The Indian Banking Recapitalization Saga

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Abstract: In the aftermath of the global financial crisis, the Government of India (GoI) took a series of capital infusion policies every year for the weak public sector banks to stabilise the banking sector and ensure healthy credit growth in the economy and, indirectly, healthy economic growth. This process of recapitalising public sector banks started in fiscal year 2008-09. However, it has neither stabilised the banking sector nor created credit growth or economic growth. We document that there has been credit misallocation instead of credit growth during recapitalisation from fiscal year 2008-09 to fiscal year 2018-19. Zombie lending has increased, and the firms receiving these loans did not undertake any economic activity.

Keywords: Recapitalisation, Bank Lending Channel, Government Banks, Zombie Lending, Credit Misallocation.

JEL classifications: G21, G28, E65

"I would like to contend that the primary cause for the recent slowdown in our growth is the stress on the banking sector's balance sheet, especially of PSBs... When bank balance sheets are so weak, they cannot support healthy credit growth. Put simply, under-capitalized banks have capital only to survive not to grow; those banks barely meeting the capital requirements will want to generate capital quickly, focusing on high interest margins at the cost of high loan volumes... A decisive and adequate bank recapitalization... is a critical intervention necessary to address this balance sheet malaise."

-Quest for Restoring Financial Stability in India
Viral Acharya

1 Introduction

In the aftermath of the financial crisis of 2008, much capital has been infused by the Ministry of Finance, Government of India (GoI) into the Indian banking sector to i) prevent the slowdown of economic growth and ii) restore the balance sheet of the banks. The capital infusions have been so frequent that it has almost become second nature of the government to earmark a recapitalisation amount in the annual budgetary process. Till 2018-19, the GoI's aggregate recapitalisation has been worth INR 3.1 trillion. Of these INR 3.1 trillion, INR 1.2 trillion has been infused in government banks (GB)[1] from 2009-09 to 2016-17. The capital was infused through the annual budgetary process. In 2017-18 and 2018-19, the GoI scrapped the yearly budgetary process and started issuing recapitalisation bonds. Around INR 1.9 trillion has been infused by the GoI to GBs in 2017-18 and 2018-19.

Despite these massive amounts of capital infusion by the GoI into GBs, it did not translate into economic growth. Several signs suggest that India's scenario is similar to the Japanese experience in the 1990s and early 2000s and the European experience after 2012. During the phase of 2009-2019, 21 percent (Chari, Jain, & Kulkarni, 2022) of the debt was owed by firms that could not cover their interest expenses out of their pretax earnings. Non-performing Assets (NPA) in the banking sector have been the highest during this phase. The NPA

[1]We use GBs and public sector banks (PSBs) alternatively. And it is the GBs that got recapitalized by the GoI.

number averaged 10 percent, which has induced a negative risk perception for the Indian banking sector (Figure 1 in data appendix). Moreover, the GBs have higher NPAs compared to other bank groups like private banks (PBs) or foreign banks (Figure 2 in data appendix). The gross non-performing assets (GNPAs) for GBs were more than thrice the amount for PBs, and if we exclude the State Bank of India (SBI) from the list of GBs, the GNPA number is almost five times that of the PBs (Figure 3 in data appendix).

To the best of our knowledge, our paper is the first to provide systematic evidence that India's banking sector NPAs and the sluggish pace of economic growth can be at least partially explained by zombie lending of GB banks that regained some lending capacity due to the frequent capital infusion but which remained weakly capitalised[2] in the post-recapitalisation period[3]. This phenomenon is similar to the banking crisis experienced in Japan. Much like the situation with weakly capitalised Japanese banks, which extended loans to support financially impaired borrowers in meeting obligations on their existing loans (as discussed in works like Giannetti & Simonov, 2013), the GoI pursued a strategy of forbearance coupled with frequent recapitalisation. This approach enabled GBs to avoid or, at the very least, postpone immediate losses arising from these loans, hoping that the respective borrowers would eventually regain solvency.

Our findings indicate that around 4 percent of the loans provided to the companies in our dataset during the post-recapitalization period fell under zombie loans. This shift of credit supply, redirecting from creditworthy borrowers to insolvent borrowers, resulted in an inefficient credit allocation. This misallocation disrupted market equilibrium and adversely affected investment and employment in the economy.

Thus, as the policy discourse revolves around concerns regarding the lack of positive real effect from infusing liquidity into the banking system due to the banks' unwillingness to

[2]The Basel III norms stipulate a capital adequacy ratio (CAR) of 10.5 percent (8 percent + 2.5 percent capital conservation buffer). The GBs were very close to this mark and were marginally satisfying the requirement throughout the recapitalisation period of 2009-2019.

[3]Post-recapitalisation or post-recapitalisation period refers to the period from 2009-2019. In this period the GoI infused capital into the GBs on a year-to-year basis.

lend, we present an additional rationale for the inefficacy of these actions: the allocation of credit does not prioritise the productive sectors of the economy. Consequently, although the recurrent recapitalisation successfully prevented a more severe economic downturn, augmenting it with a targeted recapitalisation strategy and/or mandatory bank mergers might have facilitated a more stable recovery.

For our analysis, we obtained the loan data from the Ministry of Corporate Affairs (MCA) website, GoI. The MCA records all the data of secured loans borrowed by firms on which a charge has been registered under the Companies Act 2013. Our study refers to this data as the 'MCA' data'. Our sample coverage period is from FY[4] 2006-2019. We organise the data at a firm-bank-year level. This data set allows us to trace the impact of the recapitalisation through the banking sector on the real economy. Accordingly, we organise our empirical analysis into three parts. First, we determine how much credit supply was provided by the recapitalised GBs. Second, we track the resultant change in the lending behaviour of the recapitalised GBs. Third, we evaluate whether the loan supply change led to real economic effects.

By modifying the approach of Khwaja and Mian (2008), we find that recapitalised GBs did not significantly increase their loan supply relative to banks that were not recapitalised. While the macro-level evidence regarding bank lending might imply that GBs did not significantly enhance their credit supply post-recapitalisation, the micro-level data regarding the specific firms that obtained credit presents a different story.

To analyse which type of borrowers benefited most from this frequent capital infusion process, we divide our sample into low- and high-quality borrowers based on their ability to service existing debt, i.e., their interest coverage ratio (ICR). We find that the additional loan supply was mainly directed toward low-quality borrowers, and this increase in loan supply is mainly through zombie lending.

Zombie lending is lending to economically failed borrowers to avoid (or at least defer)

[4]FY refers to fiscal year starting from April 1st of a particular year and finishing on March 31st of the next year.

loan defaults (Caballero, Hoshi, & Kashyap, 2008). To detect zombie lending, we define a zombie firm as a firm whose i) ICR has been less than one for the last three consecutive years; ii) age is greater than 15 years; iii) debt to asset ratio is greater than 0.25. Our results show that the recapitalised GBs primarily extended loans to low-quality borrowers through zombie lending.

To further analyse the impact of zombie lending by the banks, we show that non-zombie/healthy firms connected to banks that benefited from recapitalisation faced a significant reduction in capital expenditure and an increased average interest cost and wage expenses. This finding suggests that non-zombie firms were crowded out from the credit supply because of distortions created by zombie lending. Consistent with this evidence, we do not find any changes in real economic activity for zombie firms: investment or employment. This evidence suggests fundamental problems with the lending process of the GBs during the recapitalisation period, which confirms that the GBs had misallocated credit and hampered economic growth.

The paper proceeds as follows. Section 2 describes the contribution of our paper to the related literature. Section 3 briefly summarises the recapitalisation process in the Indian scenario. Section 4 details the data for our analysis. Section 5 documents and analyses the results of our paper, and section 6 concludes.

2 Related Literature

The banking system is one of the most important drivers of an economy. A healthy banking system ensures efficient credit allocation in the economy, thus pushing the economy's growth trajectory. In contrast, a poor banking system leads to credit misallocation and pulls the economy towards a recession. Because of the critical role played by the banking system in the real economy, governments tend to bail out banks during any banking or financial crisis. The flip side of the bank bailout is the associated fiscal implications and moral hazard costs.

Our paper contributes to the literature dealing with weakly capitalised banks, zombie lending and misallocation of credit (Cortés, Demyanyk, Li, Loutskina, & Strahan, 2020; V. V. Acharya, Berger, & Roman, 2018; Berger, Makaew, & Roman, 2019; Black & Hazelwood, 2013; Philippon & Schnabl, 2013; Diamond & Rajan, 2011; Steffen, 2014; Haselmann, Singla, & Vig, 2019). Most of these studies have focused on the capital purchase program in the US during 2008 or the capital infusion program in Japan during the nineties, the European stress tests during 2010 -2011, and the European comprehensive assessment programme 2014. The findings are mixed; Berger et al. (2019) and Black and Hazelwood (2013) found that banks that received enormous beneficiaries from the program increased overall lending while banks that received minor beneficiaries did not. Studies by V. V. Acharya et al. (2018) and Cortés et al. (2020) found that recapitalisation negatively impacted credit lending, and the reason was the poor implementation of the recapitalisation process. Steffen (2014) and Haselmann et al. (2019) studied the European comprehensive program in 2014. It was found that the program hurt the overall credit lending activity. The program was not very effective due to the conflict of incentives. The national governments and central banks, supposed to provide the capital backstop, conducted the tests. The examiners had a clear incentive to under report the capital shortfall.

Our paper is one of the first to focus on the Indian scenario. The Indian scenario is an interesting testing ground as i) there was a dichotomous objective of pump priming the economic growth and protecting the balance sheet of the GBs, and ii) the recapitalisation was done on a recurrent basis. Despite frequent recapitalisation, the overall credit supply did not increase significantly. The tendency of the recapitalised banks had been towards decreasing credit supply, leading to credit misallocation. In particular, if the capital infusion fails to recapitalise marginal banks[5] adequately, it creates a significant moral hazard problem. It incentivises banks to shift loan supply from high- to low-quality borrowers, with detrimental aggregate effects on employment, investment, and economic growth.

[5]The capital infusion has been directed to government banks close to their minimum capital requirements (CAG, 2017).

Our paper also corroborates the growing concern that zombie firms may be holding back growth in several countries, including Japan (Caballero et al., 2008) and Europe (V. V. Acharya, Eisert, Eufinger, & Hirsch, 2019; Gopinath, Kalemli-Özcan, Karabarbounis, & Villegas-Sanchez, 2017). Blattner, Farinha, and Rebelo (2019) examine the relationship between weak banks and low productivity growth following the European sovereign debt crisis, while Gropp, Ongena, Rocholl, and Saadi (2022) focus on the productivity impact of distressed bank recapitalisation through TARP[6] during the global financial crisis. Banerjee and Hofmann (2018) and Caballero et al. (2008) show that zombie-firm presence lowers investment and employment in more productive firms.

Our paper is related to recent papers focusing on the ongoing banking crisis in India. Chari et al. (2022) show that the perverse effects of forbearance were concentrated in state-owned banks. Moreover, in industries and bank portfolios with high proportions of zombie firms, credit was reallocated from solvent to zombie firms, a pattern that persists even after forbearance is withdrawn. Kulkarni, Ritadhi, Vij, and Waldock (2021) document the effect of bankruptcy reforms on zombie lending. They show that a 2016 bankruptcy reform in India had a limited impact since lenders were reluctant to recognise zombie credit as non-performing.

3 The Indian Recapitalisation Experience

In this section we describe the recapitalisation process followed by the GoI to infuse capital into the banking system. First, there are some analogies in the capital infusion process for the Indian banking situation; the 1990s Japanese banking crisis and the European debt crisis during the 2010s. In both these crises, the government intervened to recapitalise banks, as was done by the Indian government. An essential difference in the recapitalisation process by GoI vis-à-vis the Japanese or the European governments is that the objective of

[6]TARP stands for "Troubled Asset Relief Program." It is a U.S. government program that was established in response to the global financial crisis of 2008. The program aimed to stabilize the financial system, restore confidence in the markets, and prevent further economic collapse.

recapitalisation for GoI seemed to be a moving target. In the first half of the recapitalisation period (2009 - 2017), the capital infusion was done with the objective of credit growth and pump-priming the economy in the aftermath of the global financial crisis. A forbearance policy was followed to improve liquidity in the system and the bank's balance sheet. In the second half of the recapitalisation period (2018 -2019), the objective changed to prevent a banking crisis. Moreover, unlike a one time recapitalisation, the capital was infused on a recurrent basis which may create a moral hazard problem.

The recapitalisation structure in India has been ad-hoc (CAG Report, 2017)[7]. There was no specific process regarding the eligibility and magnitude of recapitalisation. Moreover, the eligibility requirements for recapitalisation were frequently changed. In general, the stated process for recapitalisation was based on the projections of capital requirements sent yearly by the GBs to the Department of Financial Services (DFS). The decision on the capital infusion in GBs entailed independent assessment by DFS. The GBs are supposed to consider the credit growth, risk profile of the assets, internal accruals of the bank and other sources of capital generation to project the capital requirements. In 2011-12, the stated process of capital infusion changed, and the GBs signed MoUs with DFS in February/ March 2012, which were to form the basis for capital infusion in the GBs till 2014-15. The MoUs set targets against performance parameters, the non-achievement of which was to trigger capital infusions. The parameters included various accounting measures like Current Account Savings Account (CASA) percentage, Return on Assets (ROA) percentage, Net Profit per Employee, Market share – deposits (percentage), and outstanding NPAs over two years as a percentage of total NPAs. Moreover, the basis of capital infusion, as stipulated by the rules and MoUs, was not followed. In FY 2010-11, the decision on capital infusion was taken by DFS solely based on information received from an assessment of the GBs themselves, without any independent verification (CAG Report, 2017). Instead of performance against

[7]CAG is the supreme audit institution of India and is empowered to audit all receipts and expenditures of the Government of India and the State Governments. The document's name is Report of the Comptroller and Auditor General of India on Recapitalisation of Public Sector Banks, Report No. 28 of 2017 (Performance Audit). The report is available at: https://cag.gov.in/en/audit-report/details/31779.

MoU targets being the basis for capital infusion, the actual basis was regulatory requirements regarding capital adequacy and estimates of credit growth (CAG Report, 2017). The basis for working out these performance parameters changed from year to year and often within different tranches in the same year (2010-11, 2015-16 and 2016-17), as seen in Table 1.

Patel (2020) coined "banking sector-fiscalization" to describe how sovereign control over government-owned banks in India operates. Instead of serving their primary role as financial intermediaries, the government employs these state-owned banks for routine macroeconomic management. V. Acharya (2020) proposes a fiscal dominance channel in which the sovereign's fiscal well-being influences the regulatory framework of banks. Consequently, significant sovereign authority affects default disclosure standards and loan provisioning criteria. Given the predominant role of government-owned banks in the Indian financial system, the frequent changing of criteria of capital infusion by the government shows a tacit understanding between the banks and the government. The underlying process is evidence of a strong moral hazard problem in the Indian banking system.

An important feature of the recapitalisation process is the magnitude of the recapitalisation, as mentioned by (Diamond, 2001) and (Diamond & Rajan, 2000). GoI recapitalised the government banks 135 times from the fiscal year ending 2009 to 2019. Moreover, over the years, the average size of recapitalisation in terms of equity is 12.36 percent, but that did not improve the asset size or the banks' leverage (Figure 4 in data appendix). On average, the recapitalisation amount was only 0.52 percent of the asset of the banks (Figure 5 in data appendix). Also, we witness that government banks' leverage remains very high during the entire recapitalisation period from 2009 - 2019. The leverage of GBs increased from 23:1 to 28:1. Moreover, Figure 6 shows, the CAR of the GBs did not improve by much despite capital infusion by the GoI. The implication is that the size of recapitalisation in the Indian context was very small. The inadequate size of recapitalisation can lead to credit misallocation in the economy. A preliminary analysis of zombie lending, as shown in (Figure 7, shows that zombie lending by GBs has increased vis-à-vis other banks during the recapitalisation

period. All these data points and graphs suggest that the recapitalisation process in India may have failed on a few grounds, specifically concerning the process of recapitalisation and the size of recapitalisation.

The size of recapitalisation is imperative in the context of the Indian economy as one of the main objectives of the recapitalisation process was to pump prime the economy by improving the credit growth in the economy. In the subsequent sections, we will discuss the data and formally analyse the evidence our preliminary analysis and figures allude to.

4 Data

The data for the capital infusion made by the GoI has been sourced from the CAG Report (2017) report. The CAG report contains data from FY 2008-2009 to 2016-2017. The data from 2017 to 2019 has been sourced from the Department of Financial Services, Ministry of Finance. Capital infusion data beyond FY-2019 is not available at a disaggregated bank level. We have considered a pre-capitalisation period of three years from FY 2005-06 to FY 2007-08. In this period, the GoI had not undertaken any recapitalisation exercise for the GBs. Our sample period covers FY 2005-06 to FY 2018-19.

We obtained the loan-level data set from the Ministry of Corporate Affairs (MCA), GoI[8] . The Ministry of Corporate Affairs records all the secured loans borrowed by the firms on which a charge has been registered. The loan data covered in the MCA represents a significant proportion of the Indian economy. The reason is section 125 of the Companies Act 2013 mandates that lenders register the details of the borrower's loan for which a charge has been registered against the loan. A secured loan will be treated as unsecured if lenders do not register the loan details. Therefore, it is reasonable to believe that banks will usually register charges.

In India, the Public Financial Institutions (Obligation as to Fidelity and Secrecy) Act,

[8]The data are available at https://www.mca.gov.in/content/mca/global/en/home.html.

1983[9] prohibits the banks to disclose the identity of their borrowers. However, no such restrictions exist for the firms to disclose their bankers voluntarily. The Centre for Monitoring Indian Economy (CMIE) Prowess database contains information on the identity of banks from where the firms borrowed. We take the firms' revealed bank identity and filter out the non-financial firms. This process yields 14,246 non-financial firms covering 72 industries (2-digit National Industrial Classification (NIC)). We manually match this data with the loan-level data in MCA. As the ministry does not allow the mass download of the data, we manually downloaded each firm's loan-level information on an individual basis. We call this dataset the "MCA" dataset. The loan-level data set includes the information on SRN (serial number), charge Id, charge holder name (borrower name), date of creation of the loan, date of modification of the loan, date of satisfaction, amount, and lender's address. No information is available about interest rates, loan performance or the financial statements of either the borrower or the lender.

We supplement the "MCA data" with the firm-level borrower data from the Prowess database. The Prowess database contains the balance sheet and income statement data for listed and unlisted firms in the organised sector of the Indian economy. According to CMIE, the Prowess database covers more than 70 percent of industrial output, 75 percent of corporate taxes, and more than 95 percentof excise taxes collected by the GoI. We source the bank-related information from the database of the Indian economy (DBIE) maintained by the Reserve Bank of India (RBI). We augment the bank-firm information dataset with RBI DBIE for the information related to banks.

The data coverage for our sample is shown in the Table 2. Our sample period starts from FY 2006 (April 2005 to March 2006) and ends at FY2019 (April 2018 to March 2019). We find a total of 38,160 firm-bank relationships, among which we have 33,067 firm-bank relationships with non-zero loans. 12,270 firms issued new loans during our sample period (2006-2019). 10, 987 of these new loans are issued in the recapitalisation period (2009-

[9]https://www.indiacode.nic.in/bitstream/123456789/1821/3/A1983-48.pdf

2019), and 4,504 new loans are issued in the pre-recapitalization period (2006-2008). We have 39 banks in the dataset, among which 21 are GBs and 18 are PBs. We obtain 5,34,240 firm-bank-year observations in the entire sample period. When we classify the firms as high- or low-quality borrowers based on interest coverage ratio (ICR), we get a total of 3,16,443 firm-bank-year observations (after removing the missing values). We have 2,80,154 firm-bank-year observations for the Zombie dataset, where firms are clearly identified as Zombie or healthy firms after removing the missing values.

Table 3 provides an overview of the key variables used in our analysis.

5 Empirical Strategy

According to the CAG report, the objective of the GoI to infuse capital into the GBs to pump prime the economy and renew the economic growth. The process of recapitalisation was to ensure that banks had enough capital to lend to healthy firms, which would enhance the investment activity of the firms and increase employment, leading to economic growth. In this paper, we ask whether the recapitalisation process achieved its goal of renewing the economy's growth. One of the considerable challenges in the analysis is to disentangle the firm-demand shock from the bank lending channel. To address the problem, we employ the modified Khwaja and Mian (2008) identification strategy of bank lending regression. Specifically, we trace the loan amount extended by GBs due to GoI recapitalisation to a firm, controlling for loan demand and any observed and unobserved firm characteristics that might impact the loan outcomes.

To investigate the same, we organise the data at the firm-bank-year level and do a within-firm-level analysis. In our baseline model, we use firm X-year and bank X-firm fixed effects. Firm X-year fixed effect controls time-invariant heterogeneous demand for loans and the instances in which demand for loans for firms may change with time. Moreover, as the nature of our study entails a single firm taking loans from several banks, the result may be

biased because of the specific tendency of a bank to engage in low-quality lending. Therefore, we have also taken bank X-firm fixed effects to control such a scenario and also control for time-invariant firm-bank pair relationship. In our analysis, we use bank X-year specifications to control time-invariant and time-varying bank heterogeneity that also changes over time. For example, changing the value of the sovereign bonds in the bank portfolio because of changing market interest rate scenarios (stealth recapitalisation) may also affect the bank lending channel.

We aggregate the total loan amount of a firm-bank pair taken in a particular year. If the bank has not made any loan to the paired firm in a year, then we consider the loan amount to be zero for the respective firm-bank-year observation. For example, let us assume that firm F1 receives a loan of INR 100 from bank B1 in the year 2015, we record INR100 as the loan amount for the F1-B1-2015 observation. Assume the same F1-B1 pair does not have any loan in 2016, then we record INR 0 loan amount for F1-B1-2016 observation.

The specific dates for capital infusion by the GoI are unavailable. Since the GoI decides on the total allocation for recapitalisation in its budget announcement at the end of a FY, we have considered the capital infusion dates to be the end of FY i.e. 31st March 20XX. For example, if an announcement is made for the infusion of capital before the end of the FY 2012, we consider the capital to be infused in the FY 2011-2012 and refer to it as t, whereas its impact period is any date beyond 31st March 2012, i.e., 1st April 2012 to 31st March 2013, and is considered as $t + 1$.

We use two different sets of control sets to identify the causal impact of the recapitalisation on the bank credit channel. In both the control sets, we identify banks that are not recapitalised during the recapitalised period. In the first set, we include private and public banks that are not recapitalised in a given year as controls for that year. For example, let's assume that in a year, government bank GB1 got recapitalised but not GB2, then GB2 acts as a control bank for that year, and as the government does not recapitalise all private banks, they are also a part of the control set. In the next control set, all the private banks act as

the control set, whereas the treated group consists of only the government banks that are recapitalised in a given year.

5.1 Credit Supply

Figure 8 plots the log of the total quantity of loans provided by GBs and private banks across the recapitalisation period, respectively. While PBs[10] increased their loan supply, the loan supply provided by GBs infused with capital by the GoI decreased substantially during the recapitalisation period.

Next, we formally investigate whether GBs that were recapitalised increased their loan supply to firms vis-à-vis banks that did not receive any capital infusion from the GoI. To test the impact of recapitalisation on the bank lending channel, we use the regression framework as described in the equation:

$$Y_{ib,t+1} = \beta_1.size_{bt} + \eta.X_{bt} + Firm_i.Year_{t+1} + Firm_i.Bank_b + \epsilon_{ib,t+1} \tag{1}$$

where $Y_{ib,t+1}$ is the natural log of the amount of loan taken by a firm i from bank b during the year $t+1$; $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. X_{bt} are a vector of controls that capture the time varying bank controls.

We present the results of this empirical analysis in Table 4 with non-recapitalised GBs and private banks acting as the control set and Table 5, where only private banks act as the control set. For brevity, we only report the results for our main variable of interest, the *size*. The results show that the size of the recapitalisation had a statistically insignificant impact on the banks' credit supply. This result holds across all specifications (Columns 1–4), controlling for different fixed effect sets.

In our least restrictive specification, we control for firm, time, bank fixed effects, and time-varying bank control variables (see Column 1). Column 2 shows the regression results

[10]Please note that private banks were never recapitalised by the GoI. It was only the government banks that were recapitalised by the Government of India.

for the case in which we also include firm X-year fixed effects, which allow us to control for any observed and unobserved time-varying characteristics of the firms. In Column 3, we include firm X-year and firm X-bank effects, which exploit the variation within the same firm-bank relationship over time. This controls for unobserved characteristics common to firms, bank heterogeneity, and relationships between firms and the respective bank.

To further test the robustness of these results, we follow Peek and Rosengren (2005) and Giannetti and Simonov (2013) and employ the probability of a loan disbursed in a particular year instead of the loan amount as the dependent variable. Column 4 of Table 4 and 5, confirms that our results are robust to using this alternative lending supply measure controlling for firm X-year, bank X-year and firm X-bank fixed effect. Our results indicate that banks have not been giving out loans despite the infusion of capital by GoI. This raises a question about what the banks are doing with the capital that the GoI is infusing and whether they are misallocating the credit.

5.2 Credit Supply to low ICR firms

In the previous section, we see that the capital infusion by the GoI has not led to any significant changes in the credit disbursement by the GBs at the macro level. In this section, we dig deeper to check the microstructure of the loans disbursed by the recapitalised GBs. To check for this, we look at the type of borrowers to whom the banks are supplying the loans. We frame the following regression equation to check for the same:

$$\begin{aligned} Y_{ib,t+1} = \beta_1.size_{bt} + \beta_2.borrower_{it} + \beta_3.borrower_{it}.size_{bt} + \eta.X_{bt} \\ + Firm_i.Year_{t+1} + Firm_i.Bank_b + \epsilon_{ib,t+1} \end{aligned} \tag{2}$$

where $borrower_{it}$[11] denotes the type of firms. We have segregated the firms into two types: i) low-quality firms, ii) high-quality firms. Low-quality firms are those whose ICR is less

[11] $borrower_{it}$ is a dummy variable which takes a value of 1 when the firms is a low quality firm and zero otherwise.

than the median ICR of all the firms for that particular year, and vice versa for high-quality firms. The segregation of borrowers into these types helps us identify whether there has been a misallocation of credits by the banks. The main variable of interest is *borrower.size* in the above equation.

The general picture that emerges from Table 6 with non-recapitalised GBs and private banks acting as the control set and Table 7, where only private banks act as the control set is that the credit allocation was primarily to low-IC ratio borrowers because only the interaction term 'borrower.size' is significantly positive. This result holds even after controlling firm X-year and firm X-bank effects, which exploits the variation within the same firm-bank relationship over time (see Column 3). The coefficient in column 3 of Table 6 suggests that a 1 percent increase in the size of recapitalisation translates into an approximately 3.14 percent increase in credit allocation towards low-quality borrowers.

Our results show that banks have misallocated credit in the economy by lending to low-quality firms. While the loan supply at the overall level has not changed significantly, the micro-level evidence paints an entirely different picture. It shows that the capital infusion by the GoI has been diverted towards distressed firms by the GBs.

5.3 Credit Supply to zombie firms

In the previous section, we discuss the microstructure of bank lending by categorising the borrowers into two types vis-à-vis low-quality and high-quality firms. Our definition of low-quality firms can consist of solvent firms facing a temporary liquidity crunch because of external factors and insolvent firms. To segregate firms that may be insolvent by their very nature, we identify them as zombie firms.

We define a zombie firm as a firm whose i) ICR has been less than one for the last three years, ii) age is greater than 15 years, iii) debt to asset ratio is greater than 0.25, and iv) firm's average interest expenses (interest expenses scaled by debt) are below the prime

lending rate (PLR)[12] of State Bank of India . The definition of a firm with a debt-to-asset ratio greater than 0.25 helps us identify the firm as probable insolvent. This definition may raise concerns that the firm may be facing a temporary liquidity crisis or the firm may be in its initial years of operation, because of which it may have a higher interest bill than its earnings. To mitigate the concern of a firm facing a temporary liquidity crisis, we have included only firms whose ICR has been less than one consecutively for the past three years, which alludes to the fact that it is a non-performing firm. To mitigate the concern of a firm being in its initial years of operation, we have only considered firms operating for more than 15 years.

The extant literature on zombie lending (V. V. Acharya et al., 2019; Caballero et al., 2008; Giannetti & Simonov, 2013) have defined zombie firms as distressed firms that have obtained loans at below-market interest rates. Our definition of a zombie firm does not include interest rates explicitly, as we do not have the individual interest rates of the loans issued by a bank to a firm. To mitigate this concern, we estimate a firm's average interest rate for a particular year against the SBI PLR. The average interest expense of a firm is estimated by the ratio of the interest expense of a firm to the total debt of the firm for a year. Figure 9 shows that the zombie firms, by our definition, have received loans at a rate lower than the SBI PLR.

Table 8 contrasts the attributes of zombie and non-zombie firms. It shows, on an average, zombie firms exhibit notably higher leverage while also displaying diminished net worth and profitability (measured through EBITDA/Assets ratios)[13]. Most notably, zombie firms exhibit a very low IC ratio of 0.032, in stark contrast to the ratio of 0.075 observed among other low-quality firms. Consequently, these companies found themselves incapable of fulfilling their current interest obligations using the earnings they generated. To avert instances of default, banks were consequently compelled to either furnish them with additional cost-

[12]The Prime Lending Rate is the interest rate that commercial banks charge their most creditworthy customers. It serves as a benchmark for various loans, including corporate, housing, and personal loans.

[13]These results lends credence to our reasoning for segregating the low quality firms as the zombie firms are of significantly worse quality compared to low quality firms on observable solvency and liquidity ratios.

effective liquidity through new subsidised loans and/or decrease the interest rates on their pre-existing loans to levels below the market rate.

Figure 10 plots the fraction of zombie firms in our sample over time. The figure shows that the asset-weighted fraction of zombie firms increased significantly during the recapitalisation period. It changed from a value of approximately 1 percent to a value of approximately 8 percent at the end of the recapitalisation period.

To formally test for the impact of the size of recapitalisation on zombie lending by the recapitalised banks, we estimate the following panel regression:

$$\begin{aligned} Y_{ib,t+1} = \beta_1.size_{bt} + \beta_2.zombie_{it} + \beta_3.zombie_{it}.size_{bt} + \eta.X_{bt} \\ + Firm_i.Year_{t+1} + Firm_i.Bank_b + \epsilon_{ib,t+1} \end{aligned} \tag{3}$$

where $zombie_{it}$ is a dummy variable which takes the value of 1 if the firm is a zombie, otherwise zero. Finally, note that, for our regression analysis, we lag the *zombie* indicator by one period like in Giannetti and Simonov (2013), V. V. Acharya et al. (2019) because the nonlagged zombie dummy itself would constitute an outcome of a bank's willingness to extend credit.

We present the results of this empirical analysis in Table 9 GBs and private banks acting as the control set and Table 10, where only private banks act as the control set. For brevity, we only report the results for our main variable of interest, the 'size.zombie'. The results show that the size of recapitalisation had a statistically significant impact on the banks' credit supply to zombie firms. This result holds across all specifications (Columns 1–4), controlling for different fixed effects sets.

In our least restrictive specification, we control for firm-X-year, which allows us to control for any observed and unobserved time-varying characteristics of the firms, bank fixed effects, and time-varying bank control variables (see Column 1). Column 2 shows the regression results for the case in which we also include firm X-bank fixed effects, which exploits the variation within the same firm-bank relationship over time. Column 3 includes firm X-

year, firm X-bank effects, and bank X-year effects. This controls for unobserved time-invariant and time-varying characteristics related to firm heterogeneity, bank heterogeneity, and relationships between firms and the respective bank. In particular, including bank X-year fixed effects addresses the concern that sovereign bond holdings could be endogenous to bankcharacteristics in a way that could bias the estimated treatment effect. The coefficient in column 3 of Table 9 suggests that a 10 percent increase in the size of recapitalisation translates into an approximately 33.17 percent increase in zombie lending.

To further test the robustness of these results, we follow Peek and Rosengren (2005) and Giannetti and Simonov (2013) and employ the probability of a loan disbursed in a particular year instead of the loan amount as the dependent variable. Column 4 of Table 9, confirms that our results are robust to using this alternative lending supply measure controlling for firm X-year, bank X-year and firm X-bank fixed effect. The coefficient in column 4 of Table 10 suggests that a 1 percent increase in the size of recapitalisation leads to an increase in log of odds of zombie lending by 2.79 times.

Finally, to mitigate concerns that other factors or shocks could have affected the banks' lending behaviour, we present placebo tests that randomly assign placebo recapitalisation years for the treatment GBs, and randomly reassign recapitalised amounts among the GBs. For the first placebo test, we randomly reassign the recapitalisation years across the sample period from 2006-2019. Table 11, with GBs and private banks acting as the control set and Table 12, where only private banks act as the control set, do not have a statistically significantly positive effect on the banks' zombie lending, as is evident from the coefficient of the 'size. Zombie' interaction term. We randomly reassign the capital infusion to banks for the second placebo test. Table 13 and Table 14 shows no statistically significant relation between the randomly assigned capital infusion and the zombie lending by the banks.

In the previous section, our results show evidence of misallocation of credit as the recapitalised GBs engage in low-quality lending. The point of concern is that the low-quality borrowers might seemingly be distressed because they faced a temporary liquidity crunch.

To mitigate this concern, we define zombie firms in a way that points towards economically non-viable existing borrowers of a bank. Our results show that recapitalised banks have engaged in zombie lending. The results reinforce our finding of misallocation of credits by recapitalised GBs.

5.4 Zombie Distortion and Real Effect

Our findings thus far show that there has been a misallocation of credit by the recapitalised GBs. In this section, we highlight the effect of this misallocation of credit by focusing on its impact on the real side of the economy. We analyse it in two parts. The first part focuses on the spillover effect of misallocating credit vis-à-vis zombie lending. We analyse the impact of the spillover effect of zombie lending by checking whether zombie lending is crowding out healthy lending. In the second part, we focus on whether the zombie firms that have benefitted from the credit misallocation process have contributed to the real side of the economy through increasing employment or investment.

The prevalence of zombie lending might have negatively impacted healthy businesses through two potential channels. First, banks incentivised towards zombie lending tend to redirect their credit towards existing borrowers struggling with debt obligations. This credit misallocation reduces the availability of loans and results in higher interest rates for productive, creditworthy firms operating in the same sector.

Secondly, the prevalence of zombie firms could introduce distortions to market competition, adversely affecting non-zombie companies competing within the same sectors. The typical competitive outcome would involve struggling firms reducing investment and losing their market share. However, zombie loans artificially sustain distressed borrowers, leading to market congestion. This, in turn, creates distorting effects on healthy firms within the same industries. For instance, these effects may include reduced capital expenditure, increased average interest costs, and higher wages due to retaining workers whose productivity has declined in zombie firms.

Considering these two pathways, a high prevalence of zombie firms within a particular industry is anticipated to lead to more pronounced distortions for healthy firms. Consequently, industries with a significant zombie presence are expected to experience a less robust recovery than industries with a lower prevalence of zombies. This viewpoint is also supported by V. V. Acharya et al. (2019) and Caballero et al. (2008). We provide suggestive industry-level evidence of the distortions caused by the increased zombie prevalence. Figure 11 shows that capital expenditure decreased in industries that faced a larger zombie fraction during the recapitalisation period relative to industries with a lower zombie fraction.

To test whether a high zombie presence had adverse spillover effects on non-zombie firms operating in the same industry during the recapitalisation period, we estimate the following panel regression:

$$\begin{aligned} Y_{ik,t+1} = {} & \beta_1.healthy_{ik,t} + \beta_2.healthy_{ik,t}.IndustryFracZombie_{kt} \\ & + \beta_3.healthy_{ik,t}.recapperiod + \beta_4.healthy_{ik,t}.IndustryFracZombie_{kt}.recapperiod \\ & + \eta.X_{ik,t} + Firm_{ik} + Industry_k.Year_{t+1} \\ & + \epsilon_{ib,t+1} \end{aligned} \tag{4}$$

where $IndustryFracZombie_{kt}$ measures the zombie fraction in industry k (2 digit NIC code) at time t, and $recapperiod$ is a dummy variable which takes a value of 1 for the recapitalisation period (2009-19) or 0 otherwise. The dependent variables are investment (measured as capital expenditure), average interest rate and wage expenses. Our coefficient of interest is β_4, whether healthy firms invest less, pay higher interest rates, or have higher wages. We again include firm and industry-year fixed effects. The latter fixed effect mitigates worries regarding the potential correlation between the prevalence of zombies within an industry during a specific year and the industry's overall performance. Additionally, in the scenario where the government changes/updates policies specific to industries over time, this specifi-

cation would account for such fluctuations.

Table 15, panel A, presents the results of this regression analysis. The results show that healthy firms significantly invest less ($\beta_4 < 0$). Although not statistically significant, our results also show they pay higher interest rates ($\beta_4 > 0$), and have higher wages ($\beta_4 > 0$). The estimates in Table 15, panel A, Column 1 imply that healthy firms with an average 1 percent increase in their industry's zombie fraction reduced their investment by around 0.64 percent of total assets in the recapitalisation period compared to a scenario in which the zombie fraction would have stayed at its pre-recapitalisation level. For wage expenses and average interest cost, our results do not show any significant change, although both the results are in a positive direction, implying an increase in wage expenses and interest costs.

Finally, we investigate whether these distortionary effects are disproportionately larger in industries with certain baseline characteristics. In particular, we analyse whether these negative externalities were more intense in rent-seeking, construction industries, manufacturing, trade and service sectors.

To determine the rent seeking nature of an industry, we choose industries with higher corruption/political connection (mining, power, telecommunications, steel, and metals)[14]. The results in Table 15, panel B show a significant decrease in capital expenditure of the healthy firm in this industry, emphasising the adverse spillover of zombie lending. The average interest cost has decreased significantly for healthy firms in this industry, contrary to our adverse spillover of zombie lending, but this result can be attributed to the political connectedness of this industry.

The construction, manufacturing, trade and services industries have been chosen based on National Industrial Classification (NIC). The results in Table 15, panels C and D, show a significant decrease in capital expenditure, specifically for the manufacturing and construction industry. The result highlights quite the negative impact as these industries heavily

[14]These sectors were considered as rent-seeking based on the findings of Fisman, Schulz, and Vig (2014) and Asher and Novosad (2023) who show that the mining and minerals industries in India are particularly associated with corruption and rent-seeking.

depend on capital expenditure for sustenance. Although the results in Table 15, panels E and F do not show any significant impact of either capital expenditure, average interest cost, or wage expenses in the trade and services industry. However, all the coefficients for average interest cost and wage expenses are positive, suggesting an increase in expenses of the healthy firms in these industries.

Our results indicate that banks have not been giving out loans despite the infusion of capital by GoI. This raises a question about what the banks are doing with the capital that the GoI is infusing and whether they are misallocating the credit.

To analyse whether there was any difference in the real impact of the zombie firms that benefitted from the credit misallocation by banks and non-zombie firms, we frame the following regression equation:

$$\begin{aligned} RealEffect_{i,t+1} = \beta_1.AverageExposure_{it} + \beta_2.zombie_{it} \\ + \beta_3.AverageExposure_{it}.zombie_{it} + \eta.X_{it} + FixedEffects + \epsilon_{i,t+1} \end{aligned} \tag{5}$$

We construct an average exposure variable to proxy the extent to which firms benefited from the capital infusion through their relationship with the banks. The average exposure variable captures the firm's exposure to the recapitalised banks. First, we use the size of capital infusion of each bank, as defined in Equation (1), and compute the average recapitalisation size of all banks infused with capital by the GoI. We denote this variable size. Second, we calculate a firm's indirect gains from its lending relationships by weighting the size of each of its loan from that particular bank which has been infused by the GoI by the fraction of its total outstanding loan amounts. This yields the following measure:

$$AverageExposure_{it} = \frac{size_{bt}.loan_{ib,t}}{TotalLoan_{it}}$$

We consider two measures of real impact. We consider employment growth (wages/total expense), and investment ($\Delta GFA/TotalAssets$). Our baseline regression includes firm fixed

effects, year fixed effect, and firm-level control variables – firm size, leverage, net worth, the fraction of tangible assets, the IC ratio, and the EBITDA/total assets ratio – to capture other determinants of firms' corporate policies. Additionally, we include interactions between industry, year, and bank fixed effects to capture unobserved time-varying shocks to an industry in a given year that may affect the credit demand of borrowing firms and their real outcomes. Importantly, these fixed effects also absorb all shocks at the national level (changes in tax rates, regulations, etc.) that could affect investment and employment creation.

Table 16, presents the results for the full sample. A firm year is the unit of observation. For ease of exposition, we only report the results for our key variable of interest, the interaction of $AverageExposure_{it}.zombie_{it}$. The coefficients for employment and investment (Columns 1–6) do not change significantly for zombie firms with relatively high average exposure during the recapitalisation period.

Overall, our results show that the misallocation of credit in the form of zombie distortion has led to the crowding out of healthy firms from the credit lending process The result is similar across all the industries, and specifically so for rent-seeking industries. Noticeably, these increased zombie lending did not also have any real impact on the economy in terms of employment or investment growth.

6 Concluding Remarks

In this paper, we analyse the capital infusion process undertaken by the GoI. Although capital infusion/bank bailouts have been extensively studied in the literature in different contexts, we had two unique reasons to focus on the Indian context: i) the recapitalisation process was carried out year on year for 10 years, from 2009 until 2019[15] , and ii) the recapitalisation process can be stated to be ad hoc at best, with no basis for deciding the bank that will get the capital infusion. This is in contrast to the European, Japanese or USA experiences

[15]The recapitalisation process has not stopped at the end of 2019. Due to the onset of COVID-19, it is still an ongoing process. Since our study focuses on the period from 2006 - 2019, the recapitalisation period boils down to a period of 10 years from 2009 - 2019.

wherein capital was infused only once throughout the bailout phase, and either all banks were recapitalised or recapitalisation was targeted towards specific banks based on a sound selection principle. Moreover, the underlying objective of the recapitalisation process seemed to implicitly change from protecting the Indian economy against the headwinds due to the global financial crisis, to restoring the banks' balance sheet.

Our results show that GoI has failed in its recapitalisation objectives. Overall credit growth has not significantly improved despite frequent recapitalisations. On the contrary, this repeated and ad hoc recapitalisation has encouraged banks to indulge in evergreening bad loans by increasing distressed lending (specifically zombie lending). Moreover, the increase in zombie lending has led to a significant spillover effect. It has crowded out lending to healthy firms by increasing their average interest cost and wage expenses, significantly reducing capital expenditures (investment) for these firms. To err on the side of caution, we have also analysed whether this increased zombie lending has affected the real side of the economy, i.e. whether it has increased employment or investment. Our analysis shows that there has been no significant increase in either investment or employment by zombie firms.

Although the rationale for the recapitalisation to protect the economy from the malaise of the global financial crisis was a benign objective, the amount of recapitalisation and the basis of recapitalisation could be much better. Recapitalisation costs are unquestionably consequential for a government that has to maintain its fiscal health. However, poorly implemented policy can have its own cost, as in the Indian scenario. Repeated and a meagre amount of recapitalisation has incentivised the GBs to lend to impaired borrowers. This has led to the objective of recapitalisation being changed to protecting the bank balance sheet and, subsequently, a bigger recapitalisation bill for the GoI to foot. In its stead, a one-time recapitalisation and transparent implementation of the same could have more likely induced a more robust economic recovery and ensured a healthy balance sheet for the banks.

To conclude, the recapitalisation process has failed in fulfilling its objective and has had a negative effect by incentivising zombie lending and creating distortions in the credit

supply process. Given the multitude of capital infusion policies implemented amidst the COVID-19 crisis, our findings offers a lesson of caution. Such policies can exert enduring negative impacts on credit access, the configuration of industries, and the stability of the financial sector as a whole. The process of undoing ill-planned, and inefficient capital infusion policies may prove to be arduous. As economies rebound, addressing certain persistent consequences—such as zombie lending and the inadequate capitalisation of banks—might necessitate active and resource-intensive interventions to mitigate these lasting concerns.

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A Data Appendix

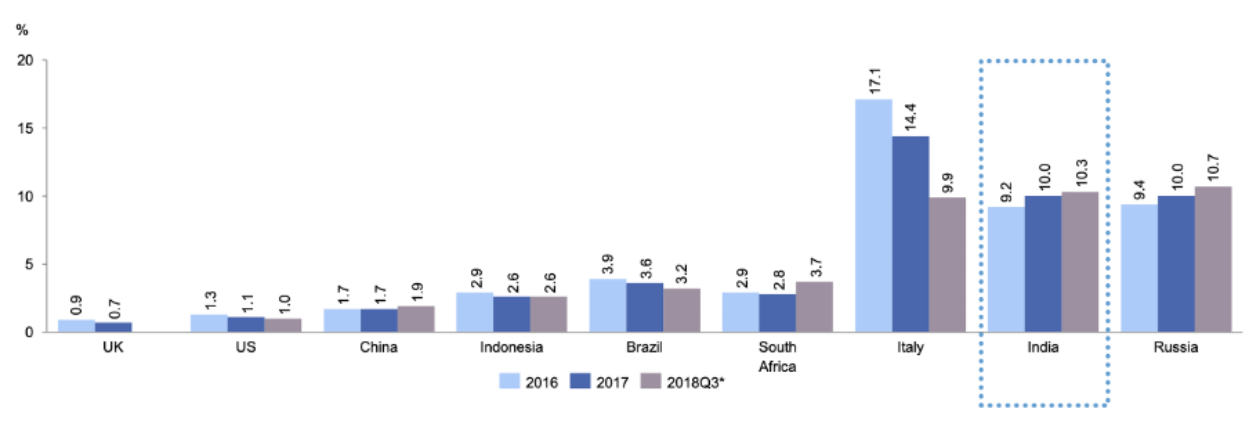

Figure 1: Gross NPA ratio

*: For Italy and China, data pertain to 2018 Q2. For UK, neither 2018 Q2 nor Q3 numbers were available. Note: Q2 and Q3 refer to calendar year quarters ending in June and September, respectively.

Source: Financial Soundness Indicators (FSI), IMF. (Taken from "The Cul-De-sac in Indian Banking: A Dominant Government Sector, Limited Fiscal Space and Independent Regulation (Is there an Impossible Trilemma?)", keynote address by Urjit Patel at the 19th Annual Conference on the Indian Economic Policy, Stanford University, 4th June, 2019.)

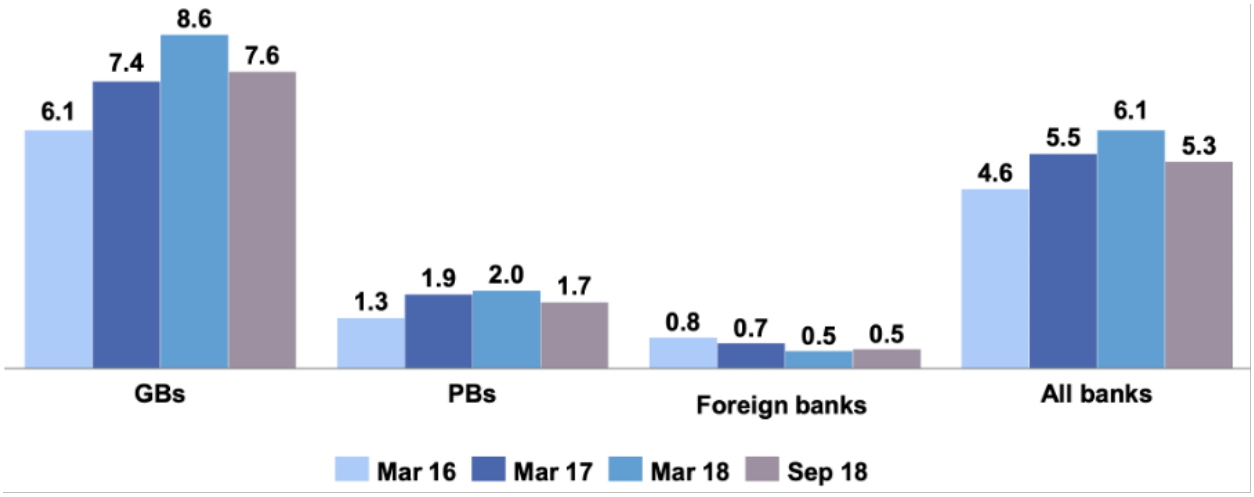

Figure 2: Net NPA ratio (%), there is a significant divergence in the performance of PBs and GBs in terms of operations financial indicators

Source: Statistical Tables Relating to Banks in India, RBI. (Taken from "The Cul-De-sac in Indian Banking: A Dominant Government Sector, Limited Fiscal Space and Independent Regulation (Is there an Impossible Trilemma?)", keynote address by Urjit Patel at the 19th Annual Conference on the Indian Economic Policy, Stanford University, 4th June, 2019.)

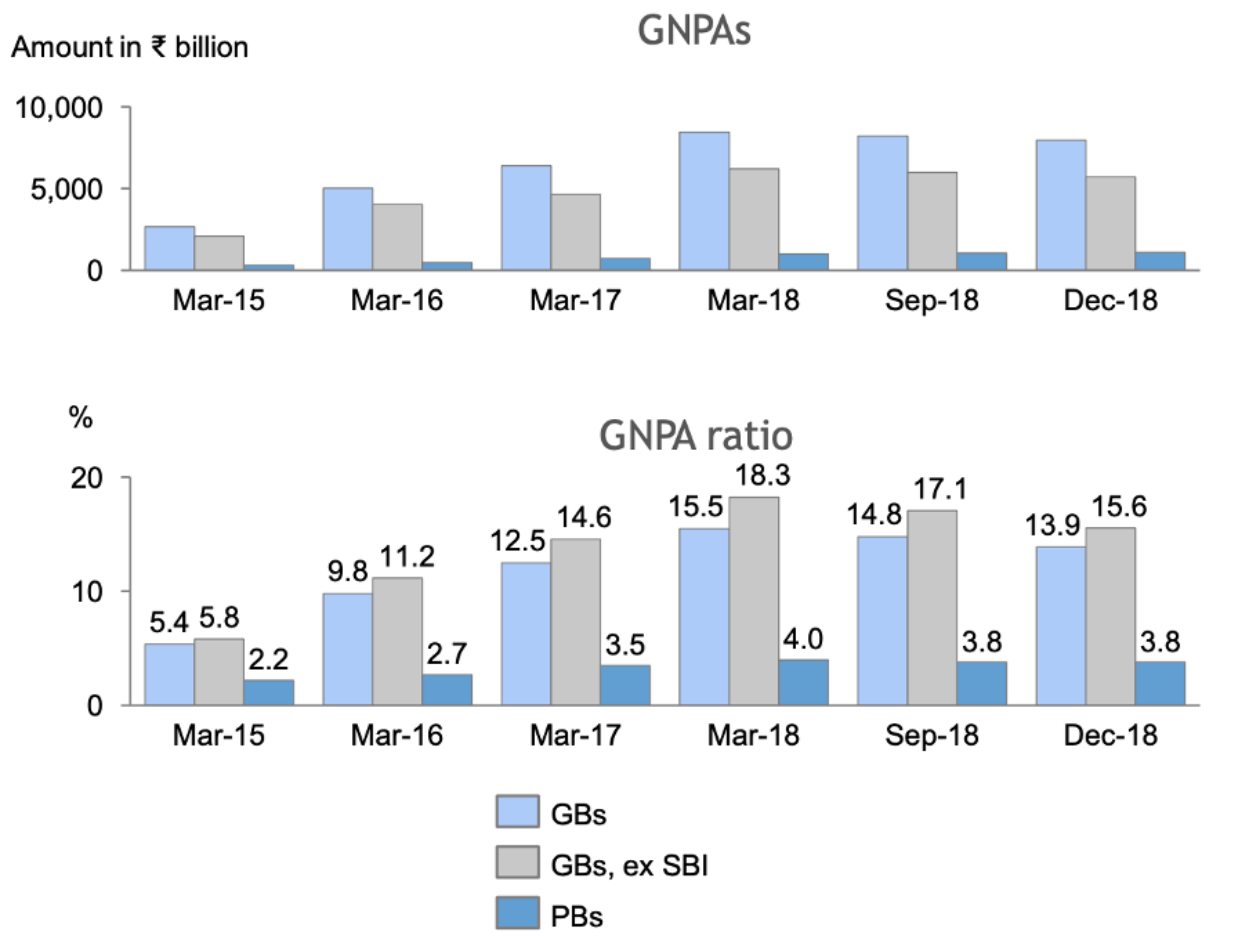

Figure 3: GNPAs GNPA ratio much higher for GBs (GNPA ratio for GBs > 3x of PBs) – even more stark for GBs-SBI

Source: Statistical Tables Relating to Banks in India, RBI. (Taken from "The Cul-De-sac in Indian Banking: A Dominant Government Sector, Limited Fiscal Space and Independent Regulation (Is there an Impossible Trilemma?)", keynote address by Urjit Patel at the 19th Annual Conference on the Indian Economic Policy, Stanford University, 4th June, 2019.)

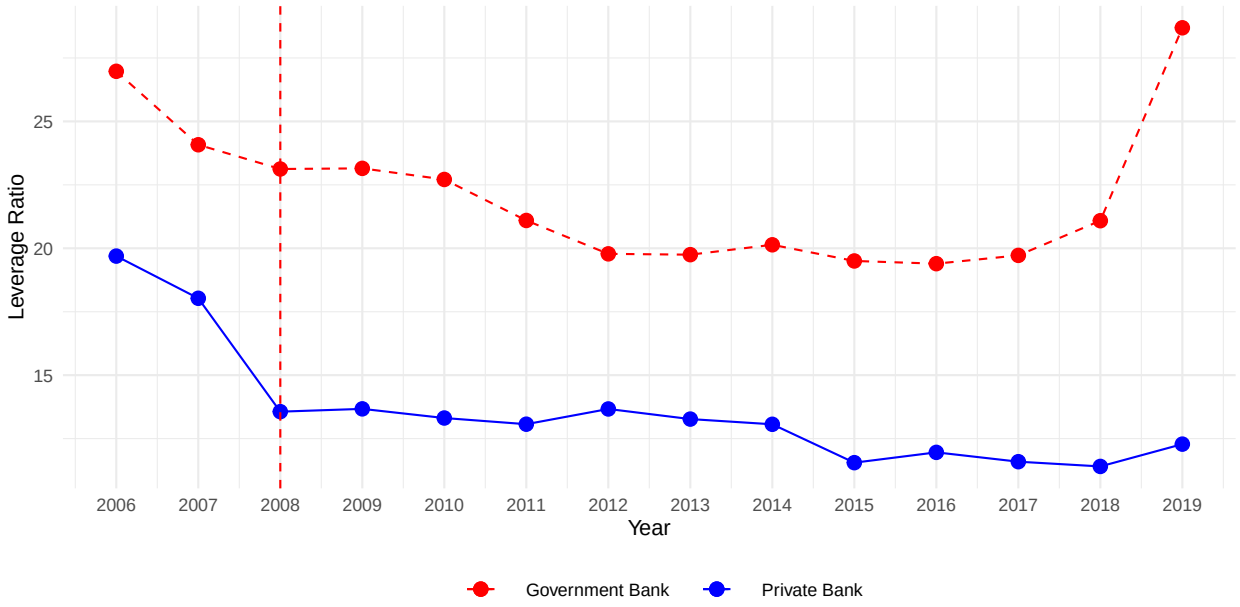

Figure 4: Leverage ratio of GBs and PBs

This figure shows the evolution of the leverage ratio of the banks from the pre-recapitalisation period to the post-recapitalisation period. Leverage ratio has been measured as the ratio of total asset to total equity. The red dotted vertical line in 2008 denotes the start of the capital infusion process.

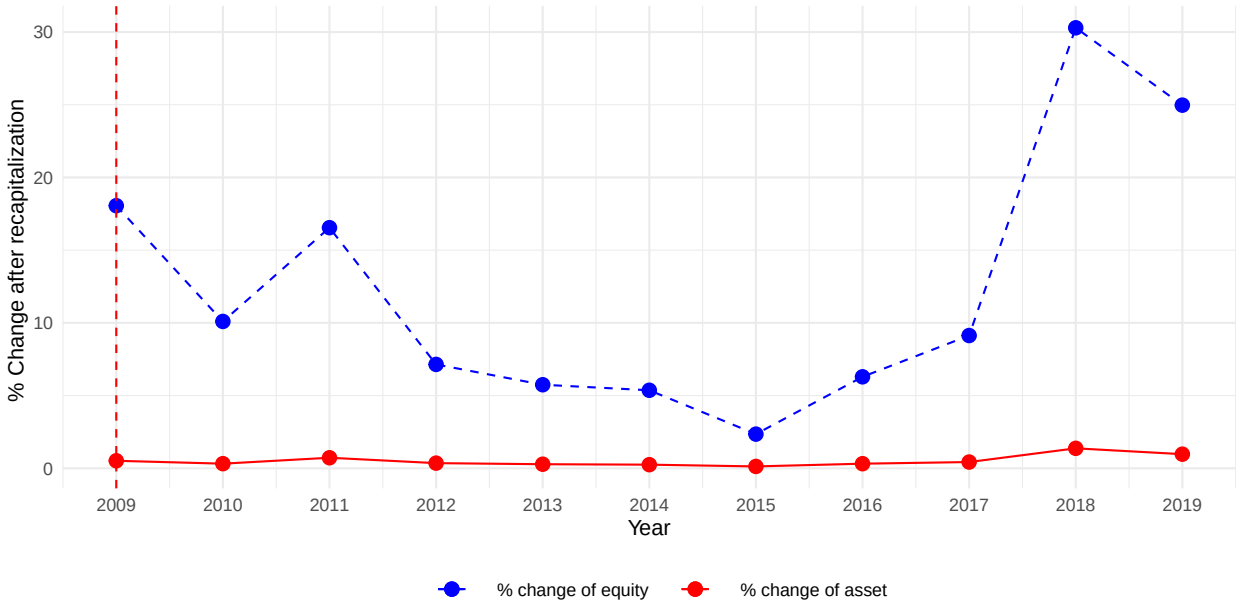

Figure 5: Change in equity and change in asset of GBs and PBs after recapitalisation

This figure shows the percentage change in equity and percentage change in asset of the recapitalised government banks relative to the capital infused by the Government of India to those banks. It shows the evolution in the post-recapitalisation period. The red dotted vertical line in 2009 denotes the start of the capital infusion process instead of 2008, since the percentage will be reflected a year later for the 2008-09 period.

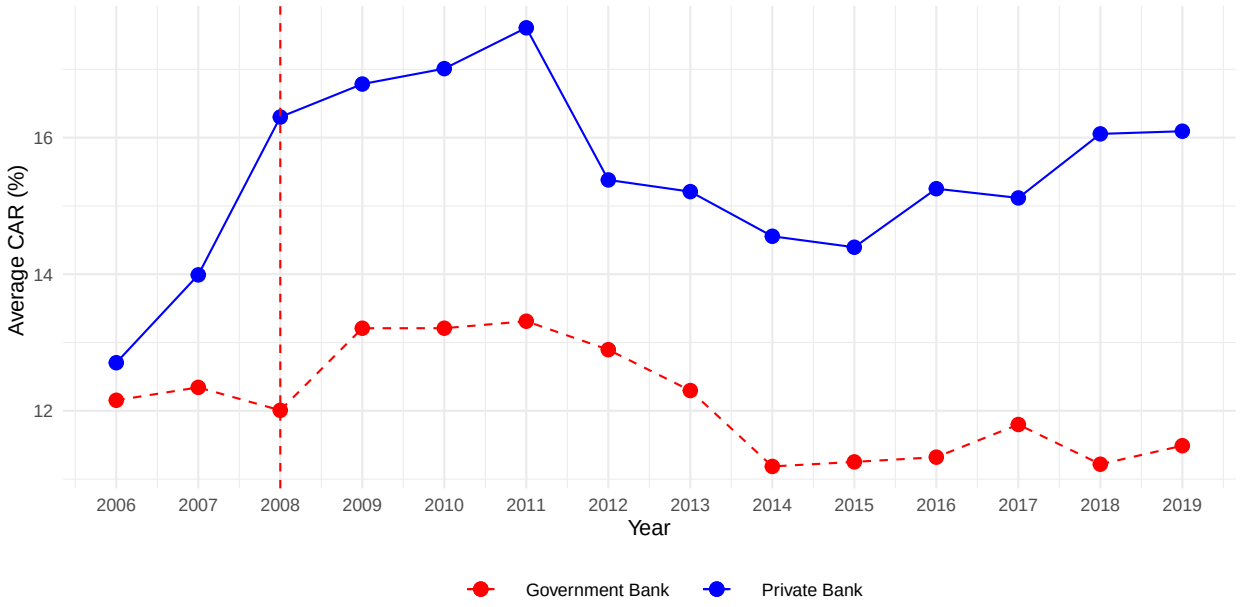

Figure 6: CAR across GBs and PBs

This figure shows the difference in the capital adequacy ratio for the government banks and the private banks during 2006 - 2019. The 'Average CAR' measures the cumulative average of the capital adequacy ratio across the government banks and private banks respectively. The red dotted vertical line in 2008 denotes the start of the capital infusion process. The line demarcates the graph into a pre-recapitalisation and post-recapitalisation phase.

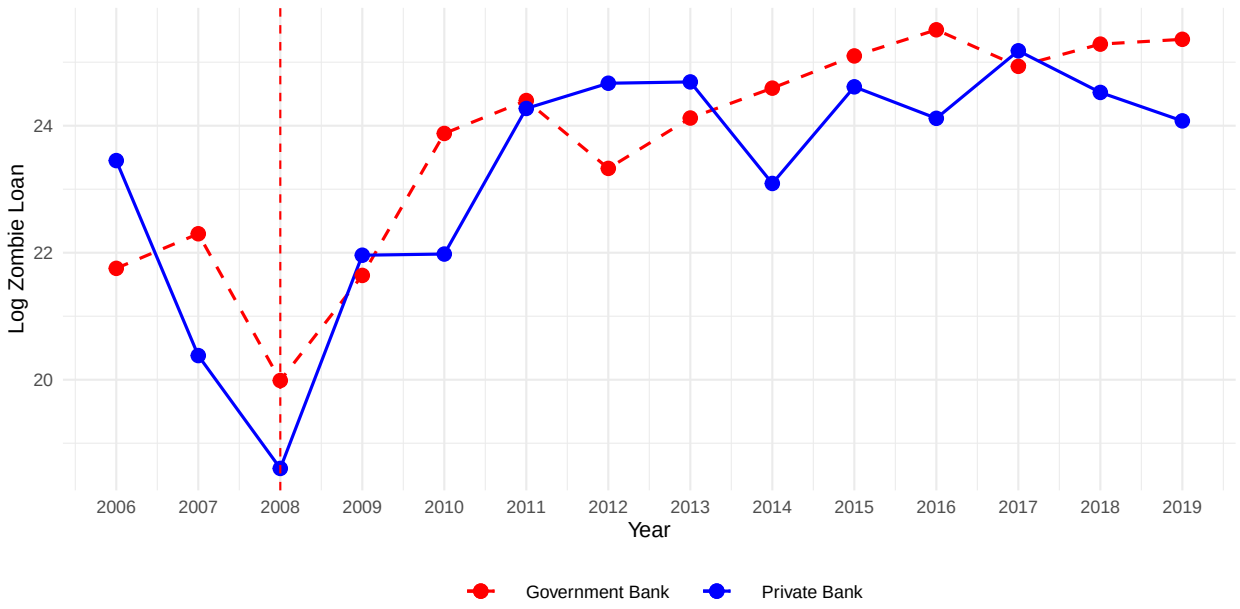

Figure 7: Zombie loan of GBs and PBs

This figure shows the evolution of zombie lending of both government banks and private banks from the pre-recapitalisation period to the post-recapitalisation period. 'Log Zombie loan' is the natural log of the cumulative amount of zombie loan supplied by the government banks and private banks respectively in a given year. A loan to firm is classified as zombie if ICR of the firm is less than 1 for consecutive three years, age of the firm is greater than 15 years, and debt to asset ratio is greater than 0.25. The red dotted vertical line in 2008 denotes the start of the capital infusion process.

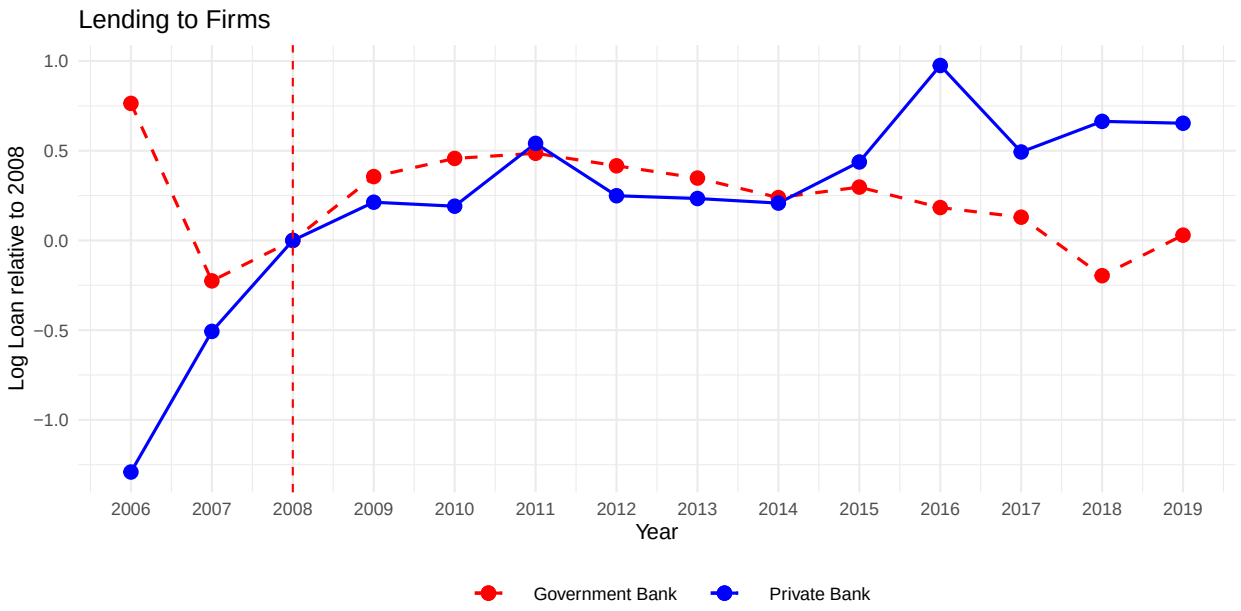

Figure 8: Credit growth

This figure shows the log ratio of the total loans in a given year relative to the year of the onset of capital infusion. The y-axis is normalised to 0 at the time of the onset of the capital infusion process. Log loan is the natural log of the cumulative amount of loan supplied by the government banks and private banks respectively in a given year. The figure shows the evolution of the credit supply of both government banks and private banks from the pre-recapitalisation period to the post-recapitalisation period. The red dotted vertical line in 2008 denotes the start of the capital infusion process.

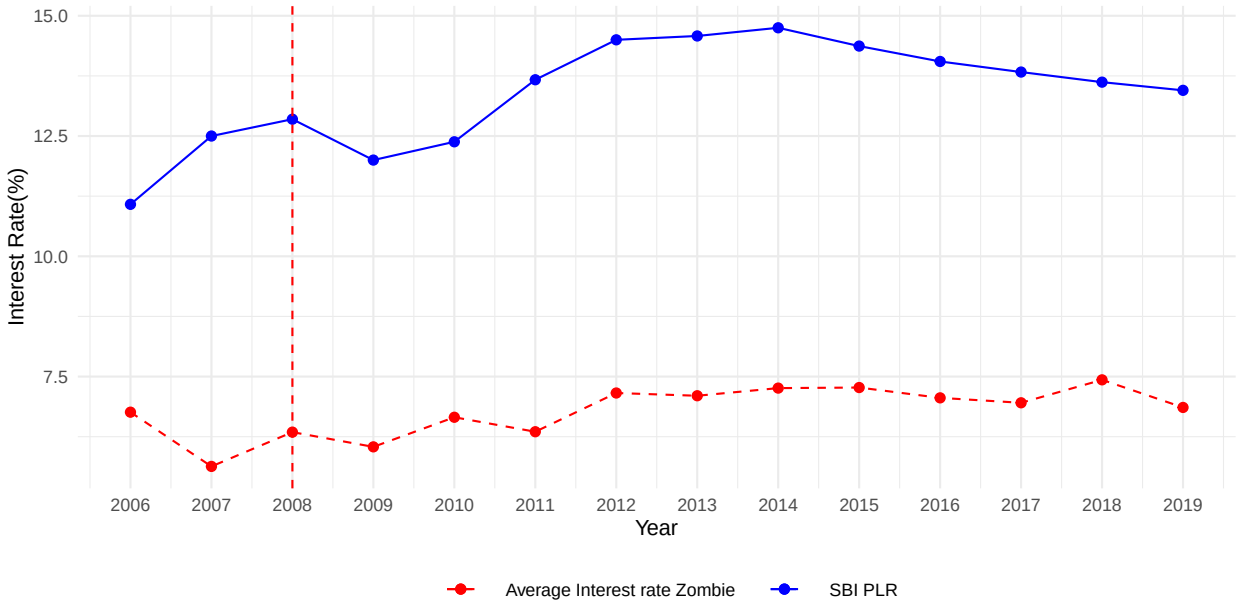

Figure 9: Zombie interest rate vs SBI PLR

This figure shows the difference in interest rate paid by a zombie firm vis-a-vis the SBI PLR rate. State Bank of India (SBI) is considered one of the healthier PSBs. The SBI PLR is the interest rate that SBI charge their most creditworthy customers. It serves as a benchmark for various loans, including corporate, housing, and personal loans. A loan to firm is classified as zombie if ICR of the firm is less than 1 for consecutive three years, age of the firm is greater than 15 years, and debt to asset ratio is greater than 0.25. 'Average interest rate zombie' is the average of the ratio of total interest expense to the total debt paid by the zombie firms in a given year. The red dotted vertical line in 2008 denotes the start of the capital infusion process.

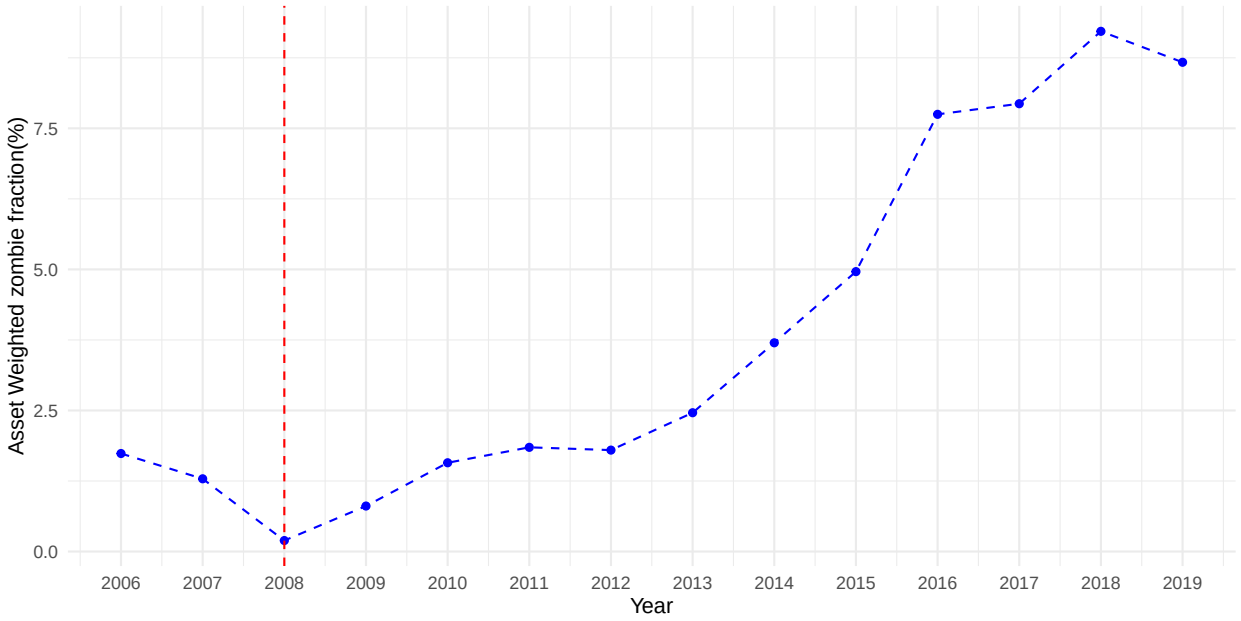

Figure 10: Evolution of zombie lending

This figure shows the sharp increase in proportion of asset weighted zombie after 2008. The red dotted vertical line in 2008 denotes the start of the capital infusion process. A loan to firm is classified as zombie if ICR of the firm is less than 1 for consecutive three years, age of the firm is greater than 15 years, and debt to asset ratio is greater than 0.25.

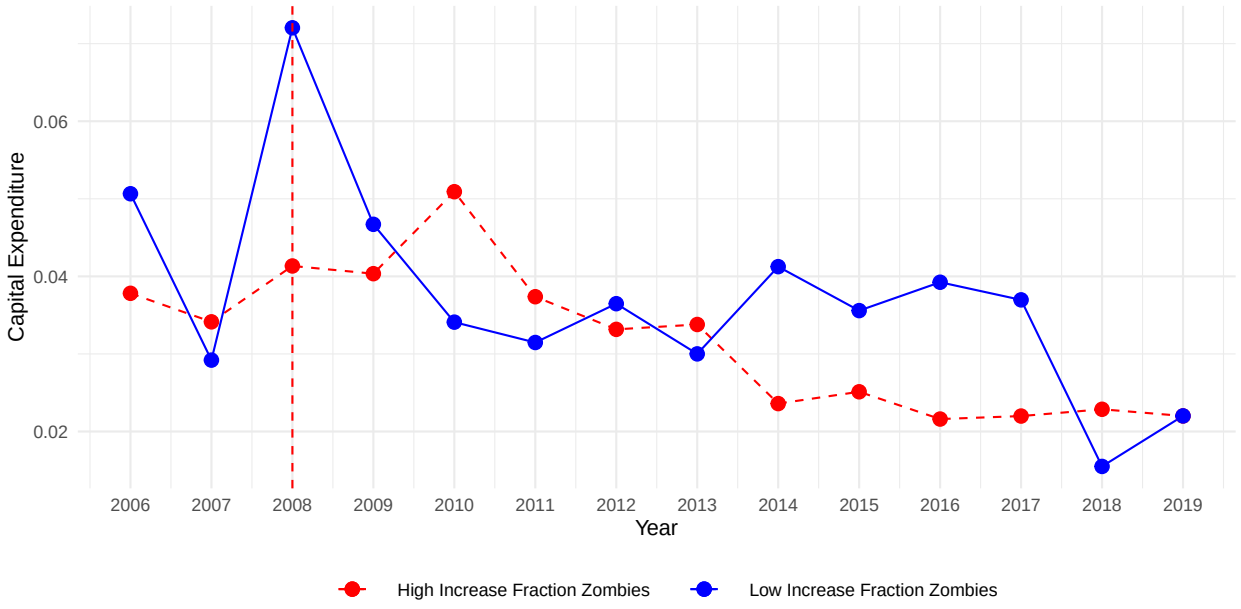

Figure 11: Capital Expenditure across zombie prevalent industries

This figure compares the capital expenditure across industries with high fraction of zombie firms vis-a-vis industries with low fraction of zombie firms. The industry has been classified into 'high increase fraction zombie' or 'low increase fraction zombie' on the basis of the asset weighted fraction of zombie firms in the given industry in the post-recapitalisation period. Industries with asset weighted zombie fraction in the top 25 percentile are classified as 'high increase fraction zombie' industries, whereas industries in the bottom 25 percentile of the asset weighted zombie fraction is classified as 'low increase fraction zombie'. A loan to firm is classified as zombie if ICR of the firm is less than 1 for consecutive three years, age of the firm is greater than 15 years, and debt to asset ratio is greater than 0.25. The red dotted vertical line in 2008 denotes the start of the capital infusion process.

Table 1: Basis of capital infusion

Financial Year	Capital Infused (INR in crores)	Mode of Recapitalisation	Basis	
			Reference Date	Actual/Estimated
2010 - 2011	7694[16]	Direct equity infusion from the budget	31/03/10	Actual Tier I CRAR
	6423	Direct equity infusion from the budget	31/03/11	Estimated Tier I CRAR
	6000	Direct equity infusion from the budget	31/03/11	Raising GoI holding to 58 percent
2011 - 2012	12000	Direct equity infusion from the budget	31/12/11	Actual Tier I CRAR
2012 - 2013	12517	Direct equity infusion from the budget	31/03/13	Estimated Tier I CRAR
2013 - 2014	14000	Direct equity infusion from the budget	31/03/14	Actual Tier I CRAR and Raising GoI holding to 58 percent
2014 - 2015	6990	Direct equity infusion from the budget	Not available	Actual RoA
2015 - 2016	9932	Direct equity infusion from the budget	31/03/16	Estimated CET-I
	10018	Direct equity infusion from the budget	31/03/16	Estimated RWA
	5050	Direct equity infusion from the budget	31/03/16	Estimated minimum regulatory capital
2016 - 2017	16414	Direct equity infusion from the budget	31/03/17	Estimated Tier I and estimated RWA
	7750	Direct equity infusion from the budget	31/03/17	Estimated CET-I
	836	Direct equity infusion from the budget	31/03/18	Estimated CET-I
2017 - 2019	190000	Recap Bonds		

Source: DFS

Note: [16]Includes INR250 crore, INR300 crore, INR700 crore and INR250 crore infused in United Bank, UCO Bank, Vijaya Bank and Central Bank of India, based on CCEA approval (February/March 2009) for infusion in 2009-10.).

Table 2: Data Coverage

MCA coverage		
Variable	Value	
MCA non financial firms	14246	
Period of observation	FY2006 - FY2019	
Firm-bank relationship	38160	
Firm-bank relationship with non zero loans	33059	
Firms issued new loans (FY2006 - FY2019)	12267	
New loan issued by banks (FY2006 - FY2019)	65529	
New loan issued by banks (FY2006 - FY2008)	9477	
New loan issued by banks (FY2009 - FY2019)	56052	
Number of firm-bank-year observations	531630	
Number of industries (NIC two digit)	72	
MCA coverage at firm and bank level		
Variable	Unique	Observations
Firms	14246	531630
Banks	39	531630
Public banks	21	321580
Private banks	18	210050
Distress firm distribution		
Variable	Unique	Observations
Firm-year-low ic = 1	10820	57620
Firm-year-low ic = 0	9766	50541
Firm-bank-year-low ic = 1		163620
Firm-bank-year-low ic = 0		151645
Total observations		315265
Zombie firm distribution		
Variable	Unique	Observations
Firm-year-zombie	1412	2948
Firm-year-non zombie	12394	89864
Firm-bank-year-zombie		9094
Firm-bank-year-non zombie		271060
Total observations		280154

Notes: This table reports the sample summary for the data set for the period 2006-2019. Our data set has been created by supplementing the "MCA data" with the firm-level borrower data from the Prowess database and the bank related information from database of the Indian economy, RBI. We also list the number of observations with non-missing values of various distress firm as well as zombie firms.

Table 3: Variable Description:

Variable	Definition	Source
Bank Level Variables		
Loan Amount	Loan borrowed by a firm from a bank in a year (INR)	MCA
Size	Capital infusion by GoI to the bank scaled by total equity	CAG report
Bank Level Control Variables		
Private size	Private paid up capital	CMIE
Log(bank asset)	Logarithm of total asset of a bank	DBIE, RBI
Equity/Asset	Ratio of equity to asset of a bank	DBIE, RBI
Impaired asset	Ratio of net NPA to net advance	DBIE, RBI
Return on asset	Bank's return on asset	DBIE, RBI
Return on investment	Bank's return on investment	DBIE, RBI
Firm Level Control Variables		
Interest Coverage ratio (ICR)	EBIT/ Interest expenses	CMIE
Zombie_1	ICR < 1 for three consecutive years, and age > 15 years, and debt to asset ratio > 0.25	CMIE
Zombie_2	ICR < 1 for two consecutive years, and age > 15 years, and debt to asset ratio > 0.25	CMIE
Log (Asset)	Natural log of total asset of a firm	CMIE
Leverage	Total debt/ Total Asset	CMIE
Net worth	Total Net worth/ Total Asset	CMIE
Tangibility	Fixed Asset/ Total Asset	CMIE
EBITDA/Asset	EBITDA/ Total Asset	CMIE
Firm Level Variables		
CAPEX	Change in the gross fixed asset/ lag total asset in a year	CMIE
Wage	Total salaries paid as a fraction of total expense in a year	CMIE
Low IC	It is a dummy variable equals to 1 if the ICR of the firm $<$ median of the ICR of all the firms in the year, otherwise 0	CMIE
Other Independent Variables		
Recap_period	It is a dummy variable which takes the value of 1 for the time period from 2009 - 2019, otherwise 0	
Industry Fraction Zombie	Asset weighted fraction of of zombie firms in a given industry in a given year	
Average exposure	$\sum \frac{Size_{bt} . Loan\_amount_{ibt}}{Total\_loan\_amount_{it}}$	
Note:	*The sample period covers from FY 2006 to FY 2019*	

Table 4: Credit Growth (all non treated bank act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
size	0.098	0.186	0.188	12.96
	(0.637)	(0.670)	(0.881)	(60.08)
Observations	531,630	531,630	531,630	531,630
R^2	0.077	0.398	0.466	0.725
Bank level controls	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No
Year fixed effect	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control includes all the banks excepting the recapitalised GBs. Standard errors are clustered at the bank level. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table 5: Credit Growth (all private bank act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
size	0.316	0.143	0.092	17.14
	(0.669)	(0.738)	(0.959)	(76.52)
Observations	432,194	432,194	432,194	432,194
R^2	0.079	0.423	0.501	0.726
Bank level controls	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No
Year fixed effect	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm -bank-year. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes only the private banks. Standard errors are clustered at the bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 6: Credit growth for low IC firms (all non treated banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
low_ic	-0.809^{***}	-2.130		
	(0.086)	(1.937)		
size	-0.491	-1.724^{***}	-1.532	
	(0.660)	(0.856)	(1.090)	
I(size $*$low_ic)	1.104^{***}	3.483^{***}	3.135^{***}	2.162^{***}
	(0.365)	(0.621)	(0.759)	(0.344)
Observations	315,265	315,265	315,265	315,265
R^2	0.088	0.368	0.455	0.731
Bank level controls	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No
Year fixed effect	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. A firm is classified as low-IC (high-IC) if the ICR of the firm below/(above) the median of the ICR of all the firms in the year. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the banks excepting the recapitalised GBs. Standard errors are clustered at the bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 7: Credit growth for low IC firms (all private banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
low_ic	-0.856^{***}	-3.097		
	(0.087)	(2.263)		
size	-0.248	-1.924^{*}	-1.872	
	(0.710)	(1.026)	(1.311)	
I(size $*$low_ic)	1.281^{***}	4.004^{***}	3.785^{***}	3.232^{***}
	(0.449)	(0.674)	(0.861)	(0.435)
Observations	257,474	257,474	257,474	257,474
R^2	0.091	0.397	0.498	0.733
Bank level controls	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No
Year fixed effect	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. A firm is classified as low-IC (high-IC) if the ICR of the firm below/(above) the median of the ICR of all the firms in the year. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes only the private banks. Standard errors are clustered at the bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 8: Zombie v/s non-zombie firms

	Good Quality			Low quality non zombie			Zombie				
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Difference in mean (t test) (low quality non zombie - zombie)	Difference in median (Wilcoxon test) (low quality non zombie - zombie)
log asset (in million)	9794	2408	18393	11940	1942	22376	16374	3765	25132	-4434^{***}	-1822^{***}
leverage	0.388	0.399	0.215	0.492	0.570	0.277	0.679	0.733	0.183	-0.187^{***}	-0.163^{***}
tangibility	0.462	0.422	0.305	0.523	0.493	0.357	0.594	0.603	0.372	-0.071^{***}	-0.110^{***}
ICR	8.165	4.212	8.505	0.692	1.086	1.139	−0.144	0.060	0.878	0.836^{***}	1.026^{***}
EBITDA/Asset	0.144	0.140	0.060	0.069	0.075	0.062	0.037	0.032	0.052	0.032^{***}	0.043^{***}
Net worth/Asset	0.415	0.402	0.193	0.203	0.228	0.271	0.220	0.182	0.164	-0.017^{***}	0.046^{***}

Notes: This table presents a test for the difference in means as well as difference in median between low-quality nonzombie firms and zombie firms. Low-quality and low-IC are used synonymously. A firm is classified as low-quality (high-quality) if the ICR of the firm below/(above) the median of the ICR of all the firms in the year. A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. *p<0.1; **p<0.05; ***p<0.01.

Table 9: Credit growth towards Zombie firms (all non treated banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
zombie_1	−7.869			
	(5.30)			
size	0.110	0.079		
	(0.857)	(1.056)		
I(size $*\text{zombie}_1$)	2.255***	2.409***	2.419***	2.425**
	(0.678)	(0.733)	(0.586)	(1.123)
Observations	280,154	280,154	280,154	280,154
R^2	0.358	0.453	0.459	0.731
Bank level controls	Yes	Yes	No	No
Firm fixed effect	No	No	No	No
Year fixed effect	No	No	No	No
Bank fixed effect	Yes	No	No	No
Firm x bank fixed effect	No	Yes	Yes	Yes
Firm x year fixed effect	Yes	Yes	Yes	Yes
Bank x year fixed effect	No	No	Yes	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the banks excepting the recapitalised GBs. Standard errors are clustered at the bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 10: Credit growth towards Zombie firms (all private banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
zombie_1	−7.504			
	(5.281)			
size	0.197	0.124		
	(0.975)	(1.191)		
I(size $*\text{zombie}_1$)	2.615***	3.216***	3.317***	2.792**
	(0.788)	(0.831)	(0.629)	(1.283)
Observations	227,896	227,896	227,896	227,896
R^2	0.386	0.497	0.501	0.733
Bank level controls	Yes	Yes	No	No
Firm fixed effect	No	No	No	No
Year fixed effect	No	No	No	No
Bank fixed effect	Yes	No	No	No
Firm x bank fixed effect	No	Yes	Yes	Yes
Firm x year fixed effect	Yes	Yes	Yes	Yes
Bank x year fixed effect	No	No	Yes	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the private banks. Standard errors are clustered at the bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 11: Placebo Test: Credit growth towards Zombie firms (all non treated banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
$zombie_1$	−7.581			
	(5.295)			
size	0.021	0.027		
	(0.143)	(0.181)		
I(size $*zombie_1$)	0.331	0.327	0.221	0.299
	(0.358)	(0.499)	(0.337)	(0.677)
Observations	280,154	280,154	280,154	280,154
R^2	0.358	0.453	0.458	0.731
Bank level controls	Yes	Yes	No	No
Firm fixed effect	No	No	No	No
Year fixed effect	No	No	No	No
Bank fixed effect	Yes	No	No	No
Firm x bank fixed effect	No	Yes	Yes	Yes
Firm x year fixed effect	Yes	Yes	Yes	Yes
Bank x year fixed effect	No	No	Yes	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. The infused capital is randomly reassigned across the years of our sample period i.e. 2006 -2019, instead of the recapitalisation period (2009 - 2019). A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the banks other than the recapitalised GBs. Standard errors are clustered at the bank level. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table 12: Placebo Test: Credit growth towards Zombie firms (all private banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
$zombie_1$	−7.367			
	(5.284)			
size	0.233	0.224		
	(0.198)	(0.287)		
I(size $*zombie_1$)	0.058	0.407	0.158	−0.585
	(0.657)	(1.083)	(0.689)	(1.067)
Observations	280,154	280,154	280,154	280,154
R^2	0.387	0.497	0.501	0.733
Bank level controls	Yes	Yes	No	No
Firm fixed effect	No	No	No	No
Year fixed effect	No	No	No	No
Bank fixed effect	Yes	No	No	No
Firm x bank fixed effect	No	Yes	Yes	Yes
Firm x year fixed effect	Yes	Yes	Yes	Yes
Bank x year fixed effect	No	No	Yes	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. The infused capital is randomly reassigned across the years of our sample period i.e. 2006 -2019, instead of the recapitalisation period (2009 - 2019). A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the private banks. Standard errors are clustered at the bank level. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table 13: Placebo Test: Credit growth towards Zombie firms (all non-treated banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
zombie_1	−7.546			
	(5.291)			
size	0.041	0.018		
	(0.132)	(0.175)		
I(size $*\text{zombie}_1$)	0.321	−0.291	−0.379	−0.875
	(0.425)	(0.581)	(0.467)	(0.763)
Observations	227,896	227,896	227,896	227,896
R^2	0.358	0.454	0.458	0.731
Bank level controls	Yes	Yes	No	No
Firm fixed effect	No	No	No	No
Year fixed effect	No	No	No	No
Bank fixed effect	Yes	No	No	No
Firm x bank fixed effect	No	Yes	Yes	Yes
Firm x year fixed effect	Yes	Yes	Yes	Yes
Bank x year fixed effect	No	No	Yes	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. The amount of infused capital is randomly reassigned across the GBs for the recapitalisation period (2009 - 2019). A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the banks other than the recapitalised GBs. Standard errors are clustered at the bank level. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table 14: Placebo Tests: Credit growth towards Zombie firms (all private banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
zombie_1	−7.344			
	(5.276)			
size	−0.003	−0.029		
	(0.142)	(0.192)		
I(size $*\text{zombie}_1$)	0.399	0.207	0.039	0.259
	(0.482)	(0.792)	(0.605)	(1.138)
Observations	227,896	227,896	227,896	227,896
R^2	0.387	0.497	0.501	0.733
Bank level controls	Yes	Yes	No	No
Firm fixed effect	No	No	No	No
Year fixed effect	No	No	No	No
Bank fixed effect	Yes	No	No	No
Firm x bank fixed effect	No	Yes	Yes	Yes
Firm x year fixed effect	Yes	Yes	Yes	Yes
Bank x year fixed effect	No	No	Yes	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. The amount of infused capital is randomly reassigned across the GBs for the recapitalisation period (2009 - 2019). A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the private banks. Standard errors are clustered at the bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 15: Zombie Distortion

	CAPX	Average Interest Rate	Wages
	(1)	(2)	(3)
A. Entire Sample:			
Industry frac zombie*Healthy*RecapPeriod	-0.636**	0.231	0.045
	(0.282)	(0.152)	(0.445)
Observations	212,015	230,212	259,326
R^2	0.319	0.229	0.238
B. Rent Seeking Industry:			
Industry frac zombie*Healthy*RecapPeriod	-60.180**	-0.417**	2.115
	(29.930)	(0.913)	(2.467)
Observations	61,394	61,394	61,394
R^2	0.292	0.282	0.239
C. Construction Industry:			
Industry frac zombie*Healthy*RecapPeriod	-3.153**	13.47	-3.419
	(1.429)	(12.47)	(2.314)
Observations	29,031	29,031	29,031
R^2	0.464	0.216	0.501
D. Manufacturing Industry:			
Industry frac zombie*Healthy*RecapPeriod	-0.845**	0.215	0.061
	(0.331)	(0.193)	(0.185)
Observations	151,810	151,810	151,810
R^2	0.271	0.228	0.324
E. Trade Industry:			
Industry frac zombie*Healthy*RecapPeriod	0.049	7.584	1.592
	(6.679)	(7.262)	(1.049)
Observations	31,095	31,095	31,095
R^2	0.365	0.171	0.749
F. Service Industry:			
Industry frac zombie*Healthy*RecapPeriod	-0.021	0.116	0.257
	(0.131)	(1.239)	(0.189)
Observations	16,133	16,133	16,133
R^2	0.521	0.117	0.848
Firm level controls	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes
Industry x Year fixed effect	Yes	Yes	Yes

Notes: This table presents firm-level regressions. The dependent variables are capital expenditures, interest cost, and wage expenses. $Industryfraczombie$ measures the asset-weighted fraction of zombie firms in a given industry in a given year. Healthy is an indicator variable equal to 1 for firms not classified as zombie firms. A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Firm control variables include the logarithm of total assets, leverage, tangibility, IC ratio, EBITDA as a fraction of total assets, and net worth. Standard errors are clustered at the firm level. *p<0.1; **p<0.05; ***p<0.01.

Table 16: Real Effect

	Dependent variable:					
	capx_asset			wage		
	(1)	(2)	(3)	(4)	(5)	(6)
avg_exposure	−0.013	−0.012	−0.012	0.006	0.006	0.006
	(0.028)	(0.028)	(0.028)	(0.008)	(0.008)	(0.008)
zombie_1	−0.006	−0.005	−0.005	−0.022	−0.022	−0.022
	(0.040)	(0.039)	(0.039)	(0.021)	(0.021)	(0.021)
I(avg_exposure $*\text{zombie}_1$)	−0.101	−0.104	−0.104	−0.023	−0.024	−0.024
	(0.103)	(0.103)	(0.103)	(0.056)	(0.056)	(0.056)
Observations	280,154	280,154	280,154	280,154	280,154	280,154
R^2	0.046	0.046	0.046	0.145	0.145	0.145
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effect	No	Yes	Yes	No	Yes	Yes
Industry fixed effect	No	No	Yes	No	No	Yes

Notes: This table presents firm-level regressions. The dependent variables are capital expenditures, and wage expenses. *AverageExposure* which measures a firm's indirect gains from its lending relationships by weighting the size of each of its loan from that particular bank which has been infused by the GoI by the fraction of its total outstanding loan amounts. A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Firm control variables include the logarithm of total assets, leverage, tangibility, IC ratio, EBITDA as a fraction of total assets, and net worth. Standard errors are clustered at the firm level. *p<0.1; **p<0.05; ***p<0.01.

B Online Appendix

Table 17: Credit growth towards alternate definition of Zombie firms (all non treated banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
I(size $*$zombie$_2$)	2.291***	2.123***	2.123***	1.724*
	(0.638)	(0.802)	(0.601)	(0.905)
Observations	280,154	280,154	280,154	280,154
R^2	0.358	0.453	0.459	0.731
Bank level controls	Yes	Yes	No	No
Firm fixed effect	No	No	No	No
Year fixed effect	No	No	No	No
Bank fixed effect	Yes	No	No	No
Firm x bank fixed effect	No	Yes	Yes	Yes
Firm x year fixed effect	Yes	Yes	Yes	Yes
Bank x year fixed effect	No	No	Yes	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. The amount of infused capital is randomly reassigned across the GBs for the recapitalisation period (2009 - 2019). A firm is classified as zombie if ICR is less than 1 for two consecutive years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the banks other than the recapitalised GBs. Standard errors are clustered at the bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 18: Credit growth towards alternate definition of Zombie firms (all private banks act as control)

	Dependent variable:			
	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)
I(size $*$zombie$_2$)	2.614***	2.809***	2.878***	2.136**
	(0.744)	(0.940)	(0.665)	(1.066)
Observations	227,896	227,896	227,896	227,896
R^2	0.387	0.497	0.501	0.734
Bank level controls	Yes	Yes	No	No
Firm fixed effect	No	No	No	No
Year fixed effect	No	No	No	No
Bank fixed effect	Yes	No	No	No
Firm x bank fixed effect	No	Yes	Yes	Yes
Firm x year fixed effect	Yes	Yes	Yes	Yes
Bank x year fixed effect	No	No	Yes	Yes

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. The amount of infused capital is randomly reassigned across the GBs for the recapitalisation period (2009 - 2019). A firm is classified as zombie if ICR is less than 1 for two consecutive years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the private banks. Standard errors are clustered at the bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 19: Credit Growth with alternate clustering of error (all non treated bank act as control)

	Dependent variable:							
	log(1 + loan_amount)			loan indicator	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
size	0.098	0.186	0.188	12.96	0.098	0.186	0.188	12.96
	(0.133)	(0.213)	(0.222)	(60.08)	(0.638)	(0.674)	(0.886)	(60.08)
Observations	531,630	531,630	531,630	531,630	531,630	531,630	531,630	531,630
R^2	0.077	0.398	0.466	0.725	0.077	0.398	0.466	0.725
Bank level controls	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No	Yes	No	No	No
Year fixed effect	Yes	No	No	No	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes	No	No	No	Yes
Clustering	Firm				Firm and Bank			

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control includes all the banks excepting the recapitalised GBs. Standard errors are clustered at two levels i)firm level, ii) firm and bank level. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

Table 20: Credit Growth with alternate clustering of errors (all private banks act as control)

	Dependent variable:							
	log(1 + loan_amount)			loan indicator	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
size	0.316**	0.143	0.092	17.14	0.316	0.143	0.092	17.14
	(0.157)	(0.271)	(0.285)	(76.52)	(0.670)	(0.745)	(0.968)	(76.52)
Observations	432,194	432,194	432,194	432,194	432,194	432,194	432,194	432,194
R^2	0.079	0.423	0.501	0.726	0.079	0.423	0.501	0.726
Bank level controls	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No	Yes	No	No	No
Year fixed effect	Yes	No	No	No	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes	No	No	No	Yes
Clustering	Firm				Firm and Bank			

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control includes all the private banks. Standard errors are clustered at two levels i)firm level, ii) firm and bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 21: Credit Growth for Low IC firms with Alternate clustering of error (all non treated banks act as control)

	Dependent variable:							
	log(1 + loan_amount)			loan indicator	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I(size ∗low_ic)	1.104***	3.483***	3.135***	2.162***	1.104***	3.483***	3.135***	2.162***
	(0.263)	(0.434)	(0.508)	(0.344)	(0.383)	(0.642)	(0.793)	(0.344)
Observations	315,265	315,265	315,265	315,265	315,265	315,265	315,265	315,265
R^2	0.088	0.368	0.455	0.731	0.088	0.368	0.455	0.731
Bank level controls	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No	Yes	No	No	No
Year fixed effect	Yes	No	No	No	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes	No	No	No	Yes
Clustering	Firm				Firm and Bank			

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. A firm is classified as low-IC (high-IC) if the ICR of the firm below/(above) the median of the ICR of all the firms in the year. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the banks excepting the recapitalised GBs. Standard errors are clustered at two levels i)firm level, ii) firm and bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 22: Credit Growth for Low IC firms with Alternate clustering of error (all private banks act as control)

	Dependent variable:							
	log(1 + loan_amount)			loan indicator	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I(size ∗low_ic)	1.281***	4.004***	3.785***	3.232***	1.281***	4.004***	3.785***	3.232***
	(0.281)	(0.479)	(0.603)	(0.435)	(0.461)	(0.698)	(0.905)	(0.435)
Observations	257,474	257,474	257,474	257,474	257,474	257,474	257,474	257,474
R^2	0.091	0.397	0.498	0.733	0.091	0.397	0.498	0.733
Bank level controls	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No	Yes	No	No	No
Year fixed effect	Yes	No	No	No	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes	No	No	No	Yes
Clustering	Firm				Firm and Bank			

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. A firm is classified as low-IC (high-IC) if the ICR of the firm below/(above) the median of the ICR of all the firms in the year. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the private banks. Standard errors are clustered at two levels i)firm level, ii) firm and bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 23: Credit growth for Zombie firms with Alternate clustering of error (all non treated banks act as control)

	Dependent variable:							
	log(1 + loan_amount)			loan indicator	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I(size $*$zombie$_1$)	2.255***	2.409***	2.419***	2.425**	2.255***	2.409***	2.419***	2.425**
	(0.636)	(0.809)	(0.814)	(1.123)	(0.710)	(0.833)	(0.661)	(1.123)
Observations	280,154	280,154	280,154	280,154	280,154	280,154	280,154	280,154
R^2	0.358	0.453	0.459	0.731	0.358	0.453	0.459	0.731
Bank level controls	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No	Yes	No	No	No
Year fixed effect	Yes	No	No	No	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes	No	No	No	Yes
Clustering	Firm				Firm and Bank			

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the banks excepting the recapitalised GBs. Standard errors are clustered at two levels i)firm level, ii) firm and bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 24: Credit growth for Zombie firms with Alternate clustering of error (all private banks act as control)

	Dependent variable:							
	log(1 + loan_amount)			loan indicator	log(1 + loan_amount)			loan indicator
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I(size $*$zombie$_1$)	2.615***	3.216***	3.317***	2.792**	2.615***	3.216***	3.317***	2.792**
	(0.683)	(0.915)	(0.925)	(1.283)	(0.821)	(0.914)	(0.689)	(1.283)
Observations	227,896	227,896	227,896	227,896	227,896	227,896	227,896	227,896
R^2	0.386	0.497	0.501	0.733	0.386	0.497	0.501	0.733
Bank level controls	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Firm fixed effect	Yes	No	No	No	Yes	No	No	No
Year fixed effect	Yes	No	No	No	Yes	No	No	No
Bank fixed effect	Yes	Yes	No	No	Yes	Yes	No	No
Firm x bank fixed effect	No	No	Yes	Yes	No	No	Yes	Yes
Firm x year fixed effect	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Bank x year fixed effect	No	No	No	Yes	No	No	No	Yes
Clustering	Firm				Firm and Bank			

Notes: This table presents the results of a modified Khwaja and Mian (2008) bank lending channel regression. The unit of observation is a firm-bank-year. For the first three columns, the dependent variable is the natural log of the amount of loan taken by a firm in a given year. In the fourth column, the dependent variable is the probability of loan increase instead of log of the loan amount. $size_{bt}$ is the infused capital by the GoI during the year t scaled by the bank equity. A firm is classified as zombie if ICR is less than 1 for consecutive three years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Bank-level controls include the logarithm of total assets, equity/assets, impaired loans/equity, and return on assets. We also control for private recapitalisation of the banks and measure it as the ratio of private recapitalisation to the total equity of a bank in a given year. The control set includes all the private banks. Standard errors are clustered at two levels i)firm level, ii) firm and bank level. *p<0.1; **p<0.05; ***p<0.01.

Table 25: Real effect with alternate definition of zombie

	Dependent variable:					
	capx_asset			wage		
	(1)	(2)	(3)	(4)	(5)	(6)
I(avg_exposure $*$zombie$_2$)	−0.093	−0.094	−0.094	0.020	0.020	0.020
	(0.109)	(0.109)	(0.109)	(0.051)	(0.051)	(0.051)
Observations	280,154	280,154	280,154	280,154	280,154	280,154
R^2	0.046	0.046	0.046	0.145	0.145	0.145
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effect	No	Yes	Yes	No	Yes	Yes
Industry fixed effect	No	No	Yes	No	No	Yes

Notes: This table presents firm-level regressions. The dependent variables are capital expenditures, and wage expenses. *AverageExposure* which measures a firm's indirect gains from its lending relationships by weighting the size of each of its loan from that particular bank which has been infused by the GoI by the fraction of its total outstanding loan amounts. A firm is classified as zombie if ICR is less than 1 for two consecutive years, and age is greater 15 years, and debt to asset ratio is greater than 0.25. Firm control variables include the logarithm of total assets, leverage, tangibility, IC ratio, EBITDA as a fraction of total assets, and net worth. Standard errors are clustered at firm level. *p<0.1; **p<0.05; ***p<0.01.