Zombie Lending and Policy Traps

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Policy response to aggregate shocks

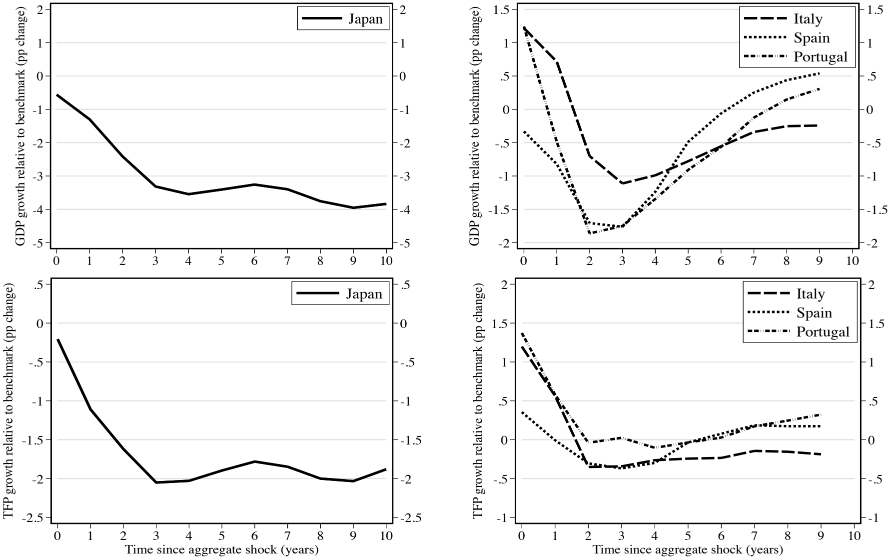
- Forbearance towards banks has been increasingly used in conjunction with accommodative monetary policy in a bid to restore economic growth in the aftermath of aggregate shocks.
  - Japan real estate crisis in the early 1990s
  - European sovereign debt crisis in 2010–12

This *policy script* was somehow able to prevent sharp contraction in credit supply,

but its impact on economic growth proved to be relatively muted,

despite its operating period exceeded initial intentions and expectations.

Post-shock GDP and TFP dynamics in Japan and South EU



Credit misallocation and Zombie Lending

Ineffectiveness of policy script imputable (at least in part) to particular form of credit misallocation.

Zombie lending: *Provision of subsidized credit to poorly performing firms.*

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Zombie lending: *Provision of subsidized credit to poorly performing firms.*

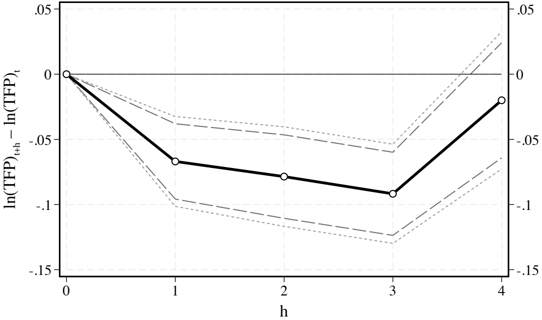
	Japan (*86-89 vs 90-01*)	*Italy*	*Spain* (*vs Germany 10-19*)	*Portugal*
Share of zombie firms	+6.1 pp.	+7.7 pp.	+2.4 pp.	+3.8 pp.
Correlation b/w change industry share of zombie firms and industry TFP growth	-57%		-61%	

- Steady increase in the number of poorly performing firms receiving subsidized credit.
- Spread of zombie lending associated with broad adverse effects on the real economy.

Zombie lending ⇒ Productivity growth dynamics

Cross-industry evidence from Europe

$$\ln(\text{TFP})_{ic,t+h} - \ln(\text{TFP})_{ic,t} = \alpha_i + \alpha_c + \beta_h \,\text{Zombie Share}_{ic,t} + \gamma_h \boldsymbol{X}_{ic,h} + \epsilon_{ic,t}$$



- The negative spillovers / congestion externalities are persistent and unfold dynamically, gradually compounding over time.

Heterogeneous firms: Technology

Each period the economy is populated by a unit mass of firms.

Each firm is endowed with one of two types $i = G, B$ of projects:

$$\text{type } i \text{ project yields output} \quad \begin{cases} y^i(z) & \text{with prob. } \theta^i \\ 0 & \text{with prob. } 1-\theta^i \end{cases}$$

where z is an aggregate *negative* shock, $\frac{\partial y(z)}{\partial z} < 0$.

Undertaking a project requires:

- \$1 of capital upfront, borrowed from a bank.
- Paying idiosyncratic, non-pecuniary cost $\epsilon \in [0, \bar{\epsilon}] \sim$ cdf H

Like "zombie firms", B firms are *riskier* and *less productive* than G firms:

$$\theta^g > \theta^b$$
$$\theta^g y^g(z) - \bar{\epsilon} > \theta^b y^b(z)$$

Heterogeneous firms: Entry & exit

Given realization of idiosyncratic cost ϵ and taking (type-specific) borrowing cost R^i as given, a firm of type i produces if

$$\mathbf{E}[\text{profit}^i] \geq 0 \iff \epsilon \leq \theta^i(y^i(z) - R^i)$$

and it exits otherwise.

Creative destruction:

A fringe of potential entrants of type G could enter the economy.

In particular, type G entrants could replace all incumbents endowed with B project …

… ***if*** they are able to obtain funding from a bank (bank capital is *the* scarce resource).

Heterogeneous banks

Unit mass of banks

Each bank is endowed with equity $e \sim$ cdf F over $[e_{\mathrm{min}}, e_{\mathrm{max}}] \subset (0, 1)$.

Treat e as exogenous for now, endogenous later.

Bank with capital endowment e :

needs to raise $(1 - e)$ of external finance at borrowing cost $\tilde{R}^i$

and invests its \$1 of assets in either one of three projects:

- loan to G firm: return $\mathbf{R^g}$ with prob. $\theta^{\mathbf{g}}$, 0 otherwise;
- loan to B firm: return $\mathbf{R^b}$ with prob. $\theta^{\mathbf{b}}$, 0 otherwise;
- safe assets: return $\mathbf{R^f}$ with prob. $\theta^{\mathbf{f}} = \mathbf{1}$.

Policy maker: Two instruments to maximize output

Policy maker wants to maximize stream of aggregate output of the economy (with perfect foresight), using two instruments that affect level and allocation of credit though mkt clearing rates (R^g, R^b):

$$\max_{\{R^f, p\}} Y_t + \beta Y_{t+1} + \beta^2 Y_{t+2} + \ldots$$

Monetary policy R^f affects:

- return on safe assets;
- banks' cost of funds.

but it is constrained: $R^f \geq$ Effective Lower Bound (ELB).

"Bank forbearance" policy $p \in [0, 1]$ captures implicit and explicit lending subsidies toward banks:

Higher p reduces banks funding costs but it also undermines market discipline and incentivizes risk-taking.

(if $p = 0$, back to MM benchmark w\ risk-pricing $\tilde{R}^i = R^f / \theta^i$)

Choice of policy mix affects aggregate output because it shapes banks' portfolio choice.

Bank expected return from investing in project of type $i = \{g, b, f\}$

$$\theta^i \left[R^i_t - \tilde{R}^i_t (1 - e_t) \right]$$

associated cost of capital:

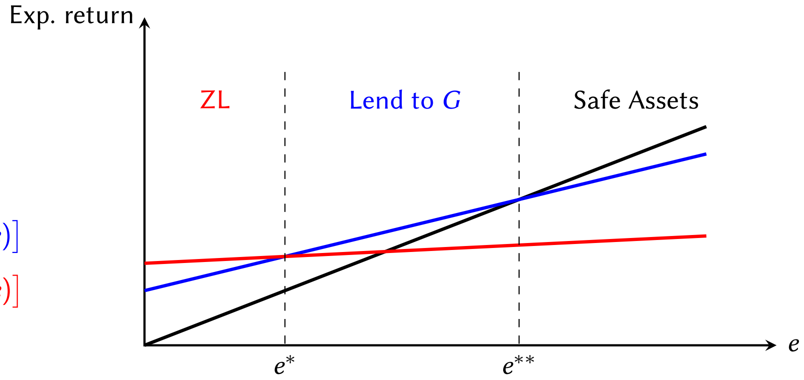
$$\tilde{R}^i_t = \frac{R^f_t - (1 - \theta^i)\, p_t}{\theta^i}$$

Diabolical sorting

$R^f e$

$\theta^g \left[R^g - \tilde{R}^g(1-e)\right]$

$\theta^b \left[R^b - \tilde{R}^b(1-e)\right]$



- Poorly capitalized banks finance poorly performing firms due to risk shifting incentives.
- Policy affects credit allocation because it impacts thresholds $e^*(p)$ and $e^{**}(p, R^f)$.

Diabolical sorting: the role of forbearance

Expected return from investing in asset of type $i = \{g, b, f\}$, accounting form endogenous $\tilde{R}^i$:

$$\theta^i \left[R^i - \tilde{R}^i(1-e)\right] = \underbrace{\theta^i R^i - R^f}_{\text{M-M return}} + \underbrace{p(1-\theta^i)(1-e)}_{\text{subsidy}}$$

Complementarity (super-modularity) between:

1. generosity of forbearance policy (p),
2. borrower's risk ($1-\theta^i$)
3. bank leverage ($1-e$).

When forbearance is high, poorly capitalized banks gain the most from lending to B firms (at subsidized rates).

Misallocation and negative externalities

Realized aggregate output:

$$Y_t = \underbrace{\int_0^{\theta^g\left(y^g(z)_t - R_t^g\right)} \left[\theta_t^g y^g(z)_t - \epsilon\right] dH(\epsilon)}_{>>0} + \lambda \underbrace{\int_0^{\theta^b\left(y^b(z)_t - R_t^b\right)} \left[\theta^b y^b(z)_t - \epsilon\right] dH(\epsilon)}_{>0}.$$

Financing B projects:

- increases realized output today, relative to *not lending:*
  $\Rightarrow$ **lending channel**.
- lowers realized output today, relative to economy's *potential output* $Y_t^* = \theta^g y^g(z)_t - \mathbf{E}[\epsilon]$.
  $\Rightarrow$ **misallocation effect**.
- lowers **future economic fundamentals** due to negative externalities:

$$z_{t+1} = z_t + \eta_t + \alpha m_t^b$$
$$\Rightarrow Y_{t+1}^* = Y_{t+1}^*\left(y^g(z)_{t+1}\right) \searrow$$

Policy response to aggregate shocks

Transitory exogenous shock

Exogenous transitory shock:

$$\eta_0 > 0$$
$$\eta_t = 0 \quad \forall t > 0$$

Endogenous persistence and impact on fundamentals:

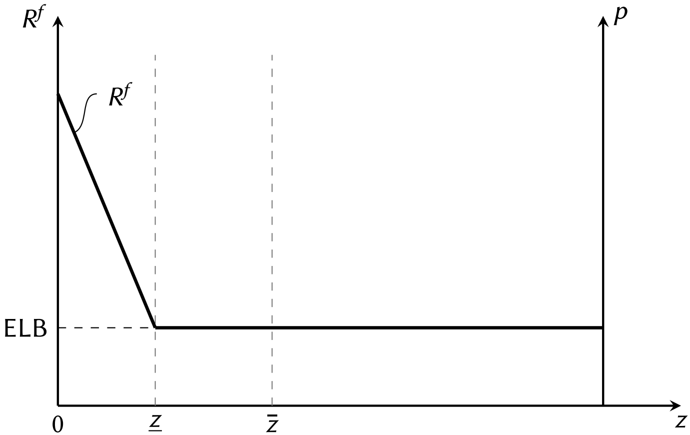
$$z_{t+1} = z_t + \eta_t + \alpha m_t^b$$

What is the optimal policy response to the shock?

Key variable affecting optimal policy rule $\{R_t^f, p_t\}$ is policy maker discount factor β.

High β captures: regulatory capture, term mandates, fiscal constraints.

Optimal policy in response to aggregate shock: Short run



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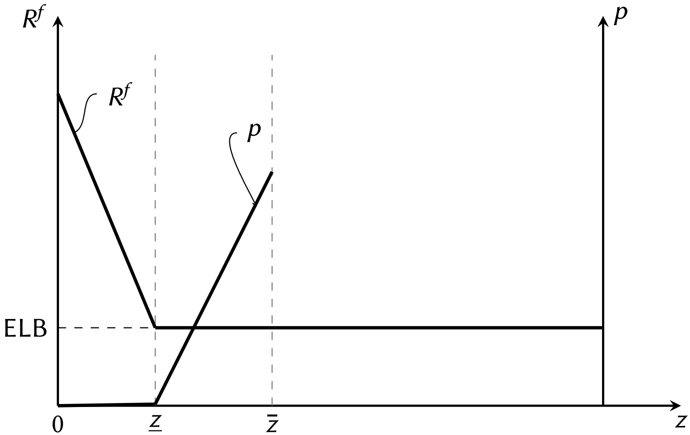

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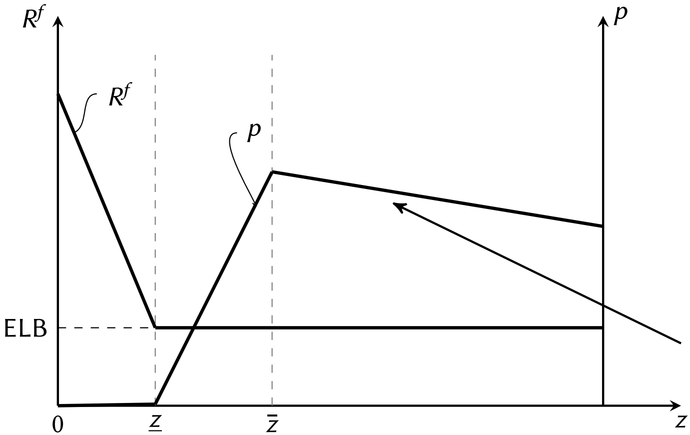

High β

Forbearance policy reversal

Scaling back p leads to contraction in aggregate lending, but prevents ZL

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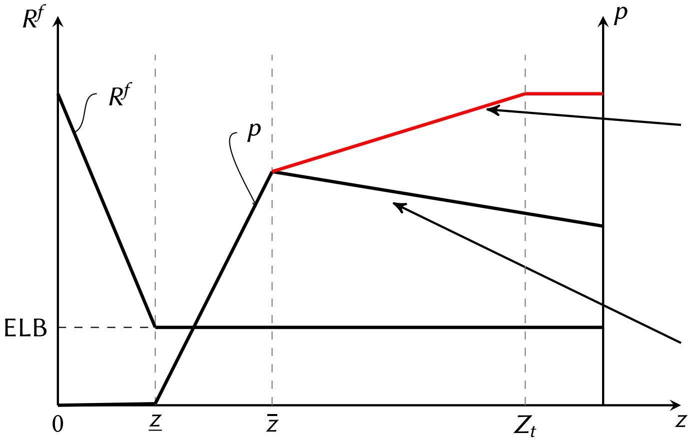

Low β
Stimulus through forbearance
Scaling up p sustains aggregate output though lending, but generates ZL

High β
Forbearance policy reversal
Scaling back p leads to contraction in aggregate lending, but prevents ZL

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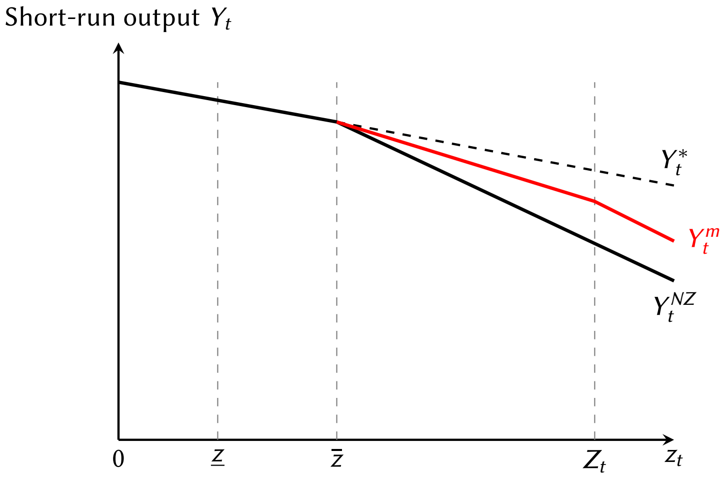

Optimal policy in response to aggregate shock: Dynamics

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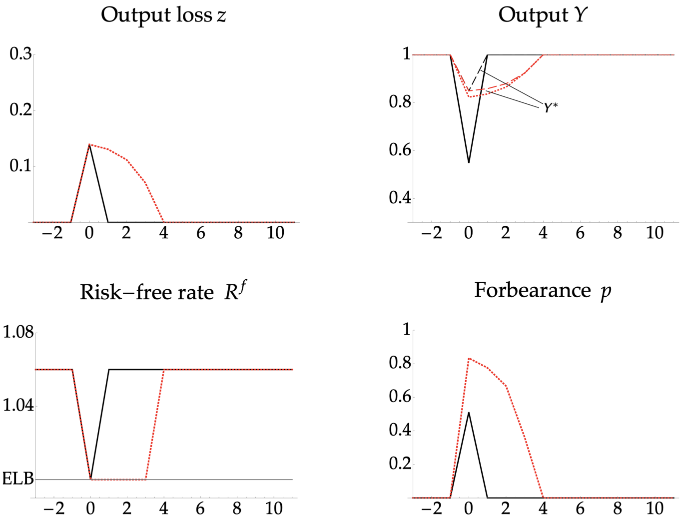

Small initial shock (low η_0)

High β:
$\Rightarrow$ "V-shaped" recession

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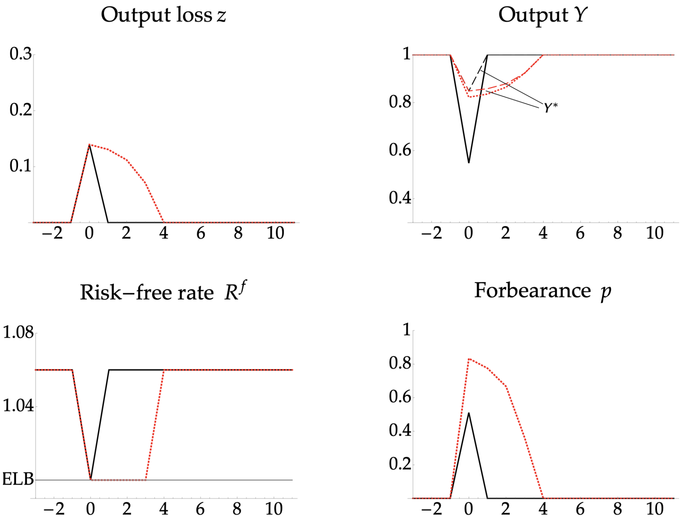

Small initial shock (low η_0)

High β:
⇒ "V-shaped" recession

Low β:
⇒ Mild short-run recession but endogenous persistence

Black solid lines: High β
Red dotted lines: Low β

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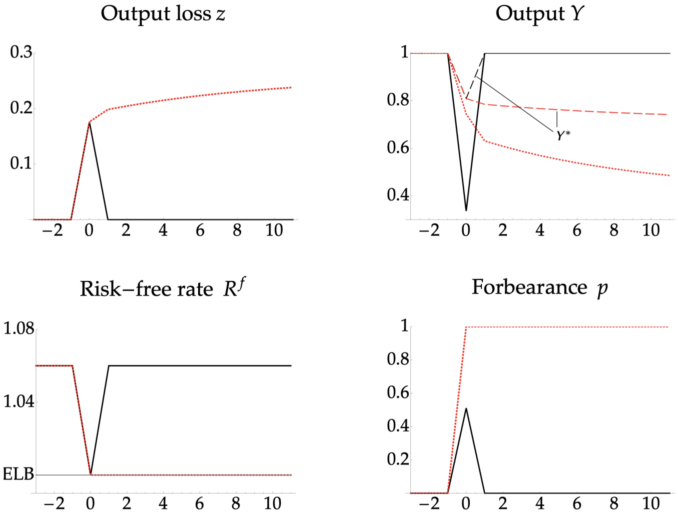

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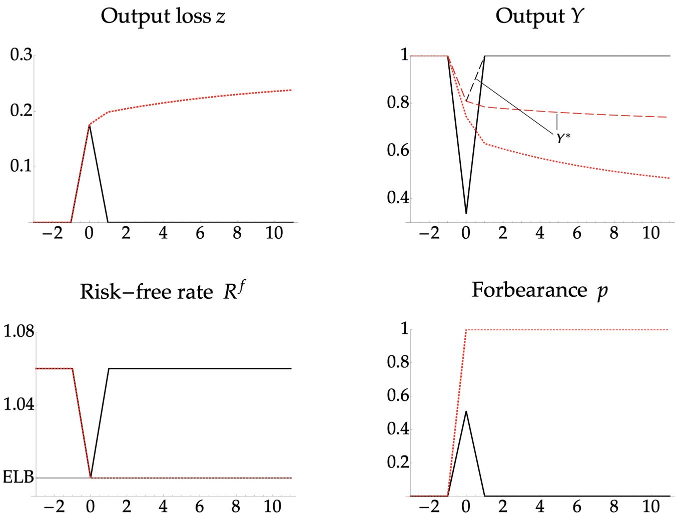

Large initial shock (high η_0)

High β:
$\Rightarrow$ Severe "V-shaped" recession.

Low β:
$\Rightarrow$ Milder short-run recession but economy diverges to a *new* steady state with lower fundamentals: sclerosis state.

$\Rightarrow$ Policy is trapped: given lower fundamentals, policy keeps accommodative stance; but without ever being able to restore pre-shock fundamentals.

The role of bank capital

- Can the economy exit the policy trap and recover from sclerosis?
  1. Improvements in fundamentals of healthy firms;
  2. Capital injections into the banking system;
  3. Bank supervision.

- Capitalization of the banking system is linchpin.
  - Well capitalized system is more resilient ($\bar{z}$ is higher) and policy trade-off less severe $\forall \beta$.
  - Bank capital requirements *help*, when imposed *ex-ante.*
  - Bank capital requirements *hurt*, when raised *ex-post:*
    - Evergreening.
    - There exists an optimal level of capital requirement: beyond it, ZL increases.