טכנולוגיות חדשות והכלכלה:
תמורות ואתגרים

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Central Bank Digital Currency and the Banking System

A Stylized Micro-Founded Model

Work in Progress

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Central Bank Digital Currency
Introduction

- (Retail) CBDC is a means of payment which is a liability of the central bank, similar to cash but in digital form.
- Central banks worldwide are exploring various aspects of CBDC.
- We focus on the potential impact on the banking system.

CBDC and the Banking System
Motivation and Research Questions

- How does the introduction of CBDC affect the banking system and the economy?
- How does a possible interest rate on CBDC influence these effects? (CBDC design)
- How does the economic environment shape the outcomes? (Number of banks, bank profitability)

What we do

- Develop a theoretical stylized micro-founded model with a banking system.
  - An analytical framework for thinking about some of the potential channels of impact.
  - Analysis within a structural model enables us to take into account the optimal responses of banks, households and firms.
- Analyze the equilibrium in the long term (steady state) following the introduction of CBDC.

CBDC and the Banking System
Our work in relation to the literature

Our work: Normal times, Long term

vs

Crises and bank runs (financial stability) (e.g. Keister and Monnet, 2022)

Optimization and equilibrium

vs

Balance-sheet accounting exercises (e.g. Bank of Israel, 2022)

Market Structure/Competition: Oligopoly with J Banks

vs

Perfect competition (Burlon et al., 2024), Monopoly (Andolfatto, 2021), Monopolistic competition with a continuum of banks (Bacchetta and Perazzi, 2025), Cournot (Chiu et al., 2023)

Other assumptions and modeling

E.g., Liquidity & capital considerations

vs

Only capital considerations (Paul et al. 2025)

Model
Overview

Banks

J Banks
Compete in the deposit and loan markets (Oligopoly)

Deposit Demand

Households

Consume and save in bonds and in liquid assets (means of payments) - Cash, Bank deposits and CBDC

Loan Demand

Entrepreneurs/Firms

Need to borrow in order to produce

Government and Central Bank

Issue bonds, cash, bank reserves and CBDC. Set the interest rates on these assets

Introduction of CBDC

Households save in liquid and illiquid assets.

Before CBDC: Liquid assets consist of Cash (*M*) and Bank deposits (*D*), which are imperfect substitutes:

$$Z = \left[\alpha_m (M)^{\frac{\zeta-1}{\zeta}} + \alpha_d (D)^{\frac{\zeta-1}{\zeta}}\right]^{\frac{\zeta}{\zeta-1}}$$

After CBDC:

$$Z = \left[\alpha_m (M)^{\frac{\zeta-1}{\zeta}} + \alpha_d (D)^{\frac{\zeta-1}{\zeta}} + \alpha_{cbdc} (CBDC)^{\frac{\zeta-1}{\zeta}}\right]^{\frac{\zeta}{\zeta-1}}$$

Preference Weights:

Before CBDC:

$$\alpha_m^\zeta = 0.4$$

$$\alpha_d^\zeta = 0.6$$

After Introduction of CBDC:

$$\alpha_m^\zeta = 0.3$$

$$\alpha_d^\zeta = 0.4$$

$$\alpha_{cbdc}^\zeta = 0.3$$

The impact of CBDC

CBDC competition to deposits reduces banks' market power, inducing higher deposit rates:

$$r^{dj} = \underbrace{\frac{\eta^j}{1+\eta^j}}_{\text{(1-markdown)}}\left(r^r - \frac{\partial \Phi^l}{\partial H^j} - \frac{\partial \Phi^l}{\partial D^j}\right)$$

CBDC introduction → η^j ↑ → r^{dj} ↑

Higher deposit rates reduce banks' profits and capital, inducing a tightening of credit supply:

$$r^{lj} = \frac{\chi^j}{\chi^j - 1}\left(r^r + \underbrace{\frac{\partial \Phi^c}{\partial L^j} - \frac{\partial \Phi^l}{\partial H^j}}_{\text{Capital and Liquidity effects}}\right)$$

r^{dj} ↑ → profits and capital ↓ → r^{lj} ↑ → L ↓

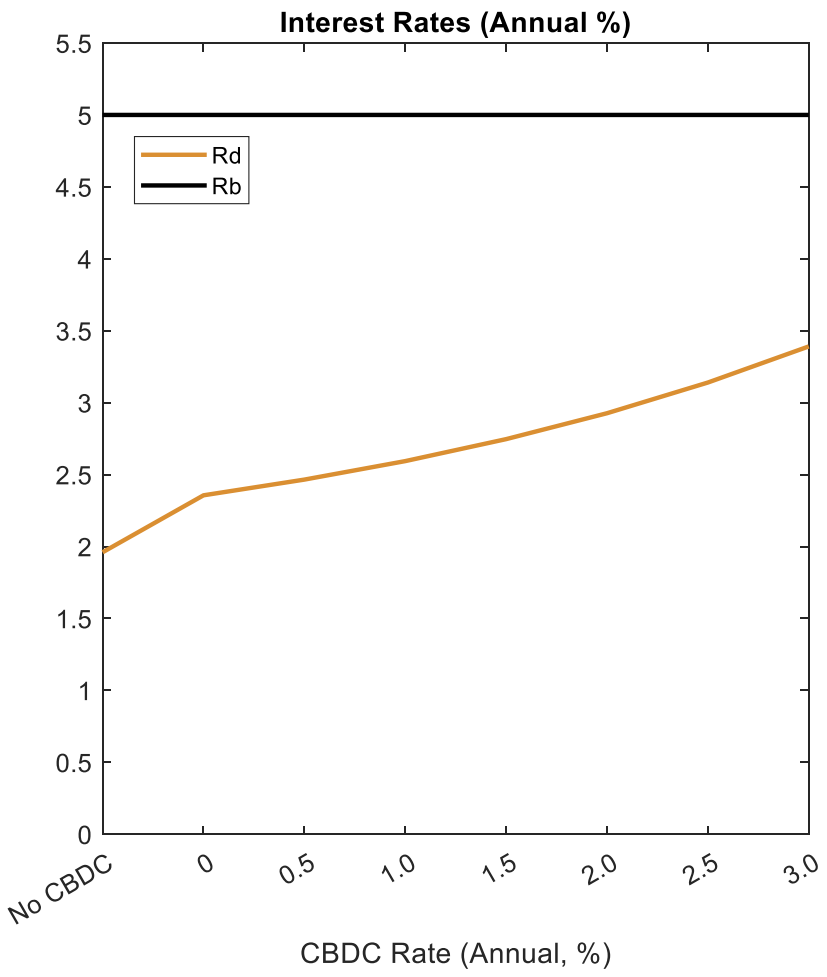
Results

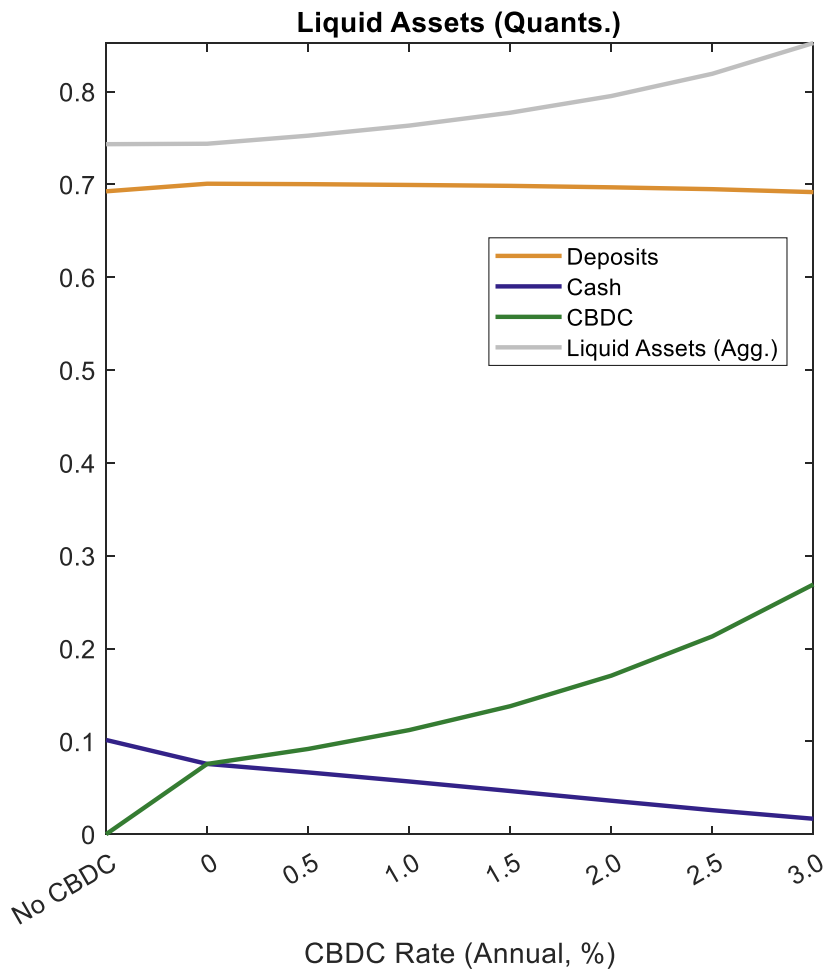
The Impact of CBDC Issuance

(Four symmetric banks)

Competition from CBDC leads banks to raise deposit interest rates ; Bank deposits remain stable and total liquid asset holdings increase

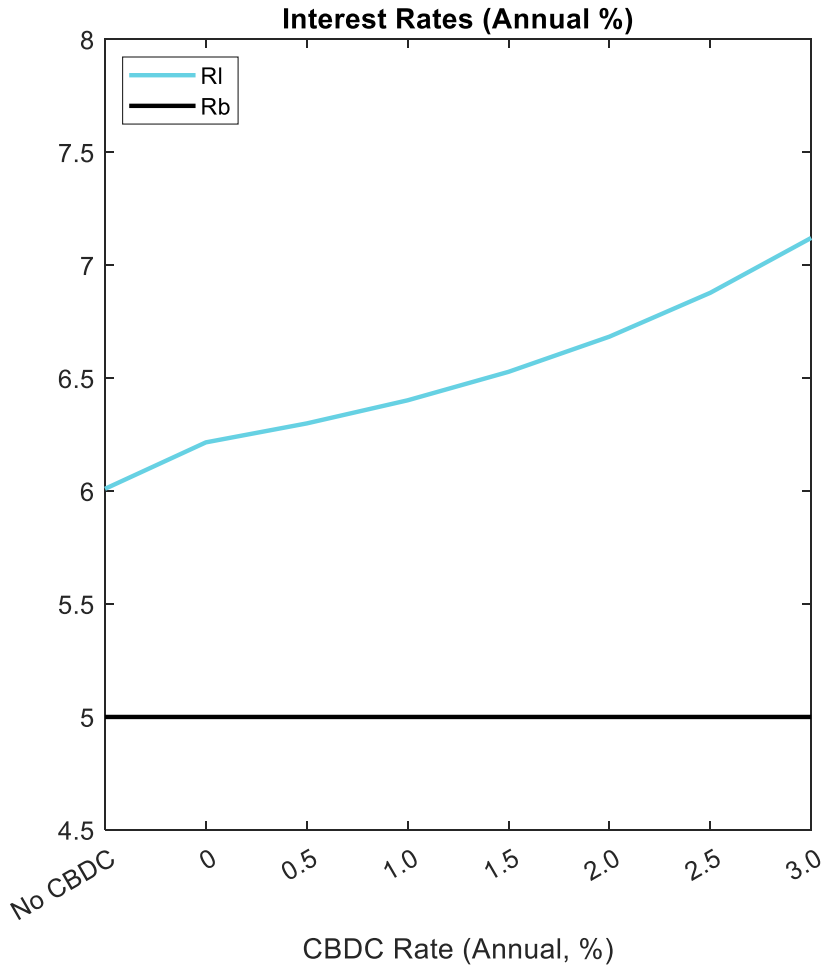
Deposits

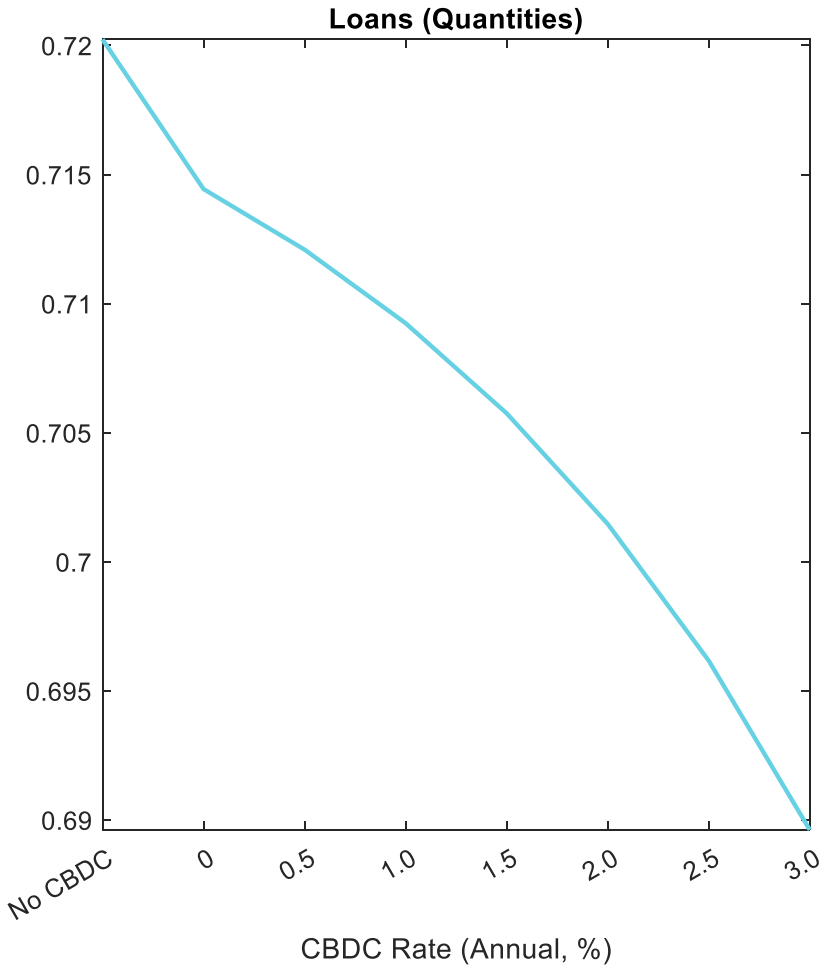




Banks raise loan interest rates due to reduced profits and capital, leading to a decline in bank credit volumes

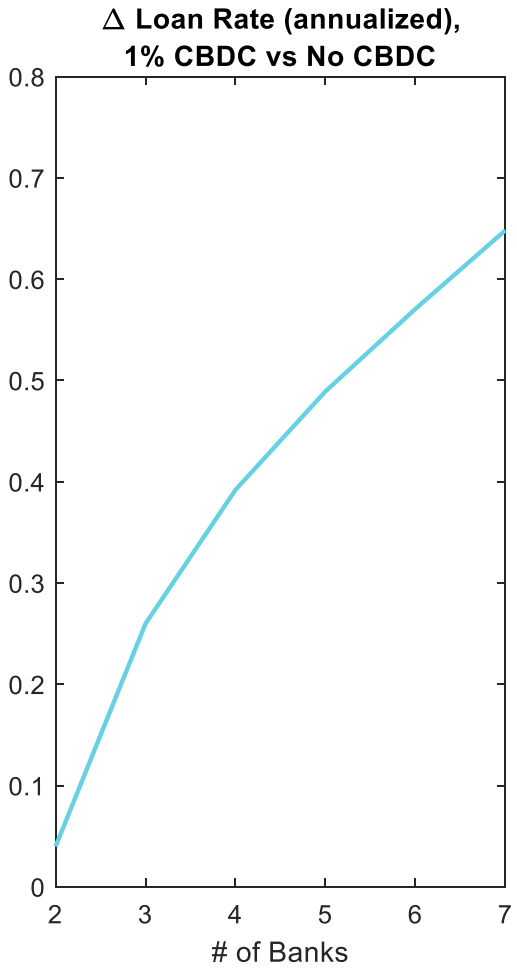
Loans

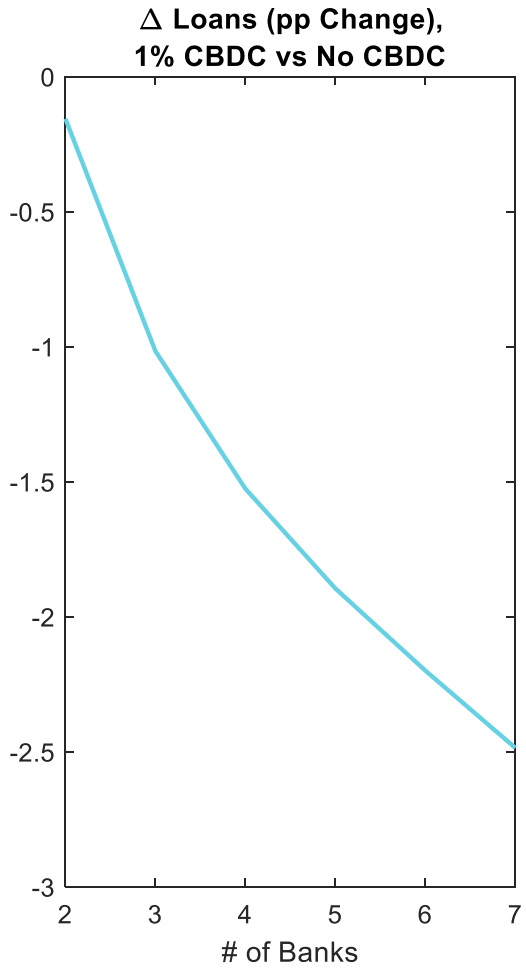


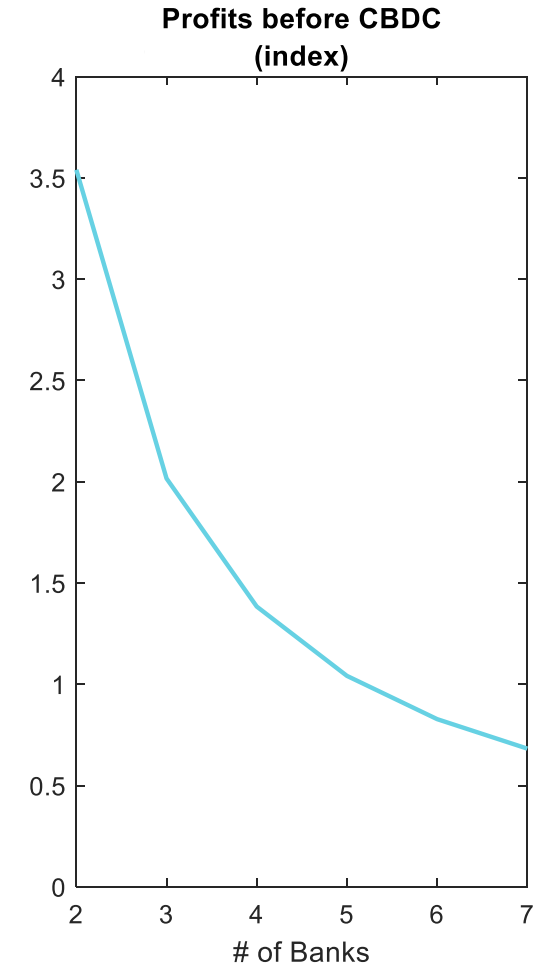


Credit disintermediation is limited in highly-concentrated highly-profitable markets

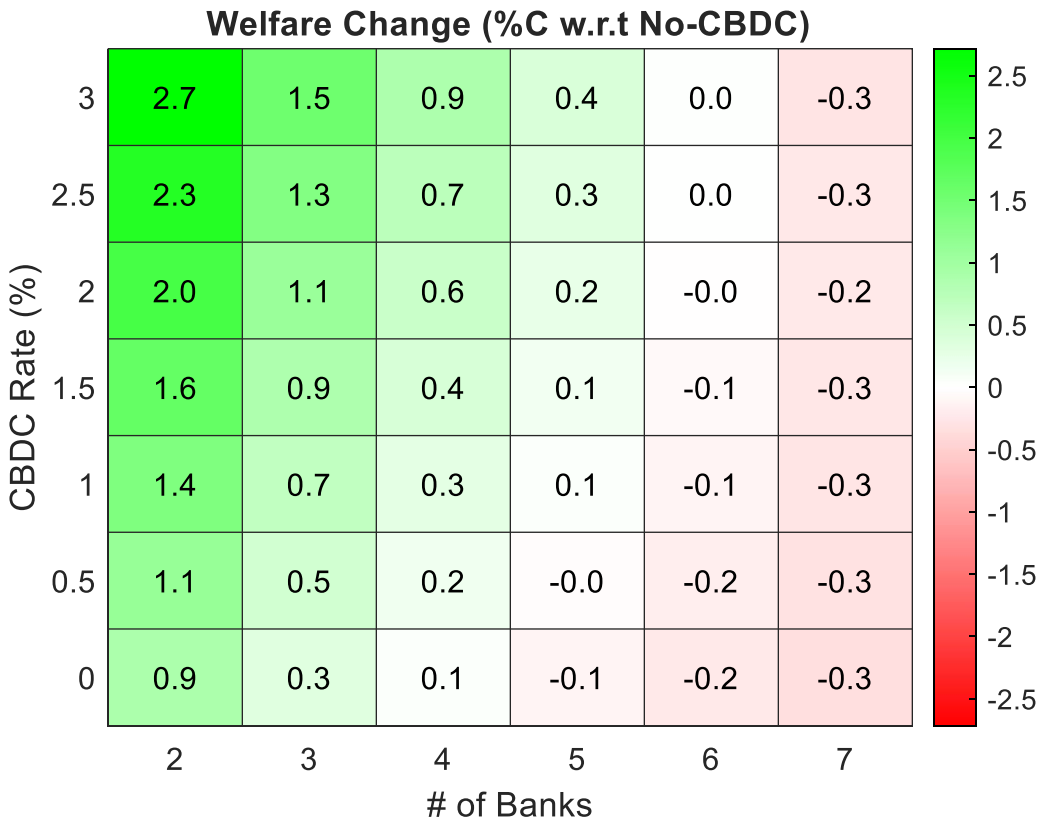
The effect of the number of banks







CBDC is more likely to increase welfare the more concentrated is the banking system



Cost-benefit (welfare) analysis within our model:

Costs	Benefits
• Credit decline leads to lower production.	• An additional means of payment. • Greater competition in the deposit market.

Conclusions

- We present a stylized model that provides a theoretical framework for considering the potential impact of CBDC introduction on the banking system.
- The model highlights a capital channel, whereby CBDC introduction may reduce banks' profits, potentially leading to a tightening of credit supply.
- The impact on credit is limited in markets that are highly concentrated and profitable.
- Our model points to possible channels and effects. A more comprehensive and detailed analysis is needed to explore additional channels and to conduct quantitative assessments of potential outcomes.

Thank you

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