Firm-bank linkages and optimal policies in a lockdown

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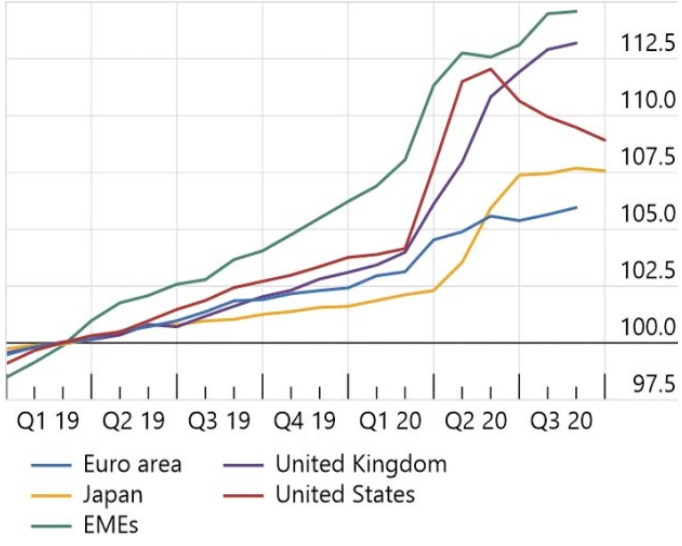
The views expressed in this paper are our own and do not necessarily coincide with those of Bank of Italy

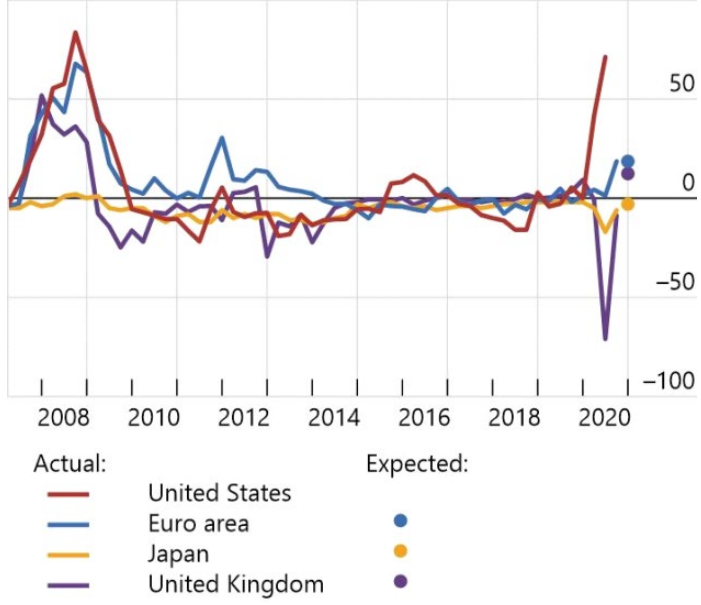
Covid-19 and firms' liquidity needs

- Lockdowns have led to cash-flow losses for firms
- Multifront policies to support firms' liquidity needs
  - Direct: transfers
  - Indirect (through banks): loan guarantees, relaxation of capital requirements
- Bank lending expansion, but initial tightening evidence

Bank lending to the non-financial sector[2]
(Q1 2019 = 100)



Credit standards from credit conditions surveys[1]
Net percentage



Macro-financial loops and government policies

IMF and FSB warn of rising risk of macro-financial feedbacks

- **Firms**: increase in indebtedness & moral hazard/debt overhang problems
  - Crouzet & Gourio 2020, Carletti et al 2020, Brunnermeier & Krishnamurthy 2020
- **Banks**: loan losses erode capitalization and affect lending
  - Blank, Hanson, Stein, & Sunderam 2020, Acharya, Engle, & Steffen 2020
- But their importance depends on size and **design of support** policies

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$\Rightarrow$ **Have governments optimally used their available budget to support firms?**

This paper

Stylized framework

- Lockdown: Firms suffer output losses & need to borrow from banks
- Two frictions:
  1. Firms: Increase in indebtedness reduces output due to moral hazard
  2. Banks: Only funding through safe debt, which limits lending supply

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$\rightarrow$ **Firm-bank amplification feedback**

Results: Optimal government policies

Welfare maximizing policies given exogenous expected government budget:

- Government provides sufficient aggregate risk insurance
  - Removes banks' funding constraints
- Implementation: transfers to firms & fairly-priced bank debt guarantees
  - Guarantees fairly reimbursed $\rightarrow$ more budget for transfers
- Funding of guarantees through future procyclical corporate profit taxation

Timeframe and agents

- Two dates: $t = 0$ (lockdown), $t = 1$ (post lockdown)
- Four agents: savers, firms, bank, government

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- Four agents: savers, firms, bank, government

Savers

- Deep-pockets
- Only invest in safe assets

Firms

- At $t = 0$, many firms with a project in place and some debt b_0
- To continue they have to incur operating cost ρ
  - No lockdown: output $r_0 = \rho$ & used to pay cost
  - Lockdown: output destroyed, $r_0 = 0$, & need to borrow ρ to continue
- If continuation, project generates payoffs at $t = 1$

$$A_z = \begin{cases} A & \text{with probability } p \\ 0 & \text{with probability } 1 - p \end{cases}$$

- Effort-choice p is unobservable & disutility cost $c(p)$

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Lemma (*Moral hazard*)

- Effort choice $\widehat{p}(b_0 + b_L)$ decreasing in additional debt due to lockdown b_L
- Low skin-in-the-game $\rightarrow$ low effort $p \rightarrow$ low output

Bank

Representative competitive bank: intermediates between savers & firms

- At $t = 0$, starts with portfolio of firms' loans with promise b_0 and liabilities d_0
- Issues new loans to firms with promise b_L, funded with safe debt d_L
- Diversifies firms' idiosyncratic project risk $\rightarrow$ loan portfolio return at $t = 1$:

$$\underbrace{\widehat{p}(b_0 + b_L)}_{\text{Success prob}} \underbrace{(b_0 + b_L)}_{\text{face value}}.$$

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- Bank funding constraint: new and legacy debts, d_L, d_0, must be safe

$$d_0 + d_L \leq \underline{\theta}\widehat{p}(b_0 + b_L)(b_0 + b_L)$$

  - Market imposed leverage constraint

Illustration: Lockdown and firm-bank linkages

- Firms need to borrow $\rho \rightarrow$ banks must issue safe debt $d_L = \rho$

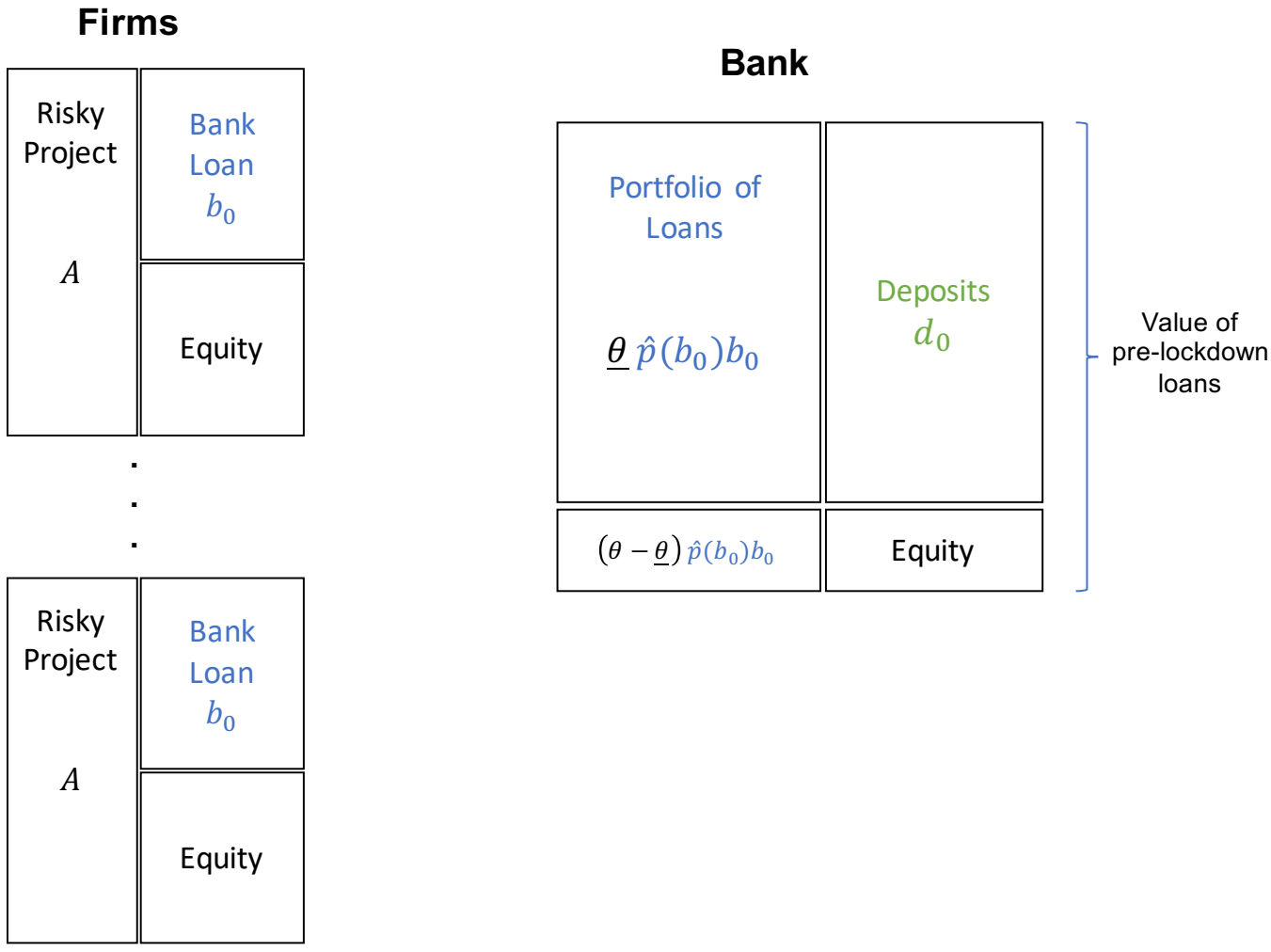


Illustration: Lockdown and firm-bank linkages

- Banks create safe collateral out of new risky loans

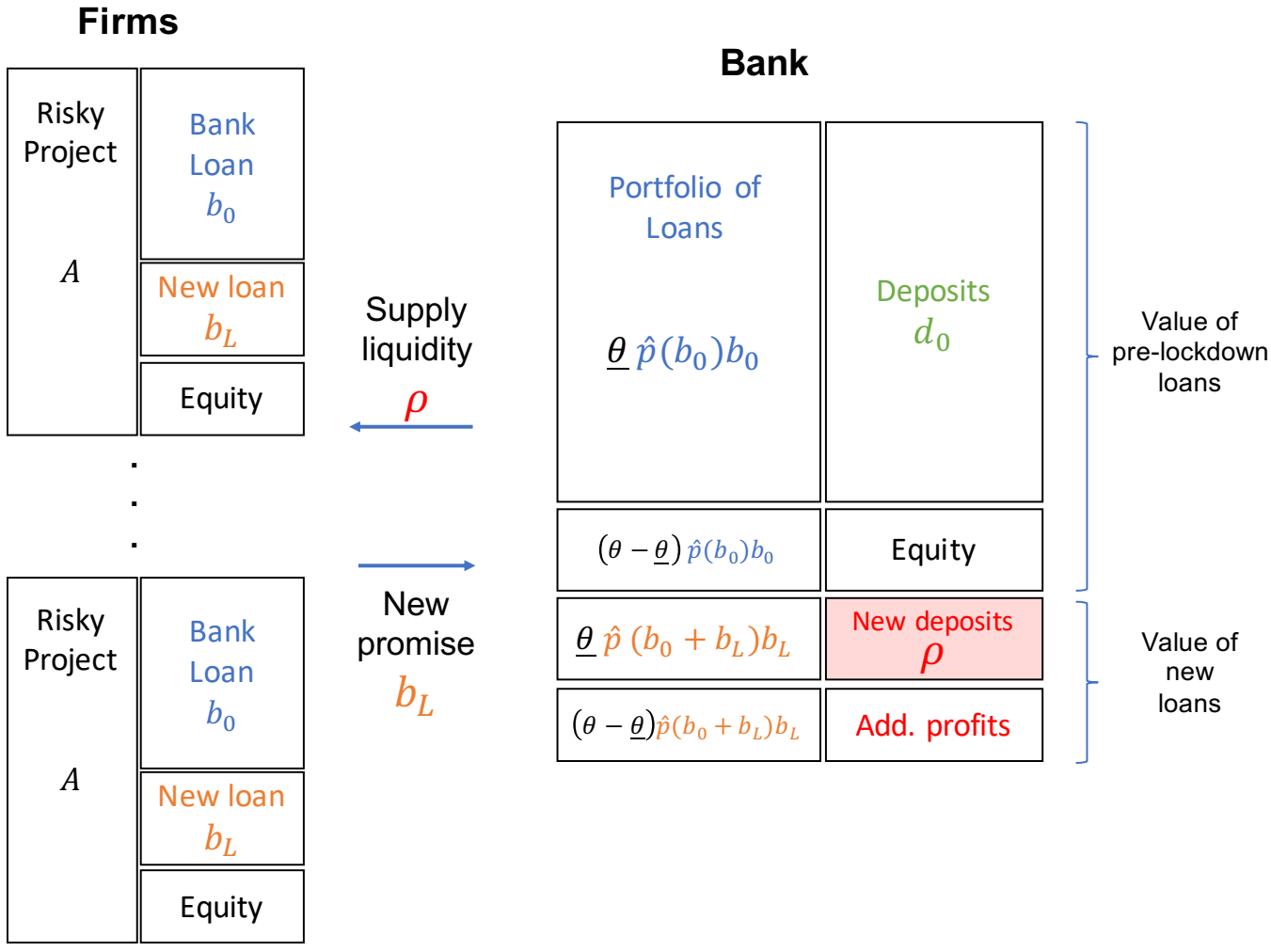


Illustration: Lockdown and firm-bank linkages

- New promise increases firms' moral hazard → value of legacy loans falls

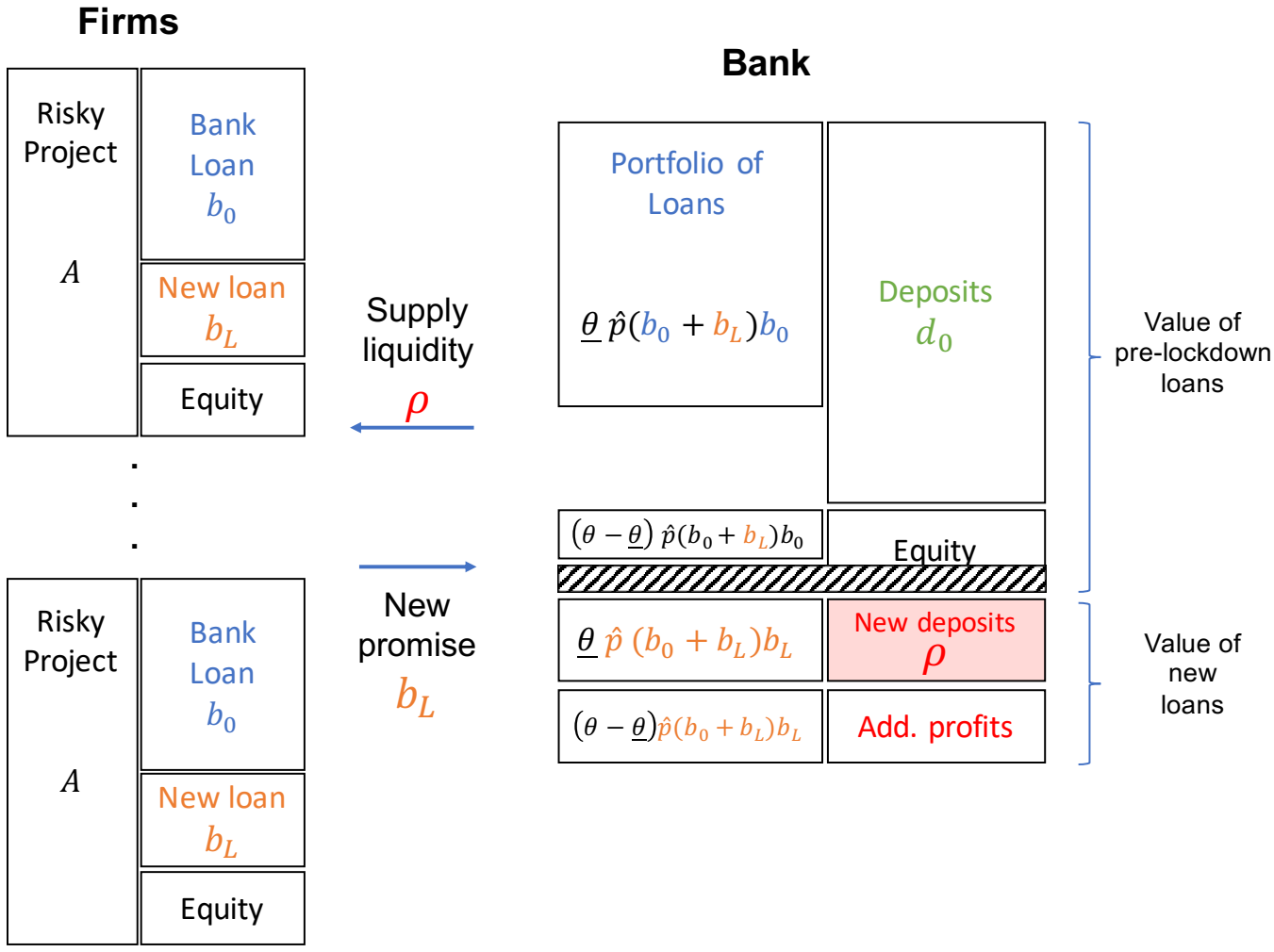
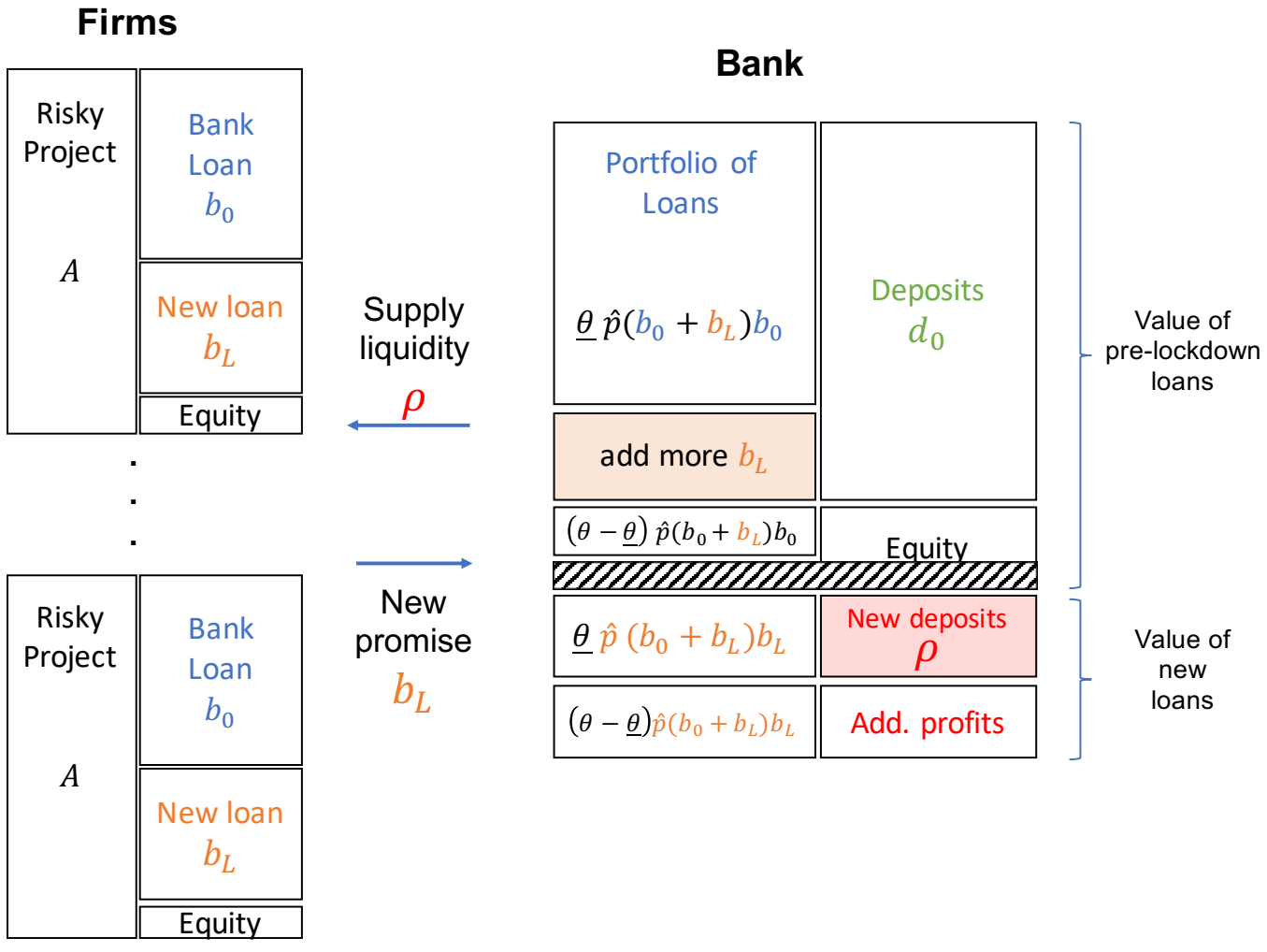


Illustration: Lockdown and firm-bank linkages

- New promise even higher $\rightarrow$ further aggravates firms' moral hazard



Government policies

- Government with resources at $t = 0, 1$ sets support policies:
  - $t = 0$: transfers to firms to pay operating cost
  - $t = 1$: transfers $\lessgtr 0$ to agents contingent on θ
- Expected cost of policies limited by exogenous $X > 0$
- Objective: maximize aggregate-welfare:

$$Y = \underbrace{pA}_{\text{firms' output}} - \underbrace{c(p)}_{\text{effort cost}} - \underbrace{\rho}_{\text{initial output loss}}$$

  $\rightarrow$ Maximization of $Y \Rightarrow$ induce maximum p

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Prop: Properties of optimal policies

1. Minimize bank profits & savers consumption, exhaust government budget
   - Welfare increasing in firms' skin-in-the-game
2. Government provides sufficient aggregate risk insurance
   - Bank's agg. risk insurance limited by its profits, which are optimally low

Decentralized implementation of optimal policies

Consider government policy consisting of (τ_L, κ):

- Direct transfers to firms $\tau_L \geq 0$ at $t = 0$
- Fairly-priced guarantees on bank debt described by shock threshold $\kappa > \underline{\theta}$:
  - Gov. insures debt for shocks $\theta < \kappa \Rightarrow$ relaxes bank funding constraint:

$$d_0 + \rho - \tau_L \leq \kappa \widehat{p}(b_0 + b_L)(b_0 + b_L)$$

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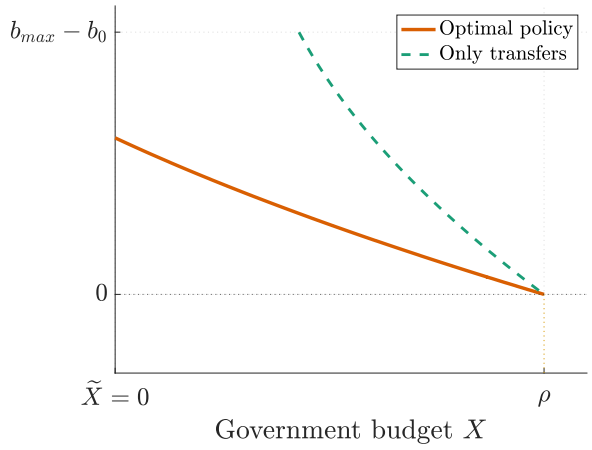
Prop. Intervention toolkit (τ_L, κ) achieves optimality:

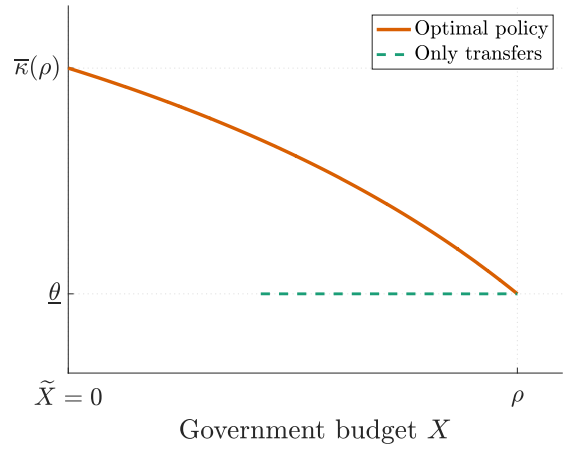
- $\tau_L = X$: government uses its entire budget to grant transfers to firms
- $\kappa \geq \overline{\kappa}$: government provides sufficient aggregate risk insurance (at no cost)

Illustration: Optimal policies versus only-transfers

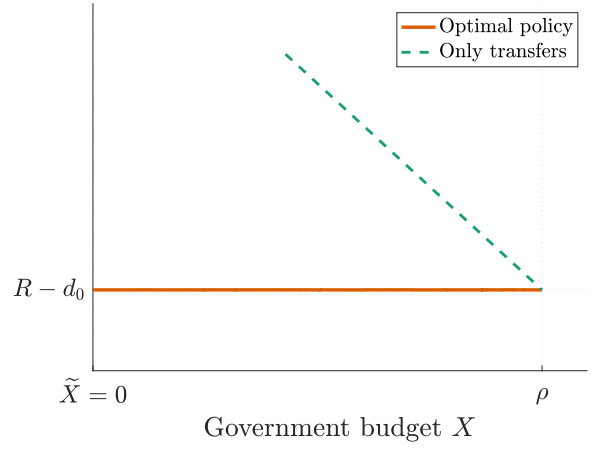
New loan promise: $b_L^*(X)$



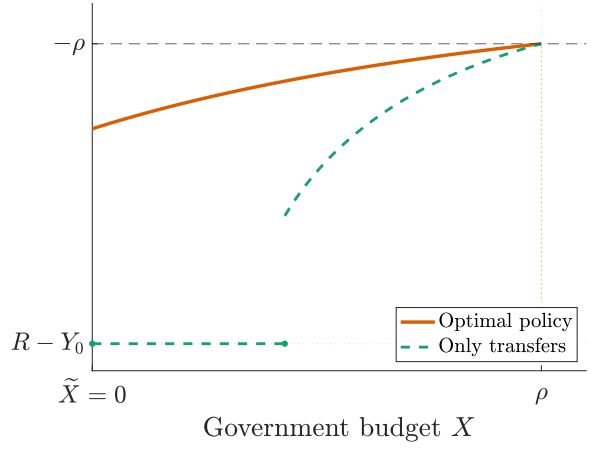
Bank leverage



Bank profits: $\Pi_B^*(X)$



Welfare loss from lockdown: $Y^*(X) - Y_0$



Firms' taxation and funding of bank debt guarantees

- Bank debt guarantees imply government disbursements upon bad shocks
- Assumption so far: government has resources from unmodeled source

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Procyclical corporate profit taxation at $t = 1$

- Bad shocks: Tax firms that make profits to pay bank debt guarantees
  $\Rightarrow$ Expands safe collateral out of firms' payoffs: $\underline{\theta} p(b_0 + b_L) \rightarrow \underline{\theta} pA$
- Good shocks: Rebate bank repayment of guarantees to non-defaulting firms
  $\Rightarrow$ Neutralizes negative effect of taxes on firms' effort

Prop: Procyclical firm taxation funds bank debt guarantees in optimal policy if $\underline{\theta}$ not too low.

Conclusions

- New framework of firm-bank loops used to analyze optimal policies in a lockdown
- Optimal that Government provides aggregate risk insurance & is reimbursed for it
- Optimal mix: transfers to firms and fairly-priced guarantees on bank debt
- Role of procyclical corporate profit taxation to finance those guarantees

Results on alternative policy toolkits

- Suboptimal: transfers + loan guarantees + relaxation of capital requirements
- Optimal: transfers + bank's equity injections

Actually implemented policy toolkits

Toolkit 1

- Transfers & non-priced bank debt guarantees
  - Analogous to relaxation of capital requirements for bank with insured deposits
- Aggregate risk insurance provided for "free" $\rightarrow$ limited by gov. budget

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Toolkit 2

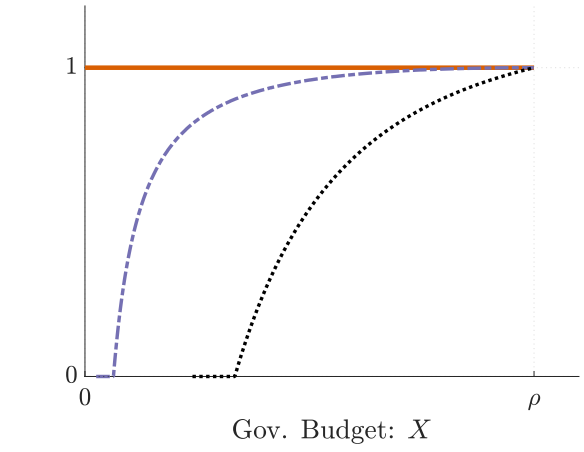
- Transfers & bank loan guarantees
  - Government repays fraction of new loans that default
- Provides some agg. risk insurance but disbursements even when bank does not fail

Pecking order of policy toolkits: Transfers + guarantee type

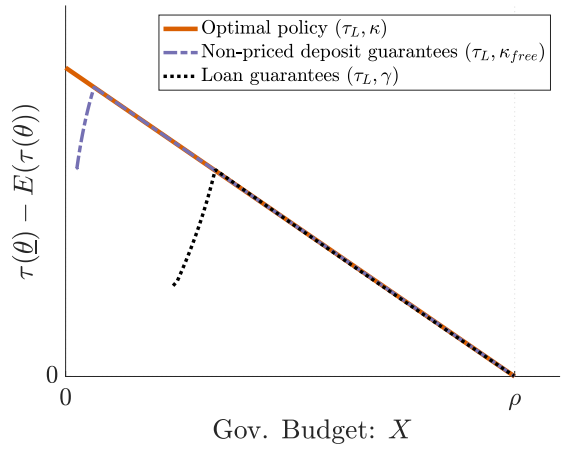
$$\text{Fairly priced bank debt} \succ \text{Non-priced bank debt} \succ \text{Bank loan}$$

Comparison of intervention toolkits

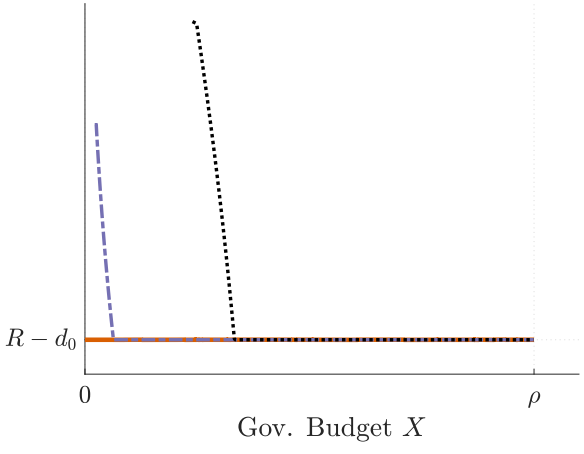
Transfers' expenditure share: $\tau_L^*(X)/X$



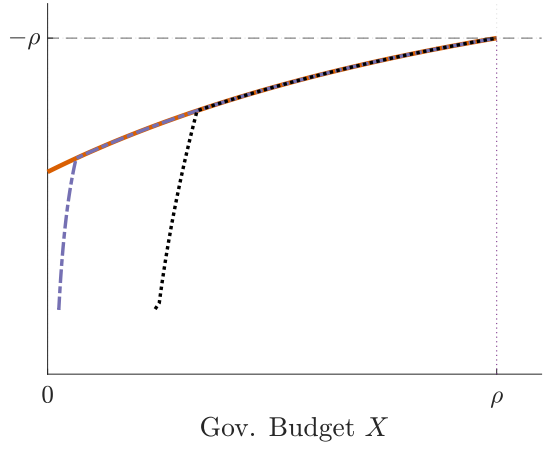
Agg. risk insurance



Bank profits: $\Pi_B^*(X)$



Welfare loss from lockdown: $\Upsilon^*(X) - \Upsilon_0$



Alternative optimal toolkit: transfers & bank equity injections

- Key feature optimal policy: fairly priced agg. risk insurance provision
- Public equity injection in banks could achieve same role

Prop. Transfers to firms and fairly reimbursed equity injections in banks constitute alternative optimal policy mix

- Government takes fairly priced equity stake $\neq$ bailout!
- Lower budget for transfers to firms $\rightarrow$ larger equity injection to banks
- Alternative toolkit implies larger initial government expenditures
  - But no additional costs upon bad shocks in the future
- Equivalence of bank debt guarantees and equity injections may not hold in reality
  - Due to, e.g., bank default externalities or political costs from public bank ownership

Implementation of optimal allocation with decentralized government policies

Government policy described by (τ_L, κ):

- Direct transfers to firms τ_L
- Fairly-priced guarantees on bank deposits described by $\kappa \geq \underline{\theta}$:
  - Government insures deposits for $\theta < \kappa \rightarrow \tau(\theta) > 0$
  - Government requires compensation for $\theta > \kappa \rightarrow \tau(\theta) < 0$

back

Competitive bank lending given (τ_L, κ)

Equilibrium. New debt promise b_L in exchange of funds $\rho - \tau_L$, such that:

- Leverage Constraint (LC): Bank deposits are safe given guarantee

$$d_0 + \rho - \tau_L \leq \kappa \widehat{p}(b_0 + b_L)(b_0 + b_L)$$

  - κ increases bank lending capacity

- Participation Constraint (PC): Bank finds optimal to lend:

$$\Pi(b_L) = \widehat{p}(b_0 + b_L)(b_0 + b_L) - d_0 - (\rho - \tau_L) \geq \underline{\Pi_B}$$

Competitive promise $b_L^*(\tau_L, \kappa)$ is the lowest b_L that satisfies LC & PC

- If the Leverage Constraint is binding
  - Bank profits are decreasing in τ_L and κ
  - As funding constraint is relaxed, competition leads to cheaper financing $\Rightarrow b_L^* \downarrow$

back