Unearthing Zombies*

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Abstract

Since ineffective debt resolution perpetuates zombie lending, bankruptcy reform has emerged as a solution. We show, however, that lender-based frictions can limit reform impact. Exploiting a unique empirical setting and novel supervisory data from India, we document that a new bankruptcy law had muted effects on lenders recognizing zombie borrowers as non-performing. A subsequent unexpected regulation, targeting perverse lender incentives to continue concealing zombies, increased zombie recognition particularly for undercapitalized and government-owned banks, highlighting the role of bank capital and political frictions in sustaining zombie lending. Resolving zombie loans allowed lenders to reallocate credit to healthier borrowers who increased investment.

JEL Classification: F34, G23, G28, G33, K42, O53

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Recent evidence indicates that the negative macroeconomic effects of excessive corporate debt are greater when prevailing resolution mechanisms are inefficient (Jordà et al., 2020). In such regimes, 'zombie' borrowers, insolvent firms kept afloat solely through repeated extensions of bank credit, might proliferate[1] dragging down investment and growth (Caballero, Hoshi and Kashyap, 2008). Reforming the bankruptcy process has naturally emerged as a popular policy action to address zombie lending (Li and Ponticelli, 2019).

However, merely reforming the legal mechanism for debt resolution might be insufficient in reducing zombie lending due to the presence of other frictions. In this paper, we show that lender incentives to *not* pursue delinquent borrowers are an important impediment to effective debt resolution. To do so, we exploit a unique empirical setting that allows us to distinguish between (a) responses to changes in the bankruptcy process itself and (b) lender incentives to use the bankruptcy process. Merely comparing outcomes before and after a change in the bankruptcy process runs the risk of conflating the above two channels, providing an incomplete accounting of policy efficacy.

We focus on India which adopted a landmark new bankruptcy law in 2016 in the midst of a corporate debt crisis that severely weakened the banking sector (Patel, 2020).[2] We find the new law led to only a modest increase in the recognition of zombie loans as non-performing assets (NPAs) with effects weakest among poorly capitalized banks and government-owned banks. What makes this setting ideal for our purposes is a subsequent unanticipated regulatory intervention specifically targeting limited lender usage of the new bankruptcy system. Importantly, the regulation did not change the bankruptcy law itself. We find there was a fourfold increase in zombie loans recognized as NPA following the regulation with large effects at poorly capitalized banks. However, NPA recognition at government-owned banks remained depressed relative to other banks. Resolving zombie borrowers allowed a reallocation of capital to healthier firms who boosted investment. To carry out our analysis, we become the first to use a new supervisory database covering the universe of large bank-borrower relationships in India.

We center our analysis on zombie borrowers since this is the set of borrowers most likely to be affected by improvements in the debt resolution process (Jordà et al., 2020).

[1]See Banerjee and Hofmann (2018) for a survey of the recent rise in zombie lending across both mature and emerging economies.

[2]Gross NPAs grew from under 3% in 2011 to over 11% in 2018 and we estimate that 15% of total lending was to zombie borrowers. Many large corporations entered financial distress despite relatively benign macroeconomic conditions.

Our primary outcome of interest is whether a loan is categorized as non-performing since this first leg of the debt resolution process is the point at which the zombie is 'unearthed'. On recognizing the loan as NPA, the bank needs to take a costly capital hit by provisioning for the expected loan loss. Weakly capitalized banks may have an incentive to continue 'evergreening' distressed loans in order to delay this provisioning cost (Peek and Rosengren, 2005). At government-owned banks, political interference might also play a role in keeping credit flowing to distressed but politically favored entities (Acharya, 2020).

We start by constructing a novel zombie measure using quarterly borrower-level exposure data for all borrowers whose total outstanding debt in a bank exceeds INR 50 million (approximately USD 725,000 as of June of 2019). We exploit the borrowers' relationship history with banks to construct a novel classification of zombie relationships at the bank-borrower level.[3] A borrower-bank relationship is classified as a zombie if in the period before our analysis window (i.e., between June 2014 and March 2016) the borrower sees positive credit growth in the quarter after being reported as 60-90 days overdue.[4] We exclude from this set borrowers who a) have been rated AAA or AA at least once, and b) borrowers who start a relationship with another lender. Intuitively, our classification captures borrowers who receive funding through an existing relationship even though they are adjacent to non-performing, are not highly rated, and no new lender is willing to issue credit to them. Using financial statement data, we validate that zombie borrowers are significantly more likely to be firms with lower profitability, lower cash flows, and higher debt.

Armed with this classification, we compare the impact of both the bankruptcy law and the subsequent regulation on (i) recognition of loans to zombie borrowers as NPAs, (ii) credit allocation to zombie and healthy borrowers, and (iii) firm-level investment, employment, and profitability. The bankruptcy law, the Insolvency and Bankruptcy Code (IBC), was adopted in December 2016 as a sweeping overhaul of corporate debt resolution mechanisms. The IBC created a new quasi-judicial process that replaced an assortment of existing schemes. Limited usage of the IBC by financial creditors prompted the bank

[3]The standard approach to identifying zombie borrowers is based on whether they receive credit at interest rates below the highest rated firms in the economy (Caballero, Hoshi and Kashyap, 2008; Acharya et al., 2019). Our data does not capture interest rates. However, focusing exclusively on one feature of the contract term (interest rates) may be misleading as other features of the contract could reflect the borrower's riskiness. Measures based on subsidized borrowing rates might be problematic, particularly in the Indian context, as lenders can capitalize interest payments and issue new loans to cover payments while charging nominally high interest rates. Additionally, the decline in policy rates in recent years can confound interest rate-based measurements (Banerjee and Hofmann, 2018).

[4]Loans are classified as NPAs once they are overdue by more than 90 days.

regulator to issue, on February 12th, 2018, new guidelines requiring lenders to report borrower delinquency at the first instance of non-repayment. This was combined with extensive curbs on regulatory forbearance and rules for the IBC referral process based on borrower size and time since the first instance of default. These guidelines (hereafter referred to by their colloquial shorthand "Feb. 12th") were wholly unanticipated by banks and market participants.

We start by examining the impact of both the IBC and Feb. 12th on NPA recognition of zombie and non-zombie borrowers. In our baseline difference-in-differences (DID) specification, we examine the coefficients on two key independent variables - interactions of a dummy variable indicating whether a bank-borrower relationship is a zombie relationship with two separate time indicators, one for the period between the first and fourth quarter of 2017 ("post IBC") and the other from the first quarter of 2018 to the first quarter of 2019 ("post Feb. 12th"). In essence, we estimate two DID coefficients – one when only the bankruptcy law is in force; the second when the Feb. 12th guidelines are introduced to complement the bankruptcy law. The latter allows us to distinguish the effect of the regulation from the law change. Our detailed micro data allows us to include bank-borrower and industry-time fixed effects throughout so that we are estimating the difference in NPA recognition for zombies relative to non-zombies in the same industry in a given period.

We show that, compared to the IBC, the Feb. 12th regulation has a fourfold impact; the former leads to a modest 2 percentage point (pp) increase in the likelihood of zombie relationships being recognized as NPAs while the effect of the latter is 9 pp. The impact of Feb. 12th is particularly striking when considering that prior to either policy action, 29% of zombie relationships are recognized as NPAs. Though the inclusion of bank-borrower and industry-time fixed effects soaks up much of the variation we are not interested in, we cannot completely rule out that some omitted factor is driving the differential reaction for zombies and healthy firms following the IBC. The new law was long anticipated and went through a standard parliamentary process before being implemented. However, the timing and nature of Feb. 12th was such that it allows us to much more credibly claim our results are causal.

The Feb. 12th guidelines, issued by the regulator, the Reserve Bank of India (RBI), were wholly unanticipated by banks and market participants. The regulations specified that the RBI would tighten supervision and would levy stringent monetary and other penalties on lenders who intentionally concealed the true status of accounts through evergreening. Additionally, they required lenders to draw up bilateral resolution plans for all accounts overdue, even if by one day, and specified deadlines beyond which

delinquent borrowers had to be referred to the IBC. Moreover, Feb. 12th significantly increased the costs of regulatory forbearance, with the provisions targeted towards borrowers with debt exceeding INR 1 billion. We thereby exploit this size threshold of INR 1 billion to causally identify the effect of Feb. 12th for "Large" borrowers.

In a triple difference setting, we compare Feb. 12th's impact for bank-firm credit exposures above the threshold relative to those below the threshold. Large zombie relationships are 4 pp more likely to be recognized as NPA compared to other zombie relationships following Feb. 12th. There is no such differential impact around the IBC which makes sense since IBC rules are size-independent. This also helps rule out the concern that the causal impact attributed to Feb. 12th is merely a lagged response to the IBC. On examining dynamic treatment effects, we see that the control (non-zombie) and treated (zombie) groups are on similar trends prior to both treatments and hence fail to reject the parallel trends assumption critical for causal identification.

To explain why Feb. 12th was significantly more effective in unearthing zombies than the IBC, we turn to the incentives that perpetuate zombie lending. Zombie lending might arise due to multiple, non-mutually exclusive reasons (i) ineffective creditor rights making bad loan resolution costly (Andrews and Petroulakis, 2019; Li and Ponticelli, 2019); (ii) bank undercapitalization making banks reluctant to provision for bad loans or to risk-shift (Peek and Rosengren, 2005; Bruche and Llobet, 2013); and (iii) political economy frictions at government-owned banks might impel them to keep politically favored firms afloat (Qu, 2018) and/or postpone loan loss recognition so that the sovereign is able to avoid a costly recapitalization (Acharya, 2020).

The IBC targeted the costly and time-consuming bankruptcy process, i.e., the first cause above. Its relative ineffectiveness in curbing zombie lending points to the other two factors driving the sustenance of a large fraction of zombie relationships, prompting us to examine the differential effects of bank capital and ownership in explaining outcomes.

While the IBC had no impact on the most weakly capitalized banks, Feb. 12th forced even the most weakly capitalized banks to recognize zombie loans. When it comes to ownership, we find that zombie recognition is weaker for government-owned banks both post-IBC and post-Feb. 12th, despite their ex-ante higher share of zombies. Although Feb. 12th did increase zombie recognition at government-owned banks, it was relatively less successful than at other banks pointing to the importance of political economy frictions in sustaining zombie lending. RBI authority over corporate governance is weaker at government-owned banks than at other banks as the former are also subject to parallel regulations by the Government of India (Patel, 2020). This relative lack of authority might explain why even the mandates of Feb. 12th fell short.

Interestingly, we do not find zombie recognition to be significantly different in industries prone to rent-seeking, indicating the avoidance of a costly government-funded recapitalization may be what perpetuates zombie lending at government-owned banks, as opposed to politically connected lending.

As government-owned banks in our sample are also more prone to be under-capitalized, we disentangle the impact of capital from ownership by identifying heterogeneity by bank capital, conditional on ownership. If bank undercapitalization was the only factor contributing to zombie lending, we would except comparable responses to the two interventions across relatively well-capitalized private and government-owned banks. Our empirical results however show that for government-owned banks, the response to the interventions does not vary by bank capital position; the results on capital come wholly from privately-owned banks. This further attests to governance rather than capital being the key friction at government-owned banks. We also document that the magnitude of the IBC effect at well-capitalized privately-owned banks, i.e., those not facing either major friction, is comparable to the unconditional Feb. 12^{th} effect. This emphasizes that it was not the provisions of the IBC but rather lender-specific frictions that were responsible for the muted effect of the IBC.

We next turn to the resulting impact on credit allocation to zombie borrowers and healthy (non-zombie) borrowers. On declaring zombie firms as non-performing, lenders cut credit to them since they no longer need to evergreen the loan. This allows credit reallocation to healthier borrowers. In particular, credit to financially-constrained firms, proxied by younger firms and unlisted firms, increases, consistent with prior literature that has found improved credit access to marginal borrowers after a strengthening of creditor rights (La Porta et al., 1997). Credit also reallocates to investment-grade borrowers after both events, and the effect is 36% higher post-Feb 12^{th}.

Consistent with the hypothesis that reallocation is through a bank lending channel, credit reallocation is higher at banks with greater ex-ante exposure to zombie borrowers. Alternatively, credit could increase due to increases in demand by healthy firms in industries which witness zombie decongestion (Caballero, Hoshi and Kashyap, 2008). We examine credit reallocation in industries with differing ex-ante zombie concentration but do not find support for this alternate demand-driven hypothesis. Instead, we find a broader reallocation of credit to industries with relatively low ex-ante concentration of zombies.

Finally, we examine the impact on firm investment and profitability. Zombie firms cut investment with larger effects post Feb. 12th as opposed to IBC, though effects on

profitability are muted. Healthy investment-grade and large firms increase investment. Overall, the findings indicate that the reforms successfully facilitate creative destruction, at least on the intensive margin. Cash holdings of investment-grade firms also increase, suggesting that creditworthy firms build financial slack.

We contribute along multiple dimensions starting with the literature on zombie lending. Focusing on Japan in the 1990s, Peek and Rosengren (2005) attribute the emergence of zombies to higher forbearance resulting from the costliness of bank bailouts and political pressure to limit firm closures. An increase in zombie lending has been observed in other developed economies with weakened banking sectors, such as in Europe after the Great Recession (Albertazzi and Marchetti, 2010; Gopinath et al., 2017; Schivardi, Sette and Tabellini, 2018). More recently, zombies have become increasingly associated with emerging economies and government-owned banks. Tan, Huang and Woo (2016), Shen and Chen (2017), and Qu (2018) highlight inefficiencies in lending practices in China, particularly by government-owned banks.

An emerging literature studies how countries can recover from zombie lending crises through private restructuring efforts (Fukuda and Nakamura, 2011), large bank capital injections (Giannetti and Simonov, 2013), more frequent supervisory inspections (Bonfim et al., 2019), or the introduction of specialized bankruptcy courts (Li and Ponticelli, 2019). Our novel supervisory data on bank-borrower relationships allows us to uniquely classify zombies and the experimental setting allows us to pinpoint how lender incentives to *not* resolve zombie borrowers can be a key impediment to bankruptcy reform.

Lending to impaired zombie borrowers inhibits the process of creative destruction (Caballero, Hoshi and Kashyap, 2008; Acharya et al., 2020) and depresses economic productivity (Blattner, Farinha and Rebelo, 2018). The debilitating effects of zombie lending are especially significant in India that has witnessed nearly a decade-long banking crisis starting in 2011 (Chari, Jain and Kulkarni, 2020; Flanagan and Purnanandam, 2019; Chopra, Subramanian and Tantri, 2020). Recovery from such zombie lending crises can be protracted as macroeconomic stabilization policies delay the requisite financial restructuring (Laeven and Valencia, 2020). Inefficient corporate debt resolution can prolong the negative macroeconomic effects of corporate leverage (Jordà et al., 2020). Our paper highlights that reforms to the debt resolution process might be inadequate on their own due to other frictions sustaining zombie lending. We, thus, also tangentially contribute to prior work that has focused on quality of enforcement in bankruptcy reforms (Ponticelli and Alecnar, 2018).

Our paper is also related to the vast literature on misallocation, particularly in developing countries such as India and China (Hsieh and Klenow, 2009; Bau and

Matray, 2020). Financial frictions can prevent optimal allocation of resources (Midrigan and Xu, 2014) and correcting for these financing frictions, say by reforming debt resolution mechanisms, can reallocate inputs to healthier firms (Bian, 2018; Ponticelli and Alecnar, 2018). In these papers, credit reallocation occurs through lender recovery from liquidation or when labor or capital sunk in distressed firms is redirected to healthier firms. Our unique empirical setting allows us to highlight a new reallocation channel. Improving the debt resolution process allows credit that would likely have been further sunk in zombie borrowers to be redirected to more productive uses.

The rest of this paper is organized as follows: In Section 1, we provide a summary of relevant institutional details. In Section 2 we describe our data sources and present descriptive evidence. Our empirical strategy and results are presented in Section 3. We conclude in Section 4.

1 Institutional background

Starting in the early 1990s, a series of economic reforms in India led to the significant liberalization of financial markets. However, debt markets have been slow to develop relative to equity markets. The corporate bond to GDP ratio in India was only 17% as of June 2018, compared to 123% in the United States (Reserve Bank of India, 2019). As a result, the corporate sector remains heavily bank-dependent. In this section, we provide a brief overview of the Indian banking system as well as the regulatory infrastructure surrounding corporate financial distress.

1.1 Lending practices

Up through the end of the 1980s, the Indian banking sector was dominated by government-owned banks [known in India as public-sector banks (PSBs)] whose lending policies were largely dictated by the state. In order to encourage the entry of privately-owned banks, the Indian government deregulated PSBs in 1991 and established a unified set of prudential norms including capital provisioning standards that depended, among other factors, on loan quality. This ensured a level playing field.

Due to these initiatives, privately-owned banks have steadily gained market share. Still, PSBs, banks in which the Indian government holds a majority stake, retain over 61% of all Indian banking assets as of March 2019.[5] Despite the objective of promoting competition in the banking sector, the government still closely monitors all new banks.

[5]Total bank assets are INR 166.012 trillion (approx. $2.42 trillion) of which INR 101.629 trillion (approx. $2.42 trillion) are held by PSBs. Source: Statistical Tables relating to Banks in India available at https://dbie.rbi.org.in/DBIE/dbie.rbi?site=publications.

Today's PSBs, while nominally independent, continue to be criticized for operating inefficiently (Acharya and Subramanian, 2016) and having inflexible lending policies due to poor loan officer incentives (Banerjee, Cole and Duflo, 2004). These banks are also susceptible to political interference, particularly during election cycles (Cole, 2009); an endemic system of favored lending to large politically connected corporations has attracted media attention due to a series of recent scandals (The Wall Street Journal, 2018). While the Reserve Bank of India (RBI) is the banking regulator, its authority over corporate governance is weaker at PSBs than at other banks (Patel, 2020). The RBI cannot remove directors or the management of a PSB. It also cannot force a merger or liquidation of a PSB, nor can it revoke the banking license of a PSB. In contrast, it can exercise all these powers when it comes to privately owned banks.[6] RBI's regulatory powers are, thus, not ownership-neutral, creating a two-tiered system of banking regulation.[7]

1.2 The Insolvency and Bankruptcy Code

In 2016, the Indian government implemented the Insolvency and Bankruptcy Code (IBC), a sweeping overhaul of the bankruptcy system. The new code was passed in May 2016 by Parliament and came into effect that December. Before the IBC, the bankruptcy system was characterized by an assortment of resolution mechanisms. This fragmented system was notorious for its inordinate delays and low recovery rates. Large cases took an average of six years to resolve (Sengupta, Sharma and Thomas, 2016) and recovery rates averaged around 26% – amongst the lowest in the world (Patel, 2020). The primary objective of the IBC was to subsume all extant resolution mechanisms and to streamline the recovery process.[8]

Upon default, either the borrowers or creditors, financial or operational, can initiate insolvency proceedings. A case may be dismissed before it is admitted to the National Company Law Tribunal, but once it is admitted, an interim resolution professional takes possession of the firm's assets. The resolution professional forms a committee representing creditors, who can then appoint a permanent trustee. This trustee solicits and vets applicants for the submission of resolution plans, and these applicants can be existing parties or outside prospective buyers. Once resolution plans are submitted, the

[6]The RBI derives its powers from the provisions of the Banking Regulation Act of 1949. Section 51 spells out the portions of the Act that apply to PSBs. For the omitted categories, regulatory power lies directly with the Government of India.

[7]An example of the RBI exercising its regulatory powers was its replacement of the board of Yes Bank, a private lender https://www.livemint.com/news/india/rbi-appoints-former-deputy-governor-ex-banker-on-yes-bank-board-for-two-years-11584702191840.html

[8]Appendix A1 briefly describes the bankruptcy resolution systems prior to IBC.

creditors' committee selects a plan by a vote of at least 75%. If a plan is not selected, liquidation procedures commence. This entire process, after admission to the Tribunal, is supposed to be take fewer than 180 days.[9]

Initiating bankruptcy proceedings against a weak borrower implies immediate costs in the form of higher provisioning, to be compensated through (expected) future recoveries. As larger borrowers may require higher provisioning for anticipated losses and likely incur longer resolution periods, provisioning requirements offer under-capitalized lenders in particular a perverse incentive to delay initiating bankruptcy proceedings against large borrowers. Thus, the IBC does not directly address banks' incentives to continue the non-recognition of zombies. This onus subsequently fell on the regulator. In May 2017, Parliament empowered the RBI to refer select borrowers to the IBC, resulting in three rounds of referrals between June and November of 2017.[10]

1.3 The February 12th Circular

The limited utilization of the IBC by lenders prompted the RBI to unexpectedly unveil new guidelines through a "circular"[11] on February 12th, 2018. We use the circular's colloquial name "Feb. 12th" as a shorthand throughout. The goal of the circular was to tighten supervision and reporting around delinquent borrowers. It also prompted banks to use the IBC as the sole avenue for loan resolution. Importantly, bankers and market participants had no advance notice that these guidelines were being developed.[12] Moreover, the RBI required immediate compliance with the new guidelines, limiting banks and borrowers' ability to adjust to the regulatory intervention. The Feb. 12th circular threatened that non-compliance by lenders would attract monetary penalties, increased provisioning requirements, and directives from the regulator to initiate bankruptcy proceedings under the IBC.

The new guidelines had three main components. First, they directed lenders to report any missed repayments as soon as they occurred. Prior to Feb. 12th, lenders were

[9] Because certain rules are still being challenged, however, most large cases initially referred to the Tribunal under the IBC have taken over 180 days to resolve.

[10] Twelve borrowers were referred in the first round in June 2017 while an additional 29 borrowers were referred in the second round in August 2017. A significant fraction of these borrowers had already been recognized as non-performing by lenders, but banks had refrained from initiating bankruptcy proceedings against them.

[11] "Circulars" in Indian bureaucratic parlance refer to the issuance of executive directions to the bureaucracy.

[12] Generally, the RBI prior to introducing a new policy shares a draft plan and solicits public opinion. No such draft was shared with regard to this intervention. Private communications with the central bank revealed that only a handful of officials were involved in the drafting of the new regulations, reducing the likelihood of any information leaking to banks or borrowers (The Economic Times, 2019).

required to report borrowers who became overdue between 60 and 90 days on a fortnightly basis. Feb. 12th altered this by mandating banks report borrowers overdue by even one day on a weekly basis. For each default, lenders were required to create a bilateral resolution plan, listing how the borrower would emerge from default. Thus, while Feb. 12th did not alter the norms for recognizing borrowers as non-performing (90 days overdue), it advanced delinquency reporting by forcing banks to report the first instance a borrower deviated from its repayment schedule. This also increased information flow to supervisory authorities.

Second, the Feb. 12th circular eliminated all existing specialized regulatory forbearance schemes and made it costly for lenders to engage in regulatory forbearance with fresh defaults. These specialized schemes, popularly known as restructurings, were introduced by the RBI in the latter half of the global financial crisis to aid borrowers facing temporary liquidity shocks. Borrowers classified under such schemes were offered flexible repayment schedules, additional credit lines, or lower interest rates. Over time, however, concerns arose that beneficiaries of these schemes were insolvent rather than illiquid. In 2015 and 2016, a policy intervention known as the Asset Quality Review (AQR) nudged banks to recognize restructured borrowers as non-performing (Chopra, Subramanian and Tantri, 2020), but the new guidelines eliminated these schemes and required banks to downgrade borrowers to non-performing. It further required that if restructured borrowers had exposures in excess of INR 1 billion, they could be upgraded from the non-performing category only if two credit rating agencies certified them as investment grade. We use this INR 1 billion threshold in later tests to causally estimate the effects of Feb. 12th. Additionally, if borrowers covered under any restructuring scheme exhibited any fresh default within one year, lenders were directed to trigger insolvency proceedings against them under the IBC.

Finally, the Feb. 12th circular required lenders to initiate bankruptcy proceedings for borrowers exceeding a pre-determined threshold, if the bilateral resolution plan was not implemented within 180 days of the date of first default. The threshold was limited to bank-firm exposures exceeding INR 20 billion and applied with immediate effect. The RBI also declared its intent to implement similar regulations for borrowers with exposure sizes between INR 1 and 20 billion.

Taken together, we expect Feb. 12th to affect banks' incentives to recognize zombie borrowers as non-performing. Prompt reporting of borrower stress coupled with more stringent supervision potentially made it harder for lenders to 'hide' zombies. The elimination of the specialized forbearance schemes would affect lenders using such schemes to keep zombies afloat. Empirically, we find that almost half of the borrowers

who were restructured at some point during their relationship histories can also be classified as zombies as per our preferred classification (discussed in Section 2). Making the bankruptcy referral process rule-based as a function of borrower size and duration of default from the first missed repayment potentially made it harder for lenders to delay the recognition of zombies, *lacking* the ability to pay, as non-performing.

We should briefly comment on the final fate of the Feb. 12th circular. Borrowers challenged the legality of the provisions and on April 2nd, 2019, five quarters after it was promulgated, the Supreme Court of India struck down the Feb. 12th circular on the grounds that the RBI overstepped its authority by directing banks to initiate bankruptcy proceedings against borrowers exceeding a size threshold.[13] After the judgement, the RBI issued a revised circular on June 7, 2019 that called for banks to report defaults within 30 days and ceded to banks the discretionary power to initiate bankruptcy proceedings against delinquent borrowers, irrespective of their exposure size. At the time of writing, these revised guidelines are in effect. Our sample period thereby ends in March 2019.

2 Data and Summary Statistics

2.1 Data Sources

Our primary data source is a proprietary bank-borrower matched dataset containing detailed information about borrower repayment history. Additionally, we also use a database of firm financial information to study the impact on firm outcomes.

CRILC: Detailed data on bank-borrower lending relationships comes from the Central Repository of Information on Large Credits (CRILC), a proprietary database maintained by the RBI. Beginning in June 2014, all commercial banks in India were required to provide quarterly updates for any borrower whose aggregate outstanding debt exceeded INR 50 million.[14] To the best of our knowledge, ours is the first study to use the CRILC data for academic research.

Every quarter, for borrowers above the reporting threshold, banks report the total exposure of the borrower and its asset quality at the end of the quarter. Information is

[13]The central bank's regulatory authority stems from Section 35A of the Banking Regulation Act of 1949, which does not allow the central bank to pass regulations against individual borrowers. While the Parliament temporarily granted the central bank this authority in 2017, it only allowed the RBI to refer individual borrowers, and not frame rules against a whole set of borrowers based on a pre-determined size threshold.

[14]CRILC does not have information on individual loans but has information aggregated across loans of large borrowers. Reporting frequency became monthly in 2018, but we aggregate all observations to the quarterly level by assigning borrowers to the worst asset quality reported during the quarter.

also provided on the borrower's credit rating[15], as well as the borrower's industry. A unique borrower ID allows us to track borrowers across banks and time. CRILC includes over 100,000 bank-borrower observations per quarter for the 20 quarters between June 2014 and March 2019. The number of unique borrowers over this period exceeds 100,000.

Asset quality is classified into two main categories: (1) Standard, if a borrower is currently in good standing and has not missed any scheduled payments; and (2) non-performing (NPA), if a borrower has not made any payments towards interest or principal for over 90 days. Between standard and NPA, there are three sub-categories of delinquency, or "special mention account" (SMA) status: (1) SMA0 if the payment is 0 to 30 days overdue, (2) SMA1 if the payment is 30 to 60 days overdue, and (3) SMA2 if the payment is 60 to 90 days overdue. A borrower is classified as NPA if even a single loan in the portfolio is more than 90 days overdue . The NPA designation extends to the entire credit exposure the bank has towards that borrower.[16]

CMIE Prowess: For a subset of borrowers in the CRILC database, banks also report the corporate identification number (CIN), issued by the Ministry of Corporate Affairs. We use the CIN to match these borrowers to the Prowess database, maintained by the Centre for Monitoring Indian Economy (CMIE). Prowess includes both publicly traded and unlisted firms, and has been used in several prior studies of Indian corporations (Bertrand, Mehta and Mullainathan, 2002; Lilienfeld-Toal, Mookherjee and Visaria, 2012; Vig, 2013). It provides annual data sourced from firm financial statements as well as daily data on stock prices. Matching firms in CRILC to Prowess allows us to identify the impact of the IBC and Feb. 12^{th} on firm outcomes. A total of 30,101 unique firms are covered by Prowess over the period of our study, with about 25,000 firms covered every year. Of these, we can match over 12,000 firms to the firms in the CRILC database. While this reflects only a third of the borrowers within CRILC, they account for over 70% of CRILC exposures, consistent with Prowess over-sampling large borrowers. While Prowess contains information on all listed firms, it covers only a subset of unlisted firms.

2.2 Classification of Zombies

A zombie is a firm that would not be able to sustain its debt burden, or even its operational existence, were it not for favored treatment by at least one bank. There are, therefore, two fundamental characteristics of a zombie: financial distress and the receipt of misallocated

[15]While credit ratings are assigned to each loan undertaken by the borrower, banks aggregate this and report the worst rating for each borrower across all loans undertaken.

[16]However, if a borrower is an NPA of a certain bank, other banks transacting with the borrower are not obligated to declare it an NPA.

credit. While either characteristic might be a symptom of a deeper economic problem, neither on its own would give rise to the same inefficiencies described by Caballero, Hoshi and Kashyap (2008).

While there are a number of frequently-used proxies for financial distress, the identification of misallocated credit is more challenging. In order to establish this misallocation, one must have a sense of the counterfactual efficient allocation of credit. In addition, credit misallocation can be measured in terms of both quantities and prices. Because we are unable to observe prices, or borrowing rates, we measure misallocation based on quantities as measured by total credit exposures.

We classify a firm as a zombie if it registered positive growth in real credit exposures with a bank despite having been reported as SMA2 (or 60 to 90 days delinquent) by any bank in the previous quarter (this information was accessible to all banks within the CRILC system). Crucially, we define zombies at the *borrower-bank relationship* level rather than the firm level. That is, a borrower can be a zombie with one bank and a non-zombie with another. Thirty percent of the zombies we identify that have multiple banking relationships are considered non-zombies by at least one other borrower. It is important for our analysis to define zombies in this way as a borrower can choose to remain current in its payments with one bank while receiving subsidized credit from another. In order to understand which of our two interventions are successful in eliminating incentives to roll over credit to delinquent borrowers, this method detects which banking relationships are problematic. In Sections 3.3 and 3.4, where we observe firm-level effects, we re-define a zombie as any borrower that has at least one zombie banking relationship.

We identify zombies using a window before our sample period. This window includes the eight quarters between June 2014 and March 2016. If a borrower-bank relationship appears as a zombie at least once during this window, it is considered a zombie during our sample period, which extends from June 2016 to March 2019. In order to minimize false positives, we exclude the following sets of borrowers from being categorized as zombies: a) borrowers ever rated AAA or AA during the classification window and b) borrowers who initiated a new banking relationship during the classification window. [17]

In summary, our zombie measure reflects lender credit extensions, conditional on borrower delinquency. Delinquency serves as a proxy for financial distress and our proxy for credit misallocation is an increase in credit conditional on recent delinquency.

[17] We do not classify a relationship as "new" if the initial exposure in the bank is below INR 100 million to prevent errors stemming from mere entry into the CRILC database rather than new relationships.

There are potential concerns with this measure. First, delinquency does not necessarily imply financial distress. Some firms may choose to be delinquent to effectively extend their days payable and conserve cash. The exclusion of creditworthy borrowers and borrowers that initiate new banking relationships partially mitigates this concern. An additional consideration is that there are circumstances under which a credit exposure increase following a period of delinquency might not signal misallocated credit, as we are unable to distinguish between the capitalization of unpaid interest and fresh lending. To address these issues, in Appendix A2, we show that our results are robust to alternative zombie definitions. The bottom panels of Figure A2 indicate that the share of borrowers reported as an NPA and the share of NPA exposures are relatively unchanged if we modify our measure by eliminating firms that are never investment grade in the classification window or firms that experienced less than 4% credit growth in the period it is identified as a zombie (to account for capitalization of interest).

Despite the above concerns, we believe that our zombie measure represents an improvement over other common zombie measures. One widely accepted method defines zombies as firms with interest coverage ratios less than one (Banerjee and Hofmann, 2018; McGowan, Andrews and Millot, 2017).[18] While this can be useful in identifying distress, it does not necessarily imply the existence of misallocated credit. Studies that attempt to identify zombies based on misallocated credit typically rely on subsidized borrowing rates (e.g., rates of interest that are lower than those charged to AAA-rated firms (Acharya et al., 2019)). There are several concerns with this methodology. First, interest rates for secured loans may depend more heavily on collateral than on the creditworthiness of the borrower.[19] Second, governments may incentivize development through subsidized credit, and this need not imply that firms receiving subsidized loans are zombies. Finally, misallocated credit does not need to show up in interest rates. A bank engaged in evergreening may capitalize interest payments or issue new loans so that funds can be used to cover loan payments while still charging nominally high interest rates.

2.3 Summary Statistics

Panel A of Table 1 presents the summary statistics for the CRILC sample at the account-quarter level, where an account is a borrower-bank pair. The summary statistics are limited to accounts in excess of INR 0.25 billion, (approximately USD 3.63 million as

[18] Appendix A2 shows that our results are robust to using a similar alternative zombie definitions based on interest coverage ratio.

[19] This is particularly salient in our case as the Feb. 12th applied to relatively large borrowers, who received collateralized credit.

of June, 2019) as borrowers under this threshold were governed by an alternate set of regulations. There are about 14,000 accounts per quarter, on average. Nearly 22% of all observations are classified as zombies. Only 55% of observations are in the standard (non-delinquent) category, 26% are classified as NPAs and the remaining are in the SMA category. The median account size across all observations is INR 0.71 billion, whereas the median account size for NPAs is INR 0.62 billion. Nearly 74% of all accounts are with PSBs. Around 34% of all observations are investment-grade, though over 40% of observations are unrated.

Summary statistics for the matched CRILC-Prowess sample are presented in Panel B of Table 1. Observations in Panel B are at the firm-year level. The median firm has total assets of INR 2.2 billion. The median debt ratio is 35.8%. Capital expenditure growth declined by an average of 5% per year across firms in the sample period, while compensation grew over 10% per year. The median Return on Assets (ROA) is 2%.

We compare the ex-ante characteristics of zombie and non-zombie accounts in Table 2. Statistics are drawn from a cross-section of data reported in March 2016, which is the last quarter of the zombie classification window. Columns (1)–(2) present the averages for non-zombies and zombies respectively, while column (3) shows the difference. For all CRILC variables, there is a significant difference between non-zombies and zombies. Non-zombies are larger in size and constitute a higher proportion of firms with exposures over INR 1 billion. Over 75% of non-zombies are reported as standard, whereas less than 30% of zombies are reported as standard. Conversely, about twice as many zombies are reported as NPA. Still, only 30% of zombies are NPAs at the start of our sample period. Zombies also have fewer banking relationships, are more likely to have a relationship with a PSB, and are less likely to receive investment-grade credit ratings.

In Figure 1, we plot the quarterly first-time NPA ratio for zombies relative to non-zombies. Panel A shows the fraction of borrowers newly-reported as NPA in a quarter, while panel B shows the fraction of total exposures newly-reported as NPA. Both panels reveal a dramatic increase in first-time NPA reporting of zombies in the quarter of the Feb. 12^{th} intervention, as well as the following quarter. The proportion of zombie borrowers newly-reported as NPA jumped from less than 5% in January of 2018 to over 10% in March of 2018, while for non-zombie borrowers it barely increased. The fraction of total exposures newly-reported as an NPA follows a similar trend, although some variation arises from outliers in terms of size.

Figure 2 shows the quarterly gross NPA ratio (GNPA), defined as the total non-performing assets to the total loans for each quarter, for zombie and non-zombie borrowers. Panel A presents data on firms with loan exposures of over INR 1 billion, to

whom Feb. 12th applied directly, while panel B presents data on smaller borrowers. While there is a general upward trend in non-zombie NPA reporting between 2016 and 2019, zombies experience a larger increase in disclosure as NPAs in this period. In addition, only zombies with exposures over INR 1 billion experienced a sharp increase around Feb. 12th. There was no corresponding increase in the NPA recognition for relatively large borrowers following the adoption of the IBC.

Collectively, our findings provide us with three insights. First, there was significant under-recognition of zombies in June 2016 – the beginning of our sample period. Second, the fraction of zombies reported as NPAs double over the time period coinciding with the two reforms, whereas non-zombies exhibit only a modest increase in NPA reporting. Third, there is a sharp increase in zombie recognition around Feb. 12th, particularly for large borrowers that are directly affected by it.

3 Results

We begin this section by identifying the impact of the IBC and Feb. 12th on recognition of zombie relationships as NPA. Next, we explore the mechanisms through which the reforms operated. We end by assessing their impact on credit and firm-level outcomes.

3.1 Zombie recognition

We use a standard difference-in-differences (DID) specification to estimate the effect of the IBC and Feb. 12th on the recognition of zombie borrowers as NPAs. Our specification is as follows:

$$Y_{ijbt} = \alpha_{ib} + \gamma_{jt} + \beta_1 Post_t \times Zombie_{ijb} + \eta \mathbf{X}_{ijbt} + \epsilon_{ijbt} \tag{1}$$

where Y denotes the asset quality of borrower i, operating in industry j and transacting with bank b in quarter-year t. We have two outcomes of interest: (i) a dummy equaling 1 if borrower i is recognized as an NPA by bank b in quarter-year t; and (ii) the log of NPA exposures.[20] For the IBC, *Post* is a dummy equaling 1 for the quarters ending in March, June, September, and December 2017. Similarly, for Feb. 12th, *Post* equals 1 for all quarters succeeding the December 2017 quarter. We estimate (1) conditioning on borrower-bank and two-digit industry-quarter fixed effects, in addition to bank- and borrower-specific covariates.[21] The identifying assumption for a causal interpretation of

[20] As NPA exposures for non-NPA borrowers is 0, we add 1 to all exposure values before logging the dependent variable.

[21] Bank-level covariates (measured in March 2015, the middle of the classification period) include i) a Herfindahl index measuring the bank's portfolio diversification across sectors; ii) fraction of exposures to restructured borrowers; and iii) fraction of exposures to borrowers recognized as SMA and NPA. Borrower-level covariates include i) borrower's initial exposure in the bank, binned across six categories; ii) total

β_1 is that, conditional on the fixed effects and the covariate vector, NPA recognition of zombie and non-zombie borrowers would have evolved identically in the absence of the respective treatments. As the treatment varies at the borrower-bank level, we cluster our standard errors at this level.

Bank-borrower fixed effects in (1) control for the characteristics of the relationship that are time-invariant. For instance, if the bank has time-invariant private information regarding the borrower's repayment ability, and this in turn affects the bank's recognition of the borrower as an NPA, this would be captured by α. Time-invariant borrower-specific characteristics and bank-specific characteristics are also captured in α.[22] The industry-quarter fixed effects (γ) control for time-varying industry shocks affecting NPA recognition. The inclusion of these fixed effects limits our comparison to borrowers within the same industry in a quarter.

3.1.1 Baseline DID Results

Panel A of Table 3 presents our baseline results from estimating (1). The sample is restricted to the 12 quarters between June 2016 and March 2019, and to bank-borrower exposures greater than INR 0.25 billion (our baseline sample). In column (1) we restrict the sample to the quarters surrounding the passage of the IBC before Feb. 12th, i.e., June 2016 to December 2017. The outcome of interest is a dummy variable equaling 1 if the borrower is an NPA and we use a linear probability model to estimate the specification. The coefficient suggests that after the passage of the IBC, there is a 2 pp increase in the likelihood that a zombie borrower is recognized as an NPA relative to a non-zombie borrower. Column (2) provides the results for the impact of Feb. 12th. Here, we use the entire sample period of June 2016 to March 2019. Zombies had an 8 pp higher likelihood of being recognized as NPA after this regulatory intervention. Column (3) jointly estimates the impact of the two policies. The reference period in all specifications is the last three quarters of 2016, the period preceding both treatments. The estimated coefficients suggest that the impact of Feb. 12th was more than four times larger than that of the IBC.

The impact of Feb. 12th is particularly salient given the extent of zombie

number of banks the borrower transacts with in the quarter; iii) dummies for the borrower's initial external credit rating; iv) dummies for borrower ownership; v) dummies for whether the loan originates from a consortium or multiple lending facility; vi) the number of bank-level SMA0/1 reportings between June 2014 and March 2016; vii) the number of system-wide SMA2 reportings between June 2014 and March 2016; and viii) a dummy indicating whether the borrower was recognized as an NPA in the past year. The time-invariant bank and borrower-level covariates are interacted with post-IBC and post-Feb12 dummies.

[22]Thus, if select banks are more diligent in pursuing non-repaying borrowers, or more prompt in recognizing non-performing borrowers, α would flexibly control for these.

under-reporting at the beginning of our sample period. In March 2016, only 29.8% of zombies were reported as NPA. Relative to this benchmark, the estimated coefficient corresponding to Feb. 12th in column (3) of Table 3 panel A reflects a 32% increase in the likelihood of the recognition of zombie borrowers as NPA.

In columns (4) through (6), we re-estimate the specifications in columns (1) through (3) with logged NPA exposures as the dependent variable, and obtain qualitatively similar results. When the effect of the IBC and Feb. 12th interventions are jointly estimated in column (6), the impact of Feb. 12th exceeds that of the IBC by a factor of six.

We next perform an identical exercise in Panel B as in Panel A but without covariates. The magnitude of the coefficients in panel B reflecting the impact of the IBC on NPA recognition is more than double while the coefficients on Feb. 12th increase by approximately 80%. Some of the covariates, such as the borrower's initial credit rating interacted with dummy variables capturing the post-treatment time periods, may absorb variation arising from our independent variables of interest. Nonetheless, we err on the side of conservative estimation and proceed with the inclusion of controls in subsequent analysis.

3.1.2 Dynamic Treatment Effects

Next, we explore the parallel trends assumption, the identifying assumption for our DID estimation. The identification assumption for a causal interpretation of the DID estimate is that the treatment and control groups (zombies and non-zombies in our case) have similar outcomes prior to the treatments. To validate this, we estimate the average quarterly treatment effects of the two treatments using a distributed lag framework:

$$Y_{ijbt} = \alpha_{ib} + \gamma_{jt} + \sum_{q=-3}^{8} \beta_q Zombie_{ijb} \times D_{Dec16+q} + \eta \mathbf{X}_{ijbt} + \epsilon_{ijbt}. \tag{2}$$

In (2), the zombie measure is interacted with a dummy variable for every quarter, with December 2016 as the reference period, which was the quarter prior to the introduction of the IBC.

The coefficients from estimating (2) are plotted in Figure 3. The outcome variable of interest in Panel A is a dummy variable equaling 1 if the borrower is reported as an NPA in that quarter while the outcome variable of interest in Panel B is logged NPA exposures. The plot indicates that the parallel trend assumptions may not hold. Consistent with Table 3, the IBC had a muted impact on NPA recognition in three out of four quarters with the corresponding coefficients not statistically distinguishable from 0. In later analysis,

however, we show that the parallel trends assumption prior to the IBC not only held but was quite robust for larger borrowers. While there is also a trend leading up to Feb. 12th, as one would expect since these quarters constituted the post-period for the IBC, there is a clear structural break between the last quarter of 2017 and the first quarter of 2018. Thus, if no other shock affecting the recognition of zombie borrowers occurred during the quarter ending in March 2018, the observed jump in NPA recognition for zombie borrowers can be attributed to Feb. 12th.

In Appendix A2, we show that our baseline results are robust to six alternative zombie classifications. All specifications indicate that there was a positive and significant relationship between both treatments and the recognition of zombie borrowers. In these tests, just as in our primary analysis, the impact of Feb. 12th is consistently larger than that of the IBC.

3.1.3 Exploiting the Size Threshold in the February 12th Circular for Causal Identification

A plausible alternative explanation of our main results is that banks responded with a lag to the reforms enacted by the IBC. If banks took time to learn about the changes to the bankruptcy process, it is possible that the enhancement in NPA recognition we attribute to the Feb. 12th intervention is a delayed effect of the IBC. It is also possible that another shock that occurred in the same quarter as Feb. 12th is responsible for our results.

To rule out these alternative explanations, we exploit size cutoffs referenced by the Feb. 12th circular. As explained in Section 1.3, Feb. 12th required banks to refer borrowers to the IBC if the borrower was at least 180 days delinquent and its exposure to the bank exceeded INR 20 billion. It also intimated that similar guidelines would soon be issued for borrowers with exposures between INR 1 and 20 billion. It also required that borrowers with exposures over INR 1 billion covered by any existing regulatory forbearance scheme would need to be recognized as NPA, and these accounts could only be reported as Standard if two credit rating agencies certified their creditworthiness. Lender costs for engaging in fresh forbearance for these larger borrowers was significantly increased. This suggests that INR 1 billion is a natural threshold around which to test the differential impact of Feb. 12th using the following triple-difference specification:

$$Y_{ijbt} = \alpha_{ib} + \gamma_{jt} + \beta_1 Post_t \times Zombie_{ijb} + \beta_2 Post_t \times Zombie_{ijb} \times Large_{ijbt} + \epsilon_{ijbt}, \quad (3)$$

where *Large* is a dummy variable equaling 1 if the borrower's exposures with the bank

in a quarter exceeds INR 1 billion. β_1 estimates the impact of the treatment of interest on the recognition of relatively small zombie borrowers as NPA, while β_2 estimates the differential impact of the interventions on the recognition of larger zombie borrowers as NPA. As the IBC applied uniformly across borrower size, we would not expect any differential impact of the IBC by size. As Feb. 12th was targeted towards larger borrowers, we expect $\beta_2 > 0$ when *Post* refers to Feb. 12th.

Table 4 contains the results from estimating (3). The outcome variable in columns (1) – (3) is a dummy variable equaling 1 if the borrower is reported as an NPA while in columns (4) – (6) it is logged NPA exposures. In columns (3) and (6), we report results from a joint estimation of the differential effect of the two interventions across large borrowers and confirm our hypothesis that Feb. 12th had a stronger impact on larger borrowers. The triple interaction coefficient in both columns is positive and significant. No such effect is seen for IBC – the *Zombie* $\times$ *Large* $\times$ *Post* coefficient corresponding to IBC does not indicate any differential effect for large borrowers, while the *Zombie* $\times$ *Post* coefficient remains significantly smaller for the IBC compared to Feb. 12th.

These results alleviate concerns that increased zombie recognition after Feb. 12th was a delayed reaction to the IBC. If that had been the case, we would not have witnessed such a sharp increase in NPA reporting at the INR 1 billion threshold. The size cutoff serves another, albeit indirect, purpose: when we revisit the distributed lag specification for large borrowers only (Figure 4), the pre-trend prior to the IBC disappears. In fact, the NPA reporting for large zombie borrowers seems to decrease in the early part of the sample period.[23]

3.2 Mechanisms

We now examine the mechanisms underlying the muted effect of the IBC and the stronger subsequent effect of Feb. 12th on recognition of zombie borrowers as NPAs. To do so, we relate the two treatments to the causes of zombie lending itself. Prior literature hypothesizes that the causes of zombie lending include (i) *ineffective creditor rights* making bad loan resolution costly (Andrews and Petroulakis, 2019; Li and Ponticelli, 2019); (ii) *weakly capitalized banks* unwilling to provision for bad loans or risk-shifting (Peek and Rosengren, 2005; Bruche and Llobet, 2013); and (iii) *governance frictions at government-owned banks* encouraging them to continued lending to politically connected

[23]It is worth noting that the RBI since June 2015 was engaged in a concerted attempt to nudge lenders into recognizing delinquent borrowers. In this regard, there are three possible explanations as to why banks might have been more willing to recognize relatively smaller zombie borrowers as non-performing, even prior to the two reforms: a) capital provisioning requirements would be smaller for smaller borrowers; b) the resolution of smaller borrowers could be less complex, leading to a shorter resolution period; c) smaller borrowers would be less likely to enjoy political patronage.

firms (Qu, 2018) and/or allowing the government to postpone costly bank recapitalization by avoiding loan loss recognition (Acharya, 2020). Of these, (i) is related to the prevailing legal system while (ii) and (iii) relate more closely to incentives facing lending institutions.

The IBC strengthened creditor rights in bankruptcy targeting (i), but, as we show, was relatively ineffective in unearthing zombies. While weak legal enforcement of the IBC may explain some of our results, our empirical setting allows us to abstract from the bankruptcy process itself to focus on lender incentives to not initiate resolution of zombie accounts. The Feb. 12th circular did not alter the IBC in any way. Thus, any effects of Feb. 12th on zombie recognition as NPA is independent of the legal improvement in creditor rights. Feb. 12th's greater effectiveness in unearthing zombies points to the other causes of zombie lending, bank capital and ownership, as channels moderating the effects of the IBC. To test if this is the case, we examine the differential effect of bank capital and government-ownership of banks. Since these mechanisms do not operate independently,[24] we also test their interaction.

3.2.1 Role of Bank Capitalization

The first mechanism we test for is the role of bank capital. Weakly capitalized banks have an incentive to engage in zombie lending as it allows them to postpone provisioning for these loans on their balance sheets (Acharya et al., 2019; Peek and Rosengren, 2005). If banks are unwilling to take advantage of the IBC due to low levels of capital, we would expect the bankruptcy reform to have a weaker effect on more under-capitalized banks. A closely related channel through which zombie lending can arise at weakly capitalized banks is through risk-shifting due to banks' limited liability. That is, the bank gambles for resurrection due to the option-like payoff of its claim. However, nearly all loans in the sample are secured and zombies are typically older firms concentrated in manufacturing industries, implying that the risk-shifting motive may be a secondary incentive for banks to lend to zombies. Nonetheless, it is admittedly difficult to disentangle these two channels since both rely on measures of bank health. Instead, we examine the heterogeneity across bank capitalization and remain agnostic as to whether the effects are due to loan provisioning requirements or banks' risk-shifting motives and interpret our results as the combined effect of frictions due to bank undercapitalization.

We measure bank capitalization based on banks' average Tier-I capital-to-assets ratio

[24] In India, during our sample period, government-owned banks were more likely to be poorly capitalized

over the twelve quarters between June 2012 and March 2015. Based on this ratio, we split banks into terciles and test for the differential effects on zombie recognition using the specification:

$$Y_{ijbt} = \alpha_{ib} + \gamma_{jt} + \beta_1 Post_t \times Zombie_{ib} + \sum_{k=2}^{3} \beta_k Post_t \times Zombie_{ib} \times Capital_b^k + \epsilon_{ijbt}. \quad (4)$$

In (4), the base category constitutes the most undercapitalized banks whose ex-ante Tier-I capital-to-assets ratio falls in the bottom tercile. β_1 estimates the impact of each intervention on zombie recognition in the most undercapitalized banks. Each β_k ($k \in \{2,3\}$) estimates the differential impact of the IBC and Feb. 12^{the} on NPA recognition of zombies in banks falling in the kth tercile of bank capital.

The outcome of interest in the regression results reported in columns (1) – (3) of Table 5 is a dummy variable equaling 1 if the borrower is an NPA and in columns (4) – (6) it is logged NPA exposures. Focusing on column (3), which provides estimates for the differential impact of the two interventions across varying levels of bank capital, we find that the IBC had a null effect on NPA recognition in the most undercapitalized banks. The triple interaction coefficients are positive and statistically significant for banks in the top two terciles of bank capital, implying that healthier banks take advantage of the improvement in creditor rights and recognize zombies as non-performing. Thus, for banks in the top tercile of Tier-I capital, the IBC caused a 6 pp increase in the likelihood of zombies being recognized as NPA. This is consistent with the hypothesis that the absence of an effective creditor rights mechanism was precluding some banks from terminating zombie relationships.

In contrast, the Feb. 12^{th} intervention pushed even the most undercapitalized banks to recognize zombie borrowers as NPA. The β_1 coefficient in column (3) is positive and significant, suggesting an 8 pp increase in the likelihood of zombie borrowers being recognized as NPA in the most undercapitalized banks. Importantly, Feb. 12^{th} also has a larger impact on relatively well-capitalized banks, indicating that the absence of creditor rights alone was not the sole factor contributing to the perpetuation of zombie lending. Thus, NPA recognition of zombies remains relatively *lower* in undercapitalized banks even after Feb. 12^{th}. For banks in the third tercile of Tier-I capital-to-assets ratio, the coefficients imply a 18 pp increase in the recognition of zombies as NPA. We are unable to reject that the impact of Feb. 12^{th} on zombie recognition is equal across banks in the bottom two terciles of tier-I capital. The results in column (6), where the outcome is measured as logged NPA exposures, are very similar to those in column (3).

In Table 5, we confirm that undercapitalized banks are less likely to recognize

zombies as NPAs after the IBC, consistent with previous findings that undercapitalized banks have a perverse incentive to engage in zombie lending. Our results confirm that improvements in the bankruptcy framework alone are not sufficient to nudge undercapitalized lenders to recognize losses stemming from insolvent borrowers. However, Feb. 12th through the advanced reporting of borrower defaults, restrictions on lenders' ability to engage in regulatory forbearance, and the elimination of lender discretion in initiating bankruptcy proceedings against borrowers in default is successful in pushing even the most undercapitalized banks to recognize zombies as NPAs. It is worth noting, however, that the impact of Feb. 12th intervention on zombie recognition remains significantly lower in undercapitalized banks (bottom two terciles), suggesting that factors apart from bank undercapitalization continue to dampen zombie recognition.

3.2.2 Role of Government Ownership of Banks

Next, we examine the role of government ownership of banks. The Indian banking system is dominated by government-owned banks ("PSBs"), which potentially face different incentives when it comes to allowing the "evergreening" of loans. We test whether bank ownership also explains the muted effect of the IBC compared to the Feb. 12th intervention by estimating (3) separately for government-owned and privately owned banks. The results are presented in Table 6. The outcome of interest in the regression results in column (1) and column (2) is a dummy equaling 1 if the borrower is an NPA, while the outcome in columns (3) and (4) is logged NPA exposures. In column (1), the results for the PSB subsample indicate that the IBC led to a modest 1.7 pp increase in NPA recognition. The impact of Feb. 12th among PSBs is five times that of the IBC. Column (2) shows that private banks have a much stronger reaction to both the IBC and Feb. 12th compared to PSBs. Even among this sub-sample, the effects of Feb. 12th dominate those of the IBC.

What explains the muted zombie recognition at PSBs? We explore two alternate political economy channels. The first is political pressure to lend to politically connected firms (Qu, 2018; Dinc, 2005; Khwaja and Mian, 2005; Faccio, Masulis and McConnell, 2006). A second potential channel is the fiscal dominance channel postulated in Acharya (2020). The government, the majority owner of PSBs, might also prefer postponing zombie recognition, especially when financially constrained. If PSBs were to recognize zombie borrowers as NPAs, they would need to provision for loan losses, depleting bank capital. The government might then need to recapitalize PSBs. A fiscally constrained government in this situation faces incentives to postpone zombie recognition.

To test whether continued lending to politically connected firms explains our results, we examine the differential impact on zombie recognition at firms in industries with higher corruption/rent-seeking (mining, power, telecommunications, steel, and metals).[25] If political connections explain muted zombie recognition at PSBs, we should expect a smaller effect of Feb. 12th on zombie recognition in high rent-seeking industries. In fact, we find the opposite in the data. Column(2) of Table 7 shows that PSBs were 3.8 pp more likely to recognize zombies in high rent-seeking industries compared other industries following Feb. 12th. Post-IBC as well, we cannot reject that zombie recognition by PSBs was the same in rent-seeking and other industries. Together, the results in Table 7 suggest that the muted zombie recognition at PSBs cannot be wholly explained by continued lending to politically connected firms.

We hence turn to the second political economy channel. While the political economy frictions arising from the government's fiscal constraints cannot be easily empirically tested, anecdotal evidence seems to support its relevance. Patel (2020) contends that while the government was initially on board with the guidelines stipulated in the February 12th circular, it slowly backtracked and lobbied for special privileges for specific sectors as the costs to the government became clearer.

3.2.3 Disentangling the Role of Capital and Ownership

While we explore the undercapitalization and political economy mechanisms in Tables 5 and 6, respectively, neither is dispositive with respect to the true mechanism because there is a significant correlation between capitalization and bank ownership. In particular, in our sample, PSBs are more likely to be undercapitalized compared to privately owned banks. In Table 8, we disentangle this correlation by estimating (4) separately for PSBs and private banks. The outcome of interest in the odd-numbered columns is a dummy equaling 1 if the borrower is a NPA; in the even-numbered column it is logged NPA exposures. In columns (1) and (2), we restrict the sample to borrowers in PSBs and in columns (3) and (4), we restrict the sample to those in private banks. The β_3 coefficients in columns (1) and (2) cannot be estimated because there are no PSBs in the top tercile of the overall bank capital distribution.

The results in Table 8 are striking. PSBs had a relatively minor response to the IBC, and this is only exhibited by those that are better-capitalized. The response by PSBs to Feb. 12th was much larger, with an 8.5 pp increase in zombie recognition, and there is no

[25] We consider these sectors as prone to rent-seeking based on the findings of Fisman, Schulz and Vig (2014) and Asher and Novosad (2020) who show that the mining and minerals industries in India are particularly associated with corruption and rent-seeking.

differential effect across levels of capitalization. For privately owned banks, we find that those in the lowest tercile of capitalization did not react significantly to the IBC, as with PSBs. However, well-capitalized banks react strongly, with banks in the highest tercile increasing zombie recognition by 11 pp. After Feb. 12th, private banks in the lowest tercile experience a large 44 pp increase in zombie recognition. While private banks in the second and third terciles of capitalization did not exhibit nearly as strong a response, they also increased their zombie NPA reporting by 18 and 14 pp, respectively.[26] Well-capitalized private banks might have had a weaker response to Feb. 12th since they reacted much more strongly to the IBC. Additionally, they started from a lower base since they had fewer zombie borrowers to begin with.

Despite the higher prevalence of zombies among PSBs in the pre-treatment period,[27] the reaction to both policy changes was stronger in private banks. Even private banks in the highest tercile of capitalization increased zombie disclosure after Feb. 12th. A considerable fraction of zombie accounts remain undisclosed, and are now even more concentrated among PSBs than in 2015. Overall, the muted effects at PSBs point to the importance of political economy factors. The influence of political ties, stronger at PSBs, outweighed the strong supervisory intervention effected by Feb. 12th. If weak capitalization was the key friction hindering use of the IBC to eliminate zombie lending, we would have expected no difference in the impact of Feb. 12th across PSBs and private banks. The limited effects on PSBs of a stringent action such as Feb. 12th underscores the RBI's lack of authority over governance at PSBs as being a key friction contributing to the perpetuation of zombie borrowers in the banking system.

We conclude with a brief discussion of the efficacy of the IBC. It can be argued that the relatively smaller impact of the IBC was due to uncertainty about the law's efficacy when it came to efficient recovery. Though existing recovery rates were low and the IBC promised a time-bound process, banks might have been reluctant to initiate proceedings without seeing the IBC being a success in practice. This would imply that, de facto, the IBC did not improve creditor rights. Our results on well-capitalized private banks inveigh against this interpretation. Once we remove the two main frictions we test, bank undercapitalization and government ownership, the effect of the IBC is much stronger. In columns (3) and (4) of Table 8, the post-IBC effect for well-capitalized private banks is comparable to the unconditional effect of Feb. 12th. These results further indicate that

[26] While Table 8 does not indicate whether the absolute response of private banks in the top two terciles of capitalization to Feb. 12th was significant, we confirm that it is significant at the 5% level.

[27] For instance, PSBs in the bottom tercile of Tier-I capital had 18% of their total credit allocated to zombie borrowers in March 2015. In contrast, private banks in the top tercile of Tier-I capital had only 10% of their total credit allocated to zombie borrowers.

inadequate bank capitalization and government ownership are the two main channels through which Feb. 12th improved zombie recognition.

3.3 Credit Reallocation

The analysis so far has focused on lenders recognizing zombies as NPA. We now turn to the knock-on effects on credit allocation to zombie borrowers relative to healthier (non-zombie) borrowers. We also disentangle the various channels through which credit is reallocated to healthier borrowers. We hypothesize that there are three main channels. The first is a "bank lending" channel, wherein once a bank decides to no longer sustain a zombie firm, lending may be redirected to healthier borrowers instead. Second, the improvement in expected future recovery rates on distressed loans due to the IBC may have led to an outward expansion of credit supply ("creditor rights" channel). A third potential channel involves healthy firms increasing their demand for credit as resources (such as labor and capital) previously tied up in zombie firms is now freed up for healthier firms. The first two channels deal with changes in credit supply while the third is related to changes in credit demand.[28]

To explore the reallocation of credit to non-zombie firms, we turn to a firm-level analysis. While we continue to rely on the CRILC data, this sample differs from the previous sections in two crucial aspects. First, we relax the INR 0.25 billion constraint and include all borrowers in CRILC. Second, we aggregate the data up to the level of the firm. We consider a firm to be a zombie if any of its banking relationships are categorized as a zombie relationship.[29] We estimate the following specification to identify the impact of the IBC and Feb. 12th on firm-level outcomes:

$$Y_{ijt} = \alpha_i + \gamma_{jt} + \beta_1 IBC_t \times Char_{ijt} + \beta_2 Feb12_t \times Char_{ijt} + \phi \mathbf{X}_{ijt} + \epsilon_{ijt} \tag{5}$$

The outcomes of interests are logged total credit exposures and the number of banking relationships. The former captures the intensive margin of credit allocation while the latter measures the extensive margin. We include firm and two-digit industry-time fixed effects, in addition to firm-specific time varying covariates.[30] Standard errors are

[28] While a decline in zombie lending frees up zombie credit for reallocation to other borrowers, this reallocation has to happen net of any provisioning required to undertaken by lenders in view of anticipated losses arising from recognizing zombies as non-performing.

[29] As our zombie classification is a function of whether a borrower is classified as SMA2 in a bank, and other lenders in the CRILC system received fortnightly system-wide updates on whether a borrower was reported as SMA2 by any lender in the system, lenders are expected to be cognisant of any borrower who are over 60 days overdue, even if the borrower is transacting with another lender.

[30] The covariates included are as follows: a) dummies for borrower ownership categories; b) whether the borrower is engaged in a multiple or consortium banking relationship; c) dummies for initial borrower

clustered by firm. *Char*, defined below, is the firm-level or industry-level characteristic of interest.

We first focus on credit reallocation between zombie and non-zombie borrowers. In column (1) of Table 9, the outcome variable of interest is firm-level aggregate credit exposures across all bank relationships in the expanded CRILC sample. The results in this column indicate that, while aggregate credit exposures to zombie firms decrease significantly after both interventions, the effect was more than twice as strong after Feb. 12^{th}. To explore whether the reallocation effects are due to banks freeing up capital previously allocated to zombie borrowers, we examine the heterogeneity across banks with differing exposures to zombie borrowers prior to the IBC. In columns (2) and (3), the outcome variables are firm-level aggregate credit exposures across banks with an above and below-median proportion of zombie credit in March 2016, respectively. The sum of the point estimates in columns (2) and (3) approximate but are not identical to the point estimate in column (1) due to the logarithmic function. These columns show that these reductions come primarily from banks with above-median zombie exposures and that the largest reduction in credit comes from high-zombie-share banks after Feb. 12^{th}.

A similar pattern holds when we observe bank relationships as the outcome. Columns (4)–(6) provides the results of the regression using the number of bank relationships maintained by each firm as the dependent variable. Because they are not logged, the point estimates in columns (5) and (6) do sum to the point estimate in column (4), with a rounding error. We see that, relative to healthy firms, the number of banking relationships that zombie firms have decreases after both treatments, although the effect is stronger following Feb. 12^{th}. The strongest decrease is again among high-zombie-share banks. Stronger effects on credit reallocation among banks with a higher pre-existing share of zombies points to the bank lending channel being relevant for credit reallocation.

Next, we test the role of credit demand. Caballero, Hoshi and Kashyap (2008) show that healthy firms in zombie-congested industries see a decline in employment and investment in Japan in the 1990s. Analogously, reduction in zombie borrowers should result in a freeing up of resources such as labor and capital for healthier firms, which then increase their credit demand. Thus, this effect should dominate in zombie-congested industries. Table 10 shows the effects of each treatment on credit to non-zombie firms within industries most affected by zombie decongestion. We use the

ratings in the first quarter in which the borrower is observed in the bank; d) dummies for whether borrower is rated as a NPA, SMA0, SMA1 or SMA2 in the past four quarters; e) whether the borrower was ever restructured. All the covariates are interacted with post-intervention dummies.

specification in (5) with *High Zombie Industry* as the firm characteristic, which is a dummy variable equaling 1 if the two-digit industry in which the firm operates has above-median exposure to zombie borrowers in March 2015. We exclude zombie and NPA firms from this sample in order to focus on credit reallocation to healthy firms. Similar to Table 9, in Table 10 we present total aggregated outcomes, along with outcomes aggregated by banks with above-median zombie shares, and banks with below-median zombie shares. Contrary to the credit demand hypothesis, the findings reveal that credit reallocation is directed toward industries with lower concentrations of zombies. There does not appear to be a significant difference in exposures between high-zombie-share banks and low-zombie-share banks. This result may be due to credit constraints. In a financially unconstrained system, zombies should only have an adverse impact on firms within that product market. In a financially constrained system, zombies tie up capital and resources that could have been deployed to firms in other sectors as well. Our results are consistent with a system in which the forces driving "evergreening" are harmful because they not only distort the market in which they operate but they also tie up scarce capital economy-wide.[31]

Together, the results so far indicate that the IBC and particularly the Feb. 12th circular led lenders to recognize zombie borrowers as NPAs. As a result, credit is reallocated to healthier (non-zombie) firms. An important contribution of this paper is establishing a new channel through which credit is reallocated to healthier firms. Previous literature documents credit reallocation occurring when lender recovery from liquidation increases, freeing up bank capital sunk in distressed firms that is then reallocated to healthier firms (Bian, 2018; Li and Ponticelli, 2019). In these papers, reallocation can also occur through a demand-side industry channel wherein labor and capital allocated to distressed firms are redeployed to healthier firms post liquidation, increasing firms' credit demand. In contrast, our paper highlights the reallocation that occurs because funds previously earmarked for zombie borrowers are redirected to healthier firms. Importantly, our empirical setting allows us to disentangle the two effects. Simply looking at an improvement in creditor rights, such as post-IBC or post a collateral reform [as in Kulkarni (2020)] would reflect the combined effect of the above two reallocation channels. In contrast, Feb. 12th targets lender incentives to not recognize zombie loans as NPA and allows us to distinguish effects of the pull-back in zombie credit from improved proceeds post-liquidation. This also explains why we see an *immediate* effect

[31] A possible alternate explanation is that zombie borrowers were concentrated in riskier sectors or in sunset industries that were already on the decline, and lenders took advantage to reduce lending to these sectors.

of the two treatments. The alternate creditor rights channel of credit reallocation from recovery proceeds of bankruptcy necessarily involves a delayed timeline as borrowers take time to go through the debt resolution process.

We briefly explore the increase in credit to healthy firms. Do banks reallocate credit to new entrants setting "creative destruction" into motion? Or does credit go to larger, established firms? The answer to these questions has relevance for the economy-wide effects of the reforms. To carry out this analysis, we limit the sample to non-zombie and non-NPA firms and analyze the heterogeneity of credit reallocation to non-zombie firms using the specification in (5).

Table 11 provides the results of the interaction of each treatment with four borrower characteristics: (i) investment grade status, (ii) size, (iii) age, and (iv) listing status. Investment grade (IG) is a dummy equaling 1 in a quarter if the firm has an investment grade rating across all banks it transacts with; $Large_{Firm}$ is a dummy equaling 1 if the firm's exposures exceed those of the median borrower in the quarter; *Young* is a dummy equaling 1 if the borrower's year of incorporation is 2014 or later; and *Listed* is a dummy equaling 1 if the firm is publicly listed. Columns (1)-(4) and columns (5)-(8) provide the regression results of the impact of each treatment on log exposures and the number of bank relationships, respectively. Of the four firm characteristics we examine, young firms benefited the most from the two interventions, experiencing a 19 and 37 pp increase in log exposures, respectively. The number of new bank relationships also increased by over 0.1 after both treatments. Since the CRILC database only includes firms with aggregate lending within a bank exceeding INR 50 million, we are unable to observe lending to many firms during the year of incorporation, which would be a more direct test of the creative destruction hypothesis - nonetheless, the magnitude of this result is striking. Investment-grade and large firms also experienced an increase in exposures and new banking relationships, particularly following Feb. 12th, although the impact on exposures is smaller at about 2-3 pp. Listed firms experienced a decrease in exposures after Feb. 12th, with no significant effect on bank relationships following either intervention, although this may be due in part to the correlation between firm age and listing status.

3.4 Real Effects

We finally examine how firm-level investment and profitability are affected by the IBC and Feb. 12th. If firms are credit constrained, and the treatments lead credit to flow to healthier, more productive uses, we expect an increase in investment, wages, and profitability for healthy firms. Alternatively, the reallocation of credit primarily to

investment-grade firms may be a case of the "rich getting richer,"[32] with little impact on productive investment at borrowing firms and only an increase in their financial slack.

We test these hypotheses in firm-level regressions using financial data from Prowess, which primarily consists of public firms, matched to lending data from CRILC. We are able to match 9,361 firms. We use a specification similar to (5), with several important differences. First, time t is measured annually rather than quarterly. In addition, we include separate firm and year fixed effects, but no longer include industry-year fixed effects because of the significantly reduced sample size. Finally, we control for size by including log assets.

Our outcomes of interest are capital expenditure growth, compensation growth, the cash ratio, and return on assets (ROA) as defined in Table A1. We continue to count a firm as a zombie if it has at least one zombie banking relationship. Since the financial year ends in the first calendar quarter for almost all firms in our sample, we consider 2017 and 2018 to be post-IBC periods and 2019 to be post-Feb. 12^{th}. The pre-period comprises 2015 and 2016, since CRILC is only available starting the second quarter of 2014.

The results in Table 12 show us the results of the interaction of each intervention with our zombie classification. Column (1) shows that the growth rate in capital expenditure reduces for zombies following both treatments, with a significant and much larger effect, 26%, following Feb. 12^{th}. This is consistent with our previous evidence showing that Feb. 12^{th} is more effective in curbing zombie lending than the IBC. Although capital expenditure growth is reduced by both treatments, there is no effect on compensation growth or the cash ratio of zombies compared to non-zombies.[33] There was a minor impact of the IBC on ROA, significant at the 5% level. These results suggest that, prior to the treatments, zombie firms were able to invest at a high rate despite being unprofitable. The treatments brought about a decline in this malinvestment.

Next, we test whether the credit reallocation to healthier borrowers has a heterogeneous impact on their investment and profitability by testing a variant of (5) on the sample of non-NPA, non-zombie borrowers. These results are presented in Table 13. Unfortunately, we are not able to observe heterogeneous impacts on young firms because there are very few firms incorporated in or after 2014 in the matched Prowess-CRILC sample.

[32]For example, Lilienfeld-Toal, Mookherjee and Visaria (2012), show that with inelastic supply, a strengthening of creditor rights can reduce credit supply for smaller borrowers but increase it for wealthier borrowers.

[33]The lack of an impact on compensation growth could possibly be due to the employee-friendly labor regulations in India which restrict the ability of large registered firms to alter worker contracts, even in the face of delinquency.

The results in Panel A show how the effects differ for investment grade firms from other firms. We saw in Table 11 that credit to investment-grade firms increases after both interventions. The results in Panel A of Table 13 indicate that this reallocation leads investment grade firms to increase their capital expenditure growth rates. Interestingly, the increase after the the IBC, 28%, is larger than the increase after Feb. 12th, 22%. Both treatments have a positive effect on the cash ratio suggesting that investment-grade firms do use the credit to improve their liquidity position. Similar to Table 12, there is no significant impact on compensation growth and only a minor negative impact on ROA.

In Panel B, the results show that larger firms experience similar outcomes as investment-grade firms. Both treatments lead to a significant and sizable increase in capital expenditure growth, 33% after IBC and 41% after Feb. 12th. There is also a significant increase in the cash ratios of large firms. The coefficient of 0.01 for Feb. 12th is comparable to the average cash ratio of 0.013. Neither affects compensation growth or ROA.

Panel C of Table 13 presents the results of the firm effects by listing status. Recall from Table 11 that listed firms experience a reduction in credit exposures post the IBC and Feb. 12th. The results show that capital expenditure growth increases by 22% after the IBC, perhaps consistent with over-optimism with regard to its effects, and 12% after Feb. 12th. Although there is no significant effect on the remaining three variables after the IBC, compensation growth increases by 3.5% after Feb. 12th.

Overall, the real effects of the credit reallocation from zombie to non-zombie borrowers are concentrated in increases in firm investment, with only muted effects on firm profitability. This may simply reflect that we only have limited post-Feb. 12th financial data and the effects on firm performance due to new investment might take a while to manifest. We also document significant cash hoarding by larger firms, possibly reflecting the slowdown of the Indian economy toward the end of our sample period.[34]

4 Conclusion

The COVID-19 pandemic is bringing about an array of policy responses worldwide that, under normal circumstances, would have had the potential to aggravate zombie lending. Not only India but Spain, Turkey, and Ukraine temporarily suspended insolvency proceedings.[35] Nearly all developed countries instituted some form of subsidized liquidity provision or government guarantee for businesses. These measures are justified given the much graver threat of fire sales and inefficient liquidations when

[34]See https://www.rbi.org.in/Scripts/AnnualReportPublications.aspx?Id=1256.
[35]See www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19.

lockdowns first went into effect. As the global economy recovers, however, policymakers may need to address a subsequent zombie problem.

Our paper addresses how to tackle zombie lending in the context of India, which, after a credit boom in the early 2000s, ended up with zombies constituting over one-fifth of bank lending relationships. Using novel supervisory data, we identify firms that are issued fresh credit despite being severely delinquent on loan payments. We document that lender incentives to not pursue these zombies can stymie bankruptcy reform. Following the introduction of a new bankruptcy law, the IBC, banks increased their reporting of zombies as NPAs by 2 pp. In 2018, after a regulatory intervention, the Feb. 12^{th} circular, zombie reporting increased by 9 pp. Well-capitalized privately-owned banks in our sample have the strongest reaction to the IBC while poorly capitalized banks have the strongest reaction to Feb. 12^{th}. Government-owned banks, however, react more weakly to both treatments suggesting that political economy frictions can hamper even the most stringent regulatory action. We also document the impact on credit supply and corporate activity. Following both treatments, banks cut back on lending to zombies and expanded lending to young and investment-grade firms. In response, non-zombies invested significantly more in capital expenditures. Though we do not attempt to quantify the welfare effects of our findings, the evidence points to there being potential aggregate gains from fixing lender incentives in the debt resolution process. Our study provides evidence on the positives and pitfalls facing efforts for reform.

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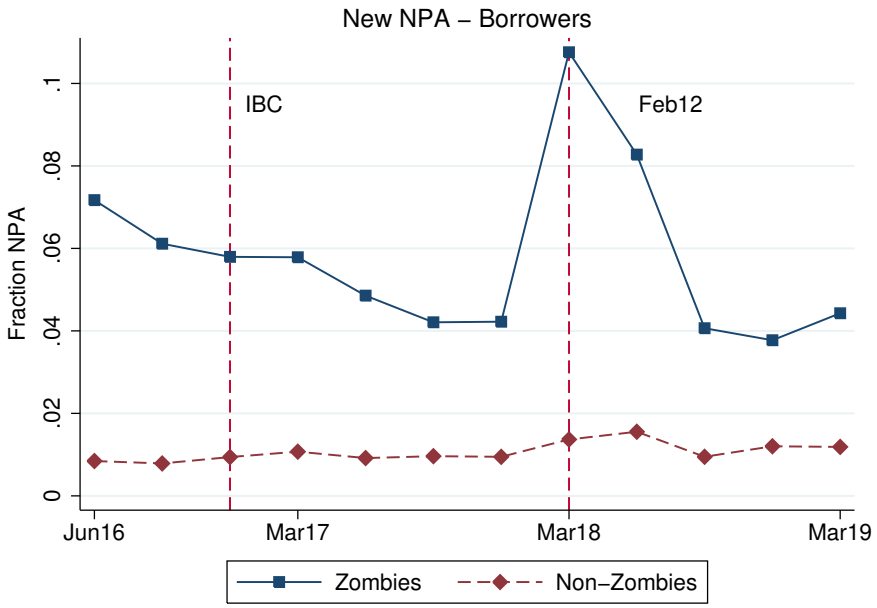
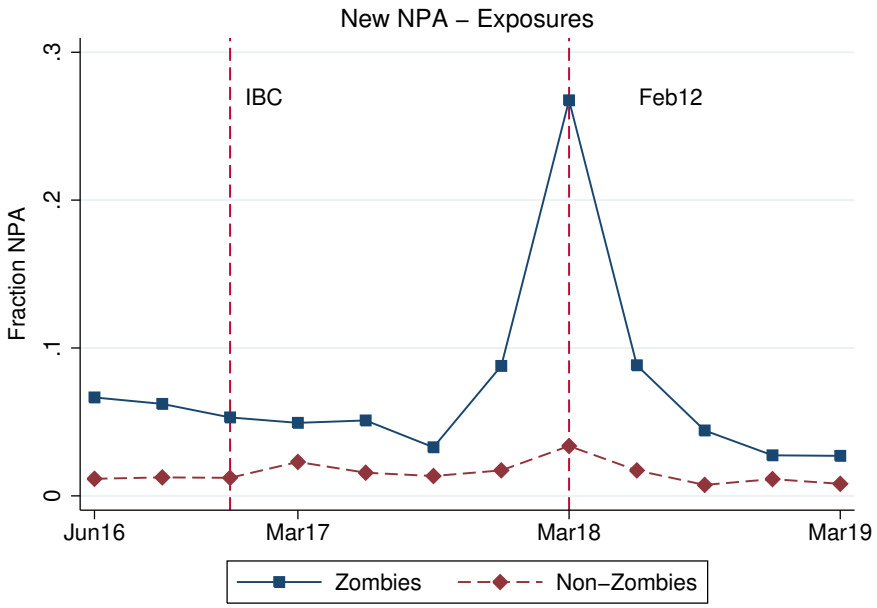
Figure 1
Fresh Non-Performing Asset Recognition for Zombies and Non-Zombie Borrowers



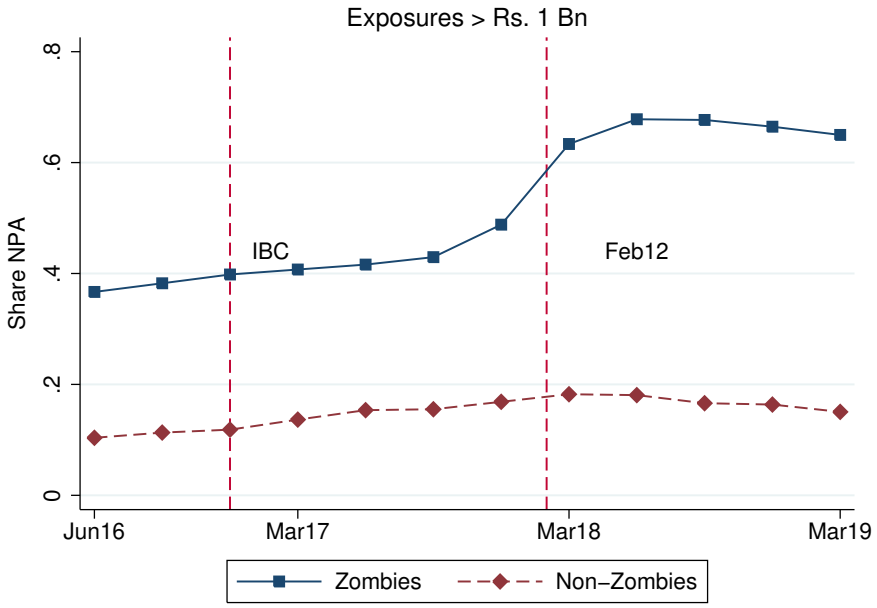
Panel A



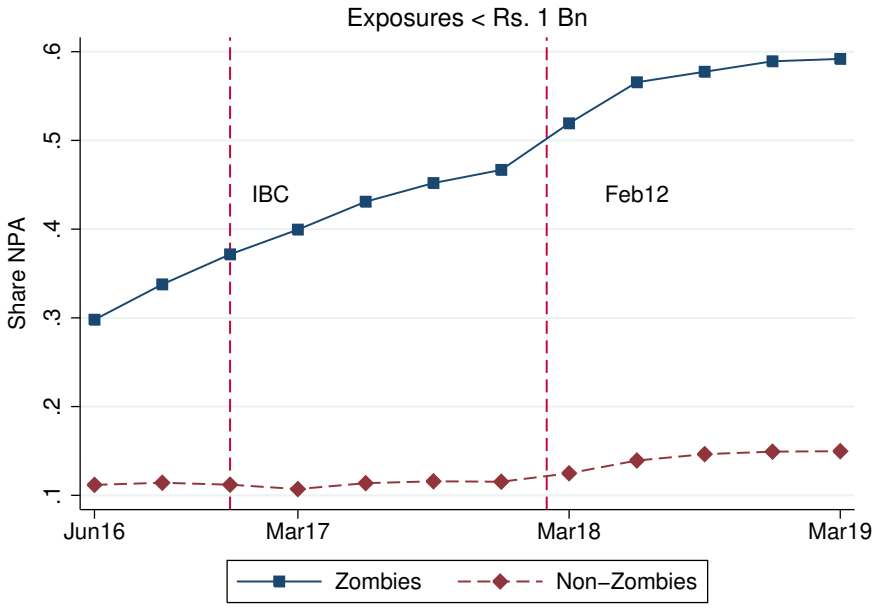
Panel B

Notes: This figure presents the quarterly trends in fresh NPA recognition for zombie and non-zombie borrowers. Panel A shows the fraction (by number) of bank-borrower relationships that are freshly classified as non-performing assets (NPA) in the quarter. Panel B shows the fraction (by volume of bank-borrower relationships that are freshly classified as non-performing assets (NPA). Both figures separate bank-borrower relationships into zombie and non-zombies. In each panel, the y-axis shows the number (volume) of new NPA (exposures) recognized in a quarter, as a fraction of the total non-NPA borrowers (exposures) in the previous quarter. A bank-borrower pair is designated as a zombie if between June 2014 and March 2016 a) it had positive growth in exposures in the quarter after being reported as SMA2; b) the borrower did not have a credit rating of AAA or AA even once; and c) the borrower had not formed any new banking relationship. Data is from CRILC for the period June 2016 to March 2019.

Figure 2
Share of Non-performing Assets by Size of Credit Exposure for Zombie and Non-Zombie Borrowers



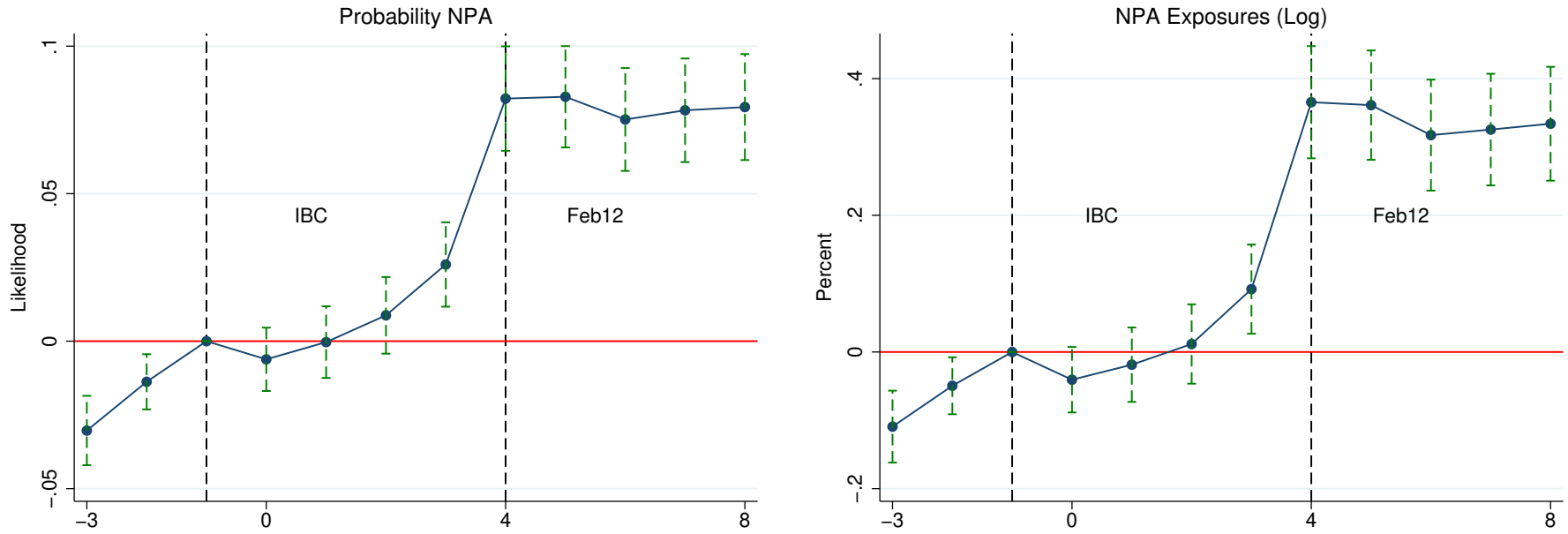
Panel A



Panel B

Notes: This figure presents the quarterly trends in the share of non-performing assets (NPAs) of large and small borrowers in the CRILC database. The y-axis in both panels is the gross non-performing assets (NPA) ratio, defined as the total non-performing assets to the total loans for each quarter. Panel A subsets to bank-borrower credit exposure in excess of INR 1 billion in the first quarter and panel B subsets to bank-borrower credit exposures less than INR 1 billion. A bank-borrower pair is designated as a zombie if between June 2014 and March 2016 a) it had positive growth in exposures in the quarter after being reported as SMA2; b) the borrower did not have a credit rating of AAA or AA even once; and c) the borrower had not formed any new banking relationship. Data is from CRILC for the period June 2016 to March 2019.

Figure 3
Impact on NPA Recognition of Zombie Borrowers

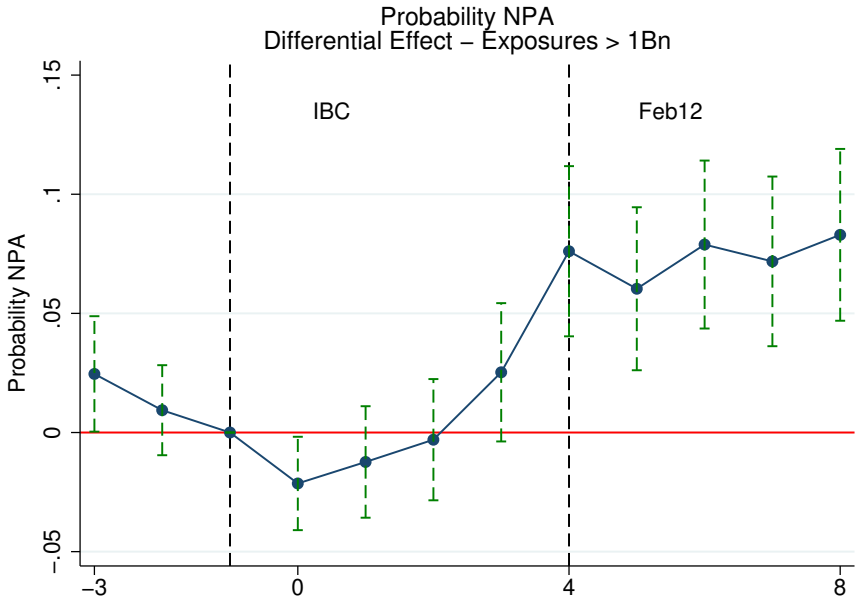


Panel A

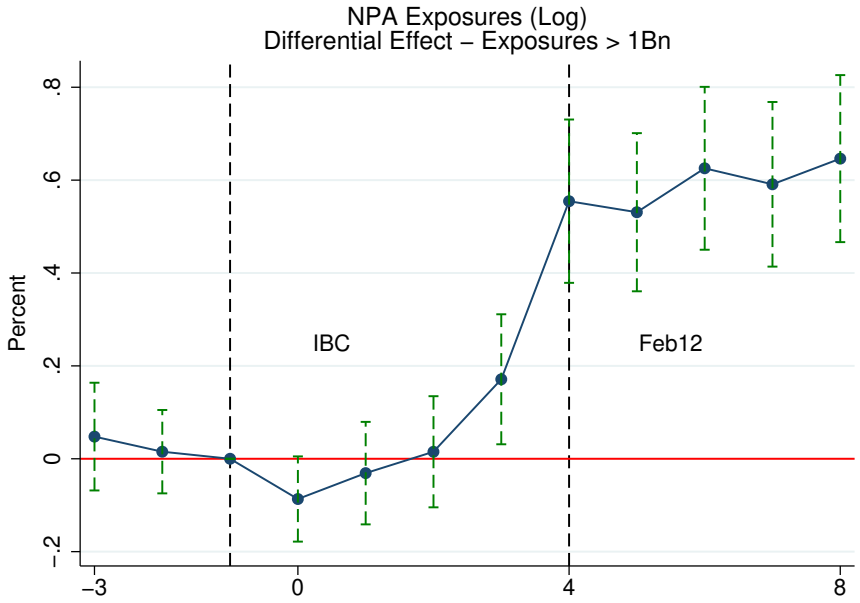
Panel B

Notes: These figures plots the coefficients estimating the average quarterly impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb 12) on non-performing asset (NPA) recognition for zombie borrowers. The dependent variable in panel A is the likelihood of a borrower being classified as NPA. In panel B, dependent variable is the logged NPA exposures. The unit of observation is the borrower-bank-quarter. All specifications include borrower-bank and two-digit industry time fixed effects, in addition to bank and borrower specific covariates. Standard errors are clustered by borrower-bank. The vertical bars represent 95% confidence intervals. Bank-level covariates are as of March 2015 and include the Herfindahl Index measuring the bank's portfolio diversification across sectors; exposures to restructured borrowers; exposures to SMA and NPA borrowers. Borrower-level covariates are borrower's initial exposure in the bank binned across six categories; the total number of banks the borrower transacts with in the quarter; dummies for the borrower's initial external credit rating; dummies for borrower ownership; dummies for whether the loan originates from a consortium or multiple lending facility; the number of bank-level SMA0/1 reportings between June 2014 and March 2016; the number of systemic SMA2 reportings between June 2014 and March 2016; and a dummy indicating whether the borrower was recognized as NPA in the past year. The time-invariant bank and borrower-level covariates are also interacted with post-IBC and post-Feb 12 dummy. The time period is June 2016 to March 2019. The first vertical line depicts the quarter in which the bankruptcy reform (IBC) is introduced (December 2016); the second vertical line depicts the quarter in which the regulatory intervention (Feb. 12th) is introduced (March 2018). Variables definitions and data sources are in Table A1.

Figure 4
Causal Impact on NPA Recognition of Zombie Borrowers



Panel A



Panel B

Notes: These figures present coefficient plots showing the average differential quarterly impact of the bankruptcy reform and regulatory intervention on non-performing asset (NPA) recognition for "large" zombie borrowers. Large borrowers refer to bank-borrowers pairs whose exposures are in excess of INR 1 billion. The dependent variable in panel A is the likelihood of a borrower being classified as NPA and in panel B is the logged NPA exposures. The unit of observation is borrower-bank. All specifications include borrower-bank and two-digit industry time fixed effects, in addition to bank and borrower specific covariates. Bank-level covariates are as of March 2015 and include the Herfindahl Index measuring the bank's portfolio diversification across sectors; exposures to restructured borrowers; exposures to SMA and NPA borrowers. Borrower-level covariates are borrower's initial exposure in the bank binned across six categories; the total number of banks the borrower transacts with in the quarter; dummies for the borrower's initial external credit rating; dummies for borrower ownership; dummies for whether the loan originates from a consortium or multiple lending facility; the number of bank-level SMA0/1 reportings between June 2014 and March 2016; the number of systemic SMA2 reportings between June 2014 and March 2016; and a dummy indicating whether the borrower was recognized as NPA in the past year. The time-invariant bank and borrower-level covariates are also interacted with post-IBC and post-Feb 12 dummy. Standard errors are clustered by borrower-bank. The vertical bars represent 95% confidence intervals. The time period is June 2016 to March 2019. The first vertical line depicts the quarter in which the bankruptcy reform (IBC) is introduced (December 2016); the second vertical line depicts the quarter in which the regulatory intervention (Feb. 12th) is introduced (March 2018). Variables definitions and data sources are in Table A1.

Table 1
Summary Statistics

Panel A: Bank-borrower Credit Data

	Observations	Mean	SD	P10	P50	P90
Zombies	168,214	0.216	0.412	0.000	0.000	1.000
Exposures (INR Billion)	168,214	1.801	5.093	0.294	0.712	3.599
Standard Asset	1682,14	0.545	0.498	0.000	1.000	1.000
SMA0	168,214	0.078	0.269	0.000	0.000	0.000
SMA1	168,214	0.035	0.183	0.000	0.000	0.000
SMA2	168,214	0.082	0.275	0.000	0.000	0.000
NPA	168,214	0.259	0.438	0.000	0.000	1.000
Exposures if NPA (INR Billion)	43,612	1.400	3.403	0.271	0.620	2.719
Bank Relationships	168,214	6.296	6.328	1.000	4.000	15.000
Public Sector Bank	168,214	0.740	0.438	0.000	1.000	1.000
Restructured	168,214	0.052	0.222	0.000	0.000	0.000
Investment Grade	168,214	0.343	0.475	0.000	0.000	1.000
Non-Investment Grade	168,214	0.243	0.429	0.000	0.000	1.000
Unrated	168,214	0.414	0.492	0.000	0.000	1.000

Panel B: Firm-level data

	Observations	Mean	SD	P10	P50	P90
Assets (INR bn)	30,300	22.300	166.000	0.400	2.200	26.700
Debt Ratio	30,300	0.405	0.358	0.056	0.358	0.743
Capex Growth	30,300	-0.055	1.437	-2.000	-0.051	2.000
Compensation Growth	30,300	0.112	0.309	-0.142	0.105	0.372
Cash Ratio	30,300	0.013	0.053	0.000	0.003	0.028
Return on Assets	30,300	0.015	0.099	-0.064	0.019	0.101

Notes: This table shows the summary statistics for bank-borrower-quarter observations (panel A) and firm-year observations (panel B). The sample is restricted to the 12 quarters between June 2016 and March 2019 and borrowers with exposures in excess of INR 0.25 billion in every quarter. The calculation of NPA exposures is restricted to the sample of borrowers recognized as NPAs. Variables definitions and data sources are in Table A1.

Table 2
Comparing Zombie and Non-Zombie Borrowers

	Non-Zombies	Zombies	Diff of Means
	(1)	(2)	(3)
Exposures (INR Billion)	1.850	1.381	0.469***
			(0.070)
Exposures > 1 Billion (INR)	0.403	0.377	0.026**
			(0.009)
Standard Asset	0.756	0.291	0.466***
			(0.008)
SMA0	0.024	0.035	-0.011***
			(0.003)
SMA1	0.034	0.100	-0.065***
			(0.005)
SMA2	0.048	0.276	-0.229***
			(0.008)
NPA	0.138	0.298	-0.160***
			(0.008)
Bank Relationships	6.784	6.220	0.564***
			(0.105)
Public Sector Bank	0.704	0.864	-0.159***
			(0.007)
Restructured	0.042	0.224	-0.182***
			(0.007)
Investment Grade	0.331	0.127	0.204***
			(0.007)
Non-Investment Grade	0.172	0.457	-0.284***
			(0.009)
Unrated	0.497	0.417	0.080***
			(0.009)
Observations	13707	3548	17255

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

Notes: This table shows the mean of the covariates of non-zombie borrowers (column 1) and zombie borrowers (column 2) and the difference between them (column 3). The sample uses data from March 2016 and borrowers with exposures in excess of INR 0.25 billion in every quarter. Variables definitions and data sources are in Table A1.

Table 3
Impact on NPA Recognition of Zombie Borrowers

Panel A: With covariates

	Pr (NPA = 1)			Log (NPA Exposures)		
	(1)	(2)	(3)	(4)	(5)	(6)
Zombie × IBC	0.023***		0.021***	0.071***		0.061***
	(0.005)		(0.005)	(0.024)		(0.024)
Zombie × Feb. 12th		0.082***	0.094***		0.358***	0.393***
		(0.006)	(0.007)		(0.030)	(0.035)
Observations	106065	167319	167319	106065	167319	167319
R sq.	0.889	0.861	0.861	0.881	0.849	0.849
Bank-Borrower FE	Y	Y	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y	Y	Y

Panel B: Without covariates

	Pr (NPA = 1)			Log (NPA Exposures)		
	(1)	(2)	(3)	(4)	(5)	(6)
Zombie × IBC	0.048***		0.048***	0.173***		0.172***
	(0.005)		(0.005)	(0.024)		(0.024)
Zombie × Feb. 12th		0.149***	0.176***		0.644***	0.742***
		(0.007)	(0.009)		(0.035)	(0.040)
Observations	106065	167319	167319	106065	167319	167319
R sq.	0.845	0.793	0.794	0.837	0.782	0.782
Bank-Borrower FE	Y	Y	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y	Y	Y

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

Notes: This table presents the difference-in-difference estimates identifying the impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on non-performing asset (NPA) recognition for zombie borrowers. The sample is restricted to the quarters between June 2016 and March 2019 and borrowers with exposures in excess of INR 0.25 billion in every quarter. The unit of observation is the borrower-bank-quarter. The dependent variable in columns (1)-(3) is a dummy equaling 1 if the borrower is an NPA in the bank; and in columns (4)-(6), the logged NPA exposures of the borrower. In columns (1) and (4), we restrict the sample to the quarters between June 2016 and December 2017. Fixed effects are as indicated. Panel A also includes bank and borrower-level covariates. Bank-level covariates are as of March 2015 and include the Herfindahl Index measuring the bank's portfolio diversification across sectors; exposures to restructured borrowers; exposures to SMA and NPA borrowers. Borrower-level covariates are borrower's initial exposure in the bank binned across six categories; the total number of banks the borrower transacts with in the quarter; dummies for the borrower's initial external credit rating; dummies for borrower ownership; dummies for whether the loan originates from a consortium or multiple lending facility; the number of bank-level SMA0/1 reportings between June 2014 and March 2016; the number of systemic SMA2 reportings between June 2014 and March 2016; and a dummy indicating whether the borrower was recognized as NPA in the past year. The time-invariant bank and borrower-level covariates are also interacted with post-IBC and post-Feb 12 dummy. Variables definitions and data sources are in Table A1. Standard errors are clustered by borrower-bank.

Table 4
Causal Impact on NPA Recognition of Zombie Borrowers

	Pr (NPA = 1)			Log (NPA Exposures)		
	(1)	(2)	(3)	(4)	(5)	(6)
Zombie × Large	0.022	0.015	0.024	0.208**	0.171**	0.179**
	(0.017)	(0.014)	(0.016)	(0.083)	(0.071)	(0.076)
Large × IBC	0.011**		0.010**	0.108***		0.101***
	(0.004)		(0.004)	(0.020)		(0.020)
Zombie × IBC	0.030***		0.027***	0.082***		0.067***
	(0.006)		(0.006)	(0.024)		(0.024)
Zombie × Large × IBC	-0.018*		-0.015	-0.023		-0.009
	(0.010)		(0.010)	(0.047)		(0.047)
Large × Feb. 12th		0.008*	0.014**		0.139***	0.202***
		(0.005)	(0.006)		(0.024)	(0.029)
Zombie × Feb. 12th		0.058***	0.073***		0.167***	0.205***
		(0.007)	(0.008)		(0.028)	(0.033)
Zombie × Large × Feb. 12th		0.057***	0.042***		0.494***	0.452***
		(0.013)	(0.015)		(0.067)	(0.075)
Observations	106065	167319	167319	106065	167319	167319
R sq.	0.889	0.861	0.861	0.881	0.851	0.851
Bank-Borrower FE	Y	Y	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y	Y	Y

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

Notes: This table shows the differential effect of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on the non-performing asset (NPA) recognition across size of lender exposure to borrowers. The sample is restricted to the quarters between June 2016 and March 2019 and borrowers with exposures in excess of INR 0.25 billion in every quarter. The unit of observation is the borrower-bank-quarter. The dependent variable in columns (1)-(3) is a dummy equaling 1 if the borrower is a NPA in the bank; and in columns (4)-(6), the logged NPA exposures of the borrower. In columns (1) and (4), we restrict the sample to the quarters between June 2016 and December 2017. Fixed effects are as indicated. All specifications include bank and borrower-specific covariates as defined in Table 3. Variables definitions and data sources are in Table A1. Standard errors are clustered by borrower-bank.

Table 5
Heterogeneity of the Impact on NPA Recognition by Bank Capital

	Pr (NPA = 1)			Log (NPA Exposures)		
	(1)	(2)	(3)	(4)	(5)	(6)
Zombie × IBC	0.006		0.006	0.004		0.003
	(0.007)		(0.007)	(0.031)		(0.031)
Zombie × Bank Capital$_{middle}$ × IBC	0.032***		0.028***	0.119***		0.101**
	(0.010)		(0.010)	(0.044)		(0.044)
Zombie × Bank Capital$_{highest}$ × IBC	0.066***		0.061***	0.282***		0.260***
	(0.020)		(0.020)	(0.093)		(0.093)
Zombie × Feb. 12th		0.079***	0.082***		0.353***	0.355***
		(0.009)	(0.010)		(0.040)	(0.046)
Zombie × Bank Capital$_{middle}$ × Feb. 12th		-0.004	0.012		-0.021	0.037
		(0.012)	(0.014)		(0.060)	(0.068)
Zombie × Bank Capital$_{highest}$ × Feb. 12th		0.062**	0.097***		0.192*	0.340**
		(0.026)	(0.030)		(0.116)	(0.136)
Observations	106065	167319	167319	106065	167319	167319
R sq.	0.889	0.861	0.861	0.881	0.849	0.849
Bank-Borrower FE	Y	Y	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y	Y	Y

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

Notes: This table shows the differential impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on non-performing asset (NPA) recognition for zombie borrowers across bank capital. The sample is restricted to the quarters between June 2016 and March 2019 and borrowers with exposures in excess of INR 0.25 billion in every quarter. The unit of observation is the borrower-bank-quarter. The dependent variable in columns (1)-(3) is a dummy equaling 1 if the borrower is a NPA in the bank; and in columns (4)-(6), the logged NPA exposures of the borrower. In columns (1) and (4), we restrict the sample to the quarters between June 2016 and December 2017. Fixed effects are as indicated. All specifications include bank and borrower-specific covariates as defined in Table 3. Bank Capital$_{middle}$ and Bank Capital$_{highest}$ refer to the middle and top terciles of bank capital as defined in Table A1. Remaining variables definitions and data sources are in Table A1. Standard errors are clustered by borrower-bank.

Table 6
Heterogeneity of the Impact on NPA Recognition by Bank Ownership

	Pr (NPA = 1)		Log (NPA Exposures)	
	Public Banks	Private Banks	Public Banks	Private Banks
	(1)	(2)	(3)	(4)
Zombie × IBC	0.017***	0.040***	0.043*	0.150**
	(0.006)	(0.013)	(0.026)	(0.060)
Zombie × Feb. 12th	0.082***	0.168***	0.339***	0.734***
	(0.008)	(0.021)	(0.037)	(0.098)
Observations	123866	43411	123866	43411
R sq.	0.861	0.830	0.850	0.818
Bank-Borrower FE	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y

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

Notes: This table shows the impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on the non-performing asset (NPA) recognition of zombie borrowers of public sector (government-owned) banks and privately-owned banks. The sample is restricted to the quarters between June 2016 and March 2019 and borrowers with exposures in excess of INR 0.25 billion in every quarter. The unit of observation is the borrower-bank-quarter. The dependent variable in columns (1)-(2) is a dummy equaling 1 if the borrower is a NPA; in columns (3)-(4), logged NPA exposures. In columns (1) and (3), we restrict the sample to borrowers in public sector banks; in columns (2) and (4), we restrict the sample to those in private sector banks. Fixed effects are as indicated. All specifications include bank and borrower-specific covariates as defined in Table 3. Variables definitions and data sources are in Table A1. Standard errors in parentheses, clustered by borrower-bank. Fixed effects are as indicated. All specifications include bank and borrower-specific covariates as defined in Table 3. Variables definitions and data sources are in Table A1. Standard errors are clustered by borrower-bank.

Table 7
Heterogeneity of the Impact on NPA Recognition Across Rent-Seeking Industries, Conditional on Ownership

	Pr(NPA = 1)			NPA Exposures (Log)		
	All	Public Banks	Private Banks	All	Public Banks	Private Banks
	(1)	(2)	(3)	(4)	(5)	(6)
Zombie × IBC	0.023***	0.022***	0.026**	0.069***	0.062**	0.086
	(0.006)	(0.006)	(0.013)	(0.026)	(0.029)	(0.060)
Zombie × High Rent × IBC	-0.009	-0.016	0.055*	-0.032	-0.067	0.255*
	(0.011)	(0.012)	(0.032)	(0.052)	(0.055)	(0.152)
Zombie × Feb. 12th	0.082***	0.072***	0.140***	0.305***	0.259***	0.571***
	(0.008)	(0.009)	(0.022)	(0.037)	(0.040)	(0.101)
Zombie × High Rent × Feb. 12th	0.044***	0.038**	0.118**	0.329***	0.295***	0.696***
	(0.016)	(0.017)	(0.049)	(0.081)	(0.087)	(0.239)
Observations	167319	123866	43411	167319	123866	43411
R sq.	0.861	0.861	0.831	0.850	0.850	0.819
Bank-Borrower FE	Y	Y	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y	Y	Y

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

Notes: This table shows the impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on the non-performing asset (NPA) recognition of zombie borrowers across rent-seeking industries for public sector (government-owned) banks and privately-owned banks. The sample is restricted to the quarters between June 2016 and March 2019 and borrowers with exposures in excess of INR 0.25 billion in every quarter. The unit of observation is the borrower-bank-quarter. The dependent variable in columns (1)-(3) is a dummy equaling 1 if the borrower is a NPA; in columns (4)-(6), logged NPA exposures. In columns (2) and (5), we restrict the sample to borrowers in public sector banks; in columns (3) and (6), we restrict the sample to those in private sector banks. Fixed effects are as indicated. All specifications include bank and borrower-specific covariates as defined in Table 3. Variables definitions and data sources are in Table A1. Standard errors in parentheses, clustered by borrower-bank. Fixed effects are as indicated. All specifications include bank and borrower-specific covariates as defined in Table 3. High Rent is a dummy equaling 1 for borrowers operating in mining, textiles, metals and steel, power generation and telecommunications. Remaining variables definitions and data sources are in Table A1. Standard errors are clustered by borrower-bank.

Table 8
Heterogeneity of the Impact on NPA Recognition by Bank Capital and Ownership

	Public Banks		Private Banks	
	Pr(NPA = 1)	NPA Exposures (Log)	Pr(NPA = 1)	NPA Exposures (Log)
	(1)	(2)	(3)	(4)
Zombie × IBC	0.008	0.013	-0.065	-0.310
	(0.007)	(0.032)	(0.052)	(0.219)
Zombie × Bank Capital$_{middle}$ × IBC	0.024**	0.077	0.105*	0.461**
	(0.010)	(0.047)	(0.054)	(0.227)
Zombie × Bank Capital$_{highest}$ × IBC			0.112**	0.487**
			(0.054)	(0.232)
Zombie × Feb. 12th	0.085***	0.363***	0.441***	1.951***
	(0.010)	(0.046)	(0.117)	(0.528)
Zombie × Bank Capital$_{middle}$ × Feb. 12th	-0.007	-0.063	-0.264**	-1.124**
	(0.015)	(0.071)	(0.120)	(0.539)
Zombie × Bank Capital$_{highest}$ × Feb. 12th			-0.297**	-1.378**
			(0.120)	(0.540)
Observations	123866	123866	43411	43411
R sq.	0.861	0.850	0.831	0.819
Bank-Borrower FE	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y

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

Notes: This table shows the impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on the non-performing asset (NPA) recognition of zombie borrowers by bank capital for public sector (government-owned) banks and privately-owned banks. The sample is restricted to the quarters between June 2016 and March 2019 and borrowers with exposures in excess of INR 0.25 billion in every quarter. The unit of observation is the borrower-bank-quarter. The dependent variable in columns (1) and (3) is a dummy equaling 1 if the borrower is a NPA; in columns (2) and (4), logged NPA exposures. In columns (1)-(2), we restrict the sample to borrowers in public sector banks; in columns (3)-(4), we restrict the sample to those in private sector banks. Fixed effects are as indicated. All specifications include bank and borrower-specific covariates as defined in Table 3. Variables definitions and data sources are in Table A1. Standard errors in parentheses, clustered by borrower-bank. Fixed effects are as indicated. All specifications include bank and borrower-specific covariates as defined in Table 3. Bank Capital$_{middle}$ and Bank Capital$_{highest}$ refer to the middle and top terciles of bank capital as defined in Table A1. Remaining variables definitions and data sources are in Table A1. Standard errors are clustered by borrower-bank.

Table 9
Credit Reallocation Away from Zombie Borrowers

	Log (Credit Exposure)			Number of Banking Relationships		
	All	High Zombie Bank	Low Zombie Bank	All	High Zombie Bank	Low Zombie Bank
	(1)	(2)	(3)	(4)	(5)	(6)
$Zombie_{Firm} \times$ IBC	-0.065***	-0.048***	-0.034***	-0.023***	-0.012***	-0.011***
	(0.005)	(0.007)	(0.007)	(0.006)	(0.004)	(0.004)
$Zombie_{Firm} \times$ Feb. 12^{th}	-0.156***	-0.134***	-0.061***	-0.052***	-0.040***	-0.013**
	(0.008)	(0.012)	(0.013)	(0.010)	(0.008)	(0.006)
Observations	720313	720313	720313	720313	720313	720313
R sq.	0.913	0.921	0.905	0.937	0.935	0.913
Borrower FE	Y	Y	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y	Y	Y

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

Notes: This table identifies the impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12^{th}) on the total credit exposure and number of bank relations for zombie borrowers relative to non-zombie borrowers. The sample is restricted to the quarters between June 2016 and March 2019 and includes all borrowers (including those with bank-borrower exposures below INR 0.25 billion in a quarter). The unit of observation is the firm-quarter. The dependent variables are logarithm of the total credit exposure at the firm-level in columns (1)-(3) and the total number of banking relationships at the firm-level in columns (4)-(6). Columns (1) and (4) include all observations, columns (2) and (5) [(3) and 6)] subsets to the firms that borrow from banks with above [below] median share of zombie borrowers in March 2015. Fixed effects are as indicated. All specifications include firm-level covariates. Firm-level covariates included are dummies for borrower ownership categories; dummies for whether the borrower is engaged in a multiple or consortium banking relationship; dummies for initial borrower ratings in the first quarter in which the borrower is observed in the bank; dummies for whether borrower is rated as a NPA, SMA0, SMA1 or SMA2 in the past four quarters; dummies for whether the borrower ever restructured. All the covariates are interacted with post-intervention dummies. All variables are as defined in Table A1. Standard errors are clustered by firm.

Table 10
Credit Reallocation Within Decongested Industries to Non-zombie Firms

	Log (Credit Exposure)			Number of Banking Relationships		
	All	High Zombie Bank	Low Zombie Bank	All	High Zombie Bank	Low Zombie Bank
	(1)	(2)	(3)	(4)	(5)	(6)
High Zombie Industry × IBC	-0.007*	-0.004	-0.007	-0.001	0.000	-0.001
	(0.004)	(0.005)	(0.005)	(0.004)	(0.003)	(0.003)
High Zombie Industry × Feb. 12th	-0.030***	-0.022***	-0.027***	-0.014**	-0.006	-0.008**
	(0.005)	(0.007)	(0.007)	(0.006)	(0.004)	(0.004)
Observations	674346	674346	674346	674346	674346	674346
R sq.	0.910	0.918	0.903	0.934	0.932	0.912
Borrower FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y

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

Notes: This table identifies the impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on the total credit exposure and number of bank relations for the subset of non-zombie borrowers (excluding non-performing assets and zombie borrowers) across industries with high zombie fraction. The sample is restricted to the 16 quarters between June 2016 and March 2019 and includes all borrowers (including those with bank-borrower exposures below INR 0.25 billion in a quarter). The unit of observation is the firm-quarter. The dependent variables are logarithm of the total credit exposure at the firm-level in columns (1)-(3) and the total number of banking relationships at the firm-level in columns (4)-(6). Columns (1) and (4) include all observations, columns (2) and (5) [(3) and 6)] subsets to the firms that borrow from banks with above [below] median share of zombie borrowers in March 2015. Fixed effects are as indicated. All specifications include firm-level covariates. Firm-level covariates included are dummies for borrower ownership categories; dummies for whether the borrower is engaged in a multiple or consortium banking relationship; dummies for initial borrower ratings in the first quarter in which the borrower is observed in the bank; dummies for whether borrower is rated as a NPA, SMA0, SMA1 or SMA2 in the past four quarters; dummies for whether the borrower ever restructured. All the covariates are interacted with post-intervention dummies. All variables are as defined in Table A1. Standard errors are clustered by firm.

Table 11
Credit Reallocation to Non-Zombie Firms

	Log (Credit Exposure)				Number of Banking Relationships			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IG × IBC	0.022*				0.045***			
	(0.012)				(0.010)			
IG × Feb. 12th	0.030**				0.034***			
	(0.014)				(0.012)			
$\text{Large}_{\text{Firm}}$ × IBC		-0.004				0.013***		
		(0.003)				(0.004)		
$\text{Large}_{\text{Firm}}$ × Feb. 12th		0.023***				0.029***		
		(0.004)				(0.005)		
Young × IBC			0.188***				0.105***	
			(0.025)				(0.027)	
Young × Feb. 12th			0.366***				0.156***	
			(0.030)				(0.033)	
Listed × IBC				-0.028*				0.017
				(0.016)				(0.022)
Listed × Feb. 12th				-0.054**				0.019
				(0.023)				(0.036)
Observations	674336	674336	341288	341434	674336	674336	341288	341434
R sq.	0.910	0.928	0.907	0.906	0.936	0.935	0.940	0.940
Borrower FE	Y	Y	Y	Y	Y	Y	Y	Y
Industry-Time FE	Y	Y	Y	Y	Y	Y	Y	Y

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

Notes: This table identifies the impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on the total credit exposures and number of banking relationships by firm characteristics for the subset of non-zombie borrowers (excluding NPA and zombie borrowers). The sample is restricted to the quarters between June 2016 and March 2019 and includes all borrowers (including those with bank-borrower exposures below INR 0.25 billion in a quarter). The unit of observation is the firm-quarter. The dependent variables are logarithm of the total credit exposure at the firm-level in columns (1)-(4) and the total number of banking relationships at the firm-level in columns (5)-(8). Fixed effects are as indicated. All specifications include firm-level covariates. Firm-level covariates included are dummies for borrower ownership categories; dummies for whether the borrower is engaged in a multiple or consortium banking relationship; dummies for initial borrower ratings in the first quarter in which the borrower is observed in the bank; dummies for whether borrower is rated as a NPA, SMA0, SMA1 or SMA2 in the past four quarters; dummies for whether the borrower ever restructured. All the covariates are interacted with post-intervention dummies. The characteristics we examine are whether a firm is investment grade (IG), large, young, or listed. All variables are as defined in Table A1. Standard errors are clustered by firm.

Table 12
Effect on Real Outcomes of Zombie and Non-Zombie Firms

	Capex Growth	Comp Growth	Cash Ratio	ROA
	(1)	(2)	(3)	(4)
Zombie × IBC	-0.091	-0.004	-0.002	-0.008**
	(0.063)	(0.016)	(0.002)	(0.004)
Zombie × Feb. 12th	-0.255***	0.002	-0.002	0.003
	(0.082)	(0.019)	(0.004)	(0.005)
Observations	29209	29209	29209	29209
R^2	0.118	0.377	0.726	0.765
Controls	Y	Y	Y	Y
Firm and Year FE	Y	Y	Y	Y

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

Notes: This table estimates the impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on firm-level outcomes for the subset of non-zombie firms, excluding non-performing assets and zombie borrowers. The unit of observation is the firm-quarter. The dependent variables are growth in capital expenditure (column 1), growth in compensation expenditure (column 2), cash ratio (column 3), and the return on assets (ROA in column 4). The sample is restricted to the quarters between June 2016 and March 2019 and includes all borrowers (including those with bank-borrower exposures in below INR 0.25 billion in a quarter). Fixed effects are as indicated. All specifications include firm-level covariates. Firm-level covariates included are dummies for borrower ownership categories; dummies for whether the borrower is engaged in a multiple or consortium banking relationship; dummies for initial borrower ratings in the first quarter in which the borrower is observed in the bank; dummies for whether borrower is rated as a NPA, SMA0, SMA1 or SMA2 in the past four quarters; dummies for whether the borrower ever restructured. All the covariates are interacted with post-intervention dummies. All variables are as defined in Table A1. Standard errors are clustered by firm.

Table 13
Heterogeneity in Real Outcomes of Non-Zombie Firms

Panel A: By Credit Rating

	Capex Growth	Comp Growth	Cash Ratio	ROA
	(1)	(2)	(3)	(4)
IG × IBC	0.276***	-0.010	0.001*	-0.004**
	(0.042)	(0.008)	(0.001)	(0.002)
IG × Feb. 12th	0.220***	0.005	0.003***	0.000
	(0.053)	(0.010)	(0.001)	(0.002)
Observations	24838	24838	24838	24838
R^2	0.117	0.369	0.725	0.790
Controls	Y	Y	Y	Y
Firm and Year FE	Y	Y	Y	Y

Panel B: By Size

	Capex Growth	Comp Growth	Cash Ratio	ROA
	(1)	(2)	(3)	(4)
$\text{Large}_{\text{Firm}}$ × IBC	0.331***	0.000	0.007***	0.001
	(0.061)	(0.015)	(0.002)	(0.002)
$\text{Large}_{\text{Firm}}$ × Feb. 12th	0.407***	0.026	0.010***	0.003
	(0.078)	(0.016)	(0.003)	(0.003)
Observations	23870	23870	23870	23870
R^2	0.114	0.361	0.719	0.790
Controls	Y	Y	Y	Y
Firm and Year FE	Y	Y	Y	Y

Panel C: By Listing Status

	Capex Growth	Comp Growth	Cash Ratio	ROA
	(1)	(2)	(3)	(4)
Listed × IBC	0.222***	0.004	0.001	-0.001
	(0.047)	(0.008)	(0.001)	(0.002)
Listed × Feb. 12th	0.122**	0.035***	0.001	-0.004
	(0.057)	(0.009)	(0.001)	(0.003)
Observations	24838	24838	24838	24838
R^2	0.117	0.369	0.725	0.790
Controls	Y	Y	Y	Y
Firm and Year FE	Y	Y	Y	Y

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

Notes: This table estimates the impact of the bankruptcy reform (IBC) and the regulatory intervention (Feb. 12th) on firm-level outcomes, excluding non-performing assets and zombie borrowers. The dependent variables and sample size are as defined in Table 12. Fixed effects are as indicated. All specifications include firm-level covariates. Firm-level covariates included are dummies for borrower ownership categories; dummies for whether the borrower is engaged in a multiple or consortium banking relationship; dummies for initial borrower ratings in the first quarter in which the borrower is observed in the bank; dummies for whether borrower is rated as a NPA, SMA0, SMA1 or SMA2 in the past four quarters; dummies for whether the borrower ever restructured. All the covariates are interacted with post-intervention dummies. Panel A examines the heterogeneity in effect for investment grade (IG) firms, panel B for large firms (by asset size), and panel C for listed firms. All variables are as defined in Table A1. Standard errors are clustered by firm.

Unearthing Zombies

Internet Appendix

Table A1
Variable Definitions

Variable	Definition
Source: CRILC	
Zombie	A bank-borrower pair is designated as a zombie if between June 2014 and March 2016 it has had positive growth in exposures in the quarter after being reported as SMA2 in the system; the firm (borrower) does not have a credit rating of AAA or AA even once; and the firm (borrower) has not formed any new banking relationship.
Standard Asset	A loan is classified as 'standard' if a borrower is currently in good standing and has not missed any scheduled payments.
SMA0	A loan is classified as 'SMA0' if the payment is 0 to 30 days overdue.
SMA1	A loan is classified as 'SMA1' if the payment is 30 to 60 days overdue.
SMA2	A loan is classified as 'SMA2' if the payment is 60 to 90 days overdue.
NPA	A loan is classified as an NPA if the borrower has not made any payments towards interest or principal in excess of 90 days.
Banking Relationships	The number of banks with whom a firm has debt outstanding in that year.
Public Sector Bank (PSB)	A dummy variable equaling 1 if the bank is a government-owned bank and 0 otherwise.
Restructured	A loan is classified as restructured if an illiquid borrower, pre-2015 is offered a forbearance scheme, wherein they are offered flexible repayment schedules, additional credit lines, or lower interest rates.
Investment Grade	A dummy variable equaling 1 in a quarter if the firm has an investment grade rating across all banks it transacts with.
Unrated	A dummy variable equaling 1 in a quarter if the firm is not rated by any rating agency.
Large	A dummy variable equaling 1 if the borrower's exposures in the bank in a quarter exceed INR 1 billion.
IBC	A dummy variable equaling 1 for the quarters ending in March, June, September, and December 2017.

Table A1
Variable Definitions (contd.)

Variable	Definition
Feb. 12^{th}	A dummy variable equaling 1 for all quarters from the one ending in March 2018 onwards.
$\text{Bank Capital}_{\text{middle}}$	A dummy variable equaling 1 if the bank's average Tier-I capital-to-assets ratio lie in the second tercile, between 2012 and 2015.
$\text{Bank Capital}_{\text{highest}}$	A dummy variable equaling 1 if the bank's average Tier-I capital-to-assets ratio lie in the third (highest) tercile, between 2012 and 2015.
$\text{Zombie}_{\text{Firm}}$	A firm-level dummy variable equaling 1 if any of its banking relationships can be categorized as a zombie relationship (see Item 1 above).
High Zombie Industry	A dummy variable equaling 1 for two-digit industries which had a above median exposure to zombie borrowers in March 2015.
IG	Investment grade (IG) is a dummy equaling 1 in a quarter if the firm has an investment grade rating across all banks it transacts with.
Listed	A dummy variable equaling 1 if the firm is listed for public trading on either of the two national stock exchanges – NSE and BSE.
Young	A dummy variable equaling 1 if the borrower's year of incorporation is 2014 onwards.
$\text{Large}_{\text{Firm}}$	A dummy equaling 1 if the firm's exposures exceed those of the median borrower in the quarter.
Source: CMIE Prowess	
CapEx Growth	The symmetric growth rate of capital expenditure defined as $\frac{Y_{it}-Y_{i,t-1}}{0.5\times(Y_{it}+Y_{i,t-1})}$.
Compensation Growth	The symmetric growth rate of wages defined as $\frac{Y_{it}-Y_{i,t-1}}{0.5\times(Y_{it}+Y_{i,t-1})}$.
Cash Ratio	The ratio of cash and bank balances in a year to total assets.
Return on Assets (ROA)	The profit after tax adjusting for prior period and extraordinary income in a year scaled by average assets.

A1 Bankruptcy System Prior to 2016

Before the passage of the Insolvency and Bankruptcy Code (IBC) in 2016, corporate insolvency in India was characterized by a fragmented system of governing authorities. Specialized restructuring courts were established in 1956 under the Companies Act, which designated the National Company Law Tribunals (NCLTs) to oversee insolvency cases, among other corporate affairs. Because secured creditors at the time did not have the power to foreclose in the event of default, and NCLTs were subject to political pressures to preserve jobs, the system under the Companies Act was viewed as management-friendly (Sengupta, Sharma and Thomas, 2016).

Stemming from prolonged weakness in the industrial sector, the Sick Industrial Companies Act (also known as the Special Provisions Act) was passed in 1985. This created a new adjudicating authority, the Board for Industrial and Financial Reconstruction (BIFR), to resolve financial distress. This process was only available to industrial firms, however, and because the law was passed with job-preserving objectives in mind, the BIFR was also considered to be friendly to management.

Restructuring cases under the NCLT and BIFR took notoriously long to resolve. The average BIFR case lasted nearly 6 years (Sengupta, Sharma and Thomas (2016)). In order to speed up asset sales, legislation in 1993 created specialized Debt Recovery Tribunals (DRTs) that were not required to follow civil procedures to which the NCLTs were bound (Visaria, 2009). The same institutional challenges that plagued the NCLTs — namely a lack of resources — led to delays at the tribunals as well. Banks were also the only creditors allowed to use these tribunals to recover from distressed debtors.

In an attempt to strengthen secured creditor rights, India passed the Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interest (SARFAESI) Act in 2002, empowering banks to foreclose on properties (Vig, 2013). This Act also facilitated the formation of specialized intermediaries, known as Asset Reconstruction Companies, designed to help manage the asset reallocation process. This Act was not successful in generating high recovery rates for banks, however. An RBI report from 2004 cited recovery

rates of less than 9% for public sector banks under this regime.

The RBI also exerts significant control over distressed asset resolution procedures, in part because it dictates provisioning requirements for banks. In 2008, the RBI put forward a set of guidelines to dictate private debt work-outs.[36] Designed for large distressed borrowers, this work-out mechanism facilitated negotiations that would bring debt loads to manageable levels. In exchange for participating in the negotiation process, the RBI relaxed provisioning requirements for banks participating in these work-outs. In 2015, a modified work-out scheme was proposed that encouraged debt-for-equity swaps and granted banks the power to replace management in certain circumstances.

The piece-meal introduction of various insolvency regimes resulted in a web of uncoordinated procedural alternatives. Firms exploited ambiguities and engaged in forum shopping, leading to a significant amount of litigation. In addition, even with several alternatives in place, there was still no process that would allow all creditors to participate in a unified structured bargaining process.

On passage of the IBC, the NCLT continued to remain the adjudicating authority, the BIFR was done away with, and debt recovery tribunals were assigned to handle individual and unincorporated insolvency cases. The private work-out schemes promoted by the RBI were abolished. The powers of foreclosure granted to secured creditors under the SARFAESI Act remained in place, although an automatic stay applied if the firm was referred to the IBC.

[36] These mechanisms were established in 2001, but it was not until 2008 that the guidelines were clarified.

A2 Alternate Zombie Measures

In section 2 of the paper we discuss our classification system for zombie banking relationships. Thus, our main specifications consider a borrower-bank relationship to be zombie if in the first eight quarters of the CRILC database (between June 2014 and March 2016) the borrower exhibits positive growth in exposures at a bank in the quarter immediately after the borrower is reported as a SMA2 in the system. Moreover, we impose the condition that these borrowers have never been rated AAA or AA and no other lender has initiated a new relationship with them during this period. However, we also verify in Table A2 that our baseline results are robust to alternate classifications of zombie borrowers. In this section, we detail the alternate zombie classifications considered, and the fraction of zombie relationships which were classified as NPA over this period for each zombie classification.

We consider three zombie classifications based on the sub-sample of borrowers from CRILC that can be mapped to the Prowess data. Using this sub-sample, we construct the following alternate zombie classifications:

Zombie Measure 1: A firm's interest coverage ratio falls below 1 in at least one year between 2012 and 2015. All borrower-bank relationships associated with this firm are classified as zombies. This classification is at the borrower-level, and not borrower-bank level.

Zombie Measure 2: A firm's interest coverage ratio falls below 1 in at least one year between 2012 and 2015, and the firm has positive growth in real exposures in the bank over the first eight quarters of the CRILC database (between June 2014 and March 2016).

Zombie Measure 3: A firm's interest coverage ratio falls below 1 in at least one year between 2012 and 2015, and a) the firm has positive growth in real exposures in the bank over the first eight quarters of the CRILC database and b) the firm is reported as SMA2 at least once during the first eight quarters of the CRILC database(between June 2014 and March 2016).

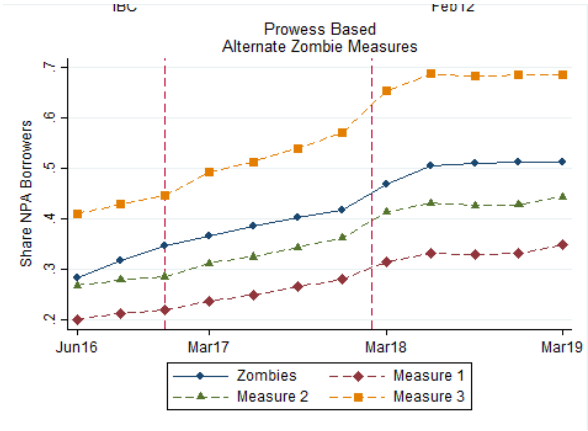
The next three zombie classifications are constructed solely using data from the first eight quarters (June 2014-March 2016) of the CRILC data.

Zombie Measure 4: In this specification, we restrict zombie relationships to borrowers who are never investment grade. Thus, a borrower-bank relationship is zombie if the borrower exhibits positive growth in real exposures in the quarter after which it is reported as SMA2 in the system and a) the borrower is never classified as investment grade (ratings of AAA, AA, A or BBB) between June 2014 and March 2016; and b) the borrower did not start a new relationship with any other bank during this period.

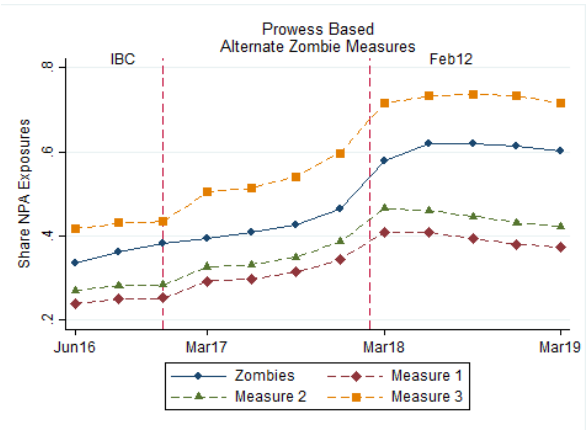
Zombie Measure 5: In this specification, we restrict zombie relationships to borrowers who exhibited relatively high growth in exposures in the quarter after which they are reported as SMA2 in the system. Thus, a borrower-bank relationship is zombie if the borrower exhibits growth in real exposures in excess of 4% in the quarter after which it is reported as SMA2 in the system and a) the borrower is never rated as AAA or AA between June 2014 and March 2016; and b) the borrower did not start a new relationship with any other bank during this period.

Zombie Measure 6: In this specification, we relax the classification of zombie relationships to borrowers who might have initiated a new banking relationship during the first eight quarters of the CRILC data. Thus, a borrower-bank relationship is zombie if the borrower exhibits positive growth in real exposures in the quarter after which it is reported as SMA2 in the system and the borrower is never rated as AAA or AA between June 2014 and March 2016.

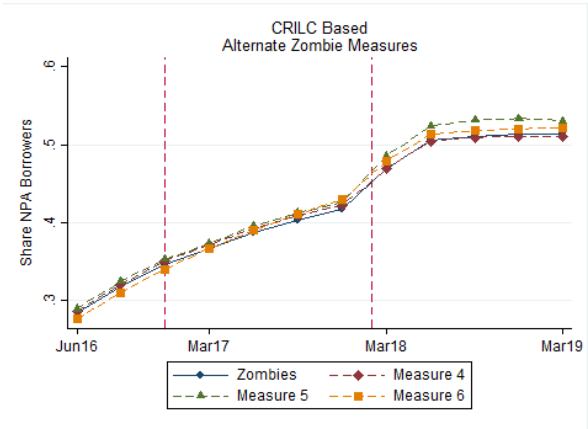
Figure A1
Share of Non-Performing Assets for Zombie and Non-Zombie borrowers: Robustness to Alternate Zombie Measures



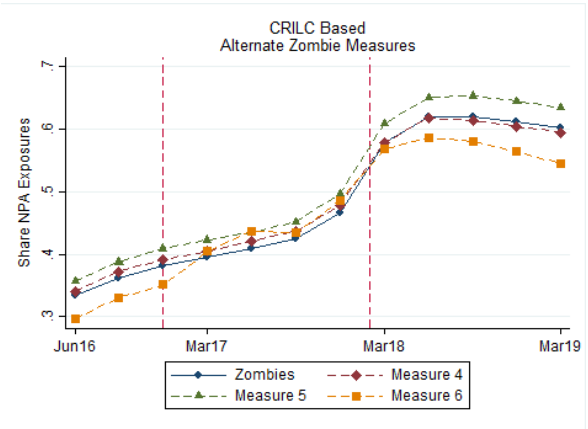
Panel A



Panel B



Panel C



Panel D

Notes: This figure presents the quarterly trends in the the share of non-performing assets (NPAs) across various classifications of zombie borrowers. The y-axis in all panels is the share of NPA or the gross non-performing assets (GNPA) ratio defined as the total non-performing assets to the total credit exposure for each quarter. Panel A and C shows the NPA ratios as a fraction of zombie borrowers; Panel B and D shows the NPA ratios as a fraction of zombie exposures for the period June 2016 to March 2019. The solid line indicates the GNPA ratios for our preferred zombie classification as defined in Table A1.

Table A2
Robustness: Alternate Zombie Measures

Panel A: Prowess Financial Characteristics

	Zombie Measure 1		Zombie Measure 2		Zombie Measure 3	
	Pr(NPA = 1)	NPA Exposures (Log)	Pr(NPA = 1)	NPA Exposures (Log)	Pr(NPA = 1)	NPA Exposures (Log)
	(1)	(2)	(3)	(4)	(5)	(6)
Zombie × IBC	0.017***	0.052*	0.025***	0.087***	0.057***	0.203***
	(0.006)	(0.026)	(0.007)	(0.030)	(0.010)	(0.041)
Zombie × Large × IBC	0.018**	0.134***	0.003	0.077	0.007	0.166***
	(0.009)	(0.043)	(0.010)	(0.048)	(0.013)	(0.063)
Zombie ×Feb. 12th	0.024***	0.036	0.040***	0.117***	0.100***	0.334***
	(0.009)	(0.037)	(0.010)	(0.042)	(0.014)	(0.057)
Zombie ×Large ×Feb. 12th	0.056***	0.418***	0.041***	0.387***	0.080***	0.718***
	(0.013)	(0.062)	(0.014)	(0.069)	(0.019)	(0.089)
Observations	100031	100031	100031	100031	100031	100031
R sq.	0.845	0.839	0.845	0.839	0.847	0.841
Dep Var Mean	0.133	0.600	0.147	0.659	0.179	0.806

Panel B: CRILIC Characteristics

	Zombie Measure 4		Zombie Measure 5		Zombie Measure 6	
	Pr(NPA = 1)	NPA Exposures (Log)	Pr(NPA = 1)	NPA Exposures (Log)	Pr(NPA = 1)	NPA Exposures (Log)
	(1)	(2)	(3)	(4)	(5)	(6)
Zombie × Post IBC	0.018***	0.032	0.033***	0.093***	0.032***	0.095***
	(0.006)	(0.023)	(0.006)	(0.025)	(0.007)	(0.028)
Zombie × Large × Post IBC	-0.019**	-0.040	-0.014	0.009	-0.018	-0.015
	(0.009)	(0.046)	(0.010)	(0.051)	(0.013)	(0.062)
Zombie ×Feb. 12th	0.051***	0.119***	0.076***	0.217***	0.079***	0.235***
	(0.008)	(0.032)	(0.009)	(0.035)	(0.011)	(0.044)
Zombie × Large ×Feb. 12th	0.066***	0.551***	0.057***	0.527***	0.063***	0.584***
	(0.014)	(0.072)	(0.016)	(0.081)	(0.017)	(0.084)
Observations	167319	167319	167319	167319	167319	167319
R sq.	0.861	0.850	0.861	0.850	0.861	0.851
Dep Var Mean	0.113	0.487	0.106	0.471	0.096	0.427

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

Notes: This table shows the robustness of the results to alternate measures of zombie relationships. The unit of observation is the borrower-bank. Panel A contains zombie measures based on financial characteristics sourced from the Prowess database; Panel B contains zombie measures based on borrowers' repayment histories based on the CRILC database. The sample is restricted to the quarters between June 2016 and March 2019 and borrowers with exposures in excess of INR 0.25 billion in every quarter. The unit of observation is the borrower-bank-quarter. The dependent variable is a dummy equaling 1 if the borrower is an NPA in the bank in the odd columns; and the logged NPA exposures of the borrower in the even columns. All columns include bank-borrower and industry-quarter fixed effects and bank and borrower-level covariates as in Table 3. See the discussion above for details on each zombie measure. All other variables are as defined in Table A1. Standard errors are clustered by borrower-bank.