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# Macroeconomic and Fiscal Consequences of Quantitative Easing

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# Motivation for rethinking QE strategies

- The rapid surge in inflation after the pandemic => more upside inflation risks
  - Quantitative Easing (QE) may have contributed to overheating and inhibited a more timely liftoff of policy rates (Orphanides, 2023; Eggertsson and Kohn, 2023)
- QE exposed CBs to greater maturity risk => large CB balance sheet losses
  - Need to rebuild capital through profit retention or recapitalization by the government => fiscal consequences, pressure on central banks
- Important to **reconsider the conditions when QE likely to be warranted** as well as implementation and communication
  - Only use QE in deep recessions?
  - More escape clauses to take account of need for early exit?

# What We Do

- Develop framework that can be used to weigh the macroeconomic benefits of QE against the consolidated fiscal costs (Cavallo et al, 2019)
  - The consolidated fiscal position includes the overall balance plus CB profits/losses
- Build New Keynesian DSGE model with:
  - Bond market segmentation (Chen et al, 2013) => QE affects real activity
  - Behavioral discounting (Gabaix, 2020) and nonlinear Phillips Curve (HLT, 2023)
- Explore effects of QE on macroeconomy, fiscal position, and CB profits under different scenarios (severity of liquidity trap, use of FG, etc)
- Compare QE to fiscal expansion

# Key Findings

- Substantial macro stimulus from QE in “deep” liquidity trap
  - Consolidated fiscal position improves significantly even if CB makes losses
  - QE contrast sharply with fiscal expansion which boosts debt
  - QE benefits tend to be sizeable even if economy recovers faster than expected
- More reason for caution in “shallow” liquidity trap
  - Macro benefits smaller under modal outlook
  - More risk of overheating and CB losses (in faster recovery scenarios)
  - Even so, fiscal position shows strong likelihood of improving, and policymakers can mitigate some risks from overheating (e.g., through escape clauses)

# Model Overview

# Model overview

- Build on model with standard NK features:  sticky prices, sticky wages, and habit persistence in consumption

- **Incorporate bond market segmentation** to allow QE to have real effects (Andres et al., 2004; Chen et al., 2013):
  - "Financially Restricted" households: trade only in long-term bonds, which are perpetuities with geometrically decaying coupons (Woodford, 2001).
  - "Financially Unrestricted" households  HHs : trade in long-term bonds subject to portfolio frictions and also trade in short-term bonds.

- **Behavioral discounting** (Gabaix, 2020) to address FG puzzle and **nonlinear Phillips Curve** (Harding et al., 2023) to capture risks of overheating

- Fiscal block includes labor and consumption taxes.

# Portfolio frictions

- All households maximize a utility functional given by:

$$U_t^j = \mathbb{E}_t^j \sum_{s=0}^{\infty} \beta_j^s \exp\{\varepsilon_{t+s}^d\} \left[ \exp\{\varepsilon_{t+s}^c\} \log(c_{t+s}^j - \varkappa \bar{c}_{t-1+s}^j) - \frac{(n_{t+s}^j)^{1+\varphi}}{1+\varphi} \right]$$

- Unrestricted households face the budget constraint:

$$P_t (1+\tau_t^c)\, c_t^u + B_t^u + (1+\zeta_t)\, P_{L,t} B_{L,t}^u + T_t^u$$
$$= R_{t-1} B_{t-1}^u + (1+\kappa P_{L,t})\, B_{L,t-1}^u + W_t (1-\tau_t^n)\, \bar{n}_t^u + D_t^u + \Xi_t^u$$

- The portfolio friction (“tax” on long-term bonds) facing unrestricted agents is given by:

$$\frac{1+\zeta_t}{1+\zeta} = \left( \frac{b_{L,t}^u}{b_L^u} \right)^{\xi}$$

- Restricted households face the same budget constraint except they face no portfolio frictions on long-term bonds and can’t hold short-term bonds

# How QE raises aggregate demand

- The foc for LT bonds for **unrestricted agents**:

$$1 = \beta E_t \frac{c_t^u}{c_{t+1}^u} \left\{ \frac{P_{L,t+1} R_{L,t+1}}{P_{Lt} \Pi_{t+1}} \right\} \frac{1}{\zeta_t}$$

- **For restricted agents**, the foc for LT bonds is:

$$1 = \beta E_t \frac{c_t^r}{c_{t+1}^r} \left\{ \frac{P_{L,t+1} R_{L,t+1}}{P_{Lt} \Pi_{t+1}} \right\}$$

- An asset purchase by the CB reduces the portfolio friction $\zeta_t$ ("tax") experienced by the unrestricted agents, reducing the term premium and long-term bond yield.

- The lower long-term bond yield in turn induces restricted agents to increase their consumption, which stimulates aggregate demand.

# Policy rules and calibration

- Taylor-type simple instrument rule for short-term rate subject to an effective lower bound (here normalized to 0):

$$R_t = \max\left\{1, \tilde{R}_t\right\}, \qquad \frac{\tilde{R}_t}{R_t^*} = \left(\frac{\tilde{R}_{t-1}}{R_{t-1}^*}\right)^{\gamma} \left[\left(\frac{\pi_t^{yoy}}{\pi}\right)^{\gamma_\pi} \left(\frac{y_t}{y_{t-1}}\right)^{\gamma_y}\right]^{1-\gamma} \exp\{\varepsilon_t^r\}$$

- **QE follows an autoregressive process** with an exogenous shock

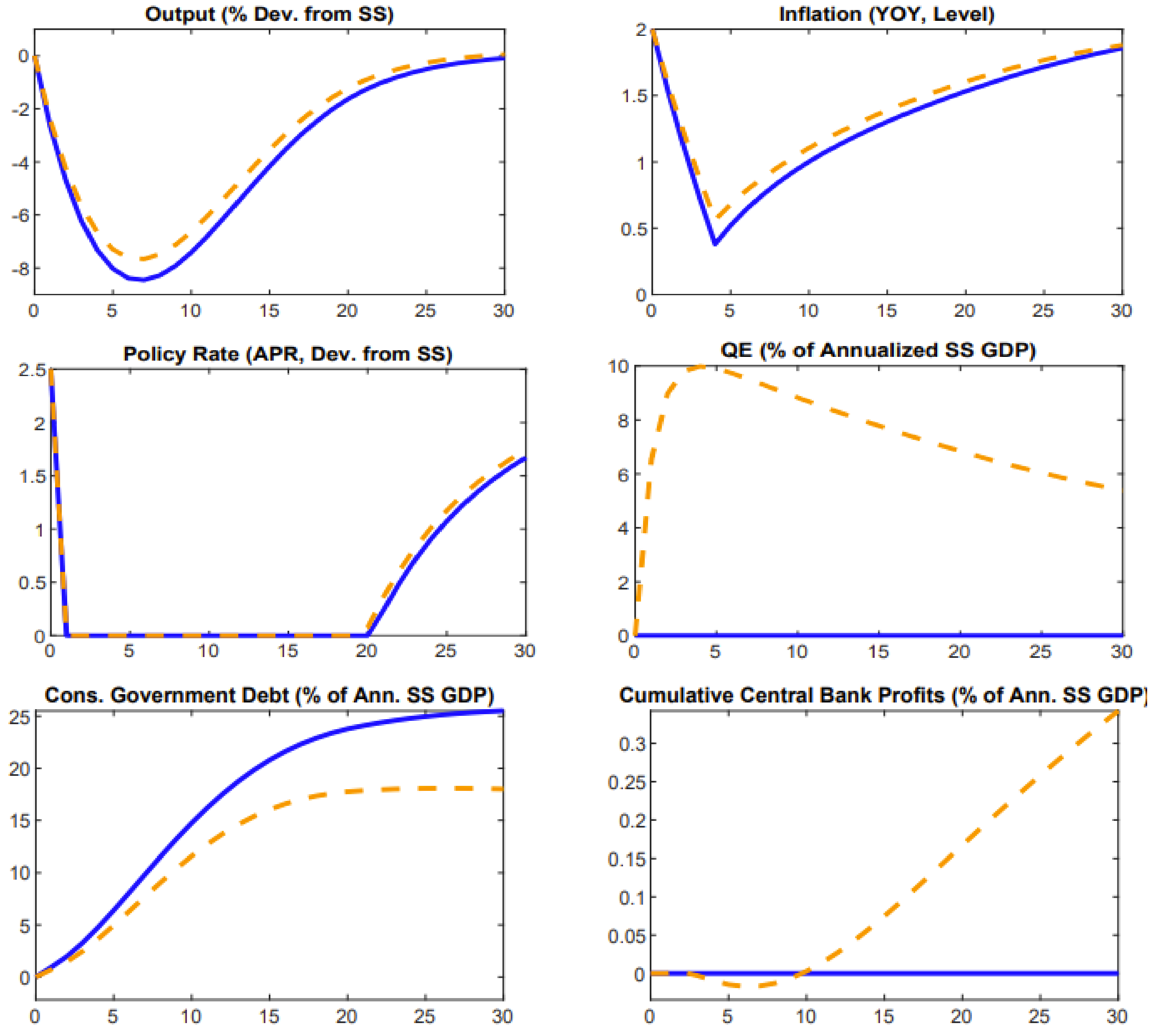
- Distortionary tax on labor income and consumption with very low adjustment of the labor tax in response to government debt

- QE: Bond market segmentation parameters calibrated so that 10 percent of GDP CB purchase reduces term premium about 50 basis points (in line with Chung, Laforte, Reifschneider and Williams, 2011)
  - Share of restricted households 20 percent and portfolio cost elasticity .02

- Steady state tax rates, debt/GDP, debt duration based on averages for US and EA

# QE in a deep liquidity trap

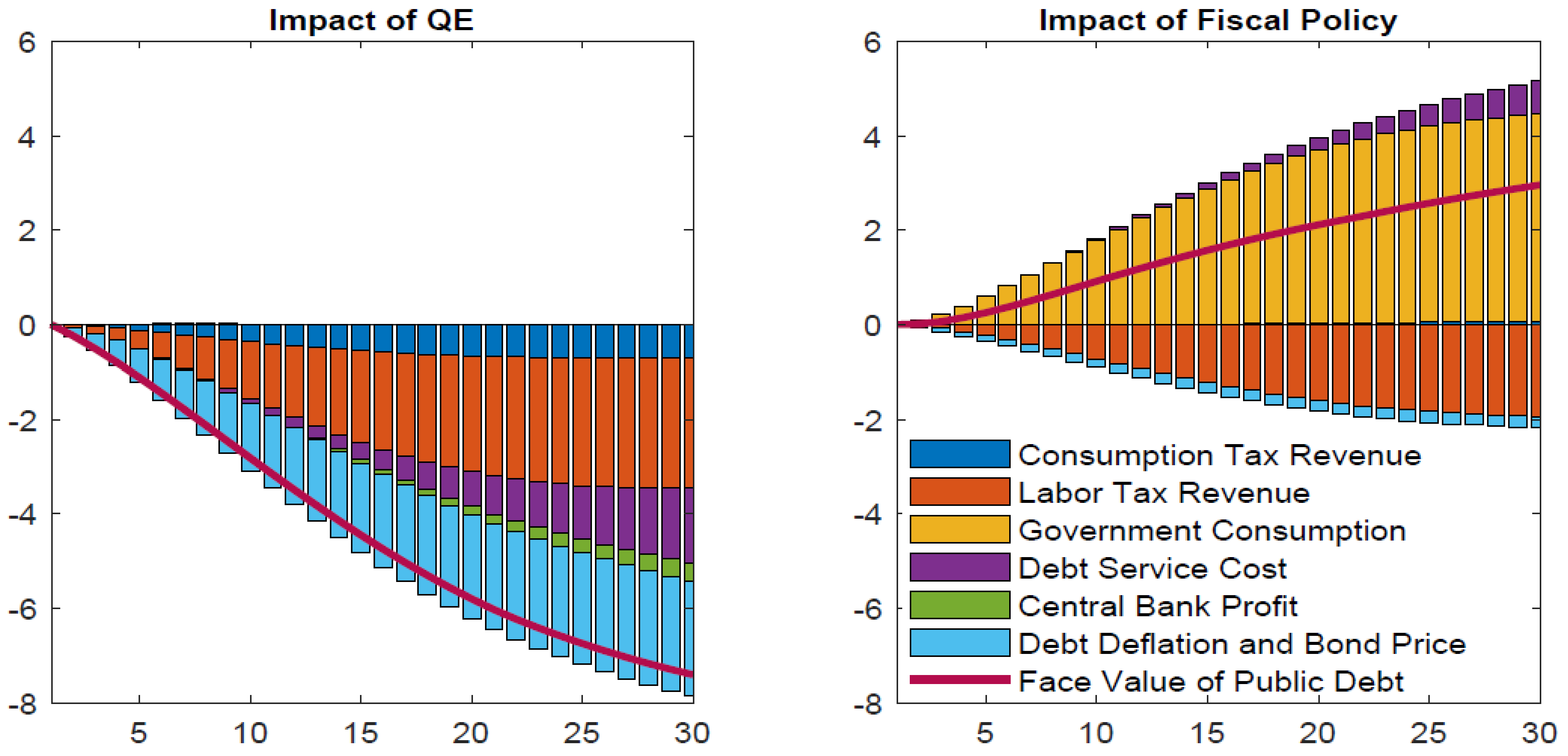
# QE in a Deep Liquidity Trap



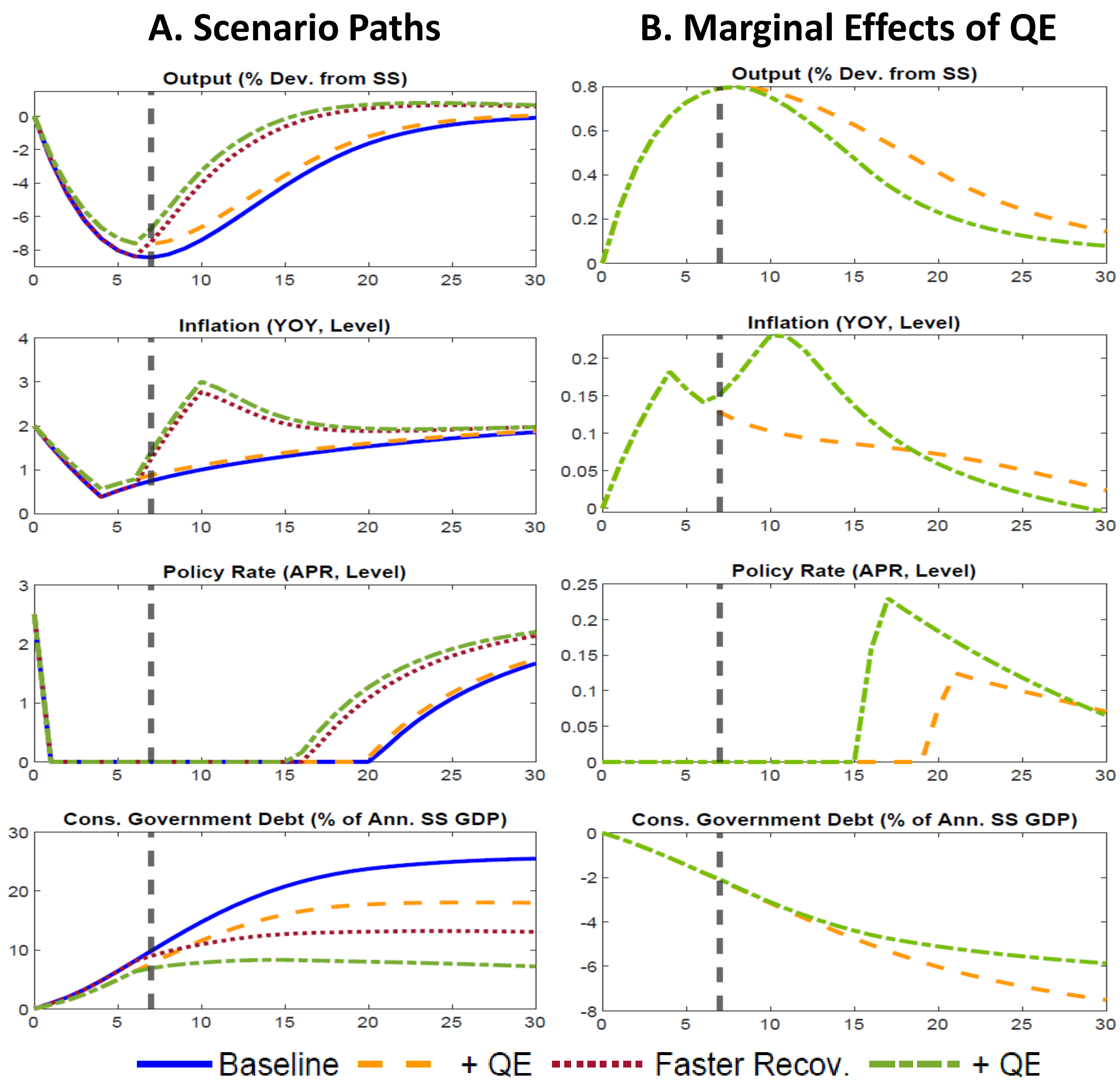

- Negative and persistent discount factor shock => liquidity trap
- Under modal outlook, QE scaled to 10 percent of GDP boosts output about 3/4 percent (below Fabo et al., 2021)
- Reduces consolidated govt debt significantly with CB profits rising

# QE versus fiscal expansion

- Compare the effect on government debt of QE and fiscal stimulus (same output boost).



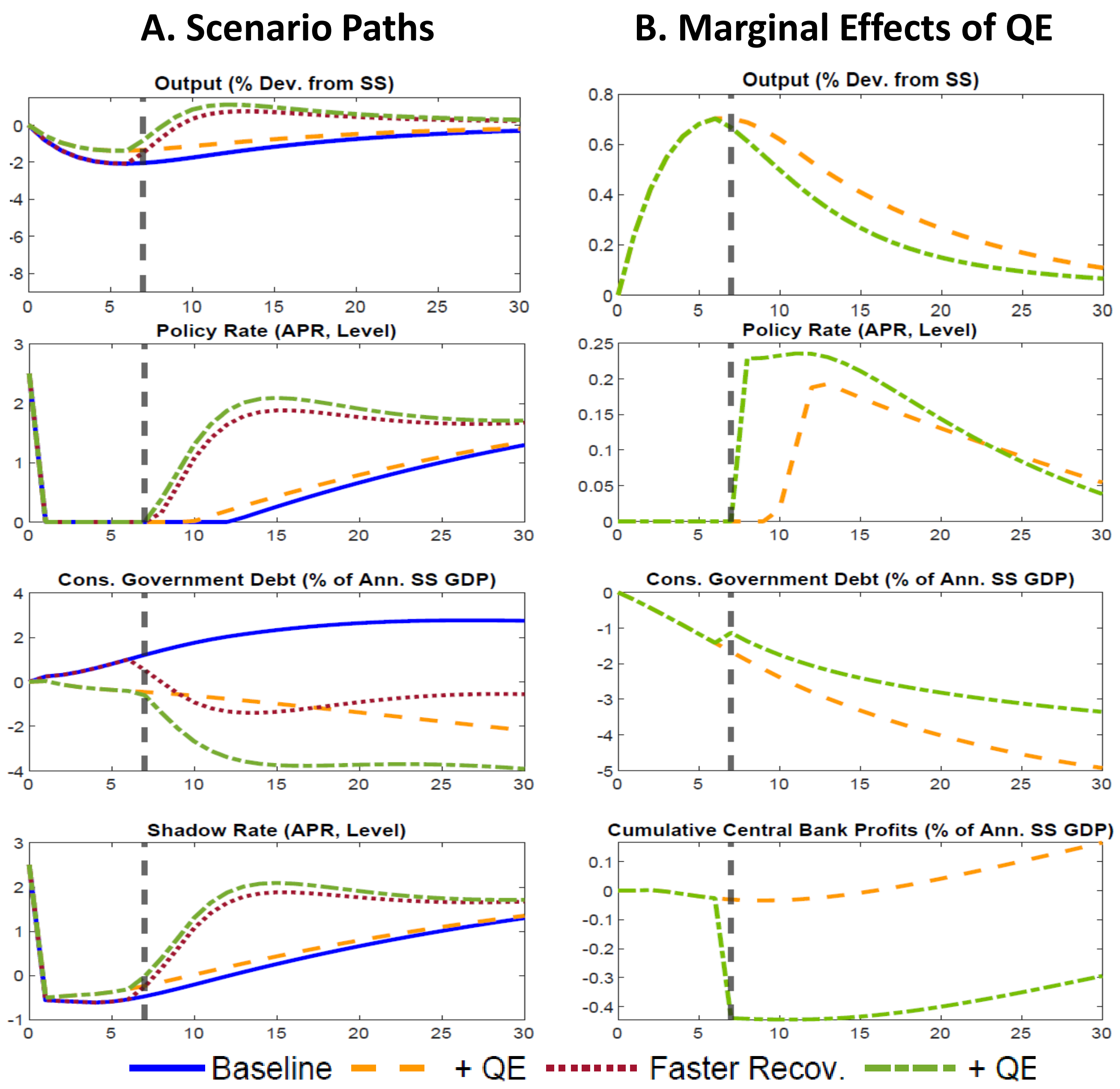
# QE in Deep Liquidity Trap with Faster Recovery




- Faster-than-expected recovery: positive demand and cost-push shocks hit 6 quarters after the initial recessionary shock
- Somewhat earlier liftoff implies only slightly smaller boost to output
- Debt falls almost as much despite minor CB losses (latter not shown)

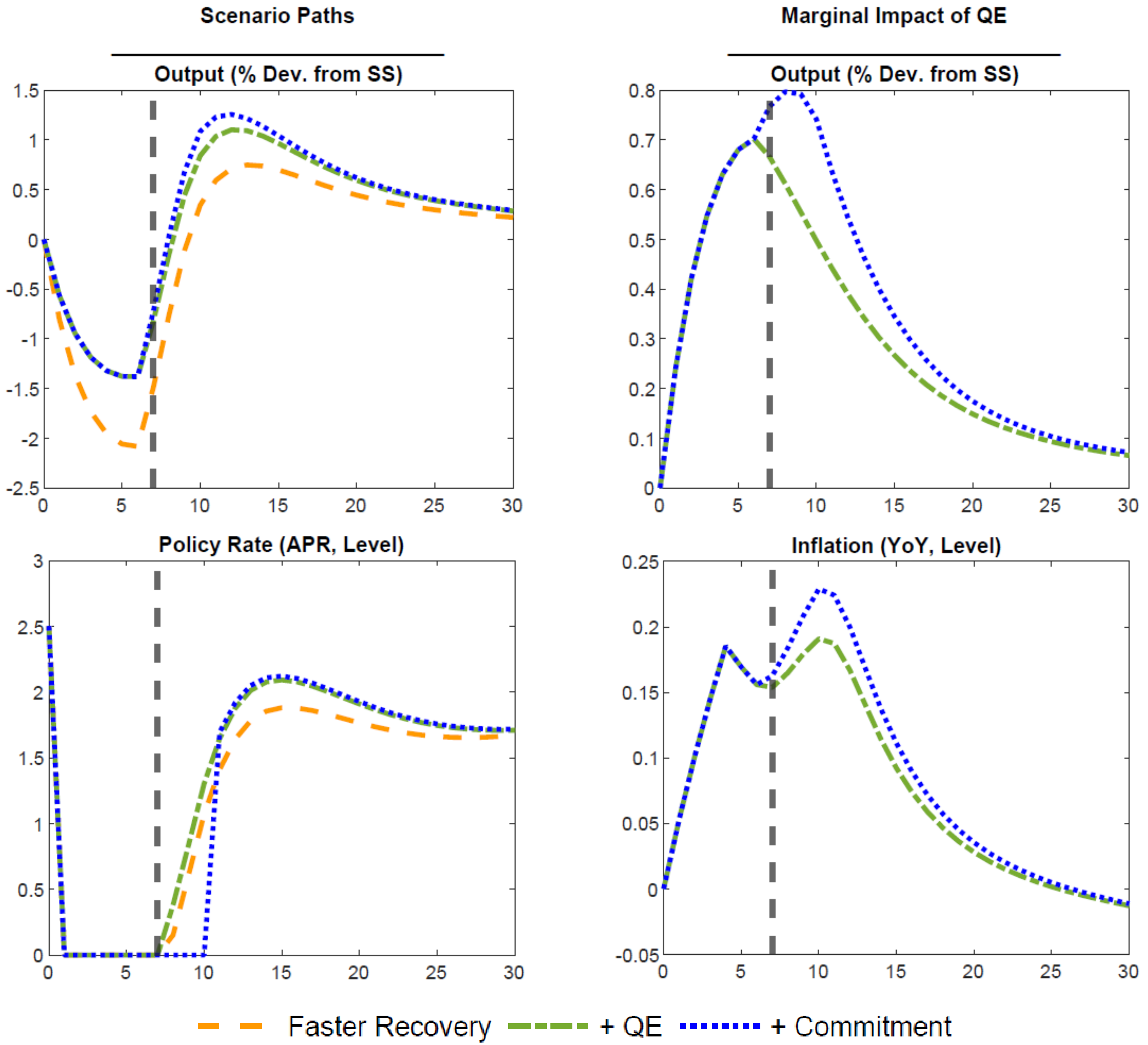
# QE in shallow liquidity trap

# QE in Shallow Liquidity Trap with Faster Recovery




- Consider baseline of a "shallow" liquidity trap where notional rate only slightly below ELB
- If recession baseline unfolds as expected when QE launched, stimulus modestly smaller than in deep liquidity trap
- But in faster recovery scenario, get almost immediate liftoff, smaller output effects, and some overheating
- Sizeable CB losses, though consolidated position still improves (n.b. losses bigger if smaller initial term premium)

# FG Commitment can Exacerbate QE Overheating Risks




- QE is often accompanied by forward guidance indicating that rates will be unlikely to rise for some time after QE ends.
- If CB feels “locked into” keeping policy rates low even when it would otherwise raise them, this can trigger more overheating.
- This is shown in the figure, where QE “with commitment” exacerbates output overheating

# Stochastic Simulations Setup

- So far, we have undertaken deterministic simulations, no future shock uncertainty.

- We now examine the consequences of QE under shock uncertainty, i.e. allow for shocks to hit the economy *t*=1,2,…,*T*. Shocks can lead to more favorable and less favorable outcomes around the modal (no-uncertainty) outlook.
    - Nonlinear solution approach implies asymmetries.

- Calibrate shock uncertainty by matching a set of moments in US data with consumption demand, technology, and price and wage cost-push shocks.
    - US quarterly data 1960Q2-2019Q4.

**Shocks used in model:**

$$\varepsilon_t^z = 0.90\varepsilon_{t-1}^z + u_t^z,\ u_t^z \backsim i.i.d.N\,(0, 0.01)$$

$$\varepsilon_t^c = 0.90\varepsilon_{t-1}^c + u_t^c,\ u_t^c \backsim i.i.d.N\,(0, 0.035)$$

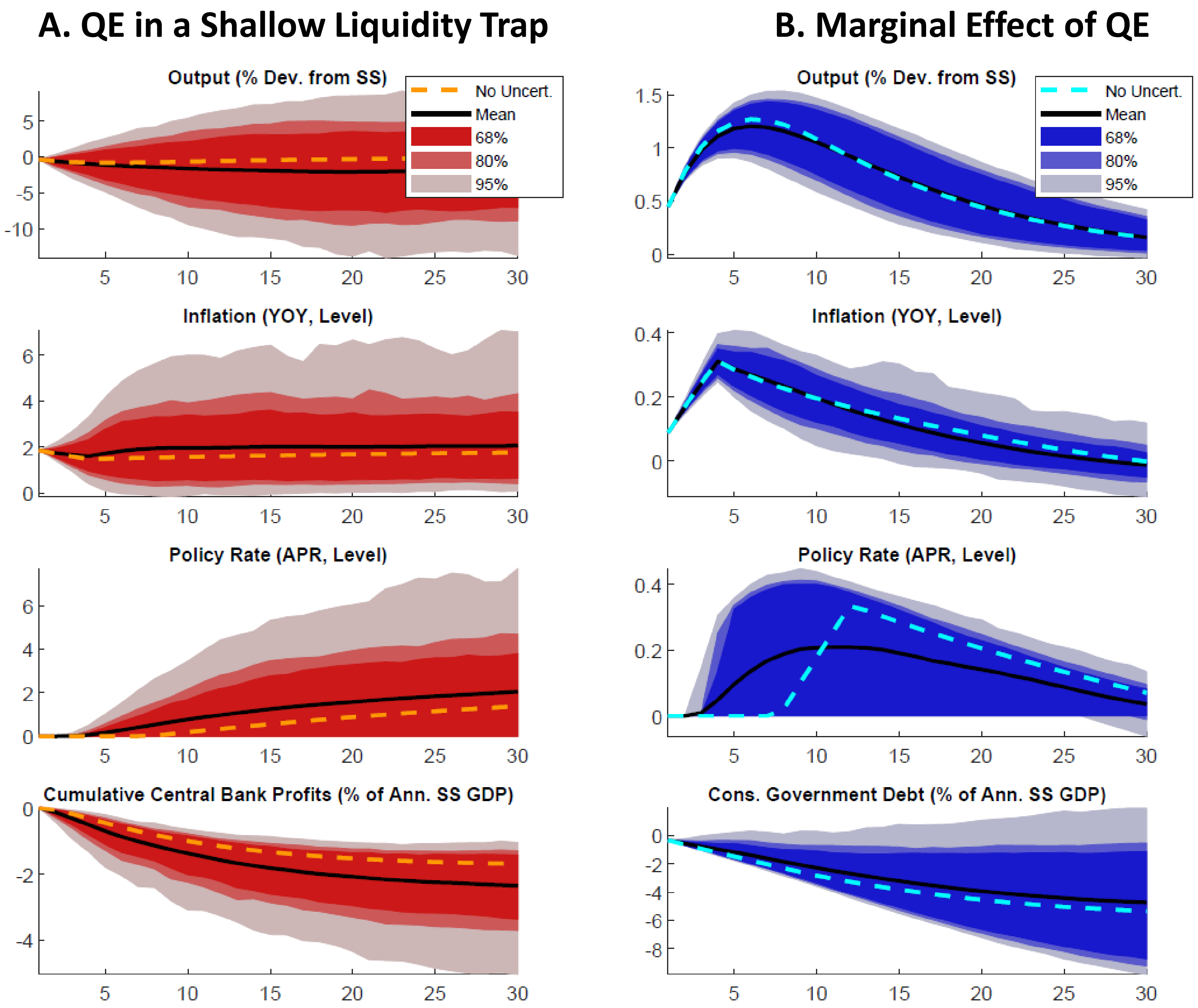
$$\varepsilon_t^p = 0.85\varepsilon_{t-1}^p + u_t^p,\ u_t^p \backsim i.i.d.N\,(0, 0.04)$$

$$\varepsilon_t^w = 0.85\varepsilon_{t-1}^w + u_t^w,\ u_t^w \backsim i.i.d.N\,(0, 0.26)$$

Table 3: Targeted Stochastic Moments.

| Moment | US Data | Model |
|---|---|---|
| Std($\Delta \ln y_t$) | 0.81 | 0.85 |
| Std($\pi_t^{ann}$) | 2.17 | 2.19 |
| Std($\pi_t^{w,ann}$) | 3.45 | 3.71 |
| Std($\hat{n}_t$) | 4.99 | 4.83 |
| Std($R_t^{ann}$) | 3.65 | 3.12 |
| Corr($\Delta \ln y_t, \pi_t^{ann}$) | -0.18 | -0.23 |
| Corr($\Delta \ln y_t, \pi_t^{w,ann}$) | -0.12 | -0.10 |
| Corr($\Delta \ln y_t, \hat{n}_t$) | 0.07 | 0.00 |

# QE in Shallow Liquidity Traps: Risk Evaluation




- Assume more risky conditions:
  - TP low (0 instead 1)
  - QE larger (20% instead of 10% of baseline GDP)
- Upside inflation risk makes earlier and sharp liftoff likely.
- Large downside risk for CB profits.
- Even so, QE likely to benefit consolidated fiscal position.

# 4. Concluding Remarks

# Conclusions

- Strong rationale for QE in “deep” liquidity trap
  - Sizeable stimulus, even when economy recovers more quickly than expected
  - Depresses public debt in contrast to fiscal which boosts debt – which is especially desirable in environment of limited fiscal space
- More reason for caution in “shallow” liquidity trap
  - Smaller macro benefits, and more risk of overheating and CB losses
  - Even so, can be worth considering in some circumstances

# Related Workstream

1, “Central Bank Exit Strategies: Domestic Transmission and International Spillovers,” Christopher Erceg, Marcin Kolasa, Jesper Lindé, Haroon Mumtaz and Pawel Zabczyk, IMF WP 2024-73

2. “New Perspectives on Quantitative Easing and Central Bank Capital Policies,” Tobias Adrian, Christopher Erceg, Marcin Kolasa, Jesper Lindé, Roger McLeod, Romain Veyrune, and Pawel Zabczyk, IMF WP 2024-103

3. “Monetary Policy and Inflation Scares,” Christopher Erceg, Jesper Lindé, and Mathias Trabandt, IMF WP 2024-260

4. “Unconventional Monetary Policies in Small Open Economies,” Marcin Kolasa, Stefan Laséen, and Jesper Lindé, IMF WP 2025-66