Creditor Rights and Allocative Distortions – Evidence from India

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Creditor rights and Allocative Distortions

- Large literature on creditor rights and impact on credit access
  - $+$: Due to higher payoffs (La Porta et. al (1998)).
  - $-$: Due to liquidation bias ((Hart and Moore (1994), Vig (2012)).
  - Heterogeneous impact: Lilienfeld-Toal, Mookherjee and Visaria (2012).
- This paper: focuses on the general equilibrium effects of creditor rights.
- Delays in creditors' ability to seize defaulters' assets prevents reallocation of resources to their best use.
  - Lower creative destruction leading to spurious allocation of resources (Caballero et al. (2008)).
  - "Evergreening" and "zombie" distortions due to a poor institutional setting.

Do improvements in creditor rights lead to a better allocation of debt?

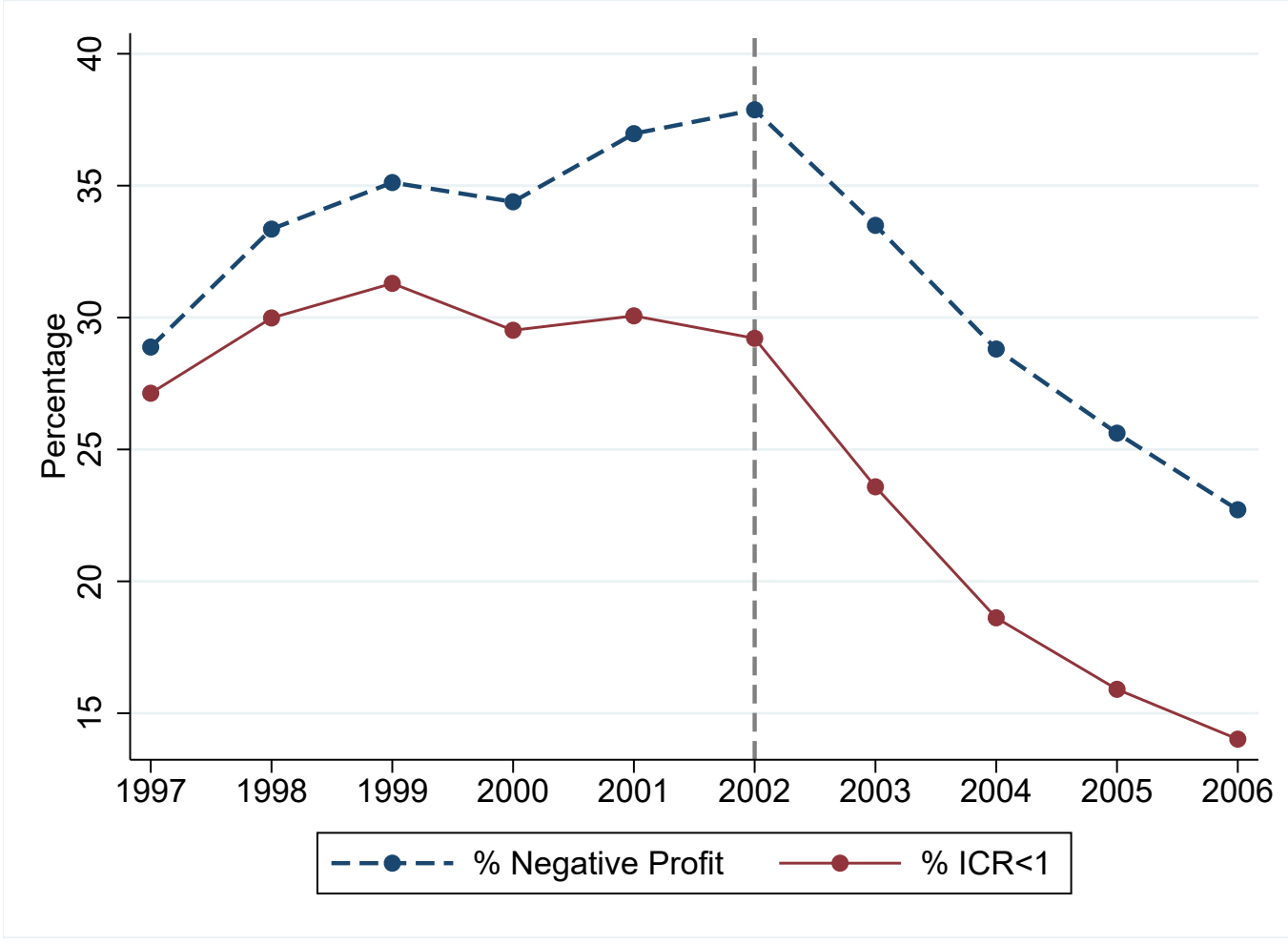
This paper . . .

My setting: Exploit a collateral reform in 2002 in India that made it easier for creditors to seize secured assets.

- Step 1: Examine reallocation of debt away from low quality borrowers to high quality borrowers (Partial Equilibrium).
- Step 2: Examine whether this is partly driven by the reduction in zombie firms.
- Step 3: Examine spillovers on non-zombies due to reduction in zombie distortions (General Equilibrium).
- Step 4: Examine productive efficiency at the industry level.

Motivation: Impact of 2002 Collateral reform

Borrower quality and Firm Profitability



ICR=EBIT/Interest Expense

Borrower quality & firm profitability improved drastically!

Preview of Findings

- Reallocate resources from "low quality" borrowers to "high quality" borrowers.
  - Reduction in secured borrowings of "low quality" borrowers by INR 38 million (76 %) but no similar impact on *unsecured* borrowings.
- Reduction in secured borrowings partly driven by reduction in zombie lending ("evergreening").
- Spillover effects on non-zombies due to reduction in zombie distortions.
  - Secured Debt, CapEx and employment of **non-zombies** ↑ in previously zombie-dominated industries.
- Improvement in productive efficiency:
  - Significant increases in the reallocation of labor and capital within industries towards firms with higher marginal products of labor and capital.

Relation to Literature

- Literature focuses on creditor rights and partial equilibrium effects on
  - Leverage (Acharya, Sundaram and John (2004))
  - Corporate risk-taking (Acharya, Amihud, Litov (2009))
  - On aggregate lending (Djankov, McLeish, and Shleifer (2007, 2008); Haselmann, Pistor and Vig (2006)); (Hart and Moore (1994); Lilienfeld-Toal, Mookherjee and Visaria (2012).
    - Vig (2012): SARFAESI to show high tangibility firms had lower debt to assets.
- Misallocation of resources
  - Hsieh and Klenow (2009), Duranton, Ghani, Goswami and Kerr (2015).
- Zombie distortions
  - Caballero, Hoshi, and Kashyap (2008) look at zombie distortion in Japan in 90's, Acharya et. al (2017).

This paper examines how improvement in creditor rights corrects allocative distortions.

Plan for Today

1. Data and institutional details.
2. Partial equilibrium effects on borrowing.
3. Zombie lending or evergreening of loans.
4. Spillovers on Debt and CapEx due to reduction in zombie distortions
5. Productivity efficiency of firms.
6. Robustness and additional results.

Data

- Firm-level data: Prowess Database.
- Bank data: RBI; Prime lending rate from State Bank of India (SBI).
- For baseline focus on 1997–2007.
- Supplement: Employment data at establishment level from Annual Survey of Industries (ASI) data.

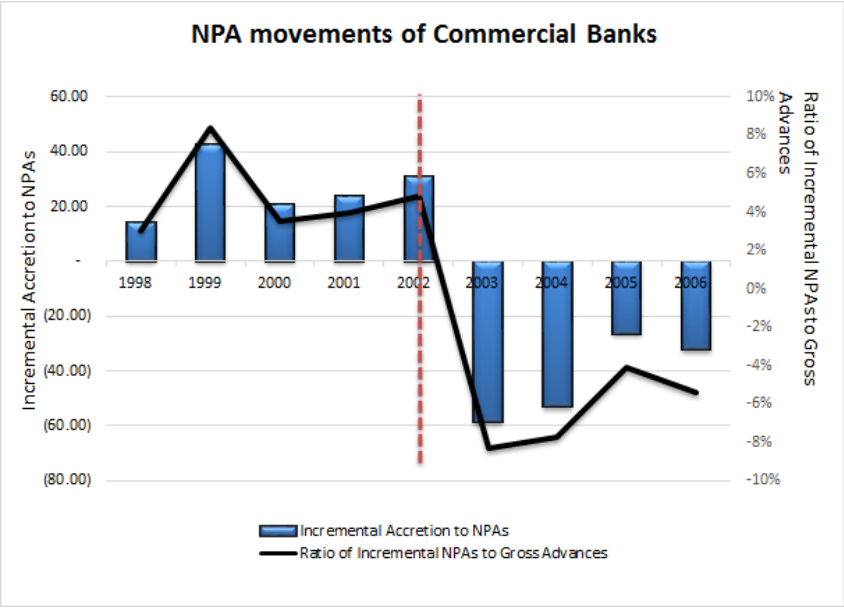
Data Item	Variables Used	Source
Item 1	Secured Borrowings = Change in Secured Debt	Derived from Prowess
Item 2	Unsecured Borrowings = Change in Unsecured Debt	Derived from Prowess
Item 3	Interest Rate Expense	Prowess
Item 4	Prime Lending Rate for Long-term Loans	SBI
Item 5	Interest Expense	Prowess
Item 6	Lending Rate for Short-term Loans	RBI/Prowess
Item 7	Interest Coverage Ratio (ICR) = EBIT/Interest Expense	Prowess
Item 8	Op. Margin= $\frac{EBITDA}{Sales}$	Prowess
Item 9	Plant and Machinery	Prowess
Item 10	Land and Building	Prowess
Item 11	Capital Work in Progress	Prowess
Item 12	Other Fixed Assets	Prowess
Item 13	Cash and Bank Balance	Prowess
Item 14	Marketable Securities	Prowess
Item 15	Specific Assets= Item 9 + Item 12	Derived from Prowess
Item 16	Non-specific Assets = Item 10+ Item 13+ Item 14	Derived from Prowess
Item 17	Tangibility = Specific assets / (Specific+Non-specific assets)	Derived from Prowess

Collateral Reform 2002

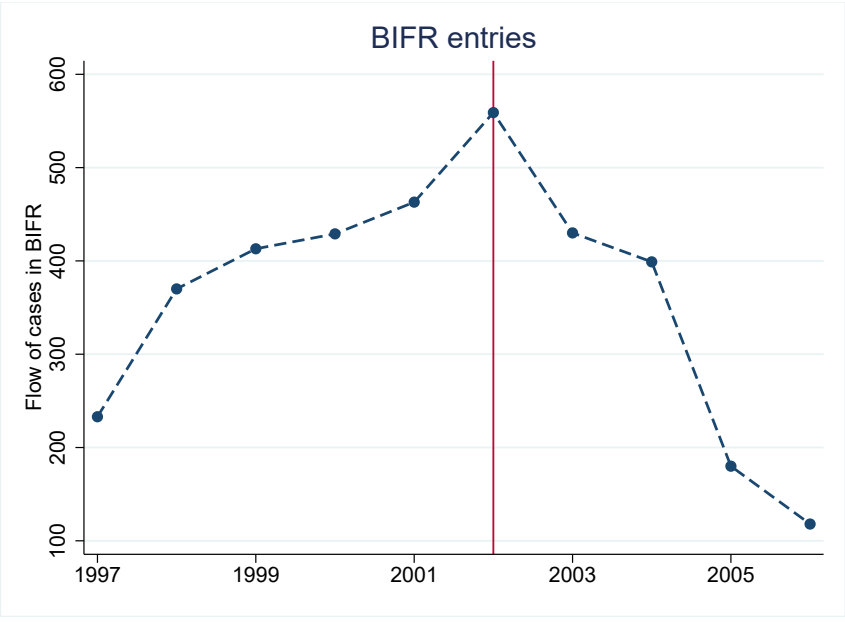
- Securitization and Reconstruction of Financial Assets and Enforcement of Security Interests Act of 2002 made it easier for secured lenders to seize secured assets of defaulting borrowers.
  - Pre: Lender subject to elaborate legal process.
  - Post: Lender can start liquidation process on defaulted borrowers (secured only).
- Effective on June 21, 2002.
- Board for Industrial and Financial Reconstruction (BIFR) in 1985 & Debt Recovery Tribunals (DRT) 90's
  - DRTs: specialized institutions to reduce delays in debt recovery suits.
  - DRT weak in effect because firms delay using BIFR (Baijal (2008)).
- 2002 collateral reform (till 2008) was "working" in that debtors were paying up (Raghuram Rajan Report 2009).

More Detail

Collateral reform had an immediate impact . . .



NPA movements



BIFRs filings

Significant NPA reductions and fixed BIFR loophole.

Low Quality Borrowers: Definition

- Define low quality borrowers in terms of interest coverage ratio (ICR).

$$Interest\ Coverage\ Ratio_i = \frac{Earning\ Before\ Interest\ and\ Taxes}{Interest\ Expense}$$

- Captures ability of firms to service existing debt.
- Borrowers are considered to be low quality if ICR below 1 in 2001.
- Baseline results robust to other profitability measures (ROA, average over 3 years).

Summary Statistics

By quality of borrowers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		Low Quality			High Quality		
Variables	Mean	SD	Pre	Post	t-stat on Diff.	Pre	Post	t-stat on Diff.
Secured Borrowings^{+}	45.23	191.6	51.74	37.54	(-4.78***)	30.96	56.52	(12.91***)
Unsecured Borrowings^{+}	3.160	17.20	1.020	4.260	(13.33***)	1.530	4.730	(18.28***)
Capital Expenditure^{+}	83.45	259.2	59.81	59.19	(-0.18)	78.02	106.7	(10.11)
Total Debt^{+}	1058	6552	1059	1363	(3.38***)	770.7	1141	(5.35***)
Secured Debt $^{+}$	506.1	1202	486.0	644.7	(7.72***)	393.6	538.1	(10.69***)
Unsecured Debt^{+}	253.6	802.7	246.7	311.5	(4.45***)	186.1	282.3	(10.21***)
Debt to Assets^{+}	0.340	0.340	0.450	0.560	(14.39***)	0.260	0.250	(-2.94***)
Log(Sales)	5.370	2.420	4.840	4.850	(0.12)	5.410	5.750	(13.11)
$\frac{EBITDA}{Total\ Assets}$	0.100	0.110	0.0300	0.0700	(23.56***)	0.130	0.110	(-14.54***)
Observations	52152		16457			35695		

$^{+}$ *INR million.*

Empirical Methodology - Baseline

Event Study

- Baseline:

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

  - where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects.
  - $\mathbb{1}_{Post} = 1$ for ($>= 2002$); $\mathbb{1}_{(LowQ)} = 1$ for "Low Quality" firms.
  - Control for Log(Sales) and EBITDA/total assets in baseline specification, S.E. clustered at the firm level.
  - y_{it}: Borrowings $= \Delta$ in secured debt (in INR million).

Concern: Does not account for factors unrelated to the collateral reform that *differentially* affected low quality borrowers.

Impact of Collateral Reform on Secured Borrowings

Event Study Analysis

Dependent Variable: Change in Secured Debt (Borrowings)

	(1)	(2)	(3)	(4)	(5)	(6)
	Low Quality	High Quality	Change in Secured Debt		*Change in Secured Debt / Assets*	
	(INR million)		*(INR million)*			
Post	-19.68***	18.29***				
	(3.824)	(2.237)				
Low Quality Borrower * Post			-46.11***	-39.79***	-0.0280***	-0.0239***
			(4.320)	(4.490)	(0.00286)	(0.00292)
Baseline Mean	51.74	30.96	51.74	51.74	0.043	0.043
No. of Obs.	16457	35695	52152	52152	45840	45840
R squared	0.399	0.341	0.360	0.362	0.261	0.265
Firm Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	N	N	Y	Y	Y	Y
Controls	N	N	N	Y	N	Y

Low quality firms ↓ secured borrowings by INR 40 million (78%) relative to high quality borrowers after the collateral reform.

Baseline robust to different subsets . . .

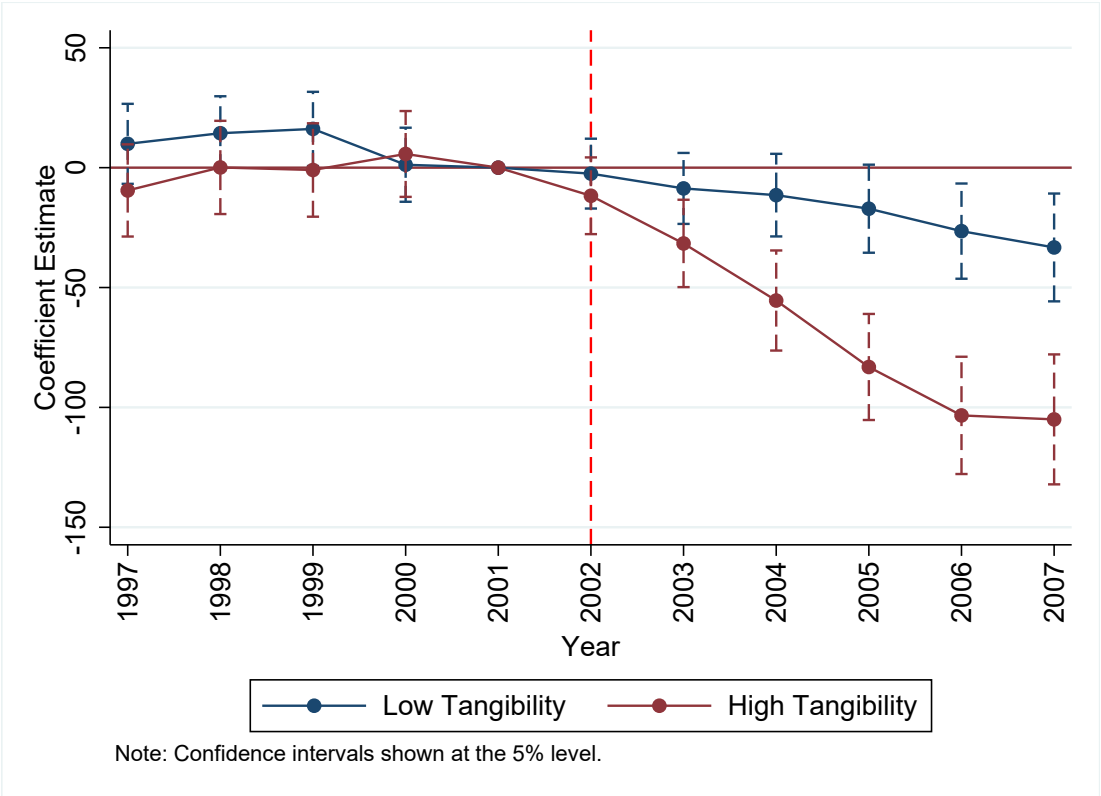
	(1) LQ Borr*Pos	(2) No. of Obs	(3) R-sq.
High Rated	-170.6**	2211	0.294
	(71.04)		
Low Rated.	-36.68***	49251	0.368
	(4.018)		
Manuf	-49.18***	31537	0.357
	(6.094)		
Non-manuf	-18.04***	19925	0.366
	(5.941)		
Age$<=$ 5*yrs*	-16.36**	17577	0.388
	(6.549)		
Age$>$ 5*yrs*	-46.85***	33885	0.351
	(5.681)		
Listed	-52.63***	28168	0.368
	(6.756)		
Non-Listed	-15.71***	23294	0.369
	(4.975)		
2 year window	-23.09***	25997	0.480
	(4.863)		
1 year window	-15.04**	16182	0.616
	(6.325)		

Results stronger for higher rated, manufacturing, older, listed firms and for a tighter window.

Towards Causality: Exploit tangibility

Event Study plots

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



Identification: Exploit collateral reform only applies to secured borrowers (ex-ante tangibility of firms).

Towards Causality: Exploit tangibility

Difference-in-Difference-in-Difference (DiDiD)

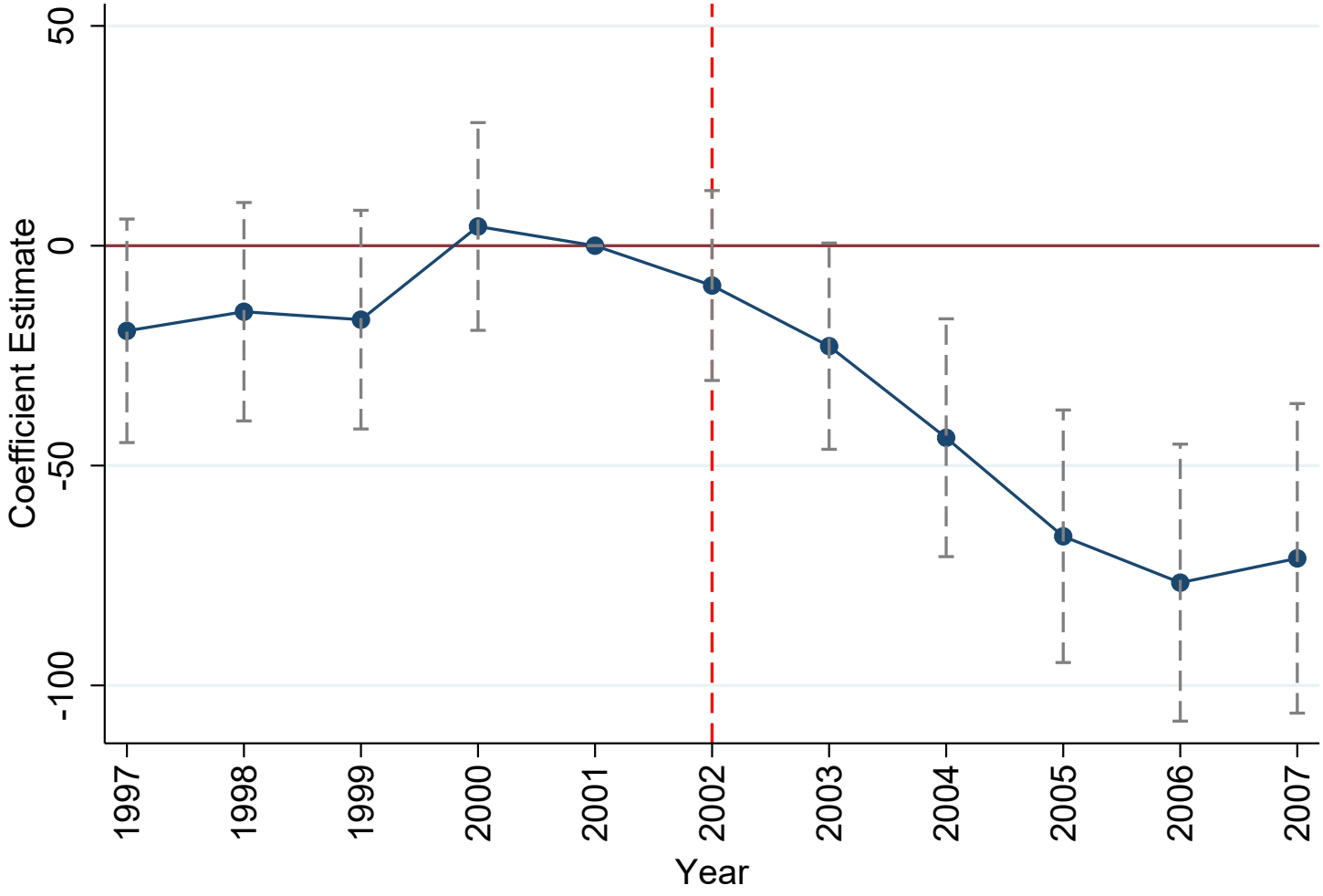
- Heterogeneity across firms with high vs. low tangible assets.

$$y_{it} = \alpha_i + \gamma_t$$
$$+\eta \times \mathbb{1}_{Post} \times \mathbb{1}_{(LowQ)} + \nu \times \mathbb{1}_{Post} \times \mathbb{1}_{(HighT)}$$
$$+\phi \times \mathbb{1}_{Post} \times \mathbb{1}_{(LowQ)} \times \mathbb{1}_{(HighT)} + \epsilon_{ijt}$$

- where i indexes firms, t indexes time, α_i and γ_t are firm and year fixed effects.
- $\mathbb{1}_{(HighT)} = 1$ for "High Tangibility" firms, that is, in excluding the bottom tercile of Tangibility Ratio.
- $\mathbb{1}_{Post} = 1$ for years when SARFAESI is in effect ($>= 2002$).
- $\mathbb{1}_{(LowQ)} = 1$ for "Low Quality" firms, that is, in bottom tercile of Interest Coverage Ratio.
- ϕ is the estimate of interest.
- S.E. clustered at the firm level.

Intuition: Control for factors not related to the collateral reform that *differentially* affected LowQ relative to HighQ borrowers by differencing out LowQ-HighQ of low tangibility firms.

Impact of Collateral Reform on Secured Borrowings



Note: Confidence intervals shown at the 5% level.

Impact of Collateral Reform on Secured Borrowings

DiDiD Specification

Dependent Variable: Change in Secured Debt (Borrowings)

	(1) Low Quality	(2) High Quality	(3)	(4)
Low Quality * Post			-22.19***	-16.77***
			(4.869)	(4.931)
High Tangibility * Post	-26.59***	12.01**	12.41**	12.19**
	(6.411)	(4.783)	(4.846)	(4.805)
Low Quality * Post * High Tangibility			-39.08***	-37.81***
			(8.023)	(8.059)
No. of Obs.	16437	35502	51939	51939
R squared	0.403	0.347	0.359	0.361
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	N	Y

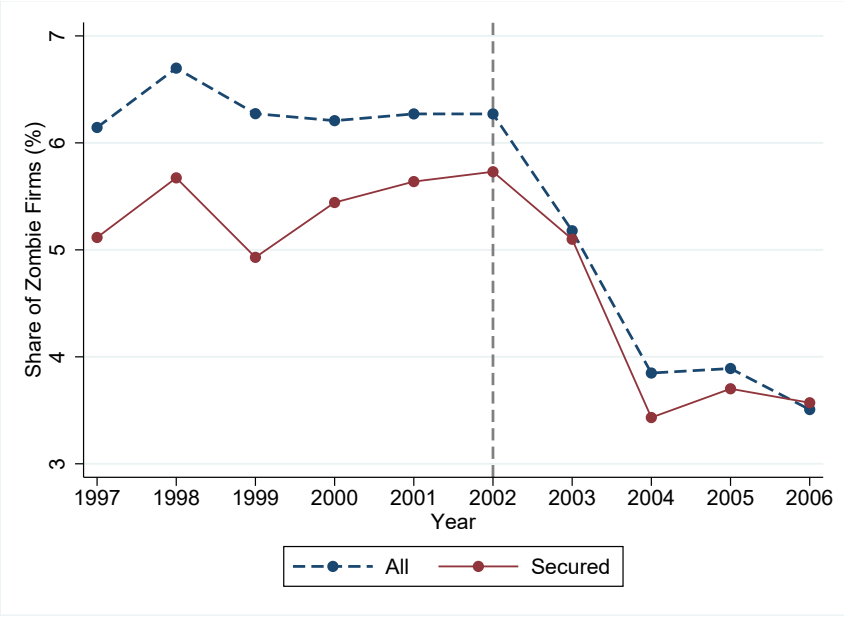
Low quality firms ↓ secured borrowings by INR 38 million (73%). Unsecured

Is Reduction in Borrowing due to Reduction in Zombie Lending?

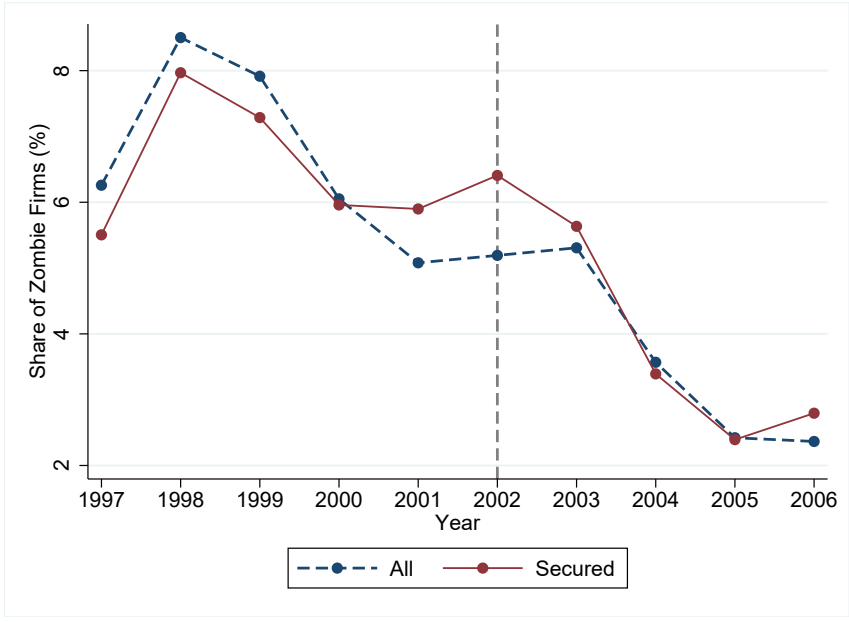
- Examine whether this is due to a reduction in evergreening of loans.
- Zombies defined as firms that receive subsidized credit.
- Ideal data: Compare the interest rates of new loans of poor quality borrowers to the interest rates of highest rated firms.
  - Given our data: Start with Caballero, Hoshi and Kashyap (2008) to identify zombies.
    - Classified as zombies if Interest expense $<$ interest expense of most creditworthy firms.
  - Above classification ignores profitability of loans:
    - Zombie: ICR of firm < 1.
    - Leverage of loans above 15 percent.
  - Evergreening of loans
    - Baseline: Borrowings > 0.
    - Robustness: *Secured* borrowings > 0.

Share of Zombies

Raw



Asset Weighted



Percentage of Zombies declined post reform. Summary Stats

Is reduction in borrowing due to reduction in Zombie Lending?

Event Study

Dependent Variable: Change in Secured Debt (Borrowings)

	(1)	(2)	(3)	(4)	(5)	(6)
	Zombies	Non-Zombies	Secured		$\mathbb{1}_{zombie\ current}$	
	(INR million)		*(INR million)*			
Post	-27.63***	20.15***				
	(5.241)	(2.165)				
Zombie * Post			-47.07***	-43.02***	-0.0939***	-0.0974***
			(5.688)	(5.824)	(0.0110)	(0.0109)
Baseline Mean	62.34	32.41	62.34	62.34	0.800	0.800
No. of Obs.	8791	43361	52152	52152	52152	52152
R squared	0.413	0.339	0.359	0.361	0.292	0.295
Firm Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
Controls	N	N	N	Y	N	Y

Split into zombies if received zombie lending in 2001.

Reduction in secured borrowings partly attributable to reduction in evergreening.

Is reduction in borrowing due to reduction in Zombie Lending?

DiDiD

Dependent Variable: Change in Secured Debt (Borrowings)

	(1) Zombie	(2) Non-zombie	(3)	(4)
Zombie * Post			-22.40***	-19.49***
			(7.281)	(7.292)
High Tangibility * Post	-32.46***	4.391	3.699	4.374
	(9.827)	(4.252)	(4.288)	(4.257)
Zombie * Post * High Tangibility			-36.65***	-35.22***
			(10.63)	(10.66)
No. of Obs.	8784	43155	51939	51939
R squared	0.418	0.348	0.358	0.360
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	N	Y

Zombie if firm received zombie lending in 2001.

Reduction in secured borrowings partly attributable to reduction in evergreening.

Analyzing Spillovers

- Examine spillovers on non-zombie firms:

$$\begin{aligned} y_{it} = \alpha_i + \gamma_t + \beta_1 \times \mathbb{1}_{\textit{High Sector Zombies}} \times \mathbb{1}_{\textit{Post}} \\ + \beta_2 \times \mathbb{1}_{\textit{Non Zombie}} \times \mathbb{1}_{\textit{Post}} \\ + \beta_3 \times \mathbb{1}_{\textit{Non Zombie}} \times \mathbb{1}_{\textit{High Sector Zombies}} \times \mathbb{1}_{\textit{Post}} \\ + \beta \times X_{it} + \epsilon_{ijt} \end{aligned}$$

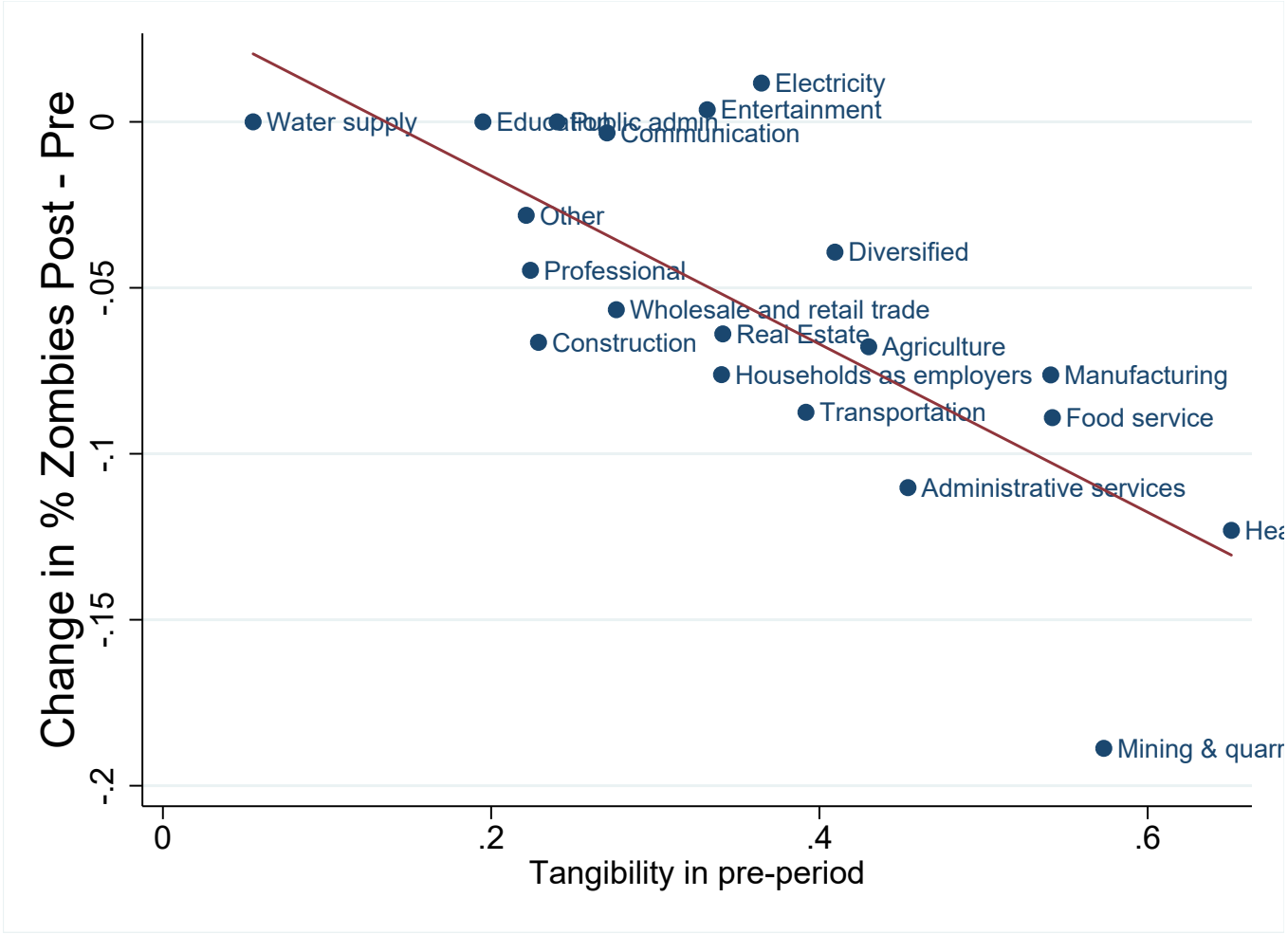
  - where i indexes firms, t indexes time, j indexes sectors, α_i and γ_t are firm and year fixed effects.
  - y_{ijt} is the outcome of interest (change in debt, CapEx, employment) from t to $t-1$.
  - $\mathbb{1}_{\textit{Post}} = 1$ for years when SARFAESI is in effect ($>= 2002$).
  - $\mathbb{1}_{\textit{Non Zombie}} = 1$ for "Non-Zombie" firms.
  - $\mathbb{1}_{\textit{Sector Zombies}} = 1$ if the sector had a high fraction of zombies in pre-SARFAESI.
  - β_3 is the estimate of interest.
  - S.E. clustered at the firm level.

Spillovers: Debt and Capital Expenditure

	(1)	(2)	(3)	(4)	(5)	(6)
	Secured Debt			CapEx		
$\mathbb{1}_{High\ Ind\ Zomb.}$*Post	-21.91**	-21.55**	-23.45**	-17.43	-20.21	-24.36**
	(10.30)	(10.89)	(10.86)	(11.77)	(12.36)	(12.26)
Post*Non-Zomb	27.40***	27.49***	22.19**	29.69***	25.12**	15.23
	(8.626)	(8.819)	(8.832)	(10.31)	(10.45)	(10.41)
Non-Zomb*$\mathbb{1}_{High\ Ind\ Zomb}$*Post	26.80**	26.65**	28.55**	24.58*	27.91**	32.02**
	(11.14)	(11.32)	(11.31)	(12.74)	(12.86)	(12.76)
No. of Obs.	52152	52152	52152	52152	52152	52152
R-squared	0.359	0.363	0.366	0.617	0.621	0.625
Firm FE	Y	Y	Y	N	N	N
Year FE	Y	Y	Y	Y	Y	Y
Industry*Year FE	N	Y	Y	N	Y	Y
Controls	N	N	Y	N	N	Y

Spillovers on non-zombie firms: ↑ in secured borrowings by INR 41 million (66%), ↑ in CapEx by INR 47 million (65%). Robustness Conclusion

Towards Causality: Exploit tangibility



Impact of collateral law on change in percentage of firms receiving subsidized credit higher in sectors with higher tangibility of assets!

Towards Causality: Exploit tangibility

- Explore spillover effects:

$$\begin{aligned} y_{it} = \alpha_i + \gamma_t + \beta_1 \times \mathbb{1}_{\textit{High Sector Tangibility}} \times \mathbb{1}_{\textit{Post}} \\ + \beta_2 \times \mathbb{1}_{\textit{Non Zombie}} \times \mathbb{1}_{\textit{Post}} \\ + \beta_3 \times \mathbb{1}_{\textit{Non Zombie}} \times \mathbb{1}_{\textit{High Sector Tangibility}} \times \mathbb{1}_{\textit{Post}} \\ + \beta \times X_{it} + \epsilon_{ijt} \end{aligned}$$

  - where i indexes firms, t indexes time, j indexes sectors, α_i and γ_t are firm and year fixed effects.
  - y_{ijt} is the outcome of interest (change in debt, CapEx, employment) from t to $t-1$.
  - $\mathbb{1}_{\textit{Post}} = 1$ for years when the collateral reform is in effect ($>= 2002$).
  - $\mathbb{1}_{\textit{Non Zombie}} = 1$ for "Non-Zombie" firms.
  - $\mathbb{1}_{\textit{High Sector Tangibility}} = 1$ if the sector had a average tangibility in the period before the collateral reform.
  - β_3 is the estimate of interest.
  - S.E. clustered at the firm level.

Spillovers: Secured Borrowing and CapEx

	(1)	(2)	(3)	(4)	(5)	(6)
	Secured Debt			CapEx		
$\mathbb{1}_{High\ Ind\ Tang}$*Post	-29.65***	49.18	34.76	-17.81	-11.80	-32.65**
	(9.326)	(51.19)	(46.70)	(10.97)	(12.94)	(14.44)
Post*Non-Zomb	23.73***	24.35***	19.96***	30.76***	26.68***	19.26**
	(5.826)	(5.996)	(5.956)	(8.754)	(8.117)	(7.973)
Non-Zomb*$\mathbb{1}_{High\ Ind\ Tang}$*Post	38.61***	35.91***	37.05***	27.92**	27.52**	29.74***
	(10.25)	(10.55)	(10.55)	(12.05)	(11.52)	(11.43)
No. of Obs.	52152	52152	52152	52152	52152	52152
R-squared	0.359	0.386	0.389	0.617	0.637	0.641
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Industry*Year FE	N	Y	Y	N	Y	Y
Controls	N	N	Y	N	N	Y

Spillovers on non-zombie firms: ↑ in secured debt and CapEx. Robustness

Conclusion

Reallocation of Capital

Within Industries

- Examine whether capital is allocated to firms with higher marginal product of labor within an industry

$$\Delta \textit{Capital Share}_{ijt} = \alpha_i + \gamma_{jt} + \delta_t + \beta_0 \times \textit{MPK}_{ijt}$$
$$+\beta_1 \times \mathbb{1}_{\textit{Post}} \times \textit{MPK}_{ijt} + +\beta_2 \times X_{ijt} + \epsilon_{ijt}$$

- i indexes firms, t indexes time, j indexes the industry in which the firm operates.
- α_i, γ_{jt}, δ_t are firm, industry-year and time fixed effects.
- $\mathbb{1}_{\textit{Post}} = 1$ for years when the reform is in effect ($>= 2002$).
- $\textit{Capital Share}_{ijt}$ is the capital share of firm i in industry j and time t.
- $\Delta \textit{Capital Share}_{ijt}$ is the log of the difference of this share between t and $t-1$.
- $\textit{MPK}_{ijt}$ is the log of the marginal product of labor calculated assuming a Cobb-Douglas production function and a translog production function. Detail
- X_{ijt} includes age controls one-year lag of age and its squared value and ensures that the specification controls for important life-cycle patterns in productivity in addition to sales and return on assets.
- Standard errors are clustered at the firm level.
- β_1 is coefficient estimate of interest and tells us the sensitivity of capital reallocation to the marginal product of capital before the reform relative to after the reform.

Reallocation of Capital

	(1)	(2)	(3)	(4)
	Cobb Douglas		Translog	
MPK * Post	0.120***	0.0655	0.0608*	-0.0435
	(0.0315)	(0.0406)	(0.0343)	(0.0496)
High Tang. * MPL		-0.216***		-0.277***
		(0.0752)		(0.0898)
MPK * Post * High Tang.		0.132**		0.175***
		(0.0637)		(0.0666)
MPK	-1.648***	-1.566***	-1.949***	-1.792***
	(0.0544)	(0.0605)	(0.0656)	(0.0811)
No. of Obs.	18040	18040	14094	14094
R squared	0.857	0.858	0.851	0.852
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Industry*Year FE	Y	Y	Y	Y
controls	Y	Y	Y	Y

Capital allocated to firms with higher marginal product of capital after the collateral reform.

Other results and Robustness

- Supplementary analysis using ASI employment data show siilar reallocation effects. Caveat: only manufacturing firms at establishment level.
- Employment ↓, concentrated in permanent employees, unprofitable establishments shutdown. IntEmp
- CapEx ↓, concentrated in non-core projects. IntCapEx
- Profitability improved for low quality firms and at the aggregate level, driven by profitability improvement of zombie firms. Profit
- Low quality firms whose primary lender were banks with greatest pre-reform exposure to zombies witnessed the lower secured borrowings. Bank
- Industries which witnessed greatest decongestion also had higher births, deaths and increase in total number of firms. Closure
- Robustness Robust
  - Collateral reform does not apply to Non-banking financial companies (NBFCs)
  - Robust to alternate definitions of "Low Quality Borrowers", ROA and for listed firms with Tobin's Q.
  - External validity with DRTs: weak due to BIFR escape route.
  - Robust to using log of debt (dependent variable).

Conclusion

- Improved creditor rights reallocate resources away from impaired debtors.
- Spillover effects on "good" firms: CapEx and Employment.
- Productive efficiency improves.
- Important for developing countries
  - Brazil, China and India introduced new bankruptcy laws in the last decade increasing the legal protection of creditors.
- Highlights the *spillovers* of improved creditor rights on "good" firms.

Thank You!

Estimation of Marginal Product of Capital

- Marginal Product of Capital captures the change in output per unit change in capital inputs. It can be expressed as -

$$MPK = log(\beta) + log(\frac{Y}{K}) \tag{1}$$

where β captures the elasticity of capital, $\frac{Y}{K}$ is the output per unit of labor.

- As a first approach, we estimate the marginal product using differences in plant output per unit of capital assuming β to remain constant within a firm industry. This can be motivated using a Cobb Douglas function whose parameters can vary across each industry-year observation. For our empirical specification, these parameters do not need to be estimated separately.

- As a second approach, we specify and estimate the Translog Production Functions which allows the elasticity of labour and capital to vary across firms.

- The Translog production function is defined as -

$$y_{ijt} = \beta_o + \beta_a * age_{ijt} + \alpha_k * k_{ijt} + \alpha_l * l_{ijt} + \alpha_m * m_{ijt} + \alpha_{kl} * k_{ijt} * l_{ijt} +$$
$$\alpha_{km} * k_{ijt} * m_{ijt} + \alpha_{lm} * l_{ijt} * m_{ijt} + \frac{\alpha_{ll}}{2} * l_{ijt}^2 + \frac{\alpha_{kk}}{2} * k_{ijt}^2 + \frac{\alpha_{mm}}{2} * m_{ijt}^2$$

Estimating MPK

- The capital elasticity is therefore given by:

$$\beta_k = \alpha_k + \alpha_{kl} * l_{ijt} + \alpha_{km} * m_{ijt} + \alpha_{kk} * k_{ijt}$$

- Cobb - Douglas assumes that factor elasticities are constant.
- The advantage of using this approach is that it allows the elasticity of labour and capital to vary across firms. This β_k captures the elasticity and measures the differential change in output with change in capital. It allows this elasticity to depend on firms' choices of all inputs.
- This is important as a factor's elasticity plays an important role in determining its marginal product and the central aspect of our analysis is modelling heterogeneity across firms in marginal products.
- We estimate these parameters (labour and capital elasticities) using simple OLS regression.

Main

Impact of Collateral Reform on Capital Expenditure

DiDiD Specification

Dependent Variable: Capital Expenditure

	(1) Low Quality	(2) High Quality	(3)	(4)
	(INR million)		*(INR million)*	
Low Quality * Post			-29.77***	-20.38***
			(5.666)	(5.781)
High Tangibility * Post	-10.85	8.534*	9.108*	9.024*
	(6.759)	(5.112)	(5.226)	(5.133)
Low Quality * Post * High Tangibility			-21.45**	-20.68**
			(8.583)	(8.586)
No. of Obs.	14714	32700	47414	47414
R squared	0.560	0.644	0.621	0.625
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	N	Y

Low quality firms $\downarrow$ capital expenditure by INR 21 million (41%).

Impact of Collateral Reform on Capital Expenditure

DiDiD Specification

Dependent Variable: Capital Expenditure

	(1) Zombie	(2) Non-zombie	(3)	(4)
Zombie * Post			-24.93	-1.810
			(48.81)	(47.60)
High Tangibility * Post	-51.38	123.6*	118.2*	123.3*
	(79.33)	(63.83)	(63.48)	(63.69)
Zombie * Post * High Tangibility			-181.7*	-170.5*
			(100.6)	(100.1)
No. of Obs.	8784	43155	51939	51939
R squared	0.345	0.528	0.517	0.518
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	N	Y

Zombie if firm received zombie lending in 2001.

Reduction in capital expenditure of zombies.

Impact of Collateral Reform on Employment

DiDiD Specification

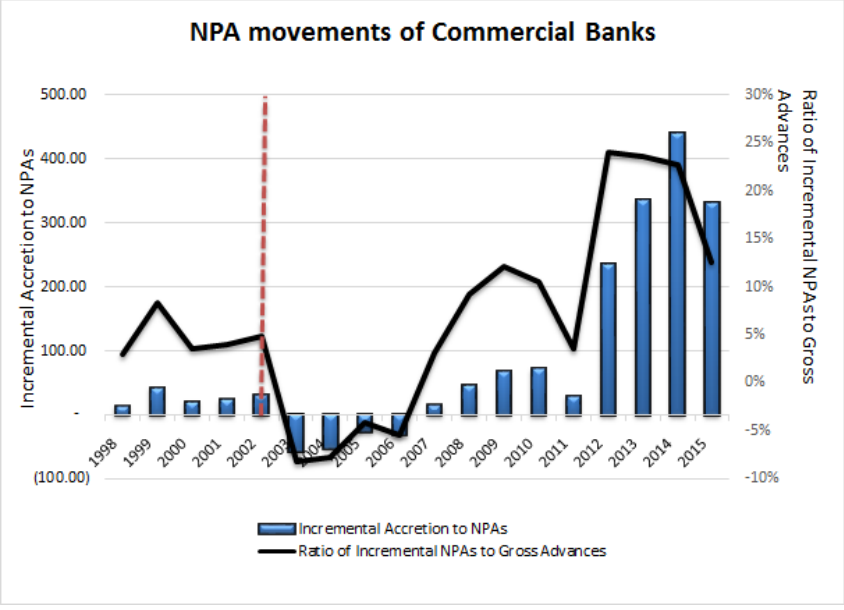
Dependent Variable: Employment

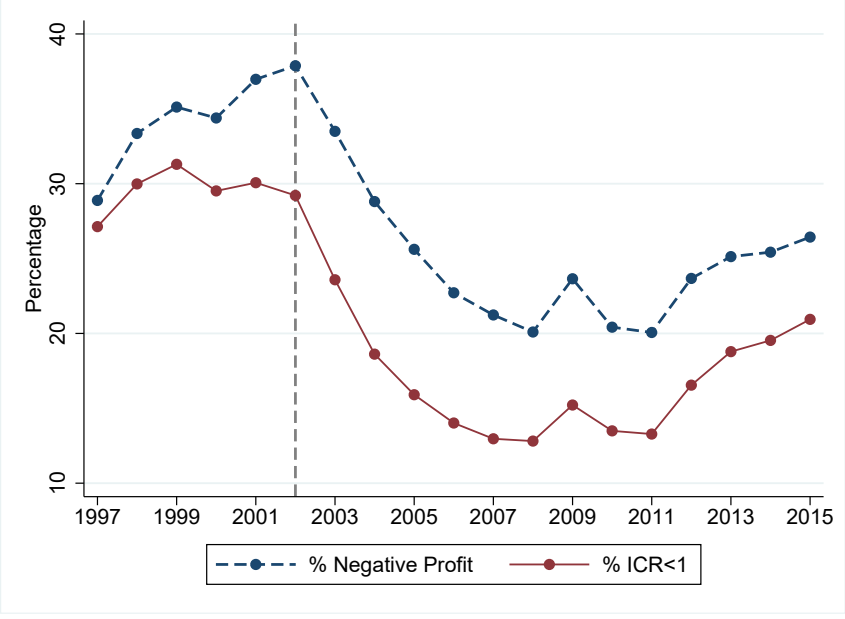
	(1) All	(2) Permanent	(3) Contract	(4) Staff
Zombie * Post			-27.27***	-24.42***
			(2.909)	(2.832)
High Tangibility * Post	-2.553	8.388**	10.96***	9.064**
	(6.230)	(3.647)	(3.718)	(3.648)
Zombie * Post * High Tangibility			-14.88**	-12.95*
			(7.466)	(7.293)
No. of Obs.	30239	83185	113424	113424
R sq.	0.913	0.925	0.919	0.921
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Controls	N	Y	N	Y

Zombie if firm received zombie lending in 2001.

Reduction in employment of zombies.

SARFAESI in the longer term . . .





- Robustness with long-term data. LT
- "Working" so well in 2008, that report warned creditors not to get complacent (Raghuram Rajan Report 2009).
- Post-2008:
  - Reluctance to recognize NPAs and evergreen loans (Peek and Rosengren (2005)).

SARFAESI (more detail)

- Under the SARFAESI Act (section 13 (2)), after a loan has been classiffed as a non- performing asset (NPA) by the secured creditor, a notice is sent to the relevant borrower.
- If the borrower fails to discharge his liability in repayment of any secured debt within 60 days from the date of notice by the secured creditor, the creditor is entitled to
  1. Take possession of the secured assets of the borrower.
  2. Takeover of the management of the business of the borrower.
  3. Appoint any person to manage the secured assets, possession of which is taken by the secured creditor.
  4. Require any person who has acquired any of the secured assets from the borrower and from whom money is due to the borrower to directly pay the secured creditor to cover the secured debt owed to the creditor.

Main

Summary Statistics

By Zombie Status

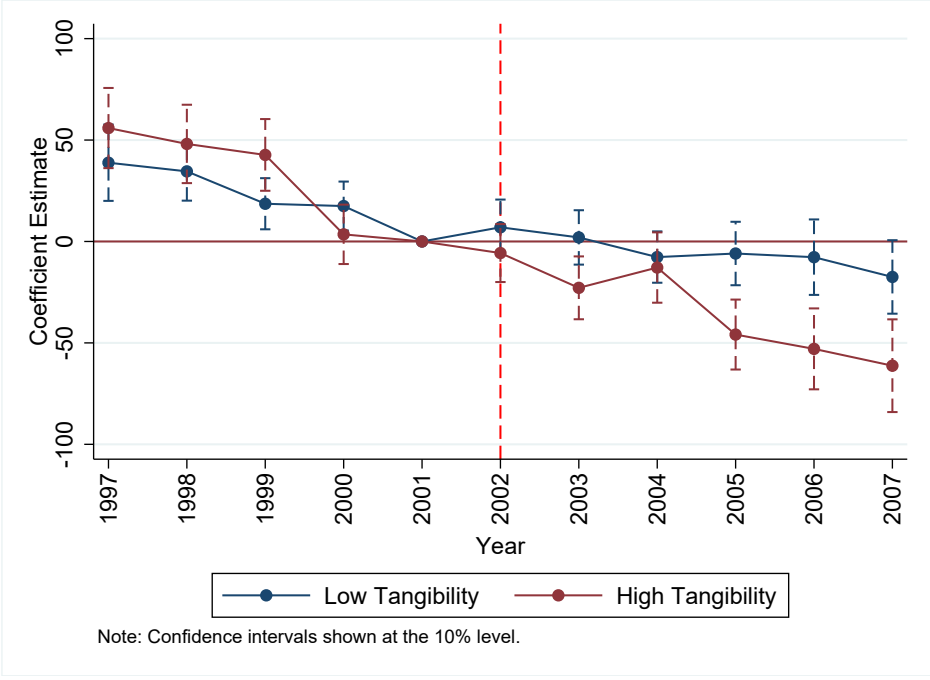
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		Low Quality			High Quality		
Variables	Mean	SD	Pre	Post	t-stat on Diff.	Pre	Post	t-stat on Diff.
Secured Borrowings	45.23	191.6	62.34	41.31	(-4.82***)	32.41	52.65	(11.40***)
Unsecured Borrowings	3.160	17.20	1.100	5.110	(10.91***)	1.410	4.490	(19.96***)
Capital Expenditure	83.45	259.2	71.84	63.71	(-1.56)	71.81	97.89	(10.55)
Total Debt	1058	6552	1373	1835	(2.82***)	752.1	1093	(5.90***)
Secured Debt	506.1	1202	533.5	724.0	(6.39***)	400.8	542.2	(11.63***)
Unsecured Debt	253.6	802.7	316.5	401.7	(3.77***)	178.8	267.7	(10.83***)
Debt to Assets	0.340	0.340	0.510	0.610	(9.05***)	0.280	0.300	(4.69***)
Log(Sales)	5.370	2.420	4.720	4.870	(3.00***)	5.340	5.590	(11.22***)
$\frac{EBITDA}{Total\ Assets}$	0.100	0.110	0.0200	0.0700	(17.10***)	0.110	0.110	(-4.03***)
Observations	52152		8791			43361		

Firm classified as zombie if it received zombie lending in 2001.

Main

Real Outcomes: CapEx

Event Study



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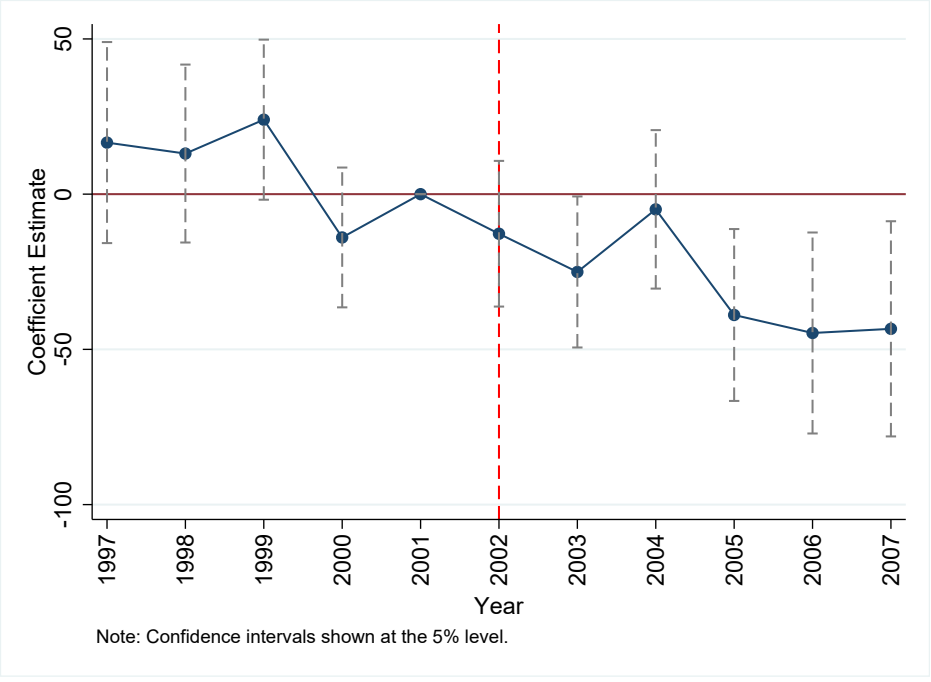


Low Quality borrowers reduce CapEx and Number of Employees.

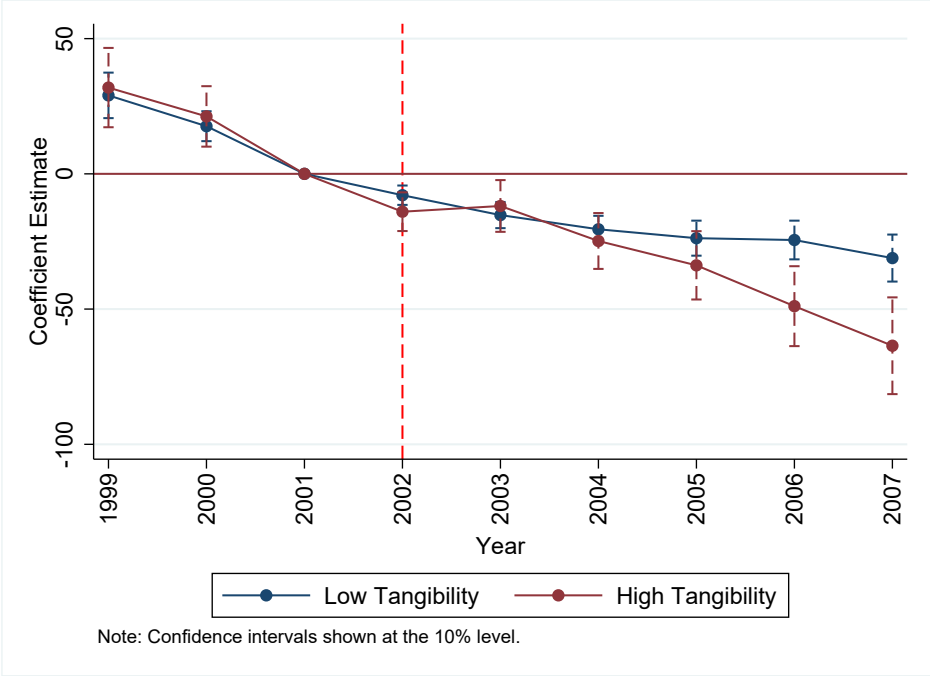
Real Outcomes: CapEx

	(1) Low Quality	(2) High Quality	(3)	(4)
	(INR million)		*(INR million)*	
Post	-11.24***	18.08***		
	(3.991)	(2.597)		
Low Quality Borrower * Post			-42.95***	-30.54***
			(4.722)	(4.788)
Baseline Mean	59.81	78.02	59.81	59.81
No. of Obs.	16457	35695	52152	52152
R squared	0.556	0.637	0.617	0.622
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Controls	N	N	N	Y

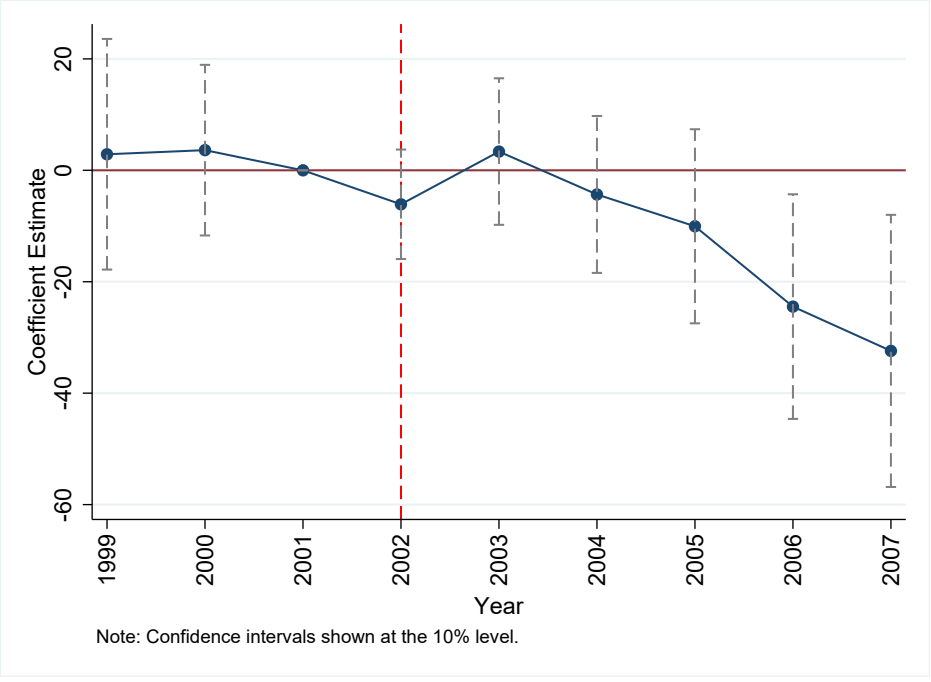
Low quality borrowers cut back on Capital expenditure.

Real Outcomes: Employment

Event Study



DiDiD



Low Quality borrowers reduce CapEx and Number of Employees.

Real Outcomes: Employment

	(1) Low Quality	(2) High Quality	(3)	(4)
	(INR million)		*(INR million)*	
Post	-47.15***	22.90***		
	(6.104)	(3.545)		
Low Quality * Post			-31.05***	-27.72***
			(2.816)	(2.744)
Baseline Mean	306	312	306	306
No. of Obs.	30239	83185	113424	113424
R squared	0.908	0.923	0.919	0.921
Controls	N	N	N	Y

Low quality borrowers cut back on labor. Main

Real Outcomes: Employment with ASI

Panel A: Type of Employees

	(1) All	(2) Permanent	(3) Contract	(4) Staff	(5) ols13	(6) ols14	(7) ols17	(8) ols18
Low Quality * Post	-31.05***	-27.72***	-2.389	-1.376	-4.510***	-3.587**	-8.889***	-8.038***
	(2.816)	(2.744)	(2.720)	(2.713)	(1.555)	(1.548)	(0.892)	(0.867)
No. of Obs.	113424	113424	113424	113424	113424	113424	113424	113424
R squared	0.919	0.921	0.747	0.748	0.762	0.763	0.921	0.923
Controls	N	Y	N	Y	N	Y	N	Y

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

Panel B: Factory Closures

	(1)	(2)
Low Quality * Post	0.0145*	
	(0.00819)	
Negative ROA * Post		0.0222***
		(0.00748)
No. of Obs.	27994	27994
R squared	0.408	0.408
Controls	N	N

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

Concentrated in permanent employees. Main

Real Outcomes: CapEx with CapExDx

Panel A: By Project Implementation Status

	(1) Total CapEx	(2) Completed Projects	(3) Announced Projects	(4) Under Implementation
Low Quality Borrower * Post	-43.82***	-2.559***	-13.22***	-9.495***
	(8.223)	(0.781)	(3.473)	(2.512)
No. of Obs.	26903	26903	26903	26903
R squared	0.614	0.177	0.271	0.284
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y

Panel B: For Non-Core Industries

	(1) All non-core	(2) Completed Projects	(3) Announced Projects	(4) Under Implementation
Low Quality Borrower * Post	-123.8**	-282.6**	49.90	-116.6*
	(51.04)	(124.4)	(70.69)	(62.86)
No. of Obs.	26903	26903	26903	26903
R squared	0.305	0.448	0.102	0.182
Firm FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y

Concentrated in non-core projects. Main

Real Outcomes: Spillovers

	(1)	(2)	(3)	(4)
	Capex		No. of Emp	
$\mathbb{1}_{Sector\ Zombie}$*Post	-29.05***	-35.39***	17.10	9.868
	(10.37)	(10.34)	(26.95)	(26.76)
Post*Non-Zombie	11.48	3.074	12.23	2.564
	(9.595)	(9.540)	(25.55)	(25.31)
Non-Zombie*$\mathbb{1}_{Sector\ Zombie}$*Post	34.28***	38.08***	51.82*	56.16*
	(12.40)	(12.30)	(31.55)	(31.31)
Baseline Mean	63.92		46.66	
No. of Obs.	50039	50039	50039	50039
R sq.	0.618	0.621	0.617	0.618
Controls	N	Y	N	Y

Standard errors in parentheses, all columns include firm and year fixed effects.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Spillovers on high quality borrowers in the same sector. Main

Profitability

Panel A

	(1)	(2)	(3)	(4)	(5)	(6)
	Low Quality	High Quality	Change in Unsecured Debt		$\frac{\text{Change in Unsecured Debt}}{\text{Assets}}$	
	(INR million)		*(INR million)*			
Post	2.141***	2.562***				
	(0.271)	(0.196)				
Low Quality Borrower * Post			-0.658**	-0.473	-0.000228	-0.000134
			(0.332)	(0.334)	(0.000264)	(0.000267)
Baseline Mean	0.700	1.130	0.700	0.700	.0007	.0007
No. of Obs.	15319	34720	50039	50039	43112	43112
R squared	0.410	0.435	0.432	0.433	0.434	0.434
Firm Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	N	N	Y	Y	Y	Y
Controls	N	N	N	Y	N	Y

Panel B

	(1)	(2)	(3)	(4)
	Low Quality	High Quality		
Low Quality * Post			-0.400	-0.0695
			(0.592)	(0.592)
High Tangibility * Post	1.163*	1.825***	1.856***	1.842***
	(0.667)	(0.556)	(0.558)	(0.557)
Low Quality * Post * High Tangibility			-0.777	-0.702
			(0.873)	(0.870)
No. of Obs.	16437	35502	51939	51939
R squared	0.422	0.435	0.430	0.431
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	N	Y

No impact on unsecured borrowing post collateral reform.

Main

Profitability

Profitability

	(1)	(2)	(3)	(4)	(5)	(6)
	Op. Margin= $\frac{EBITDA}{Sales}$			ROA= $\frac{EBIT}{Assets}$		
	Low Quality	High Quality		Low Quality	High Quality	
Post	6.619***	-0.0782		3.855***	-0.266***	
	(0.840)	(0.331)		(0.180)	(0.0903)	
Low Q. Borr. * Post			6.707***			4.139***
			(0.902)			(0.201)
No. of Obs.	14441	31399	45840	14441	31399	45840
R squared	0.0551	0.0863	0.0686	0.0648	0.0643	0.0668
Firm FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

Overall Profitability

	(1)	(2)	(3)	(4)	(5)	(6)
	Op. Margin= $\frac{EBITDA}{Sales}$			ROA= $\frac{EBIT}{Assets}$		
	Low Quality	High Quality		Low Quality	High Quality	
Low Quality * Post			4.275**			3.642***
			(1.715)			(0.343)
High Tangibility * Post	3.158*	-0.550	-0.514	0.441	-0.307*	-0.311*
	(1.902)	(0.657)	(0.659)	(0.385)	(0.180)	(0.180)
Low Quality * Post * High Tangibility			3.661*			0.777*
			(2.010)			(0.423)
No. of Obs.	14426	31263	45689	14426	31263	45689
R squared	0.0559	0.0839	0.0672	0.0666	0.0703	0.0661
Firm Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
Controls	Y	Y	N	Y	Y	N

Profitability improved post collateral reform. Main

SARFAESI in the long term

	(1)	(2)	(3)	(4)
	New Secured Borrowings		$\frac{NewSecuredBorrowings}{Assets}$	
Low Quality Borrower * Post	-39.80***	-26.88***	-0.0239***	-0.0215***
	(4.379)	(4.444)	(0.00138)	(0.00139)
No. of Obs.	82545	82545	76177	76177
R squared	0.335	0.340	0.190	0.193
Firm Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
Controls	N	Y	N	Y

SARFAESI continues to have an impact .... LT

SARFAESI in the long term: Births and Deaths

Panel A: Closures

	(1) $\mathbb{1}\_Closure(year <= 2004)$	(2) $\mathbb{1}\_Closure(year <= 2014)$
Low Q. Borr. * Post	0.0341^{***}	0.0355^{***}
	(0.00433)	(0.00401)
No. of Obs.	47598	80093
R squared	0.266	0.200
Industry Fixed Effects	Y	Y
Year Fixed Effects	Y	Y

Panel B: Number of Firms, Births and Deaths

	(1) Total Number	(2) Births	(3) Deaths
Ind. % Zombies*Post	101.1^{**}	9.238^{*}	20.16^{***}
	(43.73)	(5.214)	(7.368)
No. of Obs.	1216	1216	1216
R squared	0.872	0.667	0.538
Industry Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y

SARFAESI continues to have an impact .... Main

Robustness

	(1) NBFCs	(2) LQ-median	(3) DRT
Low Quality * Post	-6.567		
	(5.671)		
Law Applies * Post	14.31***		
	(3.578)		
Low Quality * Post * Law Applies	-32.22***		
	(7.594)		
Low Quality Borrower (median) * Post		-111.9***	
		(28.58)	
Low Quality Borrower *Post			-17.67*
			(10.13)
No. of Obs.	29340	29340	25347
R sq.	0.333	0.0832	0.315
Firm FE	Y	Y	Y
Year FE	Y	Y	Y

Main

Bank Exposure

	(1) Low Exposure	(2) High Exposure	(3) All
High Exposure * Low Quality			96.66***
			(21.97)
Low Quality * Post	113.3***	-18.47***	94.97***
	(7.802)	(4.572)	(19.59)
High Exposure * Post			-5.141
			(7.732)
Low Quality * Post * High Exposure			-113.5***
			(20.25)
No. of Obs.	354	17233	17587
R squared	0.383	0.433	0.432
Bank Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y
Controls	Y	Y	Y

Impact greater for banks with high exposure. Main

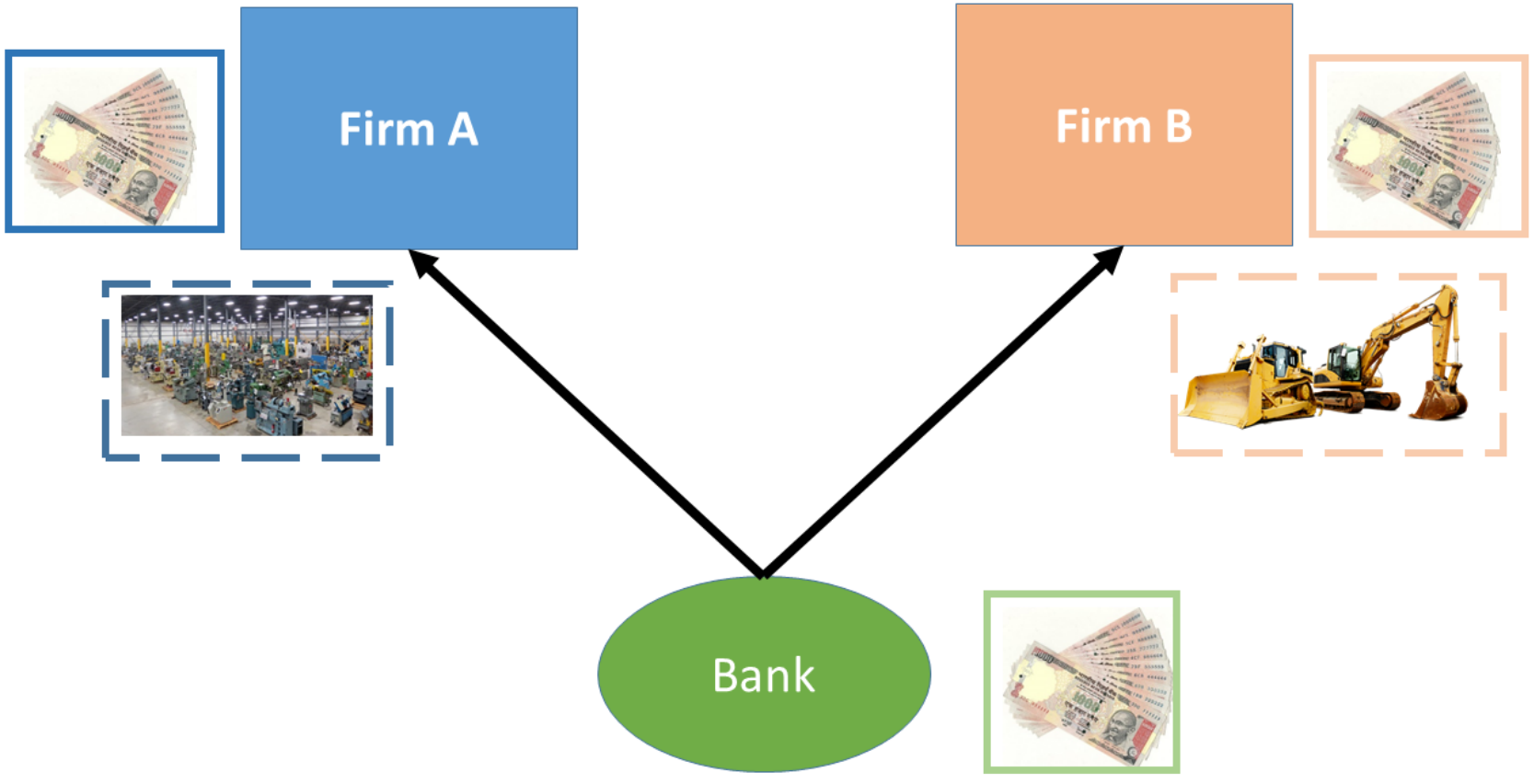
Hypothetical Example

Firm A

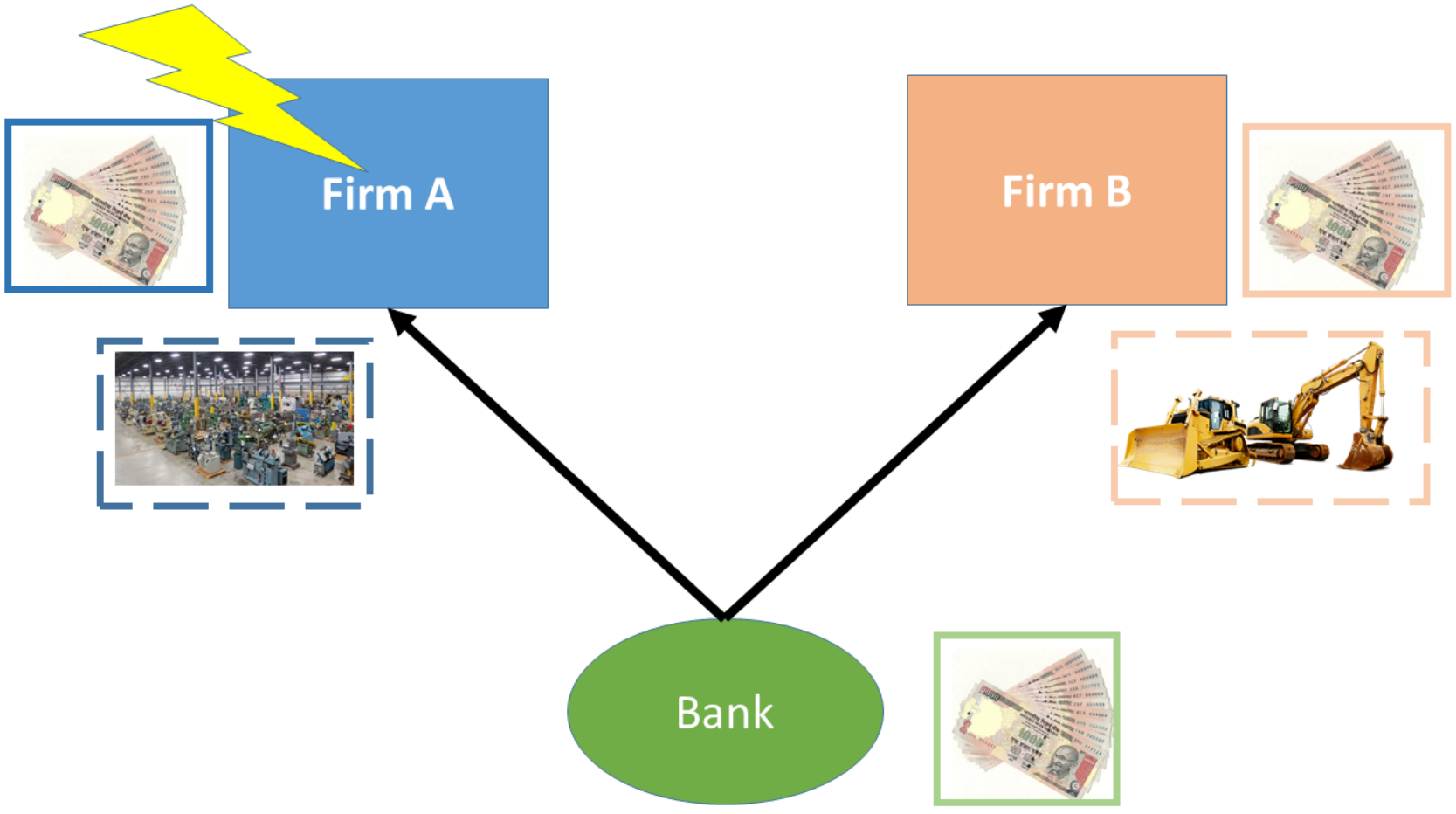
Firm B

Bank

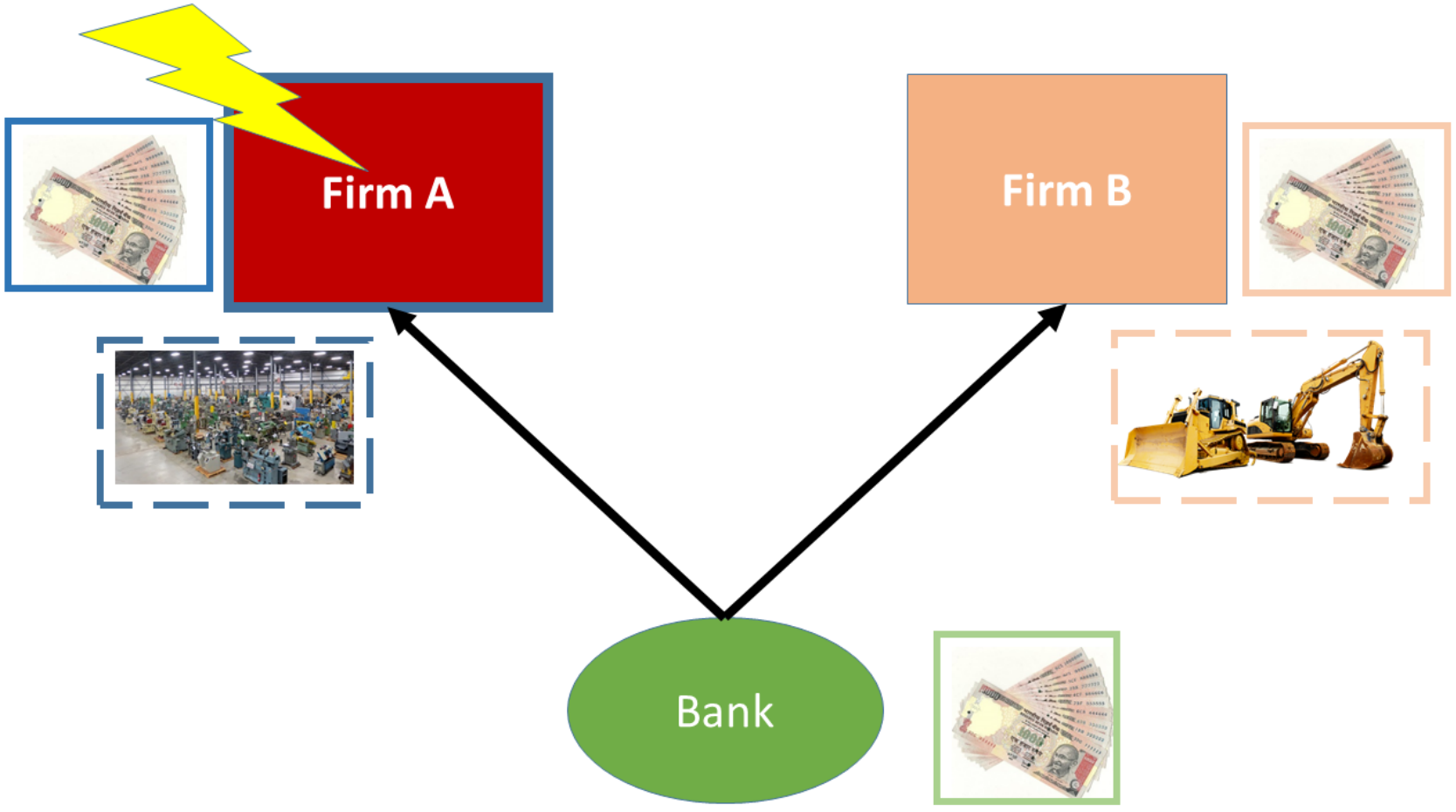
Hypothetical Example



Hypothetical Example



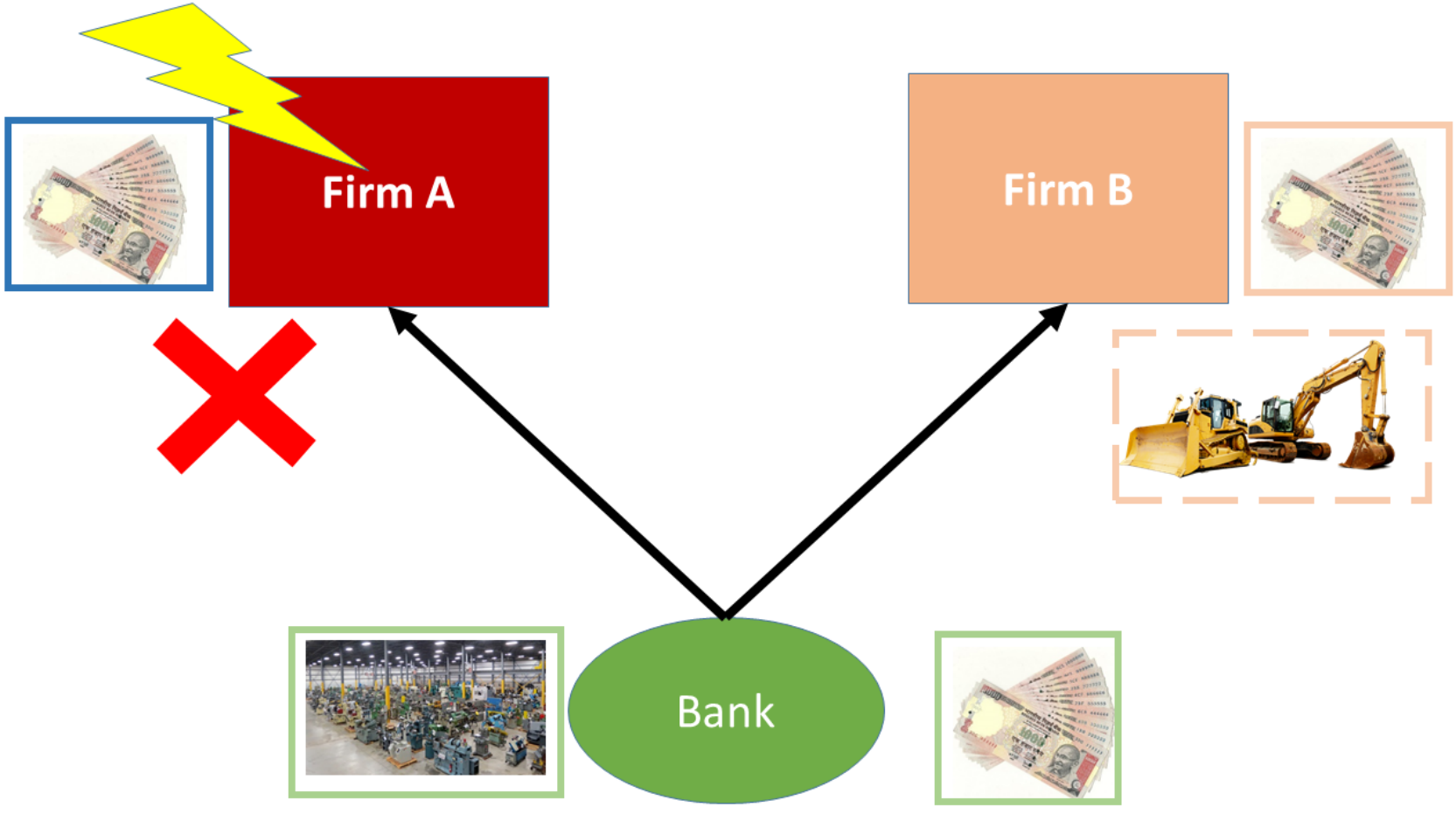
Hypothetical Example



- Firm A defaults.

Hypothetical Example: Scenario 1

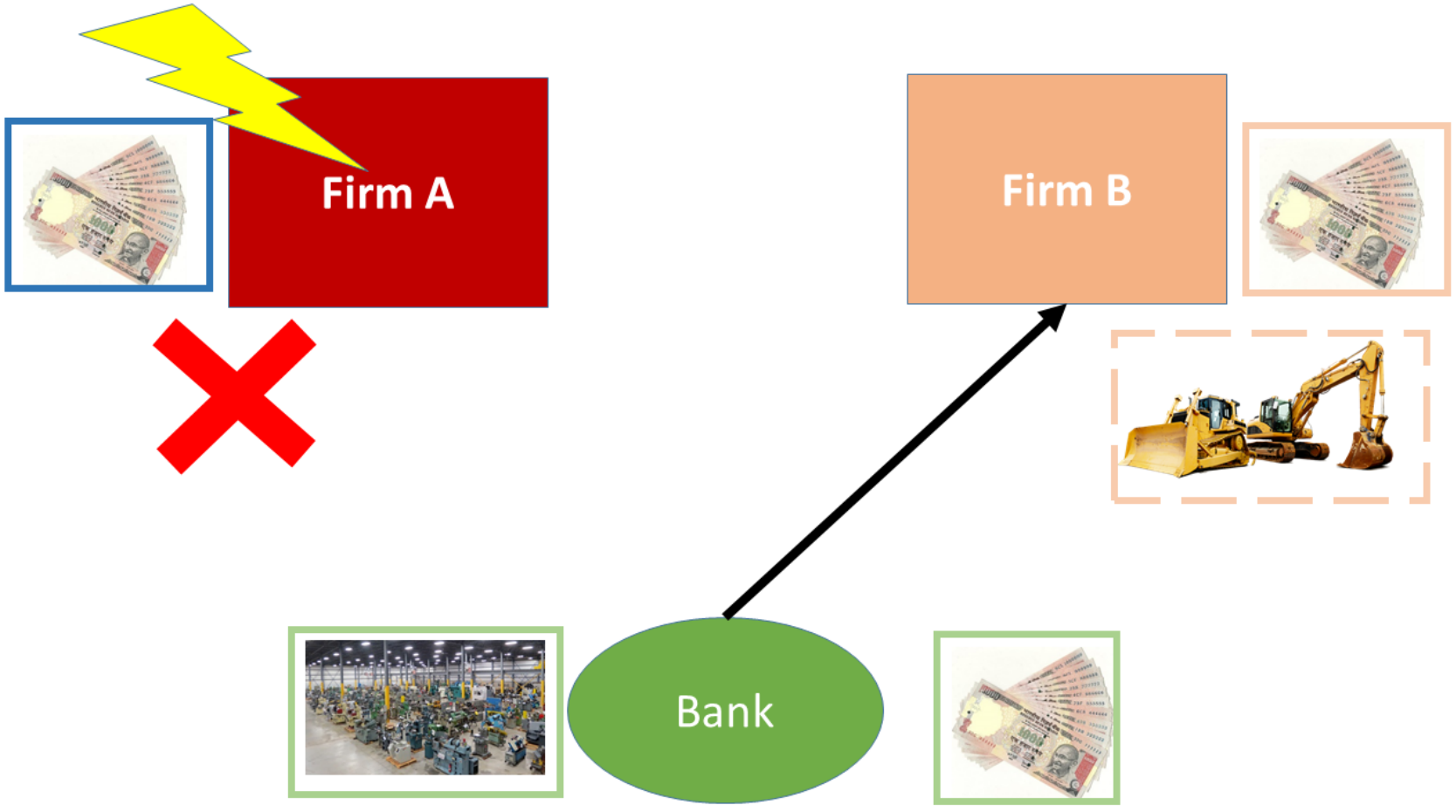
First Best Scenario: Banks can seize assets



- Firm A defaults and banks seizes assets.

Hypothetical Example: Scenario 1

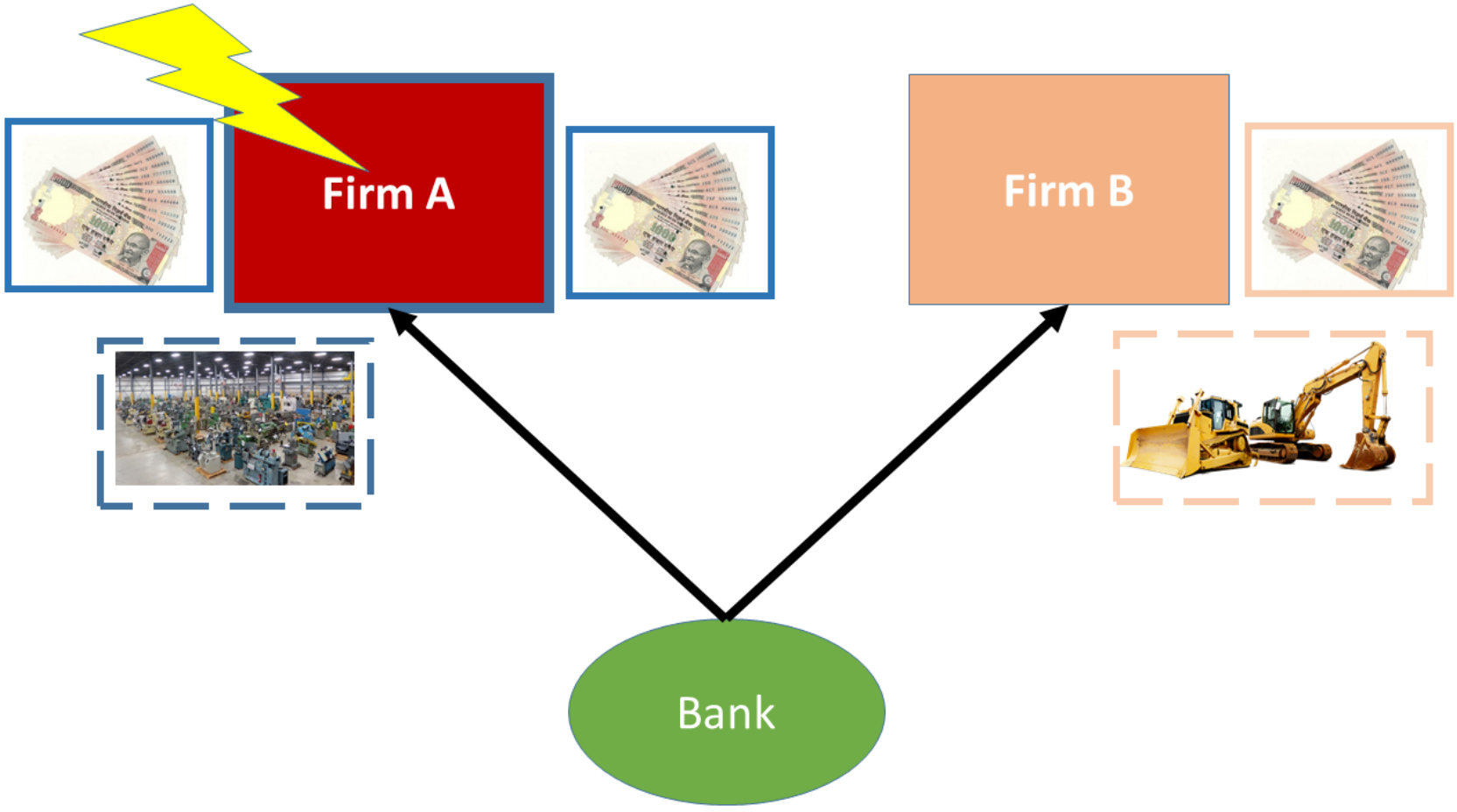
First Best Scenario: Banks can seize assets



- Bank exits relationship.

Hypothetical Example: Scenario 2

Second Best Scenario: Banks cannot seize assets



- Firm A defaults and banks CANNOT seizes assets.
  - Either: Banks "Evergreen loans"
  - And/Or: Firms borrow more (they have nothing to lose).

SARFAESI Act of 2002

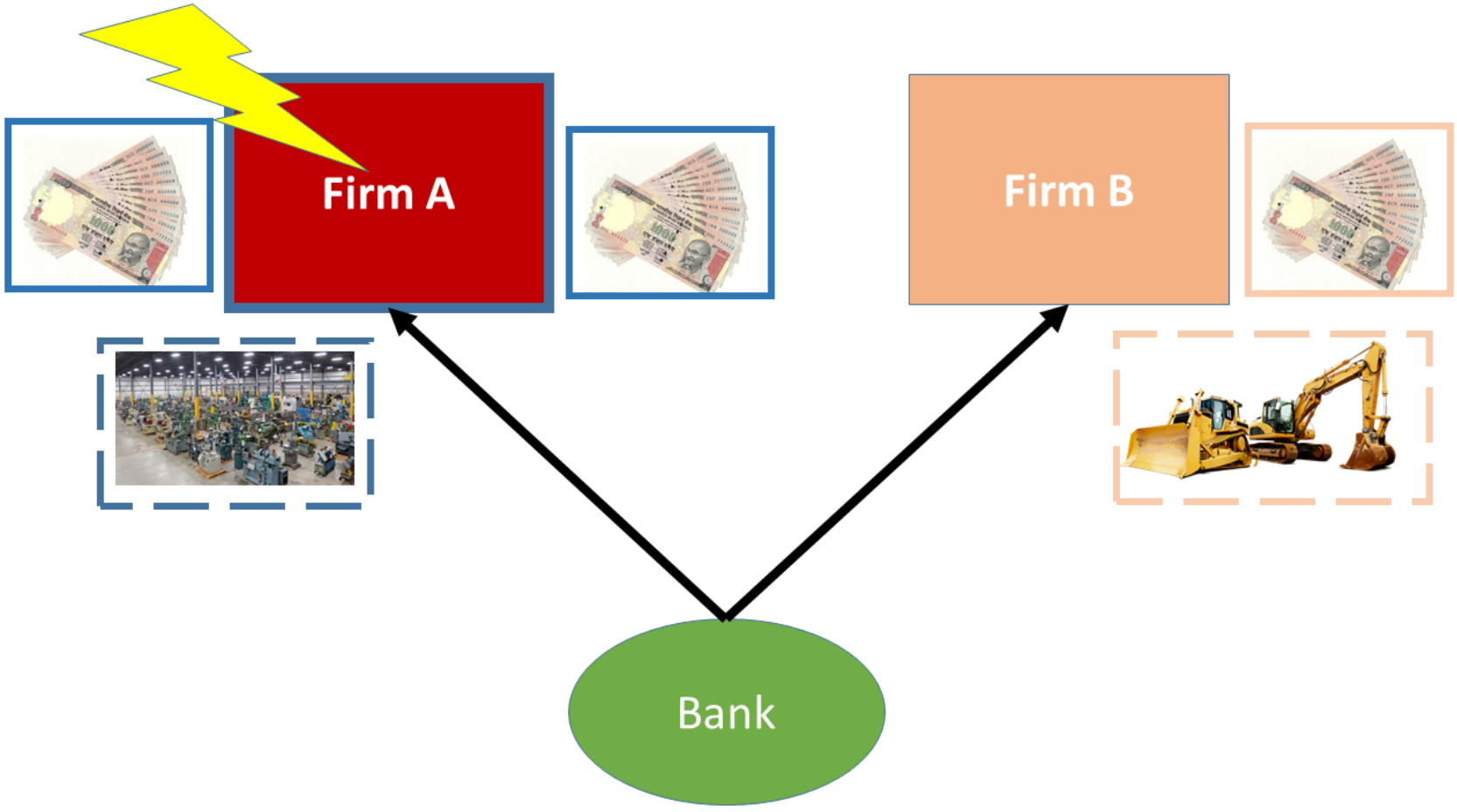
Securitisation and Reconstruction of Financial Assets and Enforcement of Security Interest

SARFAESI Act of 2002 made it easier for secured lenders to seize secured assets of defaulting borrowers.

- Pre-SARFAESI lender subject to elaborate legal process to recover dues while firm continued to operate!
- Post-SARFAESI lender can start liquidation process on defaulted borrowers (secured only).
- Exit became easier: banks could seize assets and dissolve relationships.

Pre-SARFAESI: Scenario 2

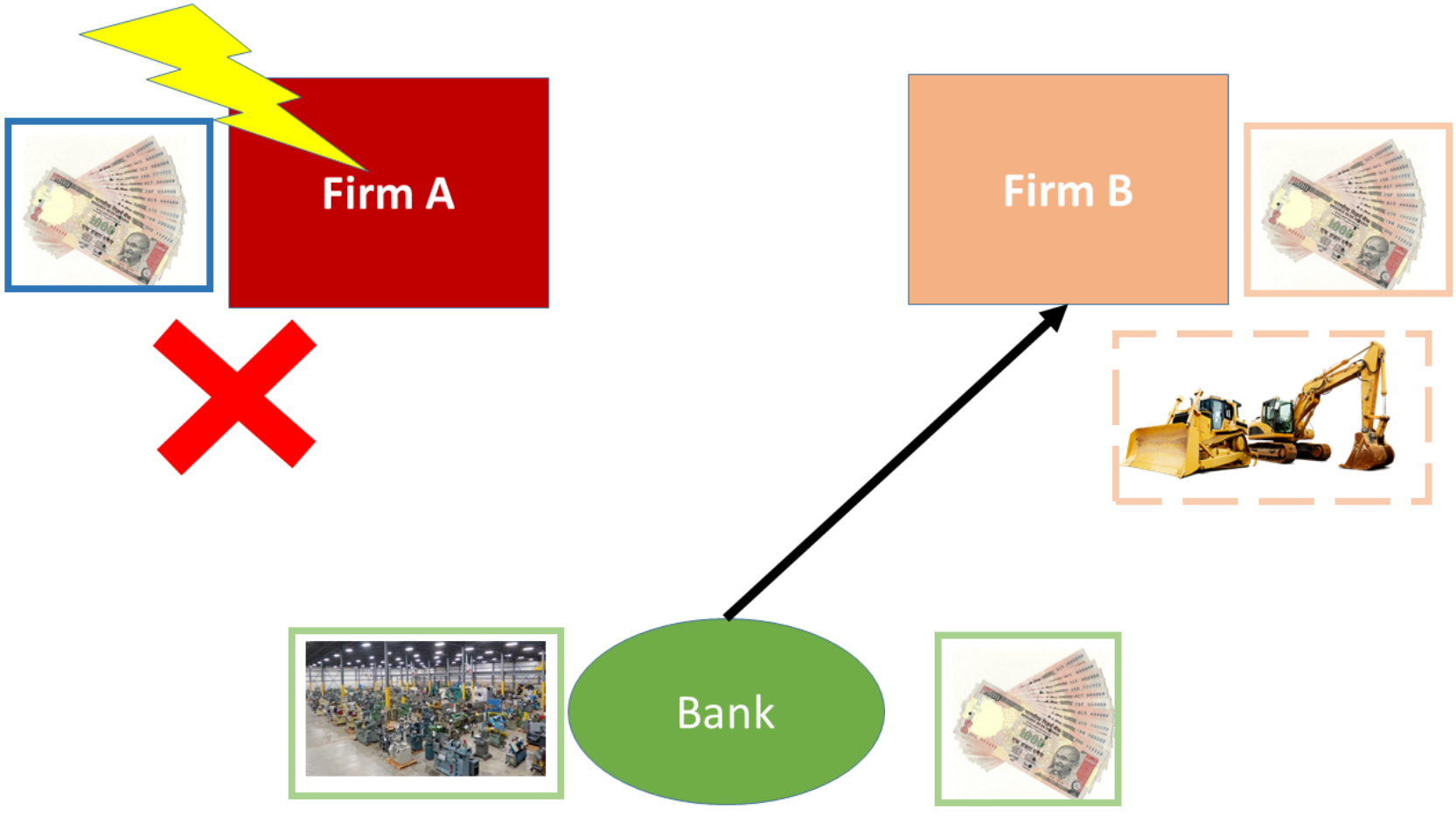
Second Best Scenario: Banks cannot seize assets



- Firm A defaults and banks CANNOT seizes assets.
  - Either: Banks "Evergreen loans"
  - And/Or: Firms borrow more (they have nothing to lose).

Post-SARFAESI: Scenario 1

First Best Scenario: Banks can seize assets



- Firm A defaults and banks CAN seize assets.
  - Banks reduce "Evergreening"
  - And/Or: Bad Firms reduce borrow lending (more at stake).