The Distortionary Effects of Central Bank Direct Lending on Firm Quality Dynamics

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New Norm: Central Bank Direct Lending (CBDL) to Firms

- Central bank lending to firms is becoming the "new norm" globally.
  - Post-2008: BOJ, ECB and BOE all have corporate bond purchase programs.
  - During COVID-19: Fed's Corporate Bond Credit Facilities; Main Street Lending Program (MSLP).
  - MSLP provides LIBOR + 3% rate for all borrowers.

- Q: how will CBDL affect post-crisis recovery and effectiveness/scale of future crises interventions?

Overview

Our paper: Although boosting aggregate investment, govt direct lending distorts firm quality dynamics due to the lack of differentiation.

- During crisis: high-quality firms overpay but low-quality firms underpay for CBDL. The natural "cleansing effect" is weakened.

- Outside crisis: expectations of future CBDL distort quality growth.

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more quality distortion

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- Gradualism is beneficial: tight government interventions always improve welfare, while aggressive ones usually decrease welfare.
- Extensions to banks and corporate liquidity management.

Outline

Preferences and Technology

- A continuous-time economy with a government and a unit of mass of households. Risk-neutral utility,

$$E[\int_{t=0}^{\infty} e^{-rt} dc_t]$$

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- A continuum of firms of type H and L, with different capital productivity, $A^H > A^L$.
  - Equity-only firms owned by households. Capital value $q_t^j, j \in \{H, L\}$ is endogenous.
  - Total output: $Y_t = A^H K_t^H + A^L K_t^L$
  - Capital quality refers to the fraction of H-type firms:

$$\omega_t = \frac{K_t^H}{K_t^H + K_t^L}$$

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- Normal-time investment opportunities arrive at **idiosyncratic** Poisson shocks dN_t^I.
  - Technology: $x_t^j k_t^j$ amount of goods into $F(x_t^j)k_t^j$. Targeted investment level $\bar{\iota}_t^j$ determined by q-theory:

$$q_t^j F'(\bar{\iota}_t^j) = 1, \quad j \in \{H, L\}$$

Financial Constraints and Crises

- Collateral constraint (due to limited commitment to pay households):

$$\underbrace{x_t^j k_t^j}_{\text{new investment}} \leq \underbrace{\chi q_t^j k_t^j}_{\text{collateral value of existing capital}}, \quad \chi \in (0,1)$$

  - Kiyotaki and Moore (1997); Geanakoplos (2010); Rampini and Viswanathan (2010).
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- Crisis: systematic Poisson shocks dN_t (intensity λ) that hits all firms, but firms can make new investment to rebuild capital.
  - For a single firm, u fraction of capital is destroyed, and $u \in [0,1]$ is randomly drawn from CDF $G(\cdot)$. Collateral constraint becomes

$$\underbrace{x_t^j k_{t-}^j}_{\text{new investment}} \leq \underbrace{\chi q_t^j (1-u) k_{t-}^j}_{\text{collateral value of capital after crisis}}$$

  - For large enough u, this constraint will be binding.

Benchmark (no govt funding) – Investment and Financing in Crises

- Firm's profit of investment (per unit of pre-crisis capital):

$$\pi(u_t, q_t^j) = \max_{x \leq \chi(1-u_t)q_t^j} \left\{ q_t^j F(x) - x \right\}$$

  In expectation, the profit is $\Pi(q_t^j) = \mathbb{E}_u[\pi(u_t, q_t^j)]$.

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- Capital pricing equation (U is the expectation of capital destruction shock u):

$$r = \underbrace{\frac{A^j}{q^j}}_{\text{output}} - \underbrace{\delta}_{\text{depreciation}} + \underbrace{\frac{\lambda_I \left(q^j F\left(\bar{\iota}^j\right) - \bar{\iota}^j \right)}{q^j}}_{\text{investment in normal times}} + \underbrace{\lambda \left(\frac{\Pi(q^j)}{q^j} - U \right)}_{\text{investment and destruction in crisis}},$$

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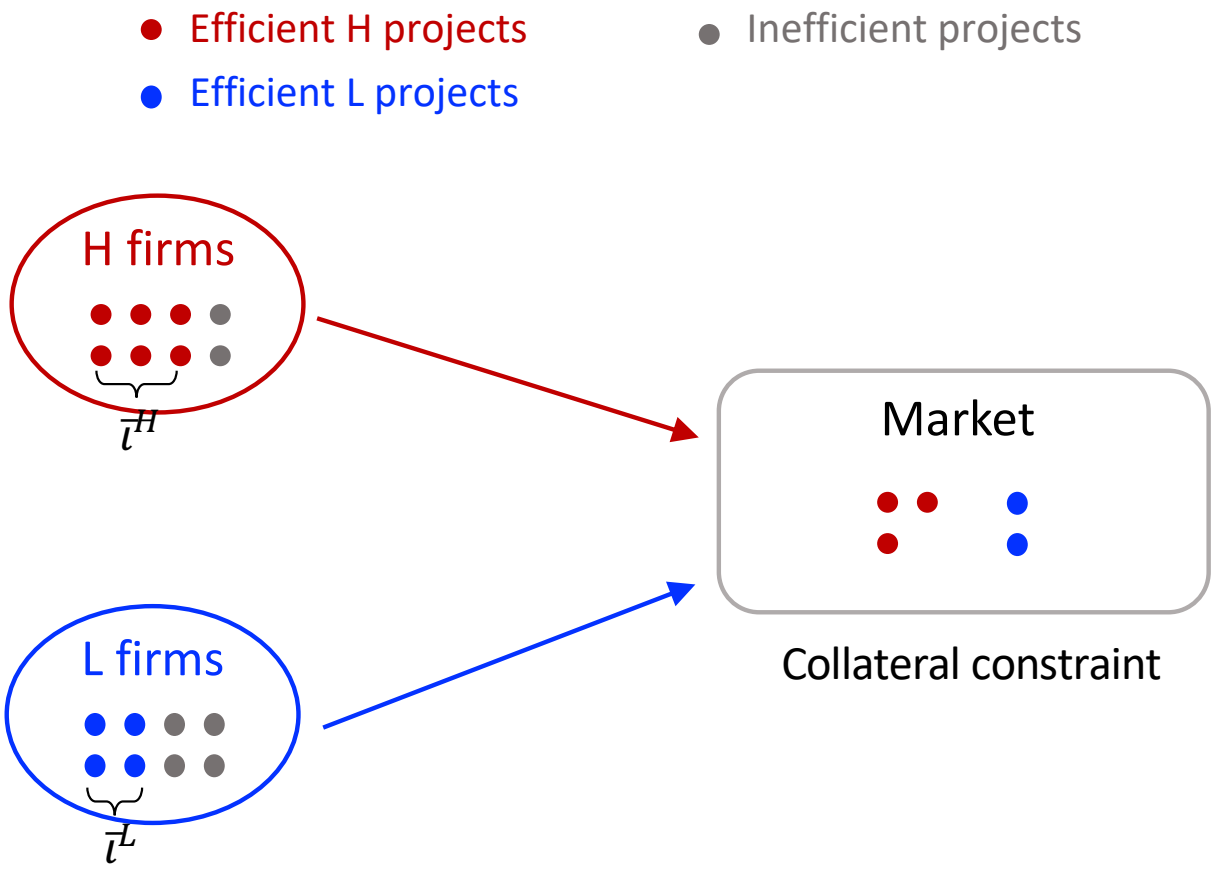
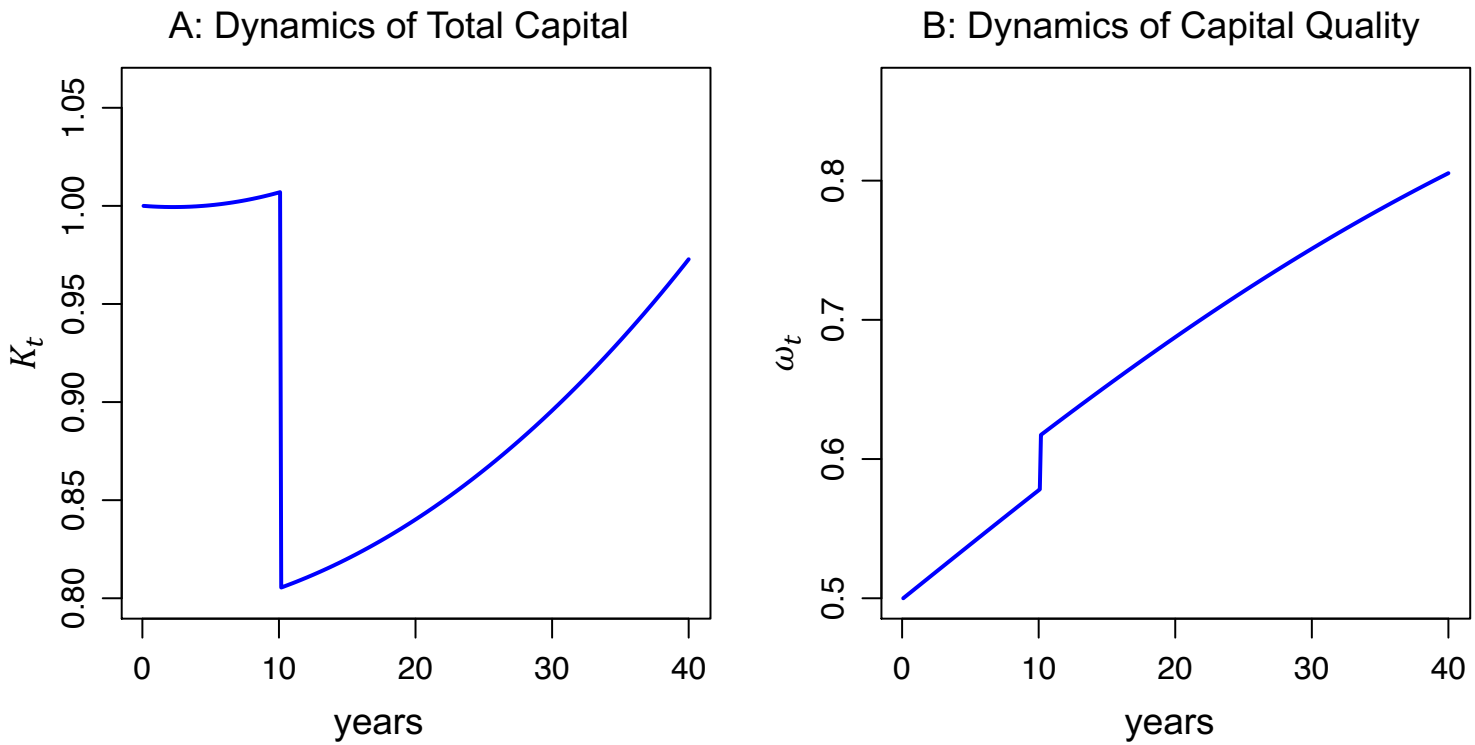
- In equilibrium, capital values and investments are constant, and $q^H > q^L$.

Private-Market Allocations in Crises



Benchmark (no govt funding) – Cleansing Effects of Crises

- Capital quality, ω_t jumps up during a crisis ("cleansing effects"). Two reasons:
  - Collateral constraint is tighter for L-type firms, i.e., $\chi(1-u)q^L < \chi(1-u)q^H$.
  - Unconstrained investment is lower for L-type firms, $\bar{\iota}^L < \bar{\iota}^H$.



Outline

Government Credit Policy

- Private market: perfectly differentiate H and L firms, but subject to credit constraints.

- Government funding: resolve the credit constraint, but cannot discriminate firms.
  - A key feature observed in reality, e.g., PPP, MSLP.
  - Two motivations: (1) political constraints – government should not "pick winners and losers"; (2) information disadvantage of central authorities (Hayek, 1945).

- For g_t^j amount of government financing to type-j firm, the government asks for $\gamma_t g_t^j$ units of capital as payment.

Firm's Financing Problem in Crises

- With government funding, the firm chooses between private-market funding and government funding in a crisis. Profit per unit of pre-crisis capital:

$$\pi(u_t, q_t^j, \gamma_t) \equiv \max_{x \geq 0,\, g \geq 0} \underbrace{q_t^j F\left(x+g\right)}_{\text{value of new capital}} - \underbrace{x}_{\text{cost of private-market funding}} - \underbrace{q_t^j \gamma_t g}_{\text{cost of govt funding}},$$

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- "Expensive" government funding ($\gamma_t q_t^j > 1$): pecking-order financing.
  - Small u_t: use private funding up to achieve $\bar{\iota}_t^j$.
  - Large u_t: exhaust private-funding capacity $\chi(1-u_t)q_t^j$, and supplement with govt funding.

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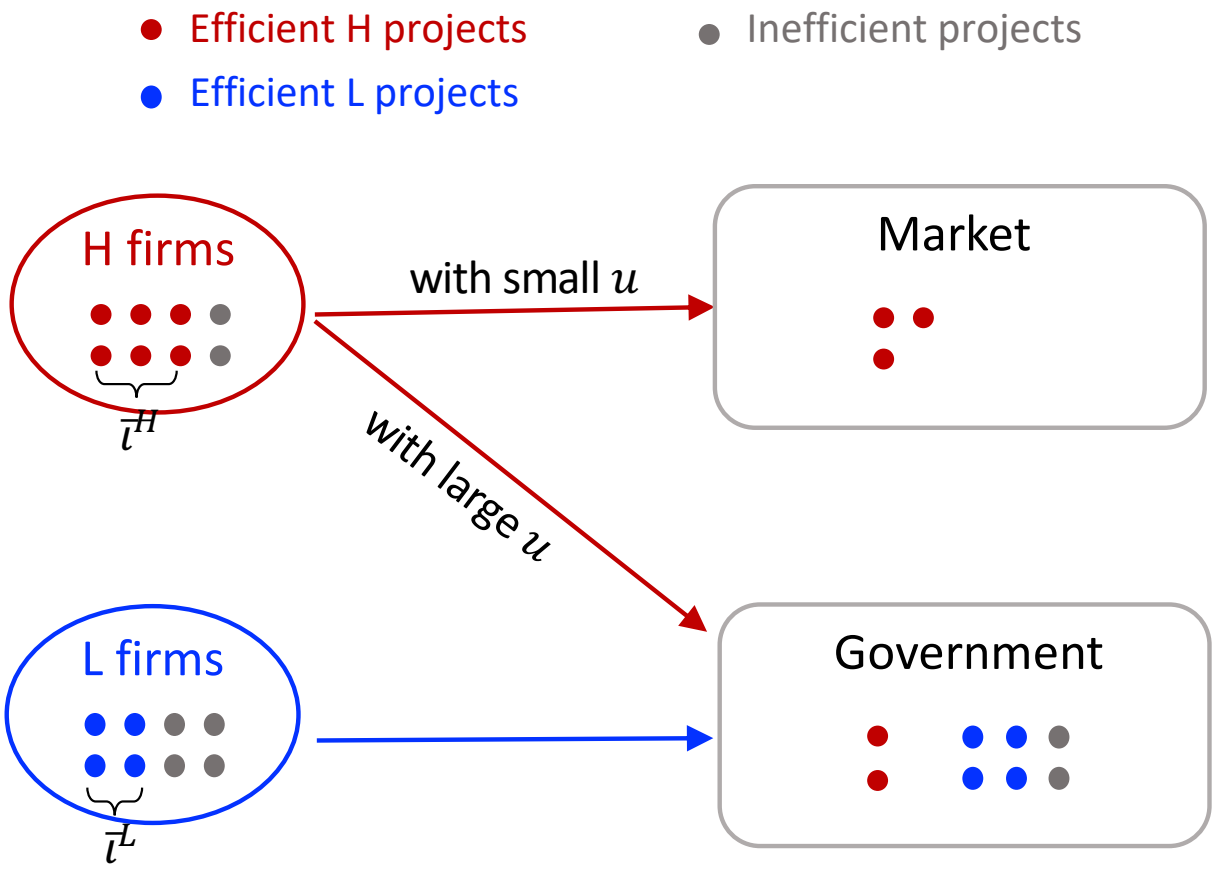
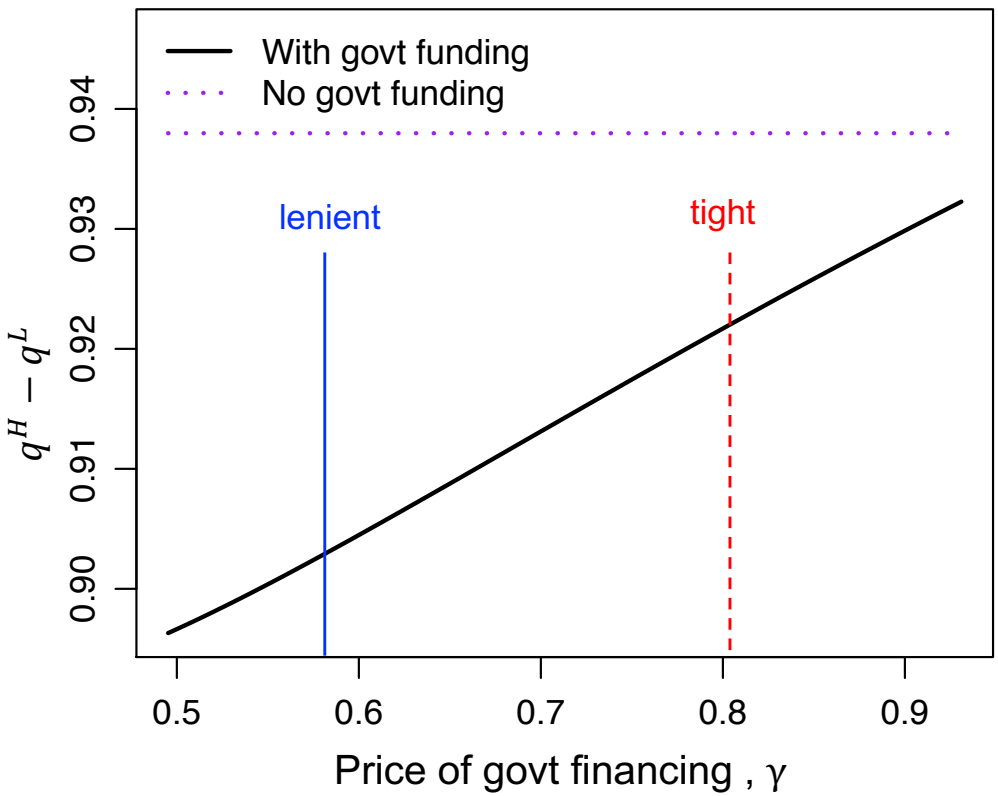
- Restrict $\gamma_t \in [1/q_t^H, 1/q_t^L]$.

Allocations with both Private Market and Government



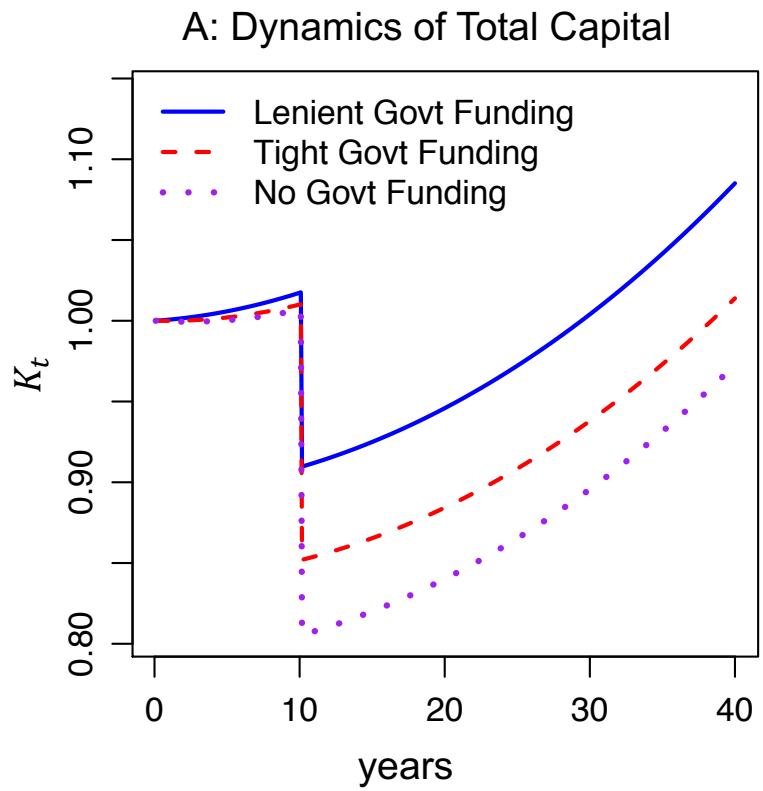
Government Funding Weakens the Cleansing Effects: Channels

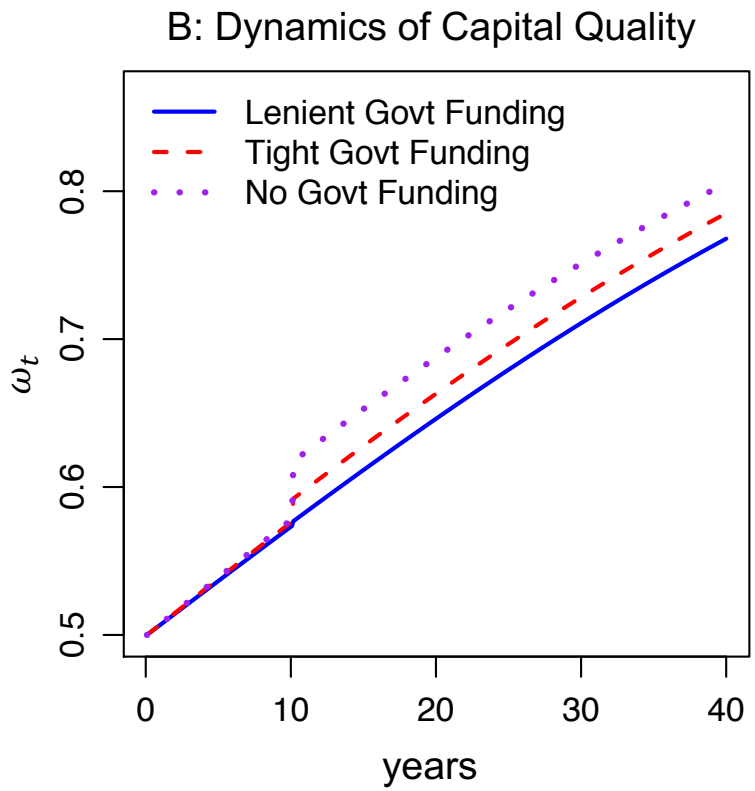
- Govt funding in crisis reduces capital decline, but weakens the cleansing effect.
  - L firms fully rely on govt funding while only highly constrained H firms need govt funding $\Rightarrow$ The wedge between q^H and q^L declines.
  - Two channels: (1) collateral constraint tightness (2) target investment level.



Government Funding Weakens the Cleansing Effects: Dynamics

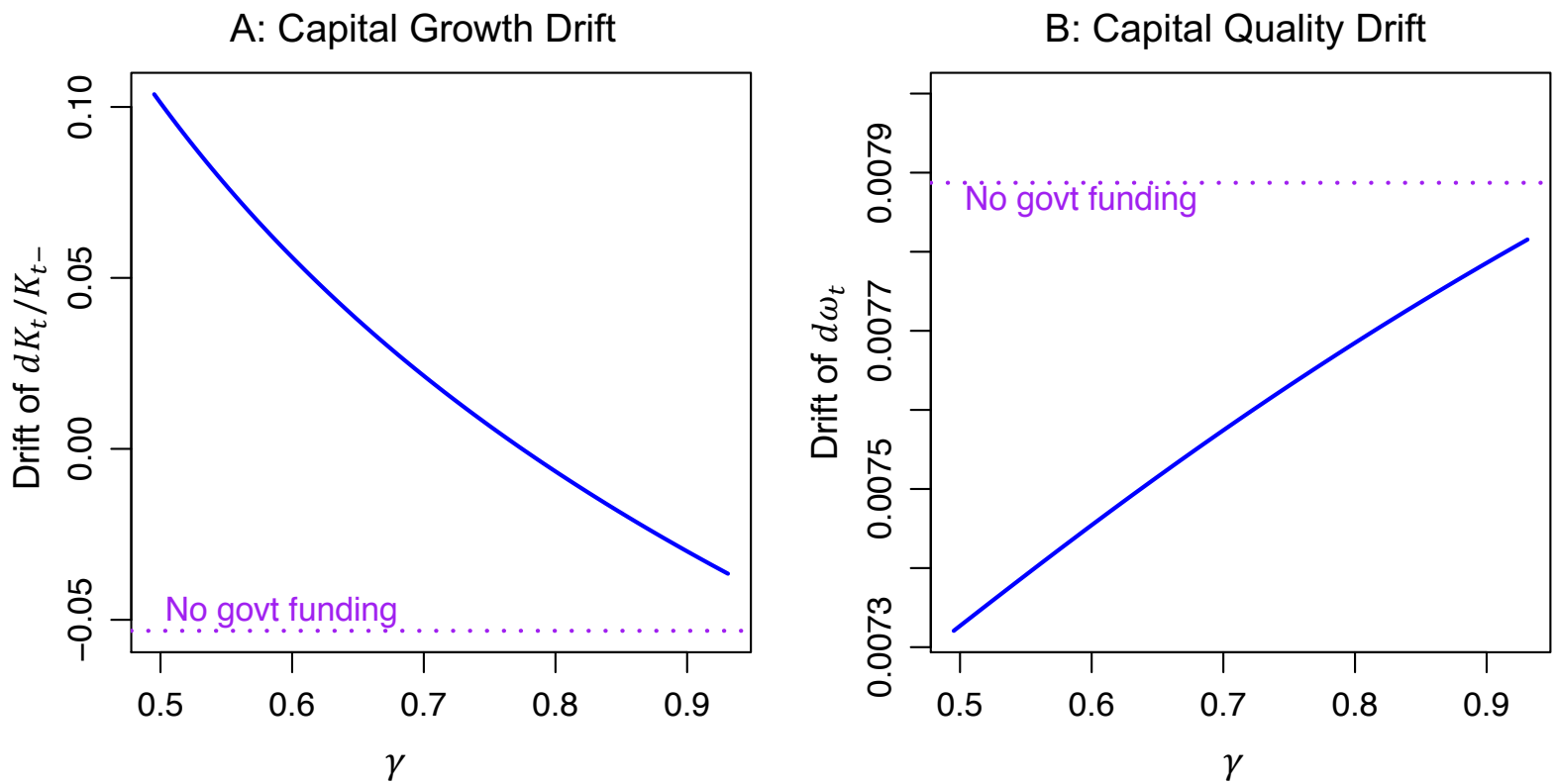
- A more lenient government funding further reduces capital decline, but worsens the capital quality dynamics.





Expectation Effects

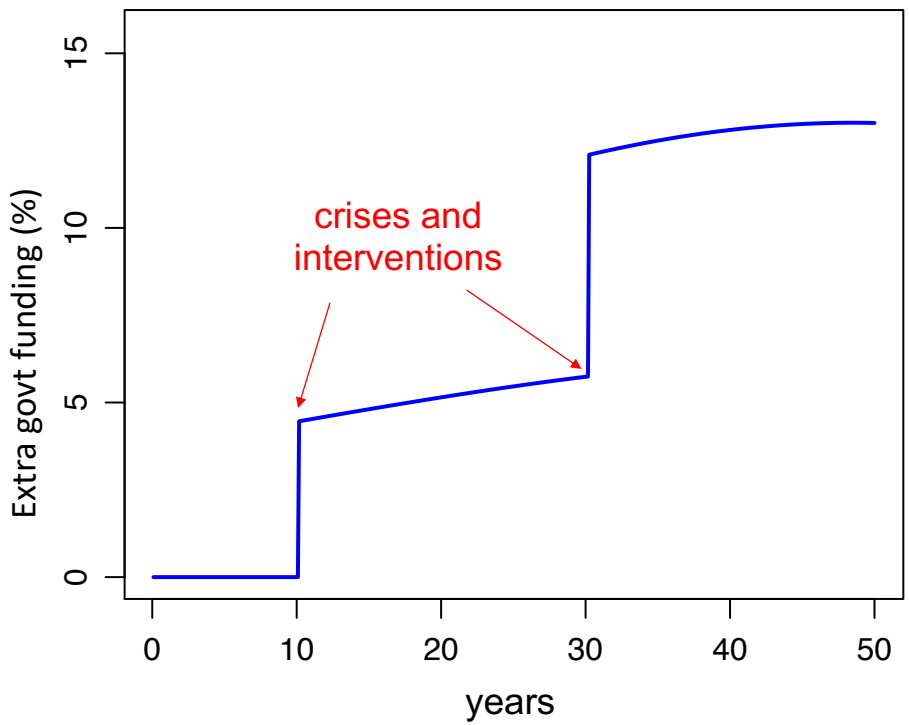
- Expectations of crises interventions drive normal-time economic dynamics.



Intervention Begets More Intervention

- Assume agents believe no intervention (expectation effect is off). Compare two cases:
  1. No actual government intervention.
  2. Government actually intervened during crises.

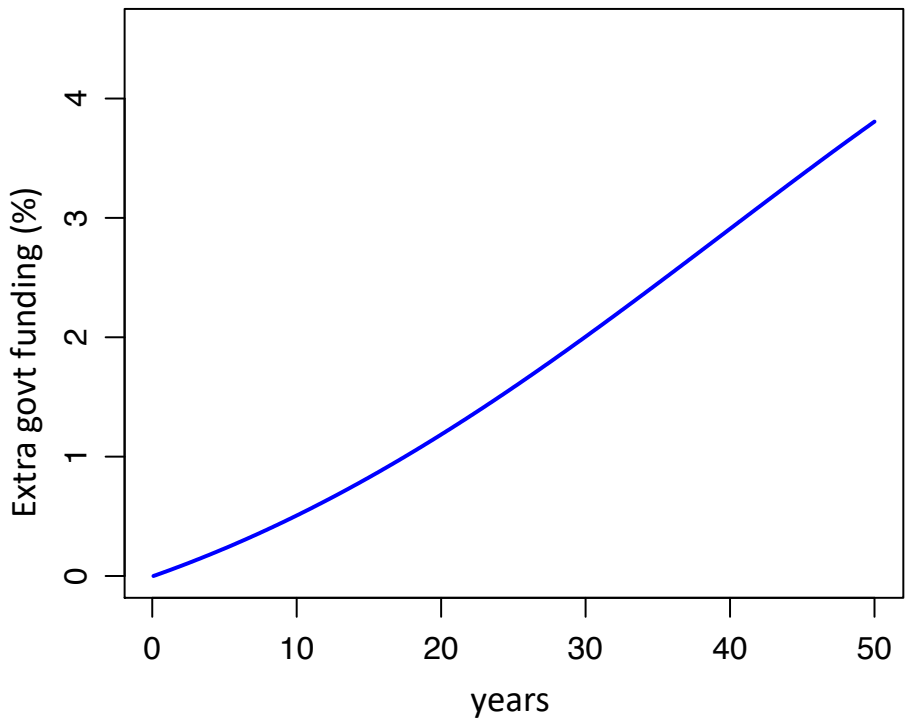
  Q: To get GDP drop=10%, how much extra govt funding is needed for an immediate crisis due to previous intervention?



Intervention Expectation Causes More Intervention

- Assume no actual intervention. Compare two cases of different beliefs:
  1. Agents believe there will be NO government intervention.
  2. Agents believe there will be government intervention.

  Q: To get GDP drop=10%, how much extra govt funding is needed due to the expectation of intervention?



Welfare Implications

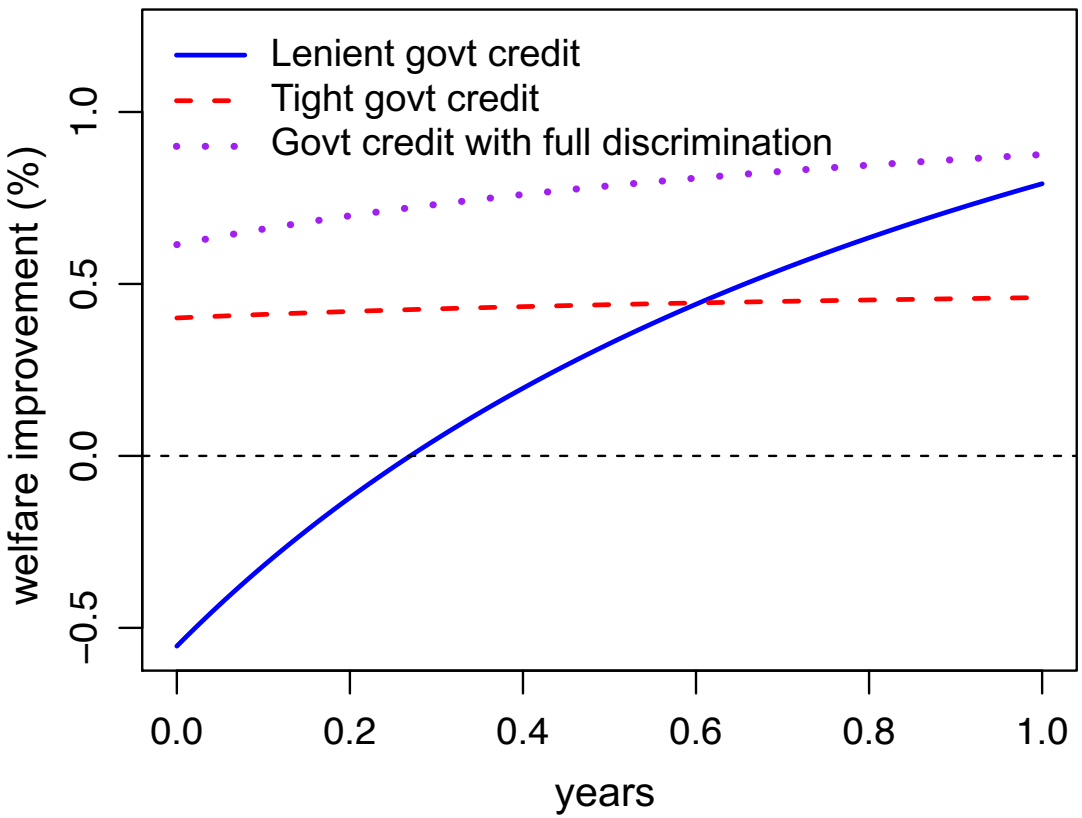
- The welfare is defined as the present value of household consumption streams:

$$W(\omega_0;\gamma)K_0 \equiv E_0[\int_0^{\infty} e^{-rt} \left(\underbrace{C_t dt}_{\text{normal time consumtpion}} - \underbrace{I_t \cdot dN_t}_{\text{crisis-time investment}} \right)]$$

- Lenient govt funding affects welfare by
  - (1) increasing investment costs in crisis
  - (2) reducing capital quality
  - (3) dampening capital decline

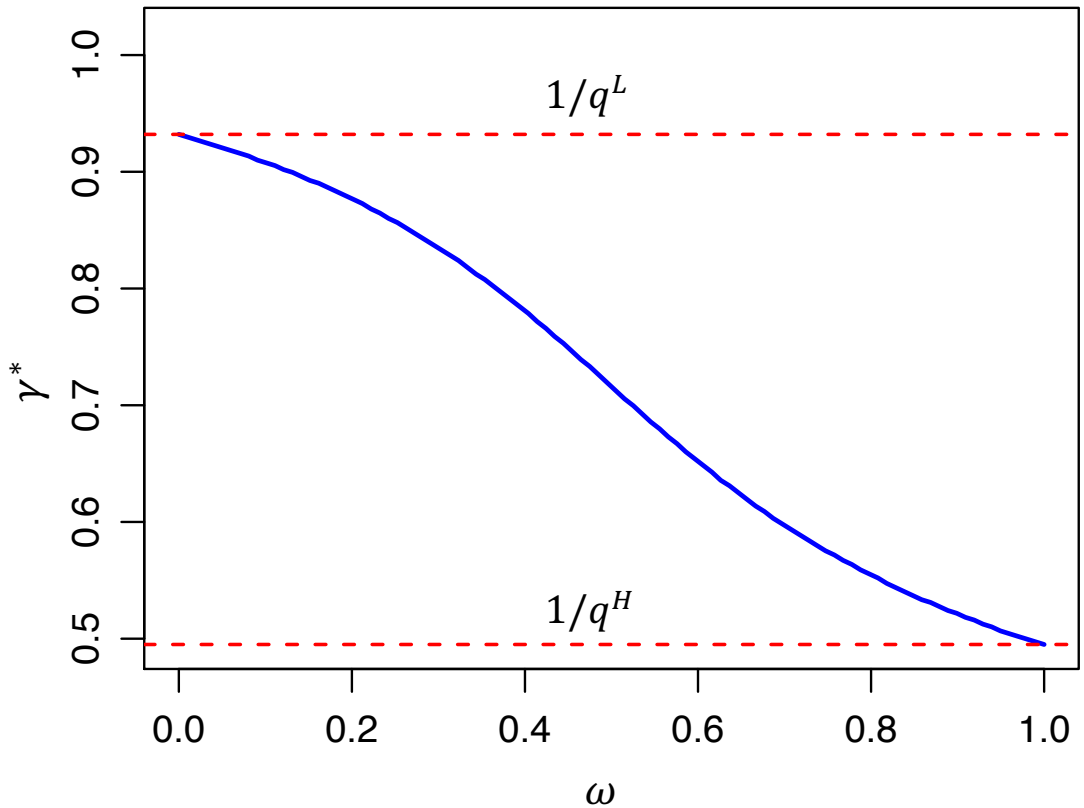
Welfare Implications

- What is the improvement of welfare due to government funding?
- Gradualism is valuable: tight govt funding always improves welfare, while lenient funding may destroy welfare.



Optimal Government Policy

- Optimal pricing: $\gamma(\omega_0) = \max_\gamma W(\omega_0; \gamma)$



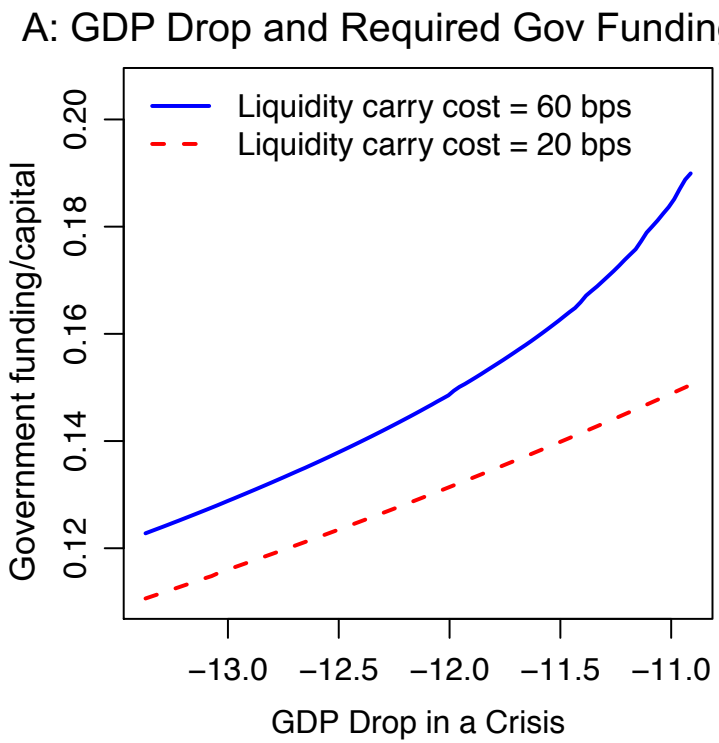
Outline

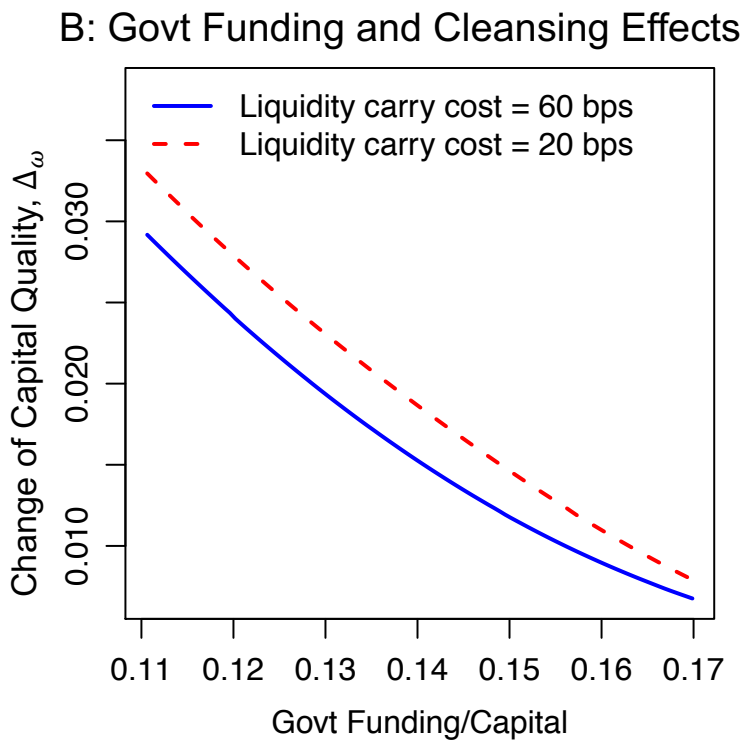
Corporate Liquidity Holdings

- Firms can accumulate liquid assets as a caution against crises. How will government credit provision interacts with savings incentives?
  - Related to dynamic liquidity management: Bolton, Chen, and Wang (2011); Hugonnier, Malamud, and Morellec (2015).
- Denote liquid asset return as $r_M < r$, so the liquidity carry cost is $r - r_M$.
  - Eventually this cost is affected by the supply of liquid assets.
- Proposition: with government intervention, only H-type firms hold liquidity.

Corporate Liquidity Holdings and Cleansing Effects

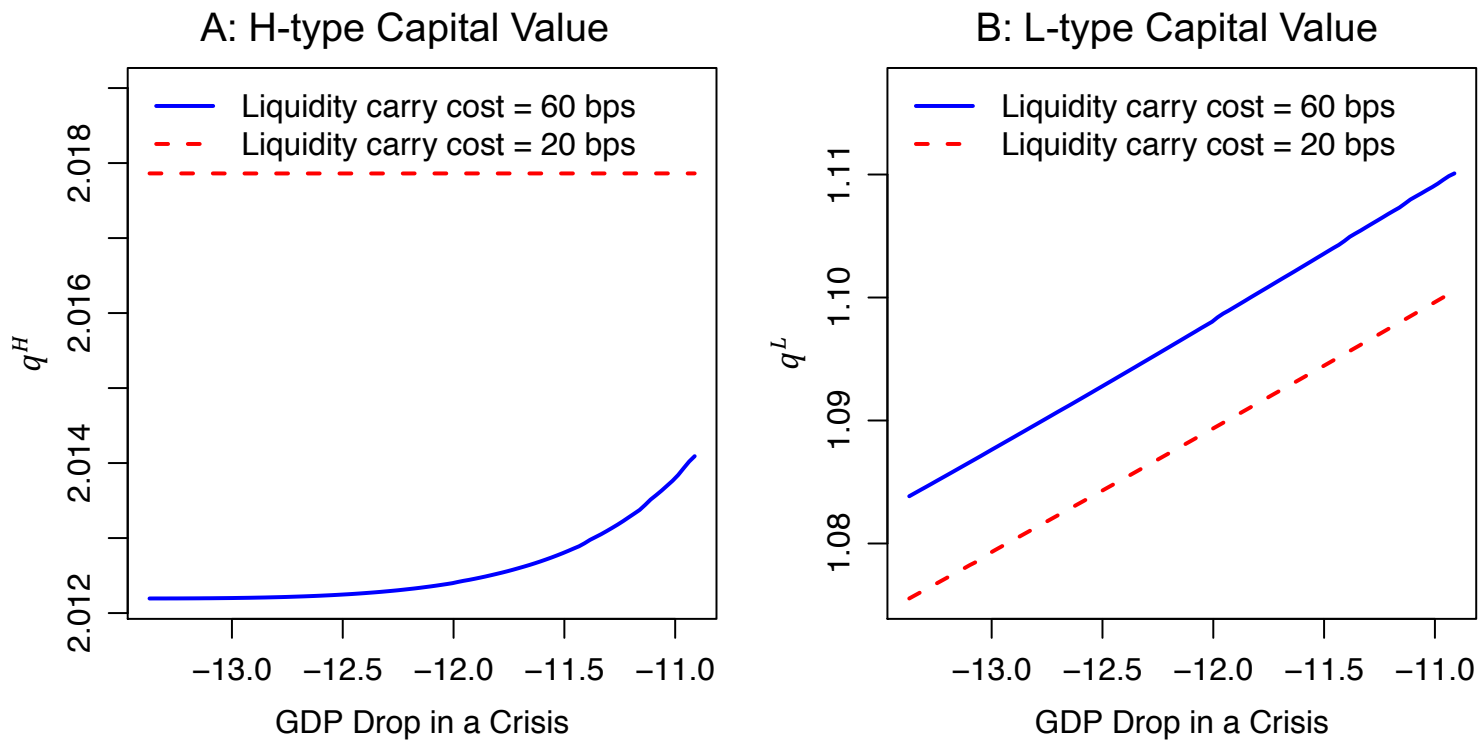
- Lower liquidity carry cost in normal times $\Rightarrow$ H firms better self-insured $\Rightarrow$
  1. Less need for govt funding $\Rightarrow$ more cleansing effects
  2. Even for the same amount of govt funding, cleansing effects are stronger.





Corporate Liquidity Holdings and the Expectation Effects

- Lower liquidity carry cost improves the expectation effects, by
  1. increasing H-type capital value
  2. decreasing L-type capital value



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Summary: Central Bank Direct Lending Affects Firm Quality Dynamics

- The lack of differentiation distorts firm quality dynamics
  - During crisis: high-quality firms overpay but low-quality firms underpay for CBDL. The natural "cleansing effect" is weakened.
  - Outside crisis: expectations of future CBDL distort quality growth.

- Inefficiencies are self-perpetuating:

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