

Muduli, Silu; Sharma, Manu

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Loan Repayment Dynamics of Self-Help Groups in India

Silu Muduli

Reserve Bank of India

Manu Sharma

Reserve Bank of India

Abstract

The overall ratio of non-performing assets to total advances (NPAs ratio) extended to Self-Help Groups (SHGs) has historically remained below 8 per cent in India. However, in the central, northern, and north-eastern regions of India, this ratio is relatively high and has remained above 15 per cent since 2015-16. Using state-level data, the study identifies SHG-specific and state-specific factors that might be responsible for higher NPAs ratio. Later, it examines whether these higher NPAs constraint fresh credit availability in the future. Spatial analysis confirms the existence of geographical clustering of non-performing assets in northern and central parts of India. SHGs with lower outstanding loans and lower savings are more likely to default, the relationship is stronger for states with higher NPAs. States with higher SHGs density, per capita income, road and railway connectivity, and lower infant mortality rate have lower SHGs' NPAs. SHGs with lower savings, higher NPAs operating in states with lower per capita income and banking penetration face difficulty in accessing fresh credits.

Keywords: Self-Help Groups; Non-performing Assets; Bank Credit.

JEL Classification: G21, O18, R51.

Silu Muduli and Manu Sharma are managers in the Department of Economic and Policy Research, Reserve Bank of India, India. The views expressed in the paper are those of the author(s) and not necessarily those of the institution to which they belong.

E-mail: silumuduli@rbi.org.in (Silu Muduli); manusharma@rbi.org.in (Manu Sharma).

1 Introduction

Credit plays a crucial role in facilitating real economic activities. However, availing of formal credit is generally difficult for individuals with non-transparent or with limited financial information. [Stiglitz & Weiss \(1981\)](#) propose a theoretical model which concludes that informational asymmetry between lender and borrower results in credit rationing. This is more prevalent for the individuals at bottom of the pyramid. Hence, in developing countries like India, individuals usually exhibit heavy dependence on informal or non-institutional sources of credit such as money lenders, trade credit providers, relatives and friends, etc., for their credit needs. All India Household Indebtedness Survey (2013) reveals that around 31 per cent of households depend on informal sources of lending. Over the years, policymakers made enormous efforts to bring down this dependency to the lowest possible level in India. Among these efforts, the introduction of Self-Help Groups (SHGs) and linking them with banks is an important milestone for providing formal credit to financially excluded individuals with huge informational opaqueness in terms of their financial status ([Pathak & Pant, 2018](#)). However, the penetration of SHGs has been remained uneven across the states in India. According to the Status of Microfinance Report (2019-20, i.e., April 2019 - March 2020), around 68.56 per cent SHGs are located in southern and eastern regions and the total savings of these regions constitute 81.62 per cent of total SHGs' savings in the country. Looking at the credit disbursement during 2019-20, southern and eastern regions get almost 93.61 per cent of the total credits extended by banks and microfinance institutions to the SHGs. What could be the possible reasons behind this unevenness of SHGs activities? The study looks at the loan quality of these regions. In the southern region, the non-performing assets (NPAs) to total loans outstanding is 3.76 per cent, and in the eastern region, it is 4.46 per cent. While in other regions this NPAs ratio is more than 10 per cent. Recent literature provides a comprehensive view of loan repayment dynamics ([Das, 2021](#); [Sinha & Navin, 2021](#)). [Sinha & Navin \(2021\)](#) argue that low peer pressure could be a possible reason behind higher NPAs. We try to incorporate this argument through an indicator of outstanding credit per SHGs. Low outstanding credit might be a source of low peer pressure in a joint liability credit repayment design. Hence, low outstanding credit might lead to higher NPA. This study empirically confirms this hypothesis. This study attempts to examine the following three objectives: a) clustering of NPAs in certain regions, b) plausible factors that are responsible higher NPAs of SHGs, c) and factors that help SHGs in accessing fresh credits.

In this study, we first provide statistical evidence on the geographical clustering of NPAs in the SHGs using spatial analysis. Next, we estimate the dynamic relationship of SHGs' NPAs. In the dynamic relationship, the study examines the effect of outstanding loans and savings on the NPAs of SHGs. Additionally, the study considers state-specific characteristics such as SHG areal density, per capita income, banking penetration, railway and road connectivity, and infant mortality rate to examine the impact of state economic development indicators on NPAs. In the last part of the study, we empirically examine the ultimate hypothesis that whether higher NPAs are responsible for lower credits. Many recent studies conjecture many possible reasons behind higher NPAs but lack empirical confirmation. For example, a study by the Bankers Institute of Rural Development ([BIRD, 2019](#)) lists different possible reasons at the individual level, group level, institutional level, etc. that might be responsible for higher NPAs. This study adds to the literature with empirical evidence on the dynamics of NPAs in a state-level

analysis by considering SHG-specific characteristics and state-specific characteristics. Looking from the policy perspective, the study suggests that higher SHG penetration, savings, and close monitoring help in reducing the NPAs and unconstraint fresh credit availability.

2 Literature and Few Stylized Facts

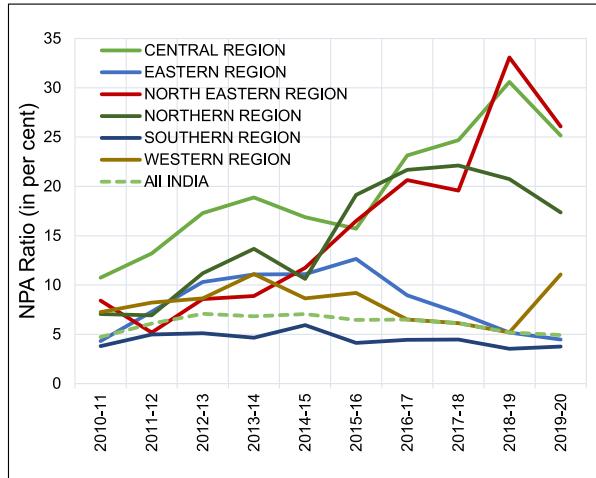
SHGs consist of approximately 10 – 20 members (may be of any gender, however, in India, they are mostly women) in a particular locality. Each member regularly saves a fixed amount of money through contributions to the group. If the SHG is linked to a bank, then the members pool in their savings in the bank account opened in the SHG's name. In case some member needs money, she/he can borrow it from two sources with consent from all members by paying a fixed interest rate. The first source is their contribution which forms a part of the total internal savings corpus of the SHG. In addition to this, banks also provide credit to the group. Group members are allocated the bank credit based on their needs. Interest income from such credit disbursements is equally distributed among the members which they can channelize back to the SHG's bank account if they wish. In case any individual defaults on the credit, the burden is shared by all the members – a joint liability contract. This brings incentive for group members to monitor the borrower and reduce credit defaults. In this way, SHGs help in accessing easy credit managed by the members and facilitated by banks.

In literature, ample studies have empirically confirmed the benefits of SHGs in India ([Deininger & Liu, 2009](#); [Swain & Wallentin, 2009](#); [Tesoriero, 2005](#)). [Hoffmann et al. \(2021\)](#) portrays that SHG loans crowds out the informal credits with a lower interest rate, and improve the welfare with a lag of two years of implementation in the Bihar state of India. [Swain & Wallentin \(2009\)](#) find that SHGs significantly improve women empowerment. [Tesoriero \(2005\)](#) shows that SHGs in South India helped women in wielding higher decisive power. [Mathur & Agarwal \(2017\)](#) using a sample from Jaipur (the capital city of state Rajasthan, India) show women participating in SHGs are more empowered and it helps them come out of poverty. Even certain studies such as [Deininger & Liu \(2009\)](#) reveal the positive impact of SHGs on women empowerment and improvement in their nutritional intake. This narrates the success story of SHGs in India from the viewpoint of financial inclusion. This success may be partially attributed to easier access to formal credit with lesser transaction costs ([Hoffmann et al., 2021](#)). As our objective is to look from the credit side, we will now turn towards some of the related literature that has explored SHGs from the credit perspective.

In a study based on Maharashtra, [Madheswaran & Dharmadhikary \(2001\)](#) observes that members borrow from their respective SHGs even though the applicable interest rate is very high. This study cites low transaction cost, quick access, and timely availability of credit as important reasons that nudge members to borrow from their respective SHGs. Moreover, in such cases, they find the repayment rate to be very high, around 90 per cent. This phenomenon is consistent with the theory that supports the role of joint liability and peer pressure mechanisms in lowering the probability of default. In a comparative study between the Integrated Rural Development Programme (IRDP) and SHGs, [Ramakrishna \(2001\)](#) finds that socio-economic empowerment is much higher among members of SHGs. They also suggest linking these SHGs with banks for better efficient credit delivery, usability, and repayment. From the perspective of credit repayment of SHGs, [D'espallier et al. \(2011\)](#) claims that SHGs with a higher percentage of female

members have a lower probability of default. In India, almost all SHGs comprise female members and the ratio of NPAs to total advances extended to SHGs has historically remained below 8 per cent (on an annual basis since 2011-12) for banks in India (Figure 1). This shows that the repayment rate is very high and the performance of the SHGs loan portfolio of banks is relatively better.

Figure 1: Region-wise NPAs of SHGs in India

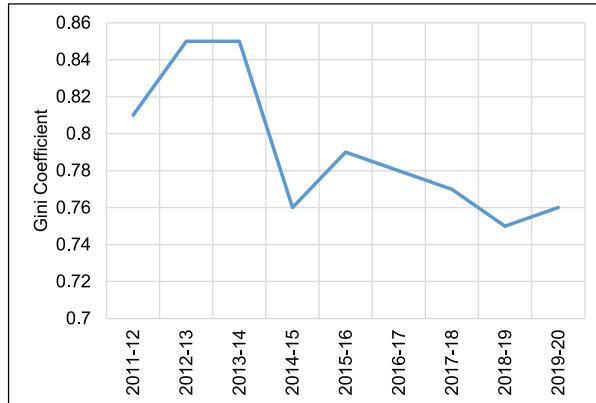


Source(s): Status of Microfinance in India Reports, NABARD.

During the 1990s in India, banking penetration was relatively less for individuals staying in remote rural areas, hence they were not able to access formal credit and reap the benefits of lower interest rates. India adopted the SHGs mechanism for improving credit availability in the rural areas in the early years of the 1990s. With the help of the National Bank for Agriculture and Rural Development (NABARD), SHGs were linked to commercial banks for easy access to formal credits in 1992. However, recent data from the Status of Microfinance in India Report (published by NABARD) shows that the non-performing assets (NPAs) level of the bank loans given to the SHGs in certain states are very high and is further increasing over time. This might be a serious concern in future for the banking sector as well as for the objective of providing SHGs access to formal bank credit without any collateral. Considering the aspect of credit allocation inequality among the states, the Gini coefficient of new loans shows a substantial rise during 2011-12 to 2013-14, and in recent period it remained stable at a relatively lower level (Figure 2). This inequality might be due to high NPAs in certain regions that led to the lesser extension of credit. Therefore, a low repayment rate appears to be one important deterrent for higher credit disbursement. This inequality will usher the unbalanced and asymmetric growth and development of SHGs.

Although the average all-India NPAs ratio for the SHGs loan portfolio of banks is below 5 per cent in recent years, the NPAs ratio for certain regions is more than 15 per cent from 2015-16 onwards, and it is steadily increasing. Since the average all-India NPAs ratio is a weighted average of the region-specific NPAs ratio where weights depend on credit disbursed to the SHGs of a particular region as compared to the all-India credit disbursement to SHGs, the low all-India level ratio is reflective of high credit disbursement to SHGs belonging to a region where NPAs are lower. This is on the expected lines because banks allocate credit to the areas with lower credit risk (Muduli & Dash, 2019). Thus, Figure 1 indirectly shows that a larger part of the credit goes to the south, west, and eastern part of India. The geographical

Figure 2: Gini Coefficient of New Loans to SHGs



Source(s): Status of Microfinance in India Reports, NABARD and authors' calculations.

clustering of NPAs of SHGs and their effect on bank credit to SHGs is empirically tested in the next section.

A study by the Bankers Institute of Rural Development ([BIRD, 2019](#)) brings out a few plausible reasons that are responsible for higher NPAs of SHGs. Among these, economic conditions, poor monitoring, lack of credit data, negative peer pressure, loan waiver by political leaders, etc. are reasons for higher NPAs. The study traces some institutional factors such as attention to small loans, lack of proper follow-up, poor monitoring etc. At the group level, poor group formation, smaller loan size, power imbalance, lack of hard information on financial transactions of the group, etc. are also a few reasons the study mentions in the report. For instance, [Sharma & Singh \(2020\)](#) for the state of Uttar Pradesh found that low recovery rates and delays in repayment are some specific reasons for higher NPAs of microfinance institutions. In this study, we focus on a few two group-level variables, size of the loan and savings per SHG as determinants of NPAs of the SHGs. SHGs with a smaller size of loans will have a lower ex-post loss if the joint liability contract is enforced. This may induce lower peer monitoring leading to higher default. From the bankers' side, the lower outstanding amount also incentivises them to pay low attention and regular monitoring. The savings of SHGs may work in opposite direction. If a SHG has higher savings, joint liability enforcement might be very costly, hence they monitor the members regularly to reduce credit default. Besides these group-level factors, we also consider broader macro variables that reveal the economic development of the state. These dimensions include SHGs per square kilometres, per capita income of the state, infant mortality rate, bank branch penetration, and railway and road connectivity etc. We jointly consider these factors and empirically determine their role in NPAs dynamic relationship. After empirically examining the determinants of NPAs, the study examines whether NPAs adversely affects the access to new bank credits, the primary objective of the SHG-bank linkage programme. There are studies which in general find a negative association between NPA and credit growth through banks' profitability channels for India ([Kanoujiya et al., 2021](#); [Wadhwa & Ramaswamy, 2020](#)). However, there are no studies that discuss the channel particular on the SHGs. [BIRD \(2019\)](#) and [Sinha & Navin \(2021\)](#) elaborate on the factors that affect NPAs of SHGs and flag the risks associated with it for future credits. We examine this empirically to fill the gap in the SHG literature for India. The study also examines the usefulness of the above group-level and state-level factors for the disbursement of new credits, particu-

larly the role of NPAs (Mani & Sudheer, 2012). The data and the concomitant analysis pertain to SHGs falling under the Self SHG-bank linkage programme.

3 Empirical Analysis

In this section, we empirically examine three important hypotheses. First, whether NPAs of SHGs are clustered in certain geographical regions of India. Second, the role of SHG specific characteristics and state-specific characteristics in deteriorating asset quality in certain states. Third, whether this piling up of NPAs rations credit for SHGs. The first hypothesis looks from a geographical perspective. While the second and third hypothesis reflects on the reasons behind higher NPAs and adverse consequences of NPAs on the availability of credit for the SHGs. For empirical analysis, secondary state-wise SHGs data has been taken from the Status of Microfinance in India Reports published by NABARD. These reports provide state-wise numbers of SHGs, outstanding loans, new loans, savings, NPAs, etc. during a financial year. We use panel data from 2011-12 to 2019-20. This data includes all states excluding union territories. In the case of Telangana, which was carved out of Andhra Pradesh in 2014, we have considered the average values and ratios of Andhra Pradesh for Telangana for the period before partition, to make it a balanced panel data. For the empirical exercise, we consider SHG specific factors and state-specific factors. SHG specific factors consist of non-performing assets to total advances, outstanding loans per SHG savings per SHG, new loans per SHG, and state-specific factors consist of per capita net state domestic products (per capita NSDP) at constant 2004-05 prices, SHG per square kilometres, banking penetration, railway and road connectivity, and infant mortality rate. The summary statistics of the above variables are given in [Table 1](#). The average NPA ratio is 13.53, this number is high because this gives equal weight to all the states. The standard deviation is very high due to extreme values in certain regions of the country. The average savings per SHG is Rs. 0.14 lakh. The average new loan per SHG is Rs. 1.39 lakh, and the outstanding loan per SHG is Rs. 0.93 lakh. The new loan per SHG is higher than outstanding because it considers only those SHG those who take loan during a current financial year and exclude SHGs that are previously taken loan but did not take loan during the current financial year. Hence the number of accounts that were given new credits will be less than the accounts with outstanding credit. On average in India, there are 3 SHGs per square kilometre. The per capita NSDP is Rs 90, 413.78 with a very high dispersion across the state. The average infant mortality rate is 31.16, i.e., around 31 deaths per 1,000 live births of children under one year of age. To incorporate the banking penetration, the number of branches per 10,000 population has been used as a proxy. On average, there are around 1.26 branches available for 10,000 populations with relatively a lower standard deviation. For road and connectivity infrastructure, the total length of railways and national highways to the total geographical area of the state has been considered, which takes an average of approximately 100 meters in a square kilometre. The number of observations is less for the above two variables due to the non-availability of data for 2019-20.

3.1 Why Does Geographical Location Matter?

In India, central, northern, and north-eastern regions show a very high level of NPAs to total advances extended to SHGs as compared to other regions ([Figure 1](#)). These regions are represented by groups

Table 1: Summary Statistics

Variables	N	Mean	Std. Dev.	Kurtosis	Skewness
NPA to total bank advances (in per cent)	261	13.51	11.00	5.53	1.57
Savings per SHG (rupees lakh)	261	0.14	0.11	13.54	2.89
New loan per SHG (rupees lakh)	261	1.39	0.79	4.79	1.47
Outstanding loan per SHG (rupees lakh)	261	0.93	0.55	6.00	1.70
SHG per square kilometres	261	2.79	3.25	6.48	1.87
Per capita NSDP (at constant 2004-05 prices in INR)	232	90413.78	51728.53	6.97	1.73
Infant mortality rate (per 1000)	232	31.16	12.71	2.24	-0.11
Bank branch density (Branches/ 10, 000 population)	261	1.26	0.74	11.09	2.48
Rail and Road Density (length per square kilometre)	261	0.09	0.15	26.10	4.95

Source: Reserve Bank of India, NABARD, and authors' estimates.

of states which are geographical neighbours to each other (i.e. they are geographically clustered). The high level of NPAs might be possible due to the existence of herd behaviour. The argument for herd behaviour from the locational perspective goes as follows. SHGs are geographically confined to villages in rural areas and particular localities in urban areas. Unlike other individual borrowers, these borrowers stay in a particular geographical location in a social and economic network. Members of the SHGs know each other as they informally interact daily. Members or heads of the different SHGs also interact and exchange information on various benefits of SHGs. This helps in the quick diffusion of information regarding new policy initiatives undertaken by the government to improve the welfare of SHG members. On the other hand, if few SHGs default on bank loans and enjoy the benefits without any financial loss since they are unsecured loans, then they might continue it consistently leading to moral hazard issues. This behaviour might get observed by other SHGs and they may also adopt it by defaulting on the loans. Once it becomes a collective behaviour it becomes very difficult for banks to recover. The only strategy the bank adopts is by reducing fresh credits. This imitation, over time, leads to the formation of a cluster of SHGs located in specific geographical areas resorting to collective joint defaults. Although not directly observable, default happening in a clustered geographical area can be a signal of this herd behaviour. Based on these arguments, we try to extract this information by using spatial analysis and empirically examine whether NPAs to total advances by banks to SHGs are geographically clustered among certain states of India. The spatial clustering index, Moran I ([Moran, 1950](#)) has been calculated for each year to analyse clustering on an annual basis¹.

¹Moran I is one of the measure for spatial clustering analysis. There is another measure for this purpose is known as Geary's coefficient ([Geary, 1954](#)). However, Moran I is more robust and significant for spatial analysis ([Chen, 2013](#))

Moran I

Suppose there are N spatial units. Each spatial unit i has some *continuous random* variable x_i for $i \in \{1, 2, 3, \dots, N\}$. Then, Moran I defined as

$$\text{Moran I} = \frac{N}{W} \frac{\sum_i \sum_j w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_i (x_i - \bar{x})^2} \quad , \quad i, j \in \{1, 2, 3, \dots, N\}, \quad w_{ii} = 0 \text{ for all } i$$

where $\bar{x} = \frac{\sum_i x_i}{N}$, w_{ij} is neighbourhood indicator function (also weight function), and $W = \sum_{ij} w_{ij}$. This index considers the geographical location through w_{ij} which is derived from the neighbourhood properties of the spatial units i and j ². For example, if i and j are neighbours, then w_{ij} takes value 1, otherwise, it takes 0. The values of the index always lie between -1 to 1. Moran I of value -1 implies perfectly dispersed values of a variable, whereas 1 implies perfectly clustering of the values in some particular geographical location. It differs from simple clustering by taking geographical location (like weights w_{ij}) into account along with values (values x_1, x_2, \dots, x_N) of a variable. Although it looks similar to the standard correlation coefficient and its values lie between -1 and 1, it differs from the standard correlation coefficient in the following dimension. A standard correlation coefficient examines the linear association between two variables for different entities (cross-sectional) or for different time periods for a single entity (time series). However, Moran I measures how the value of a particular single variable of an entity depends on the value of the same variable in the neighbourhood unit based on their geographical location. Therefore, conceptually it is a similar and generalized version standard correlation coefficient with spatial dimensions to it. Sometimes this is also called a measure for spatial dependency (or spatial autocorrelation). In this study, we use the ratio of NPAs to total advances to SHGs (as x) for 29 states (spatial units, $N = 29$) in India to study their spatial dependency. Moran I is positive and significant showing the existence of spatial correlation since 2013-14 ([Table 2](#)).

Empirical results support our argument for the existence of geographical clustering and the presence of implicit herd behaviour. From 2016-17 onwards, the phenomena are more persistent and higher NPAs are associated with particular states that are neighbours to each other. Similarly, there are certain groups of neighbouring states which have a very high loan repayment rate. These are south, western, and eastern regions ([Figure 1](#)). Since all this information is public and freely available, this might have led to higher inequality in new loans' allocations for SHGs. In the next hypothesis, we examine whether a low repayment rate in certain states leads to credit rationing in those states.

3.2 Plausible Factors Responsible for NPAs of SHGs.

In the last section, we empirically confirmed that there exists a clustering of NPAs of SHGs. This conclusion is obvious by observing the credit inequality and NPAs in different regions. In this section, the study estimates the dynamic relationship of NPAs by considering SHG-specific and state-specific factors. To examine this, we use dynamic panel regression that considers the dynamic behaviour of new loans per SHG over the sample period. The methodology also addresses endogeneity issues in the dynamic framework ([Arellano & Bond, 1991](#); [Arellano & Bover, 1995](#)). This methodology has been used in the literature to establish a dynamic relationship of variables of consideration, for instance, [Sinha & Sharma](#)

²These weights are derived from geographical locations using a shape file.

Table 2: Moran I Test Under Randomization

Financial Year	Moran I
2011-12	-0.04
2012-13	0.00
2013-14	0.25***
2014-15	0.17**
2015-16	0.11
2016-17	0.38***
2017-18	0.24**
2018-19	0.28***
2019-20	0.28***

Source: Status of Microfinance in India Reports, NABARD and authors' calculations. * p-value < 0.1, ** p-value < 0.05, *** p-value < 0.01.

(2016) use this methodology to study the dynamic relationship of profitability of banks in India. Putting it formally,

$$y_{i,t} = \alpha + \beta_1 y_{i,t-1} + \beta_2 z_{i,t} + u_i + \epsilon_{i,t}$$

Where $y_{i,t}$ is the dependent variable for i^{th} unit observed at time t , z_{it} represent other explanatory or control variables and can also take past values of certain explanatory variables. α , u_i , $\epsilon_{i,t}$ are constant, state-specific unobserved fixed effect, and standard white noise, respectively. In this case, the dependent variable is NPAs to total advances of the SHGs. Explanatory variables include lagged values of NPAs ratio, outstanding loans per SHG, savings per SHG, SHGs per square kilometres, per capita income of the state (per capita NSDP), banking penetration, railway and road density, and infant mortality rate. All the post estimation tests such as AR(1), AR(2), and Hansen tests have been carried out for consistent estimation of the parameters and validation of instruments. The regression results are shown in [Table 3](#). Results on SHG-specific factors show that states with both higher outstanding loans per SHG and savings per SHG have lower NPAs to total advances. This supports the argument that lower outstanding loans bring negative peer pressure among SHG members and low monitoring incentive for banks that results in higher credit default. These factors explain the willingness to pay dimension of a borrower, a member of the SHG. Although a borrower can pay, since there is little attention for her repayment and default is less costly, the borrower will have a higher incentive to default. Hence this could be a possible reason behind higher NPAs. Results on state-specific factors reveal that states with higher SHG per square kilometres have lower NPAs. This means states, where SHGs are denser or highly penetrated, have lower NPAs. Higher the density more developed are SHGs and they have shared experience. This helps them in sharing the benefits of good credit culture, leading to lower delinquencies. State-specific factors such as per capita income and infant mortality rate are indicators for economic development. While banking penetration, and railway and road density are indicators of better banking and physical infrastructure. The results show that states that are economically developed with better physical infrastructure have lower NPAs. The infant mortality rate is a proxy for human capital and infrastructure. A higher infant mortality rate indicates lower human capital. The empirical results show that states that have higher infant mortality have lower NPAs. In the analysis, we have not included any variable of education as it is

Table 3: Factors Influencing NPAs of SHGs

	(1) NPA _{it}	(2) NPA _{it}	(3) NPA _{it}	(4) NPA _{it}	(5) NPA _{it}	(6) NPA _{it}	(7) NPA _{it}
NPA _{i,t-1}	0.564*** (0.0152)	0.568*** (0.0166)	0.625*** (0.0160)	0.672*** (0.0201)	0.612*** (0.0266)	0.496*** (0.0155)	0.511*** (0.0271)
SHG-specific factors							
Outstanding Loan per SHG _{it}	-4.474*** (0.267)	-2.350*** (0.509)	-3.196*** (0.619)	-3.962*** (0.770)	-0.588 (0.785)	-2.731** (1.080)	-3.212*** (0.936)
Savings per SHG _{it}		-14.81*** (3.121)	-0.440 (2.879)	1.805 (2.967)	1.151 (4.206)	-4.391 (6.838)	2.208 (3.893)
State-specific factors							
SHG per square km _{it}		-0.469*** (0.111)	-0.481*** (0.117)	-0.643*** (0.127)	-0.280* (0.146)	-0.443** (0.177)	
Per Capita NSDP _{i,t-1}			-0.00000602* (0.00000324)	-0.00000177** (0.00000854)	0.00000731 (0.00000423)	0.00000170 (0.00000110)	
Infant Mortality Rate _{i,t-1}					0.192*** (0.0264)	0.138*** (0.0216)	0.162*** (0.0253)
Bank Branches per 10,000 populations _{i,t-1}						0.825 (2.109)	-0.146 (0.636)
Railway - Road Density							-8.382* (4.337)
Constant	10.69*** (0.412)	10.54*** (0.406)	9.811*** (0.480)	9.825*** (0.505)	3.635*** (1.050)	4.288*** (1.331)	5.591*** (1.211)
Observations	232	232	232	232	232	232	232
AR(1) test p-value	0.0625	0.0512	0.0585	0.0570	0.0531	0.0605	0.0609
AR(2) test p-value	0.555	0.623	0.581	0.514	0.682	0.682	0.654
Hansen test p-value	0.872	0.883	0.922	0.995	0.865	0.843	0.993

Standard errors in parentheses

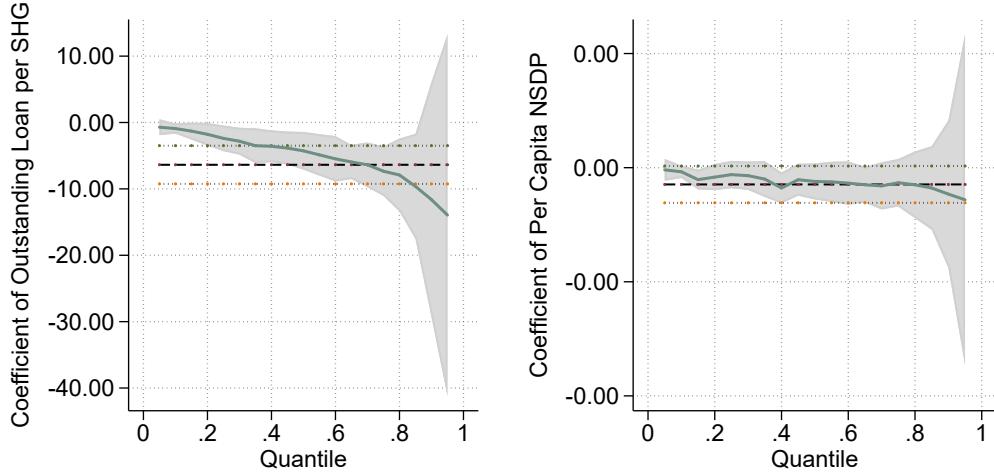
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

census data and available once in ten years. However, in 2011-12 the correlation between literacy rate and the infant mortality rate is -0.54 with a p-value of 0.003. Thus, indirectly it reveals that states with higher education levels are more likely to have lower NPAs. Moreover, commercial bank branches per 10,000 populations do not come to be a statically significant factor that is responsible for higher SHGs NPAs. Since SHGs are linked to a single bank density of other banks' branches may not matter, however, bank branch penetration may improve in formalization of the banking sector and help depositors in the timely efficient management of their deposits. Road connectivity through railways and national highways is a significant factor that reduces SHGs NPAs. This result is consistent with the ability to repay argument, i.e., SHGs are engaged in a different kind of economic activity, and better infrastructure facilitates their products and provides market access. In developed states, they get more opportunities to sell and earn profit. This enhances their ability to pay, hence this leads to lower non-performing assets. Overall, this empirical exercise confirms that SHGs with lower loan sizes and higher saving operating in economically developed states are more likely have lower NPAs.

Since there is a significant difference in NPAs across regions, it is also important to examine the role of

negative peer pressure for regions with a higher NPAs ratio. This will add to the robustness of the inference we made in the previous section. To empirically examine this we have implemented quantile regression for different quantiles. Quantile regression estimates the empirical relationship between dependent and explanatory variables for different quantiles associated with the distribution of dependent variables. In the NPAs ratio distribution, states that are with higher will fall in higher quantiles. The coefficients of outstanding loans per SHG (in the left panel) and per capita income (in the right panel) has been plotted in [Figure 3](#). The figure shows that the coefficient of outstanding loans per SHG is negative and grow stronger for states with higher NPAs ratio. Thus, the negative peer pressure effect is dominant for states falling in higher quantiles. Although, the coefficient of per capita income of the state is negative, but does not vary across quantiles. This confirms that in states where there are higher NPAs, negative peer pressure is an important determinant of loan defaults. This further adds to our previous argument and supports the view.

Figure 3: Select Coefficients of Quantile Regression



Source(s): Authors' estimates.

3.3 NPAs and Credit Rationing

In this section, we test whether high NPAs ratios credit for SHGs. If banks are rational and correctly incorporate the NPAs localization, then it is expected that higher NPAs will result in credit rationing in the states.

In this case, the dependent variable is the new loan amount per SHG. Explanatory variables are lag of new loan amount per SHG, savings per SHG, NPAs to total advances for SHGs, and total outstanding loans of the SHGs. Additionally, we have included SHG density, per capita income, banking penetration, railway and road connectivity, and infant mortality rate to examine whether SHGs get easy credits in economically developed states with better banking and physical infrastructure. Savings per SHG indicates the size and age of the SHGs. If an SHG is very old and consists of many members, then savings per SHG is more likely to be higher. Since these SHGs are linked to banks, the savings of SHGs act as an implicit

Table 4: Factors Affecting New Loans to the SHGs

	New Loan per SHG _{it}						
New Loan per SHG _{i,t-1}	0.509*** (0.0334)	0.133*** (0.0279)	0.0901*** (0.0240)	0.182*** (0.0163)	0.128*** (0.0165)	0.196*** (0.0443)	0.158*** (0.0443)
SHG-specific factors							
NPA _{i,t-1}	-0.01000*** (0.00250)	-0.0142*** (0.00456)	-0.00825* (0.00500)	-0.0103*** (0.00132)	-0.0134*** (0.00113)	-0.0104*** (0.00307)	-0.0166*** (0.00212)
Savings per SHG _{i,t-1}		4.879*** (0.888)	4.928*** (0.864)	3.542*** (0.238)	3.639*** (0.136)	2.903*** (0.222)	3.785*** (0.204)
State-specific factors							
SHG per square km _{i,t-1}			0.0899*** (0.0109)	0.0834*** (0.0141)	0.0423*** (0.00456)	0.0359** (0.0140)	0.0437*** (0.00704)
Per Capita NSDP _{i,t-1}				0.00000225*** (0.00000241)	0.000000605** (0.000000271)	0.00000147** (0.000000636)	-0.000000514 (0.000000458)
Infant Mortality Rate _{i,t-1}					-0.0149*** (0.00198)	-0.0116*** (0.00264)	-0.0148*** (0.00472)
Bank Branches per 10,000 populations _{it}						0.0267 (0.0370)	0.0856* (0.0470)
Railway and Road Density _{it}							0.165 (0.433)
Constant	0.832*** (0.0847)	0.746*** (0.0927)	0.514*** (0.0947)	0.440*** (0.0604)	1.288*** (0.0860)	0.994*** (0.149)	1.214*** (0.222)
Observations	232	232	232	232	232	232	232
AR(1) test p-value	0.0242	0.0243	0.0145	0.0265	0.0265	0.0482	0.0186
AR(2) test p-value	0.437	0.896	0.226	0.516	0.783	0.920	0.801
Hansen test p-value	0.206	0.274	0.179	0.898	0.886	0.997	0.977

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

guarantee against the credit. Therefore, it is expected that higher savings per SHG help get higher credit. NPAs to total advances will show the loan repayment status of the SHG. A low repayment rate will have high NPAs to total advance, and vice-versa. If banks are rational, then NPAs to total advances is expected to be negatively related to new loan extension. Total outstanding loan per SHGs reflects on the stock position of credit already extended by the banks based on SHGs' behaviour or initial extension. However, new loans will indicate how they have utilized the previously disbursed loans and made timely repayments. It is expected that if an SHG has a higher amount of outstanding loans, then it must have performed better in the past and utilised the allocated funds efficiently, hence, it is more likely that banks will provide new credit. Moreover, the higher amount might be a proxy for relationship lending. Thus, higher loan outstanding per SHG might help in accessing higher credit. But the recent low repayment leading to higher NPAs can have a rationing impact. This coefficient will show how outstanding loans help in accessing credit in presence of NPAs. Results of dynamic panel regression have been reported with post estimation test results in [Table 4](#).

Based on the analysis, as expected, SHGs in the states enjoy higher fresh credit allocation with higher savings and higher loan outstanding. While NPAs against bank credit hurt accessing new bank credit. For state-specific factors, higher per capita income of the state, higher bank branch penetration, and lower infant mortality rate get higher new fresh credits. This empirically confirms that the developed

states with low loan repayment rates get less fresh credit relative to states with high repayment rates. Thus, NPAs ration fresh credit. High inequality in credit allocation (Figure 2) and divergence of NPAs in certain regions (Figure 1) reflects the rational behaviour of banks in allocating credit to SHGs. Moreover, this is geography-specific and herd behaviour is a possible factor that is responsible for this inequality. The results on state-specific shows that SHGs with lower NPAs operating economically developed states with higher SHG density get easy credits. Thus, awareness of the benefits of good credit culture with higher SHG penetration helps in higher credit access.

4 Conclusions

The study examines the rising inequality in new loans' disbursement to Self Help Groups (SHGs) by considering spatial, SHG specific factors, and state-specific factors. The spatial analysis exercise made in the study confirms that non-performing assets (NPAs) in the bank balance sheet arising from the advances given to SHGs are geographically clustered. The central, northern, and north-eastern regions of India have a higher ratio of NPAs to total advances compared to southern, eastern, and western parts in India. Lower outstanding loans and savings are associated with higher NPAs. Since loan size is small, these higher NPAs may be due to low peer pressure and close monitoring by other members and lending institutions. The negative low pressure is stronger for states with higher NPAs ratios. Also, SHGs operating in states with lower SHG density and lower economic development are more likely to default. Lower NPAs with higher savings of SHGs in relatively economically developed states with higher banking infrastructure have easy access to new credit. However, in the presence of higher accumulated NPAs, the role of savings in accessing new credit is limited. Thus, a low repayment rate might be one important bottleneck for SHGs in accessing new loans. Over time, this may bring unbalanced development of SHGs across states. Benefits of SHGs-Bank linkage Programme will not be efficiently reaped in certain regions due to the piling up of the NPAs against SHGs in banks' balance sheets. Higher SHG penetration and close monitoring are a few policy measures that can improve the performance of SHGs.

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