Creditor Rights and Allocative Distortions – Evidence from India

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This paper highlights how stronger creditor rights improve allocative efficiency of credit and capital in the economy. Exploiting a collateral reform in India that strengthened creditor rights, I show that lenders cut credit to riskier borrowers. This is partly driven by a reduction in credit to otherwise insolvent borrowers (zombies). Importantly, credit access improved for non-zombie firms in industries that became decongested due to reductions in credit to zombie firms. As a result, non-zombie firms increased investment. Aggregate productivity of capital improved due to within-firm improvements and reallocation of capital to more productive firms, as well as due to their positive spillovers through the input-output linkages of the decongested industries.

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Keeping subsidized credit flowing to unproductive firms can misallocate resources in the economy (Banerjee and Duflo (2014)) which can have detrimental spillover effects on healthy firms (Caballero, Hoshi and Kashyap (2008)). This phenomenon is observed the world over, arising due to forbearance lending as seen in Japan in the 1990s or due to political economy considerations driving

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lending as seen in India (Rajan (2018)) and China (Li and Ponticelli (2019)). Such financing frictions can also adversely affect capital allocation as seen in Spain, Italy and Portugal (Gopinath et al. (2017)). The problem of continued access to subsidized credit by unproductive firms is more acute in developing economies where contract-enforcement is harder and these problems are compounded by legal procedures that favor debtors over creditors.

Making laws more creditor friendly can thus potentially correct for some of these market imperfections. The law and finance literature, however, finds conflicting evidence of the impact of creditor rights on credit access. On one hand stronger creditor rights, by lowering the cost of credit, can improve credit access to borrowers (La Porta et al. (1998)), but on the other hand it may also worsen credit access (Aghion, Hart and Moore (1992)) by reducing the insurance value of default to borrowers. This paper asks: can stronger creditor rights correct for misallocation of credit by cutting credit to some borrowers, but expanding it for others, thus reallocating credit *across* borrowers? What implications does this have for borrowing and firm investment of healthy borrowers, and in particular, for the allocative efficiency of capital in the economy?

Motivated by the above questions, I exploit a 2002 collateral reform in India that made it easier for secured creditors to seize defaulters' assets by circumventing the previously long judicial process, as a natural experiment, to examine reallocation of debt and subsequently capital across firms. The analysis produces two main findings. First, following the collateral reform, lenders reallocated secured debt away from riskier borrowers. Importantly, this was partly attributable to a reduction in continued financing or "evergreening" of loans to otherwise insolvent borrowers (also referred to as zombie firms). Second, the collateral reform had significant spillover effects on the remaining firms. Healthy non-zombie firms that operated in the newly zombie-decongested industries increased secured debt and capital expenditure. As a result, the productivity of capital in these industries improved as within-firm productivity improved and capital was reallocated to firms with a higher marginal product of capital. Additionally, firms in industries connected to decongested industries through input-output linkages also witnessed an improvement in productivity.

This paper moves beyond examining the partial equilibrium effects of stronger creditor rights and better credit access to certain set of borrowers. The results instead highlight that stronger creditor rights can generate general equilibrium effects and reallocate debt and capital, improving the overall productive efficiency in the economy.

India provides a natural setting to study the above questions. The macro-development literature finds frictions prevent optimal allocation of resources, especially in developing countries such as India and China (Hsieh and Klenow (2009)). This particular collateral reform is interesting to study because the rhetoric at the time focused on the slowdown in secured credit growth following the reform (Chakravarty (2003)) which is puzzling because India is not a creditor-friendly country to begin with.

In the baseline specification, I want to analyze the impact of the collateral reform on riskier borrowers relative to safer borrowers. Firms are divided into low- and high-quality borrowers based on their riskiness, that is, their ability to service existing debt based on their interest coverage ratio. I defer the details on exact definitions to Section II. This difference-in-difference (DD) estimate is biased because relative differences between low- and high-quality borrowers could simply reflect differences in broader economic trends between the two groups. Using the tangibility of assets as a measure of collateralizability, I instead set up a triple difference (DDD) specification.The DDD estimate then compares the double difference between low- and high-quality firms for the treated group (high-tangibility firms), with the same estimate for the control group (low-tangibility firms). The key exogeneity assumption is that the low-tangibility firms provide an unbiased benchmark for the DD estimate in the absence of a collateral reform.

The first set of results shows that secured borrowing of low-quality borrowers relative to high-quality borrowers (using the DDD specification) declined by INR 39 million representing a 75 percent decline relative to the pre-period. Interest rates of low-quality borrowers also increased by 72 basis points post reform, plausibly because the threat of liquidation allowed lenders to adjust pricing to reflect true borrower quality. While one could argue that the effects on the quantity of loans is driven by low-quality borrowers preemptively cutting back on borrowing due to the threat of liquidation (Hart and Moore (1999) and Vig (2007)), it would predict a *decline* in interest rates as the low-quality firms leave the pool of borrowers. Our results instead point to lenders increasing interest rates of the bad borrowers, possibly reflecting their true riskiness.

Building on the above finding, I further hypothesize that the threat of liquidation allows lenders to stop extending subsidized credit (or "evergreening loans") to borrowers who (inefficiently) had cheaper access to credit prior to the reform. Following Caballero, Hoshi and Kashyap (2008), I define zombies as unprofitable firms who borrow at interest rates below the minimum prime lending rate. Zombie firms reduced secured borrowing by an average of INR 35 million (62 percent decline). Firms were 13 percent more likely to transition to non-zombie status post reform, reflecting lenders' reduced incentive to evergreen loans. Lenders may have been more likely to evergreen loans prior to the reform due to the higher risk-capital and provisioning requirements for non-performing assets.[1] Facing a cut in secured debt, low-quality firms cut capital expenditure by 65 percent.

The second set of results show that there are distributional and contagious spillover effects of the reform on borrowing and investment of the healthy non-zombie firms.[2] Post reform, the fraction of zombies declined in industries most affected by the reform, that is, the industries with higher tangibility. Using the average tangibility at the industry-level as the treatment, I show that secured borrowing of non-zombies in these industries increased by INR 39 million (62 percent). Capital expenditure of these firms also increased by INR 34 million (39 percent).

Subsidized credit in the form of zombie lending can also have adverse effects on overall productivity of capital. Assuming firms equate marginal product of capital and interest rate, the marginal product of capital of the firms which access subsidized credit would be lower than the marginal product of the firms that access credit at higher cost. Reducing inefficient access to cheap credit in the form of zombie-lending should improve capital productivity of firms. Consistent with this intuition, productivity of capital improved in industries most affected by the reform. In addition, capital was also reallocated to firms with higher marginal productivity of capital in these industries. Within-firm productivity gains accounted for 69 percent of overall gains and reallocation of capital accounted for the remaining 31 percent.

These productivity improvements can also propagate through intersectoral input-output linkages, amplifying the aggregate effects of the reform (Gabaix (2011)).

[1]The provisioning requirement just prior to the reform in 2001 for sub-standard assets was 10 percent as opposed to a mere 0.25 percent for standard assets.

[2]The analysis is similar in spirit to Caballero, Hoshi and Kashyap (2008) who find the presence of zombies depressed investment and employment of non-zombies in zombie-dominated industries.

I find that productivity improved for industries whose upstream industries were connected to the treated industries through input-output linkages. However, effects are muted for industries whose downstream industries are treated, consistent with Liu (2018) who finds that targeting upstream industries has greater aggregate impact.

Finally, I show evidence for the collateral channel as the mechanism driving the credit reallocation. Lenders with higher exposure to low-quality firms prior to the reform were able to free up capital tied to unprofitable borrowers and reallocate it to more productive firms. Credit access did not increase for industries connected through input-output linkages to the treated industries. While the productivity of the connected industries improved, lenders' ability to seize collateral did not. Consistent with the collateral channel, lenders did not merely increase credit to more productive firms but only to firms whose collateral they had access to.

My paper relates to two distinct branches of literature. The first is the law and finance literature focusing on the impact of creditor rights on credit access (Levine (1998), Lilienfeld-Toal, Mookherjee and Visaria (2012)), economic development (Banerjee and Duflo (2005)), corporate policies (Acharya, Amihud and Litov (2011)), and agency problems (Jensen and Meckling (1976)). The paper also relates to the macro-development literature on the misallocation of resources (Hsieh and Klenow (2009) and Restuccia and Rogerson (2008)), specifically due to financial frictions (Buera, Kaboski and Shin (2011), Moll (2014) and Midrigan and Xu (2014)). This paper is closely related to Li and Ponticelli (2019) who also find reductions in zombie-lending due to the introduction of specialized courts with limited political influence. Their effects arise from a decline in lending to state-owned firms. My paper, instead, applies more broadly to all firms (and not just state-owned firms) and emphasizes that creditor rights can lower zombie-lending and have important spillover effects on the remaining healthy firms in the economy.

To sum, this paper highlights that stronger creditor rights can correct for existing market imperfections by reallocating credit and cutting inefficient subsidized credit to zombie firms. Importantly, I document large spillover effects on healthy firms leading to aggregate improvements in productivity of capital.

The paper is organized as follows. Section I and section II describe the institutional details and data. Section III, Section IV and Section V look at the direct effects, distributional and spillover effects and the impact of the reform on capital productivity. Section VI provides evidence for the mechanism and Section VII concludes.

I. Institutional Details and the collateral reform

Historically, enforcement of creditor rights in India has been accompanied by significant judicial delays. In 1993, the government introduced Debt Recovery Tribunals (DRTs) based on the recommendations of the Narasimham Committee I. These were quasi-legal institutions that streamlined the legal procedure and were meant to allow speedy adjudication and swift execution of judgements (see Visaria (2009)). Due to inadequate infrastructure and shortage of recovery personnel, however, the DRTs too soon got clogged with excessive cases and ended up being ineffective. Additionally, defaulters found ways to stall the process, such as simultaneously filing at the Board for Industrial and Financial Reconstruction (BIFR) meant for insolvent firms as a way to delay legal actions by creditors. The BIFR adjudicates cases between creditors and delinquent but bankrupt firms. Thus, delinquent borrowers despite being able to repay their debts, could strategically delay the DRT process by simultaneously filing at the BIFR.

Hence, based on the recommendations of the Narasimham Committee II and the Andhyarujina Committee, the government enacted the Securitization and Reconstruction of Financial Assets and Enforcement of Security Interests Act of 2002 (SARFAESI). This collateral reform allowed secured creditors to recover their non-performing assets by taking possession, managing and selling the securities *without* the intervention of a court or tribunal. Secured creditors could thus circumvent the lengthy judicial process and seize the assets securing the loan. Both pre-existing contracts as well as new contracts were covered. Although the reform only applied to banks and financial institutions and not to non-banking financial companies (NBFCs), it did not stop these institutions from seizing assets of firms under the reform. After a long legal battle, the supreme court clarified that NBFCs could not seize collateral under the SARFAESI. [3]

To start the process, a secured creditor files a notice on a loan classified as a non-performing asset (NPA). If the loan is not repaid within 60 days from the date of notice, the creditor can take possession of the secured assets. Initially, borrowers had no rights to appeal but upon subsequent reinterpretation of the law, borrowers were allowed to file appeals.

The reform had a significant immediate impact. As per the Reserve Bank of India (RBI)[4], the reform allowed banks to recover around INR 5 billion by June 2003, within a year of the reform. The accretion to NPAs also declined drastically following the enactment of the reform. Figure 1, panel A shows the accretion to NPAs and the ratio of the accretion to NPAs to gross advances. During 2002–03,

[3] See http://www.phoenixlegal.in/wp-content/uploads/2016/05/Newsletter-July-2015-NBFC-loan-not-under-SARFAESI.pdf. More recently, since 2016 certain NBFCs are also covered under the SARFAESI (https://economictimes.indiatimes.com/news/economy/policy/nbfcs-allowed-to-use-sarfaesi-for-cases-above-rs-1-crore/articleshow/53739430.cms?from=mdr.

[4] Seehttps://rbidocs.rbi.org.in/rdocs/Publications/PDFs/40092.pdf

reductions outpaced NPA additions with an overall reduction of NPAs from 14.0 percent of gross advances in 1999-2000 to 9.4 percent in 2002-2003. Further, since the reform allowed secured creditors to bypass the judicial court, it fixed one important loophole through which defaulters could delay the judicial process, namely by filing at the BIFR. Figure A1 shows that the number of cases filed under BIFR fell drastically post reform. Figure 1, panel B shows that the post reform there was a decline in distressed borrowers (those with interest coverage less than one)[5], as well as a decline in unprofitable borrowers. At least in the aggregate, the collateral reform seems to have had potentially a significant and immediate impact on the credit culture in the India.

II. Data

Financial data is primarily from ProwessDx, maintained by Centre for Monitoring Indian Economy (CMIE). Data pertains to annual financial statement data of Indian firms. Due to reporting requirements, coverage of listed firms is comprehensive but limited for unlisted firms. I focus on data between April 01, 1997 to March 31, 2007 from the March 2016 vintage. Project-wise data is from CapExDx (CMIE) and it tracks projects from their announcement through their implementation and final closure. Supplementary data on employment is from the Annual Survey of Industries (ASI). For further details on data construction, refer to the data appendix in Section A1.

Low- and high-quality borrowers are defined based on their ability to service their debt. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. ICR is the ratio of earnings before interest and taxes to total interest expense.

[5] Interest coverage ratio (ICR) is the ratio of profits (EBITDA) to interest expense and measures whether a firm is able to cover its debt expenses.

To classify zombie firms, I build on the definition in Caballero, Hoshi and Kashyap (2008). A zombie is defined as a firm that receives subsidized credit, that is, it satisfies all the following conditions: (i) interest rate of the firm is below the minimum prime lending rate, (ii) interest coverage ratio (ICR) is less than 1, (iii) leverage (total external debt to total assets) is greater than 0.20, and (iv) change in debt is greater than zero. Further details on the choice of cutoffs is provided in the data appendix in Section A1.

A few comments are in order regarding the use of debt-based cutoffs to measure low-quality and zombie firms. As Caballero, Hoshi and Kashyap (2008) also argue, this strategy permits evaluation of the effect of zombies on the economy. If instead we were to define zombie or low-quality borrowers based on their profitability or productivity characteristics, then by definition industries dominated by zombie firms would have low profitability. To avoid hard-coding this into the definition of low-quality and zombie firms, I focus on debt-based definitions in the analysis. Section A2 shows results are robust to using alternate definitions.

Table 1 shows the summary statistics of the variables used in our analysis. The mean and standard deviation are shown. In Panel A, I separate firms into low- and high-quality for the pre and post period. Panel A shows the data for all the 6,927 firms used in this analysis. The data is for 52,152 firm-year observations. There are 3,371 listed firms (roughly 50 percent). Of the 6,927 firms, 2,267 (33 percent) firms are classified as low-quality borrowers and the remaining 4,660 firms are classified as high-quality borrowers. The table shows that there are 16,457 firm-year observations for low-quality borrower data and 35,695 firms for high-quality borrower data. Panel B shows the summary statistics for zombie firms (8,791 firm-year observations for 1,073 firms) and non-zombie firms (43,361 firm-year observations for 5,239 firms) pre and post reform.

III. Direct effect on firms

A. *Empirical strategy*

This section examines the direct effect of the collateral reform on low- and high-quality borrowers. The structural relationship of interest is the effect of the collateral reform on low-quality borrowers relative to high-quality borrowers:

$$y_{it} = \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post,t} \times \mathbb{1}_{Low-Quality,i} + \varepsilon_{it} \tag{1}$$

where i indexes firms and t indexes time. α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post,t} = 1$ for years when the reform is in effect ($>=$ 2002). Firms are split into low-quality ($\mathbb{1}_{Low-Quality,i} = 1$) and high-quality ($\mathbb{1}_{Low-Quality,i} = 0$) prior to the reform as described in Section II. We are interested in the interaction term $\mathbb{1}_{Post,t} \times \mathbb{1}_{Low-Quality,i}$. The uninteracted terms ($\mathbb{1}_{Low-Quality,i} = 1$ and $\mathbb{1}_{Post,t} = 1$) are absorbed by the the firm and year fixed effects. In the baseline, y_{it} is the change in secured borrowing between $t-1$ and t. The main real outcome variable of interest is the capital expenditure between $t-1$ and t. For completeness, in the appendix I also look at change in employment between $t-1$ and t.

The coefficient of interest is η which measures the difference, conditional on controls, in outcome y between low- and high-quality borrowers after the collateral reform relative to before the reform and is analogous to a difference-in-difference (DD) estimate. The OLS estimate for η is unbiased if $\mathbb{1}_{Post,t} \times \mathbb{1}_{Low-Quality,i}$ is orthogonal to ε_{it}.

While the DD estimate removes any time-varying trends that affect *both* low- and high-quality firms simultaneously, it does not account for any factors that differentially impact low- and high-quality borrowers indicating that the estimate for η could be biased. The DD estimate could also be biased if low- and high-quality borrowers were on different time trends, say, due to a different growth and investment trend prior to the reform and thus the η estimates could be picking up these differences in the growth trajectory. To see whether the low- and high-quality firms were on similar time trends prior to the reform — also known as the parallel trends assumption — I estimate a year-by-year specification and present the results as event study plots.

$$y_{it} = \alpha_i + \gamma_t + \sum_{\tau} \eta_\tau \times (\mathbb{1}_\tau \times \mathbb{1}_{Low-Quality,i}) + \varepsilon_{ijt} \tag{2}$$

where τ ranges from 1997 to 2007, $\mathbb{1}_\tau = 1$ if year is τ and η_τ is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year the reform is announced, and all coefficients are normalized relative to $\tau = -1$. Robust standard errors are clustered at the firm level. The coefficient of interest, η_τ, measures the difference, conditional on controls, in outcome y between low- and high-quality borrowers τ years after the reform.

Figure A2 in the appendix tests for this parallel trends assumption in the DD specification where the dependent variable is change in secured borrowing (panel a) and capital expenditure (panel b). We observe from the graphs that there is a pre-trend for capital expenditure prior to the reform and that the null hypothesis of parallel trends can be rejected.

Since the parallel trends assumption for the DD specification can be rejected, I construct a triple difference strategy. Since only tangible assets can effectively be collateralized in India, I use the cross-sectional variation in tangibility to generate variation in the treatment intensity at the firm-level. The empirical specification is:

$$y_{ijt} = \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post,t} \times \mathbb{1}_{Low-Quality,i} + \nu \times \mathbb{1}_{Post,t} \times \mathbb{1}_{High-Tangibility,i}$$
$$+\phi \times \mathbb{1}_{Post,t} \times \mathbb{1}_{Low-Quality,i} \times \mathbb{1}_{High-Tangibility,i} + \varepsilon_{it} \tag{3}$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. Firms are split into high-tangibility ($\mathbb{1}_{High-Tangibility,i} = 1$) and low-tangibility ($\mathbb{1}_{High-Tangibility,i} = 1$) prior to the reform. Standard errors are clustered at the firm level. More robust specifications also control for firm-level time varying measures of firm profitability and sales and also include industry-year fixed effects.

The estimate of interest, ϕ, compares the differential effect — between low- and high-quality borrowers — of the collateral reform on the treated group (high-tangibility) firms relative to the control group (low-tangibility firms). The rationale for this specification is that the DD estimate with just the low- and high-quality borrowers does not take into account the non-reform factors that differentially affected the low-quality borrowers relative to high-quality borrowers. However, the firms with low-tangibility of assets were not affected (or affected to a lesser extent) by the reform. So the DD estimate for the low- and high-quality firms with *low-tangibility* provides an estimate of the non-reform factors that differentially affected low-quality borrowers. Subtracting the second DD estimate from the first DD estimate, the DDD estimate, therefore accounts for these endogeneities. The key exogeneity assumption is that the low-tangibility firms provide an unbiased benchmark of how the low-quality and high-quality borrowers would have differed had there been no collateral reform.

To facilitate transparent examination of parallel trends assumption in the DDD specification, I plot the coefficients of the DDD specification over time (ϕ_τ) below in event study plots.

$$
\begin{aligned}
y_{ijt} = \alpha_i + \gamma_t + \sum_\tau \eta_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Low-Quality,i} + \sum_\tau \nu_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{High-Tangibility,i} \\
+ \sum_\tau \phi_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Low-Quality,i} \times \mathbb{1}_{High-Tangibility,i} + \varepsilon_{ijt}
\end{aligned} \tag{4}
$$

where τ ranges from 1997 to 2007, $\mathbb{1}_\tau = 1$ if year is τ and η_τ is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year the reform was announced, and all coefficients are normalized relative to $\tau = -1$. Robust standard errors are clustered at the firm level. The dependent variable is the outcome of interest. The coefficient of interest is ϕ_τ, measures the difference (conditional on controls) in outcome y between low- and high-quality borrowers for the treatment group (high-tangibility firms) relative to the control group τ years after the reform.

To determine whether the above effects are driven by by zombie lending motives, I split firms into zombie firms based on whether they were receiving subsidized credit prior to the reform. The empirical specification is:

$$
\begin{aligned}
y_{it} = \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post,t} \times \mathbb{1}_{Zombie,i} + \nu \times \mathbb{1}_{Post,t} \times \mathbb{1}_{High-Tangibility,i} \\
+ \phi \times \mathbb{1}_{Post,t} \times \mathbb{1}_{Zombie,i} \times \mathbb{1}_{High-Tangibility,i} + \beta \times X_{it} + \varepsilon_{it}
\end{aligned} \tag{5}
$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Zombie,i} = 1$ for zombie firms as defined in Section II. Other terms are as defined before. ϕ is the coefficient estimate of interest and compares the outcome variable, y_{it} of zombie firms relative to non-zombie firms in the treated group (high-tangibility firms) relative to the control group (low-tangibility) firms. Standard errors are clustered at the firm level.

B. Impact on firm borrowing

First, I examine the direct effect of the collateral reform on secured borrowing (a flow variable, defined as the year to year change in secured debt). A positive value depicts an increase in the stock of secured debt and a negative value depicts a decline in the stock of secured debt. The summary statistics in Table 1 show secured borrowing of low-quality borrowers declined from INR 52 milllion in the pre-reform period to INR 38 million post reform period. This is striking since a strengthening of creditor rights led to a reduction in secured borrowing of these firms. In contrast secured borrowing of high-quality borrowers increased from INR 31 million to INR 56 million consistent with stronger creditor rights leading to better credit access. More formal estimates using regression specifications are consistent with these trends. Table A2, column 1 estimates that secured borrowing of the sub-sample of low-quality firms declined by INR 20 million (38 percent) but increased by INR 18 million for the sub-sample of high-quality borrowers (column 2). The DD estimate from Equation 1 is a relative decline of INR 40 million for low-quality borrowers compared to high-quality borrowers (column 4).

As discussed above, the parallel trends assumption can be rejected in the DD specification and hence we prefer the DDD estimate. Figure 2 plots the coefficients from the specification in Equation 2 for high- and low-tangibility firms. All coefficients are normalized relative to 2001, the year before the reform was enacted. Bars shows the 95 percent confidence intervals. Secured borrowing of low-quality borrowers relative to high-quality borrowers declined for high-tangibility firms (treated group shown in red in Panel (a)), but the effect was muted for the low-tangibility firms (control group shown in blue in Panel (b)).

Prior to the reform both the treated and control groups were on similar trajectories. Panel (b) shows the dynamics of the DDD specification using Equation 4 and allows for a more transparent examination of the parallel trends assumption in the DDD specification. We see that the parallel trends assumption in the DDD specification cannot be rejected.

Table 2 presents estimates from Equation 3. Column 1 documents that secured borrowing of low-quality borrowers fell by INR 39 million (DDD estimate). This represents a 76 percent decline relative to the pre-reform average of INR 51.74 million. On adding industry-year fixed effects and time-varying firm-level controls, we estimate a similar decline of INR 37 million. Section A2 shows that these results are robust to a number of different specifications. The effects persist across different subsets of borrowers (Figure A4b) but is stronger for manufacturing firms, older firms and listed firms. Estimates are remarkably robust to using alternate definitions of quality based on profitability and investment opportunity and across different specifications (Table A3). The effects also also externally valid and effects are similar during the earlier implementation of the DRTs which strengthened legal enforcement by reducing judicial delay (Table A4).

While both low- and high-quality borrowers saw a relatively small increase in unsecured borrowing of INR 3.2 million likely reflecting common macroeconomic trends (Table 1), more formal DDD estimates show no significant impact on unsecured borrowing (columns 3 and 4 in Table 2). Interest rates increased by 70 basis points for low-quality borrowers relative to the high-quality borrowers for the treated group, that is, high-tangibility firms (column 6, Table 2).[6]

At face value, the results on quantity of secured borrowing would be consistent with a demand-driven story wherein borrowers preemptively cutback on debt

[6]Results are significant only at the 10 percent level due to measurement error. Interest rates are calculated from annual financial statements and are hence noisy.

since they fear premature liquidation post collateral reform. As Vig (2007) notes, this would predict that borrowers switch into unsecured borrowing which is not covered by the reform. Our results, however, show that unsecured debt does not increase. This is consistent with the hypothesis that the reform empowered banks to seize collateral and discontinue lending to poor quality distressed firms. It is unlikely that banks would be willing to lend unsecured debt to low-quality borrowers given their low credit-worthiness. Of course, one can argue that unsecured lending is not well-developed in India (it stood at only 6.2 percent of secured lending) and hence firms are not able to seamless switch.

The increase in interest rates for the low-quality borrowers post reform provide another piece of evidence consistent with my credit reallocation hypothesis. In contrast, the liquidation bias hypothesis would predict an increase in interest rates that as risky firms leave the pool of borrowers. Results are consistent with a supply-side credit reallocation hypothesis wherein creditors are able to increase interest rates post reform for riskier borrowers. In the next section, I push further on this idea and see whether a cut in inefficient subsidised lending is driving these results.

C. Impact on zombie borrowing

Can the drop in borrowing be attributed to a reduction in evergreening of loans by banks? I hypothesize that prior to the reform, in a weak creditor rights regime, lenders had no other recourse and hence continued refinancing or rolling-over bad loans. Lenders may also be more likely to evergreen given the higher provisioning and risk-capital requirements for non-performing loans. Post reform, the access to the collateral underlying loans increased and banks no longer needed to continue evergreening loans. The reduction in zombie lending is further expanding on the idea that poorer quality borrowers witnessed an increase in their interest rates. Specifically, here we capture the idea of whether there was a reduction in firms that received loans at *sub-optimally* lower interest rates post the reform.

Post reform, the fraction of zombie firms fell from 5.5 percent in 2002 to 3.5 percent (Figure 5, panel (a)). Restricting zombie definition to firm which had non-zero secured lending prior to the reform yields similar trends. Asset-weighted fraction of zombies fell from 6.5 percent to 3 percent post reform (panel (b). Table 1 Panel B shows that secured borrowing declined for zombie firms, but increased for non-zombie firms. Similarly, the more robust specification in column 1 of Table A2 shows secured debt of zombie borrowers declined by INR 28 million compared to an increase of INR 20 million for non-zombie firms. The DD estimate shows secured borrowing of zombies relative to non-zombies increased by INR 40 million (column 4).

The preferred DDD estimate in Table 3 shows that the secured borrowing of zombies declined by INR 37 million compared to an average of INR 62 million pre-reform representing a 60 percent decline (column 1). Adding industry-year fixed effects and time-varying firm level controls, yields a similar estimate of INR 38 million. Figure A4, panel (a) allows us to examine the parallel trends assumption of this DDD estimate and we see that the parallel trends assumption cannot be rejected.

Now I answer the question: were zombies more likely to transition to non-zombie status post reform? I track the zombie status of each firm prior to the reform and compare it to the zombie status post-reform. I examine the probability of a firm transitioning to zombie status in a linear probability model. A firm that was classified as a zombie pre-reform, was 13 percent less likely to be classified as zombie post-reform (Table 3, column 3). Note, the number of observations in column 3 differs from 1-2 because we collapse the observations to pre and post reform period. The threat of liquidation post reform possibly allowed creditors to stop extending loans at terms more favorable than the high rated borrowers, explaining this transition from zombie to non-zombie status.

D. Impact on capital expenditure

Table 4, columns 1-2 estimate that the reform led to a relative decline in capital expenditure by INR 37 (62 percent decline). This decline is driven by zombie firms (columns 3–4). Capital expenditure of zombies relative to non-zombies for the treated group declined by INR 41 representing a 57 percent decline relative to the pre-period average.

Panel (b) in Figure 3 and Figure A4 confirm the parallel trend assumptions for the specifications in Equation 3 and Equation 5 cannot be rejected.

A subset of the firms (1,288) have data on individual projects for each firm. I spilt the projects into core and non-core project based on whether the project industry code matches the industry code for the company. Table A5 then examines the completion of core and non-core projects using our DDD specification, except we now examine projects within-firms. Columns 1 and 2 show that low-quality borrowers were 6.7 percent less likely to complete non-core. For zombie firms, core projects were 47 percent more likely to be completed. Point estimate are noisy and results are far from definitive (column 1 and column 4), due to the limited number of firms for which data is available.[7] Nonetheless, this project-wise analysis gives some insight into where the within-firm improvements (that we document later) in productivity are coming from. Ersahin, Irani and Le (2016)

[7]As Section A1 discusses, the project data is by CMIE through surveys and from news articles. The data is not based on regulatory data and hence is not updated frequently, at least for the period we study. Coverage has improved over the years, but for the period under consideration the data quality issue is a problem.

show that creditors can force firms which violate their loan covenants to refocus their operations. Consistent with this, the threat of liquidation plausibly forces low-quality borrowers to cut their non-core investments, thus helping firms streamline their operations.

For completeness I also examine labor outcomes in Table A6. There is no significant effect on employment using CMIE data (columns 1–2). Because CMIE poorly captures employment data, I repeat the analysis using ASI data (columns 5–6) with the caveat that this pertains only to the manufacturing firms. $\Delta Employment$ declined by 7 employees relative to a pre-period average of 0.089 consistent with my results. Because of data quality issues and since capital is directly tied to collateral, I focus mainly on the impact of the reform on investment and subsequently productivity of capital.

IV. Distributional and spillover effects

Having established the significant direct effects of the reform, I now turn to the distributional and spillover effects on healthy firms. Prior to the reform, higher lending to the existing distressed zombie borrowers may have crowded out credit to more productive creditworthy firms operating in these industries. Zombie lending could also impact healthy firms by keeping distressed borrowers artificially alive, congesting the industries they operate in, for example, by letting these unproductive firms hang onto capital which may be more productive if deployed elsewhere. In this section, I examine the spillover effects on credit and investment post reform especially in industries that witnessed the greatest reduction in zombies.

A. Empirical Specification

To examine spillover effects, I start with the specification in Caballero, Hoshi and Kashyap (2008) who examine the impact on investment and borrowing of firms in industries that witnessed the greatest zombie-decongestion. To get an industry level variation in the treatment of the reform, I exploit industry-level variation in tangibility of assets of firms. Building on the identification strategy in the previous section, I classify industries as high-tangibility industries if they have above median average tangibility before the reform (in 2001). Figure 6 justifies the use of this high-tangibility measure as the treatment at the industry-level. We see from the figure that post reform, the fraction of zombies declined most in sectors with higher average tangibility.

The regression specification is:

$$\begin{aligned} y_{ijt} = {} & \alpha_i + \gamma_t + \beta_1 \times \mathbb{1}_{High-Industry\,Tangibility,j} \times \mathbb{1}_{Post,t} + \beta_2 \times \mathbb{1}_{Non-Zombie,i} \times \mathbb{1}_{Post,t} \\ & + \beta_3 \times \mathbb{1}_{Non-Zombie,i} \times \mathbb{1}_{High-Industry\,Tangibility,j} \times \mathbb{1}_{Post,t} + \beta \times X_{it} + \varepsilon_{ijt} \end{aligned} \tag{6}$$

where i indexes firms, t indexes time and j indexes industry. α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post,t}$, $\mathbb{1}_{Non-Zombie,i}$ and $\mathbb{1}_{High-Industry\,Tangibility,j}$ are indicators for the post period, for whether a firm is classified as a non-zombie and for whether the firms is in a high-tangibility industry. Standard errors are clustered at the firm level.

The coefficient of interest is β_3 and compares the relative difference in zombie versus non-zombie firms in the treated industries (high-tangibility industries) compared to the same relative difference in the control industries (low-tangibility industries). The identification strategy for this DDD estimate builds on the idea that since only tangible assets can be collateralized, industries where average tangibility of firms was higher were treated to a greater extent. The DDD estimate looks at the effect on healthy non-zombie firms in industries that witnessed the highest reduction in fraction of zombies. While Caballero, Hoshi and Kashyap (2008) look at simple reduced form estimates, I am also able to exploit the cross-sectional variation in tangibility at the industry-level to get variation in the treatment intensity at the industry-level.

B. Results

We now turn to the estimates using this industry-level treatment. Table 5 reports estimates from equation 6. Non-zombies (relative to zombie firms) in the treated industries increased secured borrowing by an average of INR 34 million (column 1), representing a 55 percent average increase. Point estimates are similar (INR 36 million increase) on adding time-varying firm level controls and industry-year fixed effects. Figure 4, Panel A shows that the parallel trends assumption in the DDD specification cannot be rejected.

The result on secured borrowing emphasizes that not only do higher creditor rights allow lenders to seize assets — or at least threaten to seize assets — as we saw in Section III, but they also allow creditors to free up capital and increase lending to other, more qualified healthy non-zombie borrowers. In contrast to the law and finance literature which has emphasized greater credit access to certain sets of borrowers, these results show that an improvement in creditor rights allows credit to be allocated away from worse (zombies) to better (non-zombies) borrowers.[8]

Columns 3 and 4 in Table 5 show that post reform, non-zombies in treated industries also increased capital expenditure by INR 31 million, representing a 44

[8]As before, we do not find that the reform had an impact on unsecured debt and there were no spillover effects on unsecured debt. Results are available upon request.

percent increase. Adding firm-level time-varying controls and industry-year fixed effects yields a similar point estimate of INR 40 million increase. The correction in misallocation of loan supply due to a reduction in zombie lending, possibly helped the real economic growth of non-zombie borrowers. Figure 4, Panel B shows evidence for the parallel trends assumption implicit in this regression.

For completeness, I also examine labor outcomes. Non-zombies witnessed an addition of 7 employeees per year relative to an average decline of 5 employees prior to the reform (Table A6, columns 7 and 8 using ASI data). As before, estimates using CMIE are noisy due to data quality issues (Table A6, columns 3 and 4).

Overall, the findings in this section relate to two separate effects in the creative destruction literature (Caballero and Hammour (1998), Caballero and Hammour (2001), and Caballero, Hoshi and Kashyap (2008)): "sclerosis" and "scrambling". Sclerosis refers to the preservation of inefficient firms that would otherwise have not survived prior to the reform, possibly due to evergreening of loans or simply arising from an inability of creditors to force firms to streamline their operations. Scrambling refers to the survival of less productive firms which keeps creditors from allocating resources to more productive firms. When the impediments to creative destruction — in my setting, the inability to quickly liquidate by lenders — are removed both sclerosis and scrambling decline and hence credit *and* capital gets allocated.

Prior literature has identified two separate hypothesis to explain the decline in credit for some borrowers when creditor rights strengthen: (i) the inelastic supply hypothesis, and (ii) the insurance channel hypotheis. Lilienfeld-Toal, Mookherjee and Visaria (2012) argue that with inelastic supply, poorer borrowers may see a decline in credit access because interest rates rise post reform due to a higher overall demand for credit. Under the insurance channel (Gropp, Scholz and White (1997)), in a weak creditor rights regime, the courts protect the borrower which provides insurance value for borrowers. The emphasis of the above two hypothesis is on the unintended consequences of perhaps *excessive* creditor rights. The hypothesis in this paper is distinct. Contrary to the above, my hypothesis focuses on the it redistribution of credit from low-quality to high-quality borrowers, driven by a decline in zombie lending which has different welfare implications. This has the consequence of reallocating debt and capital from inefficient units potentially leading to overall improvement in productivity, which we turn to next.

V. Implications for the marginal productivity of capital

A. Aggregate productivity implications

After analyzing the link between credit and capital expenditure, I turn to the productivity implications for capital. First, to examine the impact on marginal productivity of firms before and after the reform, I run the followings specification:

$$Ln(MPK_{ijt}) = \alpha_i + \gamma_t + \beta \times \mathbb{1}_{High-Industry\,Tangibility,j} \times \mathbb{1}_{Post,t} + \varepsilon_{ijt} \tag{7}$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{High-Industry\,Tangibility,j}$ and $\mathbb{1}_{Post,t}$ are indicators for high-tangibility industries and the post period. Standard errors are clustered at the firm level. The outcome variable of interest if the log of the marginal product of capital calculated as log of the ratio of sales to capital. Bai, Carvalho and Philips (2018) motivate this as a measure of marginal productivity of capital using a Cobb-Douglas utility function. The coefficient of interest is β_3 which measures the impact of the reform on the average marginal productivity of the treated industries (high-tangibility industries).

To examine reallocation effects, I examine whether the share of capital allocated to productive firms changed post reform. I run the followings specification:.

$$\begin{aligned} Ln\left(\Delta Capital\,Share_{ijt}\right) &= \alpha_i + \gamma_t + \beta_0 \times Ln(MPK_{ijt}) \\ +\beta_1 \times \mathbb{1}_{Post,t} \times MPK_{ijt} &+ \beta_2 \times \mathbb{1}_{High-Industry\,Tangibility,j} \times Ln(MPK_{ijt}) \\ &+\beta_3 \times \mathbb{1}_{High-Industry\,Tangibility,j} \times Ln(MPK_{ijt}) \times \mathbb{1}_{Post,t} + \varepsilon_{ijt} \end{aligned} \tag{8}$$

where i indexes firms, t indexes time, j indexes the industry in which the firm operates. β_3 is the estimate of interest capturing the sensitivity of capital reallocation to the marginal product of capital post reform relative to the pre-reform period in the treated (high-tangibility) industries.

B. *Productivity spillovers on connected industries*

I then link the spillover effects on the productivity of firms linked to the treated markets through input-output linkages. For industries linked upstream to treated industries, I calculate the exposure of each industry to treated industries in their upstream markets measured as:

$$Exposure_{UP,j} = \sum_i Upstream\,Weight_i \times \mathbb{1}_{High-Industry\,Tangibility,i} \tag{9}$$

where j indexes industry. $Upstream\,Weight_i$ is the upstream coefficient from the industry input-output matrix as discussed in Section II. It measures what proportion of the sales of an industry come from upstream industries that are treated (high-tangibility industries). I also standardize the exposure variables so that a unit increase corresponds to a one standard-deviation higher exposure to the treated industries in the input (upstream) industries. $Exposure_{DOWN,j}$ is analogously defined with the weights replaced with the weights replaced using the downstream industry (output) weights.

To see the impact on firms in industries whose upstream industries were impacted by the reform, I run the specifications in Equation 7and Equation 8 except I replace $\mathbb{1}_{High-Industry Tangibility,j}$ with the exposure measures. Additionally, to capture *only* the spillover effects of the reform I exclude the high-tangibility firms from these regressions.

To measure the spillover on average productivity of industries whose upstream (input industries) were treated, I run the following specification:

$$Ln(MPK_{ijt}) = \alpha_i + \gamma_t + \beta \times Exposure_{UP,j} \times \mathbb{1}_{Post,t} + \varepsilon_{ijt} \tag{10}$$

where i indexes firms, t indexes time, j indexes the industry in which the firm operates. α_i and γ_t are firm and year fixed effects. Standard errors are clustered at the firm level. The outcome variable of interest if the log of the marginal product of capital calculated as log of the ratio of sales to capital. The coefficient of interest is β_3 which measures the impact of the reform on the average marginal productivity of the industries which have higher exposure in the upstream markets to the treated industries (high-tangibility industries).

Analogous to Equation 8, I run the followings specification to examine spillover through the linkages:

$$
\begin{aligned}
Ln\,(\Delta Capital\,Share_{ijt}) = \alpha_i + \gamma_t + \beta_0 \times MPK_{ijt} \\
+\beta_1 \times \mathbb{1}_{Post,t} \times MPK_{ijt} + \beta_2 \times Exposure_{UP,j} \times MPK_{ijt} \\
+\beta_3 \times Exposure_{UP,j} \times MPK_{ijt} \times \mathbb{1}_{Post,t} + \varepsilon_{ijt}
\end{aligned} \tag{11}
$$

where i indexes firms, t indexes time, j indexes the industry in which the firm operates. β_3 is the estimate of interest capturing the sensitivity of capital reallocation to the marginal product of capital post reform relative to the pre-reform period in industries whose upstream markets have a high exposure to the treated (high-tangibility) industries.

C. Allocative efficiency

Finally, to examine allocative efficiency, I decompose productivity gains into the part attributable to improvements in average productivity and the part attributable to reallocation following follow Olley and Pakes (1996).

Aggregate marginal productivity of capital can be written as:

$$
\Phi_t = \sum_i s_{it} mpk_{it} = \overline{mpk_t} + \sum_i (s_{it} - \overline{s_t})(mpk_{it} - \overline{mpk_t}) \tag{12}
$$

Φ_t is aggregate marginal productivity of capital and $mpk_{it} = Ln(MPK_{it})$ is the log of the marginal product of capital calculated as log of the ratio of sales to capital as before.[9] s_{it} is the share of capital of firm i to the entire industry.

[9] Consistent with the literature, we use the logged MPK. While the level measures are more intuitive and useful for aggregate welfare implications, the logged measure avoids measurement bias while calculating the contributions of surviving firms in the decomposition analysis. For example, if we use the level values, an overall percentage improvement in productivity of all firms in the economy would be split into equal contributions of the average productivity improvements and reallocation improvement. However, if all firms improve productivity to the same extent we would ideally like the reallocation term to be zero, which is achieved when productivity is in logs.

$\overline{MPK_t} = (1/n)\sum_i MPK_{it}$ and $\overline{s_t} = (1/n)\sum_i s_{it}$. In the Olley and Pakes (1996) decomposition the first term is the unweighted technical productivity measure which captures the within-firm productivity improvements. The second term is the total covariance between a firm's share of the market and its productivity and captures the reallocation across firms.

I calculate the above components for each industry-year cell and then run the following specification at the industry-level:

$$y_{jt} = \alpha_j + \gamma_t + \beta \times \mathbb{1}_{High-Industry\,Tangibility,j} \times \mathbb{1}_{Post,t} + \varepsilon_{jt} \tag{13}$$

y_{jt} are the outcome variables of interest: (i) the overall weighted marginal productivity, (ii) the technical productivity, and (iii) the covariance term for industry j at time t. β is the coefficient of interest and measures the impact on each term for the treated industries. α_j and γ_t are industry and time fixed effects. Remaining terms are as defined before.

D. Results

What implications does the distributional effect we observed in Section IV have for the allocative efficiency of capital in the economy? This section investigates the allocative efficiency implications of improved creditor rights in Table 6. Marginal productivity of capital in the treated industries improved by 17 percent (column 1) post reform. Column 4 shows that reallocation of capital shares towards firms with higher marginal productivity of capital increased post reform (24 percent), particularly so in the treated industries (24 + 14 = 38 percent).

Improvements in capital allocation in the treated industries also propagate to upstream and downstream industries. Productivity of capital increased by 22

See Melitz and Polanec (2015) and Petrin and Levinsohn (2012) for a discussion.

percent (column 3) for firms whose upstream industries were had 1 SD higher exposure to the treatment (high-tangibility industries). Sensitivity of capital market share of firms to marginal productivity of capital also increased by 68 percent for 1 SD higher exposure of upstream industries to the treated industries (column 7). Effects are more muted for firms whose downstream industries were more exposed to the treatment (columns 2 and 6). This is consistent with Liu (2018) who finds that targeting more upstream sectors has greater aggregate impact.

To sum, the above results show a redistribution of capital from less- to more-productive firms pointing to allocative efficiency gains driving this improvement in capital productivity. Table 7, decomposes channels driving these productivity gains into two parts following Olley and Pakes (1996): the unweighted technical productivity and the total covariance between a firm's share of capital and its productivity. In column 2, the dependent variable is the average unweighted MPK and represents the contribution of within firm capital productivity improvements amongst incumbents — for example, due to streamlining their operations as we saw in Section III — and the selection effect of incumbents and new entrants. In column 3, the dependent variable is the covariance between the firm's share of the capital market and its productivity and captures the reallocation effects contributing to the aggregate capital productivity gains. I find that nearly 69 percent of the capital productivity gains come from an increase in average productivity of firms in the high-tangibility industries. Aghion et al. (2018) find an inverted U-shaped relationship between credit constraints and productivity growth. While on the one hand, better credit access allows entrepreneurs to innovate; excessive credit allows less efficient incumbent firms to clog industries, discouraging new entrants. These counteracting factors lead to the inverted U-shaped relationship between credit access and productivity growth. Consistent with this, cutting back the credit of the more unproductive borrowers improves overall aggregate productivity.

The remaining 31 percent of the capital productivity gains comes from reallocation of capital to the more productive firms. The reallocation of capital is distinct from the reallocation of debt that we discussed in Section IV. Reallocation of debt may result in within-firm improvements in the way firm use their capital, such as say by realigning their operations to their core industries (Section III). Reallocation of debt, may also result in reallocating capital away from less to more productive firms. A larger proportion of the gains in capital productivity seem to come from the within-firm improvements post thr reform.

VI. Mechanism: The collateral channel

Post reform, lender's access to collateral plausibly provided a key mechanism to free up capital and reallocate credit to more productive firms. I show evidence that this was the key mechanism driving the reallocation.

A. Empirical specification

I test whether firms linked to banks which had greater exposure to low-quality firms witnessed a greater impact on their secured borrowing. I run the following specification:

$$\begin{aligned} y_{ibjt} = {} & \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post,t} \times \mathbb{1}_{Low-Quality,i} + \nu \times \mathbb{1}_{Post,t} \times \mathbb{1}_{Lender\,Exposure,b} \\ & + \phi \times \mathbb{1}_{Post,t} \times \mathbb{1}_{Low-Quality,i} \times \mathbb{1}_{Lender\,Exposure,b} + \varepsilon_{it} \end{aligned} \tag{14}$$

where i indexes firms, t indexes time, j indexes the industry the firm belongs to and b is the lead bank for the firm. α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Lender\,Exposure} = 1$ for firms whose lead bank has above median exposure to low-quality firms prior to the collateral reform. $\mathbb{1}_{Post,t}$ and $\mathbb{1}_{Low-Quality,i}$ are indicators for the post reform period and for whether a firm is low-quality.

B. Results

I hypothesize that stronger creditors allow lenders to reallocate credit. Creditors whose balance sheets were clogged by loans to distressed borrowers, were able to now readjust loan supply towards more profitable borrowers. I examine reallocation in borrowing by lenders most exposed to low-quality firms in the pre-reform period. Table 8 Panel A column 1 estimates that reallocation of debt from low- to high-quality borrowers was higher by INR 113.5 million for firms linked to the high exposure lenders. Point estimates are similar with additional controls (INR 123.6 million). Plausibly, the ability to seize collateral allowed firms to reallocate credit.

Gianetti and Saidi (Forthcoming) find that lenders internalize the negative spillovers of industry downturns on upstream and downstream industries. Lenders could also potentially internalize the spillover effects of improved improved creditor rights on upstream and downstream industries. However, secured borrowing of non-zombies in industries exposed to treated upstream industries did not increase despite improvements in productivity (Table 8, Panel B). Effects are similar for downstream industries. Thus, banks did not merely increase debt access to firms based on their productivity. Since the reform only improved lender ability to seize collateral of the firms in the high-tangibility industries, we do not see an increase in the credit access of firms in the upstream and downstream industries which witnesses improvements in productivity but were only indirectly affected by the collateral reform. These findings are consistent with the collateral channel as the key mechanism through which lenders reallocate debt.

VII. Conclusion

In this paper, I examine the impact of improved creditor rights on the resource allocation to firms. I show an improvement in lender ability to seize collateral led to a reduction in debt to otherwise insolvent borrowers, zombies. As a result, credit access of healthy borrowers improved which also led to better allocation of capital in the economy. Hsieh and Klenow (2009) highlight political reasons and financial frictions as a source of misallocation of resources such as labor and capital in India and China. Weak creditor rights have often been cited as a reason for financial frictions in emerging markets. Even when creditor rights exist, weak implementation can make such laws ineffective. This is especially true in developing countries. Realizing this, developing countries such as Brazil and China have recently introduced new bankruptcy laws increasing the legal protection of creditors. India, too, recently enacted the Insolvency and Bankruptcy Code 2016, which improves creditor rights and streamlines the bankruptcy process.

India provides a natural setting to study the reallocation of credit across firms. This paper highlights how improved creditor rights help reallocate resources across firms. The threat of liquidation has important spillover effects in the economy. This particular collateral reform provided a good opportunity to study the effects of creditor rights. The rhetoric at the time focused on the slowdown in secured credit growth following the reform (Chakravarty (2003)). This is puzzling because India is not a creditor-friendly country to begin with, and in some sense the pull-back in credit makes it seem as if the collateral reform made creditor rights somewhat excessive. This study highlights, that especially in countries like India which have weak creditor rights to begin with, we should initially expect to see only muted overall growth reflecting massive churn as credit gets reallocated from unproductive to productive firms. This paper highlights one important way in which despite immediate pullback in credit especially by worse performing firms, such improved bankruptcy laws can restore the health of the economy through the spillovers on remaining firms.

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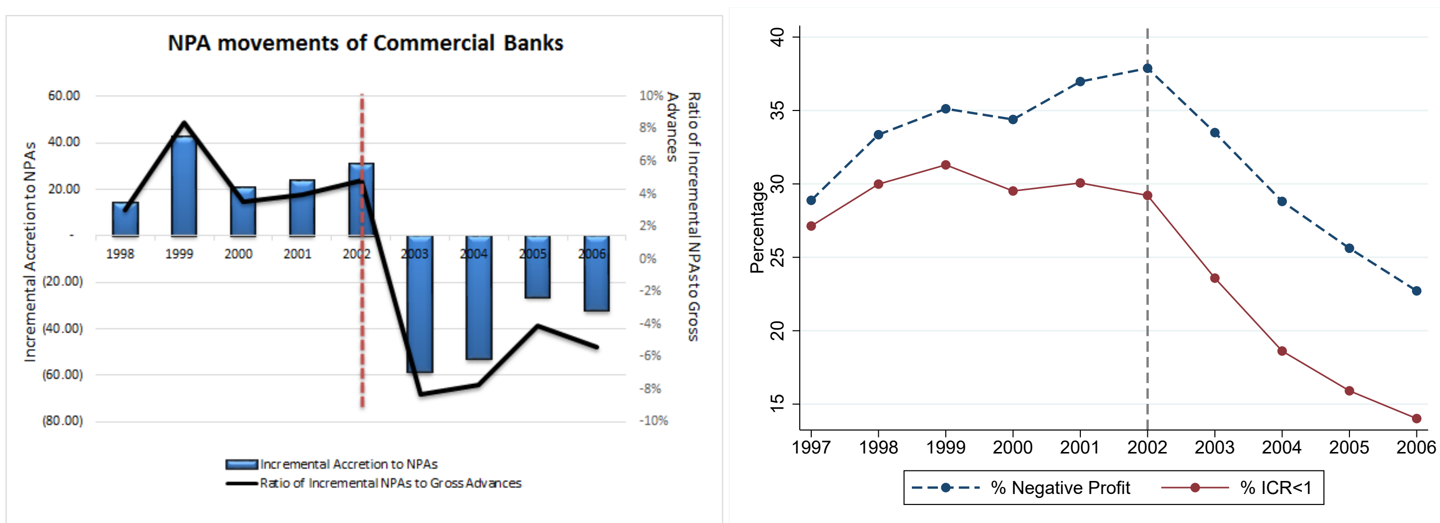
Figure 1. : Effectiveness of the collateral reform

Note: Panel A shows incremental additions in non-performing assets (NPAs) on the left-hand-side vertical axis and the ratio of incremental NPAs to gross advances on the right-hand-side vertical axis. Data is from the Reserve Bank of India and collected from IndiaStat. Data is at the annual level and as of March of each year. Panel B shows the percentage of firms with negative profit and the percentage of firms with interest coverage ratio (ICR) below 1. ICR is the ratio of earnings before interest and taxes to total interest expense. Return on assets is the ratio of earnings before interest, taxes, depreciation and amortization to total assets. Data from Prowess. All data is for the period 1997 to 2006.



(a) **NPA movements**

(b) **Aggregate impact**

Figure 2. : Impact of the collateral reform on secured debt

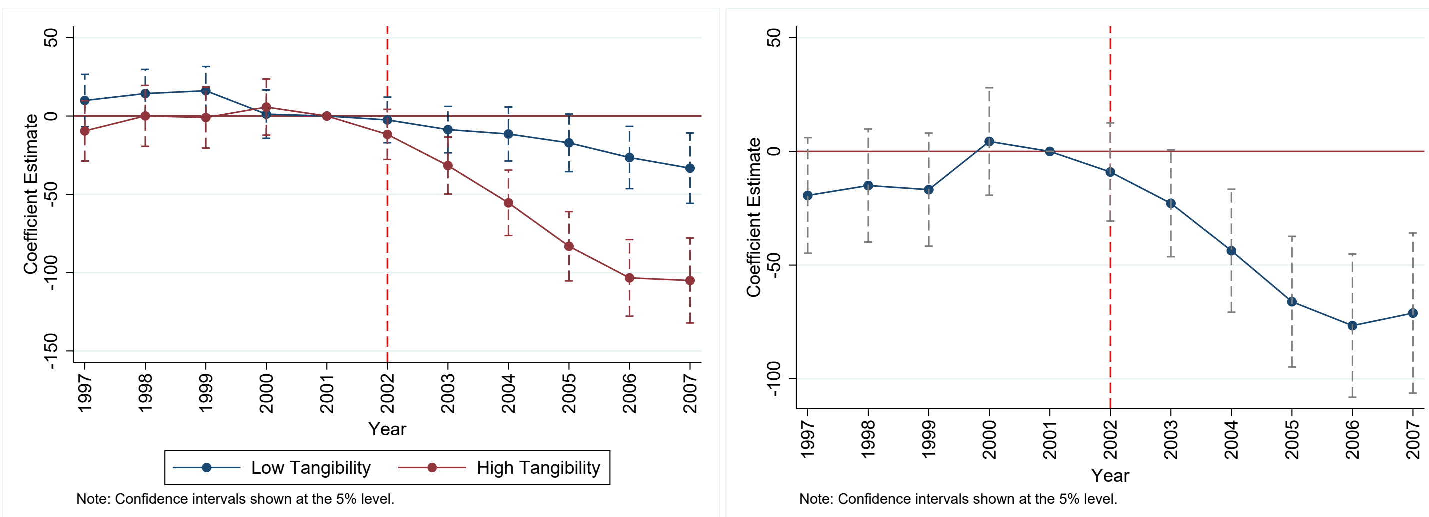
Note: The graph on the left-hand-side plots the coefficient η_τ from the following difference-in-difference (DD) specification separately for each sub-sample of high-tangibility (red line) and low-tangibility firms (blue line):

$$y_{it} = \alpha_i + \gamma_t + \sum_{\tau} \eta_\tau \times (\mathbb{1}_\tau \times \mathbb{1}_{Low-Quality,i}) + \varepsilon_{ijt}$$

The graph on the right-hand-side plots the coefficient ϕ_τ from the following triple difference (DDD) specification:

$$y_{ijt} = \alpha_i + \gamma_t + \sum_{\tau} \eta_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Low-Quality} + \sum_{\tau} \nu_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{High-Tangibility} + \sum_{\tau} \phi_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Low-Quality} \times \mathbb{1}_{High-Tangibility} + \varepsilon_{ijt}$$

where τ ranges from 1997 to 2007, $\mathbb{1}_\tau = 1$ if year is τ and η_τ is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year the reform is announced, and all coefficients are normalized relative to $\tau = -1$. Robust standard errors are clustered at the firm level. $\mathbb{1}_{Post}$, $\mathbb{1}_{Low-Quality}$ and $\mathbb{1}_{High-Tangibility}$ are indicators for the post period, low-quality borrowers, and high-tangibility firms. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. y_{it} is the secured borrowing defined as the change in secured debt between current period and the previous period. Data is from Prowess and for the period 1997–2007.



(a) **Difference-in-Difference**

(b) **Triple Difference**

Figure 3. : Impact of the collateral reform on capital expenditure

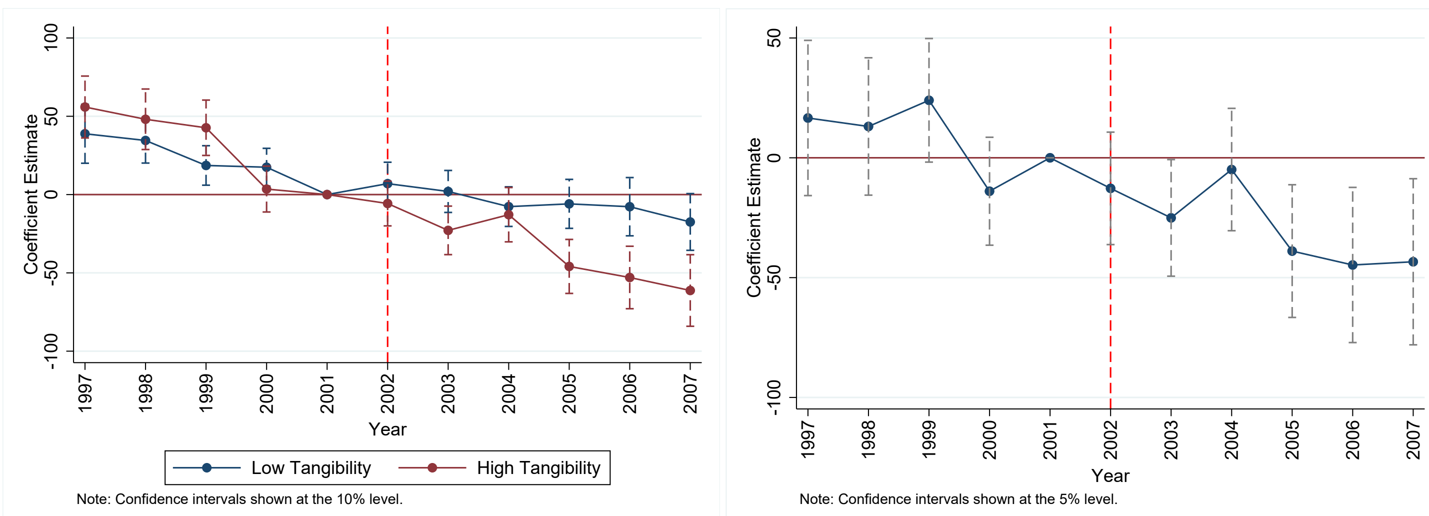
Note: The graph on the left-hand-side plots the coefficient η_τ from the following difference-in-difference (DD) specification separately for each sub-sample of high-tangibility (red line) and low-tangibility firms (blue line):

$$y_{it} = \alpha_i + \gamma_t + \sum_{\tau} \eta_\tau \times (\mathbb{1}_\tau \times \mathbb{1}_{Low-Quality}) + \varepsilon_{ijt}$$

The graph on the right-hand-side plots the coefficient ϕ_τ from the following triple difference (DDD) specification:

$$y_{it} = \alpha_i + \gamma_t + \sum_{\tau} \eta_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Low-Quality} + \sum_{\tau} \nu_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{High-Tangibility} + \sum_{\tau} \phi_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Low-Quality} \times \mathbb{1}_{High-Tangibility} + \varepsilon_{it}$$

where τ ranges from 1997 to 2007, $\mathbb{1}_\tau = 1$ if year is τ and η_τ is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year the reform is announced, and all coefficients are normalized relative to $\tau = -1$. Robust standard errors are clustered at the firm level. $\mathbb{1}_{Post}$, $\mathbb{1}_{Low-Quality}$ and $\mathbb{1}_{High-Tangibility}$ are indicators for the post period, low-quality borrowers, and high-tangibility firms. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. y_{it} is capital expenditure defined as the non-negative change in gross fixed assets between current period and previous period. Data is from Prowess and for the period 1997–2007.



(a) **Difference-in-Difference**

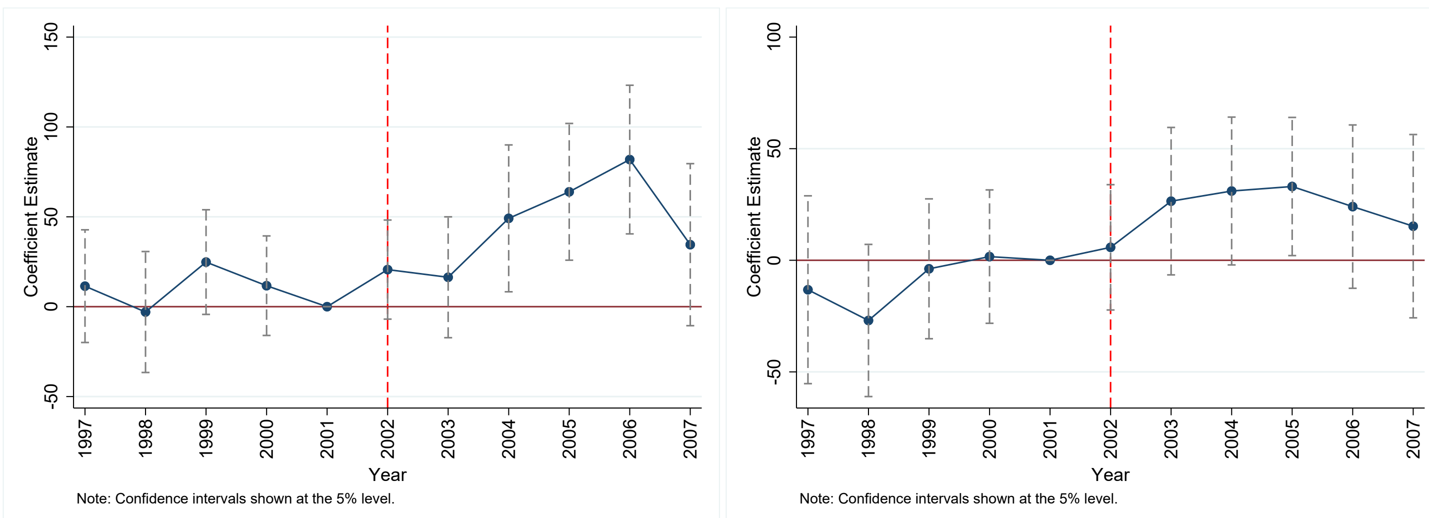
(b) **Triple Difference**

Figure 4. : Spillovers on secured debt and capital expenditure

Note: The graphs below plot the coefficient ϕ_τ from the following triple difference (DDD) specification:

$$y_{it} = \alpha_i + \gamma_t + \sum_\tau \eta_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Non-Zombie} + \sum_\tau \nu_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{High-Industry\,Tangibility} + \sum_\tau \phi_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Non-Zombie} \times \mathbb{1}_{High-Industry\,Tangibility} + \varepsilon_{it}$$

where τ ranges from 1997 to 2007, $\mathbb{1}_\tau = 1$ if year is τ and η_τ is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year the reform is announced, and all coefficients are normalized relative to $\tau = -1$. Robust standard errors are clustered at the firm level. $\mathbb{1}_{Post}$, $\mathbb{1}_{Low-Quality}$ and $\mathbb{1}_{High-Tangibility}$ are indicators for the post period, low-quality borrowers, and high-tangibility firms. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. y_{it} is the secured borrowing defined as the change between $t-1$ and t. Data is from Prowess and for the period 1997–2007.

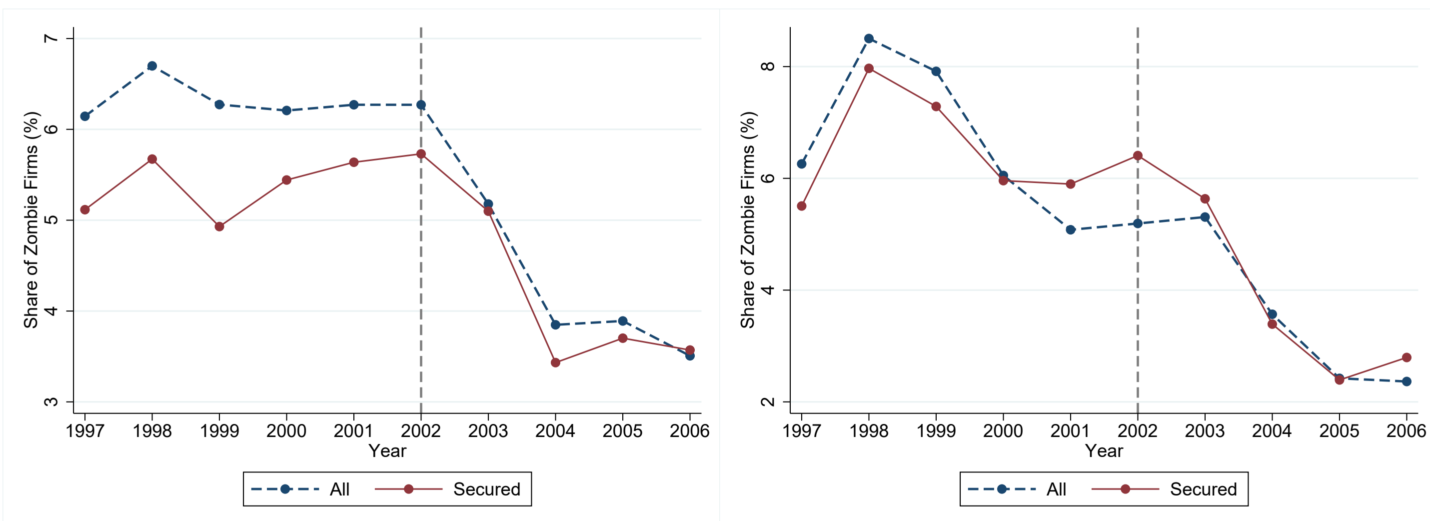


(a) **Secured Debt**

(b) **CapEx**

Figure 5. : Impact of collateral reform on percentage of firms receiving subsidized credit

Note: The graphs below plot the percentage of firms that are classified as zombies relative to the total number of firms. Panel (a) plots the raw numbers and panel (b) plots the asset-weighted percentage by total assets. A zombie is defined as a firm that receives subsidized credit, that is, it satisfies all the following conditions: (i) interest rate of the firm is below the minimum prime lending rate, (ii) interest coverage ratio (ICR) is less than 1, (iii) leverage (total external debt to total assets) is greater than 0.20, and (iv) change in debt is greater than zero. Since the collateral law only applies to secured debt, we also classify a firm as zombie if it satisfies all the conditions for a zombie and if the secured borrowings is greater than zero (solid red line in each graph). Data is from Prowess. Data is for the period 1997 to 2007.



(a) **Raw**

(b) **Asset-Weighted**

Figure 6. : Impact of collateral law on change in percentage of firms receiving subsidized credit and tangibility of assets

Note: The plot below shows the percentage change in percentage of zombies to average tangibility of firms in each sector wherein NAICS 2 digit industries have been grouped into sectors as indicated below. A zombie is defined as a firm that receives subsidized credit, that is, it satisfies all the following conditions: (i) interest rate of the firm is below the minimum prime lending rate, (ii) interest coverage ratio (ICR) is less than 1, (iii) leverage (total external debt to total assets) is greater than 0.20, and (iv) change in debt is greater than zero. Percentage of zombies is the number of zombies to the total number of firms. The change is calculated as the average in period before the reform minus the average in the period after the reform. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities.

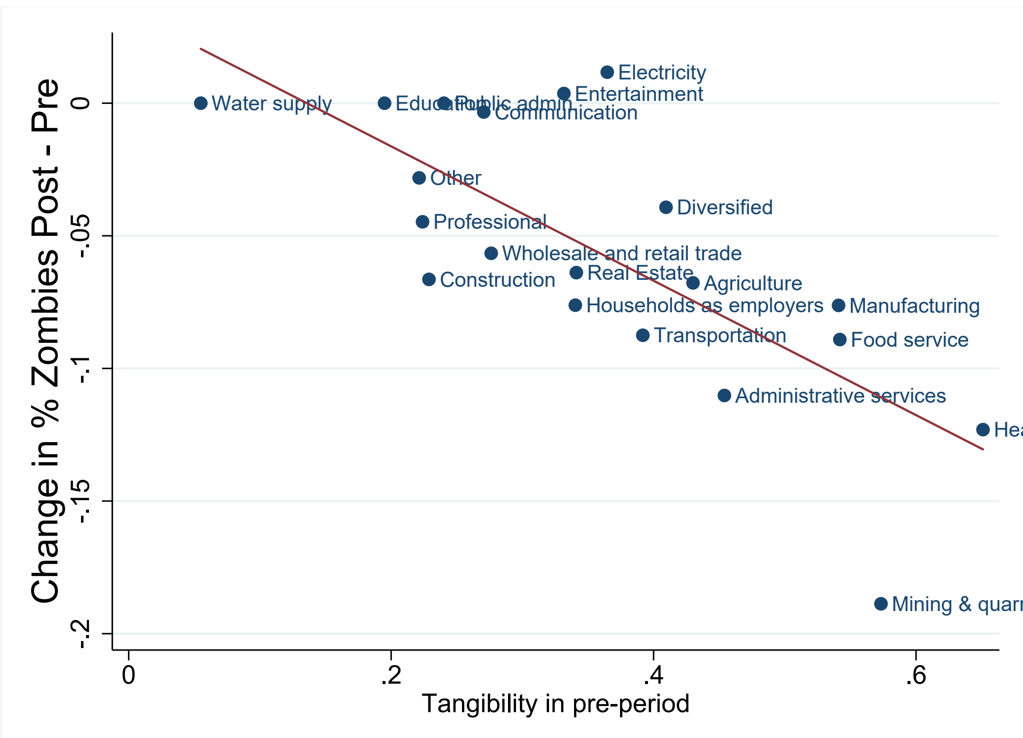


Table 1—: Descriptive statistics

Note: The table below shows the summary statistics of all the variables used in our analysis. ICR is the ratio of earnings before interest and taxes to total interest expense. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. A zombie is defined as a firm that receives subsidized credit, that is, it satisfies all the following conditions: (i) interest rate of the firm is below the minimum prime lending rate, (ii) interest coverage ratio (ICR) is less than 1, (iii) leverage (total external debt to total assets) is greater than 0.20, and (iv) change in debt is greater than zero. The mean and standard deviation are shown in columns 1 and 2. In panel a (b) Columns 3 and 4 show the average for low-quality borrowers (zombies) in the period before and after the reform, that is 2002. In panel b (a) Column 5 shows the t-statistic on the difference between the pre and post period for the low-quality borrowers (zombies). In panel a (b) Columns 6 and 7 show the average for high-quality borrowers (non-zombies) in the period before and after the reform. Column 8 shows the t-statistic on the difference between the two. For the definition of remaining variables see Table A1. Data is from Prowess for the period 1997 to 2007.

Panel A

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		Low Quality			High Quality		
Variables	Mean	SD	Pre	Post	t-stat on Diff.	Pre	Post	t-stat on Diff.
Secured Borrowing^{+}	45.23	191.6	51.74	37.54	(-4.78***)	30.96	56.52	(12.91***)
Unsecured Borrowing^{+}	3.160	17.20	1.020	4.260	(13.33***)	1.530	4.730	(18.28***)
Capital Expenditure^{+}	83.45	259.2	59.81	59.19	(-0.18)	78.02	106.7	(10.11)
Δ Employment (CMIE)	0.0100	0.180	-0.0200	-0.0200	(0.17)	0	0.0200	(2.47)
Total Debt^{+}	1058	6552	1059	1363	(3.38***)	770.7	1141	(5.35***)
Secured Debt $^{+}$	506.1	1202	486.0	644.7	(7.72***)	393.6	538.1	(10.69***)
Log(Sales)	5.370	2.420	4.840	4.850	(0.12)	5.410	5.750	(13.11)
$\frac{EBITDA}{Total\ Assets}$	0.100	0.110	0.0300	0.0700	(23.56***)	0.130	0.110	(-14.54***)
Observations	52152		16457			35695		

Panel B

	All		Zombies			Non-Zombies		
Variables	Mean	SD	Pre	Post	t-stat on Diff.	Pre	Post	t-stat on Diff.
Secured Borrowings	45.23	191.6	62.34	41.31	(-4.82***)	32.41	52.65	(11.40***)
Unsecured Borrowings	3.160	17.20	1.100	5.110	(10.91***)	1.410	4.490	(19.96***)
Capital Expenditure	83.45	259.2	71.84	63.71	(-1.56)	71.81	97.89	(10.55)
Total Debt	1058	6552	1373	1835	(2.82***)	752.1	1093	(5.90***)
Secured Debt	506.1	1202	533.5	724.0	(6.39***)	400.8	542.2	(11.63***)
Unsecured Debt	253.6	802.7	316.5	401.7	(3.77***)	178.8	267.7	(10.83***)
Debt to Assets	0.340	0.340	0.510	0.610	(9.05***)	0.280	0.300	(4.69***)
Log(Sales)	5.370	2.420	4.720	4.870	(3.00***)	5.340	5.590	(11.22***)
$\frac{EBITDA}{Total\ Assets}$	0.100	0.110	0.0200	0.0700	(17.10***)	0.110	0.110	(-4.03***)
Observations	52152		8791			43361		

Table 2—: Impact of the collateral reform on borrowing

Note: The table reports results for the triple difference specification in Equation 3. In columns 1 and 2, the dependent variable is secured borrowing. In columns 3 and 4, the dependent variable is unsecured borrowing, and in Columns 5 and 6, the dependent variables is interest rate. Secured borrowing is the change in secured debt between current period and the previous period. Unecured borrowing is the change in unsecured debt between current period and the previous period. Interest rate is calculated as defined in Section A1. $\mathbb{1}_{Post}$, $\mathbb{1}_{Low-Quality}$ and $\mathbb{1}_{High-Tangibility}$ are indicators for the post period, low-quality borrowers, and high-tangibility firms. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. All the columns include firm and year fixed effects. Columns 2, 4, 6 and 8 include industry-year fixed effects and also include controls. Firm-level controls included are log of sales and profitability (the ratio of earnings before interest and taxes, depreciation and amortization to assets). Standard errors are clustered at the firm level. Baseline mean is calculated for the low-quality borrowers in the period before the reform. Data is from Prowess for the period 1997-2007.

	(1)	(2)	(3)	(4)	(5)	(6)
	Secured Borr.		Unsecured Borr.		Interest Rate	
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post}$	-22.19***	-16.49***	-0.400	-0.274	-0.480	-0.214
	(4.869)	(5.003)	(0.592)	(0.613)	(0.340)	(0.346)
$\mathbb{1}_{High-Tangibility} * \mathbb{1}_{Post}$	12.41**	9.715**	1.856***	1.375**	-0.308	-0.230
	(4.846)	(4.810)	(0.558)	(0.600)	(0.221)	(0.236)
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post} * \mathbb{1}_{High-Tangibility}$	-39.08***	-37.06***	-0.777	-0.220	0.489	0.719*
	(8.023)	(8.181)	(0.873)	(0.888)	(0.405)	(0.409)
Baseline Mean	51.74		1.02		13.07	
No. of Obs.	51939	51939	51939	51939	34071	34071
R-sq.	0.359	0.388	0.430	0.456	0.545	0.574
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Industry-Year FE	N	Y	N	Y	N	Y
Controls	N	Y	N	Y	N	Y

Table 3—: Impact of the collateral reform on zombie lending (evergreening)

Note: The table reports results for the triple difference specification in Equation 5. In columns 1 and 2, the dependent variable is secured borrowing. Secured borrowing is the change in secured debt between current period and the previous period. $\mathbb{1}_{Post}$, $\mathbb{1}_{Zombie}$ and $\mathbb{1}_{High-Tangibility}$ are indicators for the post period, low-quality borrowers, and high-tangibility firms. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. All the columns include firm and year fixed effects. Column 2 also includes industry-year fixed effects and also include controls. Firm-level controls included are log of sales and profitability (the ratio of earnings before interest and taxes, depreciation and amortization to assets). In column 3, the dependent variable is whether a firm is a zombie in the pre and post period. For this specification, a firm is classified as a zombie in the pre- (post-) period if it is classified as a zombie in any of the years in the pre- (post-) period. Only firm fixed effects are included and the indicator $\mathbb{1}_{Post}$ is also included in this regression (though not shown). Standard errors are clustered at the firm level. Baseline mean is calculated for the zombie firms in the period before the reform. Data is from Prowess for the period 1997-2007.

	(1)	(2)	(3)
	Secured Borr.		$\mathbb{1}_{zombie\,current}$
$\mathbb{1}_{High-Tangibility} * \mathbb{1}_{Post}$t	3.699	2.559	0.0336***
	(4.288)	(4.238)	(0.0120)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post}$	-22.40***	-17.28**	-0.204***
	(7.281)	(7.433)	(0.0575)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post} * \mathbb{1}_{High-Tangibility}$	-36.65***	-37.75***	-0.139*
	(10.63)	(10.83)	(0.0718)
Baseline Mean	62.34		0.08
No. of Obs.	51939	51939	11975
R-sq.	0.358	0.387	0.677
Firm FE	Y	Y	Y
Year FE	Y	Y	
Industry-Year FE	N	Y	
Controls	N	Y	

Table 4—: Impact of the collateral reform on capital expenditure

Note: The table reports results for difference-in-difference-in-difference specification in Equation 3 with the dependent variable, capital expenditure. Capital expenditure is non-negative difference in gross fixed assets between current period and the previous period. $\mathbb{1}_{Post}$, $\mathbb{1}_{Low-Quality}$, $\mathbb{1}_{Zombie}$ and $\mathbb{1}_{High-Tangibility}$ are indicators for the post-period, low-quality borrowers, zombie borrowers and high-tangibility firms. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. A zombie is defined as a firm that receives subsidized credit, that is, it satisfies all the following conditions: (i) interest rate of the firm is below the minimum prime lending rate, (ii) interest coverage ratio (ICR) is less than 1, (iii) leverage (total external debt to total assets) is greater than 0.20, and (iv) change in debt is greater than zero. Firm-level controls included are log of sales and profitability (the ratio of earnings before interest and taxes, depreciation and amortization to assets). All the columns include firm fixed effects and year fixed effects. Columns 2 and 4 include industry-year fixed effects and controls. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. Standard errors are clustered at the firm level. Data is from Prowess for the period 1997-2007. Baseline mean is calculated for the low-quality borrowers in the period before the reform in columns 1–2 and for zombie firms in years 3–4. Data is from Prowess for the period 1997-2007.

	(1)	(2)	(3)	(4)
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post}$	-21.86***	-8.990		
	(6.181)	(6.188)		
$\mathbb{1}_{High-Tangibility} * \mathbb{1}_{Post}$	19.63***	18.85***	12.68**	12.84***
	(5.759)	(5.703)	(4.989)	(4.954)
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post} * \mathbb{1}_{High-Tangibility}$	-36.77***	-37.18***		
	(9.276)	(9.012)		
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post}$			-21.25**	-12.08
			(9.789)	(8.730)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post} * \mathbb{1}_{High-Tangibility}$			-40.91***	-40.74***
			(12.57)	(11.59)
Baseline Mean	59.81		71.84	
No. of Obs.	51939	51939	51939	51939
R-sq.	0.617	0.633	0.617	0.633
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Industry-Year FE	N	Y	N	Y
Controls	N	Y	N	Y

Table 5—: Zombie distortions: Impact on secured borrowing and capital expenditure in decongested industries

Note: In this table, we show the results for the zombie distortions specification in Equation 6. The dependent variables used in the regression are secured debt (columns 1 and 2) and capital expenditure (columns 3 and 4). Secured borrowing is the change in secured debt between current period and the previous period. Capital expenditure is non-negative difference in gross fixed assets between current period and the previous period. $\mathbb{1}_{Post}$, $\mathbb{1}_{Non-Zombie}$ and $\mathbb{1}_{High-Industry\,Tangibility}$ are indicators for the post-period, non-zombie borrowers, and high-industry tangibility. A zombie is defined as a firm that receives subsidized credit, that is, it satisfies all the following conditions: (i) interest rate of the firm is below the minimum prime lending rate, (ii) interest coverage ratio (ICR) is less than 1, (iii) leverage (total external debt to total assets) is greater than 0.20, and (iv) change in debt is greater than zero. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. Firm-level controls included are log of sales and profitability (the ratio of earnings before interest and taxes, depreciation and amortization to assets). Industries with average tangibility of firms in 2000 above median are high-tangibility industries. All regressions include year fixed effects. Even numbered columns also include controls and industry-year fixed effects. All columns include firm fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period 1997-2007. Baseline mean is calculated for the non-zombies in the period before the reform.

	(1)	(2)	(3)	(4)
	Secured Borr.		CapEx	
$\mathbb{1}_{High-Industry\,Tangibility}$*$\mathbb{1}_{Post}$	-24.74***	-70.22	-14.05	-35.45
	(9.055)	(73.85)	(11.94)	(36.05)
$\mathbb{1}_{Post}$*$\mathbb{1}_{Non-Zombie}$	22.91***	16.97**	25.69**	9.087
	(6.633)	(6.614)	(10.46)	(9.266)
$\mathbb{1}_{Non-Zombie}$*$\mathbb{1}_{High-Industry\,Tangibility}$*$\mathbb{1}_{Post}$	34.06***	35.74***	31.43**	40.16***
	(9.948)	(9.987)	(12.84)	(11.80)
Baseline Mean	62.34		71.84	
No. of Obs.	52152	52152	52152	52152
R-sq.	0.359	0.378	0.617	0.633
Firm FE	Y	Y	N	Y
Year FE	Y	Y	Y	Y
Industry-Year FE	N	Y	N	Y
Controls	N	Y	N	Y

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6—: Productivity and market shares of productive firms

Note: The dependent variable in columns 1–3 is the log of marginal productivity of capital and the dependent variable in columns 4–7 is the logarithm of the change in capital share of a firm relative to the industry in which it operates. Log of marginal productivity of capital (MPK) is calculated as the log of the ratio of sales to capital. Capital is gross fixed assets. $\mathbb{1}_{Post}$ and $\mathbb{1}_{High-Industry\,Tangibility}$ are indicators for the post-period and high-industry tangibility. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. Industries with average tangibility of firms in 2000 above median are high-tangibility industries. Exposure$_{UP}$ is the weighted average of all the upstream industries which have are classified as having high-tangibility, that is, $\mathbb{1}_{High-Industry\,Tangibility}$ is equal to 1. Exposure$_{DOWN}$ is the weighted average of all the downstream industries which are classified as having high-tangibility, that is, $\mathbb{1}_{High-Industry\,Tangibility}$ is equal to 1. Weights are from the input-output linkages (M3 matrix) provided by Ministry of statistics and programme implementation. All regressions include firms and year fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period from 1997-2007.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Ln(MPK)			Ln (Δ Capital share)			
$\mathbb{1}_{High\,Sector\,Tangibility}$*$\mathbb{1}_{Post}$	0.169***				0.000819		
	(0.0363)				(0.100)		
Exposure$_{UP}$*$\mathbb{1}_{Post}$		0.0295				-0.0262	
		(0.0219)				(0.0799)	
Exposure$_{DOWN}$*$\mathbb{1}_{Post}$			0.0356**				-0.118
			(0.0155)				(0.0752)
MPK * $\mathbb{1}_{Post}$				0.296***	0.239***	0.256***	0.268***
				(0.0315)	(0.0421)	(0.0440)	(0.0422)
MPK*$\mathbb{1}_{Post}$* $\mathbb{1}_{High\,Sector\,Tangibility}$					0.135**		
					(0.0653)		
MPK*$\mathbb{1}_{Post}$*Exposure$_{UP}$						0.0486	
						(0.0474)	
MPK*$\mathbb{1}_{Post}$*Exposure$_{DOWN}$							0.109**
							(0.0537)
No. of Obs.	51568	24060	24060	18278	18278	8787	8787
R-sq.	0.771	0.798	0.798	0.792	0.793	0.816	0.816
Firm FE	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7—: Decomposition of marginal productivity of capital

Note: The table below shows the decomposition of the marginal productivity of capital into within-firm and across-firm productivity. The dependent variable in column 1 is the weighted average marginal productivity where the weights are the share in capital of a firm to the capital in the firm's industry. The dependent variable in column 2 is the unweighted average productivity of all firms in the industry. The dependent variable in column 3 is the covariance between marginal productivity of capital and the firm share of capital relative to the industry that the firm operates in. Marginal productivity of capital is measured in logs and calculated as the log of the ratio of sales to capital. $\mathbb{1}_{Post}$ and $\mathbb{1}_{High-Industry Tangibility}$ are indicators for the post-period and high-industry tangibility. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. Industries with average tangibility of firms in 2000 above median are high-tangibility industries. All regressions include firm and year fixed effects. Data is from Prowess for the period from 1997-2007.

	(1) Aggregate productivity	(2) Within-firm productivity	(3) Reallocation
$\mathbb{1}_{High-Industry Tangibility}*\mathbb{1}_{Post}$	0.359***	0.249***	0.110*
	(0.0690)	(0.0472)	(0.0629)
No. of Obs.	571	571	571
R-sq.	0.836	0.843	0.724
Industry FE	Y	Y	Y
Year FE	Y	Y	Y

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8—: Mechanism: The collateral channel

Note: Panel A studies the effect of exposure on secured lending to low-quality borrowers. The dependent variable in both panels is the change in secured borrowing. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. Lender-level exposure is measured as the number of low-quality firms a bank was designated as the primary lender in 2000 or 2001 (year before SARFAESI was enacted). Low exposure refers to lenders in the bottom quintile of exposure measure. Remaining are classified as high exposure. Each firm has one lender designated as the primary lender. When there are more than 2 primary lenders (less than 2 percent of entire sample) I arbitrarily designate one bank as the prime lender. All regression include firm and year fixed effects. Column 2 also includes industry-year fixed effects. Panel B studies the impact on secured borrowing of non-zombies in upstream and downstream industries. Industries with average tangibility of firms in 2000 above median are high-tangibility industries. Exposure$_{UP}$ is the weighted average of all the upstream industries which have are classified as having high-tangibility, that is, $\mathbb{1}_{High-Industry\,Tangibility}$ is equal to 1. Exposure$_{DOWN}$ is the weighted average of all the downstream industries which have are classified as having high-tangibility, that is, $\mathbb{1}_{High-Industry\,Tangibility}$ is equal to 1. Weights are from the input-output linkages provided by Ministry of statistics and programme implementation. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Standard errors are clustered at the firm level. Firm-level controls included are log of sales and profitability (the ratio of earnings before interest and taxes, depreciation and amortization to assets). Remaining uninteracted terms have been included though not shown in the table.

Panel A: Lender-level analysis

	(1)	(2)
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post} * \mathbb{1}_{High-Exposure}$	-113.5***	-123.6***
	(20.25)	(16.77)
No. of Obs.	17587	17587
R-sq.	0.432	0.482
Firm FE	Y	Y
Year FE	Y	Y
Industry-Year FE	N	Y
Controls	Y	Y

Panel B: Spillover mechanism

	(1)	(2)	(3)	(4)
$\mathbb{1}_{Non-Zombie}$*Exposure$_{DOWN}$*$\mathbb{1}_{Post}$	8.981	11.22		
	(39.73)	(40.23)		
$\mathbb{1}_{Non-Zombie}$*Exposure$_{UP}$*$\mathbb{1}_{Post}$			10.23	8.935
			(14.55)	(14.75)
No. of Obs.	24576	24576	24576	24576
R-sq.	0.354	0.388	0.354	0.388
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Industry-Year FE	N	Y	N	Y
Controls	N	Y	N	Y

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

For Online Publication: Appendix

A1. Identification of Zombie Firms

Financial data is primarily from ProwessDx, maintained by Centre for Monitoring Indian Economy (CMIE). Data pertains to annual financial statement data for Indian firms. Coverage of listed firms is comprehensive (due to reporting requirements) but limited for unlisted firms. I focus on data between April 01, 1997 to March 31, 2007 from the March 2016 vintage. Table A1 describes variables used in the analysis. There are a total of 50,039 firm-year observations. Data for most firms is as of the fiscal year ending March 31. If year end occurs in a month other than March, all firms with year end before September 30 are assigned to the prior fiscal year, and remaining such firms are assigned to the next fiscal year.

The data on bankers is extracted from CMIE as a separate dataset that gives the name of the bank which is the banker to the firm in that particular year. A firm may have more than one banker in a year. The data field "Order" stores a number that determines the order in which the banks appear in the source document i.e. the annual report of the company. In case of multiple bankers, we retain the top banker based on "Order no." as it is assumed that firms display the name of its most important banker or the bank which has the highest exposure to the company at the top of the list. The top bank is assigned to a firm. This assignment makes a strong assumption that all increase in debt of a firm is from the top banker. The remaining variables pertaining to banks in our dataset is extracted from DBIE (Database on Indian Economy) and Reserve Bank of India. For easy extraction of some of the RBI related data we also relied on IndiaStat.

For the analysis on capital expenditures, we use the CapExDx database on planned investment projects. This dataset is provided by the CMIE and provides data on planned capital expenditure at the project level. An investment project in the database is any project that involves some capital expenditure and some capacity expansion. It tracks the announcement, implementation and completion of projects. The database excludes financial investment projects such as investment in secondary capital markets. It is thus ideal for our purposes. The database captures projects with capital expenditure greater than INR 10 million. The data is collected by the CMIE team from publicly available sources, by contacting the firm and internal experts. It is not based on official or regulatory data, but is useful for our purposes because it supplements the analysis on actual capita expenditure from the Prowess data. Importantly, CMIE provides a link between the projects and the Prowess database based on the company identifier. Thus, we restrict to companies for which CapExDx has at least one project for any company used in our analysis. Not all projects in Prowess are covered by CapexDx and not all CapexDx companies appear in Prowess. The expenditure amount of implemented projects, announced projects and completed projects is aggregated to company level and we have 25,623 firm-year observations. CMIE has been monitoring projects since 1976 and reliable information on data is available only starting 1996. The project also lists an industry code. I define non-core projects as those where the project industry code does not match the firm industry code. The CapExDx database also tracks the life-cycle of the project since it is first announced.

Employment data is not well populated in the CMIE. I supplement the analysis on employment with data from the Annual Survey of Industries (ASI). The survey is conducted by the Ministry of Statistics and Program Implementation (MoSPI) in India and provides information about industrial units with firms employing 10 or more workers using electricity (20 or more if the unit does not use electricity). To generate employment related statistics I use data on average number of all workers, permanent workers, contract workers and factory staff as reported in ASI. One caveat in using the ASI data is that it captures only manufacturing firms and is available only starting 1999.

The input-output linkages are from MOSPI, specifically Table M3 which provides the input-output coefficient matrix.

A. Zombie definition

I follow Caballero, Hoshi and Kashyap (2008) to define zombies. A firm is classified as a zombie if it obtains subsidized credit from its bank or the actual interest payment of the firm is below the interest expense of the most credit-worthy firms in the economy. I define zombie as a firm that has borrowed funds on interest rate below prevailing prime lending rates, despite not being the highest rated firm, has an interest coverage ratio (ICR) less than equal to 1, leverage (total external debt to total assets) of greater than 0.20 and has taken additional loan in year t. Below I define the reasoning behind using this criteria.

In their seminal paper, Caballero, Hoshi and Kashyap (2008) determine a zombie firm as one whose interest payment is lower than the risk-free interest payments. However, this criteria does not take into account evergreening of loans. Additionally, it is likely that during the times of weak demand, banks might commit to offer credit below their prime lending rates in order to attract reputable firms. Hence, I modify the Caballero, Hoshi and Kashyap (2008) definition of zombies and avoid the mistreatment of any firm, which otherwise is healthy, as a zombie. The definition also needs to look at zombie credibility, profitability and most importantly, any evidence of evergreening. Thus, the following criteria also need to be accounted for. If a firm is high rated or if the ICR is more than one, then it is not classified as a zombie. Firm's may have low interest payments if they have low leverage. Hence, firms with debt less than 20 percent of their total assets are not classified as zombies. To ensure the zombie definition captures evergreening of loans, zombie firms also increased borrowing relative to the previous year.

A zombie firm has interest rates below the minimum prime lending rate. I use prime lending rates from the State Bank of India (the largest public sector bank in India) as the benchmark or cut-off rate and calculate if the interest cost on long term loans for a firm is lower than the minimum prime lending rate. SBI is the largest public sector bank in India, its prime lending rate is an indication of the interest rate at which most creditworthy firms in the economy avail credit. Since we do not have the exact interest payments on new loans, we see if the interest expense under the prime lending rate is less than what the firm currently pays and infer this to mean the firm has borrowed funds on interest rate below prevailing prime lending rates.

The data allows me to link to the primary (lead) lender.[10] Lender-level exposure is measured as the number of low-quality firms a bank was designated as the primary lender in 2001 (year before the reform). High exposure refers to banks with above median exposure measure. Since not all firms indicate the names of banks, the number of firms in this analysis differs from our baseline case.

[10]We do not have the loans from each bank to a given firm. Thus, we make the simplifying assumption that all debt in a given year is attributed to the primary or main lender.

A2. Robustness

In this section, I show that the baseline results discussed in Section III are robust (i) across different subsets of borrowers, (ii) alternate specifications, (iii) alternate definitions of low-quality, (iv) externally valid using another law that improved creditor rights, and (v) using a different control group.

Different subsets of borrowers

Figure A4b shows the estimates for different sub-samples of borrowers . The relative decline in secured borrowing of low-quality borrowers for the treated group is stronger for manufacturing firms, older firms, listed firms, and firms with higher investment opportunity as measured by Tobin's Q (reflecting possibly a higher transfer *to* high-quality borrowers). Notably, the effect persists across all subsets except the young firms. The build up in inefficient lending in the pre-reform period was plausibly limited for younger firms and hence we do not see a relative difference in secured borrowing of young firms.

Alternate specifications

I show that results are robust to alternate specifications in columns 1-3 in Table A3. Column 1 shows that results are robust to controlling for investment opportunity (adding Tobin's Q). Since the sample also includes unlisted firms, I do not include Tobin's Q in the baseline regressions. Column 2 normalizes the dependent variable by assets. Column 3 uses log of secured borrowing as the dependent variable. All estimates confirm the relative decline in borrowing for low-quality borrowers. The point estimates are comparable to the baseline estimates in Section III

Alternate definitions of low-quality

I show results are robust to alternate definitions of low-quality in columns 4-7 in Table A3. In the baseline analysis, I define low-quality based on the firm's ability to service debt since the central hypothesis in this study focuses on quality of lending. Nonetheless, the results are similar using alternate definitions of low-quality based on profitability (column 4) and investment opportunity (column 5). Column 6 defines low-quality based on the ICR measure in 2001 (as opposed to using the average between 2000 and 2001 in the baseline specification which is more stable). Results are also robust to defining low-quality borrowers based on ICR *within* industries (column 7) and on whether a firm has persistently low ICR (less than one) throughout the pre-period (column 8).

External Validity

Table A4, columns 1-2 examine whether the results are externally valid. I find a similar relative decline in borrowing when I use the staggered implementation of another reform, the setting up of the DRTs in the 1990s. DRTs strengthened legal enforcement by reducing judicial delay (Lilienfeld-Toal, Mookherjee and Visaria (2012)). I do not use this as the main identification strategy in my analysis because, in effect, the creditor rights through the DRTs were weak. The quasi-legal courts started getting clogged up as the cases piled on. Additionally, defaulters could simultaneously file at BIFR indefinitely delaying the recovery process.

Alternate control group

Table A4, columns 3-4 use an alternate control group, namely the non-banking financing companies (NBFCs) which were not covered by the collateral reform. Consistent with our baseline results, low-quality firms financed by banks cut their secured borrowing by INR 32 million relative to low-quality firms financed by NBFCs. I do not focus on this as the baseline specification, since initially there was some uncertainty as to whether the reform applied to NBFCs.

Figure A1. : Collateral reform: Closing the liquidation loophole

Note: The graph below shows the number of cases filed under the Board for Industrial and Financial Reconstruction (BIFR). Data is hand-collected from the BIFR website. Data is for the period 1997 to 2007.

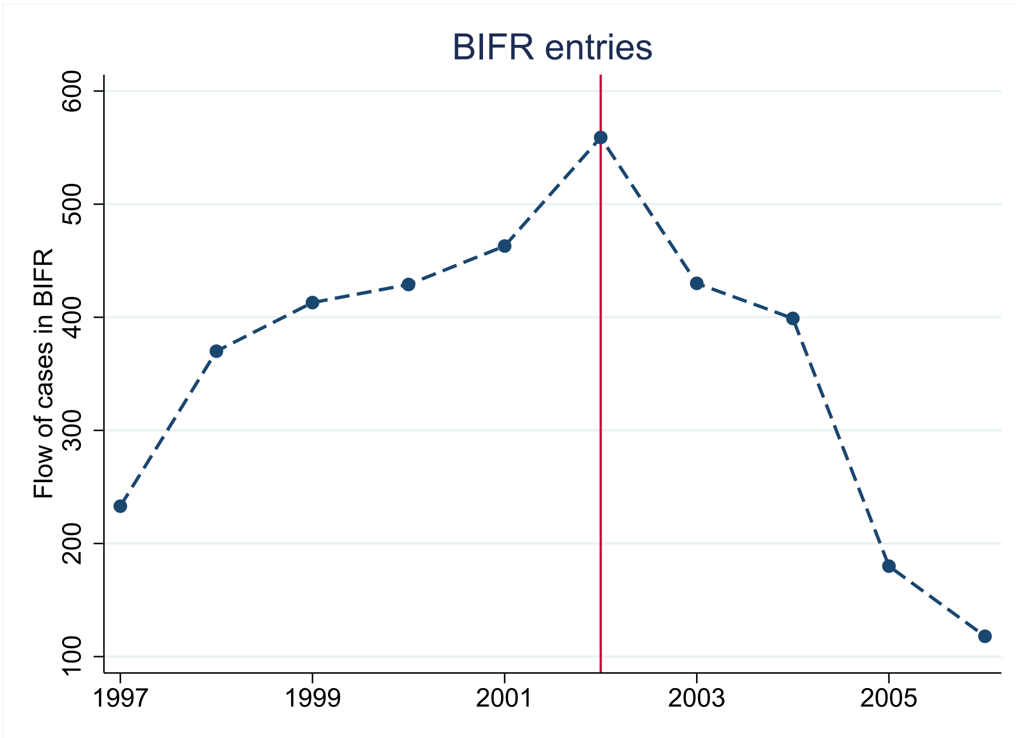
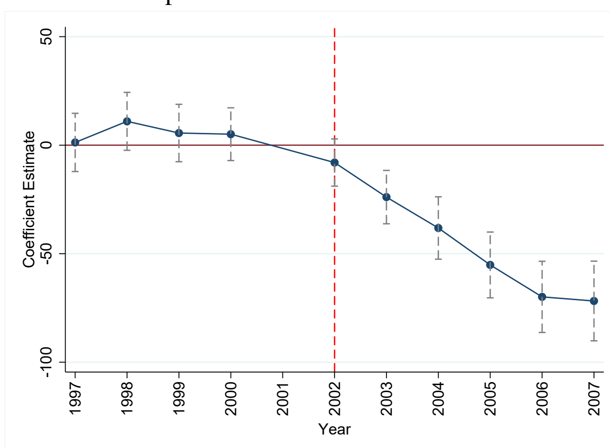


Figure A2. : Impact of the collateral reform on secured debt and capital expenditure

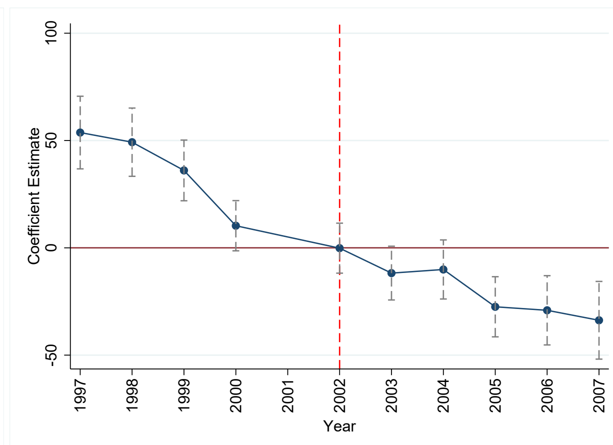
Note: The graphs below plot the coefficient η_τ from the following difference-in-difference (DD) specification:

$$y_{it} = \alpha_i + \gamma_t + \sum_{\tau} \eta_\tau \times (\mathbb{1}_\tau \times \mathbb{1}_{Low-Quality,i}) + \varepsilon_{ijt}$$

where τ ranges from 1997 to 2007, $\mathbb{1}_\tau = 1$ if year is τ and η_τ is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year the reform is announced, and all coefficients are normalized relative to $\tau = -1$. Robust standard errors are clustered at the firm level. $\mathbb{1}_{Post}$ and $\mathbb{1}_{Low-Quality}$ are indicators for the post period and low-quality borrowers. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. y_{it} is the dependent variable, secured borrowing (panel (a)) and capital expenditure (panel (b)). Secured borrowing is the change in secured debt between current period and the previous period. Capital expenditure is non-negative difference in gross fixed assets between current period and the previous period. Data is from Prowess and for the period 1997–2007.



(a) **Secured Borrowings**



(b) **Capex**

Figure A3. : Heterogeneity of effect of collateral reform on borrowing

Note: This figure shows the coefficients for the triple difference estimate in Equation 3 for various subsets of firms. The dependent variable is secured borrowing. Secured borrowing is the change in secured debt between current period and the previous period. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. All regressions include firm and year fixed effects. Standard errors are clustered at the firm level. The figure below plots the coefficients for the following subsets of firms from top to bottom: (a) manufacturing (b) non-manufacturing (c) young firms defined as firms with age less than or equal to 5 years in 2001 (d) old firms defined as firms with age greater than 5 years in 2001 (e) listed (f) non-listed (g) restricting to 3 years post reform, i.e. 2005 (h) restricting to 2 years post reform, i.e. 2004 (i) firms with above median Tobin's Q in 2001, and (j) firms with below median Tobin's Q in 2001.

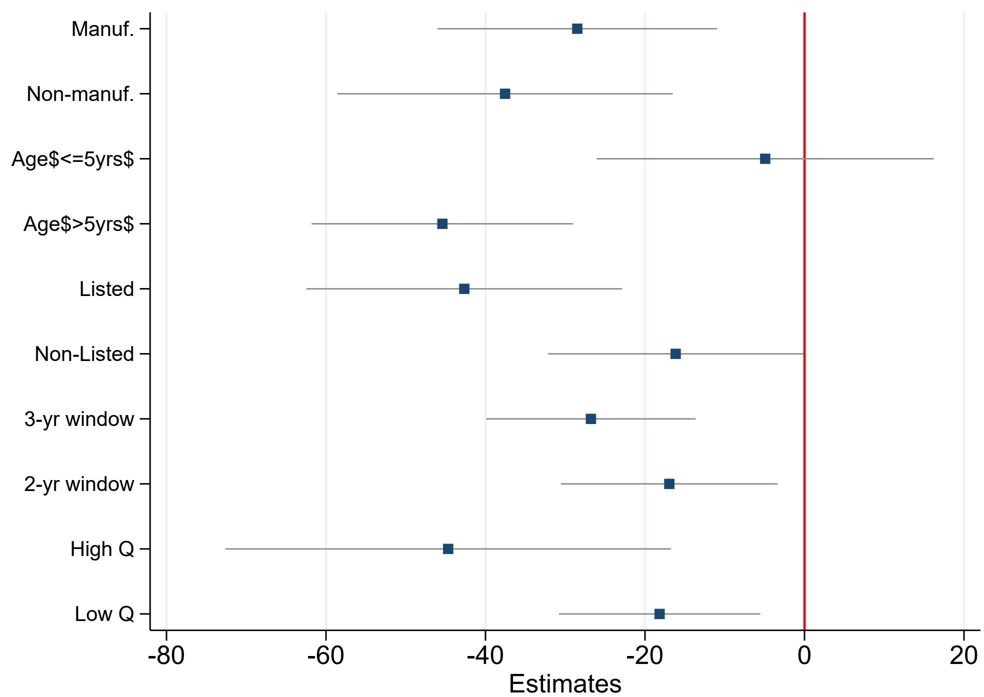
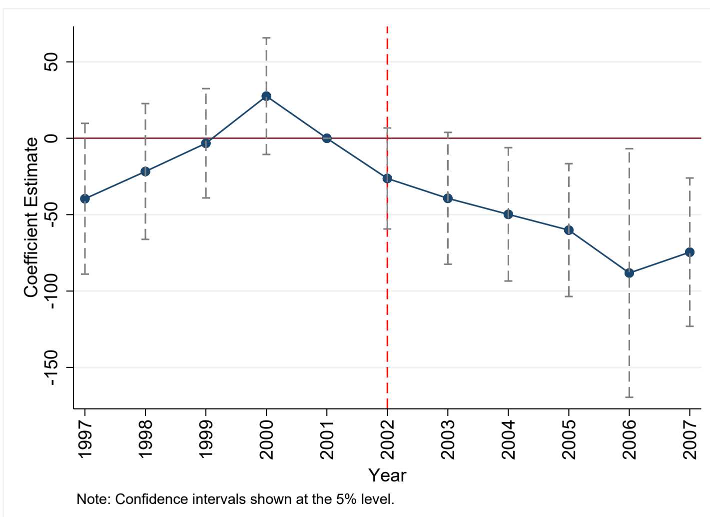


Figure A4. : Triple difference specifications using zombies

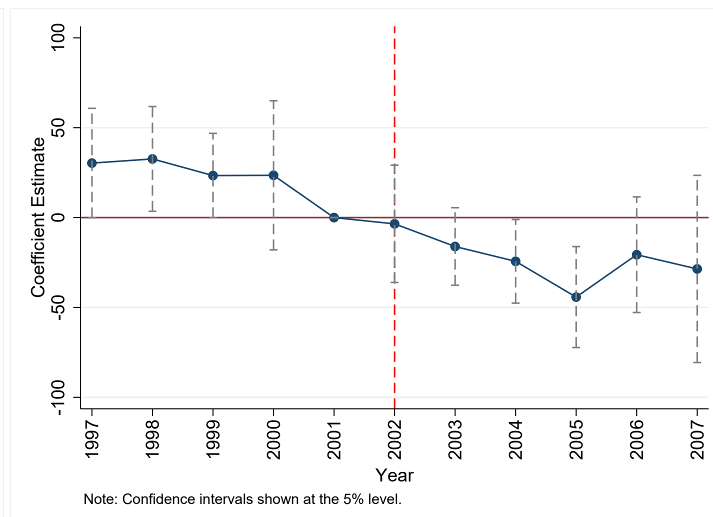
Note: The graph on the right-hand-side plots the coefficient ϕ_τ from the following triple difference (DDD) specification:

$$y_{ijt} = \alpha_i + \gamma_t + \sum_\tau \eta_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Zombie} + \sum_\tau \nu_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{High-Tangibility} + \sum_\tau \phi_\tau \times \mathbb{1}_{tau} \times \mathbb{1}_{Zombie} \times \mathbb{1}_{High-Tangibility} + \varepsilon_{ijt}$$

where τ ranges from 1997 to 2007, $\mathbb{1}_\tau = 1$ if year is τ and η_τ is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year the reform is announced, and all coefficients are normalized relative to $\tau = -1$. Robust standard errors are clustered at the firm level. $\mathbb{1}_{Post}$, $\mathbb{1}_{Zombie}$ and $\mathbb{1}_{High-Tangibility}$ are indicators for the post period, zombie borrowers, and high-tangibility firms. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. y_{it} is the dependent variable, secured borrowing (panel (a)) and capital expenditure (panel (b)). Secured borrowing is the change in secured debt between current period and the previous period. Capital expenditure is non-negative difference in gross fixed assets between current period and the previous period. Data is from Prowess and for the period 1997–2007.



(a) **Diff-in-Diff**



(b) **Diff-in-Diff-in-diff**

Table A1—: Variable Description

Note: The table below describes all the variables used in our main analysis.

Data Item	Variables Used	Source
Item 1	Current Portion of Secured Debt	Prowess
Item 2	Current portion of unsecured debt	Prowess
Item 3	Secured Debt (Secured by tangible assets)	Prowess
Item 4	Unsecured Debt (Not secured by tangible assets)	Prowess
Item 5	Number of employees	Prowess
Item 6	Short-term Borrowings	Prowess
Item 7	Long-term Borrowings	Prowess
Item 8	Total assets (Book Value of Assets)	Prowess
Item 9	Plant and Machinery	Prowess
Item 10	Land and Building	Prowess
Item 11	Capital Work in Progress	Prowess
Item 12	Other Fixed Assets	Prowess
Item 13	Cash and Bank Balance	Prowess
Item 14	Marketable Securities	Prowess
Item 15	Specific Assets= Item 9 + Item 12	Derived from Prowess
Item 16	Non-specific Assets = Item 10+ Item 13+ Item 14	Derived from Prowess
Item 17	Total Debt = Item 6+ Item 7 or item 3+Item 4	Derived from Prowess
Item 18	New Secured Borrowings = max(0, Item 3 -(lagged Item 3 -Item 1))	Derived from Prowess
Item 19	New Unsecured Borrowings = max(0, Item 4 -(lagged Item 4 -Item 2))	Derived from Prowess
Item 20	Gross Fixed Assets = Item 9 + Item 10 + Item 11 + Item 12	Derived from Prowess
Item 21	CapEx = max (0, Item 20 - Lagged Item 20)	Derived from Prowess
Item 22	Tangibility = Specific assets / (Specific+Non-specific assets)	Derived from Prowess
Item 23	Interest Rate Expense	Prowess
Item 24	Prime Lending Rate for Long-term Loans	SBI
Item 25	Lending Rate for Short-term Loans	RBI/Prowess
Item 26	Interest Coverage Ratio (ICR) = EBIT/Interest Expense	Prowess
Item 27	Interest Expense	Prowess
Item 28	Interest Coverage Ratio (ICR) = EBIT/Interest Expense	Prowess
Item 29	Leverage = Total Debt/Total Assets	Prowess
Item 30	Tobin's Q = Market Value of Assets/Book Value of Assets	Derived from Prowess

Table A2—: Difference-in-difference specifications

Note: This table looks at the impact of secured borrowing using event study and difference-in-difference estimates. Column 1, panel (a) shows the estimate on the pre- versus post-period (similar to an event study estimate) for the sub-sample of low-quality firms. Similarly column 2 in panel (a), column 1 in panel (b), and column 2 in panel (b) show the same estimate for the sub-sample of high-quality, zombie and non-zombie firms respectively. The dependent variable in both panels is secured borrowing. Secured borrowing is the change in secured debt between current period and the previous period. Columns 3–4 in panel (a) report the results for difference-in-difference specification in Equation 1. Columns 3–4 in panel (b) report the results for difference-in-difference specification in Equation 1 with a zombie indicator instead of an indicator for low-quality borrowers. Baseline mean is calculated for the low-quality borrowers in the period before the reform in columns 1, 3 and 4 in panel (a); for high-quality borrowers in column 2 in panel (a); for zombie firms in columns 1, 3 and 4; and for non-zombie firms in column 2. Refer to Table 2 for the definitions of the remaining variables.

Panel A: By quality

	(1)	(2)	(3)	(4)
	Low Quality	High Quality	Secured Borr.	
$\mathbb{1}_{Post}$	-19.68***	18.29***		
	(3.824)	(2.237)		
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post}$			-46.11***	-39.92***
			(4.320)	(4.495)
Baseline Mean	51.74	30.96	51.74	
No. of Obs.	16457	35695	52152	52152
R-sq.	0.399	0.341	0.360	0.366
Firm FE	Y	Y	Y	Y
Year FE	N	N	Y	Y
Industry-Year FE	N	N	N	Y
Controls	Y	Y	N	Y

Panel B: By zombie

	(1)	(2)	(3)	(4)
	Zombie	Non-Zombie	Secured Borr.	
$\mathbb{1}_{Post}$	-27.63***	20.15***		
	(5.241)	(2.165)		
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post}$			-47.07***	-43.29***
			(5.688)	(5.896)
Baseline Mean	62.34	32.41	62.34	
No. of Obs.	8791	43361	52152	52152
R-sq.	0.413	0.339	0.359	0.366
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Industry-Year FE	N	N	N	Y
Controls	N	N	N	Y

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3—: Robustness to alternate specifications and definitions of quality

Note: The table reports results for difference-in-difference-in-difference specification in Equation 3. It repeats the specification in column 1 of Table 2 with alternate definitions of low quality borrowers and alternate controls. The dependent variable in columns 1 and columns 4 to 8 is secured borrowing which is the change in secured debt. The dependent variable in column 2 is secured borrowing normalized by total assets. In column 3 the dependent variable is log(1+secured borrowing). Low quality borrowers in columns 1–3 are defined as firms with the median interest coverage ratio in 2000 and 2001 less than 1. In all columns firm-level controls included are log of sales and EBITDA/assets. In column 1, we also include Tobin's Q as the control variable. Low quality borrower in column 4 is defined as firms with the below median return on assets in 2001. Low quality borrower in column 5 is defined as firms with the below median Tobin's Q in 2001. Low quality borrower in column 6 is defined as firms with the median interest coverage ratio in 2001 less than 1. Low quality borrowers in columns 7 are defined as firms with the below median interest coverage ratio in 2001 within an industry. Low quality borrowers in columns 8 are defined as firms with interest coverage ratio less than 1 in the entire pre-period from 1997 to 2001. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. Standard errors are clustered at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Alternate Specifications			Alternate definitions of low-quality				
	Tobin's Q	$\frac{SecuredBorrowings}{Assets}$	Ln(1+ Secured Borrowings)	ROA	Tobin's Q	ICR in 2001	Within Industry	ICR≤1 Persists
$\mathbb{1}_{Low-Quality}$*$\mathbb{1}_{Post}$*$\mathbb{1}_{High-Tangibility}$	-50.58***	-0.0147***	-0.248**	-24.88***	-54.49***	-22.95***	-35.60***	-29.11***
	(18.96)	(0.00571)	(0.100)	(7.943)	(13.86)	(8.101)	(8.237)	(11.06)
No. of Obs.	21080	42506	35385	47870	47870	47870	47870	47870
R-sq.	0.362	0.257	0.650	0.355	0.355	0.356	0.356	0.355
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y

Table A4—: External validity and alternate control group

Note: Columns 1–2 reports results for an external validity test using the staggered introduction of the Debt Recovery Tribunals (DRTs). Columns 3–4 use non-banking financial corporations (NBFCs) as the control group for whom the collateral did not apply. The dependent variable in all columns is secured borrowing. $\mathbb{1}_{Post}$, $\mathbb{1}_{DRT}$ and $\mathbb{1}_{Banks}$ are indicators for the post period, whether the DRT is in effect and whether a firm's lead lender is a bank (as opposed to an NBFC). $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. All the columns include firm and year fixed effects. Even numbered columns also include industry-year fixed effects and controls. Firm-level controls included are log of sales and profitability (the ratio of earnings before interest and taxes, depreciation and amortization to assets). Standard errors are clustered at the firm level. Data is from Prowess for the period 1997-2007.

	(1)	(2)	(3)	(4)
	External Validity		Alternate Control Group	
$\mathbb{1}_{Low-Quality}$ * DRT	-24.03**	-21.57*		
	(12.13)	(12.08)		
$\mathbb{1}_{Low-Quality}$ * $\mathbb{1}_{Post}$ * Banks			-31.90***	-29.49*
			(11.33)	(17.28)
No. of Obs.	21869	21869	28156	28156
R-sq.	0.320	0.332	0.357	0.388
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Industry-Year FE	N	Y	N	Y
Controls	N	Y	N	Y

Table A5—: Project-level analysis: Impact of the collateral reform on capital expenditure

Note: The table reports results for difference-in-difference-in-difference specification in Equation 3 using project-level data. The dependent variable is an indicator for whether a project was completed. $\mathbb{1}_{Post}$, $\mathbb{1}_{Low-Quality}$ and $\mathbb{1}_{High-Tangibility}$ are indicators for the post period, low-quality borrowers, and high-tangibility firms. $\mathbb{1}_{Post}$ is an indicator equal to 1 if year is greater than 2002. Low-quality borrowers are defined as firms with average interest coverage ratio (ICR) in 2000 and 2001 less than 1. Tangibility measure is from Rajan and Zingales (1995) and is the ratio of specific assets to the total specific assets plus non-specific assets. Specific assets is the sum of plant and machinery and other fixed assets. Non-specific assets is the sum of land and building; cash and bank balance; and marketable securities. Firms are classified as high-tangibility if the tangibility ratio in 2001 is above the median tangibility of all firms. All the columns include firm and year fixed effects. Core (non-core) projects refer to projects where the project industry is the same (differs) as the firm industry. Standard errors are clustered at the firm level. Data is for the period 1997-2007 from CapExDx and provided by CMIE.

	(1)	(2)	(3)	(4)
	Core	Non-core	Core	Non-core
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post}$	0.448*	0.454		
	(0.252)	(0.314)		
$\mathbb{1}_{High-Tangibility} * \mathbb{1}_{Post}$	0.0726	-0.101		
	(0.146)	(0.167)		
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post} * \mathbb{1}_{High-Tangibility}$	-0.433	-0.669*		
	(0.281)	(0.369)		
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post}$			-0.382**	0.288
			(0.162)	(0.351)
$\mathbb{1}_{High-Tangibility} * \mathbb{1}_{Post}$			-0.0388	-0.134
			(0.168)	(0.160)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post} * \mathbb{1}_{High-Tangibility}$			0.468**	-0.501
			(0.213)	(0.460)
No. of Obs.	2267	1661	2267	1661
R-sq.	0.571	0.641	0.570	0.639
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6—: Impact of collateral reform on employment and the effect of zombie distortions

Note: The table reports results for difference-in-difference-in-difference specification in Equation 3 in columns 1–2 and columns 5–6. Columns 3–4 and 7–8 show the results for the zombie distortions specification in Equation 6. The dependent variable is the employment change from the current period relative to the previous period. All the columns include firm fixed effects and year fixed effects. Alternate columns also include industry-year fixed effects and controls. Standard errors are clustered at the firm level. Data is from Prowess for the period 1997-2007. Baseline mean is calculated for the low-quality borrowers in the period before the reform in columns 1–2 and 5–6 and for non-zombie firms in years 3–4 and 7–8. Data is from Prowess for columns 1–4 and from Annual Survey of Industries (ASI) in columns 5–8. Data is for the period 1997-2007. Refer to Table 4 and Table 5 for the definition of variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post}$t	-0.00316**	-0.00176			-5.431***	-3.891***		
	(0.00140)	(0.00127)			(1.491)	(1.480)		
$\mathbb{1}_{High-Tangibility} * \mathbb{1}_{Post}$	-0.000877	-0.000642			4.566**	3.484**		
	(0.00110)	(0.00113)			(1.773)	(1.758)		
$\mathbb{1}_{Low-Quality} * \mathbb{1}_{Post} * \mathbb{1}_{High-Tangibility}$	-0.000819	-0.000706			-7.299**	-6.193*		
	(0.00183)	(0.00183)			(3.364)	(3.320)		
$\mathbb{1}_{High\,Sector\,Tangibility} * \mathbb{1}_{Post}$			-0.00415**	-0.0000808			-6.800	7.899
			(0.00207)	(0.00575)			(4.493)	(11.57)
$\mathbb{1}_{Post} * \mathbb{1}_{Non-Zombie}$			0.000475	-0.00124			7.968***	6.778***
			(0.00185)	(0.00177)			(1.739)	(1.719)
$\mathbb{1}_{Non-Zombie} * \mathbb{1}_{High\,Sector\,Tangibility} * \mathbb{1}_{Post}$			0.00302	0.00403*			7.539**	6.728*
			(0.00231)	(0.00223)			(3.724)	(3.625)
Baseline Mean	0.180		0.720		.089		-5.07	
No. of Obs.	51939	51939	51939	51939	113424	113424	113424	113424
R-sq.	0.125	0.137	0.125	0.137	0.131	0.141	0.130	0.141
Firm FE	Y	Y	N	N	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry-Year FE	N	Y	N	Y	N	Y	N	Y
Controls	N	Y	N	Y	N	Y	N	Y
Dataset	CMIE	CMIE	CMIE	CMIE	ASI	ASI	ASI	ASI

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$