

Misallocation due to inefficient exits – Evidence from India

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ABSTRACT

An efficient market economy requires firm exits so that resources are lured or forced away from unproductive uses. Creditors' ability to seize defaulters' assets is an important aspect of making the process of exit of firms efficient. I examine the implications of suppressing the normal competitive process of *destruction* whereby low-quality borrowers would be forced to lose workers and cut investment. I exploit a 2002 law in India that made it easier for secured creditors to seize defaulters' assets. Prior to the policy change, low-quality and unprofitable borrowers increased debt partly due to evergreening of loans by banks. Also, the congestion created by low-quality firms during this period allocated debt away from healthier firms. Post the passage of the law, banks increased credit to high-quality firms and cut credit to low-quality firms. The resulting decongestion increased employment and investment of high-quality borrowers that operate in the same industry. Productivity and profitability of low quality firms also increased, overall profitability and productivity increased more so in industries that witnessed greater decongestion.

Keywords: Misallocation, Access to credit, Bank Credit, Financial Institutions; Firm Performance

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“The Charkavyuha legend from the Mahabharata describes the ability to enter but not exit, with seriously adverse consequences. It is a metaphor for the workings of the Indian economy in the 21st century, the legacy of several decades of economic policy making.”

— Economic Survey 2015–16, Ministry of Finance, India

Misallocation of resources across firms can lower aggregate efficiency, particularly for developing countries (Hsieh and Klenow (2009)). While this can be attributed to a variety of government policies and institutional settings I study one factor, namely the exit of firms which is necessary for the efficient functioning of a market economy. The Schumpeterian view of “creative destruction” is described as the process that “revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one.” This process of creative destruction through efficient exits ensures that resources are lured away from unproductive uses. In this paper I focus on one important aspect of making the process of firm exits efficient: creditors’ ability to seize defaulters’ assets.

Prior literature suggests that underdeveloped and politicized institutions hinder the process of creative destruction and can result in sluggish creation, technological “sclerosis” and spurious reallocation of factors of production (Caballero and Hammour (1998), Caballero and Hammour (2001)). It follows that making this process of creative destruction more efficient can reduce and reallocate rents, which leads to new distributions of firms over time. I exploit the 2002 law in India that made it easier for secured creditors to seize defaulters’ assets, as a natural experiment in which to examine patterns of resource reallocation across firms. Poor quality firms may lose market share if banks are no longer encumbered by a poor institutional setting to recover their loans.

The passage of the Securitization and Reconstruction of Financial Assets and Enforcement of Security Interests Act of 2002 (SARFAESI Act henceforth) made it easier for creditors to seize the assets of defaulting borrowers. Prior to the SARFAESI Act, the slow judicial process made it difficult for creditors to recover their assets and creditors usually went through a long judicial battle to liquidate the firm. Additionally, several loopholes meant the firms could

indefinitely stall the judicial process.¹ The SARFAESI reform allowed creditors to bypass the judicial process and creditors could seize and liquidate assets of the defaulting firm. This made it significantly easier for creditors to access the collateral securing the loan. Specifically, the law applied to secured borrowers and not unsecured borrowers.

In this paper I examine whether the above securitization reform, which strengthened the rights of secured borrowers, affected (a) the allocation of debt to low quality borrowers compared to high quality borrowers, (b) affected the capital expenditure and employment of low quality firms, and (c) whether this impacted the profitability and productivity of low quality firms.

Our empirical analysis is hence organized as follows. We begin by analyzing the impact of the SARFAESI Act on the change in secured debt holdings of firms. Importantly, for our baseline analysis, we define low quality borrowers as borrowers who had a median interest coverage ratio of less than one in the period before the passage of the law (1998, 1999 and 2000). The sample includes all non-financial firms in India. We then examine the spillovers on borrowings of other firms operating in the same industry. In the subsequent section, we look at the capital expenditure and employment of low quality firms against that of high quality firms. Finally, we also examine the profitability and productivity of low quality firms and the spillovers this has on other firms operating in the same industry.

We begin our empirical analysis by investigating the effect of the SARFAESI Act on the health of firms in the economy. We find that the percentage of firms with negative profit and with low ICR declined sharply in 2002 after the passage of the SARFAESI Act. To explain this, we examine the impact SARFAESI had on secured debt of low quality borrowers compared to high quality borrowers. We find that borrowings declined by approximately Rs. 76 million for low quality borrowers relative to high quality borrowers in the period following SARFAESI. Controlling for investment opportunities and profitability makes this number even more stark and shows that borrowings declined by Rs. 146 million for low quality borrowers compared to high quality borrowers after the passage of the SARFAESI Act. However, we do not see the same pattern in unsecured borrowings since SARFAESI did not impact the recovery of unsecured

¹See Figure A1 in the appendix as an illustration for one way in which firms could indefinitely stall the judicial process.

creditors. Additionally, it also confirms that low quality borrowers were not substituting into unsecured borrowings. This is not surprising since our hypothesis is that the reduction in debt of low quality borrowers is driven by the reduction in evergreening of loans. Once the banks can easily exit their banking relationship, we do not expect them to increase their unsecured lending to low quality borrowers.

Next we explicitly look at whether the drop in firm borrowings can be attributed to the reduction in evergreening of loans by banks. To do this, we first define a zombie firm as follows. A firm is classified as a zombie if a firm has interest rates below the minimum prime lending rate. In addition, a zombie firm has an interest coverage ratio (ICR) below 1 and leverage (total external debt to total assets) greater than 0.20. The aggregate numbers also show a consistent pattern: the fraction of zombies just before 2002 was at 9 percent and fell to around 6 percent after the passage of the SARFAESI. Results are similar with the fraction of asset-weighted zombies falling from around 10 percent to 6 percent.

We then look at the impact of the SARFAESI on the debt of zombies. Specifically, we are interested in examining whether a firm which received zombie lending in the period before SARFAESI witnessed a reduction in secured borrowings after passage of the Act. We define a firm as a zombie in the pre-SARFAESI period if it received zombie lending in 1998, 1999 or 2000. Indeed, we find that zombie firms on average reduced secured debt by Rs. 163 million. On adding controls, this number is even more stark at Rs. 353 million reduction in secured debt. As before, since SARFAESI did not apply to unsecured debt, we do not find a reduction in the unsecured debt of zombies.

We then look at this from a different angle. Was a firm likely to transition to non-zombie status in the period following the SARFAESI? To do this, we track firms that were classified as zombies in the period before the SARFAESI and then see whether they became non-zombies right after. A firm that was classified as a zombie in the period preceding SARFAESI was 19 percent less likely to be classified as a zombie in the period following the passage of SARFAESI. On adding controls, the results are similar with 20 percent likelihood that a zombie firm transitions to non-zombie status in the period following SARFAESI.

Next, we look at the spillovers of reduction in debt of zombie firms. This analysis is inspired

by Caballero et al. (2008) who examined the increase in number of zombie firms in the 1990s in Japan and found that zombie-dominated industries exhibited more depressed job creation and destruction, and lower productivity. They found that the increase in zombies depressed the investment and employment growth of non-zombies and widened the productivity gap between zombies and non-zombies. In our setting, the process of exit of firms became easier. Thus, we expect that the resulting decongestion — through a reduction in evergreening of loans — should increase credit to the high quality borrowers. We find that non-zombies in industries which had a high number of zombies in the period before the SARFAESI Act witnessed the benefits of this decongestion and increased secured debt on average by Rs 25 million. On controlling for investment opportunities and profitability, non-zombies in these industries increased secured debt by an average of Rs. 42 million. Since SARFAESI did not have an impact on unsecured debt, we do not find any spillover effects on unsecured debt.

Next we turn to the impact on real outcomes. Specifically, we look at the impact of reduction in secured debt by the low quality borrowers on capital expenditure and employment. Capital expenditure reduced by Rs. 34 million after the passage of the SARFAESI for low quality borrowers. On adding controls, the results are even more stark with capital expenditures reducing by Rs. 50 million. Similarly, number of employees of low quality firms reduced by 66 after the passage of the SARFAESI. On adding controls, the number of employees reduced by 95 after the passage of the SARFAESI. Caballero et al. (2008) show that in the 1990s in Japan, the increase in zombies depressed the investment and employment growth of non-zombies and widened the productivity gap between zombies and non-zombies. We see whether the reduction in zombies after the passage of the SARFAESI had an analogous effect on the non-zombies. Non-zombies in industries which were dominated by the zombies increased capital expenditure after the passage of the SARFAESI. Thus, the SARFAESI reduced number of zombies and this had strong spillovers on the capital expenditure of non-zombies. Post the passage of the SARFAESI, non-zombies in zombie-dominated industries also increased the number of employees by an average of 41 employees.

Next we turn to the impact on the profitability of firms. Specifically, we look at the impact of a reduction in secured debt and subsequent impact on profitability of low quality borrowers.

We find that operating margin of low quality borrowers increased by approximately 9 percent after the passage of the SARFAESI. Return on assets of low quality borrowers also increased by 6.1 percent. Similarly, total factor productivity (TFP) defined as the residual value from regressing log of sales on log of employee compensation and log of plant, property and equipment also increased by 8 percent for low quality borrowers. We find that the productivity of low quality borrowers was driven by both an increase in profits (top line) as well as a reduction in assets. Additionally, overall average productivity and profitability of firms increased, more so in industries that witnessed the greatest decongestion post-SARFAESI. There is also suggestive evidence that the gap between the profitability of non-zombie firms and zombie firms narrowed post the passage of the SARFAESI.

To summarize, our results show that the congestion created by low-quality firms before SARFAESI allocated debt away from healthier firms. Further, the presence of zombie firms depressed employment and investment of high quality firms that operated in the same industry. Post the passage of the SARFAESI Act, banks increased credit to high-quality firms and cut credit to low-quality firms. Additionally, the resulting decongestion increased employment and investment of high-quality borrowers that operated in the same industry. This also had the effect of increasing the profitability of all firms.

Our results touch on several strands of literature. Banerjee and Duflo (2005) point to how financial frictions hinder firm investment and economic development. A large literature also examines how creditor rights affect debt enforcement and corporate policies (Acharya et al. (2005), Haselmann et al. (2010), Acharya and Subramanian (2009)), Bae and Goyal (2009), Acharya et al. (2011), Gopalan et al. (2016)). Vig (2007) and Alok et al. (2016) highlight the unintended consequences of increasing creditor rights.

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.

Our paper is closely related to Vig (2007) who also exploits the SARFAESI Act and finds

that this led to a reduction in secured debt, total debt, debt maturity, and asset growth of firms with more tangible assets. In a similar vein, Alok et al. (2016) show that the SARFAESI led to ex-ante firm-level readjustment of labor and capital investment to counteract the increased threat of liquidation. Our result highlights one aspect of the ‘Lucas Critique’ that policy evaluation often fails to recognize that economic agents will change their behavior in response to policy. Thus, while the SARFAESI Act had the effect of decreasing debt to some borrowers, I show that it also had the perhaps intended consequence of allocating debt away from low quality borrowers to high quality borrowers. Importantly while weak creditor rights can hinder the reallocation of capital towards more productive projects (La Porta et al. (1997), Demirguc-Kunt and Maksimovic (1998) and Djankov et al. (2005)), it follows that an improvement in these credit rights can reallocate resources towards more productive projects.

The remaining paper is organized as follows. Section I and section II describes the institutional details and the data used in our analysis. Section III describes our empirical methodology. Section IV describes the impact of the passage of the law on firm borrowings. Section V looks at the impact of SARFAESI on real outcomes of firms. Section VI looks at the results on profitability of firms. Section VII looks at the bank-level analysis. Section VIII analyzes the birth and death of firms. Section IX describes the robustness results. Section X

I. Institutional Details

According to the Economic Survey 2015-16, impediments to easy exit of loss-making entities have substantial fiscal, economic and political costs to the Indian economy. Recent debate has also emphasized how vested interests of entities and weak institutions in India combined with an inability to punish willful defaulters blocks reforms and exit plans. Vested interests of banks encourage ever-greening of loans, thereby postponing exits. Evergreening refers to the practice of rolling over bad loans to weak borrowers. Banks keep extending additional credit to companies that already had loans with them. By extending credit, the banks enable weak corporate borrowers to keep making their interest payments, and delay bankruptcy. This, in turn, makes the banks balance sheets look better, and also keeps companies ongoing which

ideally should have been shut down. This problem of difficulty in exit of firms in India has long been recognized. A recent quote by the Finance Minister Arun Jaitley that "Every case that the litigant manages to delay hurts the larger investment environment of the country because if money of banks are blocked with some defaulters, it prevents the bank from funding others who otherwise could have utilised this investment for fruitful purposes and benefit of the country" emphasizes precisely this. ²

Public sector banks are more likely to keep extending credit to weak firms due to their perceived duty to support troubled firms and the explicit government guarantee backing them. A Business Standard (2004) article highlighted that the Reserve Bank of India (RBI) had issued a warning to public sector banks against any attempt to "evergreen" their balance sheets. ³

Prior to 1993, due to absence of defined mechanisms to deal with NPAs, banks and financial institutions (FIs) had to take recourse to the long legal route against defaulting borrowers, beginning with the filing of claims in the courts. Civil courts were already too overburdened with other type of recovery claims that bank claims failed to get any importance and resulted in long pending cases with no immediate effect. In order to deal with the lengthy judicial process and expedite recovery, the government of India introduced Debt Recovery Tribunals (DRTs) in 1993, with the objective of facilitating speedy recovery of dues for banks and FIs, in cases where the loan amount was Rs. 10 lakhs and above. Due to inadequate infrastructure and shortage of recovery personnel, DRTs got clogged with excessive cases and ended up being a failure. In 2002, based on the recommendations of the Narasimham Committee II (1998) and the Andhyarujina Committee (1999), GoI enacted the SARFAESI act for regulation of securitization and reconstruction of financial assets and enforcement of security interest by secured creditors.

The Securitisation And Reconstruction of Financial Assets and Enforcement of Security Interest Act, 2002 (SARFAESI) aims to empower Banks and Financial Institutions as secured creditors to recover their non-performing assets by taking possession, managing and selling

²See <http://indianexpress.com/article/business/banking-and-finance/arun-jaitley-to-banks-help-pvt-sector-revive-investments-3739350/>.

³See http://www.business-standard.com/article/finance/rbi-warns-on-evergreening-104032201006_1.html

the securities without the intervention of court/tribunal. The Act provides three alternative methods for recovery of NPAs:

1. Securitisation
2. Asset Reconstruction
3. Enforcement of Security without intervention of the court

Under section 13 (2) of the SARFAESI Act, after a loan has been classified as a non-performing asset (NPA) by the secured creditor, a notice to this effect is sent to the relevant borrower. If the borrower fails to discharge his liability in repayment of any secured debt within 60 days from the date of notice by the secured creditor, the creditor is entitled to exercise the rights in accordance with section 13 (4) of the Act to:

1. take possession of the secured assets of the borrower
2. takeover of the management of the business of the borrower
3. appoint any person to manage the secured assets, possession of which is taken by the secured creditor
4. require any person, who has acquired any of the secured assets from the borrower and from whom money is due to the borrower, to pay the secured creditor so much of the money as is sufficient to pay the secured debt.

In the cases where collateral is insufficient to fulfill obligations to creditors, the creditors may file an application to the DRT for recovery of the remaining portion of the dues. The borrower can also appeal to the DRT against the creditors findings. While the initial versions of the Act gave borrowers no rights to appeal against this notice, a later version introduced Sub-section 3A into SARFAESI Act to allow borrower appeals against 13(2) notices. This appeal can be made to the secured creditor alone. The bank is expected to respond to the appeal of the borrower within fifteen days.

The enactment of the SARFAESI Act has been a benchmark reform in the Indian banking sector. According to RBI's 2003 report on trends and progress of banking ⁴, the act enabled banks to recover around Rs.500 crore within a year by end-June 2003. The significant progress

⁴See <https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/40092.pdf>

was also evidenced by the fact that during 2002-03, reductions outpaced addition, especially for public sector banks and reflected in an overall reduction of nonperforming loans to 9.4 percent of gross advances from 14.0 percent in 1999-2000.

II. Data

The primary database used in our study is the Prowessdx database, maintained by Centre for Monitoring Indian Economy (CMIE). This database provides financial data for all Indian firms, both listed as well as unlisted, and has been used in several other research studies (Bhue et al. (2015), Gopalan et al. (2016)) for firm-level analysis. While the coverage for listed firms is comprehensive (due to reporting requirements), the coverage for unlisted firms is limited. We collect information under five broad categories from Prowess: Identity, Standalone Annual Financial Statements, Credit Ratings, Bankers and BSE and NSE Stocks Trading Data. We download data for the period from April 01, 1991 until March 31, 2015 from the ‘March 2016’ vintage of the CMIE Prowess, which covers 37,873 unique firms over the period. An identity dataset maintained by CMIE contains few identifiers for firms covered by Prowess. We use the Prowess ‘Company code’, a numerical code assigned to every company in the CMIE database, to identify unique entities. The variables used in the study are described in Table I.

We control for variables that are understood to affect firm debt structure. To control for firm-level heterogeneity, we use firm fixed effects in all regressions. We also include year fixed effects to control for aggregate economic shocks. We add additional controls for profitability (EBIT/Assets), size ($\log(\text{sales})$) and growth opportunities (Tobins Q).

We also look at bank level analysis. The CMIE data does not provide the amount of loan provided by each bank or lender. However it does indicate the primary lender for a given firm. The data on bankers is extracted from CMIE as a separate dataset that gives 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 stock price data and returns data for firms and banks respectively, are also extracted from Prowess database’s “BSE and NSE Stocks Trading Data”. The returns are expressed as a ratio of the closing price, gains/losses arising due to capital action and dividend per share (if any) to the closing price of previous day. A ratio of more than one indicates a positive return whereas a ratio less than one denotes negative returns. Most of the variables pertaining to banks in our dataset are extracted from DBIE (Database on Indian Economy).

We also supplement our analysis with data on workers and debt data of factories. For this analysis we use 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 our employment related statistics we use data on all average number of all workers, permanent workers, contract workers and factory staff as reported in ASI. Wages for each category is also taken from ASI. We also complement our analysis on debt by using debt data for each factory from ASI. Variable Debt stands for total liabilities. Variable trade credit is defined as working sundry creditors while formal credit is defined as working overdraft. This data allows us to look at the impact on the intensive margin of employment. Particularly, it gives information on number of permanent workers, contract workers and staff (white collar employees) at each factory within a firm. One drawback of this dataset is that it only captures the manufacturing firms.

A. Sample Construction

We download stand-alone annual financial statements for ‘All Companies’ from CMIE Prowess. The vast majority of Indian corporate firms have fiscal year end t in March. Our notation is that all fiscal year t variables are as of March 31 of calendar year t . If the year end is in a month other than March, we assign all firms with year end before September 30 in calendar year t to fiscal year t and firms with all other year-ends to year $t+1$.

B. Identification of Zombie Firms

Peek and Rosengren (2005) shows that during the 1990s, Japanese banks constantly “evergreened” that kept credit flowing to unprofitable borrowers (zombies), which led to lower capital expenditure, job creation and productivity; and hence, kept the economy from making necessary adjustments to start growing again. Additionally, it also limited Japanese banks profitability, because instead of making good new loans, they kept giving credit to bad firms. As a result, they were never able to earn their way back to health.

A firms 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. Caballero et al. (2008) determine ‘zombie’ as a firm whose interest payment is lower than the risk-free interest payments:

$$R_{i,t}^* = rs_{t-1}BS_{i,t-1} + (1/5 \sum_{j=1}^5 rl_{t-j})BL_{i,t-1} + rcb_{minoverlast5years,t} \times Bonds_{i,t-1}$$

where $BS_{i,t}$, $BL_{i,t}$ and $Bonds_{i,t}$ are short-term banks loans (less than 1 year), long-term bank loans (more than 1 year) and total bonds outstanding (including convertible bonds (CBs) and warrant-attached bonds), respectively, of firm i at the end of year t ; and rs_t , rl_t and $rcb_{minoverlast5years,t}$ are the average short-term prime rate in year t , the average long-term prime rate in year t , and the minimum observed coupon rate on any convertible corporate bond issued in the last 5 years before t .

However, there are a few shortcomings of this criterion that make it an ineffective measure of identifying zombies. First, it does not take into account the aspect of “*evergreening*”, which is what kept unhealthy firms afloat in the market economy. 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, it becomes important to modify CHK’s definition of zombies and avoid the mistreatment of any firm, which otherwise is healthy, as zombie.

We classify firms as zombies not only based on the assessment of whether they are receiving

subsidized credit, but also by looking at their credibility, profitability and most importantly, any evidence of evergreening. According to our definition, ‘zombie’ is a firm that has interest rate on long term loans below the minimum prime lending rate. To determine which firms are receiving subsidized credit, we use SBI (largest public sector bank in India) prime lending rates as our benchmark or cut-off rates and calculate if the interest cost on long term loans for a firm is lower than the minimum prime lending rate of the 5 institutions in that year. The general principle behind our choice is to select the interest rates that are extremely advantageous for the borrower. SBI being the largest public sector bank in India, its PLR is an indication of the interest rate, at which most creditworthy firms in the economy avail credit. Next, we proceed in three steps:

First is the ‘credibility’ criteria. If a firm’s interest cost is below our cut-off, but it is the highest rated firm, we do not classify it as zombie, taking into consideration the fact that the firm might be availing the advantage of its goodwill by getting credit at a subsidized rate.

Second is the ‘profitability’ criteria. If a firm’s interest coverage ratio is more than 1 or in other words, if its earnings before interest and taxes (EBIT) exceed its interest expenses; it is excluded from zombies. Simultaneously, we look at another measure of firm’s health i.e. leverage. Low leveraged firms having external debt less than 20 percent of their total assets are also excluded from the category of zombies. Excluding these firms from zombies ensures that healthy firms are not being classified as zombies.

And third is the ‘evergreening’ criteria, under which unprofitable and highly leveraged firms with increased external borrowing as compared to last year are included as zombies. Firms with negative EBIT and large external debt should ideally not be taking a new loan. Therefore, by classifying such firms as zombies, the modified criteria is more likely to be accurately categorizing unhealthy firms as zombies.

Therefore, a zombie is 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 .

The challenge for our approach: As Indian companies are not required to mandatorily give

out information on the ‘short-term’ and ‘long-term’ interest rates on borrowed funds, we do not have access to that data. Separately, the data for short term investments is available in Prowess only from the financial year ending March 2012, as the revised schedule VI was introduced for preparation of financial statements by all companies on or from 1 April 2011.

C. Summary Statistics

Table II shows the summary statistics of the variables used in our analysis. The mean, standard deviation, minimum, maximum and the various percentiles (10th, 25th, 50th, 75th and 90th) are shown. Average total borrowings for the period 1997 to 2006 was Rs. 1934 million. Of this, Rs. 5326 was secured borrowing and Rs. 651 was unsecured borrowings. ICR is the ratio of earnings before interest and taxes to total interest expense. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. 22 percent of firms were classified as low quality borrowers. 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 low (high) tangibility if the median tangibility ratio in 1998, 1999 or 2000 is below (above) median tangibility of all firms. 66 percent of firms were classified as firms with high tangibility. Capital expenditure is non-negative difference in gross fixed assets between current period and the previous period. During the period of our analysis, firms on average had a capital expenditure of Rs. 164 million. Employment is the number of employees in the firm. Number of employees was on average 227.

The profitability measures we use in our analysis are operating margin, return on assets and total factor productivity. Operating margin is the ratio of earnings before interest, taxes, depreciation and amortization to total sales. Return on assets is the ratio of earnings before interest, taxes, depreciation and amortization to total assets. TFP (total factor productivity) is the residual from a regression of log(sales) on log(employees) and log(Property, plant and equipment) across all firms in the same 2-digit SIC industry. Operating margin was on average

18 percent. Return on assets was 10 percent and total factor productivity during this period was 0.24.

III. Empirical Methodology

We now turn to an investigation of how the improvement in creditor rights impacted secured debt of low quality and high quality firms. This paper compares the impact on secured debt and real effects of the SARFAESI Act by comparing low quality borrowers against high quality borrowers.

A. Change in Secured debt due to SARFAESI

Our preferred specification to estimate the impact of the passage of the SARFAESI Act on the dependent variable of interest is given by:

$$y_{it} = \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post} \times \mathbb{1}_{(LowQ)} + \beta \times X_{it} + \epsilon_{ijt} \quad (1)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). $\mathbb{1}_{(LowQ)} = 1$ for “Low Quality” firms. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. η is estimate of interest. The controls (X_{it}) included are Tobin’s Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is η , which measures the difference, conditional on controls, in outcome y between low quality and high quality borrowers after the passage of the SARFAESI Act relative to before the SARFAESI Act.

In our baseline analysis, the dependent variable is change in secured debt between t and $t - 1$. We also look at whether this was driven by increases in debt or by decreases in debt. In these regressions, the dependent variable is whether the change in secured debt was above 0 (increases in secured debt). We also look at reductions in secured debt given by the dependent variable as an indicator whether secured debt is below 0.

To facilitate transparent examination of trends over time, I also estimate a year-by-year specification and present all my results as event study plots. The primary specification is:

$$y_{ijt} = \alpha_i + \gamma_t + \sum_{\tau} \eta_{\tau} \times (\mathbb{1}_{\tau} \times \mathbb{1}_{(LowQ)}) + \beta \times X_{it} + \epsilon_{ijt} \quad (2)$$

where τ ranges from 1996 to 2006, $\mathbb{1}_{\tau} = 1$ if year is τ and η_{τ} is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year SARFAESI was announced, and all coefficients are normalized relative to $\tau = 1$. Robust standard errors are clustered at the firm level. The dependent variable is change in secured borrowings, change in unsecured borrowings, reductions in secured borrowings and increases in secured borrowings. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. The coefficient of interest is η_{τ} , which measures the difference, conditional on controls, in outcome y between low quality and high quality borrowers τ years after the passage of the SARFAESI Act.

A.1. Analysis of pre-trends

We also look at the pre-trends in secured debt in the period prior to the passage of the SARFAESI Act. We carry out the following specification for the sample between 1996 to 2001:

$$y_{it} = \gamma_t + \delta \times \mathbb{1}_{(LowQ)} + \beta \times X_{it} + \epsilon_{ijt} \quad (3)$$

where i indexes firms, t indexes time, γ_t is the year fixed effect. $\mathbb{1}_{(LowQ)} = 1$ for “Low Quality” firms. Low quality borrowers are defined as firms with interest coverage less than 1 for the median ICR between 1994 to 1997. The controls (X_{it}) included are Tobin’s Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is δ , which measures the difference, conditional on controls, in outcome y between low quality and high quality borrowers.

We repeat the baseline analysis, with the dependent variable as the change in secured debt

between t and $t - 1$. We also repeat the analysis with low quality borrowers defined as firms with return on assets (ROA) less than 0 for the median ROA between 1994 to 1997.

B. Heterogeneity across Tangibility

Following Vig (2007), I also look at the heterogeneity across tangibility of assets. Since the SARFAESI applied to secured debt, Vig (2007) argues that firms that have more collateralizable assets (more tangible assets) are more likely to be affected by the reform than firms that have less assets to collateralize. Thus, we exploit the pretreatment cross-sectional variation in the amount of asset tangibility to look at heterogeneity in impact of SARFAESI on low quality borrowers. 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 low (high) tangibility if the median tangibility ratio in 1998, 1999 or 2000 is below (above) median tangibility of all firms.

$$\begin{aligned}
 y_{it} = & \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post} \times \mathbb{1}_{(LowQ)} + \nu \times \mathbb{1}_{Post} \times \mathbb{1}_{(HighT)} \\
 & + \phi \times \mathbb{1}_{Post} \times \mathbb{1}_{(LowQ)} \times \mathbb{1}_{(HighT)} + \beta \times X_{it} + \epsilon_{ijt}
 \end{aligned} \tag{4}$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{(HighT)} = 1$ for “High Tangibility” firms, that is, above median Tangibility Ratio. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). $\mathbb{1}_{(LowQ)} = 1$ for “Low Quality” firms, that is, in bottom tercile of Interest Coverage Ratio. ϕ is coefficient estimate of interest. Standard errors are clustered at the firm level.

To transparently examine the components of above triple-diff, we also look at the following

specification separately for the low quality and high quality borrowers:

$$y_{it} = \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post} \times \mathbb{1}_{HighT} + \beta \times X_{it} + \epsilon_{ijt} \quad (5)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). A firm is classified as a zombie if a firm has interest rates below the minimum prime lending rate. In addition, a zombie firm has an interest coverage ratio (ICR) below 1 and leverage (total external debt to total assets) greater than 0.20. $\mathbb{1}_{Zombie}$ if a firm is classified as a zombie. The controls (X_{it}) included are Tobin's Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is η , which measures the difference, conditional on controls, in outcome variable between low quality and high quality firms, after the passage of the SARFAESI Act relative to before the SARFAESI Act. y_{it} , the dependent variable, is either change in secured debt or unsecured debt.

C. Attributable to zombie lending

Next, we examine whether the reduction in secured debt in the period following the passage of the SARFAESI Act is due to a reduction in zombie lending. We run the following specification analogous to Equation 1.

$$y_{it} = \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post} \times \mathbb{1}_{Zombie} + \beta \times X_{it} + \epsilon_{ijt} \quad (6)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). A firm is classified as a zombie if a firm has interest rates below the minimum prime lending rate. In addition, a zombie firm has an interest coverage ratio (ICR) below 1 and leverage (total external debt to total assets) greater than 0.20. $\mathbb{1}_{Zombie}$ if a firm is classified as a zombie. η is estimate of interest. The controls (X_{it}) included are Tobin's Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is η , which measures the difference, conditional on controls, in outcome variable between zombie and non-zombie after the passage of the SARFAESI Act

relative to before the SARFAESI Act. y_{it} , the dependent variable, is either change in secured debt or unsecured debt.

We also want to see whether firms which were zombies transitioned into non-zombie status in the period following SARFAESI. To do that we run the following specification:

$$\mathbb{1}_{Zombie\ current} = \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post} \times \mathbb{1}_{Zombie} + \beta \times X_{it} + \epsilon_{ijt} \quad (7)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). A firm is classified as a zombie if a firm has interest rates below the minimum prime lending rate. In addition, a zombie firm has an interest coverage ratio (ICR) below 1 and leverage (total external debt to total assets) greater than 0.20. $\mathbb{1}_{Zombie}$ if a firm is classified as a zombie in the period before the passage of SARFAESI. η is estimate of interest. The controls (X_{it}) included are Tobin's Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is η , which measures the difference, conditional on controls, in outcome variable between zombie and non-zombie after the passage of the SARFAESI Act relative to before the SARFAESI Act. $\mathbb{1}_{Zombie\ current}$ is an indicator equal to one if a firm is classified as a zombie in the current period.

D. Zombie Distortions

In a final step, we investigate whether the decline in the fraction of zombie firms has positive effects on healthy (non-zombie) firms in the same industry. The basic regression we will run in this section follows Rajan and Zingales (1995) and is given by:

$$y_{it} = \alpha_i + \gamma_t + \beta_1 \times Industry\ Fraction\ Zombies \times \mathbb{1}_{Post} + \beta_2 \times Non\ Zombie \times \mathbb{1}_{Post} + \beta_3 \times Non\ Zombie \times Industry\ Fraction\ Zombies \times \mathbb{1}_{Post} + \beta \times X_{it} + \epsilon_{ijt} \quad (8)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). The controls (X_{it}) included are Tobin's Q, log

of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is β_3 .

E. Real Outcomes

We next investigate the impact of lending on capital expenditure, employment and wages. We follow the analysis in Equation 1 with the following specification:

$$y_{it} = \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post} \times \mathbb{1}_{(LowQ)} + \beta \times X_{it} + \epsilon_{ijt} \quad (9)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). $\mathbb{1}_{(LowQ)} = 1$ for “Low Quality” firms. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. η is estimate of interest. The controls (X_{it}) included are Tobin’s Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is η , which measures the difference, conditional on controls, in outcome y between low quality and high quality borrowers after the passage of the SARFAESI Act relative to before the SARFAESI Act. The dependent variable is investment and number of employees.

We also look at the spillovers on the non-zombie firms. We run the specification in Equation 8 given by:

$$y_{it} = \alpha_i + \gamma_t + \beta_1 \times \text{Industry Fraction Zombies} \times \mathbb{1}_{Post} + \beta_2 \times \text{Non Zombie} \times \mathbb{1}_{Post} + \beta_3 \times \text{Non Zombie} \times \text{Industry Fraction Zombies} \times \mathbb{1}_{Post} + \beta \times X_{it} + \epsilon_{ijt} \quad (10)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). The controls (X_{it}) included are Tobin’s Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is β_3 . The dependent variable is investment and number of employees.

F. Profitability

We next investigate the impact on profitability of firms. We follow the analysis in Equation 1 with the following specification:

$$y_{it} = \alpha_i + \gamma_t + \eta \times \mathbb{1}_{Post} \times \mathbb{1}_{(LowQ)} + \beta \times X_{it} + \epsilon_{ijt} \quad (11)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). $\mathbb{1}_{(LowQ)} = 1$ for “Low Quality” firms. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. η is estimate of interest. The controls (X_{it}) included are Tobin’s Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is η , which measures the difference, conditional on controls, in outcome y between low quality and high quality borrowers after the passage of the SARFAESI Act relative to before the SARFAESI Act. The dependent variables are profitability measures: operating margin, return on equity and total factor productivity.

We also look at the spillovers on the non-zombie firms. We run the specification in Equation 8 given by:

$$y_{it} = \alpha_i + \gamma_t + \beta_1 \times \text{Industry Fraction Zombies} \times \mathbb{1}_{Post} + \beta_2 \times \text{Non Zombie} \times \mathbb{1}_{Post} \\ + \beta_3 \times \text{Non Zombie} \times \text{Industry Fraction Zombies} \times \mathbb{1}_{Post} + \beta \times X_{it} + \epsilon_{ijt} \quad (12)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). The controls (X_{it}) included are Tobin’s Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is β_3 . The dependent variable is profitability measures operating margin, return on equity and total factor productivity.

G. Bank Level Analysis

I also look at bank level exposure to low quality firms. The hypothesis is that banks with the highest exposure to low quality firms should be the most affected by the SARFAESI and hence should show the biggest effect. We can link each firm to the primary (lead) bank or lender. We calculate the bank level exposure to low quality banks in the pre-crisis period. Then we look at the following regression.

$$y_{it} = \alpha_b + \gamma_t + \eta \times \mathbb{1}_{Post} \times \mathbb{1}_{(LowQ)} + \nu \times \mathbb{1}_{Post} \times \mathbb{1}_{(HighExp)} + \phi \times \mathbb{1}_{Post} \times \mathbb{1}_{(LowQ)} \times \mathbb{1}_{(HighExp)} + \beta \times X_{it} + \epsilon_{ijt} \quad (13)$$

where i indexes firms, t indexes time, b indexes banks. α_b and γ_t are bank and year fixed effects. $\mathbb{1}_{(HighExp)} = 1$ for “High Exposure” firms, that is, above median exposure to low quality firms in the period before SARFAESI. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). $\mathbb{1}_{(LowQ)} = 1$ for “Low Quality” firms, that is, firms with Interest Coverage Ratio below 1 in the pre-SARFAESI period. ϕ is coefficient estimate of interest. Standard errors are clustered at the firm level.

To transparently examine the components of above triple-diff, we also look at the following specification separately for the low quality and high quality borrowers:

$$y_{it} = \alpha_b + \gamma_t + \eta \times \mathbb{1}_{Post} \times \mathbb{1}_{HighExp} + \beta \times X_{it} + \epsilon_{ijt} \quad (14)$$

where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). The controls (X_{it}) included are Tobin’s Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is η , which measures the difference, conditional on controls, in outcome variable between low quality and high quality firms, after the passage of the SARFAESI Act relative to before the SARFAESI Act. y_{it} , the dependent variable, is change in secured debt.

H. Entry and Exit of Firms

Last, we study the effect of SARFAESI on entry and exit of firms in an industry. We hypothesize that industries with higher percentage of zombie firms should observe both higher births as well as higher deaths. Low quality firms which are not able to meet their debt commitments should wind-up and de-clutter the industry creating scope for new firms to enter. We take 2-digit NIC classification to define industry in our data and calculate percentage of zombie firms in each industry.

We then look at following regression:

$$y_{it} = \alpha_i + \gamma_t + \eta \times \text{Industry Fraction Zombies} \times \mathbb{1}_{Post} + \beta \times X_{it} + \epsilon_{ijt} \quad (15)$$

where i indexes industry, t indexes time, α_i and γ_t are industry and year fixed effects. $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect (≥ 2002). The controls (X_{it}) included are Tobin's Q, log of sales and return on assets. Standard errors are clustered at the firm level. The coefficient of interest is η . The dependent variable is the total number of firms, birth of firms and death of firms.

IV. Effect of SARFAESI Act on Secured Debt

A. Effect of SARFAESI Act on Secured Debt

We begin our empirical analysis by investigating the effect of the SARFAESI Act on the health of firms in the economy. Figure 1 motivates our analysis. Panel A shows the percentage of firms with low interest coverage (ICR) ratios and with negative profit. ICR is the ratio of earnings before interest and taxes to total interest expense. This essentially captures whether a firm is able to cover its interest expenses. We find that the percentage of firms with negative profit and with low ICR declined sharply in 2002 after the passage of the SARFAESI Act. Just before the passage of the act, nearly 38 percent of the firms had negative profits. After the passage of

the law, this fell to 34 percent in March 2003 and eventually to 23 percent in 2006. The number of firms with ICR less than 1 was nearly 30 percent in March 2002 and fell to 23 percent in March 2003 and eventually to 14 percent in 2006.

These two graphs show that the passage of the SARFAESI had a significant impact on the health of firms. Panel b in Figure 1 shows the corresponding impact of the law on bank balance sheets. The graph plots the net nonperforming assets additions to net advances for all banks. Net additions in nonperforming assets is defined as nonperforming asset additions less nonperforming asset recovery. Net advances is the total loans minus provisioning on nonperforming assets. This graph shows that the health of bank balance sheets improved with the NPA ratio falling from 18.2 percent in 2002 to 12.3 percent in 2003. Thus, the SARFAESI Act had a significant impact on bank health.

We now examine the impact of SARFAESI on secured debt for low quality borrowers compared to high quality borrowers. In order to do so, we define low quality borrowers as follows. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. Table III shows the results of the empirical specification in Figure 1. First we look at the effect on the change in borrowings. In Panel A, column 1 shows that borrowings declined by approximately Rs. 76 million for low quality borrowers relative to high quality borrowers in the period following SARFAESI. On controlling for investment opportunities and profitability, the results are even more stark and show that borrowings declined by Rs. 146 million for low quality borrowers compared to high quality borrowers after the passage of the SARFAESI Act. This implies that a low quality borrower with interest coverage ratio of less than 1 in the period before SARFAESI, had a lower growth in borrowings in the period following SARFAESI compared to a high quality borrower. In columns 3 and 4, we normalize the change in borrowings by the preceding period assets. Results are qualitatively the same (the results without control variables indicate a steeper impact in this case). Figure 2 shows the same results in a graphical form. As described in Section III Figure 2 shows the difference in new borrowings as calculated in Equation 2. Panel(a) shows that post the passage of the SARFAESI Act, secured lending dropped significantly for low quality borrowers. Borrowings continued to decline after 2002.

In Panel B, we turn to the impact of SARFAESI on unsecured borrowings. We find there was no significant impact of the SARFAESI on unsecured borrowings. Since SARFAESI only applied to secured credit, this result is not surprising. These results also show that low quality borrowers were not substituting into unsecured borrowings. This is not surprising since our hypothesis is that the reduction in debt of low quality borrowers is driven by the reduction in evergreening of loans. Once the banks can easily exit their banking relationship, we do not expect them to increase unsecured lending. Figure 2, panel(b) shows the same results in graphical form. Unsecured lending for low quality borrowers did not change significantly post the passage of the SARFAESI Act.

B. Debt in the period before the SARFAESI Act

In Table IV, we look at the trend in new borrowings in the period before the SARFAESI. In panel (a), Figure 1 we already saw that the number of low quality borrowers — firms with interest coverage ratios less than 1 — we increasing drastically in the period before the SARFAESI. We look at this more formally. Table IV shows the results for equation 3. In the period preceding the SARFAESI, low quality borrowers had higher secured debt compared to high quality borrowers. We also show using an alternate measure of quality, borrowers classified into two groups based on their profitability. Low profitability borrowers too had higher debt before the passage of the SARFAESI. Looking at unsecured debt, however shows that there were no significant differences in unsecured debt.

C. Zombies

Next we look at whether the drop in borrowing can be attributed to the reduction in evergreening of loans by banks. To do this, we first define a zombie firm as follows. A firm is classified as a zombie if a firm has interest rates below the minimum prime lending rate. In addition, a zombie firm has an interest coverage ratio (ICR) below 1 and leverage (total external debt to total assets) greater than 0.20. . Figure 3, panel (a) plots the percentage of firms which are zombies. Note, as described in Section II, we follow a very conservative approach to define

zombies. The fraction of zombies just before 2002 was at 9 percent. After the passage of the SARFAESI Act, the number of zombies fell to around 6 percent. Since the SARFAESI only applies to secured debt, we also use an alternate definition of zombies wherein a firm is defined as a zombie if in addition to the classification above, the firm also has non-zero secured lending in a period. Using this definition of zombies, we find that the fraction of zombies fell from around 4.5 to 2 percent after the passage of the SARFAESI Act. Panel (b) shows the asset-weighted fraction of zombies where total assets is used as the weight. Results are even more stark and asset-weighted zombies fell from around 10 percent to 6 percent. Similarly, restricting to just zombies with secured debt, we find that the asset-weighted fraction of zombies dropped from 6.4 percent to 4 percent in 2004.

We then see whether the reduction in unsecured debt can be attributed to the presence of zombies. Table V shows the results of the regression in Equation 6. In column 1, we see that zombies on average reduce secured debt by Rs. 161 million. On adding controls, this number is even more stark at Rs. 420 million reduction in secured debt (column 2). In columns 3 and 4, we repeat the above regression with unsecured debt. Since SARFAESI did not apply to unsecured debt, we do not find a reduction in the unsecured debt of zombies.

We now turn to whether a firm is likely to transition to non-zombie in the period following the SARFAESI. To do this, we track firms that were classified as zombies in the period before the SARFAESI and then see whether they became non-zombies right after. Table V, columns 5 and 6 show the regression results for Equation 7. A firm that was classified as a zombie in the period preceding SARFAESI, was 19 percent less likely to be classified as a zombie in the period following the passage of SARFAESI (column 5). On adding controls, the results are similar with a 20 percent likelihood that a zombie firm transitions to non-zombie status in the period following SARFAESI.

D. Exploring Cross-Sectional Heterogeneity

We next turn to whether a firm with higher tangible assets had higher reduction in secured debt. This analysis follows Vig (2007). Indeed, we find that low quality firms which had higher

intangible assets reduce secured debt more than low quality firms with lower intangible assets in the period following SARFAESI.

Figure 4, Panel A shows the event study plots by splitting firms into high tangibility and low tangibility. 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 low (high) tangibility if the median tangibility ratio in 1998, 1999 or 2000 is below (above) median tangibility of all firms. The solid red line pertains to firms with high asset tangibility. The effect of SARFAESI is similar to what we observed in Panel A, Figure 2 but only for firms with high asset tangibility. Firms with more tangible assets reduce their secured borrowings in the period following SARFAESI. In contrast, there is no effect on secured debt after the passage of SARFAESI in the period following SARFAESI for firms with low tangibility of assets.

Table VI looks at this more formally and shows the results of running the specification in Equation 4. First in column 1 and 2 we look at low quality and high quality borrowers separately. Low quality borrowers with high asset tangibility did reduced their secured debt by Rs. 39 million in the period following SARFAESI. In contrast high quality borrowers with high asset tangibility did not reduce their secured debt. The triple-differenced specification in columns 3 and 4 show similar results. Low quality borrowers with high asset tangibility reduced their secured debt by Rs. 21 million. On adding controls, this results is even higher with low quality borrowers with high asset tangibility reducing their secured debt by Rs. 40 million.

E. Zombie Distortions

We now look at the spillovers of reduction in debt of zombie firms. Table V, Panel B shows the results for the regression specification in Equation 8. We first divide the industries with above (below) median percentage of zombies in the period (2001) before SARFAESI was passed. We look at the impact on the non-zombies in the same industry. Columns 1 and 2 show the results of the specification in Equation 8 with secured debt as the dependent variable. Consistent

with the analysis in Panel A of Table V, we find that industries with a higher percentage of zombies reduced secured debt in the period following SARFAESI. Industries with above median percentage of zombies in 2001 reduced secured debt by an average of Rs. 40 million. Now we look at the spillover on non-zombie firms in these industries. The triple interaction term shows that non-zombies in industries with a high number of zombies reduced debt on average by Rs 29 million. On controlling for investment opportunities and profitability, the results are even more stark with industries with a high percentage of zombies reducing debt by Rs. 52 million after the passage of SARFAESI. Non-zombies in these industries reduced secured debt by an average of Rs. 43 million. Since SARFAESI did not have an impact on unsecured debt, we do not find any spillover effects on unsecured debt (column and 4).

We next explore which industries had higher change in number of zombies. Building on the analysis in the previous subsection, we see whether the number of zombie reduced more drastically for industries with higher asset tangibility. Figure 4, Panel B plots the change in number of zombies against asset tangibility for each industry. We do find that firms with higher asset tangibility witnessed a greater fall in number of zombies in the period following SARFAESI compared to industries with low asset tangibility.

V. Effect of SARFAESI Act on Real Outcomes

Next we turn to the impact on real outcomes. Specifically, we look at the impact of reduction in secured debt by the low quality borrowers on capital expenditure and employment. We run the regression specification in Equation 9 with the dependent variable as capital expenditure in columns 1 and 2 in Table VII Panel A. We see that on average, capital expenditure reduced by Rs. 34 million after the passage of the SARFAESI for low quality borrowers (column 1). On adding controls, the results are even more stark with capital expenditures reducing by Rs. 50 million. In columns 3 and 4, the dependent variable is the number of employees. In column 3 we see that number of employees reduced by 66 after the passage of the SARFAESI. On adding controls, the number of employees reduced by 95 after the passage of the SARFAESI.

Figure 5 Panel A shows the event study around the passage of the SARFAESI Act. We see

that relative to 2001, the capital expenditure of low quality firms steadily reduced compared to high quality firms. Note, however, the capital expenditure of the low quality firms was higher than 2001 in 1997–1998. Similarly in Figure 5 Panel B we see that the number of employees reduced drastically after the SARFAESI by an average of 40 employees in 2003 and an average of 100 employees over the entire period.

A. Spillovers on real outcomes of non-zombie firms

Caballero et al. (2008) show that 1990s in Japan, the increase in zombies depressed the investment and employment growth of non-zombies and widened the productivity gap between zombies and non-zombies. We see whether the reduction in zombies after the passage of the SARFAESI had an analogous effect on the non-zombies.

Table VII Panel B shows the regression results of the Equation 10. Columns 1 and 2 show that after the passage of the SARFAESI, industries with a high percentage of zombies had a greater reduction in capital expenditure. This is consistent with the result in the previous section that zombies reduced secured debt. The triple-interaction term shows that the non-zombies in industries which were dominated by the zombies increased capital expenditure after the passage of the SARFAESI. Thus, the SARFAESI reduced number of zombies and this had strong spillovers on the capital expenditure of non-zombies. Controlling for investment opportunity and profitability shows similar results in column 2.

Next, we turn to the spillovers on employment. We find that post the passage of the SARFAESI, non-zombies in zombie-dominated industries increased the number of employees by an average of 43 employees (column 3 in Table VII Panel B). Similarly, on adding controls in column 4, we see that the number of employees for non-zombies in zombie-dominated industries increased by 69.

In Table VIII we also look at the intensive margin of adjustment. For this we use the factory level data from ASI. Although this dataset only has data on manufacturing firms, it allows us to look at factory level adjustments and also to look at the type of workers (permanent/contract/staff). Low quality factories are defined as factories with interest coverage

ratio less than 1. In Table VIII Panel A, we see that low quality firm shed workers by an average of 30 workers (27 workers when we control for sales). However, most of this effect is due to a reduction in permanent workers and staff (white collar workers) and not the contract workers. Similarly in Panel B, we see that the wages paid to workers by the low quality firms is also reduced by 11.2 percent (11.6 percent when we control for sales). This effect is essentially driven by the fall in wages of permanent workers and staff. ⁵

VI. Effect of SARFAESI Act on Profitability of firms

Next we turn to the impact on profitability of firms. Specifically, we look at the impact of reduction in secured debt and subsequent impact on profitability of low quality borrowers. We run the regression specification in Equation 11 with the dependent variable as operating margin, $\log(\text{EBIT})$, $\log(\text{assets})$, $\log(\text{ROA})$, $\log(\text{TFP})$ in columns 1, 2, 3, 4 and 5 respectively in Table IX. We find that operating margin of low quality borrowers increased by approximately 9 percent after the passage of the SARFAESI. Return on assets of low quality borrowers also increased by 6.1 percent after the passage of the SARFAESI. Similarly, we look at total factor productivity (TFP) in column 5. TFP is calculated as the residual value from regressing log of sales on log of employee compensation and log of plant, property and equipment. We find no effect on the TFP of low quality borrowers.

However, from Panel 3 figure 6 we suspect that the total factor productivity of low quality borrowers were affected by the act. Table A3 in Appendix presents the result of Equation 11 with dependent variable as change in operating margin (column 1), change in RoA (column 2) and change in TFP (column 3). From column 3, we find that post SARFAESI, the TFP of low quality firms increased by 4.5 percent. Also the operating margin of low quality firms increased by 2.1 percent (column 1) and the RoA increased by 1.2 percent (column 2) post SARFAESI.

⁵We carry a similar analysis Table A2 in the Appendix. Here we classify a firm as low quality firm if the firm has Interest Coverage Ratio (ICR) below the median ICR in that year. We find the results to hold true that is low quality firms shed permanent workers and staff post SARFAESI.

A. Spillovers on profitability of non-zombie firms

We now look at the spillovers on the profitability of non-zombie firms. Table IX Panel B shows the regression results of the Equation 12. After the passage of the SARFAESI, non-zombies in industries which were dominated by the zombies improved their operating margin by 4 percent. Similarly ROA of non-zombie firms increased by 1.5 percent and TFP increased by 8.2 percent. This is driven by an improvement of EBITDA while both sales and assets of non-zombies increased.

VII. Bank Level Exposure

In this section we look at which banks had the most reduction in secured lending to low quality borrowers. The hypothesis is that banks with the highest exposure to low quality firms should be the most affected by the SARFAESI and hence should show the biggest effect. Given our data constraints, we can only link each firm to the primary (lead) bank or lender. 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.

Under this assumption, we calculate the bank level exposure to low quality banks in the pre-crisis period. Bank-level exposure is measured as the number of low quality firms a bank was designated as the primary lender in 2001 (year before SARFAESI was enacted). High exposure refers to banks with above median exposure measure.

We then run the regression specification in Equation 13 and Equation 14. Results are shown in Table X. In column 1 we repeat our baseline regression, except we restrict to only firms whose primary lender is a bank which had high exposure to low quality borrowers in the pre-SARFAESI period. We find there is no statistically significant effect of low quality borrowers compared to high quality borrowers liked to the banks which did not have high exposure (were least likely to be affected by SARFAESI). However, in column 2 we see that low quality firms whose primary lender had above median exposure to low quality firms in the pre-SARFAESI period reduced debt on average by Rs. 19 million. Similarly, in column 3 we show the triple-difference specification and find qualitatively similar results. Low quality firms

whose primary lender had above median exposure to low quality firms in the pre-SARFAESI period reduced debt on average by Rs. 17 million.

The results in this section explicitly look at our hypothesis that banks were able to reallocate debt away from poor quality borrowers to better quality borrowers. Thus, banks which would have been most affected the SARFAESI — which had the highest number of low quality borrowers in the pre-SARFAESI period — should reduce (increase) their lending to low (high) quality borrowers the most.

VIII. Effect of SARFAESI on Entry and Exit of Firms

In this section we try to study the effect of SARFAESI on entry, exit and total number of firms within an industry. We hypothesize that industries with higher percentage of zombie firms should observe higher number of both births and deaths. We run the regression specification in Equation 15 with the dependent variables as total number of firms, births and deaths in an industry and report the results in Table XI. In Panel A of Table XI we find that for industries with higher percentage of zombie firms before the SARFAESI act, the total number of firms increased by 65 firms post SARFAESI (column 1). We also see an increase in births of new firms by 14 firms in industries with higher percentage of zombie firms prior to the act (column 2). We do not find any significant impact on the number of increase in deaths in column 3 for industries with higher percentage of zombie firms. However, we suspect that winding up of a firm takes longer than creating a new firm and the effect on deaths of firms within an industry should be seen in a longer term. Consequently, in column 4 we extend our data till 2010 and find that deaths in these industries also increased by 8 firms post SARFAESI act.

A. Long Term Effects of SARFAESI

In Panel B of Table XI, we study the long term effect of SARFAESI on new secured debts and new secured debt to asset of low quality firms. We now want to see the effect of SARFAESI on all poor performing firms and classify a firm as low quality firm if the firm has interest coverage ratio of less than 1 in any of the three preceding years. To capture the effect for a

longer run, we extend our data till 2010. In column 1 we find that a low quality firm reduced new borrowings by Rs. 95 million post SARFAESI. After controlling for log sales and return on assets in column 2, the reduction in new secured borrowings by low quality firms increases to Rs. 153 million. In column 3 we find that the new debt to asset ratio fell by 2.5 percent for low quality firms post SARFAESI. Similarly in column 4, we see that the new debt to asset ratio falls by 3.1 percent after controlling for log sales and return on assets. However we hypothesize that such large effects on debt is due to old debts of the firms and may not necessarily lead to such reduction in the longer run.

IX. Robustness

A. Debt Analysis

In Table A1 we find that post-SARFESI the effect on borrowing of low quality borrowers is negative and significant. In column 1, total borrowing falls by 5.2 percent if the borrower is a low quality borrower. After controlling for size of firm using log of sales we still find that the drop is significant at 6.4 percent for low quality borrowers. Similarly, for Trade Credit the new borrowing fall by 6.7 percent for low quality borrowers and by 6.3 percent after controlling for log sales. As expected, for the formal credit the fall is even higher at 11.2 percent for low quality borrowers and 11.3 percent after controlling for log sales. Although SARFESI does not directly affect trade credit, a steep fall in formal credit by low quality borrowers suggest that these borrowers might be scaling down operations post SARFESI resulting in a negative demand for trade credit.

B. Analysis of DRT

We also analyze the effect of SARFAESI on secured borrowings if the primary lender of a firm is a Non-Banking Financial Corporation (NBFC). We present the result in column 1 of Table A4 in Appendix. The variable *LawApplies* is a binary variable which takes the value 1 if the primary lender of a firm is bank and 0 if the primary lender is a Non-Banking Financial

Corporation (NBFC). From column 1 we see that the secured borrowing of a firm increases by Rs. 14 million if the primary lender of the firm is a NBFC. However the secured borrowing of low quality firms fell by Rs. 32 million if the firm was a low quality borrower and the primary lender was a NBFC. We thus conclude that the effect of SARFAESI extends even to the firms borrowing from NBFCs. In column 2 of Table A4 we change the criteria and define a low quality borrower as a firm with ICR less than 1 in 2001 (year before implementation of SARFAESI). We find that our result is robust to the change in criteria of defining a low-quality firm.

In column 3 of Table A4 we see the effect of Debt Recovery Tribunal (DRT) on secured borrowings of low quality firms. We observe no significant effect on secured borrowings of low quality firms indicating that DRT was not as effective in forcing low quality borrowers to reduce borrowings. DRT is limited in scope to certify whether a debt is legally owed by a borrower and thus any claims by debtors are required to be disposed by civil courts.

C. Logged Variables

Lastly, we run the equation 1 with log of dependent variables and present the result in Table A4. We find that our results are robust to such changes. From column 1 we see that the new secured borrowings of low quality firms fall by 90 percent after introduction of SARFAESI. After controlling for the firm size the effect reduces to 37 percent but stays significant. However, no such effect is observed on new unsecured debts as the act did not affect unsecured borrowings (column 3 and 4).

X. Conclusion

In this paper, we examine the effect of SARFAESI Act on the resource allocation to firms. The act enabled creditors to seize assets of defaulting firms without appealing in the court. Prior to the policy change creditors were not able to seize defaulting borrowers' assets due to which low-quality borrowers did not reduce debt. This is partly due to evergreening of loans to low-quality borrowers. Further, the presence of zombie firms depresses employment and investment of high quality firms that operate in the same industry. After the passage of the law banks reduced

credit to low-quality borrowers. We also find that low-quality borrowers reduced borrowing and cut back operations due to fear of failure to repay the loan. Additionally, the resulting decongestion increased employment and investment of high-quality borrowers that operate in the same industry.

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Figure 1. Motivating Graphs

Panel A below shows the percentage of firms with negative profit and the percentage of firms with interest coverage ratio (ICR) below 1 between 1995 to 2015. Profit is the return on assets calculated as the earnings before interest, taxes, depreciation and amortization to total assets. ICR is the ratio of earnings before interest and taxes to total interest expense. Data is from Prowess. Panel B shows the net nonperforming assets additions to net advances for all banks. Net additions in nonperforming assets is defined as nonperforming asset additions less nonperforming asset recovery. Net advances is the total loans minus provisioning on nonperforming assets. Data from banks is publicly available in the Trends and Progress Report provided by the Reserve Bank of India.

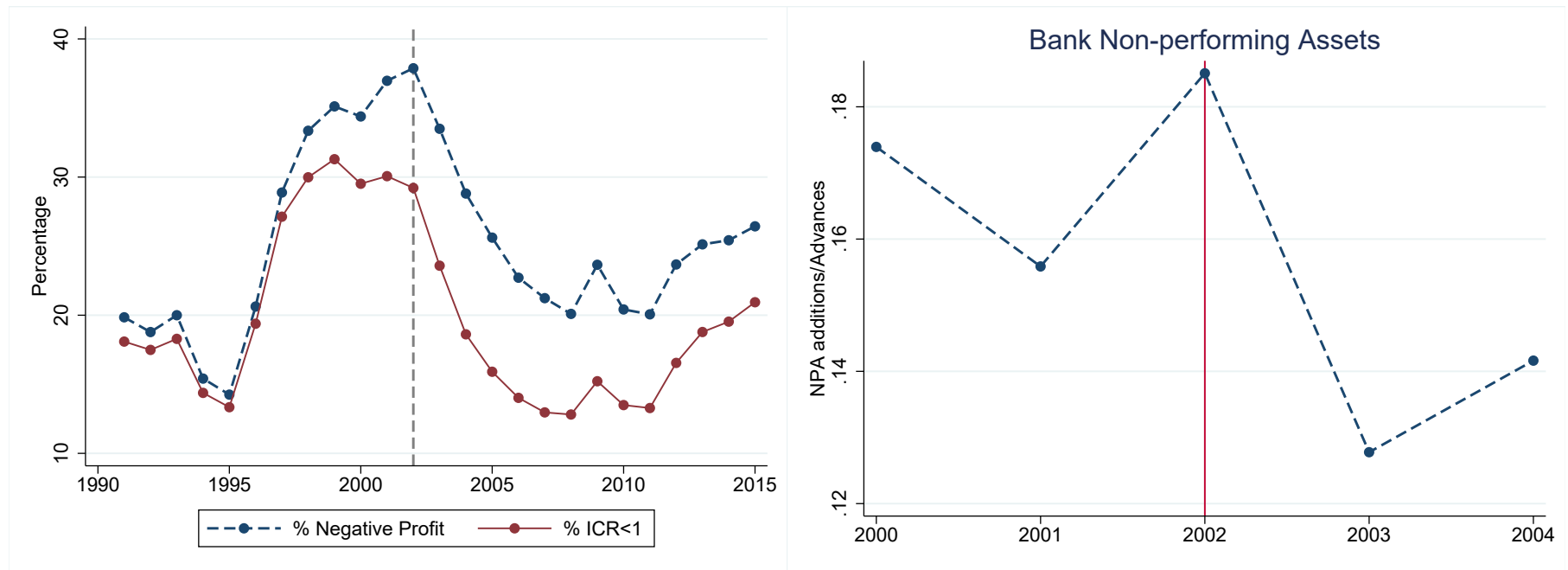


Figure 2. Misallocation of resources: Debt

The graph below shows the relationship between new borrowings and quality of borrower obtained from estimating the equation below.

$$y_{ijt} = \alpha_i + \gamma_t + \theta \times \mathbb{1}_{Post} + \delta \times \mathbb{1}_{(LowQ)} + \sum_{\tau} \eta_{\tau} \times (\mathbb{1}_{\tau} \times \mathbb{1}_{(LowQ)}) + \epsilon_{ijt}$$

where τ ranges from 1996 to 2006, $\mathbb{1}_{\tau} = 1$ if year is τ and η_{τ} is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year SARFAESI was announced, and all coefficients are normalized relative to $\tau = 1$. Robust standard errors are clustered at the firm level. In panel A the dependent variable is new secured borrowings. In panel B the dependent variable is new unsecured borrowings. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000.

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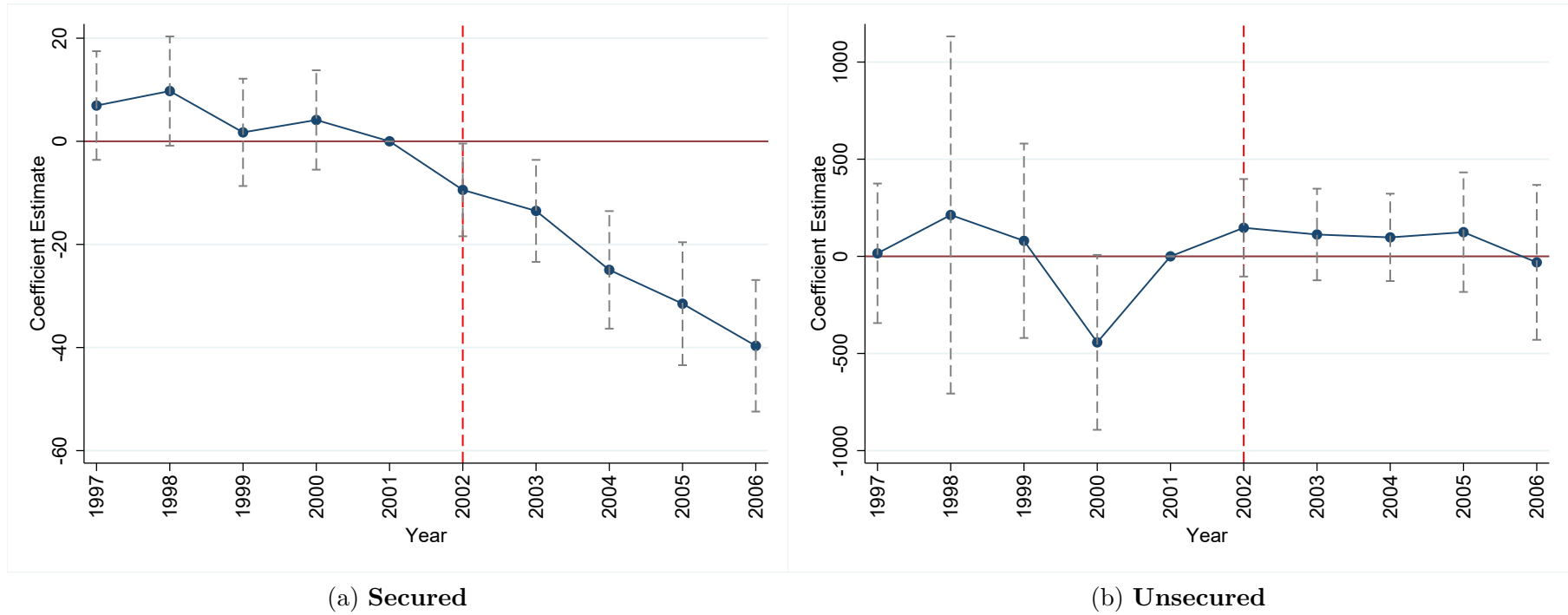
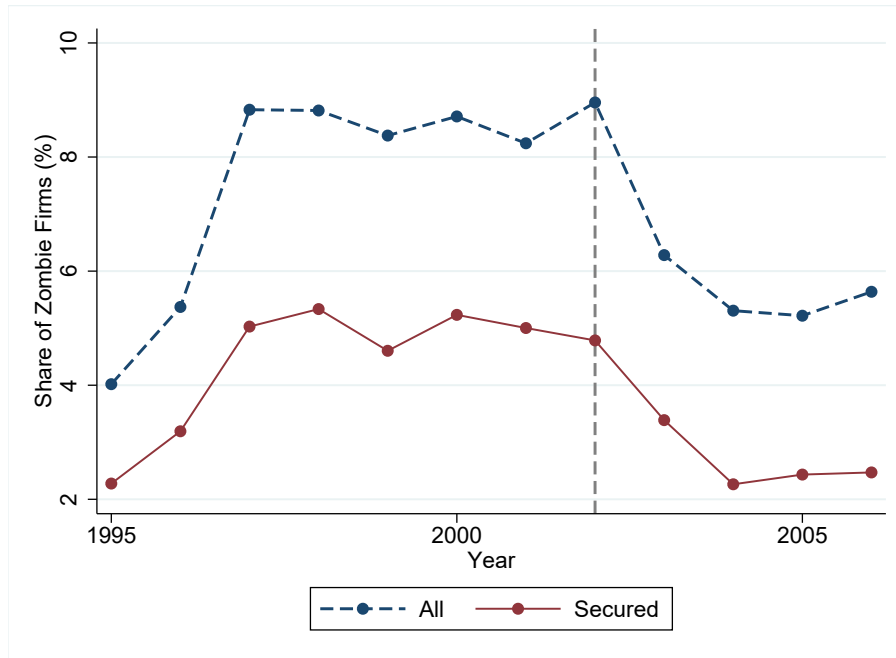
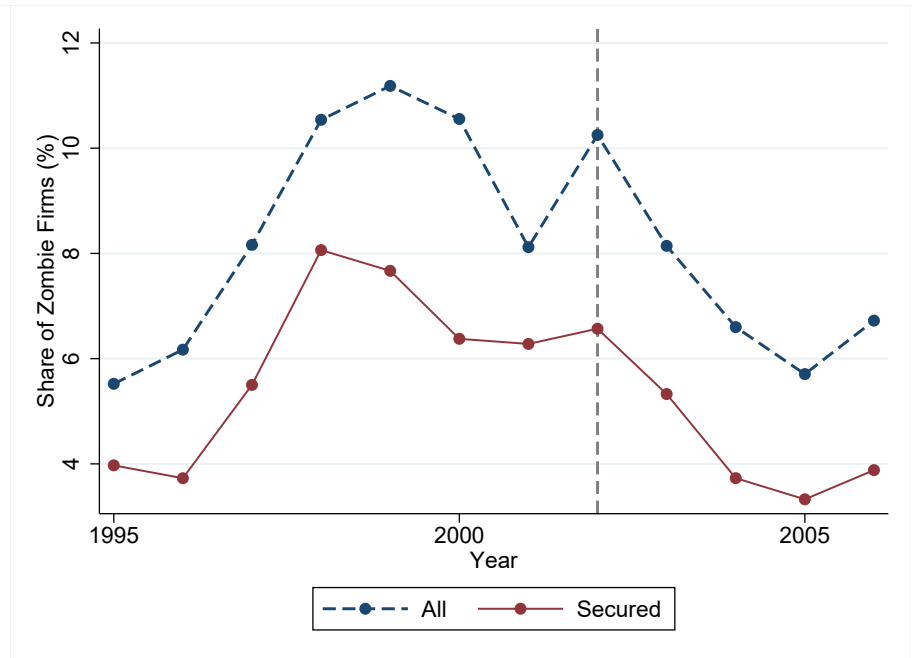


Figure 3. Zombie: Time Series

The graphs below plot the percentage of firms that are zombies between 1995 to 2006. Panel (a) plot the raw numbers and panel (b) plots the asset-weighted percentage by total assets. A firm is classified as a zombie if a firm has interest rates below the minimum prime lending rate. In addition, a zombie firm has an interest coverage ratio (ICR) below 1 and leverage (total external debt to total assets) greater than 0.20. Since the SARFAESI applies to secured debt, we also calculate the zombie ratio based on whether a firm had in addition to the above criteria also had new secured borrowings in the period (solid red line in each graph). ICR is the ratio of earnings before interest and taxes to total interest expense. Data is from Prowess.



(a) Raw



(b) Asset-Weighted

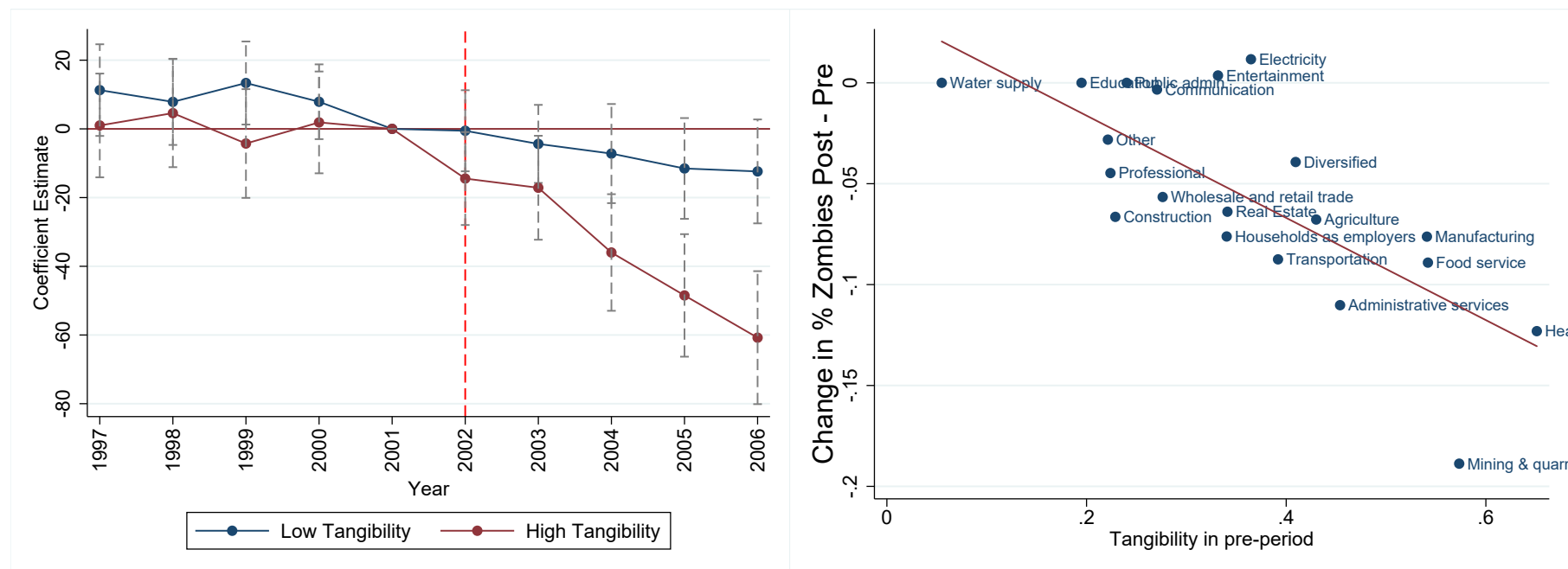
Figure 4. Zombie: Cross-Sectional

The graph on the left-hand-side shows the relationship between new borrowings and quality of borrower obtained from estimating the equation below separately for high tangibility and low tangibility firms.

$$y_{ijt} = \alpha_i + \gamma_t + \theta \times \mathbb{1}_{Post} + \delta \times \mathbb{1}_{(LowQ)} + \sum_{\tau} \eta_{\tau} \times (\mathbb{1}_{\tau} \times \mathbb{1}_{(LowQ)}) + \epsilon_{ijt}$$

where τ ranges from 1996 to 2006, $\mathbb{1}_{\tau} = 1$ if year is τ and η_{τ} is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year SARFAESI was announced, and all coefficients are normalized relative to $\tau = 1$. Robust standard errors are clustered at the firm level. In panel A the dependent variable is new secured borrowings. In panel B the dependent variable is new unsecured borrowings. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. 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 low (high) tangibility if the median tangibility ratio in 1998, 1999 or 2000 is below (above) median tangibility of all firms. The solid red line shows the coefficients for above median tangibility firms and the dashed blue line shows the coefficients for the below median firms. In Panel B, I plot the percentage change in percentage of zombies in each 2-digit industry group. A firm is classified as a zombie if a firm has interest rates below the minimum prime lending rate. In addition, a zombie firm has an interest coverage ratio (ICR) below 1 and leverage (total external debt to total assets) greater than 0.20. Percentage zombies is the number of zombies to the total number of firms. The change is calculated as the average in the post-SARFAESI period (2002 to 2006) and the pre-SARFAESI period (1996 to 2001). Tangibility is the average in the pre-period calculated as defined above.

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(a) Secured Borrowings

(b) Change in Zombies

Figure 5. Misallocation of resources: Real Outcomes

The graph below shows the relationship between the dependent variables (CapEx in panel (a) and employment in panel (b)) and quality of borrower obtained from estimating the equation below.

$$y_{ijt} = \alpha_i + \gamma_t + \theta \times \mathbb{1}_{Post} + \delta \times \mathbb{1}_{(LowQ)} + \sum_{\tau} \eta_{\tau} \times (\mathbb{1}_{\tau} \times \mathbb{1}_{(LowQ)}) + \epsilon_{ijt}$$

where τ ranges from 1996 to 2006, $\mathbb{1}_{\tau} = 1$ if year is τ and η_{τ} is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year SARFAESI was announced, and all coefficients are normalized relative to $\tau = 1$. Robust standard errors are clustered at the firm level. In panel A the dependent variable is new secured borrowings. In panel B the dependent variable is new unsecured borrowings. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. Capital expenditure is non-negative difference in gross fixed assets between current period and the previous period. Employment is the number of employees in the firm.

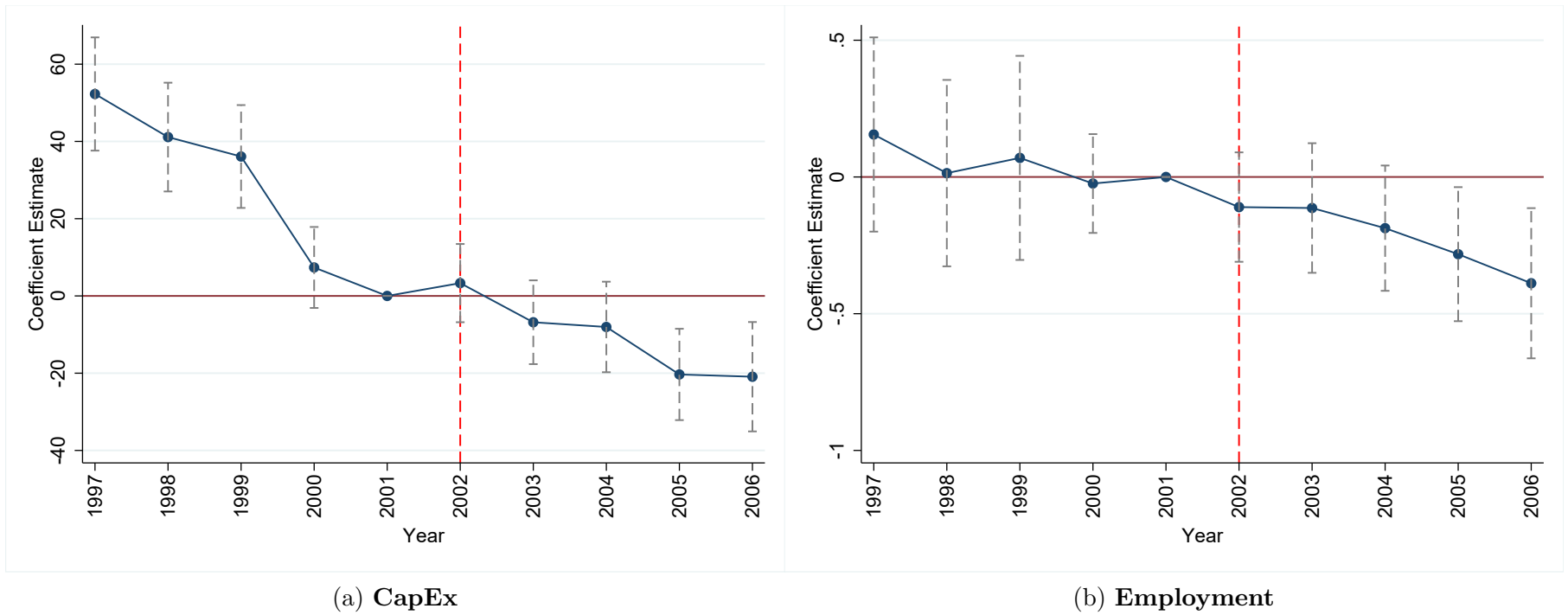
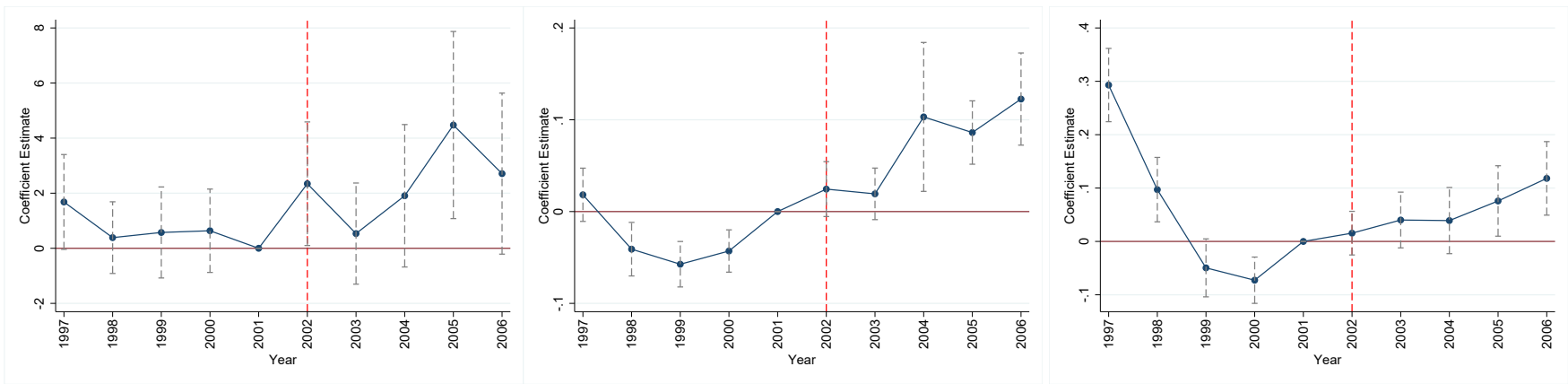


Figure 6. Misallocation of resources: Profitability

The graph below shows the relationship between the dependent variables (operating margin in panel (a), return on assets in panel (b) and total factor productivity in panel (c)) and quality of borrower obtained from estimating the equation below.

$$y_{ijt} = \alpha_i + \gamma_t + \theta \times \mathbb{1}_{Post} + \delta \times \mathbb{1}_{(LowQ)} + \sum_{\tau} \eta_{\tau} \times (\mathbb{1}_{\tau} \times \mathbb{1}_{(LowQ)}) + \epsilon_{ijt}$$

where τ ranges from 1996 to 2006, $\mathbb{1}_{\tau} = 1$ if year is τ and η_{τ} is coefficient of interest. Bars show the 95% confidence intervals, $\tau = 0$ is the year SARFAESI was announced, and all coefficients are normalized relative to $\tau = 1$. Robust standard errors are clustered at the firm level. In panel A the dependent variable is new secured borrowings. In panel B the dependent variable is new unsecured borrowings. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. Operating margin is the ratio of earnings before interest, taxes, depreciation and amortization to total sales. Return on assets is the ratio of earnings before interest, taxes, depreciation and amortization to total assets. TFP (total factor productivity) is the residual from a regression of log(sales) on log(employees) and log(Property, plant and equipment) across all firms in the same 2-digit SIC industry. Data is from Prowess.



(a) Operating Margin

(b) Return on Assets

(c) TFP

Figure 7. Misallocation of Resources: Births, Deaths and total number of Firms

The graphs below plot the total number of firms (panel a), number of births (panel b) and the number of deaths (panel c). Data is from Prowess. Total number of firms firms for which data is available in Prowess. A firm is classified under “births” if it it did not exist in the previous year and under “death” if data is not available in the following year.

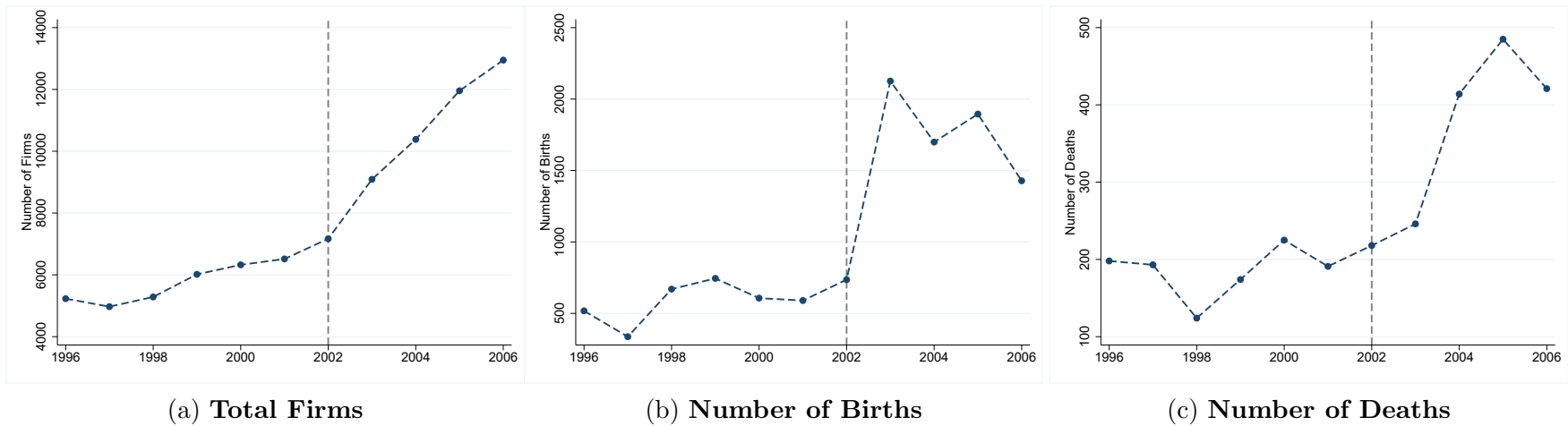


Table I. Variable Description

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 = $\max(0, \text{Item 3} - (\text{lagged Item 3} - \text{Item 1}))$	Derived from Prowess
Item 19	New Unsecured Borrowings = $\max(0, \text{Item 4} - (\text{lagged Item 4} - \text{Item 2}))$	Derived from Prowess
Item 20	Gross Fixed Assets = Item 9 + Item 10 + Item 11 + Item 12	Derived from Prowess
Item 21	CapEx = $\max(0, \text{Item 20} - \text{Lagged Item 20})$	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 II. Summary Statistics

The tables below shows the summary statistics o all the variables used in our analysis. The top panel refers to data from Prowess. ICR is the ratio of earnings before interest and taxes to total interest expense. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. 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 low (high) tangibility if the median tangibility ratio in 1998, 1999 or 2000 is below (above) median tangibility of all firms. Capital expenditure is non-negative difference in gross fixed assets between current period and the previous period. Employment is the number of employees in the firm. Operating margin is the ratio of earnings before interest, taxes, depreciation and amortization to total sales. Return on assets is the ratio of earnings before interest, taxes, depreciation and amortization to total assets. TFP (total factor productivity) is the residual from a regression of log(sales) on log(employees) and log(Property, plant and equipment) across all firms in the same 2-digit SIC industry. The bottom panel shows data from Annual Survey of Industries (ASI). The mean, standard deviation, minimum, maximum and the various percentiles (10th, 25th, 50th, 75th and 90th) are shown.

Panel A: Prowess Data

	Mean	SD	Min	Max	P10	p25	p50	p75	p90
Total Debt (INR mn)	4855.67	16931.79	0.50	264043.10	84.40	232.40	768.30	2898.50	9306.10
Total Secured Debt (INR mn)	2637.24	6924.23	0.10	77935.40	44.60	146.00	494.80	2001.60	6073.00
Total Unsecured Debt (INR mn)	2218.43	11629.02	0.00	186107.70	13.80	44.30	156.15	629.30	2923.70
Secured Borrowings (INR mn)	227.87	2335.23	-26489.60	53339.10	-241.90	-24.70	22.40	223.20	820.60
Unsecured Borrowings (INR mn)	625.25	4292.07	-44282.30	90382.30	-59.30	0.30	32.90	219.10	930.20
Low Q. Borr.	0.16	0.37	0.00	1.00	0.00	0.00	0.00	0.00	1.00
High Tangibility	0.66	0.47	0.00	1.00	0.00	0.00	1.00	1.00	1.00
Tobin's Q	0.94	0.77	0.15	3.91	0.38	0.49	0.66	1.06	1.88
Log(Sales)	7.80	1.50	-0.11	9.68	6.02	6.84	7.92	9.05	9.68
Return on Assets (PBDITA/Total assets)	0.14	0.07	0.00	0.38	0.07	0.10	0.13	0.18	0.24
Capital Expenditure (INR Mn)	296.42	461.88	0.00	1419.80	0.00	4.40	62.90	336.10	1419.80
No. of Employees	688.58	1061.48	0.00	3000.00	0.00	0.00	0.00	1098.00	3000.00
Return on Assets (EBIT/Total assets)	0.11	0.06	0.00	0.33	0.04	0.07	0.10	0.14	0.20
Total Factor Productivity	0.10	0.65	-2.93	2.43	-0.59	-0.26	0.06	0.45	0.92
Operating margin (PBDITA/Total sales)	0.18	0.16	0.00	1.25	0.06	0.09	0.14	0.21	0.30
Log(EBIT)	5.55	1.68	-0.92	7.91	3.32	4.31	5.68	6.88	7.91
Log(Assets)	7.98	1.41	3.81	10.04	6.18	6.93	7.94	9.18	10.04
Observations	1558								

Panel B: ASI Data

	Count	Mean	SD	Min	Max	P10	p25	p50	p75	p90
All Workers	155348	188.71	690.16	0.00	61869.00	10.00	17.00	46.00	165.00	442.00
Permanent Workers	155348	115.85	466.25	0.00	49692.00	4.00	9.00	22.00	91.00	267.00
Contract Workers	155348	27.75	134.48	0.00	10296.00	0.00	0.00	0.00	6.00	68.00
Staff	155348	45.12	212.49	0.00	27273.00	2.00	4.00	10.00	32.00	100.00
Short Term Debt	155348	1.16e+08	8.29e+08	-3.11e+07	9.92e+10	1016389.00	2955713.50	10859150.50	49674771.00	1.98e+08
Trade Credit	155348	42600969.47	3.79e+08	-6.22e+07	5.32e+10	236283.00	967251.50	3959494.00	17078898.50	64328573.00
Formal Credit	155348	38223427.72	2.31e+08	-1.93e+07	2.60e+10	96096.00	636877.50	2931163.00	14739338.50	67190162.00
Observations	155348									

Table III. New Borrowings by Quality

This table reports results for the Equation 1. The dependent variable in panel A is change in secured debt in columns 1 to 2 and change in secured debt to assets in columns 3 to 4. The dependent variable in panel B is change in unsecured debt in columns 1 to 2 and change in unsecured debt to assets in columns 3 to 4. The controls included are Tobin's Q, log of sales and return on assets. All regressions include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period from 1997-2006.

Panel A: New Secured Debt				
	(1)	(2)	(3)	(4)
	New Secured Borrowings		$\frac{\text{NewSecuredBorrowings}}{\text{Assets}}$	
Low Quality Borrower * Post	-75.75*** (20.18)	-146.2** (61.32)	-0.0192*** (0.00273)	-0.0157*** (0.00525)
No. of Obs.	55447	20838	48232	18091
R squared	0.120	0.0804	0.276	0.292
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	N	Y	N	Y

Panel B: New Unsecured Debt				
	(1)	(2)	(3)	(4)
	New Unsecured Borrowings		$\frac{\text{NewUnsecuredBorrowings}}{\text{Assets}}$	
Low Quality Borrower * Post	137.4 (107.1)	28.28 (113.0)	0.0188 (0.0182)	0.0102 (0.0167)
No. of Obs.	3168	1883	3128	1853
R squared	0.658	0.617	0.668	0.518
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	N	Y	N	Y

Table IV. New Borrowings in the Pre-period

This table reports results for the Equation 3. The dependent variable in Panel A is change in secured debt in columns 1 to 2 and change in unsecured debt secured in columns 3 to 4. In columns 1 and 3 in both panels, Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. In columns 2 and 4 in both panels, low quality borrowers is defined as firms with negative return on assets in either 1997, 1998, 1999 or 2000. Return on assets is the ratio of earnings before interest, taxes, depreciation and amortization to total assets. All regression include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The dependent variable in Panel B is an indicator for whether a firm is a zombie in columns 1 to 2. A firms is classified as a zombie if a firm has interest rates below the minimum prime lending rate. In addition, a zombie firm has an interest coverage ratio (ICR) below 1 and leverage (total external debt to total assets) greater than 0.20. Since the SARFAESI applies to secured debt, we also modify the zombie flag based on whether a firm in addition to the above criteria also had new secured borrowings in the period. This is the dependent variable in columns 3 and 4 in Panel B. The data is from Prowess for the period from 1997-2006.

Panel A: New Borrowings				
	(1)	(2)	(3)	(4)
	Secured		Unsecured	
Low ICR Borrower	12.02** (5.987)		-26.36 (137.5)	
Low ROA Borrower		43.05*** (8.488)		274.0 (208.0)
No. of Obs.	14383	14383	465	465
R squared	0.115	0.109	0.227	0.227
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	Y	Y
Panel B: Zombies				
	(1)	(2)	(3)	(4)
	Secured		Unsecured	
Low ICR Borrower	0.144*** (0.0121)		0.128*** (0.0113)	
Low ROA Borrower		0.170*** (0.0199)		0.143*** (0.0184)
No. of Obs.	14383	14383	14383	14383
R squared	0.0755	0.0427	0.0632	0.0330
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	Y	Y

Table V. Zombie Analysis

In this table, Panel A reports results for the Equation 6 and Equation 7. The dependent variable in panel A is change in secured debt in columns 1 to 2 and change in unsecured debt in columns 3 to 4. Columns 5 to 6 is an indicator for whether a firm is zombie. A firm is classified as a zombie if a firm has interest rates below the minimum prime lending rate. In addition, a zombie firm has an interest coverage ratio (ICR) below 1 and leverage (total external debt to total assets) greater than 0.20. Panel B reports results for the Equation 8. The dependent variable in panel B is change in secured debt in column 1 and change in unsecured debt in column 2. Percentage zombies in an industry is the average number of zombies in a given industry in the pre-SARFAESI period in 1998, 1999, 2000. A firm is flagged as a zombie if it is classified as a zombie in any year in 1998, 1999, 2000. Firm-level controls included are Tobin's Q, log of sales and return on assets. All regressions include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period from 1997-2006.

Panel A: Zombies

	(1)	(2)	(3)	(4)	(5)	(6)
	Secured		Unsecured		$\mathbb{1}_{zombie\ current}$	
Zombie * Post	-161.1*** (49.70)	-420.2** (171.3)	201.2 (158.9)	171.1 (234.1)	-0.193*** (0.0114)	-0.207*** (0.0195)
No. of Obs.	55362	20823	3165	1883	55362	20823
R squared	0.120	0.0811	0.658	0.617	0.321	0.374
Firm Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y

Panel B: Spillovers

	(1)	(2)	(3)	(4)
	Secured		Unsecured	
Sector % Zombies*Post	-16.04* (8.392)	-38.09* (21.51)	120.8 (149.6)	746.0** (295.8)
Post*Non-Zombie	10.62 (7.587)	28.15 (19.10)	-31.49 (186.1)	499.1 (361.3)
Non-Zombie*Sector%Zombies*Post	24.88*** (8.830)	41.84* (22.71)	-171.4 (239.8)	-685.6 (423.9)
No. of Obs.	62739	21245	3328	1897
R squared	0.380	0.381	0.664	0.617
Firm FE	N	N	Y	Y
Year FE	Y	Y	Y	Y

Table VI. Heterogeneity across tangibility

This table reports results for the Equation 4 and Equation 5. The dependent variable in all tables is change in secured lending. Column 1 shows the regression results for Equation 5 on the sub-sample of low quality borrowers. Column 2 shows the regression results for Equation 5 on the sub-sample of high quality borrowers. Columns 3 and 4 shows the regression results of Equation 4. Columns 1,2 and 4 include the controls. Firm-level controls included are Tobin's Q, log of sales and return on assets. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. 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 low (high) tangibility if the median tangibility ratio in 1998, 1999 or 2000 is below (above) median tangibility of all firms. All regressions include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period from 1997-2006.

	(1)	(2)	(3)	(4)
	Low Quality	High Quality	All	
Low Quality * Post			-14.59*** (3.607)	-19.91** (9.706)
High Tangibility * Post	-38.90*** (12.88)	-0.0356 (8.174)	3.146 (3.720)	-0.0603 (8.304)
Low Quality * Post * High Tangibility			-20.79*** (6.015)	-40.00*** (15.04)
No. of Obs.	5998	14799	54909	20797
R squared	0.448	0.344	0.368	0.368
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	N	Y

Table VII. Real Outcomes

In this table, Panel A reports results for the Equation 9 and Equation 10. The dependent variable in columns 1 and 2 is the capital expenditure in a given year. The dependent variable in columns 3 and 4 is the number of employees in a given year. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. Firm-level controls included are Tobin's Q, log of sales and return on assets. In Panel A we show the regression results of Equation 9. In Panel B we show the regression results of Equation 10. Percentage zombies in an industry is the average number of zombies in a given industry in the pre-SARFAESI period in 1998, 1999, 2000. A firm is flagged as a zombie if it is classified as a zombie in any year in 1998, 1999, 2000. All regressions include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period from 1997-2006. 0

Panel A: CapEx and Employment

	(1)	(2)	(3)	(4)
	CapEx		No. of Emp.	
Low Quality Borrower * Post	-34.03*** (4.224)	-50.18*** (9.664)	-65.67*** (9.681)	-95.40*** (26.12)
No. of Obs.	48316	20185	55447	20838
R squared	0.628	0.633	0.613	0.611
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Controls	N	Y	N	Y

Panel B: Spillovers

	(1)	(2)	(3)	(4)
	Capex		No. of Emp	
Sector % Zombies*Post	-27.59*** (10.28)	-70.18*** (22.29)	24.74 (20.40)	101.0*** (34.66)
Post*Non-Zombie	8.504 (9.283)	-4.608 (19.28)	12.78 (18.67)	73.72** (32.07)
Non-Zombie*Sector%Zombies*Post	35.05*** (11.24)	82.58*** (24.07)	40.45* (22.50)	18.08 (44.26)
No. of Obs.	53112	20543	62739	21245
R sq.	0.638	0.635	0.614	0.610
Firm FE	N	N	Y	Y
Year FE	Y	Y	Y	Y

Table VIII. Real Outcomes: Intensive Margin of Employment

In Panel A of this table, we report results for the Equation 9 using factory level data from Annual Survey of Industries (ASI). The dependent variable in columns 1 and 2 is total number of workers. In columns 3–8 we show the components of workers. In columns 3–4 the dependent variable is the number of permanent workers. In columns 5–6 the dependent variable is the number of contract workers. In columns 7–8 the dependent variable is the number of staff (white collar workers). In Panel B of this table, we do the similar exercise for wages. The dependent variable in column 1 and 2 is the log of wages earned by all workers. In columns 3–4 the dependent variables is log of wages earned by permanent workers. In columns 5–6 the dependent variable is the log of wages earned by contract workers. In columns 7–8 the dependent variable is the log of wages earned by staff (white collar workers). The control included is log of sales. All regressions include factory fixed effects and year fixed effects. Standard errors are clustered at the factory level. The data is for the period from 1999-2006.

Panel A: Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Workers		Permanent Workers		Contract Workers		Staff	
Low Quality*Post	-29.64*** (7.081)	-27.55*** (7.537)	-30.18*** (6.638)	-28.41*** (7.059)	0.533 (3.156)	0.855 (3.406)	-11.93*** (3.591)	-11.90*** (3.909)
No. of Obs.	214786	191519	214786	191519	214786	191519	214786	191519
R squared	0.893	0.895	0.880	0.882	0.739	0.742	0.810	0.813
Controls	N	Y	N	Y	N	Y	N	Y

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Wages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log(All Workers wages)		Log(Permanent)		Log(Contract)		Log(Staff)	
Low Quality*Post	-0.112*** (0.0149)	-0.116*** (0.0128)	-0.0903*** (0.0309)	-0.0925*** (0.0284)	-0.0442 (0.0437)	-0.0615 (0.0418)	-0.147*** (0.0145)	-0.148*** (0.0134)
No. of Obs.	211988	190973	49015	45433	57669	52861	203894	184260
R squared	0.960	0.970	0.972	0.975	0.916	0.924	0.965	0.971
Controls	N	Y	N	Y	N	Y	N	Y

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table IX. Profitability

In this table, Panel A reports results for the Equation 11, Panel B reports results aggregated to the industry level and Panel C reports the results for Equation 12. The dependent variable in Panel A in column 1, 2, 3, 4 and 5 is operating margin, log of earnings before income and taxes, log of assets, return on assets and total factor productivity respectively. The dependent variable in Panel B in column 1, 2 and 3 is the average operating margin, return on assets and total factor productivity. The dependent variable in Panel C in column 1–2, 3–4 and 5–6 is the operating margin, return on assets and total factor productivity. Columns 1,3,5 (2,4,6) restrict to firms with low (high) percentage of zombies. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. Operating margin is the ratio of earnings before interest, taxes, depreciation and amortization to total sales. Return on assets is the ratio of earnings before interest, taxes, depreciation and amortization to total assets. TFP (total factor productivity) is the residual from a regression of log(sales) on log(employees) and log(Property, plant and equipment) across all firms in the same 2-digit SIC industry. Percentage zombies in an industry is the average number of zombies in a given industry in the pre-SARFAESI period in 1998, 1999, 2000. A firm is flagged as a zombie if it is classified as a zombie in any year in 1998, 1999, 2000. For definition of remaining variables see Table I. Firm-level controls included are Tobin’s Q, log of sales and return on assets. All regression include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period from 1997-2006.

Panel A: Profitability					
	(1)	(2)	(3)	(4)	(5)
	Op. Margin= $\frac{EBITDA}{Sales}$	Log(EBIT)	Log(Assets)	ROA	TFP
Low Q. Borr. * Post	0.0910*** (0.0102)	0.297*** (0.0408)	-0.440*** (0.0171)	0.0614*** (0.00314)	0.0200 (0.0235)
No. of Obs.	47114	36343	47114	47114	47114
R squared	0.479	0.876	0.954	0.545	0.765
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y

Panel B: Overall Productivity			
	(1)	(2)	(3)
	Op. Margin= $\frac{EBITDA}{Sales}$	ROA	TFP
Post	0.0350 (0.0280)	-0.0105 (0.00874)	-0.0291*** (0.0103)
Sector % Zombies*Post	0.0636*** (0.0227)	0.0324*** (0.00708)	0.0172** (0.00832)
No. of Obs.	190	190	190
R sq.	0.618	0.469	0.247
Firm FE	Y	Y	Y
Year FE	Y	Y	Y

Panel B: Spillovers						
	(1)	(2)	(3)	(4)	(5)	(6)
	Op. Margin= $\frac{EBITDA}{Sales}$		ROA		TFP	
	Low	High	Low	High	Low	High
Post	1.712 (1.694)	0.499 (0.931)	0.247 (0.151)	0.0749*** (0.0217)	-0.312*** (0.115)	-0.330*** (0.0397)
Post*Non-Zombie	-0.452 (1.516)	-0.568 (0.963)	-0.151 (0.111)	-0.0721*** (0.0219)	0.0182 (0.109)	0.0390 (0.0363)
No. of Obs.	13420	42443	16736	45998	11247	40887
R sq.	0.327	0.232	0.161	0.178	0.765	0.783
Firm FE	Y	Y	N	N	N	N
Year FE	Y	Y	Y	Y	Y	Y

Table X. Bank Level Analysis

This table reports the results for the Equation 13 and Equation 14. The dependent variable is the new long-term borrowing. Low quality borrowers are defined as firms with interest coverage ratio of less than 1 for the median ICR in 1998, 1999 and 2000. Bank-level exposure is measured as the number of low quality firms a bank was designated as the primary lender in 2001 (year before SARFAESI was enacted). High exposure refers to banks with above median exposure measure. Each firm has one bank designated as the primary lender. When there are more than 2 primary lenders (less than 2 percent of entire sample) we randomly designate one bank as the prime lender. Column 1 includes only firms which have primary lender banks with below median exposure and column 2 includes firms in which the primary lender banks has above median exposure. Column 3 includes all firms. The remaining interaction (and uninteracted) terms have also been included though not shown. All regression include bank and year fixed effects. Standard errors are clustered at the firm level. Firm-level controls included are Tobin's Q, log of sales and return on assets. The data is from Prowess for the period from 1997-2006.

	(1)	(2)	(3)
	Low Exposure	High Exposure	All
Low Quality * Post	-5.711 (9.054)	-19.29*** (7.472)	-3.270 (8.861)
High Exposure * Post			6.169 (5.392)
Low Quality * Post * High Exposure			-17.43* (10.48)
No. of Obs.	4015	4757	8772
R squared	0.111	0.140	0.123
Bank Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y
Controls	Y	Y	Y

Table XI. Births, Deaths in industry and Long-term trends

Panel A shows the result of the Equation 15 the impact of SARFAESI on the number of firms, births and deaths. Number of firms, births and deaths are calculated at the industry level from Prowess. If a firm enters the Prowess database, then it is recorded as a birth. If a firm drops out of the database it is recorded as a death. Number of firms is the total number of firms in the database. Numbers are aggregated to the 2-digit SIC industry code. The dependent variables are total number of firms (column 1), number of births (column 2) and number of deaths (column 3–4). Percentage zombies in an industry is the average number of zombies in a given industry in the pre-SARFAESI period in 1998, 1999, 2000. A firm is flagged as a zombie if it is classified as a zombie in any year in 1998, 1999, 2000. All regression include industry and year fixed effects. Standard errors are clustered at the industry level. The data is the period from 1997-2006 for columns 1–3 and 1997-2010 for column 4 in Panel A. In Panel B, we look at the long-term impact of SARFAESI. This table reports results for the Equation 1 but with a firm classified as low quality borrowers if the firm has interest coverage ratio of less than 1 in any of the three preceding years. The dependent variable in panel B is change in secured debt in columns 1 to 2 and change in secured debt to assets in columns 3 to 4. The controls included are Tobin’s Q, log of sales and return on assets. All regressions include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The data for Panel B is from Prowess for the period from 1997-2010.

Panel A: Number of Firms, Births and Deaths

	(1)	(2)	(3)	(4)
	Total Number	Births	Deaths	Deaths (till 2010)
Ind. % Zombies*Post	65.08** (28.39)	14.54** (6.078)	2.105 (1.290)	8.135** (3.237)
No. of Obs.	672	672	672	944
R squared	0.897	0.750	0.751	0.524
Industry Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y

Panel B: Long-term effect of SARFAESI

	(1)	(2)	(3)	(4)
	New Secured Borrowings		$\frac{\text{NewSecuredBorrowings}}{\text{Assets}}$	
Low Quality Borrower * Post	-95.26*** (24.40)	-153.2*** (41.75)	-0.0251*** (0.00120)	-0.0316*** (0.00202)
No. of Obs.	95703	39221	88474	36474
R squared	0.197	0.297	0.192	0.215
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	N	Y	N	Y

Online Appendix

A. Toy Model

In this section we explain our empirical results with the help of a theoretical model motivated by the model of Caballero et al. (2008). In our model we consider an industry with two types of firms - good firms (also called Non-Zombies) and bad firms (also called Zombies). Using our model we show that good firms suffer more if there is a higher presence of Zombie firms in an industry. We assume an industry-wide productivity shock and show that the effect on good firms is more severe the more the congestion in the industry due to presence of bad firms. This is because the bad firms are blocking the resources (bank credit in our case) which could have been efficiently utilized by the good firms to increase productivity.

Let us assume that there are N firms in an industry. Out of these N firms λ is the proportion of ‘good firms’ while $1 - \lambda$ is the proportion of ‘bad firms’. Let N_G and N_B be the number of good and bad firms operating in the industry respectively. Let g be the number of good firms present in the industry and k be the number of good firms trying to enter the industry. The production function of good firms is given by:

$$Y_G = A(1 + \beta + \epsilon_i) \tag{16}$$

where Y_G is the output produced by good firms, A is the production technology used, β is the shock to productivity faced by a firm and ϵ_i is an idiosyncratic shock which is uniformly distributed on the interval 0 to 1. We also define the firm’s cost function as AC which is a linear and increasing function of number of firms. Let us assume that $C = N + \mu$. Thus a firm’s profit function is given by:

$$Y_G - C > 0$$

$$A(1 + \beta + \epsilon_i - C) > 0$$

Normalizing by the state of technology, we get the profit condition :

$$\epsilon_i > C - 1 - \beta$$

Now using this condition we calculate the exit and entry rate of a good firm in our industry:

$$E_G = g[1 - \int_{C-1-\beta}^1 di]$$

$$E_G = g(C - 1 - \beta)$$

Substituting for C we get,

$$E_G = g(N + \mu - 1 - \beta) \tag{17}$$

Similarly, we find the rate of entry of the good firms in the market:

$$M_G = k[\int_{C-1-\beta}^1 di]$$

$$M_G = k[1 - (N + \mu - 1 - \beta)] \tag{18}$$

The total number of good firms are thus given by:

$$N_G = g + M_G - E_G \tag{19}$$

and the total number of firms in the market are given by: $N = \lambda(N_G) + (1 - \lambda)(N_B)$

Solving equations 17, 18 and 19 we get:

$$N_G = \frac{g+k}{1+\lambda(g+k)}[1+R-(1-\lambda)N_B]$$

$$E_G = \frac{g}{1+\lambda(g+k)}[\lambda(g+k)-R+(1-\lambda)N_B]$$

$$M_G = \frac{k}{1+\lambda(k+m)}[1+R-(1-\lambda)N_B]$$

where $R = 1 + \beta - \mu$ which gives the aggregate productivity shock in our industry.

Differentiating with respect to R we find how the entry and exit of good firms are affected by a negative productivity shock i.e. $R < 0$ in presence of bad firms (or zombies) in the industry.

$$\frac{\partial N_G}{\partial R} = \frac{k+g}{1+\lambda(g+k)} > 0 \quad (20)$$

$$\frac{\partial E_G}{\partial R} = \frac{-g}{1+\lambda(g+k)} < 0 \quad (21)$$

$$\frac{\partial M_G}{\partial R} = \frac{k}{1+\lambda(g+k)} > 0 \quad (22)$$

We see that a negative productivity shock reduces the number of good firms in the industry by increasing the death of firms and reducing the set up of new firms. This effect is greater if there are more bad firms in the industry. We can see this by differentiating equation 20, 21 and 22:

$$\frac{\partial^2 N_G}{\partial R \partial \lambda} = \frac{-(k+g)^2}{[1+\lambda(k+g)]^2} < 0 \quad (23)$$

$$\frac{\partial^2 E_G}{\partial R \partial \lambda} = \frac{g(k+g)}{[1+\lambda(k+g)]^2} > 0 \quad (24)$$

$$\frac{\partial^2 M_G}{\partial R \partial \lambda} = \frac{-k(k+g)}{[1 + \lambda(k+g)]^2} < 0 \quad (25)$$

Clearly, from equation 23, 24 and 25 we can see that the number of good firms in an industry are affected more greater the proportion of zombie in an industry (lower λ). Also the good firms find it more difficult to enter the industry because of presence of zombies. This is because the presence of zombie firms hinders efficient credit allocation in the industry and increases the cost to other firms. Before the SARFAESI act, the banks were evergreening their loans to the zombie firms and thus facilitating their retention in the industry in the face of a crisis. These firms continued borrowing more from the banks since the consequences of default were non-threatening. We hypothesize that post 2002 banks found it easier to exit the lending relationship with the bad firms due to increased creditors rights. This implied that post-SARFAESI, the consequences of default were significantly threatening to the bad firms thus forcing them to scale down or cut operations in face of a crisis or default. Our hypothesis is empirically validated by the analysis presented in the paper.

B. Appendix

Table A1. Debt Analysis

This table analysis the post-SARFESI effect on loans of low-quality borrowers. Low quality borrowers are defined as firms with interest coverage ratio less than 1 for the year 1999 or 2000. Variable Debt stands for total liabilities. Variable Tradecredit is defined as working sundry creditors while Formalcredit is defined as wrking overdraft. All data is obtained from the Annual Survey of Industries. All regressions include factory fixed effects and year fixed effects. We control for log sales in column 2, 4 and 6. Standard errors are clustered at the factory level. The data is from ASI for the period of 1999 to 2006.

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Debt)	Log(Debt)	Log(Tradecredit)	Log(Tradecredit)	Log(Formalcredit)	Log(Formalcredit)
Low Quality*Post(1)	-0.0526*** (0.0180)	-0.0642*** (0.0166)	-0.0678*** (0.0245)	-0.0631*** (0.0236)	-0.112*** (0.0313)	-0.113*** (0.0312)
No. of Obs.	212687	190395	202068	183174	150028	139223
R squared	0.953	0.961	0.917	0.925	0.904	0.906
Controls	N	Y	N	Y	N	Y

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A2. Intensive Margin of Employment

In this table we check if our results are robust to changes in criteria defining the low quality borrowers. We now define Low Quality borrowers as firms with Interest Coverage Ratio (ICR) less than the median ICR in each year. Panel A of this table reports the results for the Equation 9 using factory level data from Annual Survey of Industries (ASI). The dependent variable in columns 1 and 2 is total number of workers. In columns 3–8 we show the components of workers. In columns 3–4 the dependent variable is the number of permanent workers. In columns 5–6 the dependent variable is the number of contract workers. In columns 7–8 the dependent variable is the number of staff (white collar workers). In Panel B of this table, we do the similar exercise for wages. The dependent variable in column 1 and 2 is the log of wages earned by all workers. In columns 3–4 the dependent variables is log of wages earned by permanent workers. In columns 5–6 the dependent variable is the log of wages earned by contract workers. In columns 7–8 the dependent variable is the log of wages earned by staff (white collar workers). The control included is log of sales. All regressions include factory fixed effects and year fixed effects. Standard errors are clustered at the factory level. The data is for the period from 1999-2006.

Panel A: Employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Workers		Permanent Workers		Contract Workers		Staff	
Low Quality*Post	-21.83*** (5.145)	-14.64*** (5.655)	-15.52*** (4.771)	-10.20* (5.370)	-6.305** (2.619)	-4.441 (2.842)	-5.117 (3.113)	-3.159 (3.387)
No. of Obs.	214786	191519	214786	191519	214786	191519	214786	191519
R squared	0.893	0.895	0.880	0.882	0.739	0.742	0.810	0.813
Controls	N	Y	N	Y	N	Y	N	Y

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Wages

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log(All Workers wages)		Log(Permanent)		Log(Contract)		Log(Staff)	
Low Quality*Post	-0.187*** (0.0109)	-0.128*** (0.00979)	-0.118*** (0.0250)	-0.0771*** (0.0239)	-0.167*** (0.0342)	-0.112*** (0.0333)	-0.198*** (0.0113)	-0.149*** (0.0106)
No. of Obs.	211988	190973	49015	45433	57669	52861	203894	184260
R squared	0.961	0.970	0.972	0.975	0.917	0.924	0.965	0.971
Controls	N	Y	N	Y	N	Y	N	Y

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3. Profitability with Change in Dependent Variables

This table reports the results for the equation 11 with change in dependent variables. The dependent variable in column 1, 2 and 3 are change in operating margin, change in return on assets and change in TFP respectively. Firm-level controls included are Tobin's Q, log of sales and return on assets. All regression include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period from 1997-2006.

	(1) Op. Margin= $\frac{EBITDA}{Sales}$	(2) ROA	(3) TFP
Low Q. Borr. * Post	0.0215** (0.00951)	0.0124*** (0.00244)	0.0477*** (0.0159)
No. of Obs.	40514	40514	40514
R squared	0.101	0.0908	0.164
Firm FE	Y	Y	Y
Year FE	Y	Y	Y

Table A4. Analysis of DRT

This table reports results for the Equation 1. The dependent variable is change in secured debt in columns 1 to 3. In column 1 we see the effect on secured debt of low quality borrowers if the primary lender to the firm is NBFC. The variable *LawApplies* is a binary variable which takes the value 1 if the primary lender of a firm is bank and 0 if the primary lender is a Non-Banking Financial Corporation (NBFC). In column 2 we re-define low quality firms as one which has Interest Coverage Ratio (ICR) less than 1 in the year 2001. In column 3 we see the effect of the Debt Recovery Tribunal Law (DRT) on low quality firms. The controls included are Tobin's Q, log of sales and return on assets. All regressions include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period from 1997-2006.

	(1) NBFCs	(2) LQ-2001	(3) DRT
Low Quality * Post	-6.567 (5.671)		
Law Applies * Post	14.31*** (3.578)		
Low Quality * Post * Law Applies	-32.22*** (7.594)		
Low Quality Borrower (Plain) * Post			
Low Quality Borrower (2001) * Post		-111.9*** (28.58)	
Low Quality Borrower * DRT			2.189 (57.52)
No. of Obs.	29340	29340	27763
R sq.	0.333	0.0832	0.245
Firm FE	Y	Y	Y
Year FE	Y	Y	Y

Table A5. Profitability with Logged Variables

This table reports the results for the equation 1 with log of dependent variables. The dependent variable in column 1, 2 and 3 are log in operating margin, change in return on assets and change in TFP respectively. Firm-level controls included are Tobin's Q, log of sales and return on assets. All regression include firm fixed effects and year fixed effects. Standard errors are clustered at the firm level. The data is from Prowess for the period from 1997-2006.

	(1)	(2)	(3)	(4)
	New Secured Borrowings		New Unsecured Borrowings	
Low Quality Borrower * Post	-0.903*** (0.124)	-0.377** (0.162)	0.430* (0.226)	0.236 (0.330)
No. of Obs.	23225	11032	2465	1457
R squared	0.694	0.717	0.817	0.794
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	N	Y	N	Y

Figure A1. BIFR: Number of filings

The figure below shows the number of filings in BIFR from 1990 to 2015. Data is from the Board for Industrial and Financial Reconstruction webpage. Number of filings have been extracted from the website. Raw number of filings were tabulated and are graphed below.

