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Relief from usury: Impact of a self-help group lending program in rural India

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A B S T R A C T

Provision of low-cost credit to the poor through self-help groups (SHGs) has been embraced as a key poverty-reduction strategy in developing countries, but evidence on the impact of this approach is thin. Using a randomized program rollout over 180 panchayats, we evaluate the impact of a government-led SHG initiative in the Indian state of Bihar. Two years after the start of the program, we find a dramatic increase in SHG membership, borrowing from SHGs, and a corresponding decline in the use of informal credit. Fewer informal lenders are operating in treatment villages, and those who do charge lower interest rates. While these credit market impacts could lead to substantial improvements in economic well-being over time, the short-run impact of the program on such outcomes is modest.

1. Introduction

Provision of low-cost credit to the poor through self-help groups (SHGs) has been embraced by governments, international donors, and development banks as a key poverty-reduction strategy. Under this approach, similar to the design of joint-liability microfinance programs, poor women are mobilized into small groups, through which they can access subsidized credit, financial services, information about livelihood opportunities and government programs, and other benefits such as skills training. SHG credit interventions are expected to improve the financial situation of poor households by reducing the cost of servicing existing debt and by expanding access to loans for consumption-smoothing and productive investment. In addition, these programs aim to build women's social networks and capacity for collective action, and to expand their role in decision-making both within and outside the home.

Government-led SHG-based credit programs financed by development banks have been implemented in Afghanistan (Singh, 2018), Bangladesh (Ali and Ahmed, 2014), and Sri Lanka (World Bank, 2015), and constitute a key component of India's poverty reduction effort through the National Rural Livelihoods Mission. World Bank project documents indicate the resources invested in current and future programs of this nature in India alone exceed $ US 5 billion (World Bank, 2011). In India, SHGs (including those formed through government

programs and NGOs) are the most important source of microcredit, in terms of both membership and total lending volume (Nair and Tankha, 2014).

Despite the significant resources invested in SHG-based credit interventions globally, evidence on their impact is thin and relies almost exclusively on observational data. In this paper, we present results from a randomized evaluation of the Bihar Rural Livelihoods Program, also known as Jeevika, an SHG program implemented by the Government of Bihar in India. The scale of the evaluation, coupled with the dramatic substitution out of informal borrowing caused by Jeevika, allow us to detect, for the first time, the impact of a randomized SHG-based credit intervention on informal credit markets.

According to government sources, 34% of household debt in rural India (GoI, 2014) and 65.9% of household debt in rural Bihar[1] was held by traditional moneylenders during the period spanned by this evaluation. These lenders charge between 12 and 150 percent annual interest, compared to typical rates of 6–20 percent offered by formal banks on larger loans (RBI, 2011). Informal loans are typically secured through personal relationships or collateral. In a context where social relationships are highly stratified by caste and wealth, this implies that the poorest households, and those from scheduled castes, face the least favorable borrowing terms (Bell, 1998; Banerjee and Duflo, 2010; Khanna and Majumdar, 2018). While the formal private, non-profit, and

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public sectors have all invested heavily in expanding rural credit access in India since the early 2000s (Galab and Rao, 2003; RBI, 2007; Brishti and Chowdhury, 2013), informal lenders remain the most important source of credit throughout much of the country. The welfare impact of these investments thus depends importantly on how they affect the cost of informal loans.

Similar to other government-led SHG programs, Jeevika's core offering is access to group-liability credit through women's self-help groups. When the project enters a new village, Jeevika staff mobilize women in predominantly scheduled caste neighborhoods to form groups of between ten to 15 members. At weekly SHGs meetings, group members are led through a curriculum on women's empowerment and basic literacy and numeracy and encouraged to make a small deposit into a personal savings account held by the SHG. Up to 50,000 Rs (1073 USD) of project funds are provided to the group as lending capital approximately three months after its formation, conditional on consistent deposits by members, and additional loans may later be accessed through links to formal banks. Group members can borrow from this pool at a monthly rate of 2%, which was less than half of the mean prevailing informal lending rate in the sample at the beginning of the evaluation period.

Given the study setting of high credit use but limited access to formal banking or microfinance institutions (MFIs), and the availability of a large pool of relatively low-cost lending capital soon after joining, participation in Jeevika was very attractive, take-up of loans through the program was high. Just over two years after program initiation, households in panchayats[2] where Jeevika was operating were 46.6 percentage points (pp) more likely to include a member who belonged to an SHG than those in control areas, and 28.3 pp more likely to have taken any loans through an SHG over the past year. While borrowing from all sources increased in both treatment and control areas during the study period (by 80% in real terms overall), outstanding debt from informal lenders was 17.5% lower in program panchayats compared to control areas, as households replaced these sources of credit with SHG loans. Primarily due to changes in loan source, the average annual interest rate on new loans in treatment areas was 8 pp (13%) lower than in control areas. Households belonging to scheduled castes or tribes (SC/ST), who were specifically targeted for SHG enrollment and faced higher informal interest rates at baseline, saw a 20% decline in their total cost of borrowing. We observe significantly fewer informal lenders operating in treatment villages at follow-up, and those present appear to charge lower interest rates. This finding suggests that the entry of an institution offering low-cost credit exerted competitive pressure on incumbent informal lenders, causing a reduction in prices and driving some lenders out of the market.

In line with previous evidence on SHG interventions, we see modest impacts on downstream outcomes among targeted households: ownership of consumption assets increased in this group, but neither productive asset holdings, nor consumption value was affected. The program had no discernible impact on an index of outcomes related women's empowerment, including decision-making power within the home, capacity for collective action outside of it, and aspirations for their daughters.

In the next section, we review the existing literature evaluating the impact of SHG interventions. We then describe theory and evidence regarding the interactions between informal rural credit markets and access to lower-cost credit. Next, we describe the design of the evaluation, before turning to the results, which we discuss in the final section.

2. Prior evidence on the impact of SHG interventions

Three previously published evaluations of large-scale, government-led projects that, like Jeevika, made lending capital available to SHGs, all use propensity score matching (PSM) as an identification strategy.

Deininger and Liu (2013) combine PSM and differences-in-differences to evaluate the Andhra Pradesh District Poverty Initiative Project (AP-DPIP) using two rounds of panel data, with controls drawn from areas where the project had not yet entered. Datta (2015) evaluates the first phase of Jeevika using one round of retrospective data from program and non-program areas, and Khanna et al. (2015) use the same strategy to evaluate impacts of the Tamil Nadu Empowerment and Poverty Alleviation Program (*Pudhu Vaazhvu*). Both Datta (2015) and Khanna et al. (2015) find a significant reduction in high-cost debt, while Deininger and Liu (2013) do not analyze this outcome. In terms of down-stream impacts, all three studies find improvements in women's agency in both the public and private domains. Khanna et al. and Datta, to a limited extent, detect impacts on asset holdings, but Deininger and Liu do not observe this. The two studies that considered food security or nutrition reported improvements on these outcomes (Deininger and Liu; Datta). Finally, Khanna et al. find an increase in skilled employment in program areas.

Using a difference-in-differences approach, Christian et al. (2019) find that an SHG-centered program implemented by the state government of Odisha had a protective effect on women's consumption and household non-food expenditures in the face of a major weather shock, despite having no impact on household consumption in the absence of such a shock.

Two RCTs evaluate the impacts of NGO-led SHG interventions that do not directly provide lending capital, but rather rely on women's own savings to form group revolving funds, and eventually (in the case of the latter) bank credit (Desai and Joshi, 2014; Baland et al., forthcoming). Desai and Joshi find impacts on women's participation in household decisions and civic life, but no impact on income or consumption levels, while Baland and coauthors report a shift in children's time from productive activities to domestic chores and positive impacts on children's educational attainment.

3. Interactions between credit interventions and existing informal markets

One motivation for public investment in the expansion of credit to the poor has been the anticipated negative impact on informal sector interest rates through competitive pressure (Hoff and Stiglitz, 1990). However, as noted by Besley (1994), rural credit markets are likely to be characterized by multiple constraints and potential market failures, making the impact of such competition theoretically ambiguous. The fact that high informal lending rates have continued to exist alongside far lower-cost institutional credit has generated a large theoretical literature exploring the interaction between formal and informal credit markets. Variation in the prevailing institutional context (Madestam, 2014), and potential riskiness involved in borrowing (Karaivanov and Kessler, 2017; Lee and Persson, 2016) determine the nature of co-existence and potential competition between the two sectors. Formal lenders are often modeled as engaging in monopolistic competition (Hoff and Stiglitz, 1997). This assumption implies that competition from new entrants may bring down lending rates. However, due either to a reduction in economies of scale in lending (Hoff and Stiglitz, 1997; Jain, 1999) or the information asymmetries that characterize credit markets, increased competition also has the potential to increase costs to borrowers.

The implications of asymmetric information in credit markets have been extensively studied, with several authors noting that access to an outside lending option could lead to moral hazard among borrowers, increasing default risk and thus interest rates (Hoff and Stiglitz, 1997; Kahn and Mookherjee, 1998; McIntosh and Wydick, 2005). A second channel through which a new entrant could positively affect incumbent rates is its impact on the composition of borrowers. If the new entrant is particularly good at identifying borrowers with a low likelihood of default, one of the commonly assumed advantages of the joint liability lending model used by SHGs and many other microfinance institutions (MFIs) (Ghatak, 1999), its entry could segment the market, driving up the average default risk of borrowers it does not serve and thus rates in the rest of the

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[2] Panchayats are local government units typically consisting of between two and four villages.

market (Bose, 1998; Demont, 2016; Mookherjee and Motta, 2016).[3,4]

Given the many channels through which the entry of lower-cost lenders could potentially affect informal credit markets and the theoretical ambiguity of net effects on interest rates, empirical evidence on this question is critical for understanding the welfare implications of subsidized credit access. However, such evidence is comparatively scant, and results are mixed. Kaboski and Townsend (2012), exploiting variation in the size of villages to which a fixed per-village value of credit was offered, find that credit taken through the Thai government's Million Baht Village Fund was almost completely additive. They find no statistically significant impact on informal lending rates, but suggestive evidence of a small positive effect on the probability of default on informal loans. Menkhoff and Rungruxsirivorn (2011), analyze the same program using a cross-sectional approach, and find no evidence that the 'village fund' acts as a substitute for informal lenders. Two other studies, both employing data from Bangladesh, use an identification strategy based on variation in the error structure of a predictive model of MFI presence that does not require an exclusion restriction. Mallick (2012) finds a positive relationship between MFI entry and informal lending rates, while Berg et al. (2015) find no relationship overall, but an increase in informal rates when MFI coverage is above the sample mean. Islam et al. (2015) employ a propensity score matching strategy with household fixed effects to show that access to microfinance reduces the incidence of borrowing from informal sources, but not the amount borrowed. In the Indian context, Demont (2016) uses panel data from the state of Jharkhand and village fixed effects and finds an inverse U-shaped relationship between SHG coverage and the rates charged by moneylenders.[5]

The objectives of micro-lending programs vary widely across lenders, from profit maximization (or at least cost recovery) to poverty alleviation. It is therefore difficult to sign the direction of potential bias in observational studies that link the presence of such programs to impacts on the informal credit market. Random assignment to a credit market intervention permits causal inference based on a far weaker set of assumptions. However, previous randomized evaluations of microcredit programs have not reported impacts on the availability or cost of informal credit, presumably due to a lack of power on these outcomes. To detect such impacts, a sufficiently large proportion of potential borrowers over a sufficiently large number of geographically distinct experimental clusters, in a setting where informal credit is widely used, would need to take up loans from a new entrant into the market. The combination of these conditions is rare, as illustrated in Appendix Table A1. Of five recent cluster-randomized trials evaluating the impact of access to MFI credit, only one was conducted in a setting with a high level of borrowing from informal lenders (Banerjee et al., 2015a). Take-up of the randomized credit offer in that study was only 8.8% higher in treatment than control areas, and borrowing from informal lenders was 5 percentage points lower. However, no impact on informal interest rates was reported. The present study, which is based on the randomized roll-out of a government-led SHG program that offered loans at approximately half the prevailing interest rate across 180 panchayats in rural Bihar, is the first that, to our knowledge, meets all these conditions.

In addition to contributing to the empirical literature on SHG-based lending interventions, and shedding light on the interaction between interventions offering low-cost credit and informal credit markets, this study also contributes to the substantial recent literature estimating household-level impacts of access to group-based lending (Angelucci et al., 2015; Attanasio et al., 2015; Banerjee et al., 2015a; Crépon et al., 2015; Tarozzi et al., 2015). In general, this literature shows that even when an expansion in access to credit results in households taking on more overall debt, impacts can be quite limited in the short to medium run (Banerjee et al., 2015b; Meager, 2019). While it is common to see shifts in livelihood activities, typically away from wage labor and toward self-employment, total household income is not generally affected. Similarly, impacts on overall consumption are rare, while reallocation away from "discretionary" spending (temptation goods, entertainment, and celebrations) is more commonly observed.

4. Setting and intervention

At the time Jeevika was initiated, Bihar was home to 32 million people living below the poverty line (GoI, 2011), and rates of borrowing through either SHGs or MFIs were very low.[6] High-cost borrowing from informal lenders, however, was widespread. This prompted the Government of Bihar, with funding from the World Bank, to implement the Bihar Rural Livelihoods Project, also known as Jeevika, the Hindi word for livelihood.

Since it was launched in 2006, Jeevika has formed over 150,000 SHGs with a total of 1.8 million members (World Bank, 2017). Jeevika SHGs consist of 10–15 women, which meet weekly. SHGs are federated into village organizations (VOs) and larger cluster-level federations (CLFs), through which linkages to the formal banking sector are established. While Jeevika targets the poor, and specifically members of scheduled castes or tribes, any adult woman residing in an area where the program is active may join. Jeevika facilitators train SHG members using a curriculum that encourages women to advocate for themselves within their own homes and to engage in collective action for the improvement of social and economic conditions in their communities. In addition, women are taught basic literacy (signing one's name, reading basic signs) and numeracy skills through the program.

SHG members are asked to contribute a minimum of 2 Rupees (Rs), equivalent to 0.04 USD, each week toward a personal savings account held by the SHG.[7] Approximately three months after formation, conditional on consistent savings deposits, SHGs are eligible to borrow up to 50,000 Rs (1073 USD) of project funds through the VO at a monthly rate of 1%. SHG members may borrow these funds at 2% per month, which was less than half of the mean prevailing informal lending rate in the sample at the beginning of the evaluation period.[8] Members of the SHG are collectively liable for loans taken from the VO. Over the longer term, Jeevika is also meant to deliver other development interventions and livelihoods training to SHG members, however these activities were not implemented in the study area during the period spanned by this study.

5. Methods

5.1. Experimental design and timeline

In order to evaluate the impacts of Jeevika, the rollout of the project was randomized across 180 panchayats, randomly selected from within 16 blocks in seven districts where Jeevika was planning to scale up. In

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[3] While some prospective borrowers are actively screened out by MFIs and SHGs, capacity constraints may also limit the number who can be covered through such programs. This implies that while average default risk among the pool of borrowers from the informal market increases, there remain many low-risk borrowers within this pool.

[4] The mechanisms described here all require that informal and formal credit are substitutes, which is what we find. It is also possible that due to differences in the terms of loans offered by traditional informal lenders and new entrants, credit from these two sources could be complementary, also with ambiguous implications for interest rates (Jain and Mansuri, 2003; Aleem, 1990).

[5] Relatedly, the general equilibrium effects of a shock to the microfinance market on consumption, earnings, and employment, are addressed by Breza and Kinnan (2018).

[6] Data as of June 30th, 2012 indicate that only 3.2% of all outstanding loans in rural Bihar were from SHGs or MFIs (computed from NSS data).

[7] Unless otherwise noted, USD equivalents are calculated using the exchange rate at the time of baseline data collection in 2011.

[8] The average rate of inflation over the study period was 8.93% per annum, implying a real annual SHG interest rate of approximately 15%.

each of the study panchayats, one to two villages (depending on the number of villages in the panchayat) were then randomly selected for data collection.

The sampling strategy aimed to recruit 70% SC/ST households, and 30% households from other castes in each village, to ensure variation in socio-economic status within the sample while maintaining a focus on the targeted group. To identify SC/ST households, majority SC/ST hamlets (*tolas*) in each village were identified through the village survey, mirroring Jeevika's strategy for identifying the target population of poor women for recruitment into SHGs. In Bihar, *tolas* are generally segregated by fields or other physical boundaries and are easily distinguishable. Within targeted *tolas*, field staff selected households following a random walk and skipping households based on the total reported population of SC/ST households in the village, and the target sample size.

"General" caste households were sampled from the remaining, non-majority SC/ST *tolas*. The survey team started with the largest of such *tolas* and conducted a random walk with a skip pattern based on the total number of non-target households in the village and the targeted sample size for this group. On rare occasions, a sampled village would have no SC/ST households, or no non-target households. The survey firm was instructed to accordingly oversample such populations from other villages in the panchayat, and failing that, other villages in the block to preserve the 70/30 split at the block level.

Baseline and follow up surveys included detailed questions on debt, asset holdings, consumption expenditures, livelihood activities, and women's mobility, role in household decisions, and mothers' aspirations for their daughters. In addition, in each village and during each round of data collection, village elders, members of the local government council (panchayat), well-established farmers, and other knowledgeable individuals were invited to participate in village-level survey. The group was asked to come to consensus on a set of questions regarding village level attributes including village the population by caste group, local sources of credit, interest rates from each source, local wage rates, and the presence of or distance to markets and other institutions and amenities.[9]

We construct inverse probability of sampling weights for each household in a sub-group (SC/ST or general caste)[10] using data on the total number of such households in the village from the baseline village survey, so that the weighted sample reflects the caste composition of each village. To make results based on household- and village-level data comparable, we normalize weights to sum to one at the village level, so that each village is given equal weight in the analysis.

The baseline survey was administered during July to October of 2011 to 8988 households across 333 villages in 179 panchayats.[11] Following the baseline survey, panchayats were paired to their nearest neighbor within the same administrative block in terms of the mean level of outstanding high cost debt (monthly interest rate of 4% or higher) held by households at baseline. The paired panchayats were then randomly assigned to either an early rollout group or a late rollout group.[12] The project began in the early rollout panchayats between January and April 2012, and the follow-up survey was completed between July and September 2014. Implementation in late rollout areas began after the 2014 round of data collection.

5.2. Analysis

The SHG intervention is expected to lead to a series of potential impacts, which we classify as direct, indirect, and downstream. One or more *direct* impacts (increased SHG membership; increased utilization of credit though SHGs, or substitution away from other lenders) is a necessary but insufficient condition for the intervention to lead to *indirect* effects on informal credit markets (number of lenders, interest rate). Changes in *downstream* outcomes (asset holdings, consumption level, women's empowerment) may follow from either direct or indirect impacts.

Following the registered pre-analysis plan,[13] we estimate the following ANCOVA specification to test the reduced-form, intent-to-treat impact of Jeevika on each group of outcomes:

$$y_{ivp2014} = \alpha_0 + \alpha_1 JEEVIKA_p + \alpha_2 y_{ivp2011} + (\alpha_3 X_{ivp}) + \alpha_4 S_p + \varepsilon_{ivp} \quad (1)$$

where y_{ivpt} is the outcome of interest for household i in village v in panchayat p in year t, $JEEVIKA_p$ is random assignment of the panchayat to early (2012) rollout of the intervention, X_{ivp} is a vector of pre-specified baseline controls used in the primary specification, S_p represents a vector of stratification dummies, and ε_{ivp} is a random individual-level error (notation constant across specifications for simplicity).[14] These results are weighted by the inverse probability of selection and reweighed such that each village contributes equally to the analysis, to produce results that reflect the caste composition of the village. Unweighted results are generally similar; as recommended by Solon et al. (2015), these are included in the Appendix.

Analysis of heterogeneous effects based on both baseline landholdings and caste were specified in the pre-analysis plan for this study. There is significant overlap between the landless and SC/ST populations in the sample, and the estimated impacts of the intervention on these subgroups are very similar. We choose to present the analysis based on SC/ST status because this group was specifically targeted for the intervention and was over-sampled for the study. We test for heterogeneous treatment effects based on households' SC/ST status using the following (unweighted) equation:

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\begin{aligned}
y_{ivp2014} = {} & \beta_0 + \beta_1 JEEVIKA_p + \beta_2 SC/ST_{ivp} + \beta_3 SC/ST_{ivp} * JEEVIKA_p \\
& + \beta_4 y_{ivp2011} + (\beta_5 X_{ivp}) + \beta_6 S_p + \varepsilon_{ivp}
\end{aligned}
\quad (2)
$$

where β_1 represents the treatment effect on land holding households, β_2 is the difference in outcome y between SC/ST and other households in control areas at follow-up, $\beta_1 + \beta_3$ is the treatment effect on SC/ST households, and $\beta_2 + \beta_3$ is the difference in the outcome between SC/ST households and others at follow-up in the presence of the intervention.

Specifications (3) and (4) below mirror those above aside from the omission of non-stratification baseline controls, and are used to test for balance on key outcomes and demographic variables at baseline.

$$y_{ivp2011} = \gamma_0 + \gamma_1 JEEVIKA_p + \gamma_2 S_p + \varepsilon_{ivp} \quad (3)$$

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[9] We also conducted women-specific village-level surveys in one of the targeted hamlets in each village. Data from this survey are not utilized in the present paper.

[10] Based on our sampling strategy, each SC/ST household in a village has the same probability of being sampled, and each non-SC/ST household in a village has the same probability of being sampled.

[11] One of the selected Panchayats could not be surveyed due to security concerns.

[12] In five blocks with an odd number of panchayats, the median panchayat was allocated randomly without a pair. Random assignment used the random number generator within the Stata statistical analysis software package.

[13] https://www.socialscienceregistry.org/trials/570.

[14] The pre-analysis plan indicates that block dummies and the panchayat-level mean of households' high-cost debt will be used to control for the stratification. We deviate from this, instead following the best practice of including randomization cell dummies as stratification controls. This deviation from the pre-analysis plan does not substantively affect the results. The five median panchayats without a pair are randomly allocated to one of their neighboring pairs ex-post. There are 32 possible allocations for the five median panchayats. The point estimates of treatment effects differ slightly across allocations, as does the significance level for three of the outcome variables. We report results from an allocation yielding results that are in the majority, in terms of significance level, and also conservative (less significant than alternative allocations) for all three of these borderline outcomes under our primary specification.

$$y_{ivp2011} = \theta_0 + \theta_1 JEEVIKA_p + \theta_2 SC/ST_{ivp} + \theta_3 SC/ST_{ivp}*JEEVIKA_p$$
$$+ \theta_4 y_{ivp2011} + \theta_5 S_p + \varepsilon_{ivpb} \qquad (4)$$

Huber-White clustering of standard errors at the panchayat level is employed in all specifications. Since we test multiple hypotheses, many of which are closely related, we follow earlier literature and include regressions of indices for each 'family' of outcomes (Kling et al., 2007; Banerjee et al., 2015a), and present adjusted p-values across these indices (both main and heterogeneous effects) using the Romano-Wolf step down method (Romano and Wolf, 2005a,b, 2016; Clarke et al., 2019).[15,16] In addition to standard p-values, randomization inference p-values are shown for the main and sub-group treatment effects estimated for each outcome.

6. Results

6.1. Baseline credit access by caste group

We begin the analysis with a description of credit use and costs, assets, and welfare indicators by SC/ST status. As shown in Table 1, borrowing in this population is high, particularly among SC/ST households, over 86% of whom have outstanding debt, compared to 82% of the non-SC/ST population. SC/ST households also have a larger number of loans than other households, but a lower mean level of outstanding debt, at the equivalent of US $216 versus US $301 among other households, implying a smaller average loan size. Indeed, the debt held by SC/ST households is more expensive: the mean (simple) monthly interest rate paid by those in scheduled castes and tribes is over half a percentage point higher than that paid by other households, translating to an annual difference of 7 percentage points. The higher rate implies an additional debt servicing cost of nearly Rs 700 per annum, equivalent to 96% of the mean monthly consumption value per adult equivalent for these households.

We also see that SC/ST households tend to hold fewer interest-free loans, suggesting that informal risk-sharing mechanisms are less prevalent in this segment of the community. Finally, the last four rows of Table 1 show that SC/ST households are disadvantaged in terms of their ownership of productive assets and have lower material well-being in terms of ownership of durable consumption goods, housing quality, and consumption expenditures.

6.2. Balance at baseline

In order to establish the validity of the randomized assignment to early rollout, we test for pre-treatment balance across treatment and control groups in the primary outcomes of interest specified in the pre-analysis plan, and other important household characteristics. We do this by comparing normalized differences for each variable, estimated through linear regressions in which controls for stratification variables

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[15] We take a 'family' to be a set of variables measuring the same conceptual outcome and construct an index of these variables as follows. The values of variables within a family are first adjusted so that higher values corresponds to "better" outcomes for families in Tables 2, 4, and 5. In the village-level index of indirect effects on credit markets (Table 3), we leave both outcomes as they are, given that both negative and a negative coefficient is more intuitive. Z-scores for each component variable are then calculated by subtracting the control group mean and dividing by the standard deviation in the control group. The index is an average of these 'normalized' component variables. If an individual has a response to at least one component measure of an index, any missing values for other components are imputed at the random assignment group mean – i.e., treatment observations are imputed as the treatment group mean, and control observations are imputed as the control group mean. This is the procedure followed in Kling et al. (2007).

[16] The Romano-Wolf method is implemented with 5000 replications of the main specifications, with re-sampling clustered at the panchayat level.

Table 1
Credit access, assets, and consumption, by caste at baseline.

	Means			SC/ST - Non-SC/ST (se)
	Obs	SC/ST	Non-SC/ST	Difference in Means
	(1)	(2)	(3)	(4)
Credit Markets: Interest Rates, Amounts Borrowed, Loan Terms				
Any Outstanding Debt (%)	8988	86.00	82.00	0.04***
				(0.01)
No. of Loans (per HH)	8988	2.03	1.90	0.12***
				(0.04)
Total Outstanding Interest-Bearing Debt (000 Rs.)	8988	10.05	14.03	−3.98***
				(0.53)
Average Interest Rate (% per month)	7039	5.45	4.87	0.58***
				(0.06)
Average Informal Interest Rate (% per month)	6389	5.49	4.87	0.62***
				(0.06)
Interest Free Loans (No. per HH)	8988	0.11	0.26	−0.15***
				(0.02)
Material Well-Being: Assets and Consumption Expenditures				
Productive Asset Index (Filmer-Pritchett, normalized)	8988	−0.28	0.09	−0.37***
				(0.03)
Consumption Asset Index (Filmer-Pritchett, normalized)	8988	−0.40	0.20	−0.60***
				(0.03)
Housing Index (Filmer-Pritchett, normalized)	8988	−0.10	0.04	−0.13***
				(0.04)
Real Total Monthly Consumption PA (Rs 000)	8988	0.73	0.83	−0.09***
				(0.01)

Note: Standard errors of differences in means are clustered at the panchayat level. Regressions are unweighted.
*p < 0.1, **p < 0.05; ***p < 0.01.

are included and standard errors are clustered at the panchayat level, following Imbens and Rubin (2015).[17] We also calculate randomization inference p-values (Fisher, 1935; Rosenbaum, 2002) for all normalized differences.[18]

Results, shown in Table A2 (column 5), indicate that SC/ST households in treatment panchayats are more likely (p < 0.01) to include an SHG member than SC/ST households in control panchayats (a normalized difference of 0.13, which is 3.4 percentage points). Relatedly, the mean outstanding SHG debt is higher in treatment areas, though the difference is small in economic terms (110 rupees, equivalent to less than US $2.5). Monthly interest rates measured at the household level are higher in treatment areas among SC/ST households, and this is driven by informal lending rates. Population-weighted interest rates, and those measured through village surveys, however, are well balanced. Take-up of informal loans is also well-balanced both overall and for SC/ST households, suggesting that selection into credit use is similar across treatment and control areas. Access to entitlements, defined as possession of a job card under the National Rural Employment Guarantee Act (NREGA) or housing through a government program, is slightly higher for SC/ST households in treatment areas, while an index of women's decision-making authority within the household is higher overall and for women in SC/ST households. Non-SC/ST households in treatment panchayats hold fewer productive assets on average than those in control panchayats. Attrition, at 3%, is low given the three-year interval between surveys, and does not differ between treatment and control areas. The number of participants in, and caste composition of, key informants who participated in village-level surveys is balanced across treatment and control villages at both the baseline and follow-up.

While we do see imbalance at baseline in certain outcomes of interest, reassuringly, none of the normalized differences exceed the 0.25 cut-off,

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[17] Imbens and Rubin (2015) define normalized differences, $\hat{\Delta}_{ct} = \frac{\overline{X}_t - \overline{X}_c}{\sqrt{(s_t^2 + s_c^2)/2}}$, as a scale-free measure of differences in covariate values.

[18] Implementing Heß (2017) in Stata.

Table 2
Direct effects of Jeevika.

	Participation	Any loans taken over the last 24 months from:			Outstanding Debt (000 Rs)			Cost	Family
	SHG Membership (%)	SHG (%)	Informal lender (%)	Any source (%)	SHG loans	Informal loans	All loans	Mean interest rate on new loans (% per month)	Index of dependent variables
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Main Effects									
Jeevika	46.59***	28.31***	−5.10***	3.41***	1.95***	−3.71***	−1.96**	−0.70***	0.73***
	(1.66)	(1.28)	(1.40)	(1.29)	(0.10)	(0.75)	(0.87)	(0.07)	(0.03)
Additional baseline controls?	yes	yes	yes	yes	Yes	yes	yes	yes	yes
Number of observations	8851	8987	8987	8987	8987	8987	8987	6805	8988
Number of clusters	179	179	179	179	179	179	179	179	179
R-squared	0.34	0.22	0.14	0.14	0.12	0.09	0.11	0.23	0.25
Mean, omitted category	8.24	1.80	74.07	75.64	0.11	21.21	24.21	5.27	−0.03
RI p-value	[0.000]	[0.000]	[0.013]	[0.061]	[0.000]	[0.000]	[0.107]	[0.000]	[0.000]
RW p-value									*0.000*
Panel B: Heterogeneous effects by Caste									
Jeevika	43.71***	25.08***	−3.81*	3.34	1.92***	−3.27***	−2.32*	−0.53***	0.67***
	(2.32)	(1.90)	(2.17)	(2.23)	(0.17)	(1.14)	(1.30)	(0.10)	(0.04)
SC/ST HH	0.97	−1.36	4.63**	4.35**	−0.03	−4.21***	−5.47***	0.79***	−0.00
	(1.48)	(0.93)	(1.88)	(1.89)	(0.07)	(1.13)	(1.30)	(0.09)	(0.02)
Jeevika X SC/ST	9.95***	11.54***	−2.51	0.04	0.34	0.39	1.81	−0.56***	0.19***
	(2.52)	(2.11)	(2.48)	(2.51)	(0.20)	(1.44)	(1.62)	(0.13)	(0.05)
Linear combinations									
Effect of Jeevika if SC/ST	53.66***	36.63***	−6.33***	3.38***	2.26***	−2.87***	−0.51	−1.09***	0.87***
	(1.73)	(1.37)	(1.19)	(0.96)	(0.12)	(0.57)	(0.63)	(0.08)	(0.03)
Effect of SC/ST if Jeevika	10.92***	10.18***	2.11	4.38**	0.31	−3.82***	−3.66**	0.23**	0.19***
	(2.24)	(2.09)	(1.75)	(1.82)	(0.20)	(0.97)	(1.23)	(0.09)	(0.05)
Additional baseline controls?	yes	yes	yes	yes	yes	yes	yes	yes	yes
Number of observations	8851	8987	8987	8987	8987	8987	8987	6805	8988
Number of clusters	179	179	179	179	179	179	179	179	179
R-squared	0.36	0.24	0.11	0.10	0.13	0.07	0.09	0.22	0.27
Mean, omitted cat	7.01	1.49	69.41	71.45	0.11	22.87	27.45	4.76	−0.04
RI p-value (SC/ST)	[0.000]	[0.000]	[0.000]	[0.004]	[0.000]	[0.000]	[0.503]	[0.000]	[0.000]
RI p-value (Non-SC/ST)	[0.000]	[0.000]	[0.145]	[0.207]	[0.000]	[0.009]	[0.116]	[0.000]	[0.000]
RW p-value (Jeevika X SC/ST)									*0.000*

Notes: Standard errors clustered at the panchayat level shown in parentheses. Coefficients are from an ANCOVA specification - linear regressions of each outcome on its value at baseline, and an indicator of treatment status; panel B has linear regressions of each outcome on indicators of treatment status, caste group, and their interaction. All specifications control for strata dummies and baseline controls († in Table A1). Regressions in panel A are weighted to reconstitute the caste composition of a village. Regressions in panel B are unweighted. Randomization Inference p-values for all treatment effects from 5000 permutations are also presented.
Column 9 presents coefficients in a regression of an index of z-scores of the outcome variables in this "family" - following Kling et al. (2007). Adjusted (RW) p-values for these regressions are reported to control the FWER across all index outcomes, following Romano and Wolf (2005a,b, 2016) and Clarke et al. (2019).
Rupee values are in CPI-adjusted 2011 equivalents.
*p < 0.1, **p < 0.05; ***p < 0.01.

above which linear regression methods are sensitive to specifications (Imbens and Wooldridge, 2009). We control for baseline values of outcomes in the primary (ANCOVA) specifications used to identify treatment effects. In addition, we present both difference-in-differences and simple difference models as robustness checks of in Appendix Tables B1–B4. In the presence of a baseline difference in outcomes, the ANCOVA estimator is generally less biased than either of these alternative estimators (Frison and Popock, 1992). However, since the difference-in-differences and simple difference models respectively over- and under-correct for baseline differences, these results can be considered bounds on the true treatment effects. The unweighted analysis of main effects using all three

specifications is presented in Tables C1–C4.

6.3. Direct impacts: SHG membership and borrowing

Table 2 presents estimates of how access to Jeevika affected what we refer to as direct program impacts: SHG membership; the probability of taking out any new loans since the initiation of the program 24 months prior to the follow-up survey through an SHG, informal lender, and overall; outstanding debt by loan source, irrespective of the date of borrowing; and the mean monthly interest rate paid on loans taken during the past year, by which time almost all of the SHGs formed

through Jeevika would have had access to lending capital.[19] Results shown in columns 1 and 2 of Panel A indicate that nearly 55% of households in treatment areas included an SHG member by follow-up and over 30% of households had taken out a SHG loan in the past year, compared to 8% and 2% of households in control areas respectively. We find that in line with the targeting of SC/ST households, take-up of the program was higher in this sub-group, with SC/ST households 11 pp more likely to include an SHG member, and 10 pp more likely to have taken an SHG loan in the past 24 months (Panel B).

Just over 5 pp fewer households had taken on new informal loans in the treatment group since gaining access to Jeevika (in the last 24 months) overall, and among SC/ST households, the decline was 6 pp (column 3). This reduces to a statistical zero the higher use of informal credit by SC/ST households that is observed in control areas. Due to the increase in SHG loans, however, Jeevika had a net positive impact on the number of loans taken over the past 24 months, with households in program areas 3.4 pp more likely to take out any new loans (column 4).

Columns 5 through 7 show the impact of Jeevika on households' outstanding debt from various sources, regardless of when these loans were taken. We note that on average, households in both treatment and control areas became more indebted over the period covered by the evaluation. In control areas, average indebtedness rose by 81% in real terms, from a base of Rs. 13,390 (287 USD at the time).[20] Despite the higher proportion of households taking on debt in program areas during the program period, however, Jeevika did not increase the value of overall debt. Indeed, access to Jeevika appeared to *reduce* households' total outstanding debt (column 7). This effect is larger among non-SC/ST households, which drive the population-level imbalance (p < 0.1) of this variable in the same direction at baseline. Further, the estimated effect is smaller and non-significant in the more conservative difference-in-differences specification (column 7, Tables B1 and C1), suggesting caution in the interpretation of this result.

The effect of Jeevika on households' source of credit, in contrast, is dramatic and robust. Across specifications, the total outstanding debt owed to SHGs is higher by Rs. 1820 to 2160 in Jeevika panchayats than in control areas by follow-up (column 5; Table 2, B1 and C1), equivalent to approximately 10% of total borrowing among SC/ST households. The debt owed to informal lenders in Jeevika areas is correspondingly lower, by approximately the same value as the increase in SHG borrowing for SC/ST households, and more for other households (col 6, Table 2, B1, and C1). The transfer of household debt from informal moneylenders to Jeevika results in a marked decline in the average interest rate on households' outstanding debt. Households could access credit through Jeevika SHGs at a monthly rate of 2%, less than half the mean baseline informal lending rate. Together with the high levels of loan take-up through the program, this implies a strong direct impact on the average interest rate paid by households on recent loans. Mean monthly rates paid on all loans taken within the past 12 months were 0.7 pp lower in program areas, a reduction of 13% compared to control panchayats

(col 7, Table 2). The impact on interest rates is especially pronounced for SC/ST households, who faced higher rates at baseline, as shown in Table 1. Both the impact of Jeevika on this group of outcomes and the difference in impact between SC/ST households and others, as measured through the index shown in column 9, are significant at p < 0.001 after correcting for multiple hypothesis tests.

We note that the average level of indebtedness increased over the evaluation period. This was primarily driven by borrowing from the informal sector. In control areas, 94% of the increase in outstanding debt between the baseline and follow-up surveys was from traditional moneylenders. But even in areas where Jeevika was operating, informal loans accounted for 69% of the increase, highlighting the fact that informal credit remains important even in the context of a large-scale program providing access to lower-cost loans.

6.4. Indirect impacts: informal credit markets

Given the sizable decrease in informal borrowing in treatment villages when compared to control villages, we turn next to analysis of informal lender activity and interest rates, beginning with a description of loan terms and data on interest rates.

Formative work conducted to inform the baseline survey indicated that lenders in the study region generally charge non-compounding interest on a monthly basis, and that this is the sole cost of credit. Indeed, monthly rates were reported for 98% of the loans observed in the household data, and all of the rates in village surveys were reported monthly. Respondents to the household survey were asked whether collateral was required to secure any of their outstanding loans. This requirement proved to be relatively rare and decreasing over time: only 7% of informal loans at baseline and 3.5% of those at follow-up (3.3% in control and 3.7% in treatment areas) were collateralized. When collateral was required, the borrower generally retained control of the mortgaged asset; for only 0.2% of loans at both baseline and follow-up was a mortgaged asset under the lender's control.

While we collect household data on all outstanding loans,[21] we analyze interest rates only on loans taken during the year preceding the follow-up survey, as specified in the pre-analysis plan. We do this primarily because the formation of SHGs in treatment panchayats across the study area took some time, and once groups were formed, it was another three months before the groups were able to access lending capital through Jeevika. The impact of the program on credit markets is thus expected to take some time to develop. Focusing our analysis of interest rates on loans taken during the year before follow-up balances the need to wait for the effect to develop, with the need to include a sufficient number of loans to detect the effect statistically. As it turned out, 86% of loans taken between Jeevika's roll-out and the follow-up survey were obtained during this interval. We analyze both the unweighted mean of interest rates on loans taken by the household during this period, and the mean household rate weighted by loan size.

During village-level surveys, participants were asked to come to a consensus on the standard rate charged on loans from various sources. Consensus on this point was reached easily, as borrowing is common in this context and standard interest rates are well known. As noted in the introduction, individuals may be able to negotiate lower rates, or may be charged higher rates, depending on their relationships, networks, assets, and reputations. The mean across villages of the lowest informal interest rate reported by an SC/ST household at baseline was 3.36% percent per month, while the mean of village-level maxima was 7.45% (mean within-village SD = 1.08%). For other households, within-village variation in informal rates was somewhat lower, with an average minimum of 3.48% and an average maximum of 5.84% (SD = 0.877%).

As presented in columns 1 and 2 of Table 3, we see no impact of the intervention on average informal interest rates reported by borrowers at

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[19] Of loans taken after the start of the program, 86% were taken during the year preceding the follow-up survey. When calculating the mean household-level interest rate on all loans (Table 2) or informal loans specifically (Table 3), we include only loans to be repaid in cash and for which the monthly interest rate is reported. These account for 98% of all loans at baseline. Loans for which the interest rate is reported on a daily or yearly basis exhibit an identical distribution of (unadjusted) rates, calling into question the validity of the reported interest period. We exclude loans on which no interest is charged, since these are likely to reflect informal risk-sharing arrangements rather than the informal lending market. In addition, we exclude 13 loans taken by three households for which the interest rate exceeded 15% per month (over 6 standard deviations above the mean monthly rate at baseline). No rate this high is reported at follow-up, nor in any of the village-level surveys, leading us to suspect that either the rate, or the period over which it was charged, was misrecorded.

[20] In all tables, Rupee values are shown in CPI-adjusted 2011 equivalents.

[21] Results on outstanding debt include all loans.

Table 3

Effects of Jeevika on the informal credit market (indirect).

	Household-level data				Village-level data		
	HH level mean rate (% per month) (Overall)		HH level mean rate (% per month) (Selection Corrected)		Informal lending rate (% p.m.)	Number of informal lenders	Index of dependent variables
	Average	Weighted Average	Average	Weighted Average			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Main Effects						
Jeevika	−0.03	−0.03	−0.20*	−0.21*	−0.29*	−0.28**	−0.24***
	(0.06)	(0.06)	(0.11)	(0.11)	(0.16)	(0.12)	(0.07)
Additional baseline controls?	yes	yes	yes	yes	Yes	yes	yes
Number of observations	6211	6211	6211	6211	327	333	333
Number of clusters	179	179	179	179	179	179	179
R-squared	0.28	0.28	0.28	0.28	0.45	0.32	0.37
Mean, omitted category	5.33	5.33	5.33	5.33	5.73	2.85	0.00
RI p-value	[0.713]	[0.712]	[0.045]	[0.044]	[0.132]	[0.049]	[0.007]
RW p-value							*0.004*
	Panel B: Heterogeneous effects by Caste						
Jeevika	0.03	0.04	−0.06	−0.06			
	(0.10)	(0.10)	(0.13)	(0.13)			
SC/ST HH	0.69***	0.69***	0.74***	0.75***			
	(0.08)	(0.08)	(0.08)	(0.08)			
Jeevika X SC/ST	−0.21	−0.23*	−0.20*	−0.22**			
	(0.13)	(0.13)	(0.11)	(0.11)			
Linear combinations							
Effect of Jeevika if SC/ST	−0.18**	−0.19**	−0.26**	−0.28**			
	(0.08)	(0.08)	(0.12)	(0.12)			
Effect of SC/ST if Jeevika	0.48***	0.46***	0.54***	0.52***			
	(0.10)	(0.10)	(0.08)	(0.08)			
Additional baseline controls?	yes	yes	yes	yes			
Number of observations	6211	6211	6211	6211			
Number of clusters	179	179	179	179			
R-squared	0.23	0.23	0.23	0.23			
Mean, omitted cat	4.83	4.83	4.83	4.83			
RI p-value (SC/ST)	[0.103]	[0.075]	[0.019]	[0.012]			
RI p-value (Non-SC/ST)	[0.751]	[0.701]	[0.544]	[0.547]			
RW p-values (Jeevika X SC/ST)				*0.070*			

Notes: Standard errors clustered at the panchayat level shown in parentheses. Coefficients are from an ANCOVA specification - linear regressions of each outcome on its value at baseline, and an indicator of treatment status; panel B has linear regressions of each outcome on indicators of treatment status, caste group, and their interaction. All specifications control for strata dummies and baseline controls († in Table A1). Household level regressions in panel A are weighted to reconstitute the caste composition of a village. The outcome in columns 2 and 4 is the loan-size weighted average household interest rate, while the outcome in columns 1 and 3 is the simple household average interest rate. Regressions in Panel B are unweighted. Regressions in columns 5, 6, and 7 use data from a village level dataset. Randomization Inference p-values for all treatment effects from 5000 permutations are also presented.

in the population-weighted sample (Panel A), though the interest rates faced by SC/ST households do appear lower in Jeevika panchayats (Panel B). However, the estimated impact of Jeevika on informal interest rates using household-level data includes effects of the program on borrower composition. If, as posited by Maitra et al. (2013), the highest-risk borrowers obtained loans through Jeevika, informal lenders would have been left with a lower-risk pool of clients, pushing down average of observed informal lending rates. On the other hand, if low-risk borrowers disproportionately satisfied their credit needs through SHGs as posited by a number of other theoretical treatments of this topic, informal rates paid by the higher-risk borrowers remaining in the market could be higher as a result of the change in borrower composition (Bose, 1998; Demont, 2016; Mookherjee and Motta, 2016). To estimate the impact of the intervention on the informal interest rate net of these compositional effects, we correct for selection effects using Newey's (2009) semi-parametric two-step procedure.[22] Identification relies on an

exclusion restriction; we use the number of health shocks experienced by the household over the past 12 months as an instrument in the first stage.[23] Regressions presented in Table C6 show that for a given household, the interest rate charged on an informal loan does not depend on whether the loan was taken to cope with a health shock, or for some other purpose. The Chi-squared test statistic on the instrument in the first stage probit selection model is 12.19 with a p-value of 0.000.

The selection-corrected reduction in the average monthly informal interest rate overall is a modest 0.2% per month, equivalent to a 3.8%

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[22] This generalizes Heckman (1979) without requiring normally distributed errors.

[23] Following Botsch and Malmendier (2017), we use a power-series control function approach proposed in Newey (2009). We estimate the probability of selection into informal borrowing using a probit model that includes all primary controls, strata dummies, and the health shock variable; results are reported in Table C5 of the Appendix. We then use the fourth order power series of $(2\Phi(x\beta) - 1)$ as the control function in the second stage treatment impact regression. The health shock instrument is excluded in the second stage, and standard errors are computed using a bootstrap with 5000 repetitions. Re-sampling for the bootstrap is clustered at the panchayat level.
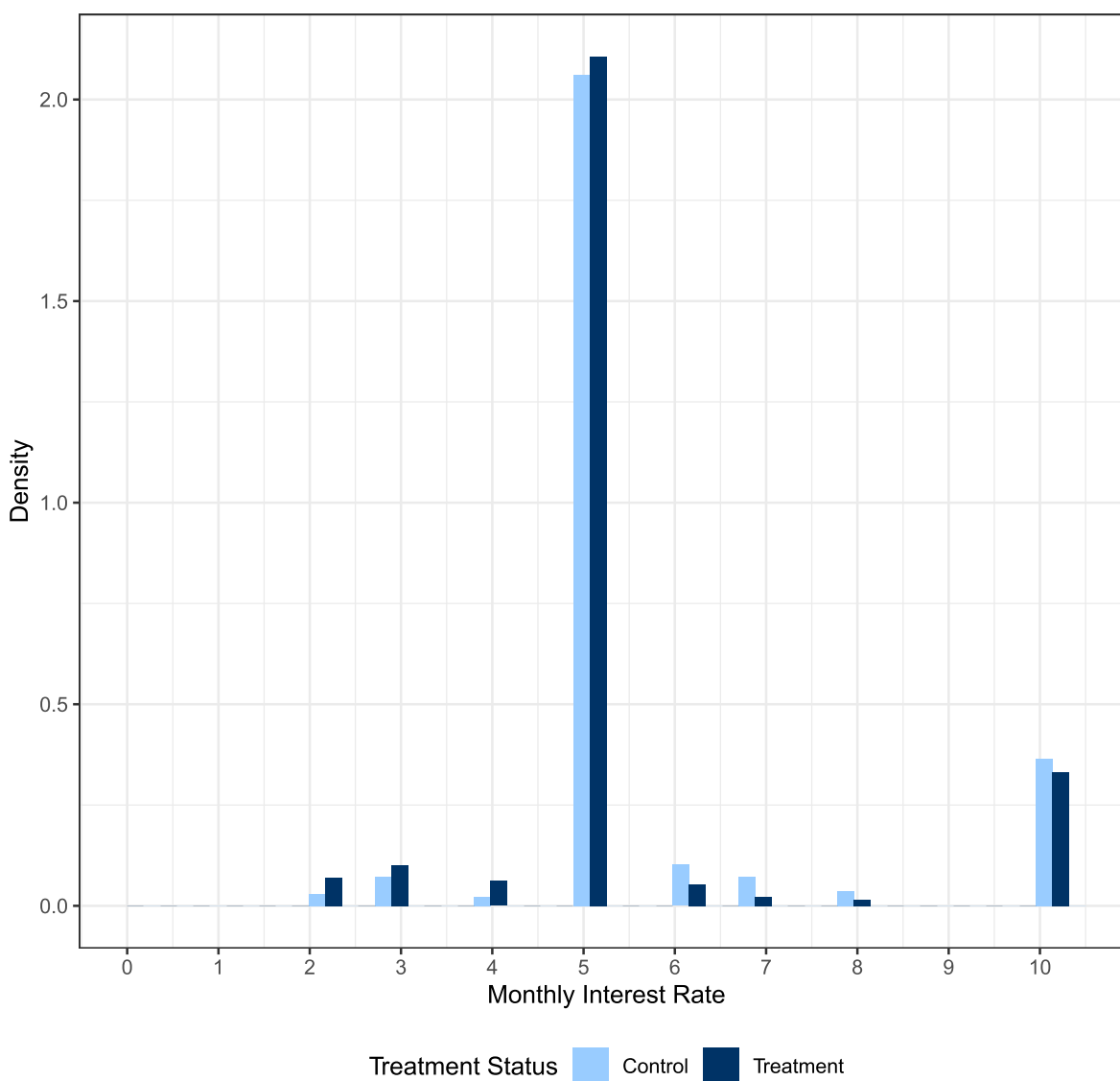
Fig. 1. Illustrates the distribution of monthly informal lender rates reported at the village level by treatment group. The difference in rates is driven by a lower density of rates at levels over 5% in the treatment group, and a higher density of rates at or below 5%.

reduction from of the average monthly rate of 5.33 observed in control areas (columns 3 and 4). This effect is concentrated among SC/ST households, for whom the estimated reduction of 0.26% constitutes a 4.7% drop. While informal interest rates are imbalanced for this subgroup at baseline, the direction of imbalance is in the opposite direction of the estimated treatment effect.

As this approach to correcting for selection bias relies heavily on the suitability of the instrument, we also analyze village-level data on informal interest rates, which are expected to be less affected by the composition of borrowers than the rates reported by borrowers themselves. The estimated impact of Jeevika on interest rates using village-level data, presented graphically in Fig. 1, is similar to the selection-corrected estimate, and is significant at the 10 percent level despite lower power to detect impacts at the village level (Table 3, column 5).[24]

The number of informal lenders listed during the village-level survey

also shows a decline of approximately 10% in Jeevika areas (column 6). Aggregating the village-level outcomes per Kling et al. (2007), we find an effect on this family of outcomes that is significant at the 1% level, with a Romano-Wolf adjusted p-value of 0.004. The heterogeneous effect on the household-level interest rate weighted by loan size is marginally significant at $p = 0.07$ after this correction.

6.5. Mechanisms contributing to indirect impacts

Our results indicate that in the context of rural Bihar, informal credit and SHG credit are substitutes, with households on average reducing informal borrowing on both the intensive and extensive margins when lower-cost credit is offered through SHGs (Table 2). In addition, we observe a decline in the informal interest rate that does not appear to be driven by the composition of the informal borrower pool. One potential mechanism consistent with the combination of reduced informal borrowing and lower interest rates is that administrative costs associated with informal lending decrease due to the use of SHG credit to service informal debt. Data on the use of loans at follow-up indicate that only 2.8% of SHG loans in treatment areas, and 2.4% in control areas, were used for debt service, suggesting that this mechanism is unlikely to play a

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[24] Controls in this case are village-level means of the household-level baseline variables included in the models with household-level outcomes. For villages with no rate recorded at baseline, the mean rate at the panchayat (16 observations) or district (2 observations) level is used.

Table 4
Effects of Jeevika on household asset position, entitlements, and welfare.

	Consumption Asset Index	Productive Asset Index	Housing quality Index	Access to entitlements (% any)	Real Consumption per AE (000 Rs)	Index of Dependent Variables
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Main Effects						
Jeevika	0.04	−0.02	−0.01	−0.67	0.00	−0.00
	(0.03)	(0.02)	(0.02)	(0.68)	(0.02)	(0.02)
Additional baseline controls?	yes	yes	yes	yes	yes	yes
Number of observations	8987	8987	8987	8987	8987	8988
Number of clusters	179	179	179	179	179	179
R-squared	0.40	0.25	0.39	0.11	0.09	0.30
Mean of dep var, omitted cat	0.00	−0.00	−0.00	92.93	1.12	0.11
RI p-value	[0.338]	[0.430]	[0.843]	[0.492]	[0.949]	[0.841]
RW p-value						>0.999
Panel B: Heterogeneous effects by Caste						
Jeevika	−0.01	−0.10*	−0.04	−1.21	−0.01	−0.04
	(0.05)	(0.06)	(0.04)	(1.15)	(0.04)	(0.03)
SC/ST HH	−0.19***	−0.20***	−0.12***	−0.22	−0.06	−0.12***
	(0.04)	(0.04)	(0.04)	(1.00)	(0.04)	(0.02)
Jeevika X SC/ST	0.10*	0.12*	0.06	1.46	0.02	0.07**
	(0.05)	(0.06)	(0.05)	(1.39)	(0.06)	(0.03)
Linear combinations						
Effect of Jeevika if SC/ST	0.09***	0.02	0.02	0.25	0.01	0.03**
	(0.03)	(0.02)	(0.02)	(0.53)	(0.03)	(0.01)
Effect of SC/ST if Jeevika	−0.09**	−0.08*	−0.06*	1.24*	−0.04***	−0.05**
	(0.04)	(0.04)	(0.03)	(1.09)	(0.03)	(0.02)
Additional baseline controls?	yes	yes	yes	yes	yes	yes
Number of observations	8987	8987	8987	8987	8987	8987
Number of clusters	179	179	179	179	179	179
R-squared	0.37	0.22	0.37	0.37	0.37	0.37
Mean of dep var, omitted cat	0.47	0.31	0.27	91.22	1.20	0.21
RI p-value (SC/ST)	[0.019]	[0.208]	[0.438]	[0.708]	[0.799]	[0.056]
RI p-value (Non-SC/ST)	[0.866]	[0.101]	[0.467]	[0.349]	[0.901]	[0.207]
RW p-values (Jeevika X SC/ST)						0.024

Notes: Standard errors clustered at the panchayat level shown in parentheses. Coefficients are from an ANCOVA specification - linear regressions of each outcome on its value at baseline, and an indicator of treatment status; panel B has linear regressions of each outcome on indicators of treatment status, caste group, and their interaction. All specifications control for strata dummies and baseline controls († in Table A1). Regressions in panel A are weighted to reconstitute the caste composition of a village. Regressions in panel B are unweighted. Randomization Inference p-values for all treatment effects from 5000 permutations are also presented.
Column 6 presents coefficients in a regression of an index of z-scores of the outcome variables in this "family" - following Kling et al. (2007). Adjusted (RW) p-values for these regressions are reported to control the FWER across all index outcomes, following Romano and Wolf (2005a,b, 2016) and Clarke et al. (2019).
Rupee values are in CPI-adjusted 2011 equivalents.
*p < 0.1, **p < 0.05; ***p < 0.01.

major role. A second potential mechanism is that the cost of informal lending falls as demand shrinks due to increasing marginal costs of lending. This however is at odds with existing evidence about the cost structure of informal lending, which is characterized by large fixed costs and not generally limited by availability of lending capital (Aleem, 1990). A final possibility, and our preferred explanation, is that the decline in interest rate is due to competitive pressure from Jeevika, which forced informal lenders to either reduce their prices or exit the market.

6.6. Downstream impacts: assets, consumption and women's empowerment

While Jeevika had immediate and dramatic effects on household level borrowing patterns and also appeared to affect credit markets in targeted villages, we see null to very small impacts on household asset possession, material well-being, and various measures of women's economic and social empowerment within the two-year window covered by the evaluation. Table 4 presents the impact of the program on indices for three asset classes: productive, consumption, and housing. Each index is based

on a set of binary asset ownership variables, aggregated using the method proposed by Filmer and Pritchett (2001).[25] We observe a positive impact of Jeevika only on the ownership of consumption assets among SC/ST households (column 1, Table 4, Panel B). While this effect is statistically significant, it is modest in magnitude, equivalent to 0.09 standard deviations of the normalized index. No impact is observed for the overall population, nor for either subgroup on access to entitlements or consumption value. Nevertheless, the impact on the index representing this family of outcomes is positive and statistically significant for SC/ST households (Table 4, column 6, Panel B).

We test the impact of the intervention on several variables constructed to measure various aspects of women's economic and decision-making roles, autonomy, capacity for collective action, and aspirations. The first of these is the proportion of adult women in the household who

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[25] The index is the normalized score of the first principal component based on all the individual asset ownership (binary) variables. Baseline indices are normalized using the pooled mean and standard deviation, while follow-up indices are normalized using the control group mean and standard deviation.

work for income. The second is an index representing women's participation in household decision making. This is a binary variable, taking a value of 1 when women have the most say in one or more of the following decisions: purchases of durables, purchases of personal items, migration of family or primary earner, own labor, borrowing for the family, politics (such as who to vote for), and education of children. The variable takes a value of 0 when the respondent does not have the most say in any of these decisions. The third measures propensity for collective action as a binary variable, indicating whether women indicate an inclination to engage in collective action to resolve issues in the village (relating to entitlements, domestic violence, and consumption of alcohol in the village). For each of the three questions, collective action is coded as 1 if the respondent says she would ask community members to intervene, gather community members to intervene together or intervene herself. The overall collective action index is 1 if any of the sub-indices are 1, indicating propensity for collective action in one or more spheres. A fourth variable measures women's mobility, and is constructed as the proportion of places she can

visit alone out of those she needs to visit at all (out of a possible total of seven: ration shop, health center, friend or relative outside the village, women's group meetings, panchayat meetings, bank, or post office). Finally, women's aspirations for their daughters is measured as a binary variable, which takes a value of 1 if a woman wishes for her daughter to finish at least high school.

In Table 5, we see a positive impact of Jeevika on the proportion of women who work outside the home (col 1, Panel A), though this result is absent in both subgroups (Panel B), and in the pooled, unweighted results (Table C4), casting doubt on its validity. A negative effect of the program on women's decision-making within the household is apparent for SC/ST households ($p < 0.1$) in the ANCOVA model, and significant at $p < 0.05$ in all three of the pooled unweighted specifications (column 2, Table C4). On the other hand, a positive impact on women's propensity for collective action among SC/ST households is significant at $p < 0.1$ in both weighted ANCOVA and simple difference models (column 3, Table 5 and B4) and for the overall sample in the unweighted ANCOVA (column 3,

Table 5
Effects of Jeevika on Women's economic roles, empowerment, and aspirations.

	Proportion HH women work for income (%)	Women's decision-making in HH index (%)	Women's collective action index (%)	Women's Mobility (%)	Aspirations for girls (%)	Index of Dependent Variables
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Main Effects						
Jeevika	3.02***	−1.60	1.32	0.06	−2.83	0.01
	(1.15)	(1.42)	(1.27)	(1.53)	(1.92)	(0.02)
Additional baseline controls?	yes	yes	yes	yes	yes	yes
Number of observations	8830	8841	8841	8813	3910	8988
Number of clusters	179	179	179	179	179	179
R-squared	0.22	0.10	0.07	0.10	0.23	0.12
Mean of dep var, omitted cat	61.41	85.39	87.18	47.68	37.46	−0.06
RI p-value	[0.055]	[0.423]	[0.461]	[0.977]	[0.273]	[0.546]
RW p-value						*0.668*
Panel B: Heterogeneous effects by Caste						
Jeevika	1.86	−3.37	1.67	0.42	−3.72	0.00
	(2.25)	(2.04)	(1.62)	(2.08)	(3.11)	(0.03)
SC/ST HH	16.11***	1.08	0.90	3.42*	−7.27***	0.10***
	(1.75)	(1.58)	(1.29)	(1.82)	(2.78)	(0.02)
Jeevika X SC/ST	−3.18	1.28	0.31	−0.40	5.32	−0.01
	(2.59)	(2.19)	(1.67)	(2.30)	(3.46)	(0.03)
Linear combinations						
Effect of Jeevika if SC/ST	−1.32	−2.09*	1.98*	0.02	1.60	−0.00
	(0.91)	(1.12)	(1.22)	(1.55)	(1.61)	(0.02)
Effect of SC/ST if Jeevika	12.93***	2.36	1.22	3.02*	−1.95	0.09***
	(2.02)	(1.90)	(1.22)	(1.61)	(2.64)	(0.02)
Additional baseline controls?	yes	yes	yes	yes	yes	yes
Number of observations	8830	8841	8841	8813	3910	8988
Number of clusters	179	179	179	179	179	179
R-squared	0.19	0.08	0.05	0.07	0.17	0.10
Mean of dep var, omitted cat	53.55	84.08	86.62	44.93	45.35	−0.12
RI p-value (SC/ST)	[0.262]	[0.151]	[0.204]	[0.990]	[0.419]	[0.917]
RI p-value (Non-SC/ST)	[0.506]	[0.146]	[0.393]	[0.869]	[0.268]	[0.903]
RW p-values (Jeevika X SC/ST)						*>0.999*

Notes: Standard errors clustered at the panchayat level shown in parentheses. Coefficients are from an ANCOVA specification - linear regressions of each outcome on its value at baseline, and an indicator of treatment status; panel B has linear regressions of each outcome on indicators of treatment status, caste group, and their interaction. All specifications control for strata dummies and baseline controls († in Table A1). Regressions in panel A are weighted to reconstitute the caste composition of a village. Regressions in panel B are unweighted. Randomization Inference p-values for all treatment effects from 5000 permutations are also presented.
Column 7 presents coefficients in a regression of an index of z-scores of the outcome variables in this "family" - following Kling et al. (2007). Adjusted (RW) p-values for these regressions are reported to control the FWER across all index outcomes, following Romano and Wolf (2005a,b, 2016) and Clarke et al. (2019).
Rupee values are in CPI-adjusted 2011 equivalents.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table C4), and at p < 0.05 in the unweighted simple difference specification (column 3, Table C4). We observe no impact on either the index of women's mobility, or on mothers' aspirations for their daughters, and the estimated family-wise treatment effect on this group of outcomes is zero.

7. Discussion

Chronic indebtedness and exploitative moneylenders are well-established tropes in fictional and cinematic accounts of poverty in rural India. Several studies, including an important recent survey by the National Sample Survey Organization (GoI, 2014) and technical papers by the Reserve Bank of India (RBI, 2007, 2011, 2017) have documented the widespread reliance of rural households on high-cost debt from the informal sector at rates of up to 150 percent per annum. Over the past two decades, micro-credit institutions have rapidly expanded into markets previously served almost exclusively by traditional moneylenders. One would expect this influx of competition to affect existing credit markets, but the nature of these impacts is not obvious *ex ante*.

The limited empirical literature on this question consists of observational studies and finds zero or positive impacts on lending rates charged by informal sector lenders. Despite the existence of a large literature on the impact of micro-credit programs, no randomized impact evaluation to date has documented a significant effect on interest rates. This is the first study to do so. The randomized roll-out evaluated in this study, conducted in seven of the 38 districts of Bihar, increased self-help group (SHG) membership by 47 percentage points, and take up of loans through SHGs by 28 percentage points. Based on the impact of the program on take-up of SHG loans, and mean SHG borrowing levels, we find that those who joined a Jeevika SHG shifted 28% of their household debt from high-interest informal sources to Jeevika, on average. The large influx of relatively low-cost credit extended through Jeevika allows us to detect, for the first time, the impact of a micro-credit intervention on informal credit markets through a randomized evaluation.[26]

We note that the particular features of the study setting and intervention, namely widespread use of high-cost informal credit at baseline, low existing penetration by MFIs, and the relative ease of accessing credit through Jeevika, may have led to stronger credit market effects than would be expected in other cases of MFI entry into a new market. However, the qualitative result that access to low-cost credit crowds out higher-cost competitors and puts downward pressure on informal rates seem likely to be generalizable.

At baseline, the per annum interest rate on loans carried by SC/ST households was an average of 7 percentage points higher than the rate faced by other households. The decrease in informal interest rates observed appears to be especially strong for these households, leading to a reduction of the informal rate premium faced by these households of 35% by follow-up. The fact that the impact on lending rates is concentrated among the economically marginalized is indicative of the segmented nature of credit markets in this context.

The total impact of expanded access to low-cost credit through Jeevika on rural households' financial position can be computed as the sum of two effects: a direct effect of shifting debt from informal lenders to SHGs, and an indirect effect of the lower interest rates paid on the informal debt that remains. The direct effect is simply the difference between the average monthly rate on informal loans in the control group (5.73%, using village level data) and the SHG rate of 2% multiplied by the increase in credit obtained through SHGs in treatment areas (Rs. 1950), which we assume would otherwise have been taken from informal lenders.[27] This amounts to Rs 872 (18.74 USD) per year. The indirect effect is calculated as the mean value of informal loans taken over the past two years in treatment areas (Rs. 16,318), multiplied by the village-based estimate of program impact on the informal interest rate (−0.29 percentage points per month), which comes to Rs 568 (12.19 USD) per year.[28] By the time of follow-up data collection, the total effect of the program was thus to increase household's annual disposable income by Rs. 1,441, approximately 2.3% of annual household consumption expenditure at follow-up in control villages.

Reflecting this modest effect on debt servicing costs, no impact on consumption expenditures was seen two years after initiation of the program, though there is evidence of an impact on the asset position of targeted households. Given that debt service costs are recurrent, and that debt loads in the study area are increasing, we cannot rule out the possibility that asset and potentially consumption impacts of the intervention will strengthen over time, and that other downstream impacts may still arise. Baland et al. (forthcoming), who find an impact of such a program on the enrollment of children in secondary school six years after SHG formation, note that the length of time for SHG interventions to achieve measurable impacts on household-level outcomes can be significant.

The lack of impact on women's empowerment detected through this evaluation is inconsistent with quantitative and qualitative evaluations of Jeevika's first phase (Datta, 2015; Sanyal et al., 2015). A qualitative evaluation comparing implementation of the program in its first and second phases by Majumdar et al. (2017) explains the discrepancy. The authors document differences in the nature of SHG mobilization during the two phases of the project. They find that the project proceeded in a more scripted manner in the second phase, and focused on material benefits (access to loans) rather than the possibility of collective problem-solving to overcome common challenges. This led to a lower intensity of participation in the project among members, and ultimately to less impact on non-material outcomes. Jeevika's first phase, while not as large as the second, covered 400,000 households. The concordance of qualitative and non-experimental quantitative findings on significant impacts on women's empowerment during this phase suggest that meaningful changes on this outcome can be achieved through large-scale SHG-based interventions, but the findings from phase 2 provide a cautionary tale about the pace of implementation.

Contributor roles taxonomy

Hoffmann: Conceptualization, investigation, methodology, writing - original draft, formal analysis, funding acquisition; **Rao**: Conceptualization, investigation, writing - original draft, supervision, funding acquisition; **Surendra**: Methodology, software, formal analysis, data curation,

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[26] We note that the evaluation started in 2011, shortly after the government of Andhra Pradesh passed an ordinance strictly controlling microfinance lending in response to a spate of reported suicides and widespread public frustration with MFI practices. This ordinance led to widespread defaults on loans taken from microfinance institutions and threatened to collapse the sector. Households in the evaluation sample were not affected directly by the ordinance, which was limited to the state of Andhra Pradesh, but their access to formal credit could have been affected through its effect on the MFI sector nationally. Further, demand for MFI loans could have been curtailed by media reports of predatory practices by these institutions leading up to and during the evaluation period. Analysts of India's 2010 microfinance crisis have pointed out that the SHG model we evaluate is the main competitor to the MFIs that were the target of the Andhra Pradesh government's restrictions, so challenges faced by MFIs during the evaluation period may have contributed to the high rate of SHG loan adoption observed. All this said, it seems unlikely that the microfinance crisis was determinant of our findings, given the low rate of MFI penetration in Bihar at the time the crisis started in 2010. Bihar was among the bottom 5 states in terms of microfinance penetration in India in 2010 (Srinivasan, 2010), and only 1.35% of households in the study sample had any outstanding MFI loans (classified as formal loans in the statistics above) at baseline.

[27] We ignore in this calculation the negative effect of the program on total borrowing.

[28] This represents an upper bound of the impact, given that the impact on the informal interest rate was unlikely to have been immediate upon program initiation.

Data availability

I have shared my code and data at the "attach files" step.

Appendix

Table A1
Randomized credit market interventions.

Study	Area	Unit of randomization	Number of units	Take-up of randomized credit offer (T-C)	Use of informal credit at endline (control)	Estimated impact on use of informal credit	Ratio of TEs: value of informal loans vs. loans from new source
Tarozzi et al. (2015)	4 rural zones, Ethiopia	Kebele	133	0.252	0.052	−0.006	0.010
Banerjee et al. (2015a)	Hyderabad, India	Neighborhood	104	0.088	0.760	−0.052**	−0.771
Angelucci et al. (2015)	North-central Sonora, Mexico	Town or neighborhood	238	0.115	0.051	0.011	0.139
Attanasio et al. (2015)	Rural Mongolia	Village	40	0.508	0.004	0.009	0.029
Crepon et al. (2015)	Rural Morocco	Village	162	0.130	0.059	−0.003	−0.141

Table A2
Summary statistics randomization balance across treatment groups at baseline.

	Means			Normalized Differences (SE) [RI p-value]		
	Obs	Control	Treatment	Full sample	SC/ST	General
	(1)	(2)	(3)	(4)	(5)	(6)
Household Characteristics						
Caste Group (†) (%)	8988	32.30	32.40	−0.01 0.04 [0.887]	–	–
Land Ownership (%)	8988	45.60	44.30	−0.02 (0.03) [0.656]	−0.04 (0.03) [0.283]	−0.03 (0.04) [0.567]
Household Size	8988	6.05	6.00	−0.03 (0.02) [0.314]	−0.02 (0.02) [0.554]	−0.03 (0.03) [0.538]
Female HH Head (%)	8988	13.90	12.60	−0.04 (0.03) [0.284]	0.00 (0.03) [0.934]	−0.06 (0.03) [0.241]
Self Help Groups, Savings and Debt						
SHG Membership (†) (%)	8988	4.45	6.44	0.10*** (0.04) [0.029]	0.13*** (0.04) [0.013]	−0.02 (0.04) [0.729]
Any Savings? (†) (%)	8988	38.30	42.20	0.08** (0.04) [0.148]	0.07 (0.05) [0.295]	0.09* (0.05) [0.174]
Real High cost debt (†) (000 Rs.)	8988	8.79	8.24	−0.02 (0.02) [0.496]	0.01 (0.01) [0.642]	−0.03 (0.03) [0.356]
Real Total Outstanding Debt (000 Rs.)	8988	13.39	12.16	−0.04* (0.02) [0.176]	−0.00 (0.02) [0.846]	−0.05* (0.03) [0.226]
Real Outstanding Informal Debt (000 Rs.)	8988	11.08	10.77	0.00 (0.02) [0.913]	−0.00 (0.01) [0.830]	−0.00 (0.03) [0.978]
Real Outstanding SHG Debt (000 Rs.)	8988	0.03	0.14			

Table A2 (*continued*)

	Means			Normalized Differences (SE) [RI p-value]		
	Obs	*Control*	*Treatment*	*Full sample*	*SC/ST*	*General*
	(1)	(2)	(3)	(4)	(5)	(6)
				0.08***	0.05**	0.08***
				(0.02)	(0.02)	(0.03)
				[0.001]	[0.072]	[0.012]
Credit Markets: Interest Rates and Number of Informal Lenders per Village						
Household avg. monthly interest rate paid (†)	6460	5.09	5.17	0.05	0.12***	−0.04
(% p.m.)				(0.04)	(0.04)	(0.05)
				[0.282]	[0.016]	[0.538]
Household avg. monthly rate, informal loans	6389	5.10	5.18	0.06	0.12***	−0.05
(% p.m.)				(0.04)	(0.04)	(0.05)
				[0.268]	[0.013]	[0.520]
Mean rate, informal loans (village level)	320	5.20	5.22	−0.00	–	–
(% p.m.)				(0.10)		
				[0.980]		
Number of informal lenders (village level)	333	2.12	2.05	−0.02	–	–
				(0.09)		
				[0.823]		
Household Consumption, Assets and Entitlements						
Productive asset index (†)	8988	0.00	−0.05	−0.05*	−0.05*	−0.08**
(Filmer-Pritchett, Normalized)				(0.03)	(0.03)	(0.04)
				[0.182]	[0.198]	[0.117]
Consumption asset index (†)	8988	0.00	0.02	0.03	0.05	−0.02
(Filmer-Pritchett, Normalized)				(0.04)	(0.03)	(0.04)
				[0.559]	[0.287]	[0.755]
Housing quality index (†)	8988	0.00	−0.02	−0.00	0.01	−0.03
(Filmer-Pritchett, Normalized)				(0.03)	(0.04)	(0.04)
				[0.951]	[0.839]	[0.634]
Real Consumption value per Adult Equivalent (†)	8988	0.80	0.80	0.00	0.05*	−0.04
(000 Rs.)				(0.03)	(0.03)	(0.04)
				[0.977]	[0.222]	[0.489]
Entitlements accessed by HH (†) (%)	8988	52.3	51.4	−0.02	0.06**	−0.03
				(0.03)	(0.03)	(0.04)
				[0.647]	[0.153]	[0.517]
Women's Roles and Capabilities						
Proportion HH women who work for income (†) (%)	8985	69.70	70.30	−0.01	−0.02	−0.02
				(0.04)	(0.03)	(0.05)
				[0.856]	[0.579]	[0.751]
Women's HH decision-making index (†) (%)	8988	83.50	86.70	0.12***	0.13***	0.07
				(0.04)	(0.04)	(0.04)
				[0.048]	[0.032]	[0.246]
Women's collective action index (†) (%)	8988	81.30	81.00	0.01	−0.02	−0.01
				(0.04)	(0.03)	(0.04)
				[0.833]	[0.717]	[0.843]
Women's mobility (†)	8960	0.33	0.32	−0.02	0.02	−0.07
				(0.03)	(0.03)	(0.04)
				[0.704]	[0.639]	[0.224]
Aspirations for girls (†) (%)	5235	37.70	36.60	−0.02	0.07*	−0.06
				(0.04)	(0.04)	(0.05)
				[0.670]	[0.153]	[0.380]
Attrition						
Attrition (%)	8988	2.82	2.94	0.01	0.02	−0.01
				(0.02)	(0.02)	(0.03)
				[0.756]	[0.476]	[0.897]
Baseline Village-Level Survey Respondents						
No. of respondents	333	10.89	11.04	0.07	–	–
				(0.10)		
				[0.550]		
Average Age	333	45.84	44.64	−0.19*	–	–
				(0.10)		
				[0.125]		
Share, Men (%)	333	99.14	98.00	−0.13	–	–
				(0.13)		
				[0.654]		
Share, SC/ST (%)	333	27.04	25.08	−0.11	–	–
				(0.09)		
				[0.328]		
Share, OBC (%)	333	35.30	36.64	0.04	–	–
				(0.10)		
				[0.751]		
Share, EBC (%)	333	20.97	22.65	0.09	–	–
				(0.10)		
				[0.426]		

Table A2 (*continued*)

	Means			Normalized Differences (SE) [RI p-value]		
	Obs	Control	Treatment	Full sample	SC/ST	General
	(1)	(2)	(3)	(4)	(5)	(6)
Share, SC/ST women (%)	333	0.33	0.15	−0.13 (0.10) [0.282]	–	–
Endline Village-Level Survey Respondents						
No. of respondents	333	11.25	11.07	−0.09 (0.09) [0.434]	–	–
Average Age	333	42.38	42.17	−0.01 (0.10) [0.902]	–	–
Share, Men (%)	333	97.98	97.97	−0.04 (0.10) [0.742]	–	–
Share, SC/ST (%)	333	59.44	55.23	−0.14 (0.10) [0.235]	–	–
Share, OBC (%)	333	25.54	27.02	0.06 (0.10) [0.612]	–	–
Share, EBC (%)	333	8.74	12.00	0.17* (0.09) [0.147]	–	–
Share, SC/ST women (%)	333	1.36	1.20	−0.01 (0.10) [0.915]	–	–

Notes: Normalized differences (Imbens and Rubin, 2015) across treatment groups and their standard errors (clustered at the panchayat level) are from separate linear regressions on an indicator of treatment status, with controls for stratification variables. Outcomes marked with † are primary outcomes of interest according to the pre-analysis plan, and are used as controls in the regressions as specified in the plan. Means and regressions on the full sample are weighted to reconstitute the caste composition of the village. Regressions focusing on caste groups are unweighted, to obtain precise estimates within each group. Randomization Inference p-values are computed from 5000 permutations.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table B1a
Direct effects, alternative estimators.

	Participation	Any loans from			Outstanding Debt (000 Rs)			Cost
	SHG Membership (%)	SHG	Informal lender	Any source	SHG loans	Informal loans	All loans	Mean interest rate (% per month)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Simple Difference Estimator, no Baseline Controls								
Overall impact	46.59*** (1.66)	28.36*** (1.28)	−5.13*** (1.41)	3.37*** (1.29)	1.95*** (0.10)	−3.66*** (0.75)	−2.04** (0.88)	−0.70*** (0.07)
Impact on non-SC/ST HHs	43.71*** (2.32)	25.11*** (1.91)	−3.72* (2.18)	3.43 (2.24)	1.93*** (0.17)	−3.18** (1.13)	−2.46* (1.31)	−0.53*** (0.10)
Impact on SC/ST HHs	53.66*** (1.73)	36.64*** (1.37)	−6.40*** (1.19)	3.32*** (0.97)	2.26*** (0.12)	−2.90*** (0.57)	−0.54 (0.63)	−1.09*** (0.08)
Panel B: Difference-in-Difference								
Overall impact	44.72*** (2.48)	27.27*** (1.72)	−5.49** (2.12)	3.18 (2.07)	1.82*** (0.14)	−3.43*** (1.21)	−1.11 (1.31)	−0.72*** (0.12)
Impact on non-SC/ST HHs	43.98*** (2.55)	24.38*** (2.07)	−5.43* (2.96)	2.36 (2.89)	1.81*** (0.19)	−3.43** (1.47)	−1.77 (1.60)	−0.43*** (0.10)
Impact on SC/ST HHs	51.18*** (3.00)	36.29*** (1.96)	−7.83** (1.60)	1.79 (1.60)	2.26*** (0.16)	−2.61*** (0.77)	−0.26 (0.83)	−1.20*** (0.15)

Notes: Regressions in Panel A control for stratification dummies. Results shown in Panel B include panchayat fixed effects. Overall Treatment Effects regressions are weighted to reconstitute the caste composition of a village. Group specific Treatment Effects are unweighted.
Rupee values are in CPI-adjusted 2011 equivalents.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table B1b
Direct effects, alternative estimators.

	Participation	Any loans from			Outstanding Debt (000 Rs)			Cost
	SHG Membership (%)	SHG	Informal lender	Any source	SHG loans	Informal loans	All loans	Mean interest rate (% per month)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Simple Difference Estimator, no Baseline Controls								
Overall impact	46.59***	28.36***	−5.13***	3.37***	1.95***	−3.66***	−2.04**	−0.70***
	(1.66)	(1.28)	(1.41)	(1.29)	(0.10)	(0.75)	(0.88)	(0.07)
Impact on non-SC/ST HHs	43.71***	25.11***	−3.72*	3.43	1.93***	−3.18**	−2.46*	−0.53***
	(2.32)	(1.91)	(2.18)	(2.24)	(0.17)	(1.13)	(1.31)	(0.10)
Impact on SC/ST HHs	53.66***	36.64***	−6.40***	3.32***	2.26***	−2.90***	−0.54	−1.09***
	(1.73)	(1.37)	(1.19)	(0.97)	(0.12)	(0.57)	(0.63)	(0.08)
Panel B: Difference-in-Difference								
Overall impact	44.72***	27.27***	−5.49**	3.18	1.82***	−3.43***	−1.11	−0.72***
	(2.48)	(1.72)	(2.12)	(2.07)	(0.14)	(1.21)	(1.31)	(0.12)
Impact on non-SC/ST HHs	43.98***	24.38***	−5.43*	2.36	1.81***	−3.43**	−1.77	−0.43***
	(2.55)	(2.07)	(2.96)	(2.89)	(0.19)	(1.47)	(1.60)	(0.10)
Impact on SC/ST HHs	51.18***	36.29***	−7.83**	1.79	2.26***	−2.61***	−0.26	−1.20***
	(3.00)	(1.96)	(1.60)	(1.60)	(0.16)	(0.77)	(0.83)	(0.15)

Notes: Regressions in Panel A control for stratification dummies. Results shown in Panel B include panchayat fixed effects. Overall Treatment Effects regressions are weighted to reconstitute the caste composition of a village. Group specific Treatment Effects are unweighted.

Rupee values are in CPI-adjusted 2011 equivalents.

*p < 0.1, **p < 0.05; ***p < 0.01.

Table B2
Effects on informal credit market.

	Household-level data				Village-level Data	
	HH level mean rate on informal loans (% per month)		HH level mean rate on informal loans (% per month) (Selection Corrected)		Informal Lending Rate (% per month)	Number of Informal Lenders
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Simple Difference Estimator, no Baseline Controls						
Overall impact	−0.03	−0.03	−0.23**	−0.23**	−0.33**	−0.28**
	(0.06)	(0.06)	(0.10)	(0.10)	(0.16)	(0.12)
Impact on non-SC/ST HHs	0.03	0.04	−0.05	−0.05		
	(0.10)	(0.10)	(0.12)	(0.12)		
Impact on SC/ST HHs	−0.18**	−0.19**	−0.25**	−0.27**		
	(0.08)	(0.08)	(0.11)	(0.11)		
Panel B: Difference in Differences Estimator						
Overall impact	−0.04	−0.04	−0.21**	−0.22**	−0.28	−0.20
	(0.12)	(0.12)	(0.10)	(0.10)	(0.24)	(0.16)
Impact on non-SC/ST HHs	0.18*	0.18*	0.13	0.12		
	(0.10)	(0.10)	(0.08)	(0.08)		
Impact on SC/ST HHs	−0.31**	−0.32**	−0.37***	−0.39***		
	(0.14)	(0.14)	(0.13)	(0.13)		

Notes: Regressions in Panel A control for stratification dummies. Results shown in Panel B include panchayat fixed effects. Overall Treatment Effects regressions are weighted to reconstitute the caste composition of a village. Group specific Treatment Effects are unweighted.

Columns 3 and 4 presents results from a semiparametric selection correction model, based on Newey (2009), using a 4th-order power series control function in the probability of selection. Bootstrapped standard errors are reported.

Rupee values are in CPI-adjusted 2011 equivalents.

*p < 0.1, **p < 0.05; ***p < 0.01.

Table B3
Effects on household assset position, entitlements, and welfare.

	Consumption Asset Index	Productive Asset Index	Housing Quality Index	Access to Entitlements (% any)	Real Consumption per AE (000 Rs.)
	(1)	(2)	(3)	(4)	(5)
Panel A: Simple Difference Estimator, no Baseline Controls					
Overall impact	0.04	−0.03	−0.01	−0.67	0.00
	(0.03)	(0.03)	(0.03)	(0.68)	(0.02)
Impact on non-SC/ST HHs	−0.01	−0.10*	−0.04	−1.21	−0.01
	(0.05)	(0.06)	(0.04)	(1.15)	(0.04)

Table B3 (*continued*)

	Consumption Asset Index	Productive Asset Index	Housing Quality Index	Access to Entitlements (% any)	Real Consumption per AE (000 Rs.)
	(1)	(2)	(3)	(4)	(5)
Impact on SC/ST HHs	0.09***	0.02	0.02	0.25	0.01
	(0.03)	(0.02)	(0.02)	(0.53)	(0.03)
Panel B: Difference in Differences Estimator					
Overall impact	0.04	−0.01	0.02	0.25	0.01
	(0.05)	(0.05)	(0.04)	(2.38)	(0.04)
Impact on non-SC/ST HHs	−0.01	−0.06	−0.02	1.64	−0.02
	(0.07)	(0.07)	(0.05)	(2.47)	(0.05)
Impact on SC/ST HHs	0.06	0.04	0.03	−2.17	−0.00
	(0.04)	(0.02)	(0.04)	(1.62)	(0.03)

Notes: Regressions in Panel A control for stratification dummies. Results shown in Panel B include panchayat fixed effects. Overall Treatment Effects regressions are weighted to reconstitute the caste composition of a village. Group specific Treatment Effects are unweighted.
Rupee values are in CPI-adjusted 2011 equivalents.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table B4
Effects on women's economic roles, empowerment, and aspirations.

	Proportion HH women work for income (%)	Women's decision-making in HH index	Women's collective action index	Women's Mobility	Aspirations for girls
	(1)	(2)	(3)	(4)	(5)
Panel A: Simple Difference Estimator, no Baseline Controls					
Overall impact (weighted)	3.02***	−1.60	1.32	0.06	−3.24*
	(1.15)	(1.42)	(1.27)	(1.53)	(1.92)
Impact on non-SC/ST HHs	1.87	−3.37	1.67	0.42	−4.03
	(2.26)	(2.04)	(1.62)	(2.08)	(3.08)
Impact on SC/ST HHs	−1.31	−2.09*	1.98*	0.02	1.33
	(0.91)	(1.12)	(1.13)	(1.55)	(1.57)
Panel B: Difference in Differences Estimator					
Overall impact (weighted)	2.83	−5.32*	1.76	0.98	−2.95
	(2.28)	(2.94)	(2.59)	(2.64)	(2.99)
Impact on non-SC/ST HHs	3.34	−6.25*	2.48	2.30	−0.70
	(2.90)	(3.50)	(3.10)	(3.02)	(4.15)
Impact on SC/ST HHs	−0.27	−6.53**	2.64	−0.05	−1.13
	(1.59)	(2.73)	(2.48)	(2.59)	(2.43)

Notes: Regressions in Panel A control for stratification dummies. Results shown in Panel B include panchayat fixed effects. Overall Treatment Effects regressions are weighted to reconstitute the caste composition of a village. Group specific Treatment Effects are unweighted.
Rupee values are in CPI-adjusted 2011 equivalents.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table C1
Direct effects, unweighted.

	Participation	Any loans from			Outstanding Debt (000 Rs)			Cost
	SHG Membership (%)	SHG	Informal lender	Any source	SHG loans	Informal loans	All loans	Mean interest rate (% per month)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ANCOVA	50.85***	33.36***	−5.62***	3.37***	2.16***	−2.98***	−1.02**	−0.95***
	(1.54)	(1.21)	(1.05)	(0.89)	(0.10)	(0.43)	(0.48)	(0.07)
Simple Diff	51.36***	0.31***	−0.06***	0.04***	2.20***	−2.86***	−0.97*	−0.94***
	(1.55)	(0.01)	(0.01)	(0.01)	(0.10)	(0.45)	(0.50)	(0.08)
Diff-in-Diff	49.19***	0.30***	−0.08***	0.02	2.14***	−2.85***	−0.69	−1.01***
	(2.55)	(0.02)	(0.02)	(0.02)	(0.13)	(0.70)	(0.77)	(0.12)

Notes: ANCOVA regressions include all baseline controls and stratification dummies. Simple difference regressions include baseline controls. Diff-in-diff regressions include panchayat fixed effects. All specifications are run without sampling weights.
Rupee values are in CPI-adjusted 2011 equivalents.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table C2
Effects on informal credit market.

	Household Level Interest Rates (% per month)			
	Uncorrected		Selection Corrected	
	Average	Weighted Average	Average	Weighted Average
	(1)	(2)	(3)	(4)
ANCOVA	−0.13*	−0.14**	−0.21*	−0.23**
	(0.07)	(0.07)	(0.11)	(0.11)
Simple Diff	−0.11	−0.12	−0.19	−0.21*
	(0.07)	(0.07)	(0.12)	(0.12)
Diff-in-Diff	−0.20	−0.20	−0.26**	−0.28***
	(0.12)	(0.12)	(0.10)	(0.11)

Notes: ANCOVA regressions include all baseline controls and stratification dummies. Simple difference regressions include baseline controls. Diff-in-diff regressions include panchayat fixed effects. All specifications are run without sampling weights.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table C3
Effects on household assset position, entitlements, and welfare (unweighted).

	Consumption Asset Index	Productive Asset Index	Housing Quality Index	Access to Entitlements (% any)	Real Consumption per AE (000 Rs.)
	(1)	(2)	(3)	(4)	(5)
ANCOVA	0.06**	−0.01	0.01	−0.16	0.00
	(0.03)	(0.02)	(0.02)	(0.43)	(0.02)
Simple Difference	0.08**	−0.04*	0.02	−0.14	0.01
	(0.03)	(0.02)	(0.03)	(0.48)	(0.02)
Diff in Diff	0.04	0.01	0.02	−1.22	−0.01
	(0.04)	(0.03)	(0.03)	(1.68)	(0.03)

Notes: ANCOVA regressions include all baseline controls and stratification dummies. Simple difference regressions include baseline controls. Diff-in-diff regressions include panchayat fixed effects. All specifications are run without sampling weights.
Rupee values are in CPI-adjusted 2011 equivalents.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table C4
Effects on women's economic roles, empowerment, and aspirations (unweighted).

	Proportion HH women work for income (%)	Women's decision-making in HH index	Women's collective action index	Women's Mobility	Aspirations for girls
	(1)	(2)	(3)	(4)	(5)
ANCOVA	−0.42	−2.45**	1.89*	0.14	0.35
	(0.81)	(1.05)	(1.05)	(1.37)	(1.44)
Simple Diff	−0.84	−2.33**	2.12**	0.15	0.78
	(1.02)	(1.08)	(1.05)	(1.36)	(1.51)
Diff-in-Diff	0.80	−6.43**	2.60	0.61	−0.76
	(1.49)	(2.57)	(2.23)	(2.39)	(2.30)

Notes: ANCOVA regressions include all baseline controls and stratification dummies. Simple difference regressions include baseline controls. Diff-in-diff regressions include panchayat fixed effects. All specifications are run without sampling weights.
Rupee values are in CPI-adjusted 2011 equivalents.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table C5
Selection model first-stage.

	Any Informal Loans at Endline
	(1)
Health Incidents	0.03***
	(0.01)
Jeevika	−0.19***
	(0.03)
Baseline Informal Loans	0.29*
	(0.17)

Table C5 (*continued*)

	Any Informal Loans at Endline
	(1)
SC/ST	0.12***
	(0.04)
Obs	8987
Clusters	179
Pseudo R-sq	0.08
Chi-sq	20466.46
Prob > chi-sq	0.000

Notes: Standard errors are clustered at the panchayat level. Co-efficients are from a probit regression with controls for the pre-specified baseline variables, and strata dummies.
*p < 0.1, **p < 0.05; ***p < 0.01.

Table C6
Informal loan interest rates by purpose in the control group.

	Loan-level Data			
	(1)	(2)	(3)	(4)
Health	−0.01	0.03	−0.02	0.01
	(0.02)	(0.03)	(0.04)	(0.05)
SC/ST		0.55***		0.56***
		(0.20)		(0.06)
Health X SC/ST		−0.03		0.00
		(0.04)		(0.06)
Fixed Effects	HH	HH	Panchayat	Panchayat
Obs	13345	13345	13915	13915
Clusters	90	90	90	90
R-sq	0.70	0.68	0.22	0.21
Mean, omitted cat	5.29	4.89	5.28	4.88

Notes: Standard errors are clustered at both the household and panchayat levels in all specifications. Columns 1 and 3 present coefficients from regressions of the informal interest rate on a dummy indicating whether the stated purpose was for health-related reasons on the control sample pooled across baseline and follow-up, with observations weighted by inverse sampling probability. Columns 2 and 4 present coefficients from unweighted regressions of the informal interest rate on the health dummy, caste status and the interaction of the two. All regressions control for the log of loan size.
*p < 0.1, **p < 0.05; ***p < 0.01.

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