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Determinants of Repayment Performance in Indian Micro-Credit Groups

Klaus Deininger
Yanyan Liu

The World Bank
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Abstract

Despite their potential importance and ease of modification, impacts of monitoring and loan recovery arrangements on micro-credit groups' repayment performance have rarely been studied. Data on 3,350 expired group loans in 300 Indian villages highlight that regular monitoring and audits, high repayment frequency, consumption smoothing support through rice credit, and having group savings deposited with the lender all significantly increase repayment rates. Estimated magnitudes of their effects vastly exceed those of members' socio-economic characteristics. Significantly lower repayment on loans originating in externally provided grant resources suggests that stringent monitoring will be essential for these to have a sustainable impact.

This paper—a product of the Sustainable Rural and Urban Development Team, Development Research Group—is part of a larger effort in the department to better understand the impacts of decentralized governance and local development.. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at kdeininger@worldbank.org or yliu3@worldbank.org. .

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Klaus Deininger *

Yanyan Liu *

World Bank, Washington DC;

*Email kdeininger@worldbank.org and yliu3@worldbank.org. We thank CESS staff, in particular Prof. S. Galab, Prof. M. Dev, and Dr. P. Reddy, for their support and collaboration in making the data available and Renate Kloeppinger-Todd, Ajai Nair, Ren Mu and Yasuharu Shimamura for insightful comments and suggestions. Funding from the Norwegian ESSD Trust Fund (poverty window), the Gender Action Plan, and the Knowledge for Change Trust Fund is gratefully acknowledged. The views expressed in this paper are those of the authors and do not necessarily represent those of the World Bank, its Board of Executive Directors, or the countries they represent.

Determinants of repayment performance in Indian micro-credit groups

1. Introduction

The past 30 years have witnessed a veritable boom of micro-finance. As of the end of 2006, 3,316 micro-credit institutions reported reaching more than 133 million clients, about 92.9 million of whom were, at the point of taking their first loan, among the poorest (Daley-Harris 2007). The reason for such expansion is believed to lie in the ability of such groups to mitigate the challenges of moral hazard and adverse selection by applying peer monitoring and pressure that are less costly than those available to formal institutions (Stiglitz 1990, Banerjee *et al.* 1994, Besley and Coate 1995, Conning and Udry 2005). However, there is considerable debate about whether such groups will do so sustainably by ensuring that even poor borrowers will pay back their loans. While factors affecting repayment performance would thus be of great policy relevance, results in the literature vary widely (Zeller 1998, Ahlin and Townsend 2007, Cull *et al.* 2007), and few studies have explored cross-group variation in management practices as a factor that could affect this outcome variable.

We examine whether and how much repayment is affected by loan source, groups' provision of public goods in the form of insurance substitutes, and exogenously imposed management practices. The data used are from more than 2,000 groups, federated in 299 village organizations (VOs) in a program to deliver micro-credit to poor rural women in the Indian State of Andhra Pradesh. The fact that each VO's management practices vary considerably but are not a choice variable for groups who joined the program after the VO had come into existence provides a source of exogenous variation. Section two describes the program and data. Section three describes the model and estimation method. Section four reports results and section five concludes.

2. Program Description and Data

The program under study builds on a tradition of women self-help groups (SHGs) which consist of 10-15 members who meet regularly to discuss social issues and activities, deposit a small thrift payment into a joint account, and make decisions on loans. The program aims to trigger SHG-formation by non-participant households and federation of all SHGs in a village into Village Organizations (VOs) to help obtain loans from commercial banks and provide public goods.

In contrast to the literature that mostly looks at individual loan repayment, we focus on SHG loans. Funds for these can come from three sources, namely commercial bank loans via the VO, internal savings by participating SHGs, or grants provided to the VO under a "community investment fund" (CIF). Our

data cover 3,350 “expired” loans past their original due date by 2,147 SHGs in 299 VOs. They started in 2003 after the majority of VOs were formed and coincide with a major drive for SHG formation up to 2006.

Table 1 illustrates that of the 40 million rupees (about 1 million USD) transferred through these loans, about 60% emanated from CIF resources. With only 63% fully repaid (and 23% of the amount still outstanding), repayment is lower for these compared to bank (87%) and internal (89%) loans. The variables at SHG and loan levels that might affect repayment rates as summarized in table 2 include size, source, length, and interest rate of the loan and a dummy for high (monthly or less) repayment frequency and the SHG’s size, age, and membership composition.

The rules governing monitoring and loan recovery, the main subject of this study, are VO-specific and were determined by SHGs in existence at the time of VO formation. SHGs formed thereafter adopted the rules of the VO in their village by default, providing us with a source of exogenous variation. Rules differ in four key dimensions, namely (i) the modalities for SHGs to obtain and repay loans; (ii) VOs’ monitoring of financial affairs by member SHGs; (iii) the extent to which the VO provides public goods; and (iv) SHGs being required to make regular thrift payments that are deposited with the VO.

Repayment modalities include existence of a “loan recovery” committee to monitor SHGs’ credit worthiness (e.g., through rating) and whether fees need to be paid by SHGs who miss an installment. We would expect both to increase repayment probability. VOs’ monitoring of SHGs’ financial affairs is proxied by three variables, namely whether the VO (i) regularly inspects member SHGs’ books at monthly meetings; (ii) employs a trained book keeper; and (iii) regularly audits members' books. Again, all of these should help to reduce defaults. VOs’ provision of non-financial services to raise members’ economic potential is proxied by two dummies indicating whether in-kind consumption credit and marketing services are provided. As such benefits can be cut off in case of default they should enhance repayment incentives, especially insofar as alternative sources for the associated benefits are unavailable. VOs’ collection of thrift from member SHGs provides a cash collateral that can be withheld in case of default and thus should increase repayment incentives as well.

Summary statistics for these variables reported in table 3 suggest that 36% of the VOs in the sample applied a sanction for SHGs who miss an installment, 41% had a loan recovery committee, 35% provided in-kind consumption credit, 25% provided marketing services, 47% collected thrift from their member SHGs, 82% employed trained book keepers, 37% of the SHGs in the sample were regularly audited, and 23% presented books at VO meetings.

3. Model and Estimation Method

We use a novel tobit model with random VO and group effects to account for unobservables at both levels. Indexing VOs, SHGs, and loans by *i*, *k*, and *h*, respectively and letting X be a vector of explanatory variables that include monitoring and repayment rules as well as loan and SHG characteristics and denoting our dependent variable, the percentage of the amount of expired loans overdue by y_{ikh}, we get

$$y_{ikh} = \begin{cases} 0 & \text{if } y^*_{ikh} < 0 \\ y^*_{ikh} & \text{if } 0 \le y^*_{ikh} \le 1, \\ 1 & \text{if } y^*_{ikh} > 1, \end{cases}$$

where y^*_{ikh} is the latent variable taking the form

$$y^*_{ikh} = X_{ikh}\beta + v_i + u_{ik} + \varepsilon_{ikh},$$

where v_i and u_{ik} are unobserved effects at VO and SHG levels and ε_{ikh} a random error term. Assuming $v_i \mid X_{ikh} \sim N(0, \sigma_v^2)$, $u_{ik} \mid X_{ikh}, v_i \sim N(0, \sigma_u^2)$, and $\varepsilon_{ikh} \mid X_{ikh}, v_i, u_{ik} \sim N(0, \sigma_\varepsilon^2)$, the partial log-likelihood function is

$$\begin{aligned} LL &= \sum_i \sum_k \sum_h \log\left[f(y_{ikh} \mid X_{ikh}) \right] \\ &= \sum_i \sum_k \sum_h \log\left[\int \left[\int f(y_{ikh} \mid X_{ikh}, v_i, u_{ik}) f(u_{ik} \mid X_{ikh}, v_i) du_{ik} \right] f(v_i \mid X_{ikh}) dv_i \right], \end{aligned}$$

where

$$f(y_{ikh} \mid X_{ikh}, v_i, u_{ik}) = \left[1 - \Phi\left(\frac{M_{ikh}}{\sigma_\varepsilon}\right) \right]^{1[y_{ikh}=0]} \left[\frac{1}{\sigma_\varepsilon} \phi\left(\frac{y_{ikh} - M_{ikh}}{\sigma_\varepsilon}\right) \right]^{1[0<y_{ikh}<1]} \left[\Phi\left(\frac{M_{ikh} - 1}{\sigma_\varepsilon}\right) \right]^{1[y_{ikh}=1]}$$

$$M_{ikh} = X_{ikh}\beta + v_i + u_{ik}$$

To estimate this model, we use simulated partial maximum likelihood estimation in three steps:

(1) draw R_v random numbers from the standard normal distribution, and denote the random draws by $a_i^{r_v}$, $r_v = 1, \ldots, R_v$ for each VO;

(2) draw R_u random numbers from the standard normal distribution, and denote the random draws by $b_{ik}^{r_u}$, $r_u = 1, \ldots, R_u$ for each SHG;

(3) estimate β, σ_u^2, σ_v^2, and σ_ε^2 by maximizing

$$SLL = \sum_i \sum_k \sum_h \log\left[\frac{1}{R_v R_u} \sum_{r_v} \sum_{r_u} f(y_{ikh} \mid X_{ikh}, v_{i_i}^{r_v}, u_{ik}^{r_u}) \right],$$

where

$$f(y_{ikh} \mid X_{ikh}, v_i^{r_v}, u_{ik}^{r_u}) = \left[1 - \Phi(\frac{M_{ikh}^{r}}{\sigma_\varepsilon})\right]^{1[y_{ikh}=0]} \left[\frac{1}{\sigma_\varepsilon}\phi(\frac{y_{ikh} - M_{ikh}^{r}}{\sigma_\varepsilon})\right]^{1[0<y_{ikh}<1]} \left[\Phi(\frac{M_{ikh}^{r} - 1}{\sigma_\varepsilon})\right]^{1[y_{ikh}=1]}$$

$$M_{ikh}^{r} = X_{ikh}\beta + \sigma_v a_i^{r_v} + \sigma_u b_{ik}^{r_u}.$$

4. Estimation Results

Tobit regression results (with R_v and R_u both equal to 80) and average partial effects evaluated at sample means of explanatory variables on the probability of full repayment $P(y=0 \mid X)$ and the share overdue $E(y \mid X)$ are reported in table 4. As noted earlier, VO-level rules were chosen by existing SHGs at the time of VO formation whereas SHGs formed thereafter had to accept existing rules. Because inclusion of SHGs who, at the time of VO formation, participated in framing the rules could violate orthogonality between rules and unobserved SHG characteristics, we focus on the restricted sample that only includes SHGs who joined the program thereafter (col. 1-4), while noting that coefficients' signs, and in most cases significance levels, are similar between the two samples.

Monitoring and loan recovery arrangements are highly significant both statistically and economically. Regular audits, checking of SHG-books at VO meetings, and having savings deposited with the VO are estimated to increase full repayment probabilities by 8.3, 9.5, and 20 points. This is in line with evidence on the impact of access to information (Luoto *et al.* 2007). While VOs' marketing involvement has no impact, in-kind consumption credit is predicted to increase probability of full payment by 12.7 points, consistent with other studies suggesting that non-economic benefits from credit groups, access to which could be lost through default, increase repayment incentives (Godquin 2004). It also implies that VOs are better positioned to help smooth consumption and address credit market imperfections than to intervene in output markets.

The highly significant and negative coefficient on a bank source dummy suggests that loans from banks are, by 18.6 points according to the estimate, more likely to be fully repaid, with a significant, though slightly smaller, effect of internal lending in the large sample. This lower repayment on loans made from groups' own capital (including resource made available to them through an externally funded project) points to limits in VOs' credibility, possibly due to their relatively recent establishment. High installment frequency has an almost equally large effect (15 points), consistent with the notion that, with credit constraints, frequent small installments enhance repayment performance. Consistent with other studies, full repayment is less likely for loans with longer duration and (less significantly) higher interest.

Compared to mixed evidence on the impact of group characteristics in the literature (Armendariz de Aghion 1999, Guttman 2006), our results suggest that repayment probability increases up to a size of about 14 members and decreases thereafter, and decreases with group age up to about five years. Although the positive significant coefficient on the share of very poor members (and a marginally significant one for poor members) point to lower rates of full repayment in groups with poor individuals, the magnitude is small: a 10 point increase in very poor members' share would reduce full repayment by 1.7 points only, suggesting that there is much less of a trade-off between sustainability and serving the poorest than would be suggested by cross-country studies (Cull *et al.* 2007). Neither caste-composition nor homogeneity has a significant impact. Overall, the overriding importance of rules and management practices emerging from our data suggests that, in the context at hand, even groups comprised of very poor borrowers in high risk conditions can achieve high repayment rates if proper rules and management practices are adopted.

5. Conclusion

In contrast to most existing literature that studies the impact of group and individual attributes on loan repayment in micro-credit groups, we investigate the impacts of exogenous monitoring and loan recovery arrangements, together with loan and group characteristics. As banks and others can provide micro-finance institutions with additional resources contingent on adoption of certain minimum rules, this could be of great practical relevance. Our results highlight the overriding importance of rules, suggesting that the impact of regular monitoring, audits, and high repayment frequencies as well as in-kind credit to ensure consumption can more than compensate not only for loans made out of grants rather than bank loans but, more importantly, for the decrease in repayment probability incurred by focusing on groups of very poor borrowers.

Table 1. Loan characteristics in the sample

Source of loans	Bank	CIF	Internal	Mixed
Number of loans	255	1086	457	349
Amount of loans (Rs million)	8.28	23.72	3.12	4.87
Full repayment	0.87	0.63	0.89	0.81
% overdue	0.08	0.23	0.08	0.12
Interest rate	12.5	13.2	14.8	13.4
Number of SHGs		2147		

Table 2. Summary statistics of explanatory variables at loan and SHG levels

Variable	Mean	Std. Dev.
Loan level		
Loan size (1,000Rs)	15.8	24.1
Source is bank	0.28	0.45
Source is internal lending	0.19	0.39
From CIF	0.44	0.50
Source is mix	0.10	0.30
Annual interest rate (%)	14	4
Length of loan (year)	0.90	0.43
Installment weekly or fortnightly	0.74	0.44
No. of observations (loans)	3,350	
SHG level		
SHG size (number of members)	13.1	2.4
SHG age (years)	5.30	2.39
Share of very poor members (%)	0.34	0.32
Share of poor members (%)	0.39	0.28
Share of members belong to Scheduled Caste/Tribe (%)	0.33	0.38
Share of members in other backward castes (%)	0.54	0.44
Share of members from dominant caste (%)	0.91	0.16
No. of observations (groups)	2,147	

Table 3. Village Organizations' management practices

Variable	Mean	Std. Dev.
If fine paid by SHGs who miss an installment	0.36	0.48
If loan recovery committee existed	0.41	0.49
If VO provided in-kind consumption credit	0.35	0.48
If VO provided marketing services	0.25	0.43
If VO collected thrift from SHGs	0.47	0.50
If VO employed a trained book keeper	0.82	0.38
If SHG audited by VO*	0.37	0.48
If SHG required to present the books at VO*	0.23	0.42

* The two variables are at SHG level.

Table 4. Tobit regression results

	SHGs who joined after VO formation					All SHGs				
Variable	**coeff**	**(se)**	**sig**	**APE on P(y=0|X)**	**APE on E(y|X)**	**coeff**	**(se)**	**sig**	**APE on P(y=0|X)**	**APE on E(y|X)**
Loan characteristics										
Amount (1,000Rs)	0.000	(0.001)		0.000	0.000	0.003	-0.001	***	-0.001	0.001
From bank	-0.683	(0.136)	***	0.186	-0.251	-0.688	-0.096	***	0.156	-0.209
From internal lending	0.025	(0.102)		-0.009	0.012	-0.218	-0.073	***	0.062	-0.083
From mixed fund	-0.165	(0.107)		0.057	-0.078	-0.037	-0.07		0.011	-0.015
Interest rate p.a. (%)	0.024	(0.011)	**	-0.009	0.006	0.009	-0.007		-0.003	0.002
Length (years)	0.409	(0.084)	***	-0.149	0.111	0.489	-0.059	***	-0.145	0.121
Installments at least monthly	-0.332	(0.095)	***	0.129	-0.176	-0.465	-0.065	***	0.151	-0.201
Borrower characteristics										
SHG size	-0.245	(0.072)	***	0.089	-0.066	-0.057	-0.048		0.017	-0.014
SHG size squared	0.009	(0.003)	***			0.002	-0.002			
SHG age	0.186	(0.079)	**	-0.068	0.050	-0.018	-0.036		0.005	-0.004
SHG age squared	-0.020	(0.007)	***			0	-0.003			
Share of very poor members (%)	0.461	(0.161)	***	-0.167	0.125	0.351	-0.114	***	-0.105	0.087
Share of poor members (%)	0.288	(0.169)	*	-0.104	0.078	0.012	-0.117		-0.003	0.003
Share of scheduled caste/tribe members (%)	0.219	(0.179)		-0.080	0.059	0.317	-0.109	***	-0.094	0.079
Share of other backward caste members (%)	0.265	(0.175)		-0.096	0.072	0.214	-0.106	**	-0.064	0.053
Share of members from dominant caste (%)	-0.285	(0.238)		0.104	-0.077	-0.391	-0.17	**	0.116	-0.097
VO's Management practices										
SHG regularly audited	-0.233	(0.091)	**	0.083	-0.113	-0.078	-0.058		0.023	-0.031
SHG required to present books at VO meeting	-0.275	(0.094)	***	0.095	-0.128	-0.191	-0.067	***	0.054	-0.073
fees for missing installment	-0.088	(0.084)		0.032	-0.043	-0.199	-0.057	***	0.059	-0.079
loan recovery committee existed	-0.062	(0.077)		0.023	-0.031	-0.102	-0.051	**	0.03	-0.04
VO collected thrift from SHGs	-0.541	(0.087)	***	0.200	-0.272	-0.429	-0.058	***	0.133	-0.178
VO employed trained book keeper	-0.149	(0.097)		0.056	-0.077	-0.166	-0.067	**	0.052	-0.07
VO provided in-kind consumption credit	-0.371	(0.092)	***	0.127	-0.173	-0.353	-0.06	***	0.102	-0.137
VO provided marketing services	0.003	(0.084)		-0.001	0.002	0	-0.055		0	0
Other parameters										
Constant	0.861	(0.424)	**			0.342	-0.311			
σ_v (VO random effect)	0.010	(0.278)				0.525	-0.126	***		
σ_u (SHG random effect)	0.768	(0.053)	***			0.267	-0.268			
σ_ε (random error term)	0.306	(0.089)	***			0.756	-0.134	***		
Number of observations		1,120					3,350			

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