coefficients of the dummies for education are negative and the coefficient of debt literacy turns positive in the rest of models. An implication of the findings from Models 2 and 3 is that in order to overcome the low usage of financial services by women, policies should focus on improving their debt literacy. The instrument validity checks show that the instruments are valid for all of these models.

<sup>25</sup> Moreover, the Hansen J statistic for Model 1 shows that the result is not reliable as instrument validity is not supported in this model.

Table 16  
The effect of debt literacy on credit usage of females\_all-India, IV

VARIABLES	With instruments only	With major controls	With age square
	Model 1	Model 2	Model 3
Debt literacy	-12.06*** (3.595)	69.40*** (25.05)	70.60*** (25.39)
Age		0.00605 (0.0599)	0.214 (0.312)
Age squared			-0.00232 (0.00342)
Dummies for education		Included	Included
Dummies for location		Included	Included
Constant	30.35*** (7.646)	-157.9*** (60.25)	-164.9*** (60.45)
Observations	9,231	9,231	9,231
Hansen J statistic	172.508***	5.765	5.875
First stage F	5.30***	19.69***	19.29***

Notes: The table reports regression estimates with debt-asset ratio (DA) of the respondents as the dependent variable. Robust standard errors are shown in parentheses. Model 1 shows the two-variable regression of DA on debt literacy. In Models 2 and 3, we have included controls for age, education, household size and location. Model 3 tests for non-linear effects of age. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

## 6. Robustness Checks

To assess the robustness of the above findings we used the doubly robust treatment effects estimation method of inverse-probability-weighted regression adjustment (IPWRA) which is a widely used method in treatment effects estimation on observational data (Manda et al., 2018; N'dri & Kakinaka, 2020). We also carry out sensitivity analysis of the treatment effects results using Rosenbaum bounds approach (Rosenbaum, 2002).

### 6.1 Treatment effects estimation using IPWRA

This estimation method allows inferences about causal relationships based on observational data viz. treatment effects estimation which uses reweighting and matching approaches to give consistent

estimates of average treatment effects (Abadie & Imbens, 2016; Rosenbaum & Rubin, 1983). Individuals are matched on observables to group them into treatment and control categories and then their outcomes compared. This method works under the assumptions that the selection process into a treatment group (e.g. possession of debt literacy in our study) depends on observables and that the model which is used to match or reweight is a good one (Nichols, 2007). Such matching approaches have been used in a variety of contexts to assess causality of public policy interventions (Canedo & Morse, 2021; Di Cintio et al., 2020; Jordà et al., 2016; Manda et al., 2018; N'dri & Kakinaka, 2020; Webster & Piesse, 2018).

We consider possession of debt literacy in an individual as the treatment. Based on the average level of debt literacy in our sample, we categorized individuals into two groups of high and low debt literacy. Individuals with less than average debt literacy fall into the low debt literacy category (treatment group) and those with higher than the average debt literacy fall into the high debt literacy category (control group)<sup>26</sup>. We estimate average treatment effect on the treated (ATT) as per the related empirical literature (Canedo & Morse, 2021; N'dri & Kakinaka, 2020; Rosenbaum & Rubin, 1983). Following Manda et al. (2018) and N'dri and Kakinaka (2020), we describe ATT as follows:

$$ATT = E [Y_1 | D=1, X=x] - E [Y_0 | D=0, X=x]$$

where:

x - a set of relevant pre-treatment characteristics,

$E [Y_1 | D=1, X=x]$  is the expected outcome for the units that received treatment

$E [Y_0 | D=0, X=x]$  is the expected outcome for the treated units' best matches.

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<sup>26</sup> This kind of categorization of respondents into binary categories was followed by Fernández-Sastre and Montalvo-Quizhpi (2019). Moreover, since the mean of debt literacy score is below one in our sample, we effectively categorize the respondents into either zero or positive debt literacy. Therefore, we study the difference in credit usage between the two groups - those having no debt literacy versus those having some debt literacy.

We first estimate the ATT using the inverse-probability-weighted regression adjustment (IPWRA) method which offers a remedy for the issue of bias due to potential misspecification errors (Imbens & Wooldridge, 2009; N'dri & Kakinaka, 2020). The double robust property of IPWRA ensures that the estimates are consistent as it can account for the misspecification in either the treatment model or the outcome model (Imbens & Wooldridge, 2009; Wooldridge, 2010). The results of IPWRA analysis are reported in Table 17 and they confirm that our results from different estimation methods remain largely consistent with that of the OLS and IV regressions in most of the cases. It implies that generally, people with positive debt literacy exhibited higher credit usage compared to those with zero debt literacy.

Table 17  
Average treatment effects using IPWRA

Sample	Debt literacy Levels		Average Treatment Effect (ATT)
	Positive Debt literacy	Zero Debt literacy	
<b>Kerala</b>			
Full sample	3.050	1.533	1.577***(0.567)
Agricultural Households	2.344	1.026	1.548**(0.647)
Females	3.095	1.108	2.018***(0.670)
<b>All-India</b>			
Full sample	770.5	647.8	116.4**(53.05)
Agricultural Households	1.281	1.383	-0.104(0.0823)
Females	436.5	412.1	19.57(72.67)

Notes: The table reports result with standard errors in parentheses. \*\*\* denotes 1% level of significance; \*\* denotes 5% level of significance; \* denotes 10% level of significance.

Therefore, our treatment effects results show that there exists a positive and significant impact of debt literacy on credit usage i.e. debt literacy enables people to avail more credit. As most of the loans availed in our sample is reported to be from formal financial institutions, this result could indicate that people with high debt literacy are able to make use of the easily available credit in the new institutional landscape of high levels of financial inclusion.

## 6.2. Sensitivity Analysis

Even after accounting for potential endogeneity concerns due to reverse causality, there still could be the uncaptured effect of unobservables which could influence both the treatment and the outcome. This is termed as hidden bias whose effect must be checked in order to establish the reliability of our results.

We conducted a sensitivity analysis using Rosenbaum bounds approach (Becker & Caliendo, 2007; DiPrete & Gangl, 2004; Rosenbaum, 2002) which examines the severity of the unobserved heterogeneity between treated and control groups. This test has been used in various studies that employ treatment effects estimation (Bharath et al., 2011; Clément, 2011; Hasan & Gerber, 2016; Roth TMS et al., 2015). We use the Rosenbaum bounds to assess the strength of the unmeasured confounding variables. In case they are stronger than expected, the reliability of the causal inferences drawn from the matching analyses could be affected. Suppose,  $\Gamma$  represents the ratio of the odds of receiving treatment for two matched respondents  $i$  and  $j$  who have different unobserved characteristics. Following Rosenbaum (2002), we write:

$$1/\Gamma \leq (P_i/(1-P_i))/(P_j/(1-P_j)) \leq \Gamma$$

where,  $P_i$  and  $P_j$  are the true treatment probabilities if data were available on the unobservables. We start with a value of  $\Gamma$  equal to 1 and increase it progressively to test at what level would we be overestimating the true effect (Caliendo & Tübbicke, 2020).

Table 18  
Sensitivity analysis using Rosenbaum bounds (N = 194 matched pairs)

$\Gamma$	Significance level		Hodges-Lehmann point estimate		95% Confidence interval	
	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound
1	.000025	.000025	.5	.5	.2125	.775537
1.1	.000227	2.0e-06	.395105	.567226	.104136	.848041
1.2	.00128	1.5e-07	.305572	.625	.040983	.978929

1.3	.005093	1.0e-08	.263613	.7125	-2.6e-07	1.0892
1.4	.015399	6.8e-10	.20339	.786341	-2.6e-07	1.21212
1.5	.037472	4.3e-11	.125	.833335	-2.6e-07	1.30645
1.6	.076596	2.6e-12	.077353	.912823	-.001461	1.44658

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The result of the sensitivity analysis using Rosenbaum bounds for the full sample is shown in Table 18. We see that for a  $\Gamma$  value of 1, the p-value is less than 5% with both upper and lower bounds remaining equal. However, when we increase  $\Gamma$  to 1.1 (i.e. when the odds of an individual being in the higher debt literacy group is increased by 10 percent because of the influence of unobserved variables), the inference remains significant in the upper and lower bounds. Progressively raising  $\Gamma$  in this manner till 1.5 we see that our analysis is insensitive to a bias that would increase the odds of treatment by 50 percent due to potential unobservables. This is within the acceptable critical value limits proposed by Watson (2005) according to whom the critical value for assessing robustness of treatment effects in social sciences can be between 1.1 and 2.2, that is lower compared to that of natural sciences (as high as 6). Therefore, we conclude that our estimated treatment effect is relatively free from the influence of unobserved heterogeneity. The results of the sensitivity analysis for the sub-samples also show that our results are robust (results are available on request).

## 7. Conclusion and Implications

Previous research has shown that financial literacy levels are low among many samples across the globe (Lusardi & Mitchell, 2011b, 2014). In this work, we observed low levels of debt literacy among the sample of 600 respondents in rural Kerala in India even after an increase in the financial inclusion initiatives in the region. The results from a nationally representative data-base turned out to be qualitatively similar. Our findings add to the empirical evidence on the relation between credit usage and debt literacy in the context of new participants in the financial system in a developing country. Interestingly, we found a positive relationship between debt literacy and the level of debt in the case of

the full sample as well as agricultural households and females which is contrary to the case of lower levels of debt literacy being associated with higher debt load in Gathergood (2012) and Lusardi and Tufano (2015). One of the reasons for this difference could be our use of an objective measure of debt level whereas previous studies have considered the self-reported subjective debt load. Another reason could be the differences in the implications of debt literacy in the context of developed and developing countries. While debt literacy helps in improving consumer protection in developed countries, in the case of developing regions with comparatively lower financial outreach, debt literacy could play an empowering role by influencing access to and take up of formal financial services (Xu & Zia, 2012).

An important implication of our finding is that higher debt literacy may have helped the people in our sample to seek out loans from banks and other financial service providers. It could mean that those who are more debt literate were able to successfully negotiate the necessary documentation like the Know Your Customer (KYC) requirements and other complex procedures to avail more formal loans which are the predominant type of loan in our sample. Our findings suggest there is scope for policy-based solutions to improve the usage of formal financial services like bank-based credit by improving the debt literacy levels of the rural population and particularly of farmers and females. Our results also have lessons for financial institutions as they could use debt literacy training as a part of responsible lending. It could also be considered as a factor for credit appraisal and lenders could employ debt literacy assessment in their credit scoring. Going beyond KYC and income assessment, this will help lenders to do risk-based pricing and provide more financial services like cash credit and individual loans. Our findings could also inform the design of financial education policies to address the informational and capability limitations of households in rural regions.

The lessons post achievement of high levels of financial inclusion from one of the pioneer states i.e. Kerala could be significant as other regions are catching up. In sum, our findings contribute to an improved understanding of the role of debt literacy of rural households in a region that has witnessed institutional change brought about by financial inclusion. This could aid the design of more informed

education and financial policies to address the informational and capability limitations of rural households in developing countries.

Some of the limitations of this study are due to the primary nature of our dataset which is limited by a sample size of 600. Though the sample has been selected to represent the rural households in a developing country like India, generalizability of the findings would require conducting similar studies in other regions as well. Due to the primary nature of the data, we could only examine the cross-sectional relationship between debt literacy and credit usage, but there is scope for further research on the dynamic effects of debt literacy on financial behavior. Although the instrument validity tests show that our instruments are reliable, we understand that our instruments may not be fully exogenous to the extent there could be unobserved confounders (such as psychological factors and social norms) that we are unable to capture. Though some studies have examined the role of psychological factors in the financial decision making of individuals (Strömbäck et al., 2017), we could not examine such factors as it is beyond the scope of our study. While future research can proceed in the above directions, our study can be considered as a focused attempt to understand the role of policy relevant variables like debt literacy in influencing financial decision making in a rural region witnessing a transformation in its household finance landscape due to unprecedented increase in the levels of financial inclusion.

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