Unconventional Credit Policy in an Economy with Supply and Demand Credit Frictions

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*The views expressed are our own and should not be interpreted as reflecting the views of the Central Reserve Bank of Peru

1. Motivation, Research Question and Results
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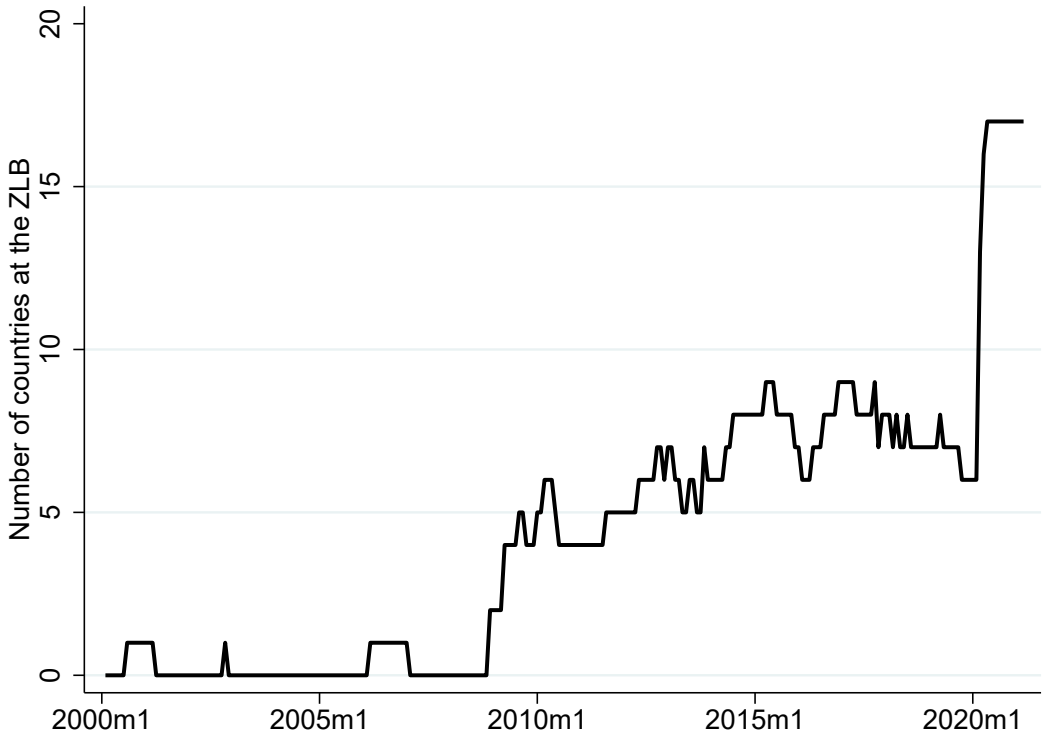
4. Government Guarantees
5. Endogenous Credit Policy Rules

Motivation

- The Covid-19 global shock has confronted policy makers with the limits of standard policy tools to stimulate economy
- Around 41 countries adopted unconventional credit policies (UCP) to reduce the cost of external finance.
- UCP: central bank (CB) liquidity injection to banks provided they commit to issue government guaranteed loans to firms.



Note: Source: IMF, BIS. Own computations. Monthly data: 2000m1-2021m3. Indeed, this is the number of countries whose monetary policy rate becomes equal or lower than 0.25%.

Research Question and Methodology

Research Question:

- What are the implications of unconventional credit policies? What are the mechanisms at work?
  - What are the role of government guarantees?
- Unconventional Credit Policy: **government guaranteed** loans to firms. Two forms: issued directly or indirectly by the Central Bank. Here: We focus on loans issued indirectly.

Methodology:

- Develop a DGSE: Sticky prices + demand side credit frictions (a la Bernanke, Gertler and Gilchrist, 1999) & credit supply frictions (a la Gertler and Karadi, 2011) + UCP.

Main Results

- Credit supply frictions allows us to mimic a more realistic dynamic of credit after a monetary policy shock.
- Credit demand frictions, on the other hand, are required to better understand the various mechanisms underlying the implementation of unconventional credit policies.
- UCP effects:
  1. It reduces bank required equity per unit of credit (bank + CB)
     $\Rightarrow$ Higher credit supply and investment
  2. CB loans are government guaranteed
     $\Rightarrow$ Zero credit spread: reduces the funding costs of entrepreneurs & higher credit demand
- In normal times, the first effect is more important, while in high-uncertainty periods, the third effect also becomes very important.
- When traditional bank loans have higher seniority, the impact of the credit policy stronger.
- Announcing the policy does not lead to significant benefits when the credit spread is small.

The Model

- Households:
  - Consume and save via deposits.
- Banks:
  - Intermediate borrowing and lending and screen entrepreneur's projects.
  - Credit supply frictions: Moral hazard problem between depositors and banks.
- Entrepreneurs:
  - Demand bank loans and purchase capital to produce wholesale goods.
  - Credit demand frictions: Costly State Verification problem.
- Retailers:
  - Differentiate these goods and sell them. Face price rigidities.
- Government:
  - Provides the guarantees for the loans funded by Central Bank liquidity.
- Central Bank (CB):
  - Inject liquidity to banks and set the policy rate with a Taylor rule.

Entrepreneurs: Credit demand frictions (BGG 1999) (I)

- Ex-ante identical entrepreneurs
- Balance sheet: $Q_t K_t = N_{et} + B_t$.
  - K_t: capital, N_{et}: Equity , B_t: Credit. Q_t: Capital price
- Payoff: $\omega R^k_{t+1} K_{t+1}$ and obligations $Z_{t+1} B_t$. Some entrepreneurs default others do not.
  - ω: idiosyncratic shock
  - R^k_{t+1} Aggregate capital return (it contains the aggregate shock)
  - Z_{t+1}: non-default lending rate.
- Asymmetric information problem between banks and entrepreneurs.
  - ω is not observed by banks.
  - Banks pay a monitoring cost of μ (of payoff) to observe ω .
- Banks can perfectly diversify the idiosyncratic shock and require R^l_{t+1} for their loans.
- The non-default lending rate, Z_{t+1}, is going to be higher that R^l_{t+1}.
- Loan contract: The non-default lending rate, Z_{t+1}, responds to aggregate shock, R^k_{t+1}, such that banks always obtain the required return, R^l_{t+1}.

Entrepreneurs (II)

- Entrepreneurs aim to maximize:

$$\mathbb{E}_t \left\{ \left[1 - \mu \int_0^{\bar{\omega}} \omega dF(\omega) \right] R^k_{t+1} Q_t K_t - R^l_{t+1} B_t \right\}.$$

  where $\mu \int_0^{\bar{\omega}} \omega dF(\omega) R^k_{t+1} Q_t K^j_t$ are the total monitoring costs. F is the *cdf* od ω. $F(\bar{\omega})$ is the failure probability of entrepreneurs.

- We obtain the **credit demand curve** of entrepreneurs.

- The monitoring costs reduces the effective return of entrepreneurs' investments.

- The failure probability increases expected monitoring costs, which ceteris paribus reduces entrepreneurs' incentives to invest and demand bank loans.

Banks: Credit supply frictions (GKa 2011) (I)

- Balance sheet:

$$B_t = N_{bt} + D_t$$

  where B_t: credit; N_{bt}: equity; D_t: deposits.

- There is a moral hazard problem between banks and depositors (households).
- Bankers can divert a fraction λ of bank assets.
- Banks operate if:

$$V_t \geq \lambda B_t.$$

  where V_t is charter value of the bank.

- We calibrate the model so this always bind.
- $\rightarrow$ This limits bank ability to capture deposits and hence to lend.

Banks (II)

- Bank lending capacity depends on the size of bank equity, N_{bt}, i.e.,

$$\frac{B_t}{N_{bt}} = \frac{\eta_t}{\lambda - \nu_t},$$

  where $\eta_t = f(R^l_{t+1}/R_t), f' > 0$ depends positively on the credit spread and R_t is the risk-free interest rate.

- This is the **credit supply curve** of banks.

- The model is flexible regarding R^l_{t+1}. Two alternative assumptions.

- R^l_{t+1} is **not** state-contingent to the aggregate shock, R^k_{t+1}: BGG 1999
  - Banks do not absorb aggregate risk.

- R^l_{t+1} is state-contingent:
  - For example: $R^l_{t+1} = \xi_t R^k_{t+1}$. Aggregate risk is also absorbed by banks.

Other Ingredients of the model

- The problem of capital producer is as GKQ 2012 and GKi 2011. The retailer problem is as in BGG 1999 and GKa 2011.
- Taylor rule: $i_t = \rho_i i_{t-1} + (1-\rho_i)[i_{ss} + \kappa_\pi \pi_t + \kappa_y (y_t - y_t^n)] + \varepsilon_{i,t}$
- Households preferences:

$$U_t(C_t, C_{t-1}, Ht) = ln(C_t - hC_{t-1}) - \chi/(1+\varphi)H_t^{1+\varphi}.$$

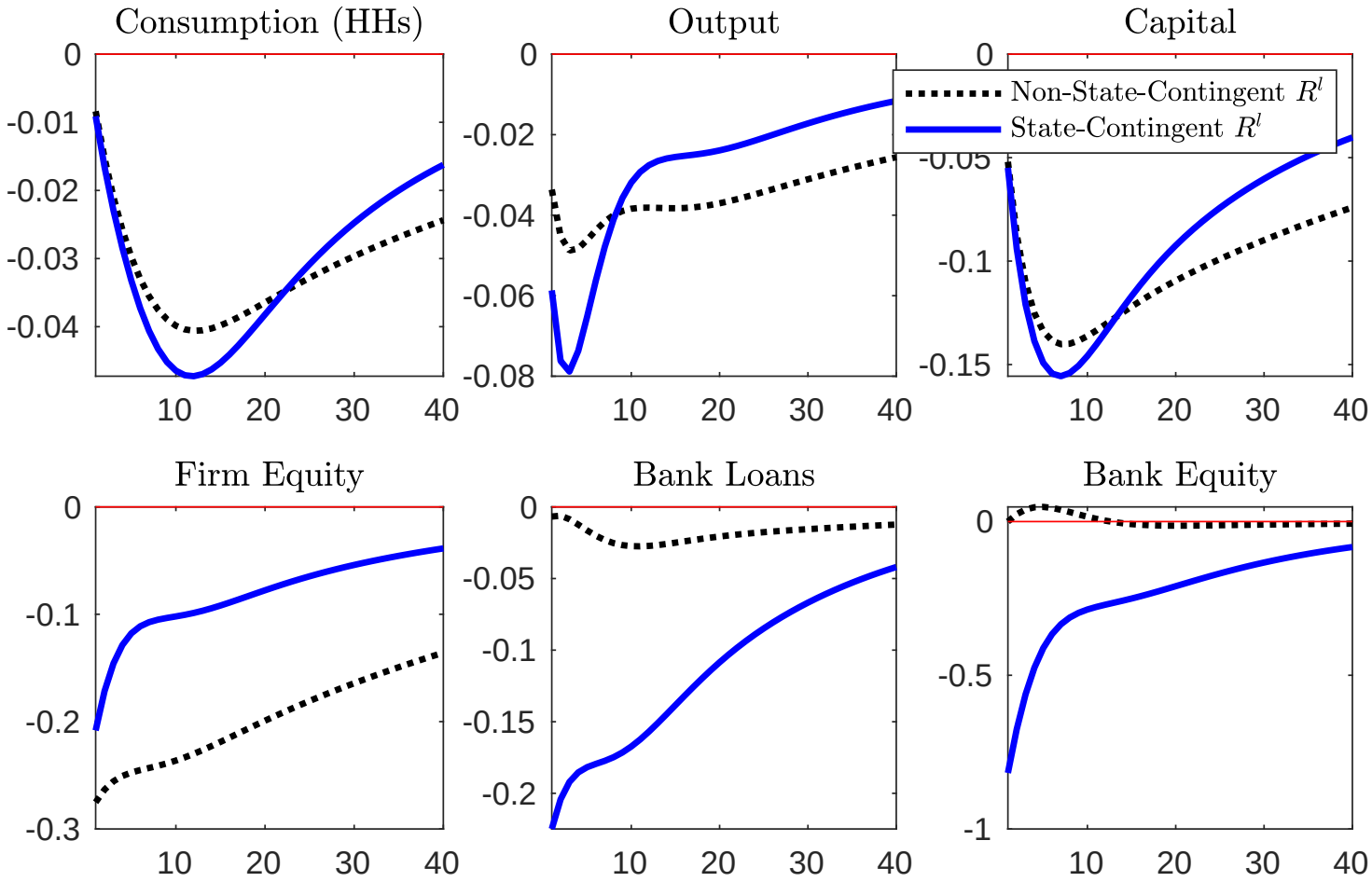
- Like in BGG 1999, entrepreneuers offer labor (H^e). Production function is:

$$Y_t = A_t(\psi_t K_{t-1})^\alpha (L_t)^{1-\alpha}, \qquad L_t = (H_t)^\Omega (H_t^e)^{1-\Omega}$$

- ψ_t: is the capital quality shock (destruction capital)
- Capital dynamics: $K_t = I_t + (1-\delta)\psi_t K_{t-1}$.
- Capital return: $R_{t+1}^k = ((1/X_{t+1})(\alpha Y_{t+1}/K_t) + \psi_{t+1}(1-\delta)Q_{t+1})/Q_t$.
- Parametrization and steady state:
  - Values taken from BGG 1999, GKa 2011 and GKi 2011. $\lambda = 0.363$. $\Omega = 0.984$. Taylor rule: $\rho_i = 0.8$, $\kappa_\pi = 1.5$, $\kappa_y = 0.125$,
  - Entrepreneurs leverage: 2, (annual) Entrepreneurs' failure probability. 3%, Banks leverage = 4, (annual) $R^k - R^l = 1\%$, $R^l - R = 1\%$.
- Simulation: negative 5% capital quality shock ($\rho_\psi = 0.66$).

Who absorbs the risk matters?

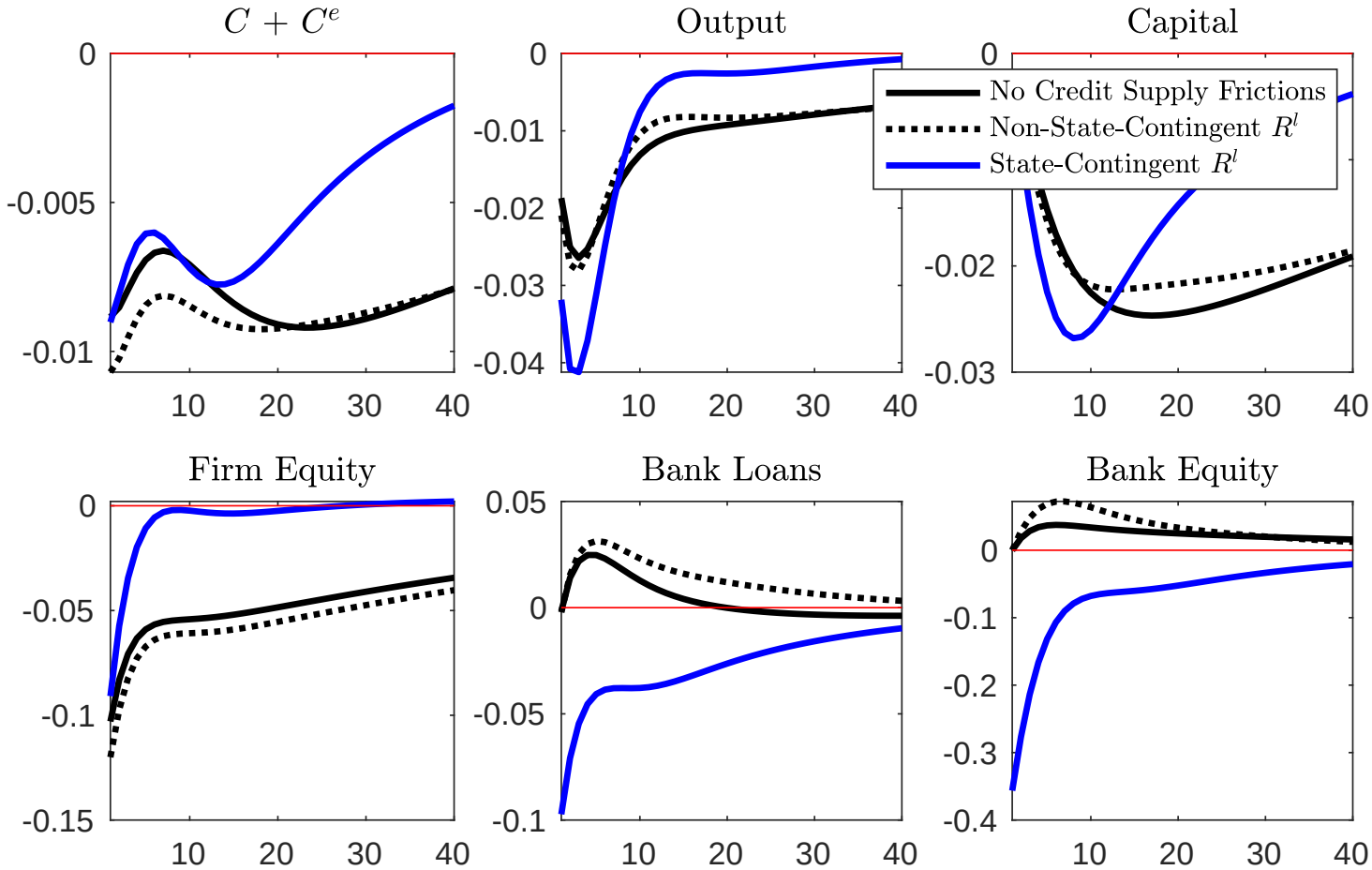
- When bank absorb aggregate risk, fluctuations are larger.



Log deviations from steady-state.

Puzzle: Bank credit increases after a contractionary monetary policy in an economy without credit supply frictions.

- No credit supply frictions → credit increases.
- Credit supply friction + Banks also absorb risk → Banks' equity and credit supply shrink → credit decreases.



A contractionary monetary policy shock of 25 bps ($\rho_i = 0.80$). Log deviations from steady-state.

Unconventional Credit Policy (I)

Definition:

- Central Bank inject liquidity B_t^g to banks, so they can issue loans to firms B_t^g:

$$Q_t K_t = B_t^g + B_t + N_{et}.$$

- Four characteristics:
  1. These loans (CB loans, for simplicity) are guaranteed by the government.
  2. The Central Bank charges to banks the risk-free interest rate for liquidity injection.
  3. There is not moral hazard problem between Central bank and banks.
  4. Liquidity injection is to banks that offer the lowest non-default lending rate + (2)+(3): The required return for the guaranteed loans is the risk-free interest rate.

Unconventional Credit Policy (II)

- **Effects:** Increase of credit supply and demand
  - **Credit Supply:** (3): Increases credit supply per unit of bank equity (GKa 2011)
  - **Credit Demand:** (1) y (4) the interest rate of CB loans is the risk-free interest rate $\rightarrow$ entrepreneurs replace expensive loans (B) with cheap CB loans (B^g) $\rightarrow$ lower failure probability. Ceteris paribus, smaller monitoring cost and greater incentives to invest and demand more credit.

- Liquidity injection as a proportion of total credit:

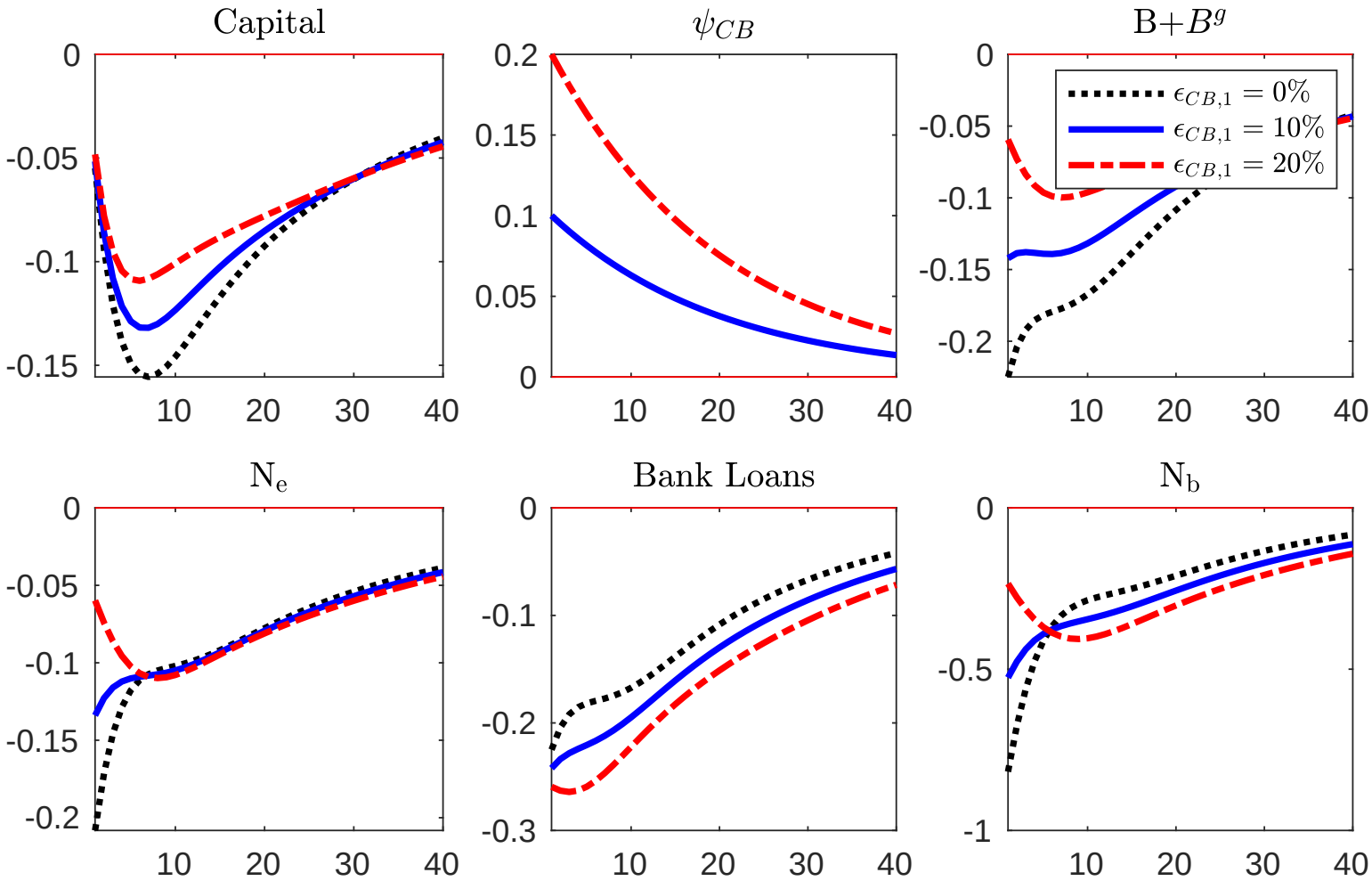
$$B_t^g = \psi_{CB,t}(Q_t K_t - N_{et})$$

  - **Exogenous rule:** $\psi_{CB,t} = \rho_{CB}\psi_{CB,t-1} + \varepsilon_{CB,t}$; $\rho_{CB} = 0.95$; $\varepsilon_{CB,1} = 10\%$ and $\varepsilon_{CB,t} = 0; \forall\, t > 1$.

- Unless otherwise stated, we assume CB loans and traditional loans have the same seniority and banks absorb some risk (i.e., $R_{t+1}^l = \xi_t R_{t+1}^k$).

Unconventional Credit Policy Effects

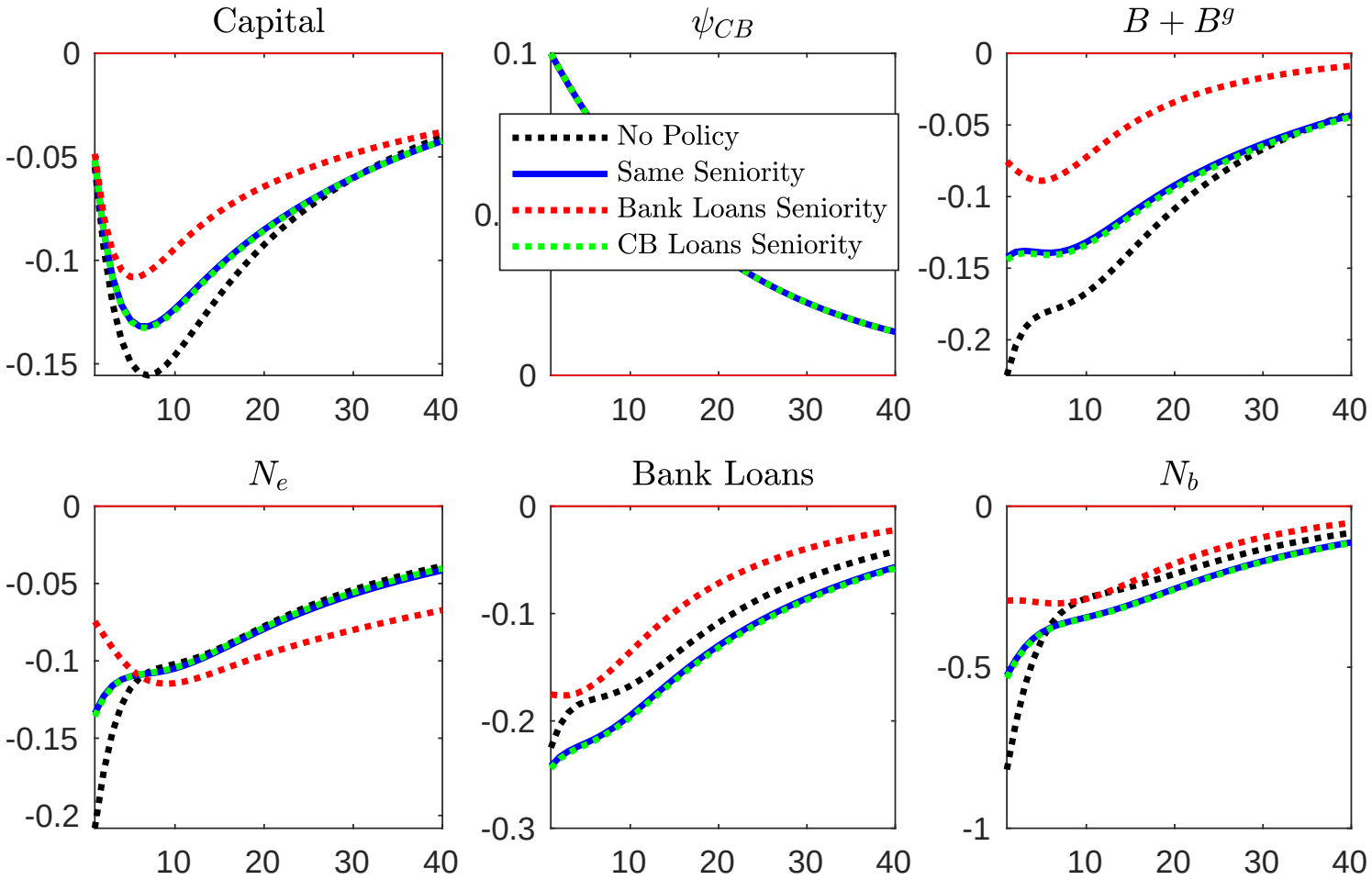
- The unconventional credit policy diminishes the negative impact of the shock.



Log deviations from steady-state expect ψ_{CB}.

Seniority and the impact of the credit policy

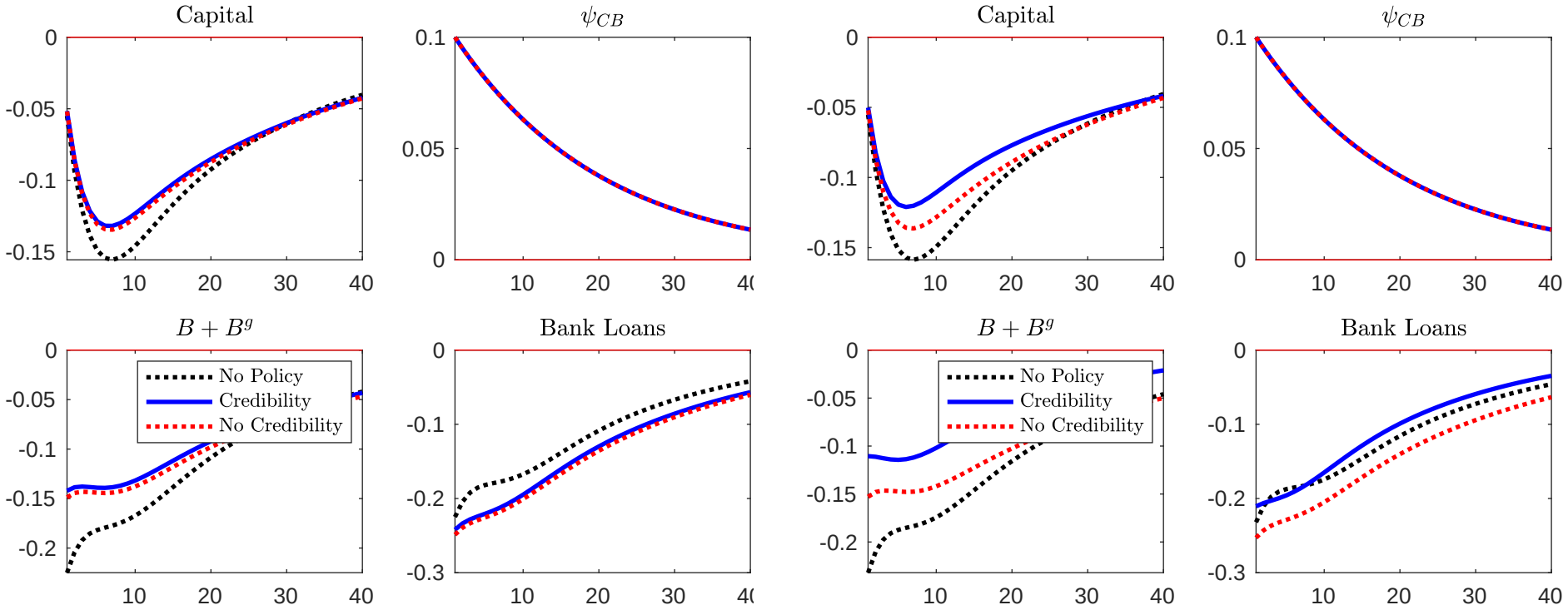
- The higher the seniority of the traditional bank loans, the stronger the impact of the credit policy.
  - Since bank loans are paid first, CB loans are riskier and government transfers are greater.



Log deviations from steady-state except spreads and CB loans share.

The impact of government guarantees is stronger the higher the uncertainty

- If banks never believes the government is not going to honor the guarantees, then:
  - Banks charge a higher non-default lending rate Z_{t+1} to compensate for those resources that are not going to be received from the government.
  - This is equivalent to no government guarantees.



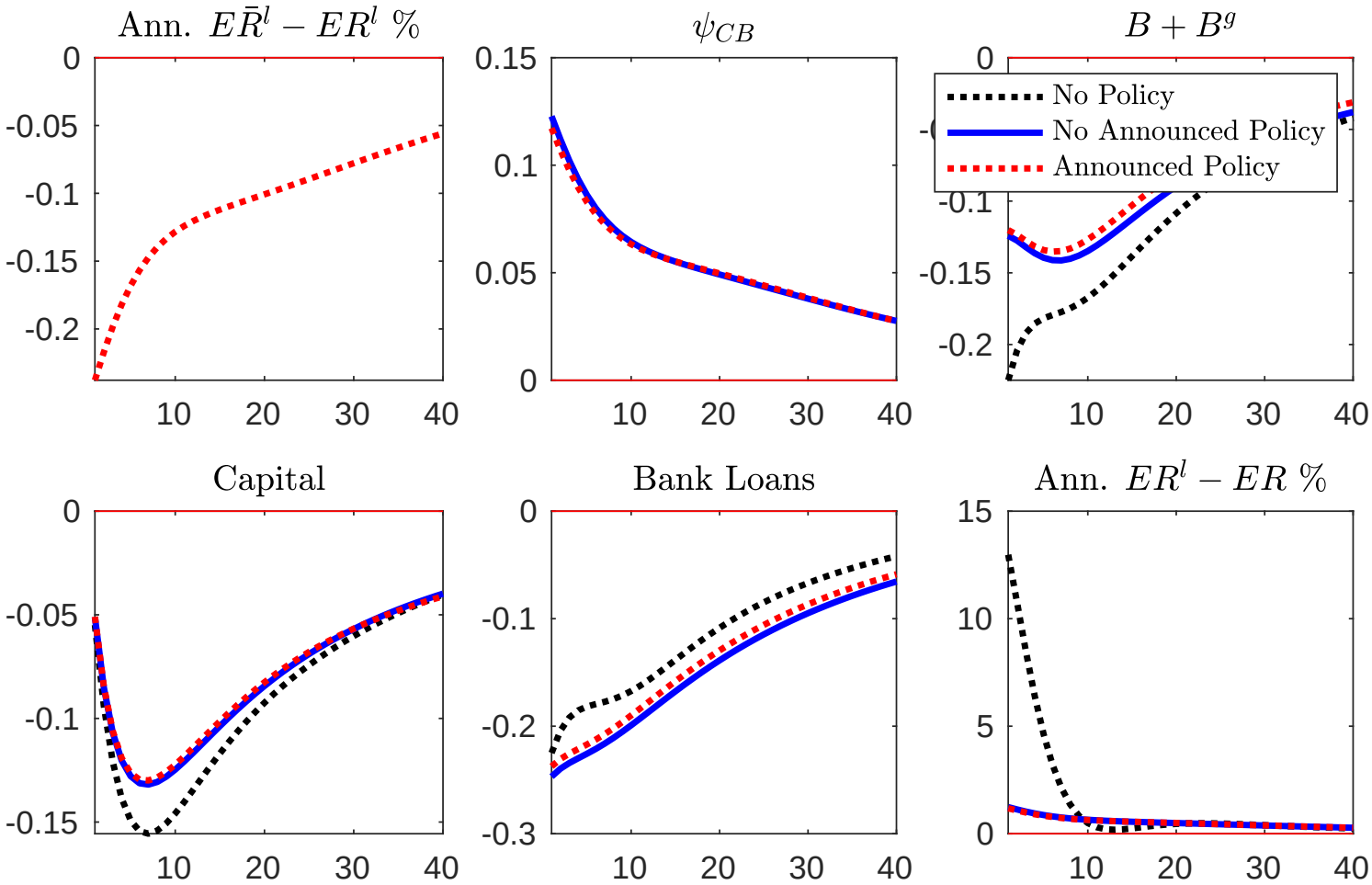
Ann. failure probability = 3%

Ann. failure probability = 20%

Log deviations from steady-state expect ψ_{CB}.

Announcing the endogenous credit policy

- Reduces marginal costs of external funding and increases entrepreneurs incentives to demand credit.
- Announcing the policy does not lead to significant benefits when the credit spread is small.



Log deviations from steady-state except spreads and CB loans share.

Conclusions

- Adding credit supply frictions allows us to mimic a more realistic dynamic of credit after a monetary policy shock.
- We find that the unconventional credit policy diminishes the impact of a negative shock on the real economy.
- When traditional bank loans have higher seniority, the impact of the credit policy stronger.
- The credibility of the government guarantees is key in high-uncertainty periods.
- Announcing the policy does not lead to significant benefits when the credit spread is small.