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# **DOES MORATORIUM AFFECT LOAN REPAYMENT BEHAVIOUR?**

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# Does moratorium affect loan repayment behaviour?<sup>1</sup>

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## Abstract

Governments and lenders provide loan moratoria to help struggling borrowers, particularly during an economic crisis. While it can provide relief to borrowers, such a policy also has a possibility of inducing moral hazard among the beneficiaries. But it is difficult to segregate the effects of the crisis itself from that of moratorium as a relief measure, on loan repayment behavior. In this paper, we use an unanticipated announcement of lockdown to curb the spread of Covid-19 in India on March 25<sup>th</sup> 2020 to estimate the impact of moratorium on loan repayment behaviour. The Reserve Bank of India announced a moratorium on March 27<sup>th</sup> 2020, on payment of all loan instalments falling due between March 1, 2020, and May 31, 2020. Borrowers whose loans were due in the last week of March 2020, i.e., between March 25<sup>th</sup> to 31<sup>st</sup>, 2020, but were not able to repay due to lockdown restrictions, thereby availed the moratorium during March 2020. Whereas borrowers whose installment due dates were between March 1<sup>st</sup>-24<sup>th</sup>, 2020, and had already repaid their installments before the lockdown, could only avail the moratorium from April 2020 onwards. We use this arbitrary date cut-off imposed by the announcement of lockdown for the identification of causal impact of one extra month of moratorium on borrowers' loan repayment behavior post the moratorium. We find that an extra month of moratorium led to a 6.4 percentage point higher monthly default rate and a 2.5 percentage point higher Non-Performing Assets (NPA) classification rate among borrowers after the moratorium. We also find an additional month of moratorium led to a higher NPA classification rate among individual loan borrowers (5.6%) compared to joint-liability group loan borrowers (2.4%) who are peer-monitored, suggesting moral hazard could explain the observed borrower behaviour post the moratorium.

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# 1. Introduction

The financial economics literature is debating the effective ways of reducing delinquency from distressed borrowers (Ganong and Noel, 2020; Kanz, 2016; Agarwal et al., 2017). Providing temporary relief from debt payments, i.e. moratorium, is one such method, particularly in case of a sudden economic crisis (Dinerstein et al. 2022). In this study, we measure the causal impact of moratorium on borrowers' loan repayment behavior. We think of loan moratorium as a regulator and/or lender-authorized temporary suspension of repayments implemented to help borrowers deal with financial distress.

There are two possible impacts of moratorium on borrowers' subsequent repayment behaviour. One, the financially distressed borrowers could benefit from temporarily easing the debt repayment burden, resulting in improved subsequent repayment rates (Bolton and Rosenthal 2002; Collins and Urban 2015; Fiorin et al. 2022). Two, on the contrary, allowing borrowers to miss repayments could induce indiscipline, resulting in higher subsequent delinquencies.<sup>2</sup> Kanz (2016) has documented the presence of moral hazard among borrowers whose debt was waived off permanently.

This paper investigates how the temporary suspension of debt repayment obligations affects the borrowers' subsequent loan repayment behavior. Does the moratorium help the borrowers improve their repayment rates, or does it induce moral hazard and lead to higher defaults? This question is difficult to answer because such large-scale loan moratoria are almost always implemented in response to economic crises that affects the borrowers, thus making it difficult to separate the impact of moratoria on borrowers' repayment from the impact of the crises. Therefore, in this paper, we use a natural experiment to segregate the effect of moratorium on debt repayment behavior from that of the crisis.

The context of this study is the Covid-19 induced lockdown and the subsequent debt moratorium provided to help the borrowers affected by the sudden economic crisis. To prevent the rapid spread of the Covid-19 disease, the Government of India enforced a strict lockdown

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<sup>2</sup> <https://economictimes.indiatimes.com/markets/stocks/news/moral-hazard-moratorium-extension-may-trigger-more-defaults-analysts/articleshow/75882595.cms?from=mdr>

starting 25th March 2020.<sup>3</sup> The Reserve Bank of India (RBI), on March 27<sup>th</sup>, 2020, announced a moratorium on payment of all loan instalments falling due between March 1, 2020, and May 31, 2020.<sup>4</sup> On May 22, 2020, the RBI extended the moratorium for another three months from June 1, 2020 till August 31, 2020 taking the total period of applicability of the measure to six months (i.e. from March 1, 2020 to August 31, 2020).<sup>5</sup> Given the national lockdown was announced on 25<sup>th</sup> March, 2020, this date segregated the borrowers into two categories:

- 1) The **Treatment** group, consisting of borrowers whose installment due dates were between March 25<sup>th</sup>-31<sup>st</sup>, 2020, and hence could not repay their installments because of lockdown related restrictions on mobility.<sup>6</sup> This group had to avail the moratorium in March 2020.
- 2) The **Control** group, consisting of borrowers whose installment due dates were between March 1<sup>st</sup>-24<sup>th</sup>, 2020, and had already repaid their installments before the lockdown came into effect. This group did not have to avail the moratorium in March 2020.

The announcement of lockdown restrictions on March 25<sup>th</sup>, 2020, acted as an arbitrary cut-off date that segregated the borrowers into those who availed (treated) and did not avail (control) the moratorium in March 2020. We can consider this as a natural experiment that sorted all active borrowers in India into quasi-random treatment and control groups, with the only difference being the treatment group availing an extra month of moratorium.

A large Non-Banking Financial Company (NBFC) that lends primarily to low-income borrowers in India provided us with administrative data on loan terms, demographic details, and monthly repayments of its 17,864 borrowers.<sup>7</sup> These borrowers had only one outstanding loan and were punctual payers in the pre-crisis period. In compliance with the RBI's regulations, the lender provided the moratorium scheme to all borrowers between March and

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<sup>3</sup> Indian Prime Minister Modi announces 21-day lockdown as COVID-19 toll touches 12, The Hindu, 24<sup>th</sup> March 2020; Access the full article here: <https://www.thehindu.com/news/national/pm-announces-21-day-lockdown-as-covid-19-toll-touches-10/article61958513.ece>

<sup>4</sup> RBI circular on moratorium <https://www.rbi.org.in/Scripts/NotificationUser.aspx?Id=11835&Mode=0>

<sup>5</sup> RBI circular on moratorium extension [https://www.rbi.org.in/Scripts/bs\\_viewcontent.aspx?Id=3859](https://www.rbi.org.in/Scripts/bs_viewcontent.aspx?Id=3859)

<sup>6</sup> Most of this lender's borrowers pay their installments to loan officers who come to their doorstep. The share of borrowers making digital repayment, at least in 2020, was very low.

<sup>7</sup> A non-deposit non-banking financial company (NBFC) cannot take deposits. It borrows from banks to lend further.

August 2020.<sup>8</sup> We collected data from six months before the start of the crisis and six months after the end of the moratorium. So, the sample period is one-and-a-half years: September 2019 to February 2021.

Using the difference-in-difference method with time fixed effects, we compare the loan repayments of these treated and control groups of borrowers after the moratorium was withdrawn, while controlling for borrower characteristics and loan terms. We find that an additional month of moratorium led to a 6.4 percentage points higher default rate for the treated borrowers, compared to the control borrowers. The other outcome variable, classification of loan account as a Non-Performing Asset (NPA), yields similar results. An additional month of moratorium led to a 2.5 percentage points higher NPA classification rate for the treated borrowers, compared to the control borrowers.

We supplement this result with several sanity checks. First, we plot the repayment rates of the treated and control groups. We do not observe any differential trend in repayment rates of the two groups (before the crisis) that would have mechanically predicted the difference during the post-moratorium period.

Second, we check for the similarity of the two groups on several observable factors like loan terms and demographic characteristics. The treated and the control groups are not statistically different for most of these variables. A few loan terms are statistically different, but the economic magnitudes of these differences are insignificant. We take two steps to alleviate any concerns about the mismatch. The first step is to control for the observable loan terms and borrower characteristics in the regressions. The second step is to run regressions on a nearest-neighbor-matched sample of the two groups. Both these steps produce marginal probability estimates similar to our primary estimates.

Next, we examine the heterogeneous effect of the duration of moratorium on debt repayment behavior. In compliance with the RBI's regulations, the lender provided moratorium scheme

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<sup>8</sup> The lender extended an opt-out moratorium scheme to the borrowers. The borrowers had the option to opt out of the scheme once they regained their ability to repay.

to every borrower with an opt-out option.<sup>9</sup> During the moratorium scheme, non-repayment did not deteriorate credit score, but interest charges kept accumulating. Therefore, some borrowers who regained the ability to repay opted out of the moratorium sooner than others. To control for the effect of borrowers opting out of the moratorium scheme during different months and thus availing the moratorium for different number of months, we classify borrowers into five sub-groups, based on the month during which they opted out of the moratorium scheme. We get five sub-groups corresponding to April, May, June, July, and August of 2020. The borrowers in each of these monthly sub-groups availed the moratorium until that month. But the treated borrowers in each monthly subgroup would have availed one additional month of moratorium than the control borrowers, in March 2020. For example, in the May sub-group, the treated borrowers availed the moratorium in March, April, and May only, while the control borrowers took a moratorium in April and May only.

For each of the monthly sub-groups, the difference-in-difference logistic regressions show higher delinquencies (defaults and NPAs) for the treated group. The treatment effect increases with the duration for which moratorium was availed. Borrowers who were less affected by the crisis opted out sooner primarily to avoid paying additional interest charges. Therefore, borrowers who availed the moratorium for longer are likely to be the ones who were more affected by the crisis. Thus, our results show the treatment effect was enhanced by the effect of the crisis. Similar treatment effects are observed if we classify distressed borrowers using their type of occupation. The lowest treatment effect was observed among the agricultural borrowers, who were relatively less impacted by the Covid-19 crisis in 2020.

We also try to understand the reason behind the observed treatment effect. One possible reason is moral hazard induced due to the long moratorium. A borrower who does not repay the lender for a longer period without any negative consequences might tend to default more subsequently. Such a borrower might perceive the lower collection effort from the lender as lenient and expect similar behavior in later periods. To empirically test whether moral hazard might be driving the results, we examine the differential repayment behavior of treatment and control groups for Joint-Liability Group (JLG) loan borrowers, vis-à-vis Individual Liability

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<sup>9</sup> The lender extended an opt-out moratorium scheme to the borrowers. Non-repayment did not affect their credit scores, but interest amount continued to get accrued. The borrowers had the option to opt out of the scheme once they regained their ability to repay.

(IL) loan borrowers. JLG loans can curb the moral hazard problem via peer monitoring (Stiglitz (1990), Besley and Coate (1995)) and ensure higher repayment rates even during a crisis (Agarwal et al. (2021)). In our results, we see that the treatment effect was larger among JLG loan borrowers than IL borrowers vis-à-vis monthly default rates, i.e., an additional month of moratorium led to a larger increase in monthly default rates among JLG loan borrowers (6.4%) than IL borrowers (5.4%). However, we see that the treatment effect was larger among IL borrowers than JLG borrowers vis-à-vis NPA classification rates, i.e., an additional month of moratorium led to a larger increase in NPA classification rates among IL borrowers (5.6%) than JLG borrowers (2.4%). NPAs are loan accounts with three or more consecutive months of default and pose a higher risk for the lender. Even if JLG loan borrowers who availed an extra month of moratorium were more likely to default than IL borrowers who availed an extra month of moratorium, the peer monitoring effect of JLG was a driving factor in preventing JLG borrowers from defaulting consecutively for three or more months. But the absence of peer monitoring among IL borrowers led to higher NPA classification rates post the moratorium. These results suggest that the long moratorium in 2020 could have induced moral hazard in borrowers.

We contribute to the growing literature on the efficacy of measures that aim to help financially distressed borrowers repay their debt. Ganong and Noel (2020), Goodman et al. (2021) have documented the effect of increased household liquidity, reduced delinquencies and increased homeownership, respectively. Agarwal et al. (2017) show that mortgage renegotiations can reduce foreclosures. Catherine and Yannelis (2023) report positive effects of targeted loan forgiveness in the context of student loans, whereas Gin'e and Kanz (2018) report the opposite, where defaults increased after a large-scale loan forgiveness program in rural farmers of India. Mukherjee et al. (2018) show that debt relief negatively affects loan repayment behavior of non-beneficiaries.

Our paper adds to the literature in the context of temporary relief from debt repayment during a crisis. Fiorin et al. (2022) show improved repayment as a response to debt moratorium during normal times using a randomized trial. Contrary to their finding, our rare natural experiment finds an extra month of (longer) moratorium leads to lower repayment rates. The main contribution of this paper is to provide clean estimates of the default response of borrowers to a debt moratorium during an economic crisis. An extra month of moratorium

leading to a lower NPA classification rate among joint-liability group borrowers compared to individual loan borrowers in our sample suggests that moral hazard can explain the observed borrower behavior. We also add to literature on the moral hazard costs of debt relief (Mayer et al. (2014), O'Malley (2021)).

The remainder of the paper proceeds as follows. Section 2 outlines the institutional context of our study and describes the sample. Section 3 draws out the empirical research design and defines the corresponding variables. Section 4 presents the results of our analysis and robustness tests. Section 5 describes the variation in results with the duration of moratorium, and Section 6 suggests moral hazard as the potential mechanism. Section 7 concludes.

## 2 Institutional Setting and Data

### 2.1 Government's response to COVID-19 and moratorium scheme

In March 2020, Covid-19 cases started rising rapidly worldwide.<sup>10</sup> To curb the rising risk of mass contagion of the disease, the Government of India imposed a strict nationwide lockdown starting 25th March 2020.<sup>11</sup> The lockdown restricted all non-essential activities for several following weeks. Debt repayment was not listed as an essential activity. The top panel of **Figure 1** shows the sudden decline in all work-related mobility in the last week on March 2020.

The lockdown hindered the debt collection process of all lenders. These hindrances resulted in mechanical non-repayment from borrowers who had their repayments due in the last week of March 2020. To treat these borrowers fairly, the Reserve Bank of India (RBI) announced a moratorium for the month of March 2020 as well, when it announced the debt moratorium on March 27<sup>th</sup> 2020.<sup>12</sup> This date segregated the borrowers into two categories:

- 1) The **Treatment** group, consisting of borrowers whose installment due dates were between March 25<sup>th</sup>-31<sup>st</sup>, 2020, and hence could not repay their installments because of

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<sup>10</sup> Figure 1 in WHO Covid-19 Situation Report 71 - <https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200331-sitrep-71-covid-19.pdf>

<sup>11</sup> Indian Prime Minister Modi announces 21-day lockdown as COVID-19 toll touches 12, The Hindu, 24<sup>th</sup> March 2020; Access the full article here: <https://www.thehindu.com/news/national/pm-announces-21-day-lockdown-as-covid-19-toll-touches-10/article61958513.ece>

<sup>12</sup> RBI circular on moratorium <https://www.rbi.org.in/Scripts/NotificationUser.aspx?Id=11835&Mode=0>



lockdown related restrictions on mobility.<sup>13</sup> This group availed the moratorium in March 2020.

- 2) The **Control** group, consisting of borrowers whose installment due dates were between March 1<sup>st</sup>-24<sup>th</sup>, 2020, and had already repaid their installments before the lockdown came into effect. This group did not avail the moratorium in March 2020.

The announcement of lockdown restrictions on March 25<sup>th</sup>, 2020, acted as an arbitrary cut-off date that segregated the borrowers into those who availed (treated) and did not avail (control) the moratorium in March 2020. Thus, the treatment group availed the moratorium for one extra month compared to the control group. We can consider this as a natural experiment that sorted all active borrowers in India into quasi-random treatment and control groups, with the only difference being the treatment group availed an extra month of moratorium during March 2020.

The moratorium scheme was designed to automatically provide all borrowers the option not to repay their monthly obligations for subsequent months as well. Though the scheme ran until August 2020, borrowers had the option to opt out of the scheme sooner. If a borrower availed moratorium in a month, the non-repayment in that month did not add to the overdue days of the loan account. However, the moratorium scheme allowed the lender to keep adding interest charges to the outstanding debt for each missed payment.

Besides the debt moratorium, the Government of India also provided free food grains and small amounts of direct benefit transfers to women bank account holders. However, these relief measures could not have been applied differently to the treatment and control groups.

## 2.2 Data and sample selection

We collect loan transaction level details of borrowers of a large non-banking financial company (NBFC) in India.<sup>14</sup> NBFCs are financial institutions that can perform all banking transactions except accepting public demand deposits and issuing cheques. Our data provider operates in six Indian states: Tamil Nadu, Karnataka, Odisha, Jharkhand, Chattisgarh, and Uttarakhand. As shown in **Appendix Figure A1**, these states are in different regions of India.

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<sup>13</sup> Most of this lender's borrowers pay their installments to loan officers who come to their doorstep. The share of borrowers making digital repayment, at least in 2020, was very low.

<sup>14</sup> A non-banking financial company (NBFC) cannot take deposits. It borrows from banks to lend further.

From this lender, we collected demographic and monthly repayment data for borrowers with one loan each. We asked the lender to only provide the data for borrowers who repaid every month during September 2019 and March 2020. The data is restricted to the borrowers in the treatment group who were punctual payers in January and February 2020 and those in the control group who were punctual payers in January, February, and March 2020. Punctual payers are borrowers who repaid between  $\pm$  three days of their due date. We use the three-day relaxation window to provide concession for public holidays, weekends, etc. The monthly due date of each loan is assumed to be the same day every month as the day of disbursement, e.g., a loan that was disbursed on 17th January will have its monthly repayments due on 17th February, 17th March and so on.

The final sample has a total of 17,864 borrowers. 6,325 borrowers fall in the treatment group and 11,539 borrowers in the control group. The coverage summary of this dataset is documented in **Panel A** of **Table 1**. Each borrower has one loan only. 97% of these loans are joint-liability group (JLG) loans, i.e., the borrowers form groups of four or five while borrowing. Each member in the group gets an individual loan and is responsible for repaying it fully. However, the joint-liability clause means that even if one member of the group defaults, the entire group is termed a defaulter. All banking transactions of the group occur in the monthly group meeting with the loan officer. The remaining 3% loans are individual liability loans. All loans in this sample are unsecured loans.

The loans are repayable in equated monthly installments, and we observe each borrower's monthly repayments (and hence, non-repayments) in our data. Therefore, the final data set is organized at a loan-repayment year-month level and amounts to 3,00,185 borrower(loan)- year-month observations. Each observation also contains information on loan terms, such as the loan amount, loan tenure, interest rates, and loan purpose. The NBFC also collects borrower-specific information relating to age, gender, marital status, income, and occupation. These borrowers are distributed across 206 branches of the lender.

The lender primarily operates in the micro-finance space and lends to low-income rural women for business as well as consumption purposes. In **Panel B** of **Table 1**, we document how the borrowers, and their loans, differ across treatment and control groups. The two groups

are quite similar on most factors. This similarity reinforces the quasi-random nature of the natural experiment we are exploiting in this study. Even for the variables where the two groups are statistically different, the economic magnitude of the difference is quite low, for example, the monthly repayable amount across the two groups differs by INR 25 which is 0.3% of their average monthly income of  $\sim$  INR 8,000. The two groups are also indistinguishable in terms of join-liability group loans and individual liability loans. Treatment group borrowers, however, are more likely to borrow for business purposes.

The two groups are also similar in terms of their default rates in the period before the lockdown took effect. This similarity exists because we dropped all borrowers who missed even a single repayment between September 2019 and February 2020. So, the monthly and quarterly non-repayments are precisely zero for each group in the period before the crisis. However, we document the difference in the percentage of repaid installments during the same period and report the results in **Panel C of Table 1**. We find that the treatment group has a slightly higher repayment rate in the pre-moratorium period than the control group.

### 3 Empirical Strategy

As noted in the Introduction, a moratorium scheme is always implemented during an economic crisis. The borrowers who are more affected by the crisis are also more likely to avail the moratorium. Thus, studying the impact of any one of these two simultaneously occurring phenomena is extremely difficult. In this paper, we want to assess a moratorium's effect on borrowers' debt repayment behavior. We cannot just find the correlation between the duration of the moratorium availed and the subsequent debt repayments of borrowers. The economic crisis itself would confound such measurement.

Therefore, we use a natural experiment<sup>15</sup> to measure the effect of moratorium independently from that of the crisis. Since the Government of India implemented a strict nationwide lockdown starting 25th March 2020, borrowers who had their monthly repayment due between 25th and 31st March 2020 mechanically failed to repay that month's installment amount. When the

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<sup>15</sup> Natural experiments or quasi-natural experiments in economics are serendipitous situations in which persons are assigned randomly to a treatment and a control group, and outcomes are analysed for the purposes of putting a hypothesis to a severe test; they are also serendipitous situations where assignment to treatment approximates randomized design or a well-controlled experiment (The New Palgrave Dictionary of Economics).

RBI announced the debt moratorium from March to May 2020, these borrowers were able to avail the moratorium for March 2020, unlike other borrowers who had already paid their installments due for March 2020 before the lockdown was announced. Borrowers who availed the moratorium for an extra month in March 2020 are classified as the treatment group, and borrowers who had already repaid their installments in March 2020 and availed the moratorium for one less month from April 2020 onwards are classified as the control group. In subsequent months, all borrowers could avail the moratorium until August 2020. They had a choice to opt out of the moratorium program at any point during this period.

The lockdown and the follow-up moratorium scheme give us a set of borrowers who exogenously got an extra month of moratorium (i.e., March 2020). So, we design our analysis to measure the effect of one extra month of moratorium on borrowers' subsequent debt repayment behavior. We use the loan repayment, loan terms, and borrower demographics data from a large NBFC in India. This data spans a six-month period before the beginning of the moratorium scheme (Sep 2019 to Feb 2020), six months during the moratorium period (Mar 2020 to Aug 2020), and six months after the moratorium scheme ended (Sep 2020 to Feb 2021). Data is organized at the borrower-year-month level, which is equivalent to the loan-year-month level in this case, as each borrower only has one loan.

To assess the impact of one extra month of moratorium on loan performance, we estimate the following difference-in-differences logistic regression model:

$$\text{logit}(Y_{it}) = \beta_0 + \beta_1 \times \text{Treated}_i + X_{it} + \mu_t + \varepsilon_{it}, \text{ if } \text{Post}_{it} = 1 \quad (1)$$

We use two dependent variables in our study viz.  $Y_{it}$  is either  $\text{Default}_{it}$  or Non-Performing Asset $_{it}$  ( $\text{NPA}_{it}$ ). The subscript  $i$  represents a borrower, and the subscript  $t$  represents each year-month.  $\text{Default}$  is an indicator variable that equals one if a borrower makes no repayment in a month and zero otherwise.  $\text{Default}$  is also adjusted to zero for the months when the borrower took a moratorium.  $\text{NPA}$  is another indicator variable that equals one if a borrower defaults for three consecutive months and zero otherwise.  $\text{NPA}$  is automatically adjusted for the moratorium as it is constructed from the  $\text{Default}$  variable.  $\text{Post}_{it}$  is an indicator variable that we construct. It equals one for every month after the moratorium period or for every subsequent month after a borrower opted out of the moratorium. This variable also has the  $it$  subscript, as

each individual borrower could opt out of the moratorium scheme in a different month during April 2020 and August 2020. We include in the regression only those observations where  $Post_{it}$  is equal to one, as we concern ourselves with repayment behaviour after the moratorium.

The primary independent variable here is  $Treated_i$ , an indicator variable that equals one for a borrower who availed an additional month of moratorium in March 2020 and zero for all other borrowers.  $X_{it}$  represents borrower characteristics and loan terms. Borrower characteristics are gender, marital status, age, individual income, household income, and occupation category (agriculture, non-agriculture, salaried, and others). Loan terms include the loan amount, tenure, interest rate, and loan purpose (business and consumption).  $\mu_t$  stand for year-month fixed effects incorporated to control for time-variant characteristics.<sup>16</sup>  $\varepsilon_{it}$  is the error term. We cluster the standard errors around the lender's branches.<sup>17</sup> The estimates in all the regression tables are marginal probabilities of independent variables.

## 4 Main Result

We run the difference-in-differences logistic regression mentioned in the previous section and report the marginal probability estimates and their respective standard errors in **Table 2**. Column (1) shows the results for the dependent variable, Default, without including the additional control variables on loan terms. This regression includes only time (year-month) fixed effects and controls for borrower characteristics. The main variable of interest here is  $Treated$ , and its marginal probability estimate for Default shows that the Treated group had a 6.4 percentage points higher default rate compared to the control group after the moratorium ended. Similarly, the Treated group had a 2.4 percentage point higher NPA classification rate.

In columns (2) and (4), we estimate the logistic regression equation 1 for Default and NPA as dependent variables, respectively, after including additional controls, i.e., loan terms. The

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<sup>16</sup> We also had borrower fixed effects in our initial specification. But due to the computationally demanding nature of logistic regression, we could not incorporate it while running the regressions. While we control for borrower characteristics in all the regressions, this is a computational limitation of the study.

<sup>17</sup> Controlling for borrower characteristics and loan terms, introducing year-month fixed effects, and clustering the standard errors help in separating the effects of these factors from the effect of treatment, on the observed difference in behaviour between the treatment and the control group. They also help in ensuring that the observed differences between the treatment and control group are not because of fundamental differences between the treatment and control group vis-à-vis these factors, but because of the treatment.

results remain similar even after including control variables. The Treated group had a 6.3 percentage point higher default rate and a 2.5 percentage point higher NPA classification rate.

#### 4.1 Pre-trends

As we run a difference-in-differences logistic regression model, we must rule out the possibility of a pre-existing differential trends for the Treated and Control groups. To rule out pre-trends, we plot the average repayment rates of treated and control borrowers for each month between September 2019 and February 2021 in the bottom panel of **Figure 1**. Here, the repayment rates are not adjusted for the moratorium.

#### 4.2 Matched Sample

The treated and control groups are largely similar to each other in terms of observable characteristics as shown in **Panel B** of **Table 1**. However, some differences are statistically significant, and treated groups are more likely to borrow for business purposes. To alleviate any concerns of systematically different borrowers being sorted into the treated and control groups, we use Mahalanobis-distance-based propensity score matching to get a 1:1 matched sample. There are 6,325 treatment borrowers and 6,325 control borrowers. The covariate balance of the matched sample is reported in **Appendix Table A1**.

We run the difference-in-differences logistic regressions on this matched sample as per equation 1 and report the marginal probability estimates in **Table 3**. Columns (1) and (2) show the results for the dependent variable, Default. Columns (3) and (4) show the result for NPA as the dependent variable. All logistic regressions include time (year-month) fixed effects and controls for borrower characteristics. Columns (2) and (4) have additional control variables vis-à-vis loan terms. The marginal probabilities estimated using this matched sample are quite similar to those obtained with the unmatched sample. In the matched sample, the treated group had a 7.3 percentage point higher monthly default rate (6.4 percentage point higher default rate in the unmatched sample) and a 2.9 percentage point higher NPA classification rate (2.5 percentage point higher NPA classification rate in the unmatched sample), compared to. The control group. The similarity in results strengthens our belief that the treated and the control groups are not systematically different.

### 4.3 Alternate measure of default

For most of this study, we use dependent variables that we constructed from the monthly repayments data. The lender also provided us with its own delinquency measures: (1) 1 to 29 Days Overdue, and (2)  $\geq 30$  Days Overdue. We also combined these two delinquency measures to create another measure that captures  $\geq 1$  Day Overdue. **Table 4** reports the marginal probability estimates of logistic regression equation 1 with 1 to 29 Days Overdue as the dependent variable in columns (1) and (2). Columns (3) and (4) have  $\geq 30$  Days Overdue as the dependent variable, and columns (5) and (6) have  $\geq 1$  Day Overdue as the dependent variable. Columns (1), (3), and (5) show the marginal probability estimates after running the regression without controlling for loan terms, and columns (2), (4), and (6) show marginal probability estimates after controlling for loan terms. The marginal probability estimates for these alternate measures of default shows that the treated borrowers had a 1.2 percentage point higher classification rate as 1-29 day overdue, 3.2 percentage point higher classification rate as  $\geq 30$  day overdue, and a 3.5 percentage point higher classification rate as  $\geq 1$  day overdue. This treatment effect is similar to the treatment effect on monthly default rate (6.4 percentage points higher default rate than the control group) and NPA classification rate (2.5 percentage points higher NPA classification rate than the control group).

## 5 Heterogeneous Effects

### 5.1 Duration of moratorium

As mentioned in **Section 2.1**, the moratorium scheme had an opt-out option enabling the borrowers to stop their moratorium scheme in any month up to August 2020. It is reasonable to assume that borrowers who were affected more by the crisis would have availed the moratorium for longer. If the treated and the control groups differ in terms of the duration for which they availed the moratorium, it would imply they would have experienced differential levels of distress due to the Covid-19 crisis, thus affecting our requirement of comparing treatment and control groups who were facing similar levels of distress after the moratorium.

To control for this and ensure we only compare treatment and control borrowers who were experiencing similar levels of distress after the moratorium, we classify borrowers into five

sub-groups according to the month in which they stopped their moratorium scheme. The April sub-group has treatment borrowers who availed the moratorium in March and April only, and control borrowers who availed moratorium in April only. May sub-group has treatment borrowers who availed moratorium in March, April, and May only, and control borrowers who availed moratorium in April and May only. Similarly, we created June, July and August subgroups as well, where the treatment and control groups differ only in terms of an extra month of moratorium availed by the treatment group in March 2020.<sup>18</sup>

In **Table 5**, we list the months of moratorium availed by each monthly sub-group and the corresponding borrower counts. We run logistic regression equation 1 for each of these sub-groups and report the results in **Table 6. Panels A and B** show the results with Default and NPA as the dependent variables, respectively. The results show that an additional month of moratorium affected subsequent delinquency rates of borrowers across all monthly sub-groups. The treated borrowers from the April, May, June, July, and August subgroups had a 1.7 percentage point, 2.1 percentage point, 6.9 percentage point, 7.9 percentage point, and 17.8 percentage point higher default rate respectively, compared to the control borrowers from their monthly subgroups. As we can see, the marginal probability estimates of default become larger as the duration for which the moratorium was availed increases. The largest estimate comes from the August monthly sub-group. These results show that the treatment effect was larger for borrowers who were affected more by the crisis.

## 5.2 Occupation Categories

We also check for the heterogeneous effects of the moratorium on repayment rates of different occupations. We categorize different occupations into four categories: Agriculture, Non-Agriculture, Salaried, and Others. In **Appendix Table A2**, we list the composition of these occupation categories. We run the logistic regression equation 1 and report the results in **Appendix Table A3** for each of these occupation categories separately. In **Appendix Table A4**, we report results of a regression that breaks the Treated of regression equation 1 into

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<sup>18</sup> We can be reasonably sure that that the treatment and control borrowers from the April, May, June, and July subgroups were experiencing similar levels of distress after the moratorium. This is because both the treatment and control borrowers from these subgroups had opted out of the moratorium scheme before it ended in August 2020, thus signalling their reasonable recovery from distress during the same month. However, no such signal exists for borrowers from the August subgroup as they did not opt out of the moratorium scheme, as it ended in August 2020.



Treated  $\times$  Agri, Treated  $\times$  non-Agri, Treated  $\times$  Salaried, and Treated  $\times$  Others. In **Appendix Table A3**, we see the treatment effect among agriculture borrowers (5.9 percentage points) was lower than among non-agricultural (6.5 percentage points) and salaried (7.4 percentage points) borrowers, vis-à-vis monthly default. This is because agriculture was among the least affected sectors during the Covid-19 crisis of 2020. Most agricultural activities were considered essential activities and exempted from lockdown restrictions,<sup>19</sup> and agricultural sector was among the very few sectors that registered a growth during the Financial Year 2020-2021.<sup>20</sup>

### 5.3 Duration of prior relationship between the lender and borrower

We also check for heterogeneous effects of the moratorium based on the duration of prior relationship between lender and borrower. A borrower graduates to a subsequent cycle of their joint liability group (JLG) loan after completing the repayment of their current cycle of loan successfully. For example, a borrower in the fifth JLG cycle has already repaid four loans successfully to the lender. Since each loan cycle typically lasts for two years, this borrower has a prior relationship with the lender lasting more than eight years. We check the treatment effect on borrowers who have a relationship of more than five years (fourth or a higher cycle) with the lender, i.e., old JLG borrowers, and compare it with the treatment effect on borrowers who have fewer than five years of relationship with the lender, i.e., new JLG borrowers. We run logistic regression equation 1 for both old and new JLG borrowers and report the results in **Appendix Table A5**. As expected, we see a lower treatment effect on old JLG borrowers when compared to new JLG borrowers, showing that an extra month of moratorium leads to lower default and NPA classification rates among borrowers who have a long pre-existing relationship with the lender. An additional month of moratorium led to around 7 percentage points higher default and 3 percentage points higher NPA classification rate among new JLG borrowers after the moratorium, but around 6 percentage points higher default and 2 percentage points higher NPA classification rate among old JLG borrowers.

<sup>19</sup> Farm workers, agriculture companies exempted from lockdown: Home Ministry, The Economic Times, 27<sup>th</sup> March 2020; Access the full article here: [https://economictimes.indiatimes.com/news/economy/agriculture/govt-exempts-farm-activities-from-lockdown/articleshow/74852730.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/economy/agriculture/govt-exempts-farm-activities-from-lockdown/articleshow/74852730.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)

<sup>20</sup> How Agriculture Grew Despite COVID Crisis, IndiaSpend, 28<sup>th</sup> December 2020; Access the full article here: <https://www.indiaspend.com/agriculture/how-agriculture-grew-despite-covid-crisis-705395>

## 6 Potential Mechanism

The results in the previous sections document the negative effect of an extra month of moratorium on the subsequent repayment behavior of borrowers. It is important to understand the reason behind this behavior. One possibility we test in this section is moral hazard induced due to the moratorium. A borrower who does not repay the lender for a longer period without any negative consequences might tend to default more subsequently. Such a borrower might perceive the lower collection effort from the lender as lenient and expect similar behavior in later periods.

To empirically test whether moral hazard might be driving the results, we examine differential repayment behavior of treatment and control groups for Joint-Liability Group (JLG) loan borrowers, vis-à-vis Individual Liability (IL) loan borrowers. JLG loans can curb the moral hazard problem via peer monitoring (Stiglitz (1990), Besley and Coate (1995)) and ensure higher repayment rates even during a crisis (Agarwal et al. (2021)). We modify the logistic regression equation 1 to compare the treatment effect on the JLG loan borrowers versus the IL borrowers. We run the following logistic regression:

$$\begin{aligned} \text{logit}(Y_{it}) = & \beta_0 + \beta_1 \times \text{Treated}_i + \beta_2 \times \text{JLG}_i \times \text{Treated}_i + X_{it} + \mu_t + \\ & \varepsilon_{it}, \text{ if } \text{Post}_{it} = 1 \end{aligned} \quad (2)$$

Here, the definitions of the variables are the same as in **Section 3**. JLG is an indicator variable that equals one for the borrowers whose loan is a Joint-Liability Group loan and zero if it is an Individual Liability loan. The results of the above logistic regression are reported in **Panel B** of **Table 7**. Here, we do not include loan terms as controls, as they can be redundant if JLG is already included. In **Panel A** of **Table 7**, we separately report the results for regression 1 for JLG and IL borrowers, with Default and NPA as the dependent variables.

The results from **Panel A** of **Table 7** show that the treatment effect was larger among JLG loan borrowers than IL borrowers vis-à-vis monthly default rates, i.e., an additional month of moratorium led to a larger increase in monthly default rates among JLG loan borrowers (6.4%) than IL borrowers (5.4%). However, we see that the treatment effect was larger among IL borrowers than JLG borrowers vis-à-vis NPA classification rates, i.e., an additional month of

moratorium led to a larger increase in NPA classification rates among IL borrowers (5.6%) than JLG borrowers (2.4%). NPAs are loan accounts with three or more consecutive months of default and pose a higher risk for the lender. Even if an additional month of moratorium led to a higher default rate among joint-liability group loan borrowers than among individual loan borrowers, the peer monitoring effect of JLG loans seems to have prevented them from defaulting consecutively for three or more months. But the absence of peer monitoring among individual loan borrowers potentially resulted in an extra month of moratorium leading to a higher NPA classification rate among individual loan borrowers than among joint-liability group loan borrowers. These results suggest that long moratoria can induce moral hazard in borrowers.

## 7 Conclusion

We study the effect of debt moratoria, a commonly used form of relief to distressed borrowers, on debt repayment behavior of borrowers. Using a natural experiment that divided the borrowers into quasi-random treatment and control groups, we find that an additional month of moratorium led to a higher default and NPA classification rate in the post-moratorium period. This negative effect of an additional month of moratorium was higher among borrowers who availed the moratorium for longer and faced greater distress because of the Covid-19 crisis. The negative effect was also lower among agricultural borrowers compared to non-agricultural and salaried borrowers, as the agriculture sector was not as affected by the crisis as other sectors. Agricultural activities were allowed to continue as an essential activity even during the Covid-19 lockdown and as agricultural sector managed to register growth during the Financial Year 2020-21. An extra month of moratorium led to lower defaults and NPA classification rates among borrowers in fourth or higher cycles of JLG loans when compared to borrowers in their first three cycles of JLG loans, showing that a prior, long-lasting relationship between the lender and borrower lowered the chances of defaults and missed repayments. Lastly, without any peer monitoring, an extra month of moratorium was associated with a higher NPA classification rate (three or more consecutive months of default) among individual loans compared to joint-liability group loans, posing a greater risk to the lender.

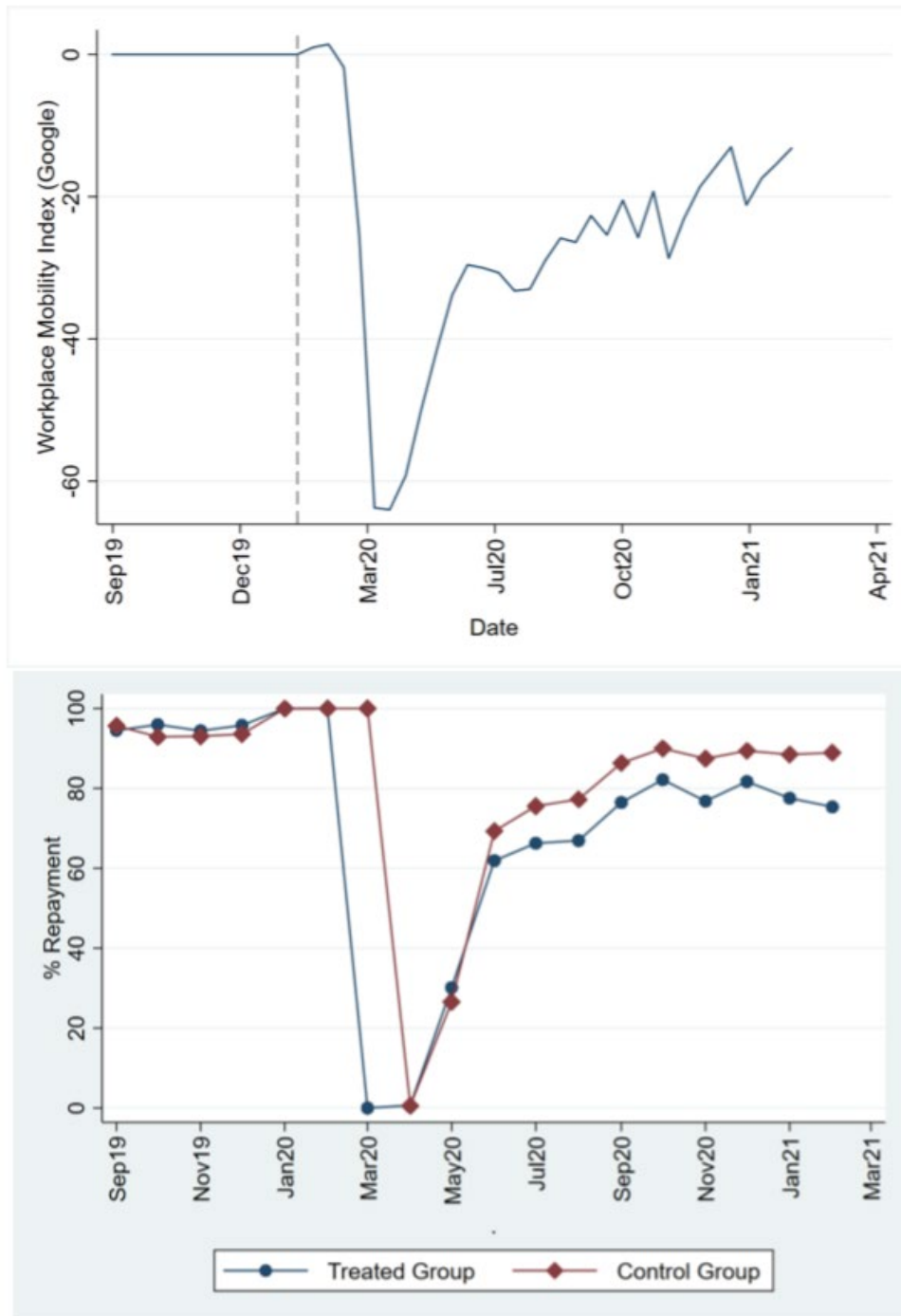
The natural experimental setting and the empirical strategy of controlling for borrower characteristics and loan terms, introducing year-month fixed effects, clustering of the standard

errors at the branch level, all ensure that the observed difference in subsequent repayment behaviour between the treatment and control groups can be causally attributed to the moratorium by isolating its impact from the impact of the crisis and any underlying differences between the treatment and control groups. In addition, we run the logistic regression on a propensity score matched sample of treatment and control borrowers to ensure that only similar treatment and control borrowers are compared. It gives similar results, showing that the observed change in repayment behaviour is not because of any underlying differences between the treatment and control borrowers but because of the treatment effect. While a moratorium is required to ease the burden of crisis on borrowers, these results show that policymakers should also be cognizant of potential moral hazard costs of a blanket moratorium.

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**Figure 1 - Lockdown and Repayment-Trend:** This figure plots how Workplace Mobility Index changed during 2020 in the top panel. This index reported by google measures human mobility around places of work. Google started reporting this index from 15-Feb-2020. In the bottom panel, we report the percentage of monthly installments paid by borrowers of treatment and control groups across time. Note that the first month of non-repayment for the treatment group was March 2020, and for the control group, it was April 2020. The Government of India imposed a strict lockdown starting 25th March 2020, thus curbing the ability of borrowers to repay after this date. Borrowers who had already paid their dues by the 24th March 2020 and thus did not have to avail the moratorium in March 2020 belong to the Control group. Borrowers whose due dates were on March 25<sup>th</sup> 2020 or later and thus could not repay and had to avail the moratorium for an extra month in March 2020 belong to the Treatment group.

**Table 1 - Data Description:** Here we describe the data used for this study. Panel A lists the coverage summary of the sample. Panel B compares the treatment and control groups across several loan terms and borrower characteristics. Data used for the comparisons is restricted to February 2020, the month preceding the start of the lockdown (and the moratorium) in March 2020. Segregation of borrowers into Treatment and Control groups are defined in **Section 2.1**. Treatment group has the borrowers who did not repay in March-2020, and thus received a moratorium for that month. All borrowers who made a repayment in the month of March 2020 did not get a moratorium for that month; these borrowers constitute the Control group. Panel C compares the repayment rates of the two groups before the moratorium started, and after it ended. Repayment is the percentage of monthly installment repaid by the borrower in a month, capped at 100%.

Panel A: Coverage Summary				
Sample Period	Sep-2019 to Feb-2021			
Maximum Moratorium Period	Mar-2020 to Aug-2020			
Number of branches	206			
Number of loan-month observations	300185			
Number of loans	17864			
Number of borrowers	17864			
Number of Treated borrowers	6325			
Number of Control borrowers	11539			
Panel B: Compare Treated and Control groups				
	Treated	Control	Difference	p-Value
Loan Terms				
Loan Amount (INR)	37292	37830	538***	0.00
Loan Instalment Amount (INR)	2082	2108	25***	0.00
Interest Rate (%)	24.88	25.02	0.14***	0.00
Tenure (Years)	1.87	1.88	0.01***	0.00
Business Loan	0.65	0.56	-0.09***	0.00
Joint Liability Group Loan	0.97	0.97	0.00	0.63
Borrower Characteristics				
Age (Years)	40.24	40.53	0.30**	0.03
Individual Income (INR)	97047	96659	-388	0.66
Household Income (INR)	379096	395008	15992*	0.08
Female	0.99	0.99	-0.00	0.65
Married	0.96	0.96	-0.00	0.19
Count	6325	11539		
Panel C: Compare Repayment Rates				
Time Period	Treated	Control	Difference	p-Value
Sep-19 to Feb-20	0.9690	0.9603	-0.0087***	0.00
Post-Moratorium	0.8412	0.9187	0.00775***	0.00



**Table 2 – Main Result:** This table presents the marginal probability estimates for logistic regression equation 1. We show results for two dependent variables: Monthly Default in columns (1) and (2), and Non-Performing Asset (NPA) in columns (3) and (4). Variables used in the regression are described in **Section 3**. All regressions have year-month fixed effects and control for borrower characteristics. Columns (2) and (4) also control for loan terms. Standard errors are clustered at the branch level and are reported in parentheses.

	(1)	(2)	(3)	(4)
	Default		NPA	
Treated	0.0641*** (0.006)	0.0630*** (0.006)	0.0249*** (0.004)	0.0254*** (0.004)
Female	-0.0304 (0.018)	-0.0491* (0.021)	0.0123 (0.016)	0.0021 (0.017)
Married	-0.0121 (0.009)	-0.0002 (0.009)	-0.0091 (0.007)	-0.0026 (0.007)
Age (Years)	-0.0003 (0.000)	0.0001 (0.000)	-0.0000 (0.000)	0.0002 (0.000)
Log (Individual income)	-0.0046 (0.005)	-0.0029 (0.004)	-0.0001 (0.003)	0.0006 (0.003)
Log (Household income)	-0.0015 (0.003)	-0.0016 (0.003)	-0.0020 (0.002)	-0.0002 (0.002)
Voluntary Moratorium Months	0.0858*** (0.003)	0.0083*** (0.003)	0.0427*** (0.003)	0.0406*** (0.003)
Log (Loan amount)		-0.0914*** (0.021)		-0.0563*** (0.013)
Tenure (Years)		0.0027 (0.020)		0.0050 (0.015)
Interest Rate (%)		0.0057 (0.008)		0.0062 (0.005)
Business Loan		0.0083 (0.009)		-0.0049 (0.005)
N	95163	95163	60249	60249
Year-month Fixed Effects	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes
Occupation Controls	Yes	Yes	Yes	Yes
Loan Controls	No	Yes	No	Yes

**Table 3 - Matched Sample:** This table documents the marginal probability estimates of logistic regression Equation 1 for dependent variables Default in columns (1) and (2), and NPA in columns (3) and (4) on the matched sample described in Table A1. Columns (1) and (3) use the 1:1 Treatment: Control nearest neighbour matched sample. Columns (2) and (4) also control for loan level controls. Standard errors are clustered at the branch level and are reported in parentheses.

	(1)	(2)	(3)	(4)
	Default		NPA	
Treated	0.0728*** (0.008)	0.0733*** (0.008)	0.0288*** (0.006)	0.0323*** (0.006)
Female	-0.0226 (0.029)	-0.0296 (0.032)	0.0068 (0.024)	0.0045 (0.026)
Married	-0.0158 (0.013)	-0.0030 (0.013)	-0.0015 (0.010)	0.0055 (0.009)
Age (Years)	-0.0004 (0.000)	-0.0000 (0.000)	-0.0001 (0.000)	0.0002 (0.000)
Log (Individual income	-0.0101 (0.006)	-0.0089 (0.006)	-0.0015 (0.004)	-0.0011 (0.004)
Log (Household income)	-0.0005 (0.003)	-0.0006 (0.003)	-0.0056* (0.002)	-0.0060* (0.002)
Voluntary Moratorium Months	0.0999*** (0.004)	0.0971*** (0.004)	0.0569*** (0.004)	0.0538*** (0.004)
Log (Loan amount)		-0.0985*** (0.028)		-0.0684*** (0.017)
Tenure (Years)		-0.0075 (0.028)		0.0031 (0.020)
Interest Rate (%)		0.0186 (0.011)		0.0157* (0.007)
Business Loan		0.0117 (0.012)		-0.0120 (0.007)
N	49778	49778	31508	31508
Year-month Fixed Effects	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes
Occupation Controls	Yes	Yes	Yes	Yes
Loan Controls	No	Yes	No	Yes

**Table 4 – Robustness - Alternate Measure of Default:** This table presents marginal probability estimates for logistic regression equation 1. We show results for three dependent variables 1 – 29 Days Overdue in columns (1) and (2),  $\geq 30$  Days Overdue in columns (3) and (4), and  $\geq 1$  Day Overdue in columns (5) and (6). These are lender-defined variables used for measuring repayment discipline. All regressions have year-month fixed effects and control for borrower characteristics. Columns (2), (4), and (6) also control for loan terms. Standard errors are clustered at the branch level and are reported in parentheses.

	(1) 1-29 days Overdue	(2) 1-29 days Overdue	(3) $\geq 30$ days Overdue	(4) $\geq 30$ days Overdue	(5) $\geq 1$ day Overdue	(6) $\geq 1$ day Overdue
Treated	0.0139*** (0.004)	0.0116** (0.004)	0.0306*** (0.004)	0.0321*** (0.004)	0.0347*** (0.005)	0.0345*** (0.005)
N	130891	130891	166625	166625	202347	202347
Year-month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes	Yes	Yes
Loan Controls	No	Yes	No	Yes	No	Yes

**Table 5 - Monthly Sub-groups Construction:** To precisely categorize borrowers into the treatment and control groups, we pick sub-samples of borrowers from each group such that they take moratorium in same months, differing only for the month of March 2020. For example, in the “April sub-group”, the treated borrowers took moratorium only in the months of March and April, while the control borrowers took moratorium only in April. Similarly, in the “May subgroup”, the treated borrowers took moratorium only in March, April and May, and the control group borrowers took moratorium only in April and May.

Monthly Sub-group	Treatment			Control		
	Moratorium taken in months	Number of Months	Borrowers	Moratorium taken in months	Number of Months	Borrowers
April	Mar and Apr only	2	1,461	Apr only	1	2,657
May	Mar, Apr, and May only	3	1,510	Apr, and May only	2	4,089
June	Mar, Apr, May, and Jun only	4	419	Apr, May, and Jun only	3	956
July	Mar, Apr, May, Jun, and Jul only	5	348	Apr, May, Jun, and Jul only	4	595
August	Mar, Apr, May, Jun, Jul, and Aug	6	1,074	Apr, May, Jun, Jul, and Aug	5	1,386

**Table 6 - Monthly Sub-groups:** For each sub-group defined in **Table 5**, we run the logistic regression equation 1, and report the marginal probability estimates in this table. Panels A and B document results using Default and NPA as dependent variables respectively. All regressions have year-month fixed effects and control for borrower characteristics. Standard errors are clustered at the branch level and are reported in parentheses.

**Panel A: Default**

	April Subgroup	May Subgroup	June Subgroup	July Subgroup	August Subgroup
Treated	0.0169*** (0.005)	0.0213*** (0.006)	0.0690*** (0.019)	0.0789** (0.026)	0.1775*** (0.020)
N	21111	29141	7309	5280	14027
Year-month Fixed Effects	Yes	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes	Yes
Monthly Subgroup	April	May	June	July	August

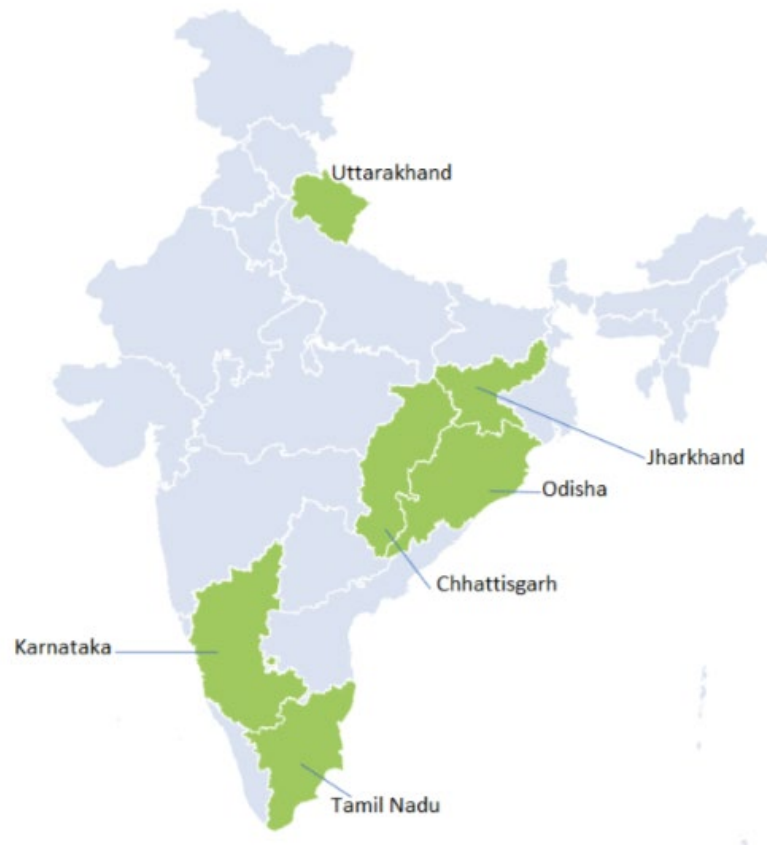
**Panel B: NPA**

	April Subgroup	May Subgroup	June Subgroup	July Subgroup	August Subgroup
Treated	-0.0011 (0.002)	-0.0019 (0.002)	0.0097 (0.007)	0.0159 (0.014)	0.1204*** (0.020)
N	11441	18162	4493	3399	9125
Year-month Fixed Effects	Yes	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes	Yes
Monthly Subgroup	April	May	June	July	August

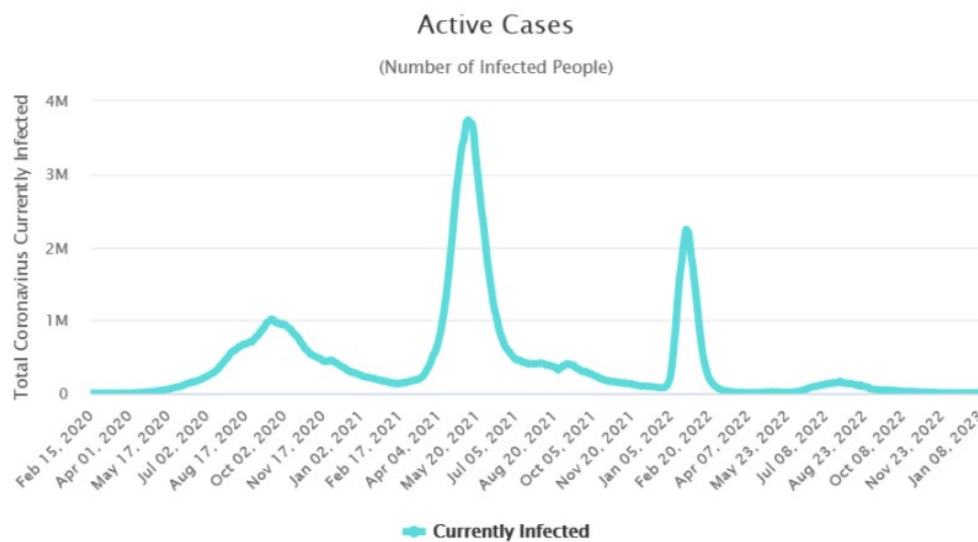
**Table 7 - Loan Types:** In Panel A of this table, we document the marginal probability estimates of logistic regression equation 1 for different types of loans. Columns (1) and (3) have only joint-liability loans; columns (2) and (4) have only individual liability loans. The dependent variable in columns (1) and (2) is Default, and in columns (3) and (4) is NPA. In Panel B, we compare the treatment effects of joint-liability group loans with individual liability loans using regression equation 2 in columns (1) and (3) with the aforementioned dependent variables, respectively. JLG is an indicator variable that equals one if a borrower has borrowed a joint-liability group loan, and zero if the loan has individual liability. Columns (2) and (4) include additional borrower-level control variables like gender, marital status, income, occupation, age. The variable definitions remain the same as described in **Section 3**.

<b>Panel A: Treatment Effect in Subsamples of Loan Types</b>				
	(1)	(2)	(3)	(4)
	Default		NPA	
Treated	0.0643**	0.0536*	0.0243***	0.0564**
	(0.007)	(0.022)	(0.004)	(0.019)
N	92699	2464	58730	1519
Year-month Fixed Effects	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes
Loan Type	JLG	IL	JLG	IL
<b>Panel B: Comparing Treatment Effect of Loan Types</b>				
Treated	0.1670***	0.0911***	0.0711***	0.0436***
	(0.018)	(0.014)	(0.011)	(0.009)
JLG x Treated	-0.0773***	-0.0279	-0.0352***	-0.0195*
	(0.017)	(0.014)	(0.010)	(0.009)
N	95163	95163	60249	60249
Year-month Fixed Effects	Yes	Yes	Yes	Yes
Borrower Controls	No	Yes	No	Yes
Occupation Controls	No	Yes	No	Yes

## Appendix



**Figure A1 - Map of India:** States of India where the lender is active.



**Figure A2 - Covid Case Count:** Covid cases in India as reported on <https://www.worldometers.info/coronavirus/country/india/>



**Table A1 - T-test Matched Sample:** We use the propensity score matching method to find the nearest neighbors of the treatment borrowers in the control group, based on Mahalanobis distance. The table reports the difference between treatment and control groups, where both groups have an equal number of borrowers. We use demographic details of borrowers and loan terms from February 2020 to get the matched sample.

	Treated	Control	Difference	p-Value
<b>Loan Terms</b>				
Log (Loan amount)	10.49	10.49	0.00	0.399
Interest Rate (%)	24.88	24.91	0.03***	0.000
Tenure (Years)	1.87	1.87	-0.00	0.953
Business Loan	0.65	0.65	0.00	1.000
<b>Borrower Characteristics</b>				
Age (Years)	40.24	40.26	0.03	0.874
Individual Income (INR)	98746.86	98811.79	64.92	0.947
Household Income (INR)	364804.31	371137.48	6333.16	0.289
Female	0.99	0.99	-0.00	0.918
Married	0.96	0.96	0.00	1.000
Occupation Agriculture	0.12	0.12	-0.00	0.956
Occupation non-Agriculture	0.82	0.82	0.00	0.982
Occupation Salaried	0.04	0.04	0.00	0.964
Occupation Others	0.03	0.03	0.00	1.000
N	6325	6325		

**Table A2:** Occupation Categories

Occupation Category	Occupation Details
Agriculture	Agri-trading, Farming, Dairy, Goat Rearing, Fishing
Non-agriculture	Driver, Performing Arts, Shop Owner, Small Industry, Tailor, Labour, Migrant Labour, Other Business, Other Professional
Salaried	Government Employee, Private Sector Salaried Employee
Others	Unemployed, Student, House-wife, Retired/Pensioner, Works Abroad, Rental Income, Others

**Table A3 - Occupation Category:** This table documents the marginal probability estimates of logistic regression equation 1 for different types of occupations. The occupation details are described in **Table A2**. The dependent variable in Panel A is Default and Panel B in NPA. The variable definitions remain the same as described in **Section 3**.

	Agriculture	Non-agriculture	Salaried	Others
<b>Panel A: Default</b>				
Treated	0.0591*** (0.011)	0.0651*** (0.007)	0.0701*** (0.018)	0.0458* (0.021)
N	11458	76821	3931	2953
Year-month Fixed Effects	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes
Occupation Category	Agriculture	Non-agriculture	Salaried	Others
<b>Panel B: NPA</b>				
Treated	0.0295*** (0.007)	0.0234*** (0.004)	0.0455** (0.014)	0.0151 (0.015)
N	7189	48554	2486	2020
Year-month Fixed Effects	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes
Occupation Category	Agriculture	Non-agriculture	Salaried	Others

**Table A4 - Occupation Category:** This table presents marginal probability estimates after modifying the logistic regression equation 1 by replacing Treated with Treated  $\times$  Agri, Treated  $\times$  Non-Agri, Treated  $\times$  Salary, and Treated  $\times$  Others. The occupation categories are defined in **Table A2**. We show results for three dependent variables Default in columns (1) and (2), and Non-Performing Asset (NPA) in columns (3) and (4). Variables used in the regression are described in **Section 3**. All regressions have year-month fixed effects and control for borrower characteristics. Columns (2) and (4) also control for loan terms. Standard errors are clustered at the branch level and are reported in parentheses.

	(1)	(2)	(3)	(4)
	Default		NPA	
Agri x Treated	0.0719*** (0.010)	0.0708*** (0.010)	0.0352*** (0.007)	0.0361*** (0.007)
Non-agri x Treated	0.0628*** (0.007)	0.0625*** (0.007)	0.0222*** (0.004)	0.0233*** (0.004)
Salaried x Treated	0.0677*** (0.014)	0.0614*** (0.015)	0.0374*** (0.009)	0.0331*** (0.009)
Others x Treated	0.0591** (0.018)	0.0551** (0.018)	0.0328** (0.012)	0.0315** (0.011)
N	95163	95163	60249	60249
Year-month Fixed Effects	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes
Loan Controls	No	Yes	No	Yes

**Table A5 – Customer Type:** This table presents the marginal probability estimates of logistic regression equation 1 for different types of customers. Columns (1) and (3) have the estimates for new customers who are in their first, second, or third cycle of JLG loan; columns (2) and (4) have the estimates for old customers who are in their fourth or higher cycle of JLG loan. The dependent variable in columns (1) and (2) is Default, and in columns (3) and (4) is NPA

	Default		NPA	
	New JLG Customer	Old JLG Customer	New JLG Customer	Old JLG Customer
Treated	0.0670*** (0.007)	0.0614*** (0.009)	0.0285*** (0.005)	0.0184*** (0.005)
N	59739	32960	37779	20951
Year-month fixed effects	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes