The Forced Safety Effect

How Higher Capital Requirements Can Increase Bank Lending

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Motivation

- Capital requirements
  - Tightened since the crisis
  - Time-varying adjustments
- Policy debate
  - Positive view: Capital is costly $\Rightarrow$ lending cut
  - Normative view: Is capital socially costly?

This paper

- Positive approach
- Implicit subsidy from government guarantees
- Tightening capital requirements
  - reduces the subsidy
  - does not imply a lending cut
- Implicit subsidy is not a plain vanilla subsidy
  - We carefully decompose the relevant mechanisms
  - We derive conditions under which the bank increases lending

The baseline model

- Two dates: 1 and 2
- A bank, risk neutral investors, deep-pocketed, no discounting

Payoffs (date 2)	Assets		Liabilities	
$BX(x)$	(new loans)	x	$\gamma(x+\lambda)$	(capital)
$A\lambda$	(legacy loans)	λ	$(1-\gamma)(x+\lambda)$	(deposits)

The bank chooses x, c, and d...

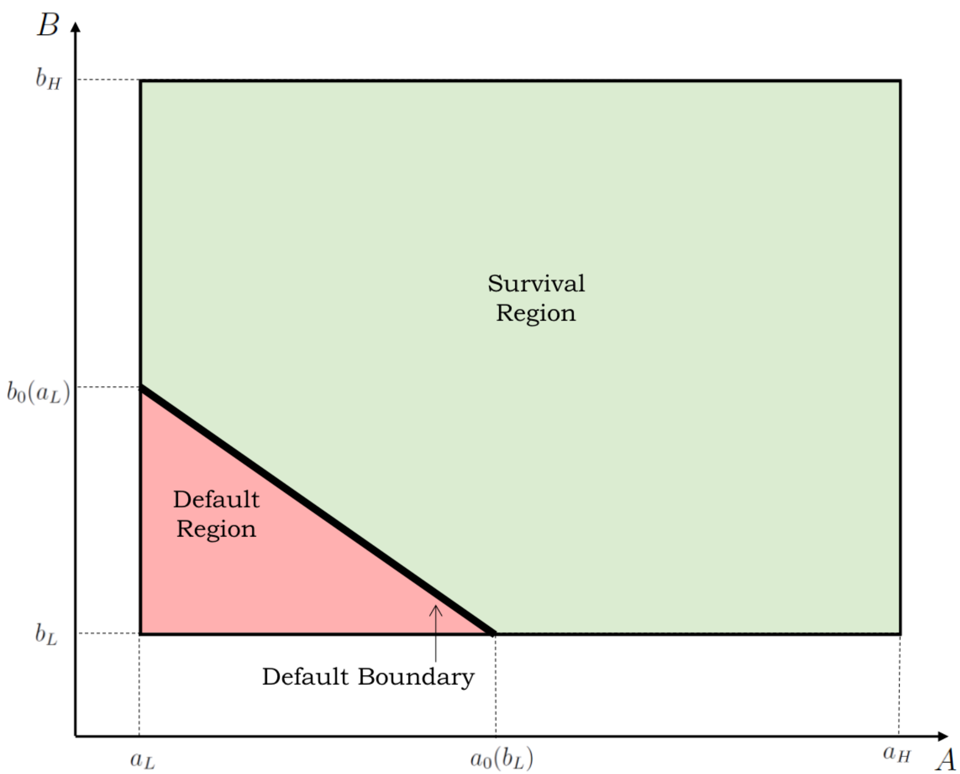
... to maximise initial shareholder's expected date-2 payoff w.

Capital requirement: $\kappa + c \geq \gamma(x+\lambda)$

Default

- The bank defaults on deposits if

$$\begin{aligned} \text{total cash flow} &< \text{promised repayment} \\ BX + A\lambda &< (1-\gamma)(x+\lambda) \end{aligned}$$



The maximisation problem

$$\max_{x\geq 0} w(x) = \underbrace{X(x) - x + E[A]\lambda - \lambda}_{\text{economic surplus}} + \underbrace{E_\Delta\left[(1-\gamma)(x+\lambda) - BX(x) - A\lambda\right]}_{\equiv s(x)\text{, i.e. the implicit subsidy}} + \kappa$$

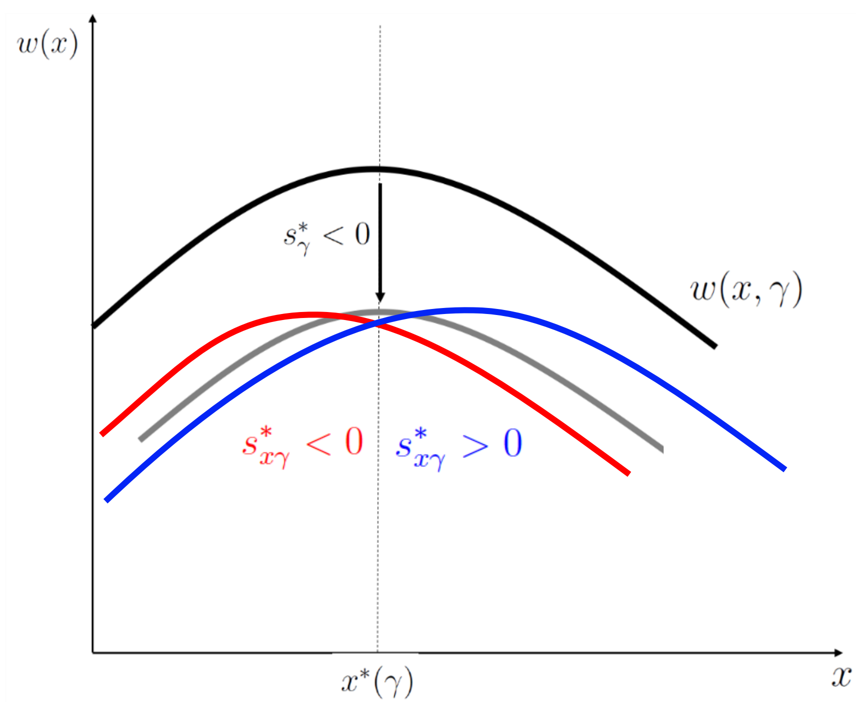
- FOC implicitly defines $x^*(\gamma)$

$$X_x^* - 1 + s_x^* = 0$$

- Is $x^*(\gamma)$ decreasing or increasing?

- Three basic points
  - γ only affects the wedge
  - $s_\gamma < 0 \Rightarrow w_\gamma < 0 \Rightarrow$ capital is costly

What matters is the sign of $s_{x\gamma}^*$

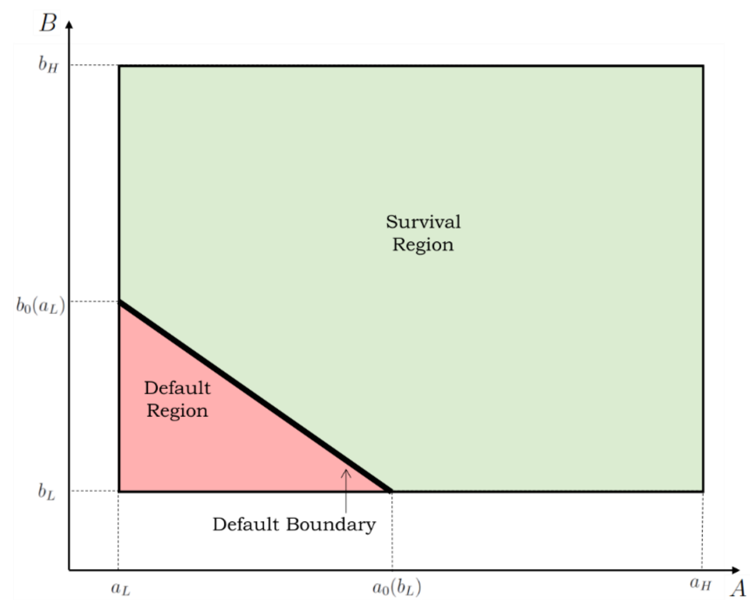


Key object: the residual cash flow

- Issuing the marginal loan affects the bank's cash flows
  - Revenue increase by BX_x
  - Due repayment increase by $1-\gamma$
- Define the marginal residual cash flow as the difference:

$$Z \equiv BX_x - (1-\gamma)$$

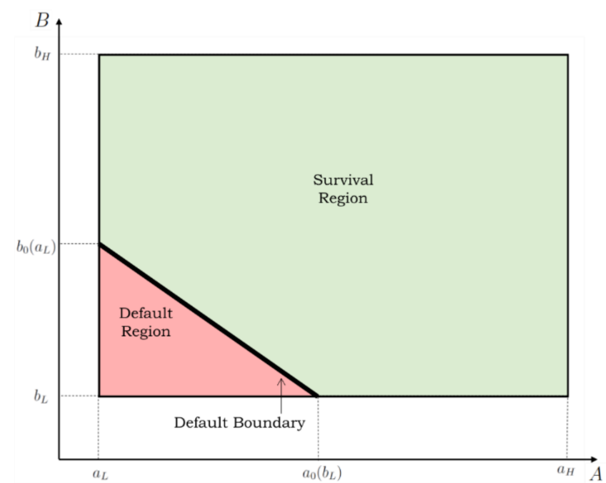
- Property rights over Z (residual claimant)
  - Survival: shareholders
  - Default: (in effect) the taxpayer



The Forced Safety Effect

$$s^*_{x\gamma} = \underbrace{-(1-p^*)}_{\text{COMPO}<0} + \underbrace{p^*_\gamma z^*_{\Delta 0}}_{\text{FSE}\gtrless 0}$$

- A change in γ generates a COMPO(sition) effect
- And affects the default boundary: also generates a FSE, which can be positive and dominate



Changes in γ affect the boundary...

... and this is exactly what conventional wisdom overlooks

Average vs Marginal Residual Cashflows

Default boundary defined by Total_RCA $= 0$

$$BX + A\lambda - (1-\gamma)(x+\lambda) = 0$$

Equivalently Average_RCA $= 0$

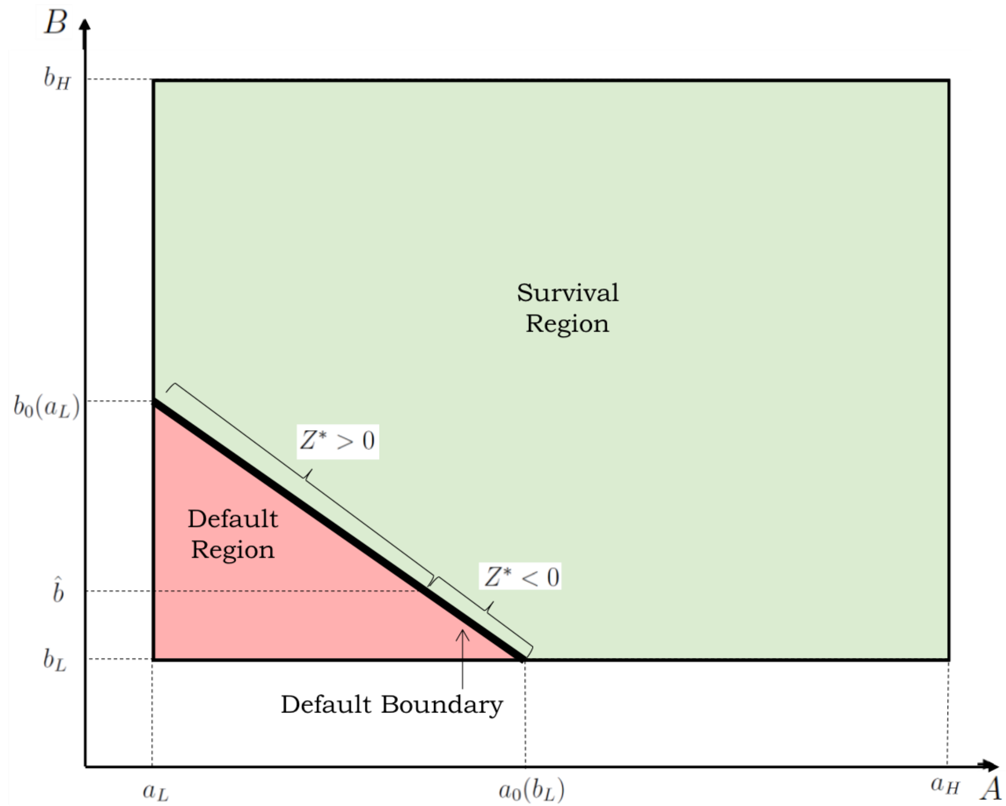
$$\overline{Z} \equiv \frac{BX + A\lambda}{(x+\lambda)} - (1-\gamma) = 0$$

But the RCA on the marginal loan is

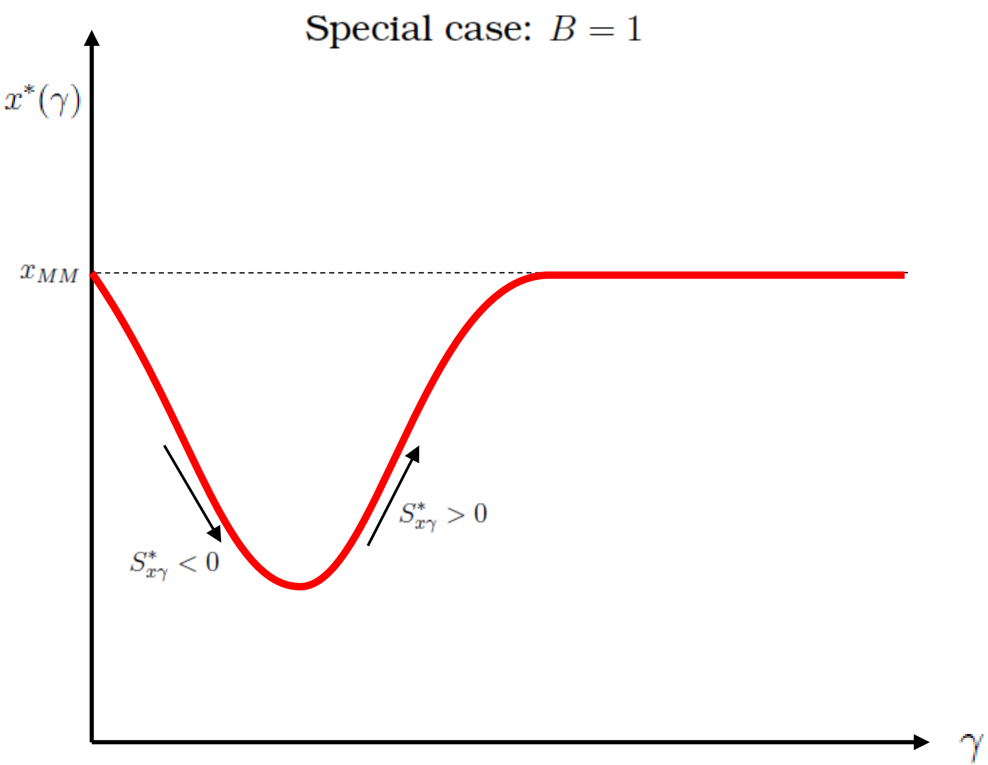
$$Z \equiv BX_x - (1-\gamma)$$

Except under very special circumstances,

there will be states in which $Z > \overline{Z} = 0$



Simple example



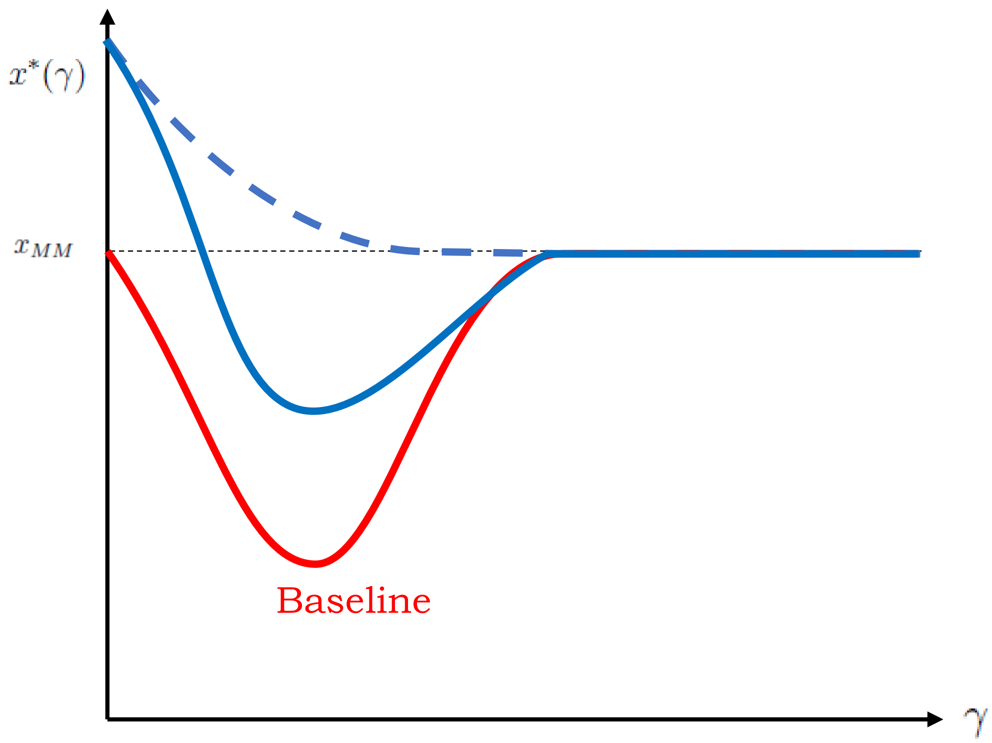
How can the implicit subsidy lead to less lending?

A subsidy or a tax?

- Imagine there is only legacy loans
  - When A is low, the bank defaults, the tax payer is on the hook.
- Issuing new loans
  - generates positive Z
  - reduces the amount needed from the tax payer
  - shareholders do not fully internalise Z
  - In fact s_x^* is always negative in this example, hence $x^* \leq x_{MM}$
- Think of a lumpsum subsidy + a marginal tax

$\boxed{\text{This is the } \textit{guarantee overhang} \text{ problem}}$

More general examples



- Is it about relative riskiness?
- Is it about correlation?

$\boxed{\text{Structure of the residual cash flows}}$

Empirical relevance: calibration

- Extended model
  - Competition
  - Tax advantage of debt
  - Bank heterogeneity.

Takeaways

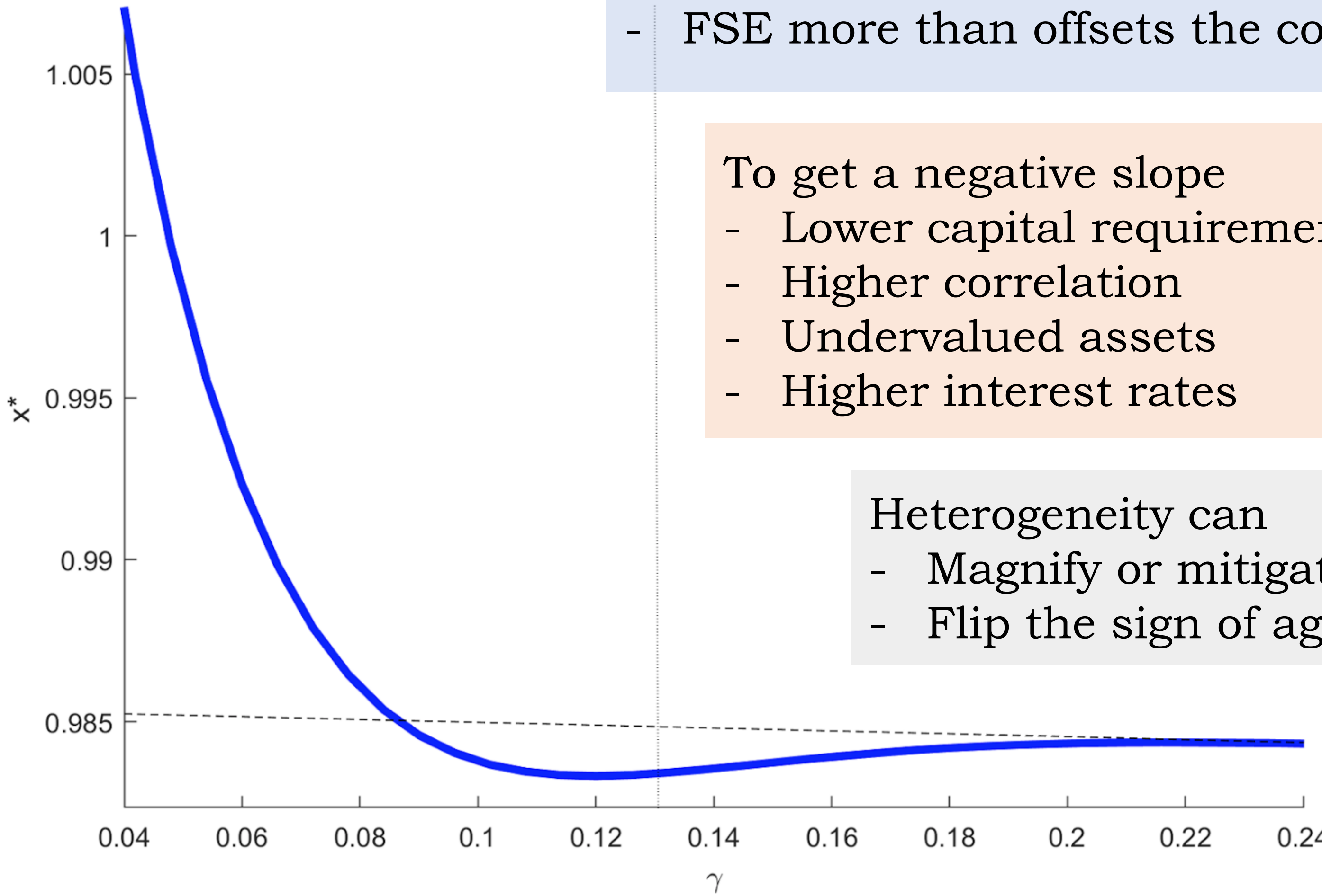
1. Representative global bank in 2017: response is midly positive (not true pre-crisis)
2. Sign and magnitude vary a lot in both cross section and the time series
3. Strongly positive responses under plausible parameter values
4. Mitigation effect

Full model: calibration

Parameter	Definition	Value	Comment
γ	capital requirement	13%	We show $x^*(\gamma)$
α, β	risk weights	50%	Mariathasan and Merrouch (2012).
r	interest rate	1.2%	Average 1 year constant maturity treasury yield (FRB).
τ	corporate tax rate	24%	OECD average
x_{MM}	MM level of lending	1	Normalisation given $E[B] = 1 + r$
z	Legacy loans	4	20% of loans maturing each year; De Nicolo, Gamba and Lucchetta (2014 XXX)

Parameter	Definition	Target	Value	Comment
n	# of banks	loan spread	2%	Gives $n = 12$.
η	elasticity of demand	elasticity mortgage demand	0.2	Best et al (2015)
ρ	Correlation	arbitrary	0.5	(Sensitivity analysis)
$\sigma_\alpha, \sigma_\beta$	Stand. dev.	"default" probability	3%	Assume $\sigma_\alpha = \sigma_\beta$, $\rho = 0.5$ (arbitrary)
μ_A	Legacy loan quality	arbitrary	1.012	$E[A] = 1 + r$ (Sensitivity analysis)

Full model: calibration



Slope is relatively flat
- Interest rate is low (shield almost irrelevant)
- FSE more than offsets the composition effect

To get a negative slope
- Lower capital requirement
- Higher correlation
- Undervalued assets
- Higher interest rates

Heterogeneity can
- Magnify or mitigate
- Flip the sign of aggregate

Contribution (1)

- “Capital is costly” $\nRightarrow$ “negative lending response”
- The Forced safety effect
  - makes the bank internalise residual cashflows
  - can be positive and dominate
  - is a quantitatively relevant force
  - is what conventional wisdom overlooks
- The Guarantee Overhang problem
  - Is why the implicit subsidy can lead to underlending
  - does not arise from existing debt
  - Makes a positive response more likely, but is not a necessary condition

Contribution (2)

- Inefficiency

Limited liability	+ Existing debt	+ Government guarantees
Asset substitution	Jensen and Meckling 1976 (Risk shifting)	Kareken and Wallace 1978 (Risk shifting)
Overvaluation	Allen and Gale 2000 (Bubbles)	
Undervaluation	Myers 1977 (Debt Overhang)	

Residual cashflow approach unifies all cases

- Effect of capital requirements

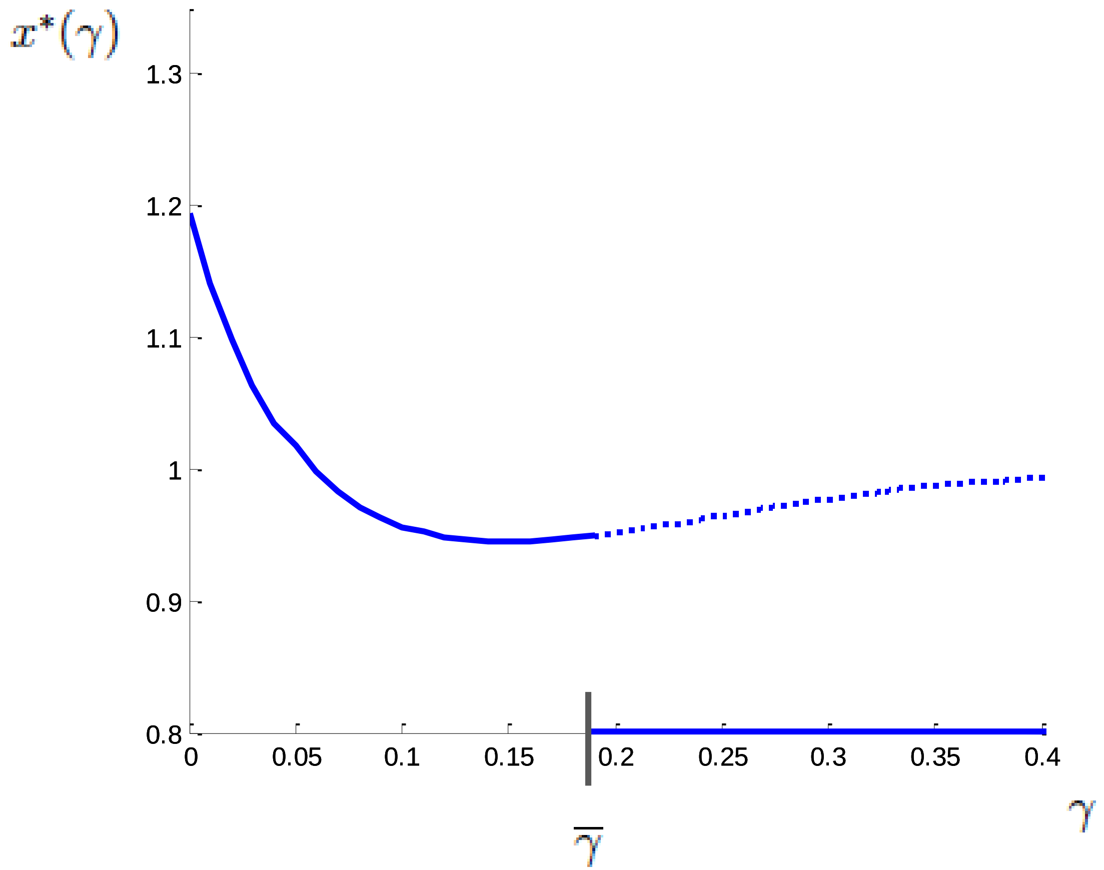
Both cases are compatible with either positive or negative lending response

Conventional wisdom: models built to naturally deliver a negative lending response (e.g. Thakor 1996, Martinez-Miera Suarez 2014, Begenau 2018, Malherbe 2017).

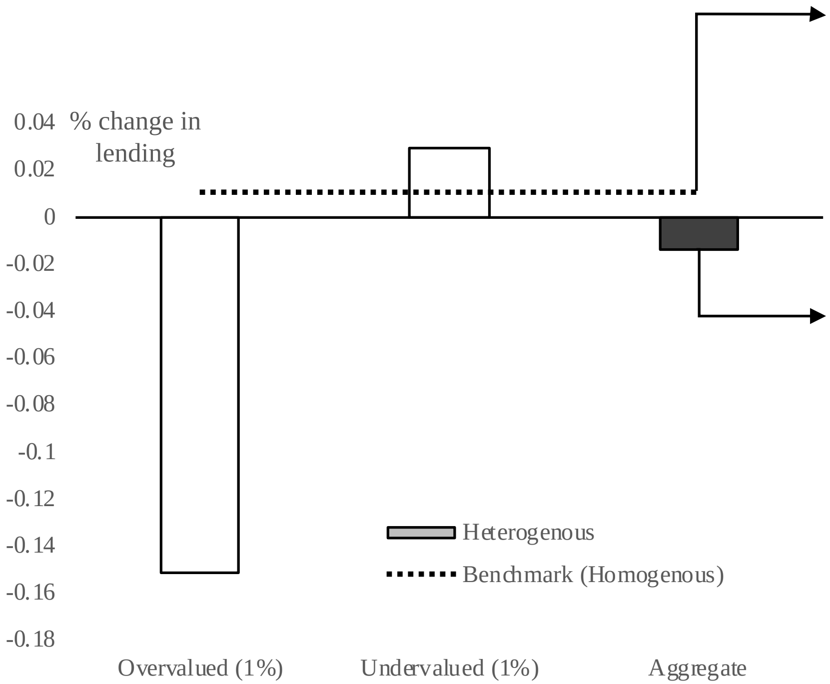
Thank you

Distressed bank

- Assume $E[A] < 1$ and $e < \gamma z$



Heterogeneity



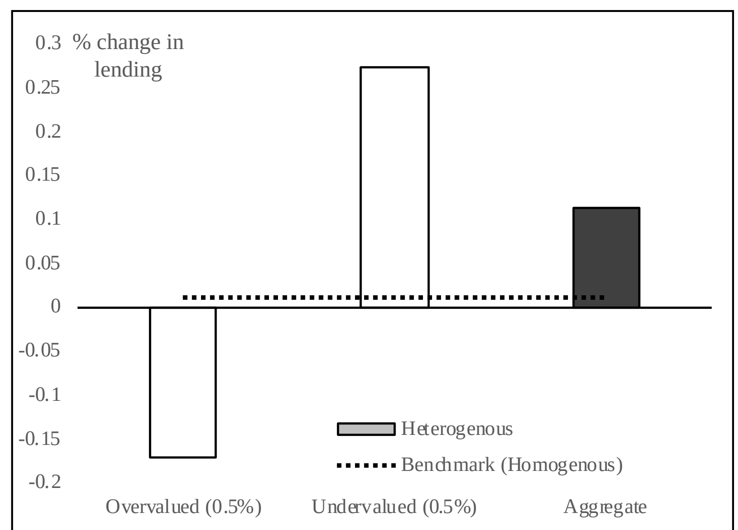
Benchmark
- Representative bank
- Assets fairly valued

⇒ Small positive response

Heterogeneity
- 50% banks with overvalued assets
- 50% banks with undervalued assets

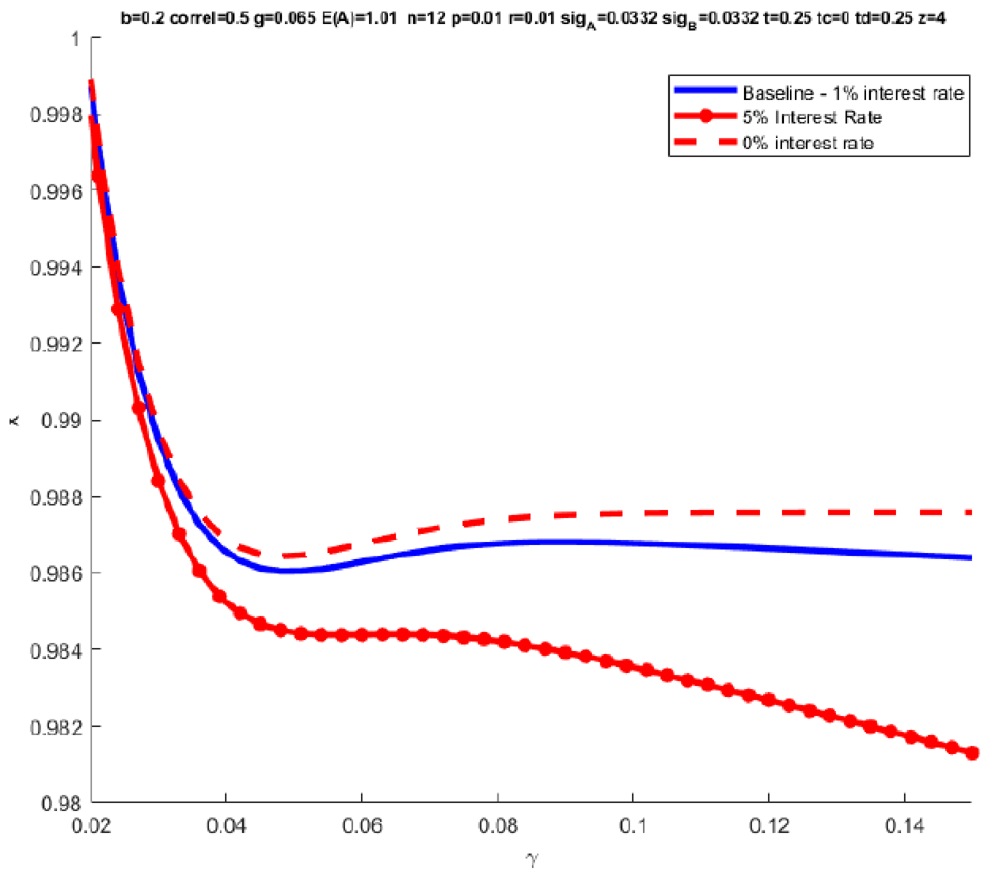
⇒ Small negative response

But heterogeneity can also magnify the aggregate response



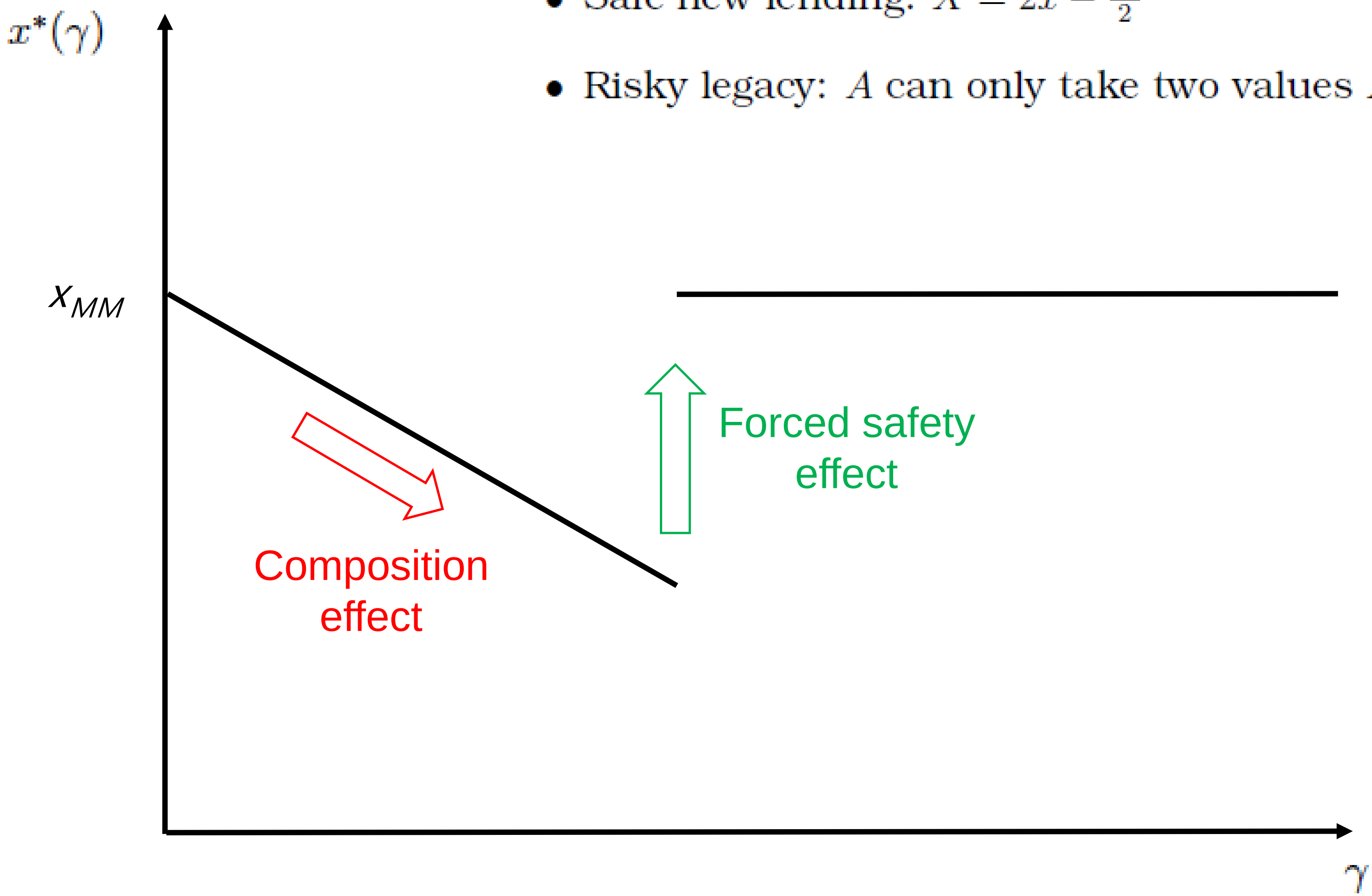
Interest rates

Figure 7: Interest rate



Two-state case

- Safe new lending: $X = 2x - \frac{x^2}{2}$
- Risky legacy: A can only take two values A_L and A_H



Three-state case