Unearthing Zombies: Regulatory Intervention to Aid Bankruptcy Reform

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November 13, 2019

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Motivation

- Strong creditor rights facilitate the process of growth and development (Levine 1998; La Porta et al. 1997)
- Weak creditor rights can disincentivize banks from recognizing bad assets
- Weakly capitalized banks disincentived from recognizing bad assets (Acharya et al. 2017)
- Non-recognition of bad assets can promote "zombie" lending
  - Lending to insolvent borrowers kept afloat solely by bank credit (Caballero et al. 2008)
  - Zombie lending reduces firm entry and investment, both within and across sectors (Caballero et al. 2008)
- This paper: are legislative interventions to strengthen creditor rights sufficient to eliminate zombie borrowers?

Research Questions

- Can regulatory interventions compel banks to recognize zombie borrowers as non-performing assets?
  - Contrast the role of regulatory guidelines introduced by the RBI vis-a-vis reforms to bankruptcy code
  - Guidelines made it harder for banks to delay the recognition of bad assets
  - Guidelines eliminated lender discretion in initiating bankrupcty proceedings for large bad assets
- Are regulatory interventions more effective in increasing recognition of bad assets in under-capitalized banks
  - Under-capitalized banks have higher incentives to engage in zombie lending in an effort to avoid recognition of losses
- Downstream effects:
  - Do the regulatory interventions lead to reallocation of credit towards creditworthy borrowers?

Contributions

- Zombie lending:
  - Large literature documenting the negative effects of zombie lending
  - Limited work on how to arrest zombie lending
  - This paper: shows that regulatory interventions eliminating lender discretion can limit zombie lending
- Creditor rights and bank lending
  - Alecnar and Ponticelli (2016): Law is not enough, need efficient courts
  - This paper: law is not enough, need a credible regulator in an environment with under-capitalized banks

Outline

- Background of Regulatory and Legislative Interventions
- Conceptual Framework
- Data and Descriptive Trends
- Results

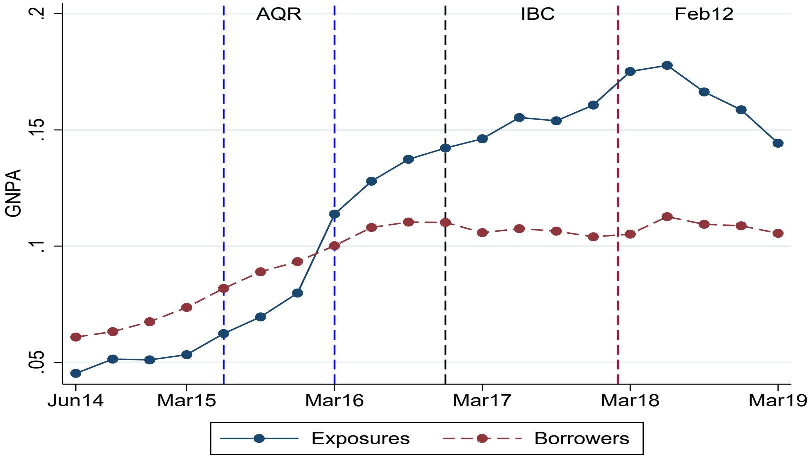
Nudging Lenders to Recognize Bad Assets: Timeline of Recent Interventions

- June 2015-March 2016: Asset Quality Review (AQR)
  - RBI pushes banks to recognize non-performing assets (NPA)
- May 2016-December 2016: Insolvency and Bankruptcy Code (IBC)
  - Legislative intervention to aid lenders' recovery of bad assets
  - Time-bound resolution of insolvency process
- May 2017: NPA ordinance
  - RBI empowered to direct banks to refer select borrowers to the IBC

February 12 Circular: Central Bank's Sledge Hammer

- Unanticipated intervention by RBI on February 12, 2018 (Feb12 Circular)
- Advances recognition of defaults
  - Banks mandated to recognize borrowers as defaulters immediately and initiate resolution process
- Time-bound bankruptcy initiation for delinquent borrowers
  - **Borrowers with debt $>$ Rs. 20bn:** bankruptcy proceedings if no resolution within 180 days of *first default*
  - **Information intervention:** similar guidelines upcoming for borrowers with debt between Rs. 1-20bn
- Eliminates "restructuring"
  - Regulatory forbearance schemes such as rollover of credit and soft repayment schedules withdrawn with immediate effect
  - Restructured borrowers downgraded to non-performing

Quarterly Gross NPA Ratio



Conceptual Framework: Why Should Regulatory Intervention Affect Recognition of Zombie Borrowers?

- Pre Feb12: Banks recognize default after 90 days
  - Defaults between 0-90 days costless for borrower and lender
- Post Feb12: Advancement in recognition of default
  - Lenders must recognize default with immediate effect
  - Information intervention: If RBI is credible, banks would be anticipating new guidelines for large defaulters
- Post Feb12: Arrest zombie lending via restructuring
  - 50% of restructured borrowers can be classified as "zombies"
- *Hypothesis 1: NPA recognition for "large" zombie borrowers (Debt $>$ Rs. 1bn) will increase post Feb12 circular*

Conceptual Framework: Regulatory Interventions vs Bankruptcy Reforms

- Pre-Feb12: Lender discretion in initiating bankruptcy proceedings against delinquent borrowers
  - To initiate bankruptcy proceedings, banks need to recognize borrowers as NPA
  - NPA recognition: immediate provisioning costs for lenders
- Bank's tradeoff for recognizing a delinquent borrower of size B
  - Provision .15*B today and receive $\frac{h*B}{1+\delta}$ in the future
  - Disincentive for under-capitalized banks to recognize large delinquent borrowers
- Feb12 circular: Eliminates lender discretion in bankruptcy proceedings for large borrowers
- *Hypothesis 2: NPA recognition for large zombie borrowers would be weaker pre-Feb12 in under-capitalized banks*

Data

- Borrower-level data from CRILC
  - Quarterly borrower-bank panel for all borrowers with aggregate exposures exceeding Rs. 50 million
  - 20 quarters of data since quarter ending June 2014
- Key variables reported:
  - Outstanding debt (exposures) for borrower-bank combination
  - Asset quality
  - External credit rating
  - Industry of operation
- Non performing assets: No repayment in excess of 90 days
- Special mention accounts (SMA):
  - SMA2: No repayment for 60-90 days; all other lenders informed of a borrower's SMA2 status through CRILC

Detecting Zombie Lending

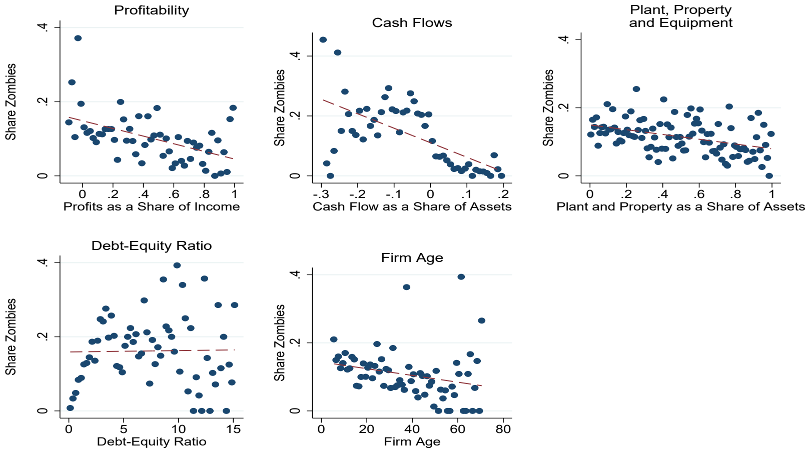
- Qualifying zombie lending relationships:
  - Caballero et al. (2008): firms receiving subsidized credit
  - Acharya et al. (2017): firms receiving credit at rates lower than AAA rated firms
- Major drawback of CRILC data:
  - No information on interest rates
- This paper: borrower has a zombie relationship with a bank if between June 2014 and March 2016:
  - At least 1 SMA2 report by any bank in CRILC
  - Positive growth in exposures *post* SMA2 reporting
  - Never rated AAA or AA
  - No new banking relationship
- Verify CRILC-based zombie measure using firm-level data from Prowess for matched sub-sample
- Test sensitivity of results with alternate definition of zombie borrowers using Prowess

Zombie and Non-Zombie Borrowers: Pre-Treatment Summary Characteristics

Table 1: Zombies vs Non-Zombies: June 2014-March 2015

	(1) Zombies	(2) Non-Zombies
Exposures - Rs. Billions	.744	.447
Growth in Exposures	.091	.081
Investment Grade	.169	.213
Non-Investment Grade	.356	.207
Unrated	.475	.580
Public Sector Bank	.812	.621
Banks with Low Tier 1 Capital	.417	.243
Banking Relationships	4.75	3.05
Restructured Asset	.143	.031
Standard Asset	.581	.848
NPA	.060	.059
SMA2	.249	.041
SMA0	.039	.028
SMA1	.071	.024
Private	.776	.800
Government Owned	.012	.019
Public Sector	.144	.134
Industries	.496	.459
Services	.333	.353

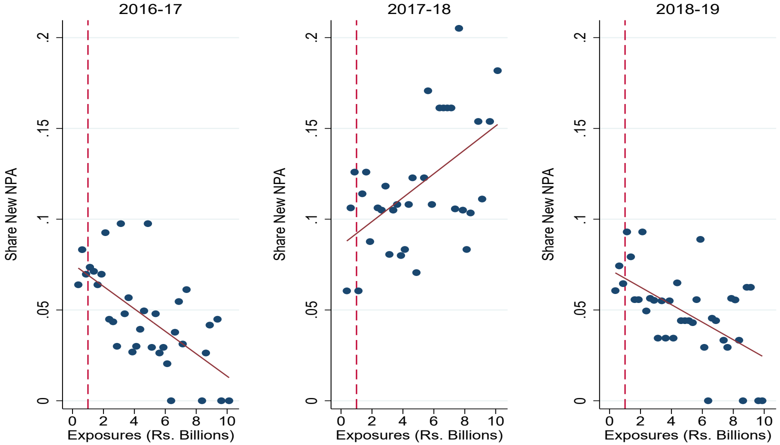
Pre-Treatment Financial Characteristics of Zombie Borrowers



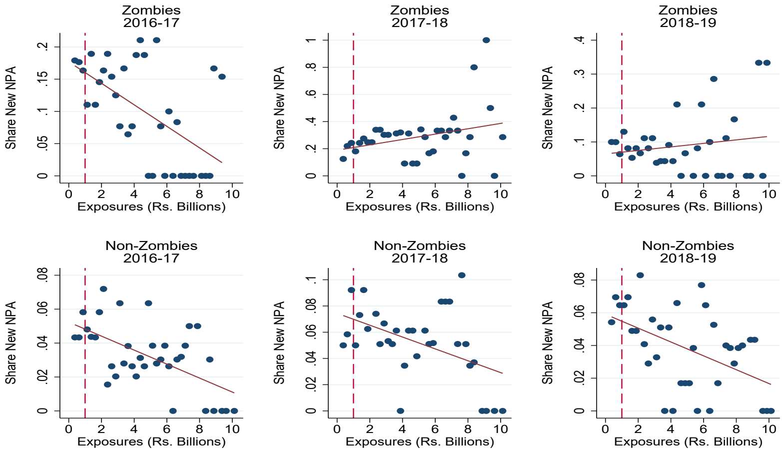
Non-Parametric Relationship Between NPA Recognition and Borrower Size for Zombie and Non-Zombie Borrowers

- Restrict sample to borrowers observed in end-March quarters of years 2017, 2018 and 2019
- Define $NewNPA = 1$ if borrower is NPA in March of year t but not March t-1
- Compute unconditional mean of *NewNPA* in 0.25 billion bins of exposures
- Disaggregate by zombie and non-zombie borrowers

New NPA and Borrower Size: Non-Parametric Relationship



New NPA and Borrower Size: Non-Parametric Relationship by Zombies and Non-Zombies



Empirical Strategy: Difference-in-Difference Specification

- Average treatment effect for ex-ante zombie borrowers

$$Y_{ijbt} = \alpha_{ib} + \gamma_{jt} + \beta_1 Post_t * Zombie_{ijb} + \eta \mathbf{X}_{ijbt} + \epsilon_{ijbt} \quad (1)$$

- Outcome of interest:
  - Probability of borrower i, operating in industry j, borrowing from bank b is NPA in time t
  - Logged NPA exposures of borrower i in bank b and time t
- Bankruptcy reform (IBC): $Post = 1$ for $Dec16 > t \leq Dec17$
- Regulatory intervention (Feb12): $Post = 1$ for $t > Dec17$
- α and γ: borrower-bank and 2-digit industry-time FE
- Restrict sample to 12 quarters between June 2016 and March 2019
- Cluster by borrower-bank

Empirical Strategy: Identifying Variation

- Regulatory intervention is a sudden unanticipated shock
  - Banks and firms had no prior knowledge about Feb12 circular
  - RBI mandated immediate compliance
  - Unlikeley that borrowers and banks would have anticipated the regulatory guidelines
- Borrower-bank fixed effects: control for time-invariant factors governing borrower-bank relationship
- Industry-quarter fixed effects: control for time-varying industry specific-shocks
- Threats to identification:
  - Within-industry time-varying shocks affecting individual borrower's repayment abilities
  - Time-varying changes in banks' recognition of borrowers as NPA

Regulatory Intervention vs Bankruptcy Reform for Zombie Borrowers

Table 2: Baseline Results

	(1)	(2)	(3)	(4)	(5)	(6)
		Pr(NPA = 1)			NPA Exposures (Log)	
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post\ Feb12}$	.032***		.038***	.172***		.201***
	(.007)		(.009)	(.036)		(.042)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post\ IBC}$		.015**	.012*		.063**	.051*
		(.006)	(.006)		(.030)	(.030)
Observations	130822	83309	130822	130822	83309	130822
R^2	.86	.89	.86	.85	.88	.85
Dep Var Mean	.15	.15	.15	19.28	19.28	19.28
Borrower-Bank FE	Y	Y	Y	Y	Y	Y
Industry Time FE	Y	Y	Y	Y	Y	Y

Exploiting the Variation in Applicability of Regulatory Intervention Across Exposure Threshold

- Examine hypothesis 1 by testing for differential impact of Feb12 circular for larger borrowers
    - Validates the identification strategy as the Feb12 circular is expected to have an augmented impact on NPA recognition for larger borrowers
- Estimate a triple difference specification to identify differential effect of IBC and Feb12 circular across borrowers with exposures in excess of Rs. 1bn

Differential Effect of Regulatory Intervention and Bankruptcy Reform for Large Zombie Borrowers

Table 3: Differential Effects by Exposure Size

	(1)	(2)	(3)	(4)	(5)	(6)
	Pr(NPA = 1)			NPA Exposures (Log)		
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post\ Feb12}$	.005		.014	-.046		-.031
	(.009)		(.010)	(.035)		(.042)
$\mathbb{1}_{Exp>1Bn} * \mathbb{1}_{Post\ Feb12}$	.015***		.018**	.180***		.226***
	(.006)		(.007)	(.027)		(.033)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Exp>1Bn} * \mathbb{1}_{Post\ Feb12}$	.056***		.051***	.451***		.478***
	(.013)		(.016)	(.066)		(.077)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post\ IBC}$		.017**	.016**		.030	.028
		(.008)	(.008)		(.031)	(.031)
$\mathbb{1}_{Exp>1Bn} * \mathbb{1}_{Post\ IBC}$		.002	.005		.064***	.072***
		(.005)	(.005)		(.022)	(.022)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Exp>1Bn} * \mathbb{1}_{Post\ IBC}$		-.005	-.009		.066	.047
		(.011)	(.011)		(.053)	(.053)
Observations	130822	83309	130822	130822	83309	130822
R^2	.86	.89	.86	.85	.88	.85
Dep Var Mean	.15	.15	.15	19.28	19.28	19.28
Borrower-Bank FE	Y	Y	Y	Y	Y	Y
Industry Time FE	Y	Y	Y	Y	Y	Y

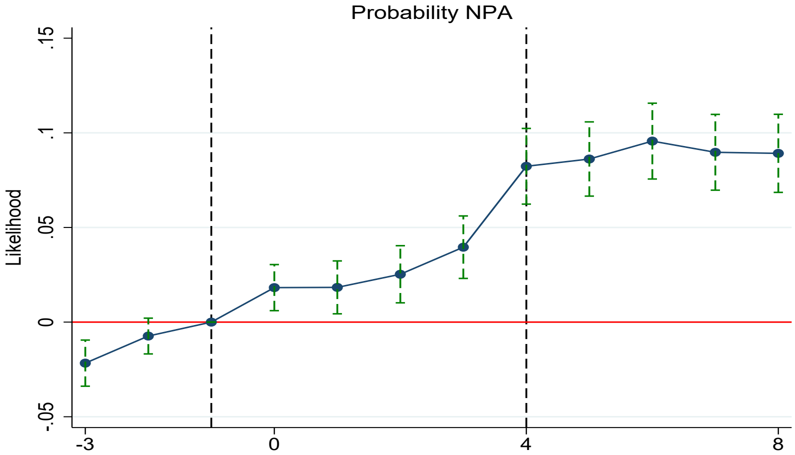
Testing for Pre-Trends: Distributed Lag Specification

- Validate the difference-in-difference strategy by testing for pre-trends using a distributed-lag specification

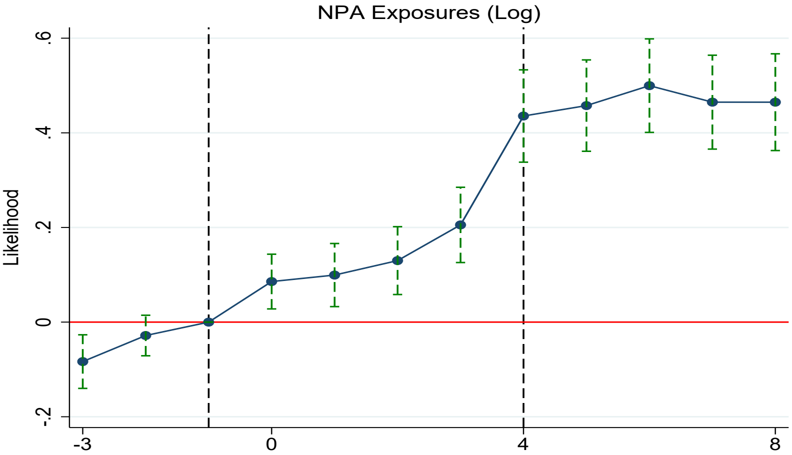
$$
\begin{aligned}
Y_{ijbt} = {} & \alpha_i + \gamma_{jt} \\
& + \sum_{q=-3}^{8} \beta_q Zombie_{ijb} * D_{Dec16+q} + \eta \mathbf{X}_{ijbt} + \epsilon_{ijbt} \qquad (2)
\end{aligned}
$$

- Reference period: Quarter ending December 2016
- Feb12 circular effective 5 quarters post reference period

Quarterly Treatment Effects on NPA Likelihood



Quarterly Treatment Effects on NPA Exposures



Structural Break in NPA Recognition Due to the Regulatory Intervention?

- Does the increase in NPA recognition coinciding with Feb12 circular constitute a structural break?
  - Test for a structural break using Greenstone and Hanna's (2014) framework

$$\hat{\beta}_q = \pi_0 + \pi_1 \mathbb{1}(Post\ IBC)_q + \pi_2 \mathbb{1}(Post\ Feb12)_q + \pi_3 q + \pi_4 \mathbb{1}(Post\ IBC)_q * q + \pi_5 \mathbb{1}(Post\ Feb12)_q * q + \psi_q \quad (3)$$

- For structural break:
  - $\pi_2 > \pi_1 \geq 0$
  - $\pi_5 \leq \pi_4 \leq 0$

Differential Effect of Regulatory Intervention and Bankruptcy Reform for Large Zombie Borrowers

Table 4: Structural Break in NPA Recognition

	(1)	(2)	(3)	(4)	(5)	(6)
	Pr(NPA = 1)			NPA Exposures (Log)		
$\mathbb{1}_{Post\ IBC}$	.035***	.020**	.018	.167***	.097**	.037
	(.006)	(.007)	(.013)	(.030)	(.035)	(.064)
$\mathbb{1}_{Post\ Feb12}$	.098***	.063***	.103***	.502***	.340***	.519***
	(.006)	(.013)	(.016)	(.029)	(.063)	(.077)
Trend		.004**	.011**		.020**	.042**
		(.002)	(.003)		(.007)	(.015)
$\mathbb{1}_{Post\ IBC}$*Trend			-.004			-.003
			(.004)			(.018)
$\mathbb{1}_{Post\ Feb12}$*Trend			-.009**			-.035*
			(.004)			(.017)
Observations	12	12	12	12	12	12
R^2	.97	.98	.99	.97	.99	.99

Differential Effects of Regulatory Intervention and Bankruptcy Reform for Under-capitalized Banks

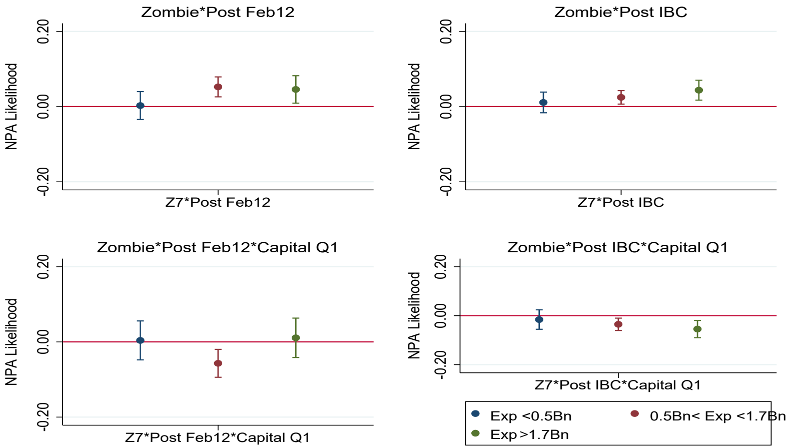
- Examine hypothesis 2 by identifying differential effects across banks closest to regulatory threshold
  - Classify banks falling in the lowest quartile of capital-assets ratio as those closest to regulatory threshold
  - Capital measured using tier I capital (shareholder capital)
  - Banks' tier I capital to assets ratio based on average tier I capital assets ratio between 2012-2015
- For effects across borrower size, split sample by borrowers' initial exposures in banks
  - 3 bins based on 25th (Rs. 0.5bn) and 75th (Rs. 1.7bn) percentiles of initial borrower exposure
- Expect Feb12 circular to have highest impact for borrowers in the top quartile of exposures
- Expect IBC to have least impact for borrowers in the top quartile of exposures in banks closest to regulatory threshold

Differential Effect of Regulatory Intervention and Bankruptcy Reform Across Banks Closest to Regulatory Threshold

Table 5: Differential Effects Across Banks Closest to Regulatory Threshold

	(1)	(2)	(3)	(4)	(5)	(6)
	Pr(NPA = 1)			Log(NPA Exposures)		
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post\ Feb12}$	.033***		.049***	.167***		.240***
	(.009)		(.011)	(.047)		(.055)
$\mathbb{1}_{Low\ Capital} * \mathbb{1}_{Post\ Feb12}$	-.001		.004	-.026		-.003
	(.006)		(.007)	(.030)		(.035)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Low\ Capital} * \mathbb{1}_{Post\ Feb12}$	-.003		-.025	.011		-.087
	(.013)		(.016)	(.068)		(.079)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Post\ IBC}$		.032***	.028***		.144***	.127***
		(.008)	(.008)		(.038)	(.038)
$\mathbb{1}_{Low\ Capital} * \mathbb{1}_{Post\ IBC}$		.010*	.009*		.042*	.040*
		(.005)	(.005)		(.025)	(.024)
$\mathbb{1}_{Zombie} * \mathbb{1}_{Low\ Capital} * \mathbb{1}_{Post\ IBC}$		-.041***	-.038***		-.185***	-.172***
		(.011)	(.011)		(.053)	(.053)
Observations	130822	83309	130822	130822	83309	130822
R^2	.86	.89	.86	.85	.88	.85
Dep Var Mean	.15	.15	.15	19.28	19.28	19.28
Borrower-Bank FE	Y	Y	Y	Y	Y	Y
Industry Time FE	Y	Y	Y	Y	Y	Y

Differential Effects of Feb12 Circular and IBC Across Banks Closest to Regulatory Threshold in Initial Exposure Size Bins



Regulatory Intervention and Bankruptcy Reform on Zombie Borrowers: Summary of Results

- Regulatory intervention increases the recognition of zombie borrowers as NPA
    - Impact of regulatory intervention significantly higher than bankruptcy reform
    - Regulatory intervention: significantly higher impact on recognition of large zombie borrowers as NPA
    - Bankruptcy reform: muted impact on NPA recogntion of large zombie borrowers in weakly capitalized banks
    - Possible entrenched factors continue to hinder NPA recognition in weakly capitalized banks post Feb12 circular
- Results highlight the complementary role of regulatory interventions in aiding bankruptcy reform
- Results robust to alternate classification of zombies and restriction of sample to borrowers around Rs. 1bn threshold
- Results not driven solely via restructured borrowers

Downstream Effects of Regulatory Interventions on Credit Disbursement

- Does the enhanced recognition of non-performing assets lead to higher credit disbursement by lenders?
- Possible avenues for higher liquidity for banks
  - Reduction in zombie lending
  - Reduction in strategic default for borrowers with the ability to pay
  - Lenders anticipate future recovery of bad assets due to insolvency proceedings

Downstream Effects of Regulatory Interventions on Credit: Primary Hypotheses of Interest

- Do lenders increase credit to healthy borrowers?
  - Measure borrower health based on external credit rating of borrowers - borrowers rated AAA-BBB are "creditworthy"
- Do banks lend more to "large" borrowers for whom creditor rights are strengthened?
  - Test for differential effects across borrowers with exposures in excess of Rs. 1Bn
- Does the increase in credit occur along the intensive or extensive margin?

Downstream Effects of Regulatory Interventions on Credit: Empirical Specification

$$Y_{ijbt} = \alpha_{ib} + \gamma_{jt} + \beta_1 IG_{ijbt} * Post_t + \beta_2 Large_{ijbt} * Post_t + \beta_3 IG_{ijbt} * Large_{ijbt} * Post_t + \eta \mathbf{X}_{ijbt} + \epsilon_{ijbt} \quad (4)$$

- Outcomes of interest:
  - Logged exposures
  - Dummy equaling 1 if a borrower starts a new banking relationship
- *IG*: Dummy equaling 1 if borrower is rated AAA-BBB
- β_1: Differential impact of Feb12 circular on small healthy borrowers
- β_2: Differential impact of Feb12 circular for non-creditworthy large borrowers
- β_3: Differential impact of Feb12 circular for large healthy borrowers

Impact of Regulatory Intervention on Credit Disbursement

Table 6: Reallocation to Healthy Borrowers

	(1)	(2)	(3)	(4)
	Exposures (Log)		Pr(New Bank Relation = 1)	
$\mathbb{1}_{Exp>1Bn} * \mathbb{1}_{Post\ Feb12}$		.020		-.009***
		(.015)		(.003)
$\mathbb{1}_{Post\ Feb12} * \mathbb{1}_{Investment\ Grade}$	.048***	.021***	-.007***	-.007***
	(.007)	(.006)	(.001)	(.001)
$\mathbb{1}_{Post\ Feb12} * \mathbb{1}_{Unrated}$	.006	.006	-.063***	-.064***
	(.004)	(.004)	(.001)	(.001)
$\mathbb{1}_{Exp>1Bn} * \mathbb{1}_{Post\ Feb12} * \mathbb{1}_{Investment\ Grade}$		.067***		.013***
		(.018)		(.004)
$\mathbb{1}_{Exp>1Bn} * \mathbb{1}_{Post\ Feb12} * \mathbb{1}_{Unrated}$		.014		.023***
		(.019)		(.005)
Observations	983413	983413	983413	983413
R^2	.91	.92	.27	.27
Dep Var Mean	99.29	99.29	.15	.15
Borrower-Bank FE	Y	Y	Y	Y
Industry Time FE	Y	Y	Y	Y

Downstream Effects of Regulatory Interventions on Credit: Additional Hypotheses of Interest

- Does credit disbursement increase differentially in banks with relative higher exposure to zombie borrowers?
  - If zombie lending has reduced, these banks should face a positive liquidity shock
  - Identify differential effects of regulatory intervention across banks with ex-ante high share of zombie borrowers
- Which sectors witness an expansion in credit?
  - Creative destruction: if credit issued to borrowers in sectors with high ex-ante share of zombies
  - Sectoral reallocation: if credit issued to borrowers in sectors with low ex-ante share of zombies
  - Identify differential effects of regulatory intervention across industries with ex-ante high share of zombie borrowers

Regulatory Intervention and Credit Disbursement: Sources of Credit and Sectoral Reallocation

Table 7: Differential Effects Across Zombie Banks and Industries

	(1)	(2)	(3)	(4)
	Exposures (Log)		Pr(New Bank Relation = 1)	
$\mathbb{1}_{Investment\ Grade} * \mathbb{1}_{Post\ Feb12}$	.031***	.044***	.006***	-.011***
	(.009)	(.014)	(.002)	(.003)
$\mathbb{1}_{Unrated} * \mathbb{1}_{Post\ Feb12}$	-.006	.005	-.061***	-.063***
	(.005)	(.008)	(.002)	(.003)
$\mathbb{1}_{Zombie\ Bank} * \mathbb{1}_{Post\ Feb12}$	-.033***		.029***	
	(.006)		(.002)	
$\mathbb{1}_{Zombie\ Bank} * \mathbb{1}_{Investment\ Grade} * \mathbb{1}_{Post\ Feb12}$	.054***		-.029***	
	(.015)		(.003)	
$\mathbb{1}_{Zombie\ Bank} * \mathbb{1}_{Unrated} * \mathbb{1}_{Post\ Feb12}$	.028***		-.004	
	(.008)		(.003)	
$\mathbb{1}_{Zombie\ Industry} * \mathbb{1}_{Investment\ Grade} * \mathbb{1}_{Post\ Feb12}$		.014		.006*
		(.015)		(.003)
$\mathbb{1}_{Zombie\ Industry} * \mathbb{1}_{Unrated} * \mathbb{1}_{Post\ Feb12}$		.001		-.001
		(.009)		(.003)
Observations	823422	823019	823422	823019
R^2	.90	.90	.27	.27
Dep Var Mean	98.41	98.41	.15	.15
Firm FE	Y	Y	Y	Y
Industry Time FE	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y

Downstream Effects of Regulatory Interventions on Credit Disbursement: Summary of Results

- Lenders expand credit to large borrowers post regulatory intervention
  - Credit increase concentrated towards investment grade borrowers
- No withdrawal of lending from sectors with ex-ante high share of zombie borrowers
  - Partial support for findings of Caballero et al. (2008) that zombie firms hurt healthy non-zombie firms in the same sector
- Increase in credit primarily along the intensive margin

Conclusion and Future Research

- Regulatory interventions can aid in the elimination of zombie borrowers from the banking system
  - Bankruptcy reform is necessary but not sufficient to eliminate zombie relationships: need a credible regulator in an environment with large delinquent borrowers in under-capitalized banks
- Lenders respond to improved creditor rights by expanding credit to healthier borrowers
- Future research:
  - Do under-capitalized banks proxy for other factors such as rent-seeking/corruption?
  - Identify impact of higher credit disbursement by banks on firm-level outcomes