MONEY AND BANKING IN THE SHADOWS: MONETARY POLICY AND (NON)BANK FINANCE

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SNS – December 2023

MOTIVATION

- Complex set of nonbank entities in modern financial system
  - Investment funds, GSEs, ABS issuers, finance companies
- Nonbank financial intermediaries (NBFIs)
  - Provide services traditionally associated with banks
  - Account for 50% of global financial assets (Pascual et al. 2023)
- Relation between monetary policy and NBFIs remains underexplored
  - Nonbank liquidity transformation

THIS PAPER

- I study the transmission of monetary policy in the United States
  - Impact on bank and nonbank financial intermediation
- Empirical response to monetary policy surprises
  - Household portfolios, lending to firms and economic activity
  - More accurate measures of lending (Gallin 2013)
- Theoretical model
  - New-Keynesian model with banks and investment funds
  - “Deposits channel” (Drechsler et al. 2017) and “shadow banking channel” (Xiao 2020)

TAKEAWAYS

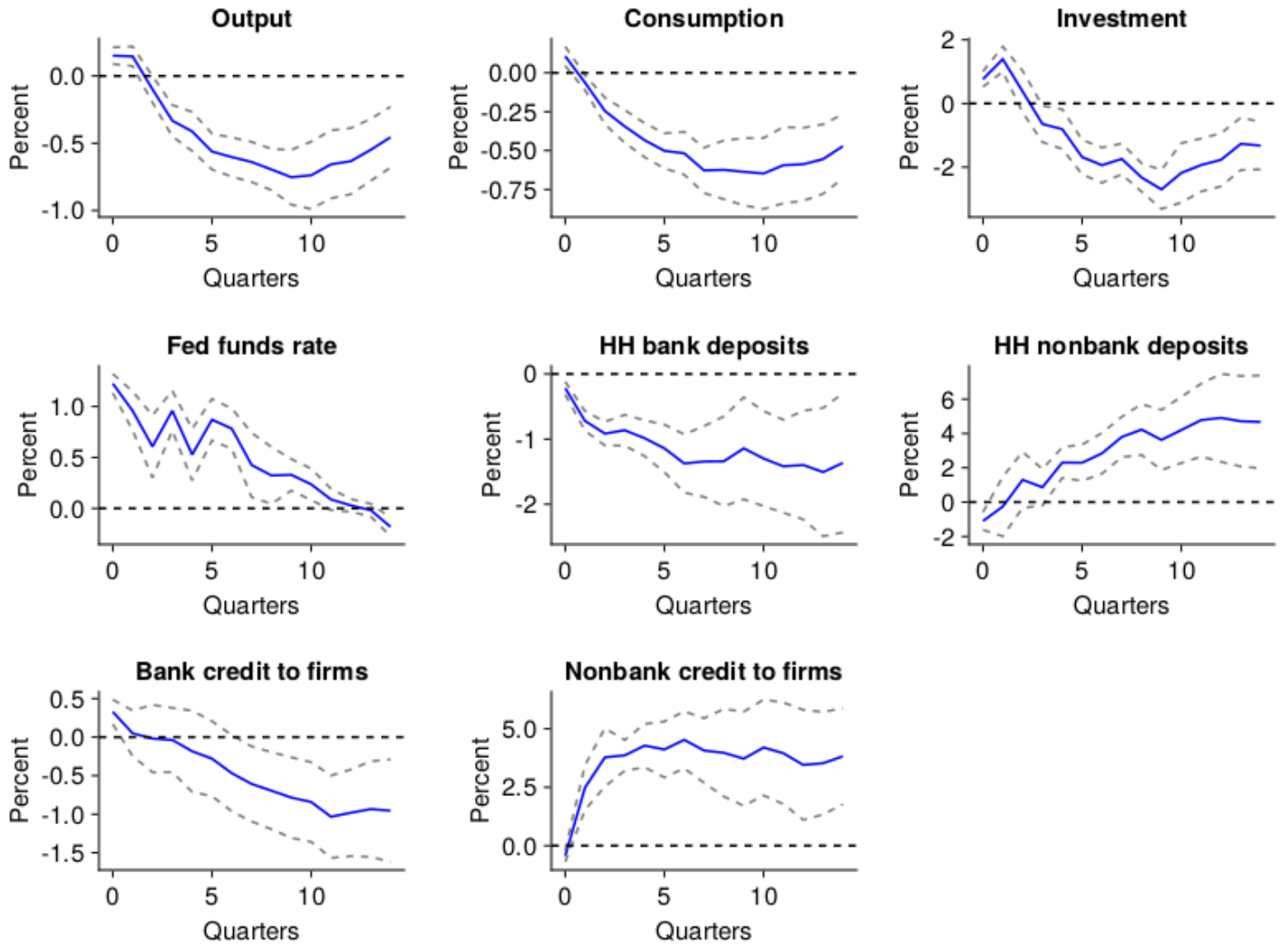
- Empiricallly, following monetary policy tightening
  - U.S. households substitute towards nonbank liabilities
  - Nonbank credit intermediation expands
- New-Keynesian model with banks and investment funds
  - Households value a combination of bank and nonbank liabilities
  - Cost of bank deposits more sensitive to monetary policy
  - Bank market power and constraint on bank leverage

EMPIRICAL EVIDENCE

- Measures of bank and nonbank financial intermediation
  - Gallin (2013) methodology for netting out interconnections
  - Money market funds and mutual funds as NBFIs of focus
- Empirical response to monetary policy surprises
  - Local projections (Jordà 2005)
  - Monetary shocks by Miranda-Agrippino and Rey (2020)
- Empirical specification follows Luetticke (2021)

$$y_{t+j} = \beta_{0,j} + \beta_{1,j} D_t + \beta_{2,j} \bar{\epsilon}_t + \beta_{3,j} \mathbf{x}_{t-1} + v_{t+j}, \quad j = 0, \ldots, 15$$

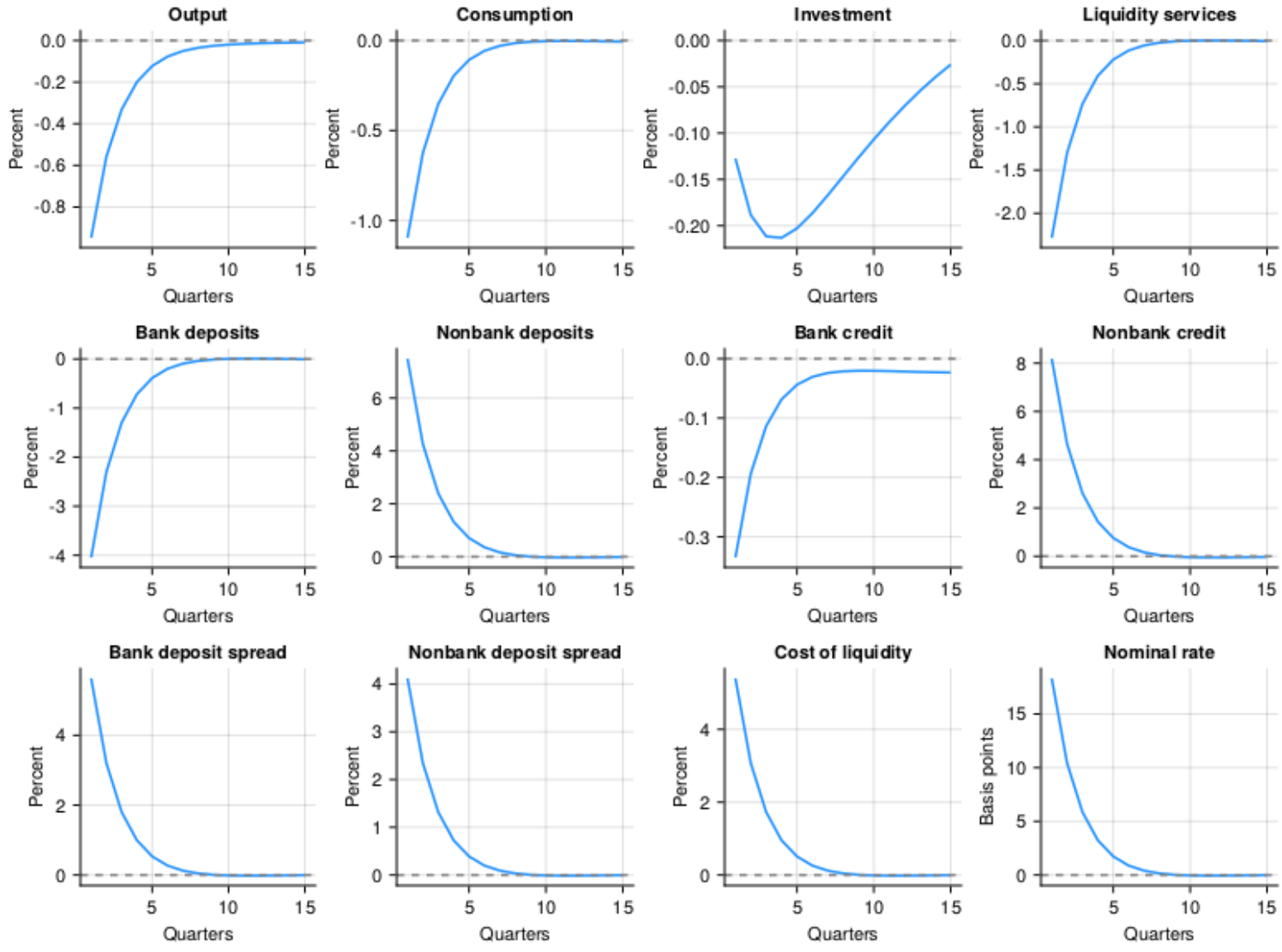
EMPIRICAL RESPONSE TO MONETARY SHOCKS



NEW-KEYNESIAN MODEL OF TWO DEPOSITS CHANNELS

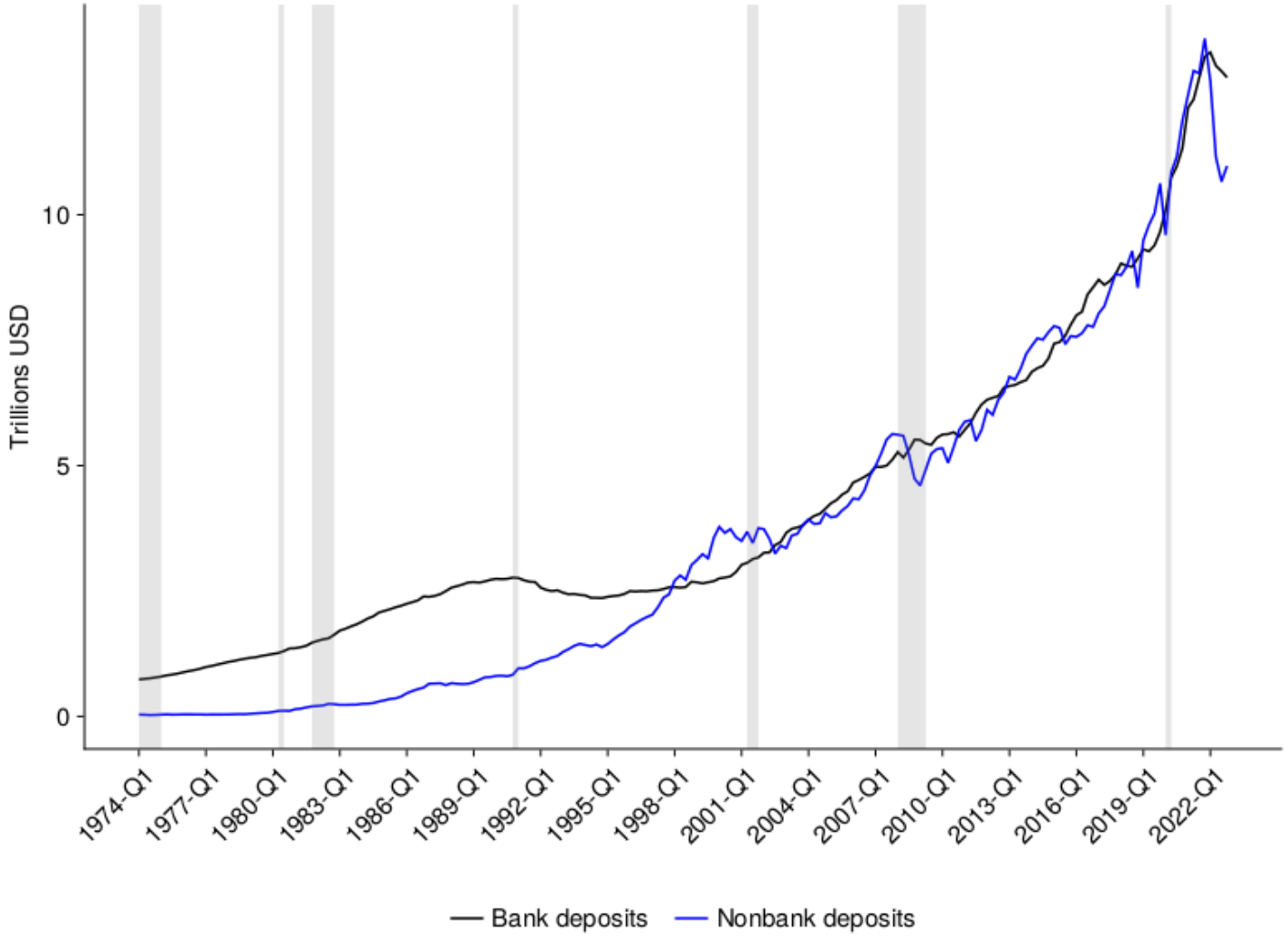
- "Deposits channel" and "shadow banking channel"
- Households
  - Value bank and nonbank deposits for liquidity
  - Portfolio allocation depends on interest spreads
- Financial intermediaries
  - Issue liabilities to fund lending to firms
  - Banks: oligopolistic competition, constraint on bank leverage
  - Investment funds: competitive, no leverage

IMPULSE RESPONSES



APPENDIX: FIGURES

U.S. households' bank and nonbank deposits



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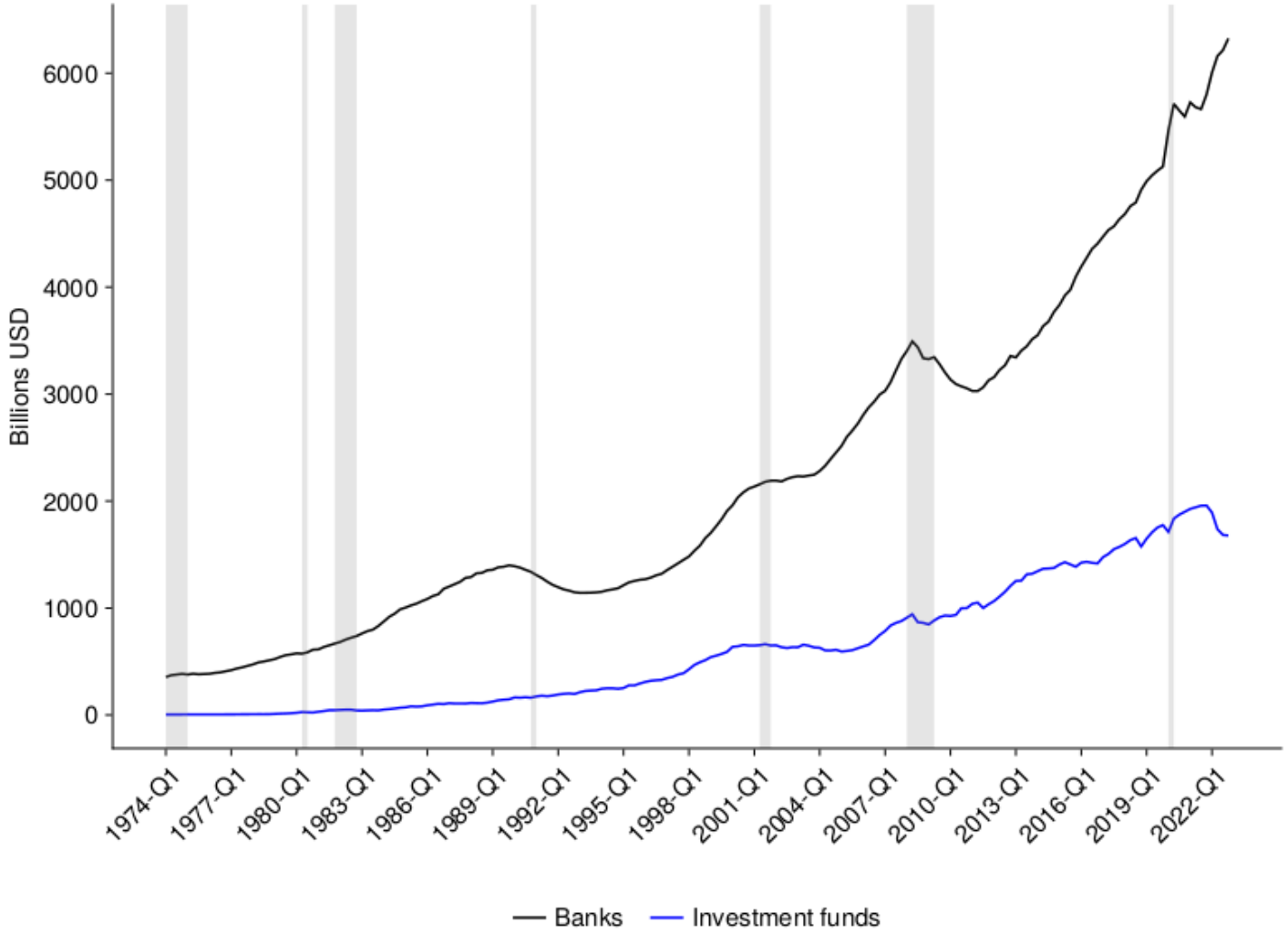
APPENDIX: FIGURES

Bank and nonbank lending to firms



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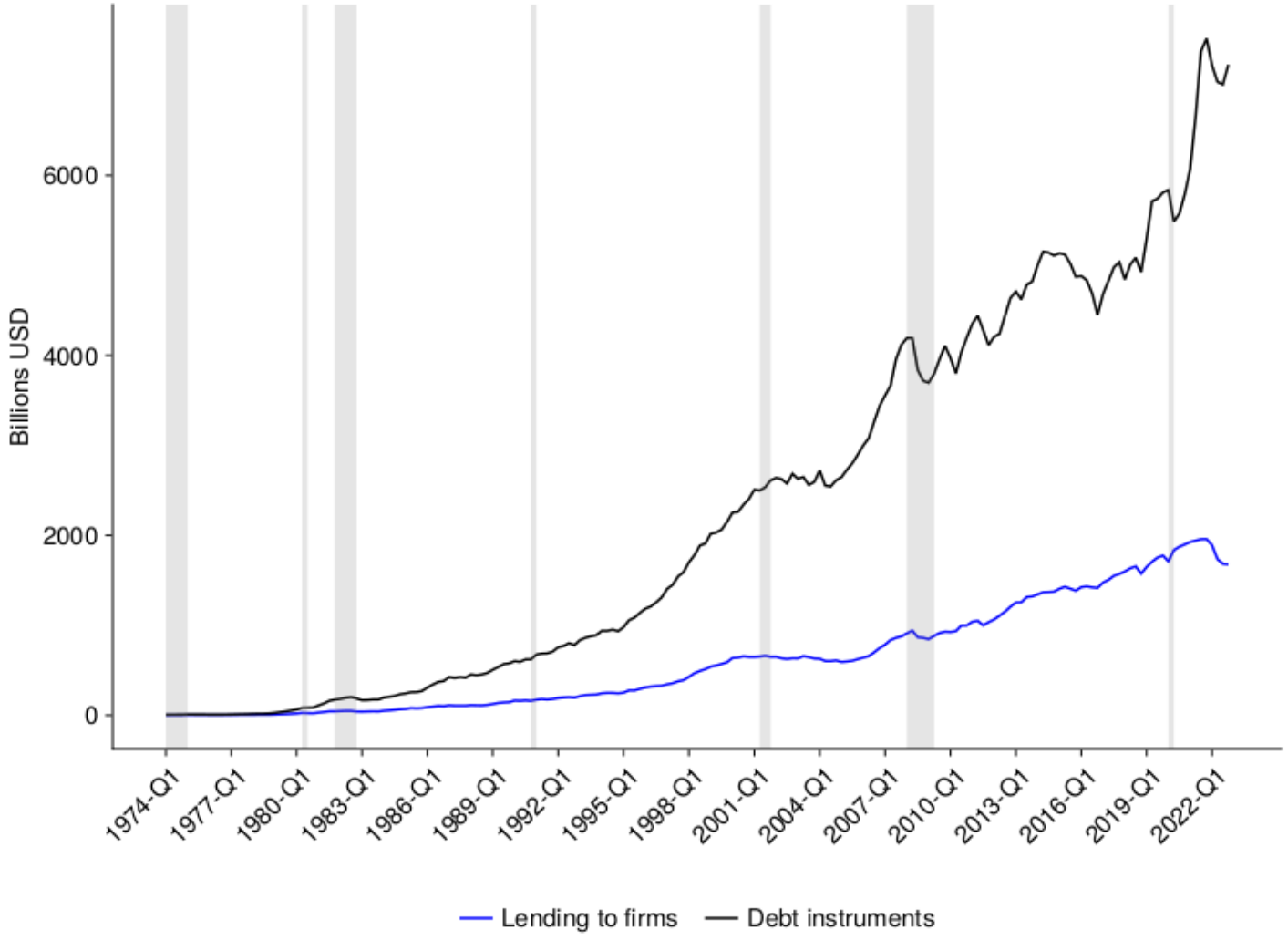
APPENDIX: FIGURES

Nonbank lending to firms vs. holdings of debt



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APPENDIX: HOUSEHOLDS

- Functional forms

$$u(c_t, z_t, x_t) = \frac{\left(c_t^{1-\psi} + v z_t^{1-\psi}\right)^{\frac{1-\sigma}{1-\psi}}}{1-\sigma} - \xi \frac{(1-x_t)^{1+\iota}}{1+\iota},$$

$$z_t = \left(\gamma d_t^{1-\epsilon} + (1-\gamma) s_t^{1-\epsilon}\right)^{\frac{1}{1-\epsilon}}, \quad d_t = \left(\frac{1}{n}\sum_{i=1}^{n}\left(n d_t^i\right)^{1-\eta}\right)^{\frac{1}{1-\eta}}$$

- Budget constraint

$$c_t + \sum_{i=1}^{n} d_t^i + s_t + b_t + \tau_t = w_t(1-x_t) + \pi_t + \sum_{i=1}^{n} \frac{d_{t-1}^i R_t^{d,i}}{\Pi_t} + \frac{s_{t-1} R_t^s}{\Pi_t} + \frac{b_{t-1} R_t}{\Pi_t}$$

back

APPENDIX: HOUSEHOLDS

- Interest spreads

$$\chi_{t+1}^{d,i} = \frac{R_{t+1} - R_{t+1}^{d,i}}{R_{t+1}}, \quad \chi_{t+1}^{d} = \left(\frac{1}{n} \sum_{i=1}^{n} \left(\chi_{t+1}^{d,i} \right)^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}}, \quad \chi_{t+1}^{s} = \frac{R_{t+1} - R_{t+1}^{s}}{R_{t+1}}$$

- Average cost of liquidity

$$\chi_{t+1}^{z} = \frac{\chi_{t+1}^{d} \chi_{t+1}^{s}}{\left((1-\gamma)^{\frac{1}{\epsilon}} \left(\chi_{t+1}^{d} \right)^{\frac{1-\epsilon}{\epsilon}} + \gamma^{\frac{1}{\epsilon}} \left(\chi_{t+1}^{s} \right)^{\frac{1-\epsilon}{\epsilon}} \right)^{\frac{\epsilon}{1-\epsilon}}}$$

back

APPENDIX: HOUSEHOLDS

- Household demand

$$z_t = c_t \left(\frac{v}{\chi^z_{t+1}} \right)^{\frac{1}{\psi}}, \quad d_t = z_t \left(\gamma \frac{\chi^z_{t+1}}{\chi^d_{t+1}} \right)^{\frac{1}{\epsilon}}, \quad s_t = z_t \left((1-\gamma) \frac{\chi^z_{t+1}}{\chi^s_{t+1}} \right)^{\frac{1}{\epsilon}}$$

- Euler equation and labor supply condition

$$c_t^{-\sigma} \Omega^c_t = \beta \mathbb{E}_t \left[\frac{c_{t+1}^{-\sigma} \Omega^c_{t+1}}{\prod_{t+1}} \right] R_{t+1}, \quad \xi (1 - x_t)^{\iota} = w_t c_t^{-\sigma} \Omega^c_t$$

- Ideal price index for a bundle of consumption and liquidity

$$\Omega^c_t = \left(1 + v^{\frac{1}{\psi}} \left(\chi^z_{t+1} \right)^{1 - \frac{1}{\psi}} \right)^{\frac{\psi - \sigma}{1 - \psi}}$$

back

APPENDIX: BANKS

- Balance sheet

$$q_t k_t^{b,i} + r_t^i = d_t^i + e_t^i$$

- Leverage constraint

$$d_t^i \leq \zeta \left(r_t^i + \lambda q_t k_t^{b,i} \right)$$

- Bank profit at time t

$$q_{t-1} k_{t-1}^{b,i} R_t^k + r_{t-1}^i \frac{R_t^r}{\Pi_t} - d_{t-1}^i \frac{R_t^{d,i}}{\Pi_t} - e_t^i - \theta^b d_t^i$$

back

APPENDIX: BANKS

- Pricing equation

$$\chi^d_{t+1} + \chi^d_{t+1}\left(-\frac{1}{n}\left(\frac{1-\mu_{t+1}}{\psi} + \frac{\mu_{t+1}}{\epsilon}\right) - \left(1-\frac{1}{n}\right)\frac{1}{\eta}\right)^{-1} = \frac{\chi^r_{t+1}}{\zeta} + \theta^b$$

where

$$\mu_{t+1} = (1-\gamma)^{\frac{1}{\epsilon}}\left(\frac{\chi^z_{t+1}}{\chi^s_{t+1}}\right)^{\frac{1-\epsilon}{\epsilon}} \in [0,1],$$

$$\chi^r_{t+1} = \frac{R_{t+1} - R^r_{t+1}}{R_{t+1}}$$

back

APPENDIX: INVESTMENT FUNDS

- Balance sheet

$$q_t k_t^f = s_t$$

- Investment fund profit at time t

$$q_{t-1} k_{t-1}^f R_t^k - s_{t-1} \frac{R_t^s}{\Pi_t} - \theta^f s_t$$

- Pricing equation

$$\chi_{t+1}^s = \lambda \chi_{t+1}^r + \theta^f$$

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