# Can Monetary Policy Create Fiscal Capacity?

Vadim Elenev
JHU Carey

Tim Landvoigt
Wharton

Patrick Shultz
Wharton

Stijn Van Nieuwerburgh
Columbia GSB

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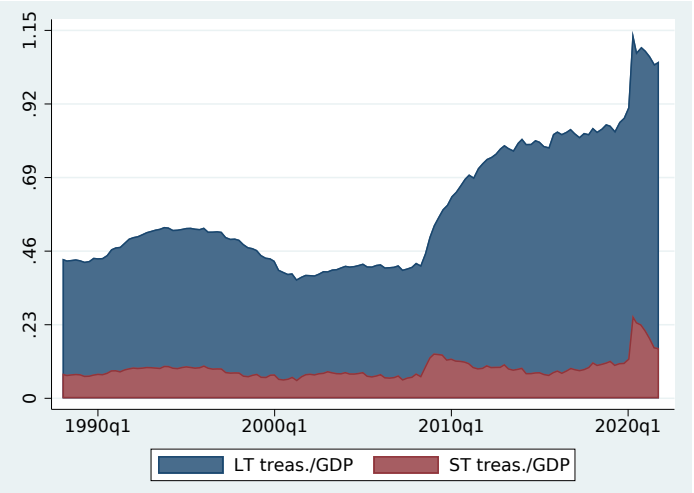
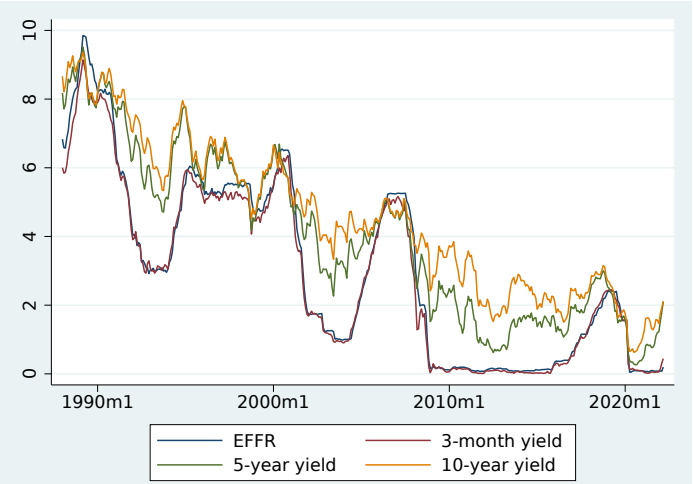
# Motivation

- Govt. debt issuance to finance large and persistent primary deficits following GFC and Covid crises



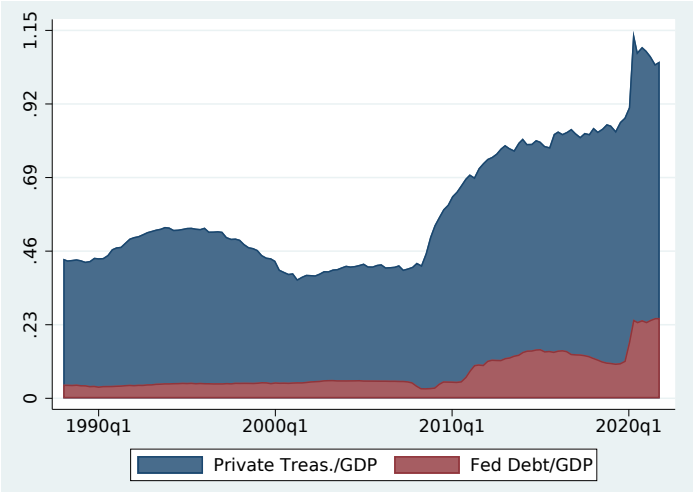
# Motivation

- Supported by conventional MP (ZLB)



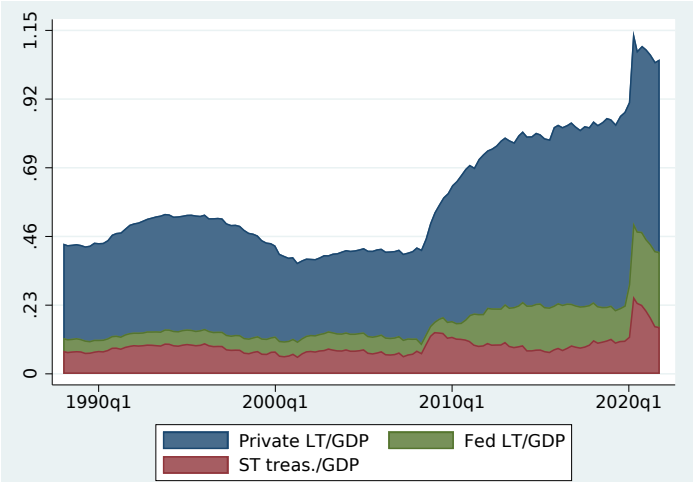
# Motivation

- And by unconventional MP (QE): Fed purchases of Treasuries



# Motivation

- In 2020-21, Fed purchased most of new issuance of LT debt



# Research Question

- How will this debt be repaid?
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- GE effects through primary surplus, GDP

# Main Findings

- Study fiscal/monetary interaction during and after economic crisis
  - Calibrate a rich NK model with intermediaries, fiscal and monetary authorities, realistic asset pricing
  - Crisis: Negative aggregate supply and demand shocks pushing economy into ZLB, causing large contraction
  - Analyze macro, financial, and fiscal impact of policies

Related Literature

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  3. UMP lowers the risk of future tax increases by 19pp if 85% debt/GDP initially

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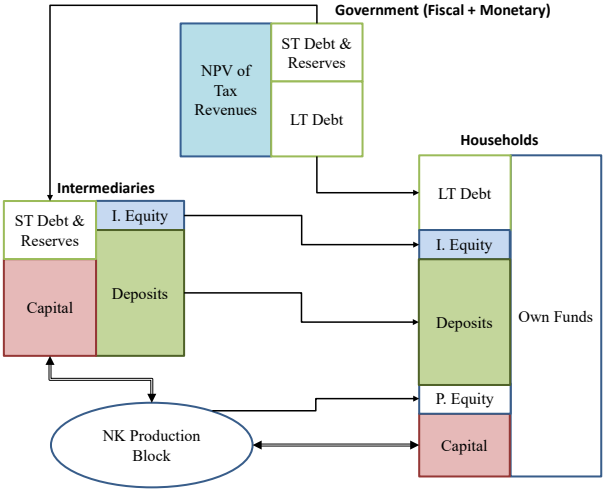
- **Unconventional monetary policy** (UMP) in crisis creates fiscal capacity
- **Conventional monetary policy** that accommodates fiscal authority creates fiscal capacity
  - Surprise increase in transfer spending (e.g. American Rescue Plan Act of 2021)
  - Temporarily adding debt stabilization in Taylor rule lowers debt/gdp
  - Permanent change to MP rule has opposite effect

Related Literature

# Model Overview



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- Two frictions in household portfolio problem
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- Intermediary is firm owned by households with equity issuance cost subject to
  - Regulatory capital requirement

$$\text{Deposits} \leq \nu \left(\text{Reserves} + \nu_K \text{Capital}\right)$$

    - ⋆ $\nu$ is Supplementary Leverage Ratio (SLR), $\nu_K$ capital risk weight
  - Liquidity coverage cost that captures regulatory Liquidity Coverage Ratio (LCR)

# Monetary and Fiscal Policy

- Two Monetary Policy tools
  - Central bank sets **interest rate on reserves**: $i_t^S = \bar{i}^S + \alpha_\pi(\pi_t - \bar{\pi}) + \alpha_y \hat{y}_t$
  - **QE**: through purchases/sales of government debt, CB can change
    - ⋆ maturity composition of debt held by the public
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- Fiscal policy subject to standard gov budget constraint
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- Countercylical government spending rules: automatic stabilizers
  - cyclical component of output $\hat{Y}_t = Y_t / Z_t^G$
  - Discretionary spending: $G_t = \gamma(\hat{Y}_t) Y_t$
  - Transfer spending: $\Theta_t = \theta(\hat{Y}_t) Y_t$
  - $\gamma'(\hat{Y}_t) < 0$, $\theta'(\hat{Y}_t) < 0$

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- Tax policy with endogenous regime-switching
  - **Regime 1**: tax revenue $\tau_t = \tau(\hat{Y}_t)Y_t$ procyclical, no response to debt/GDP
  - **Regime 2**: passive fiscal policy only in **tails** of debt/GDP distribution

# Debt/GDP with Endogenously Regime-Switching Fiscal Policy

- Ergodic distribution of debt/GDP in model: profligacy/austerity infrequent


Regression Evidence

# Debt/GDP with Endogenously Regime-Switching Fiscal Policy

- AC of debt/GDP $=.99$: likely to observe long sample path without fiscal adjustment


Regression Evidence

# Fiscal/Monetary Policy in Crisis

- Crisis: bad TFP shock $+$ aggr. demand shock (increase in discount factor $\beta$)
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  2. UMP: Unconventional Monetary Policy
     - ⋆ QE: central bank buys 24% of supply of LT bonds by issuing reserves
     - ⋆ Relaxation of SLR for reserves

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     - ⋆ Agents have correct expectations from start

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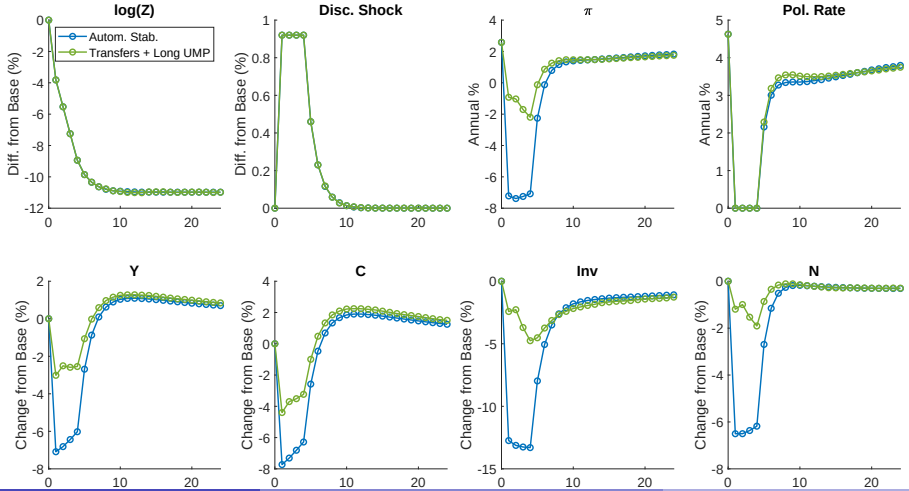
- Shock lasts 4 quarters. Supply shock is low TFP state. Find the negative demand shock to generate inflation of -1.5% between 2008.Q4-2009.Q3 under the Transfers + Long UMP policy (the "data generating policy")

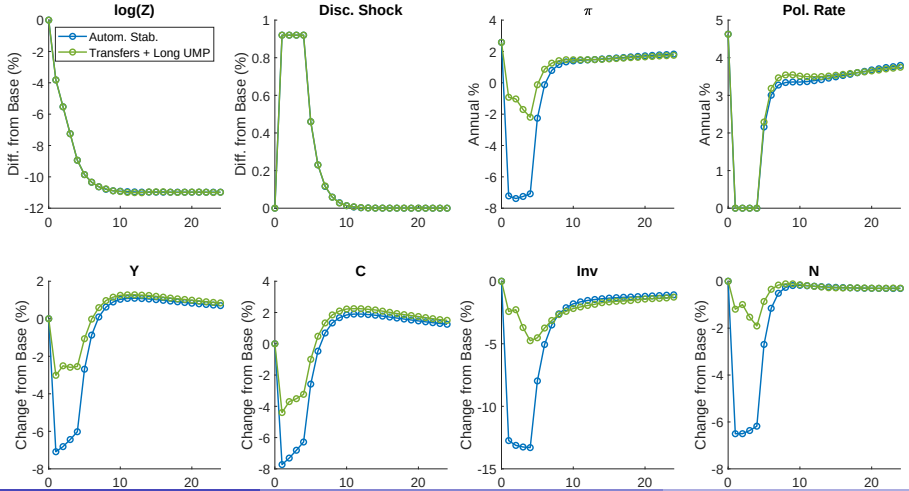
# Crisis and Recovery: Macro Aggregates

- Transfers + Long UMP: Policy rate at ZLB; deep recession -2.5% rel. to trend GDP dyn.



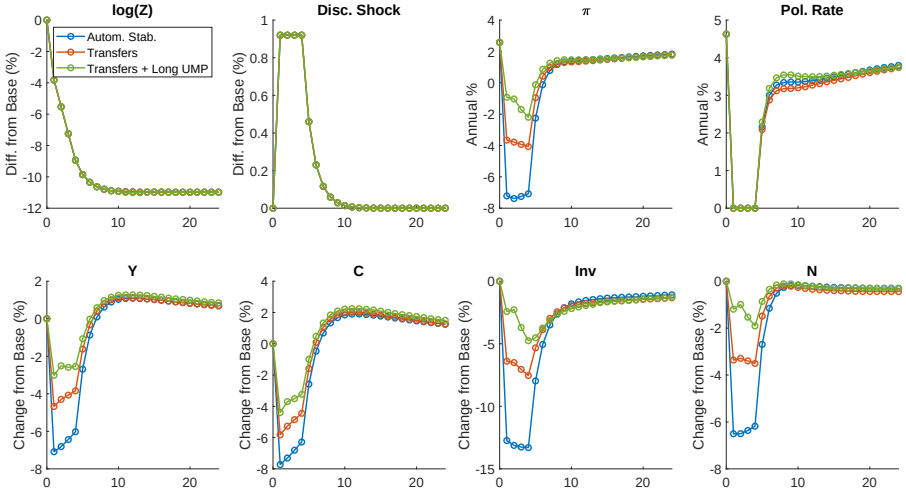
# Crisis and Recovery: Macro Aggregates

- Automatic Stabilizers: GDP falls 6%, cons 6%, inv 12%, 6% deflation



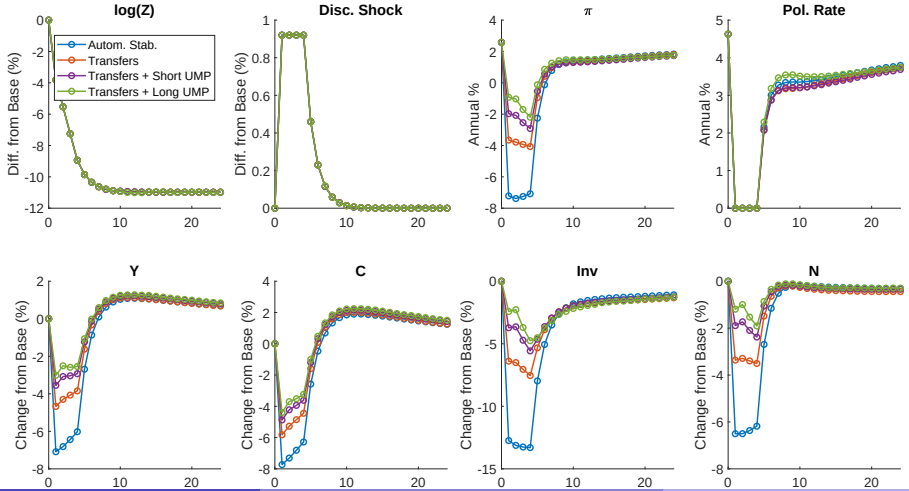
# Crisis and Recovery: Fiscal and Monetary Policy

- Transfers: Spend additional 7% of GDP, boost GDP by 2%



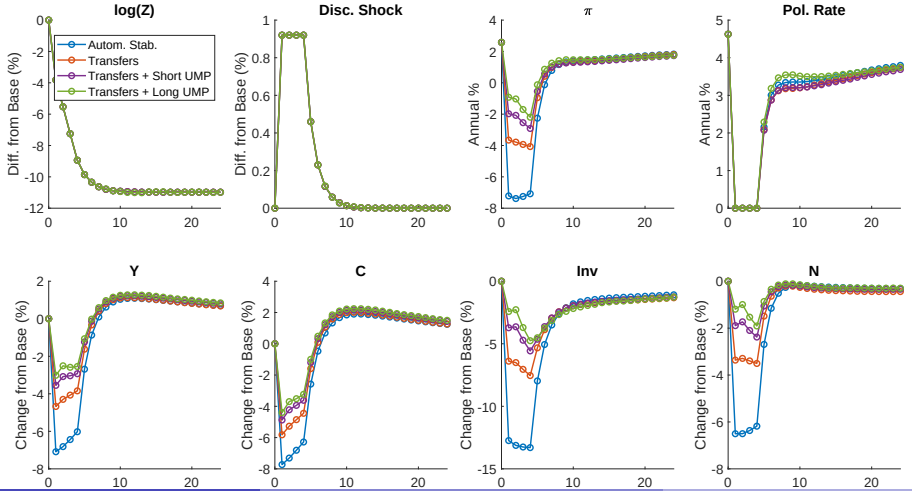
# Crisis and Recovery: Fiscal and Monetary Policy

- Transfers + UMP: additional output stabilization by 1%



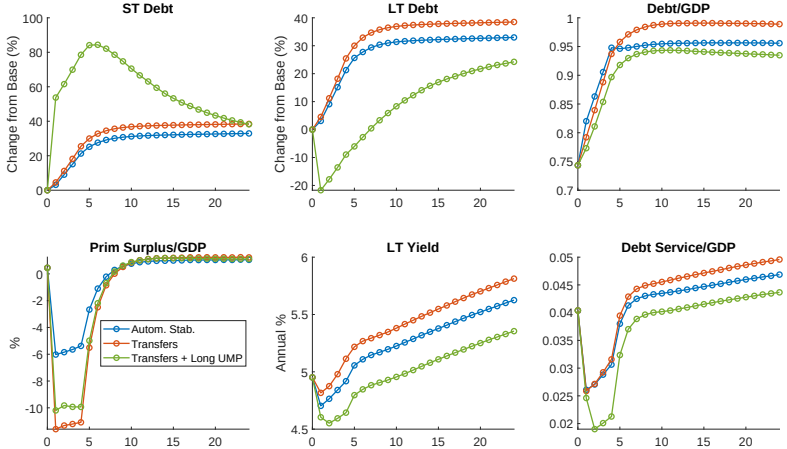
# Crisis and Recovery: Fiscal and Monetary Policy

- Transfers + Long UMP: longer (announced) duration amplifies effect



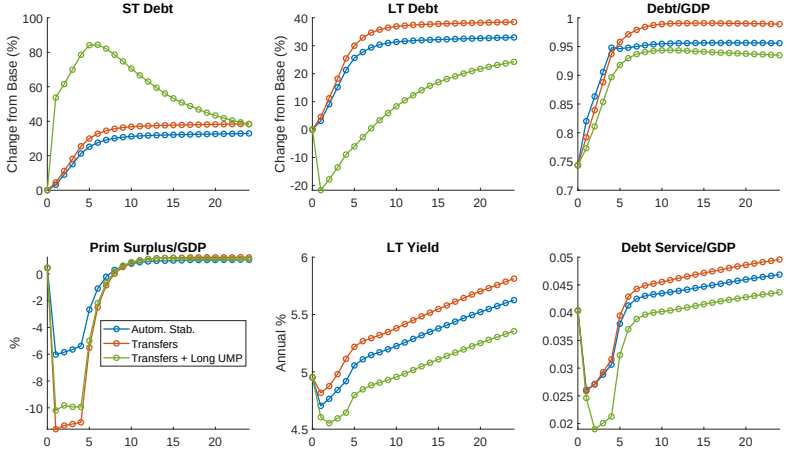
# Crisis and Recovery: Government Debt

- Automatic Stabilizers: Large rise in debt/GDP, 5% deficit



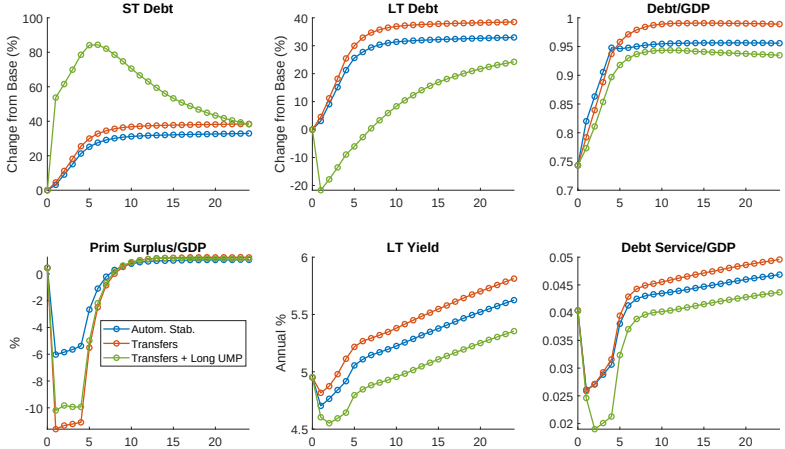
# Crisis and Recovery: Government Debt

- Transfers + Long UMP: Match primary surplus/GDP of -10%



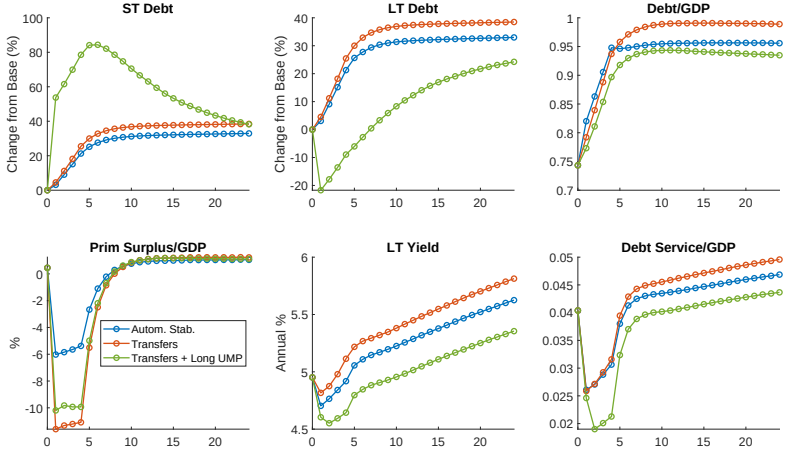
# Crisis and Recovery: Government Debt

- Relative to only Transfers, Long UMP lowers deficit by 1% (improved macro)



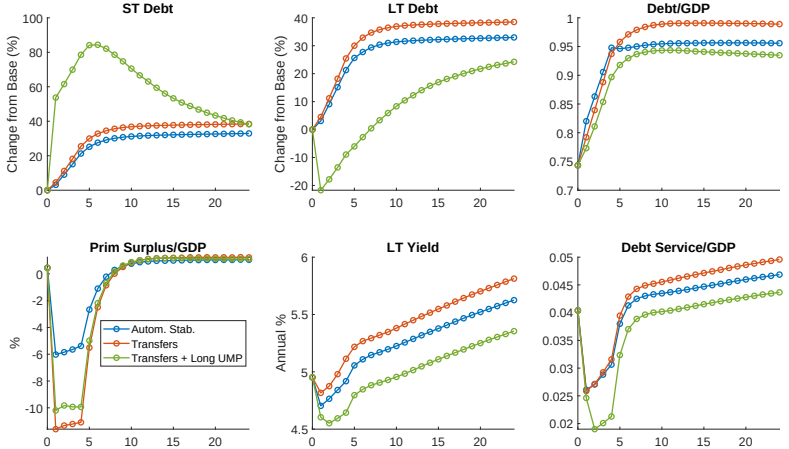
# Crisis and Recovery: Government Debt

- Relative to only Transfers, Long UMP depresses LT yields (50bps)



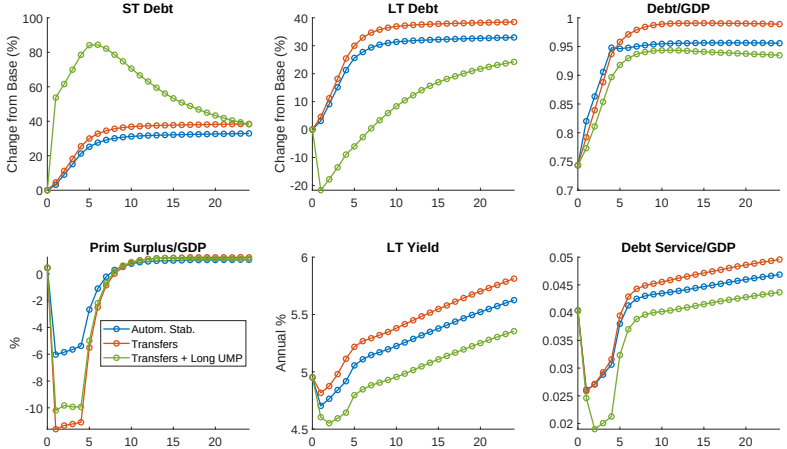
# Crisis and Recovery: Government Debt

- Relative to only Transfers, Long UMP decreases debt service costs by 0.8% of GDP



# Crisis and Recovery: Government Debt

- Relative to only Transfers, Long UMP lowers debt/GDP by 5.3pp $\Longrightarrow$ **Fiscal capacity**



# Economic Mechanism for QE

- UMP acts as positive aggregate demand shock by stimulating consumption and discouraging savings
- Why does QE have this effect?
  1. CB buys LT debt from HH and turns it into bank reserves
  2. Reserves are better collateral for banks than firm capital (loans to firms) $\Rightarrow$ banks shed firm capital: *crowding out channel* of QE
  3. Households must absorb this firm capital, but are worse at intermediation
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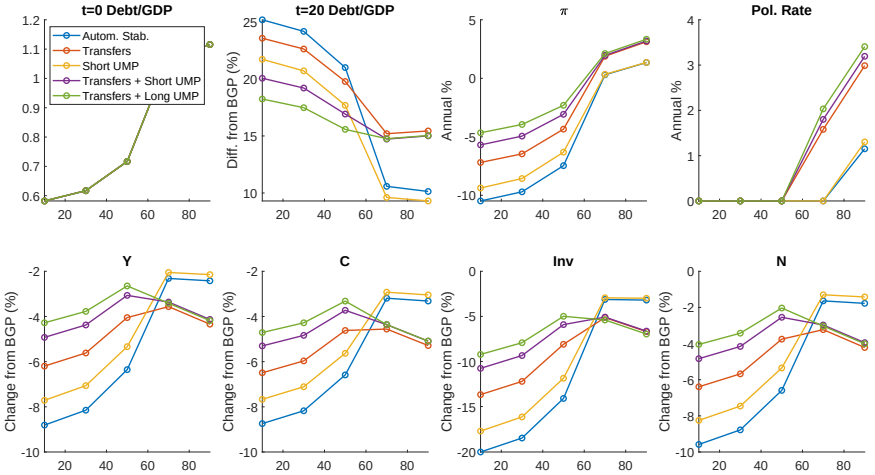
- Temporary QE ($=$ QE $+$ QT) $\Rightarrow$ positive demand shock Uncond.
- Permanent QE $\Rightarrow$ *negative* supply shock Permanent

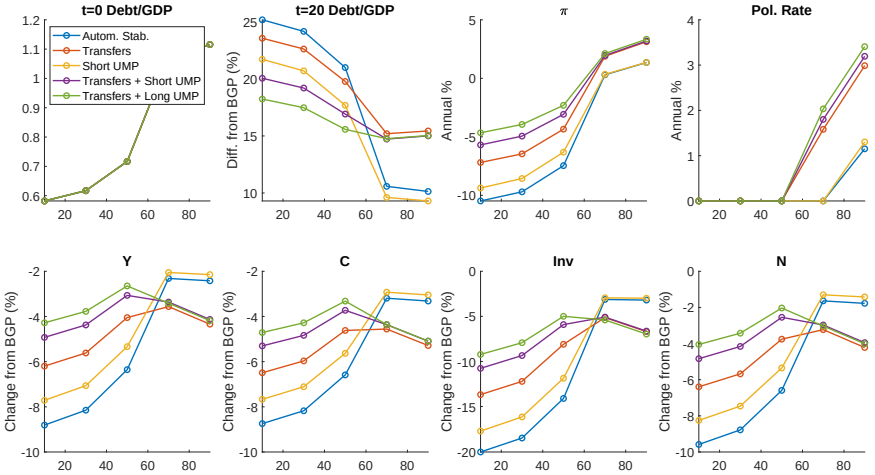
# State Dependence of Policy Effectiveness

- Crisis policies at different starting levels of debt/gdp, fixing other state vars



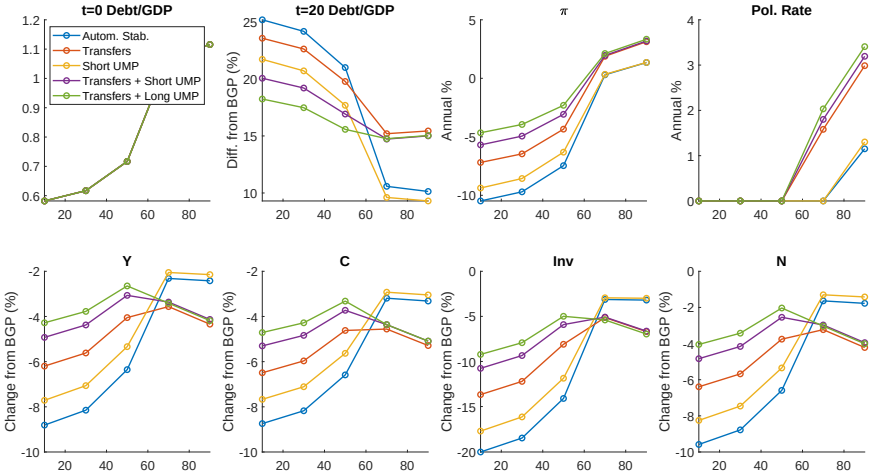
# State Dependence of Policy Effectiveness

- Fiscal capacity and output boost highest at low debt/gdp levels



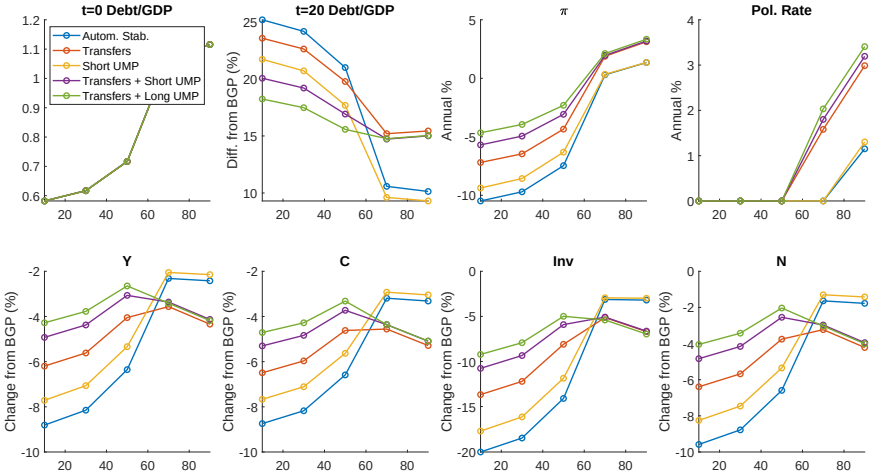
# State Dependence of Policy Effectiveness

- Transfer spending in austerity region has negative multiplier



# State Dependence of Policy Effectiveness

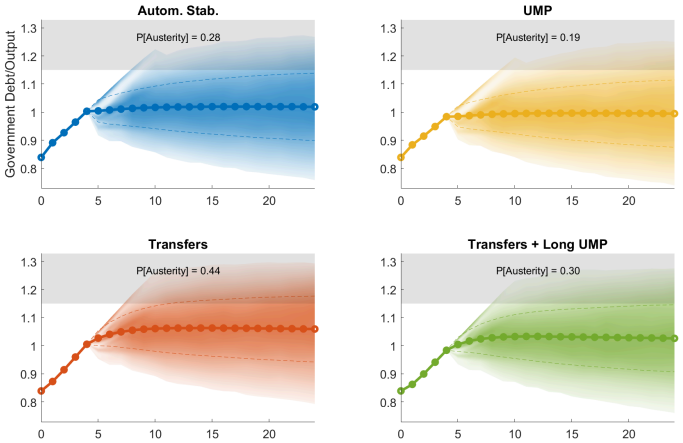
- QE loses its potency at high debt/levels (farther from ZLB)



# Fiscal Risk Avoidance Channel of UMP

Smooth Tax & Low RRA

- Initial debt/GDP of 85%: substantial risk of explosive debt growth
- Long-term support from Fed: reduction in average debt and risk of tax increase; stimulates consumption



# Conclusion

- Fiscal expansions post-GFC and Covid raise questions on debt repayment
- Conventional monetary and fiscal policy insufficient to fight crisis; result in substantial risk of future tax increases
- Unconventional monetary policy not only helps to stabilize the economy but also to lower the debt burden and reduces risk of future tax hikes
- QE crowds out fin sector lending, crowds in liquidity. Temporary QE in response to crisis acts like positive aggregate demand shock. Effective to combat demand-driven crises.
- Technical contributions
  - Solve NK model with non-trivial risk (premia), constrained intermediary, and ZLB
  - Global fiscal rule for debt stationarity
  - Consistent with observed risk properties of tax and spending processes

# Related Literature

- **Interaction of Fiscal and Monetary Policy**
  Sargent and Wallace (1981); Leeper (1991); Sims (1991); Woodford (1994), Woodford (1995), Woodford (2001); Cochrane (1998), Cochrane (2001); Schmitt-Grohhe and Uribe (2000); Bassetto (2002); Reis (2016); Sims (2016); Bianchi and Melosi (2019)

  *Contribution: Fiscal policy endogenously regime-switching*
  - *Active fiscal and monetary stabilization policies in normal times*
  - *Globally, fiscal policy keeps debt/GDP stationary*

back

# Related Literature

- **Interaction of Fiscal and Monetary Policy**
- **Fiscal Policy when $r^f < g$**

  Blanchard (2019); Jiang et al. (2019, 2020, 2021); Barro (2020), Brunnermeier et al. (2020), Reis (2021), Mankiw and Ball (2021), Cochrane (2019a,b)

  *Contribution: quantitatively match evidence in full-fledged GE model with lots of risk and rich mon. and fiscal policy*
  - Cyclicality of tax revenue and govt spending
  - Cointegration of tax revenue and govt. spending with GDP
  - Large risk premia on GDP and hence tax and gov. spending claims
  - $r^f < g$ due to precautionary savings motive
  - Govt debt/GDP ratio highly persistent
  - Convenience yields decreasing in debt/GDP

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- **Interaction of Fiscal and Monetary Policy**
- **Fiscal Policy when $r^f < g$**
- **Monetary Policy and Asset Prices**
  De Paoli et al. (2010); Gourio and Ngo (2020); Isoré and Szczerbowicz (2017); Gourio (2012); Campbell et al. (2020); Pflueger and Rinaldi (2021)

  *Contribution: Realistic asset prices in NK model with fiscal policy*
  - *Match equity risk premium*
  - *Match term spread and deposit spread*

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- **Interaction of Fiscal and Monetary Policy**
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- **Monetary Policy and Asset Prices**
- **Nominal Rigidities and Intermediary Frictions**

  **NK + Fin Sector**: Piazzesi et al. (2021); Wang (2020); Elenev (2020); Faria-e-Castro (2020); Sims et al. (2021)

  **QE**: Woodford (2012); Vissing-Jorgensen and Krishnamurthy (2011, 2012, 2013); Vissing-Jorgensen et al. (2018); Bernanke (2020)

  *Contribution: state-dependent QE through intermediary constraints, lower equity RP*

back

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- **Monetary Policy and Asset Prices**
- **Nominal Rigidities and Intermediary Frictions**
- **Fiscal Policy and Asset Prices**
  Croce, Nguyen, and Schmid (2012b); Croce, Kung, Nguyen, and Schmid (2012a); Pastor and Veronesi (2012); Kelly, Pastor, and Veronesi (2015); Croce, Nguyen, Raymond, and Schmid (2019); Liu, Schmid, and Yaron (2020); Corhay, Kind, Kung, and Morales (2021)

  *Contribution: effect of taxation via labor supply rather than investment*

back

# Intermediary Problem

$$V^I(W_t^I, \mathcal{S}_t) = \max_{e_t^I, B_t^{I,S}, X_t^{I,K}, D_t^I} \chi_o W_t^I - e_t^I + \mathsf{E}_t \left[ \mathcal{M}_{t,t+1} V^I(W_{t+1}^I, \mathcal{S}_{t+1}) \right]$$

subject to:

$$(1 - \chi_o^I) W_t^I + e_t^I - \chi_1 \frac{(e_t^I)^2}{2} \geq Q_t X_t^{I,K} + p_t^S B_t^{I,S} - (p_t^D - \rho_t(D_t^I, B_t^{I,S})) D_t^I,$$

$$W_{t+1}^I = \exp(-g_{t+1}) \left[ \left( r_{t+1}^K + (1 - \delta_K) Q_{t+1} \right) X_t^{I,K} + B_t^{I,S} - D_t^I \right],$$

$$D_t^I \leq \nu \left( X_t^{I,S} + \nu_K Q_t X_t^{I,K} \right),$$

$$X_t^{I,K} \geq 0$$

$$\mathcal{M}_{t,t+1} = \beta \exp((1-\gamma) g_{t+1}) \left( \frac{C_{t+1}}{C_t} \right)^{-1} \left( \frac{C_{t+1}^{1-\psi} (D_{t+1}^H)^{\psi}}{C_t^{1-\psi} (D_t^H)^{\psi}} \right)^{1-\varphi} \left( \frac{V_{t+1}^H}{CE_t} \right)^{\frac{\varphi-\gamma}{1-\varphi}}$$

$$\rho_t(D_t^I, X_t^{I,S}) = \varrho_o \bar{D} \left( \frac{X_t^{I,S}}{\bar{D} D_t^I} \right)^{1-\varrho_1}$$

# Debt and Taxes

- Data: high debt/GDP does not coincide higher taxes or surpluses

| | *Dependent variable:* | | | | | |
|---|---|---|---|---|---|---|
| | Δ Tax Rev. *Data* (1) | Δ Pr. Sur. *Data* (2) | Δ Tax Rev. *Model* (3) | Δ Pr. Sur *Model* (4) | Δ Tax. Rev. *Model* (5) | Δ Pr. Surp. *Model* (6) |
| Δ Debt/GDP | −0.074*** (0.012) | −0.317*** (0.033) | 0.027*** (0.001) | −0.066*** (0.001) | −0.024*** (0.0004) | −0.103*** (0.001) |
| Prof. | | | | | −0.0004*** (0.00001) | −0.002*** (0.00003) |
| Aus. | | | | | 0.001*** (0.00003) | 0.003*** (0.0001) |
| Δ Debt/GDP × Prof. | | | | | 0.068*** (0.0004) | 0.016*** (0.001) |
| Δ Debt/GDP × Aus. | | | | | 0.083*** (0.0004) | 0.065*** (0.001) |
| Observations | 275 | 275 | 3,999,600 | 3,999,600 | 3,999,600 | 3,999,600 |
| $R^2$ | 0.118 | 0.253 | 0.131 | 0.150 | 0.410 | 0.194 |
| *Note:* | | | | | | *p<0.1; **p<0.05; ***p<0.01 |

back

# Debt and Taxes

- Yet compatible with active monetary / passive fiscal regime

| | *Dependent variable:* | | | | | |
|---|---|---|---|---|---|---|
| | Δ Tax Rev. *Data* (1) | Δ Pr. Sur. *Data* (2) | Δ Tax Rev. *Model* (3) | Δ Pr. Sur *Model* (4) | Δ Tax. Rev. *Model* (5) | Δ Pr. Surp. *Model* (6) |
| Δ Debt/GDP | $-0.074^{***}$ (0.012) | $-0.317^{***}$ (0.033) | $0.027^{***}$ (0.001) | $-0.066^{***}$ (0.001) | $-0.024^{***}$ (0.0004) | $-0.103^{***}$ (0.001) |
| Prof. | | | | | $-0.0004^{***}$ (0.00001) | $-0.002^{***}$ (0.00003) |
| Aus. | | | | | $0.001^{***}$ (0.00003) | $0.003^{***}$ (0.0001) |
| Δ Debt/GDP × Prof. | | | | | $0.068^{***}$ (0.0004) | $0.016^{***}$ (0.001) |
| Δ Debt/GDP × Aus. | | | | | $0.083^{***}$ (0.0004) | $0.065^{***}$ (0.001) |
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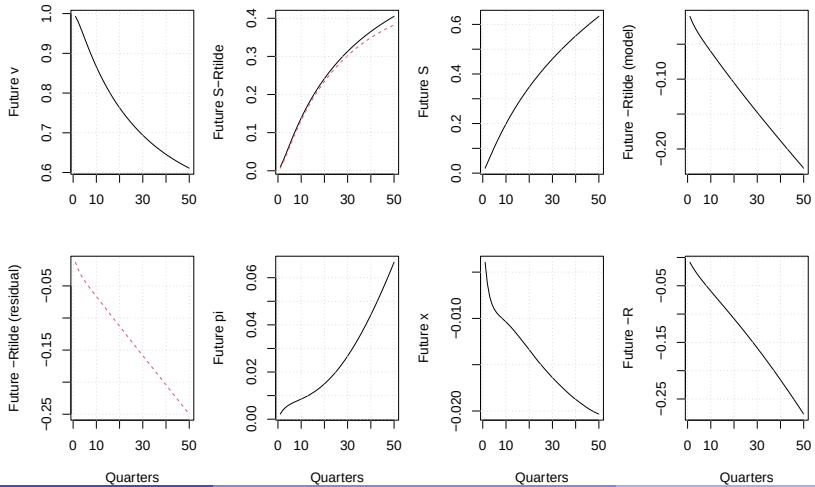
| *Note:* | | | | | | $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$ |

back

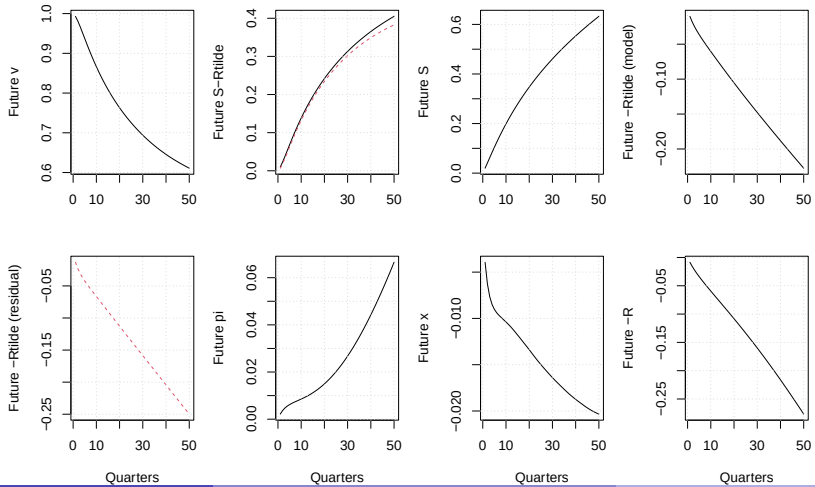
# Campbell-Shiller Decomposition Debt/GDP

- Variation in debt/GDP mostly **does not** reflect future surpluses or returns



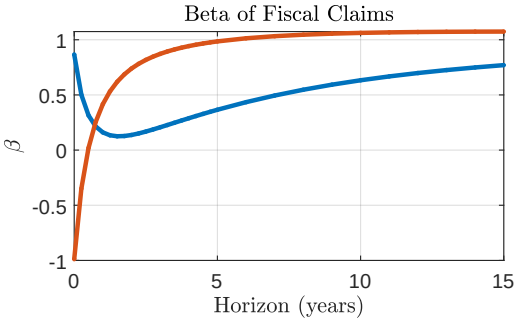
# Campbell-Shiller Decomposition Debt/GDP

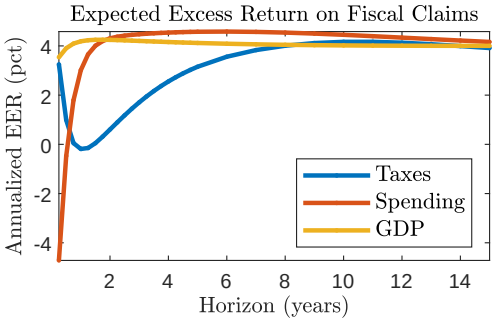
- The dogs that did not bark (Jiang et al. 2021)



# Fiscal Risk: Model and Data

- Government provides insurance to taxpayers and spending recipients in short-run
- Tax and spending claims co-integrated with output in long-run, inherit long-run output risk (Jiang et al. 20)

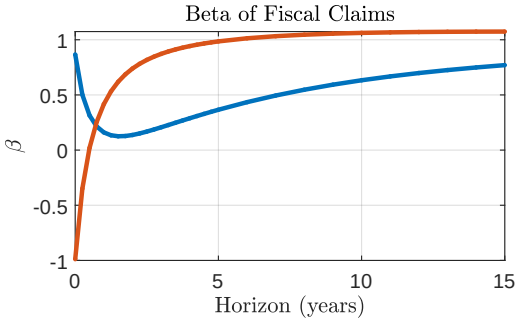


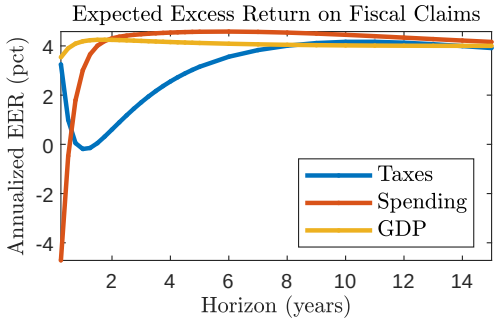




back

# Fiscal Risk: Model and Data

- Term structure of risk premia reflects beta profile: stabilization policy in short-run and long-run risk of GDP claim at low frequencies (right panel)

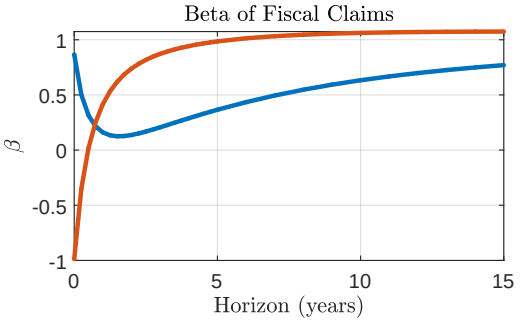


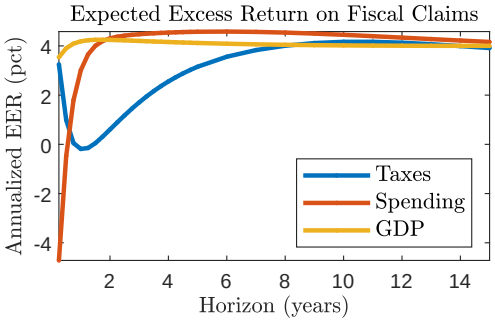




back

# Fiscal Risk: Model and Data

- Keeping debt safe (insuring bondholders) requires reducing riskiness of taxes at intermediate frequencies, i.s., shifting the risk onto the taxpayers

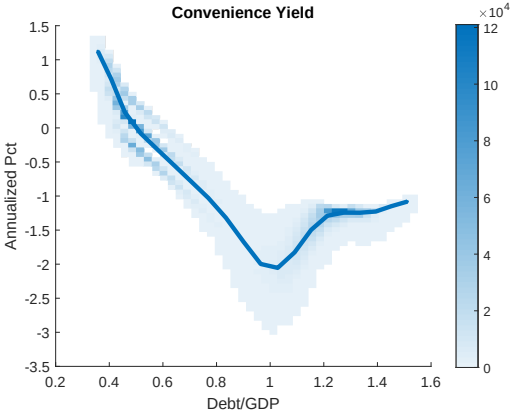



back

# Convenience Yields Declining in Debt/GDP

- Conv. yield = wgt-avg yield on Treasuries - wgt-avg duration-matched zero-coupon rate
- Zero coupon rate = $E[\mathcal{M}_{t,t+h}]^{-1}$
- Downward sloping demand for liquidity (Krishnamurty and Vissing-Jorgensen 12) until approaching austerity

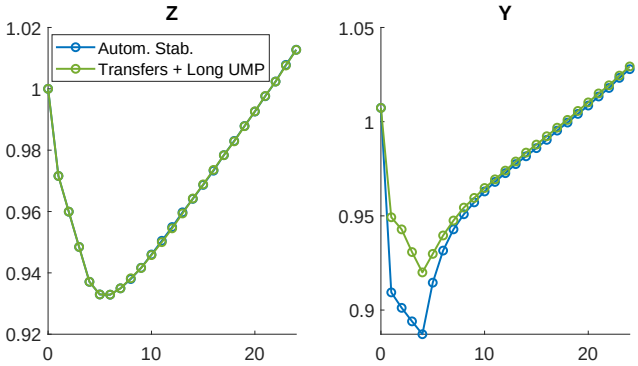



back

# GDP Dynamics Including Perm. Shock

back

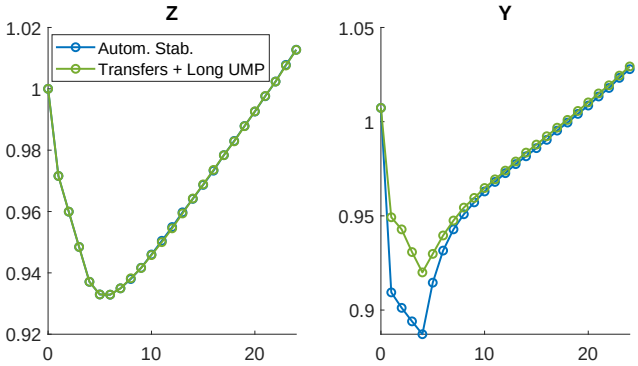
- Permanent shock causes downward shift in trend GDP



# GDP Dynamics Including Perm. Shock

back

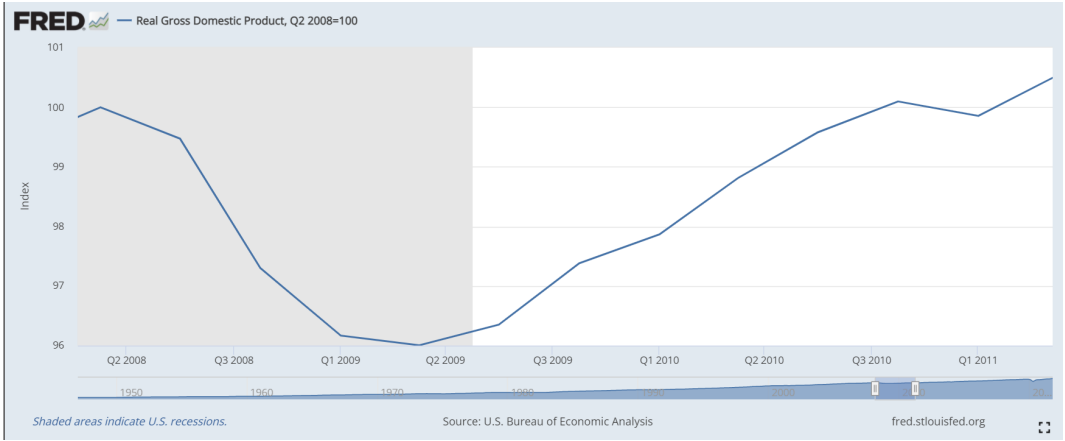
- Policies dampen initial recession



# GDP Dynamics Including Perm. Shock

back

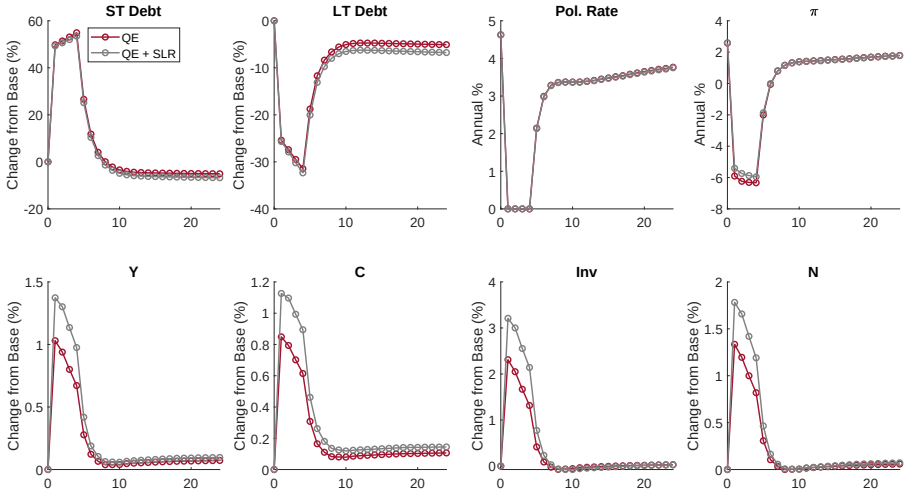
- Magnitude and persistence in line with GFC



# Decomposing UMP in a Crisis: Macro rel. to Baseline

back

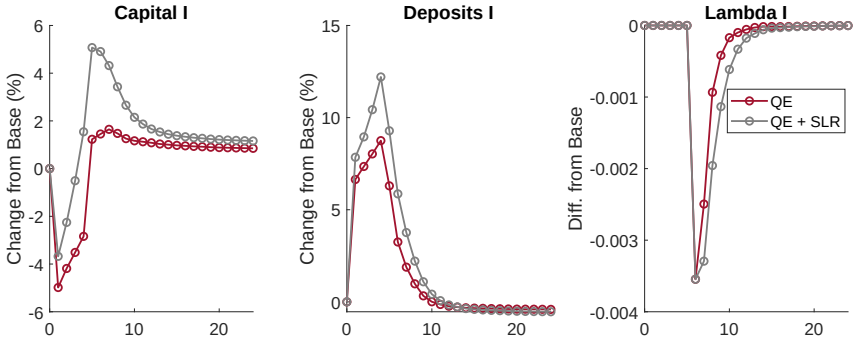
- QE: Fed buys LT bonds by issuing reserves



# Decomposing UMP in a Crisis: Macro rel. to Baseline

back

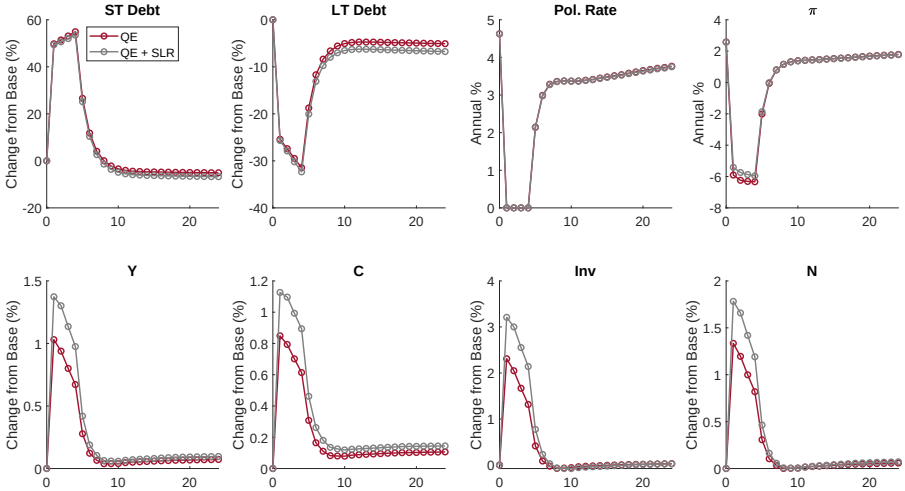
- Intermediaries raise deposit supply, dividends to households



# Decomposing UMP in a Crisis: Macro rel. to Baseline

back

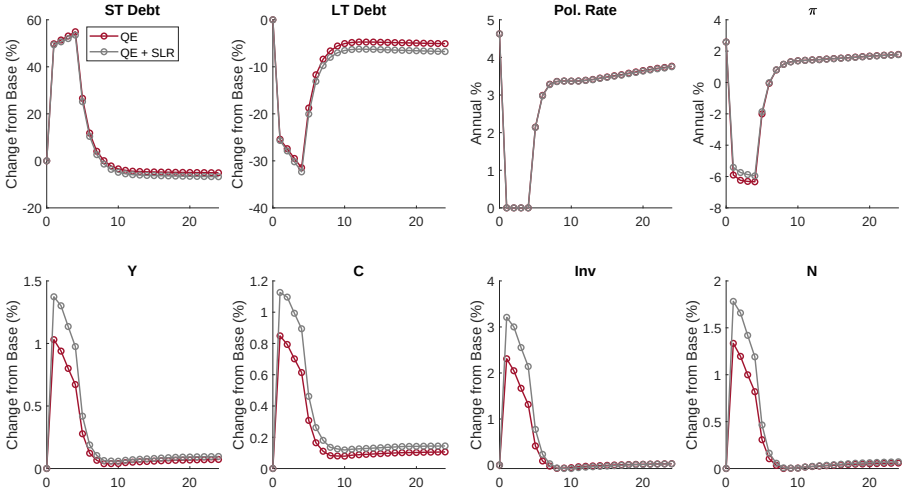
- Positive demand shock: consumption, output rise



# Decomposing UMP in a Crisis: Macro rel. to Baseline

back

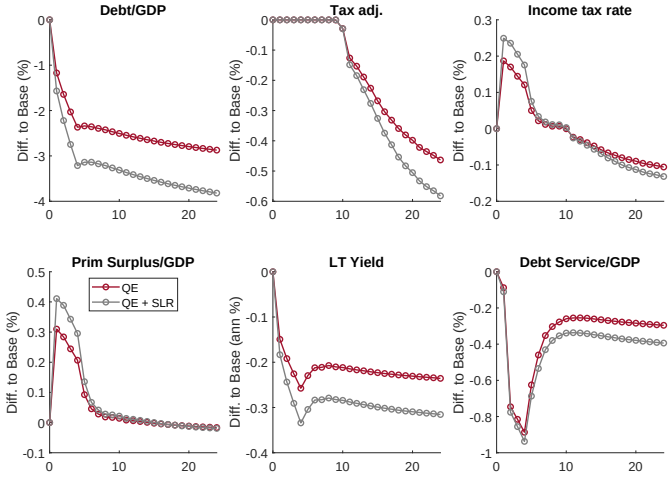
- Relaxing SLR amplifies the positive demand shock



# Decomposing UMP in a Crisis: Fiscal rel. to Baseline

back

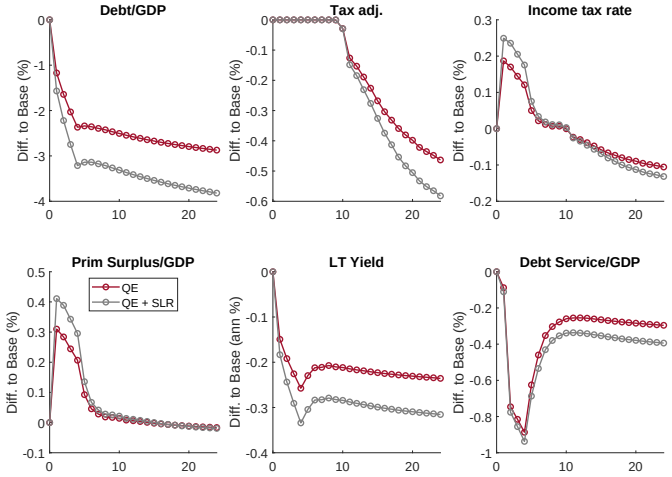
- QE & SLR relaxation reduce debt service costs



# Decomposing UMP in a Crisis: Fiscal rel. to Baseline

back

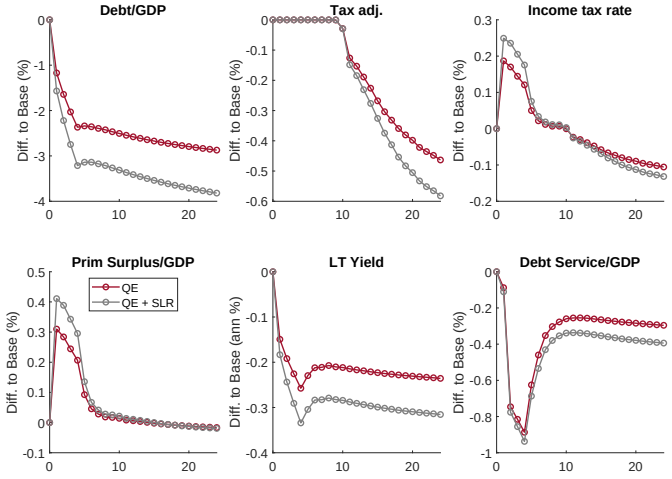
- And reduce cyclical deficits



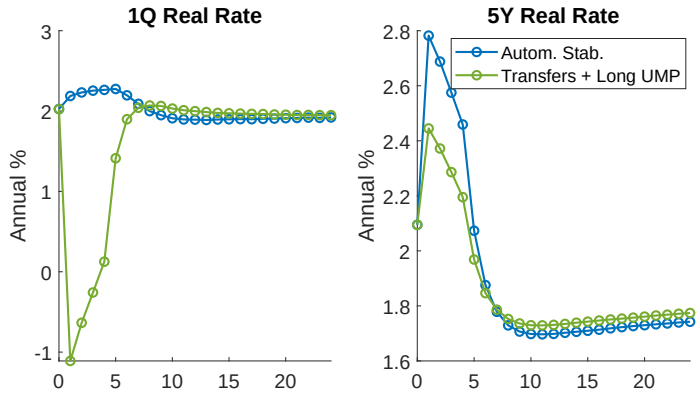
# Decomposing UMP in a Crisis: Fiscal rel. to Baseline

back

- Fiscal effects mostly due to QE



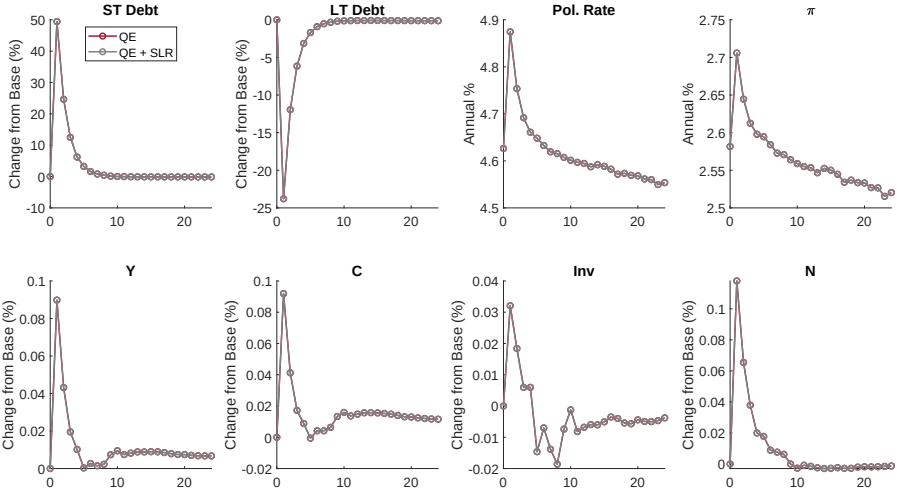
# Crisis and Recovery: Interest Rates



# State dependence: QE in good times has weak effects

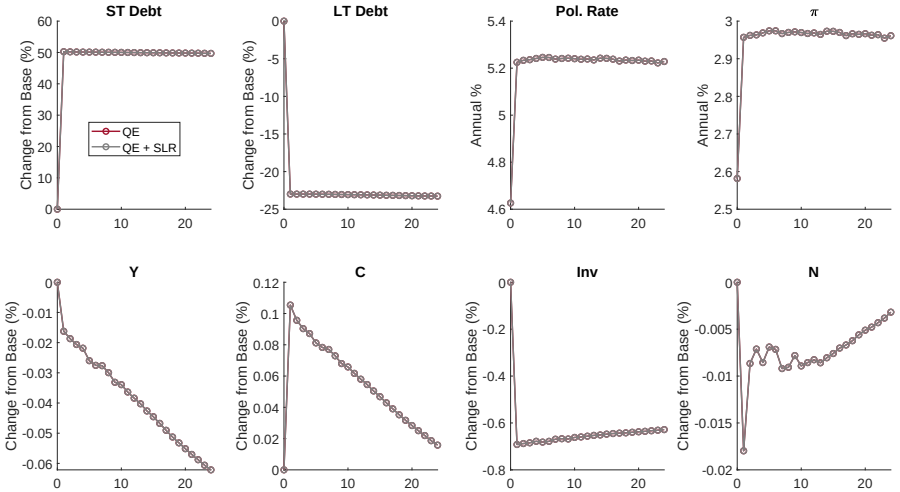
back

- QE acts like aggregate demand shock, but effect 10x smaller when temporary QE is done in normal times



# Duration Dependence: Permanent QE back

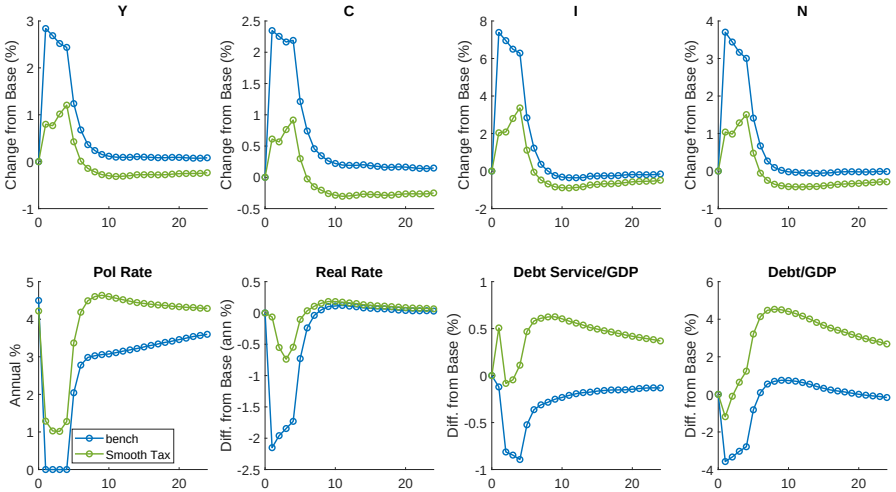
- Permanent QE (= shorter govt debt maturity) acts like a negative supply shock in neoclassical model: $K \downarrow$



# Robustness: Policy Effects Under Alternative Parameters

back

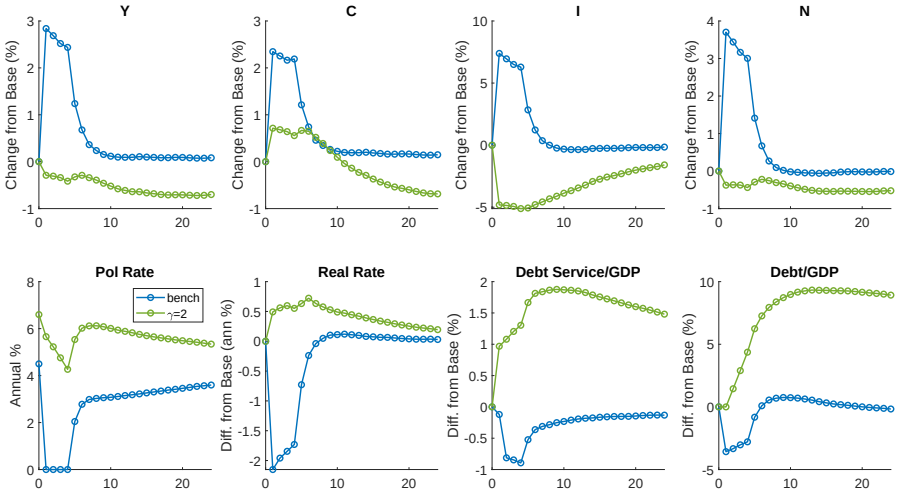
- Smooth tax rule: $\tau_\Delta(\hat{Y}_t, \Delta_t) > 0 \quad \forall \Delta_t$



# Robustness: Policy Effects Under Alternative Parameters

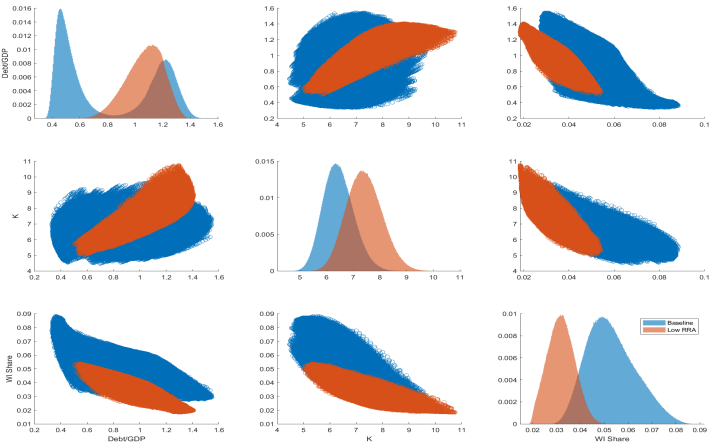
back

- Lower RRA: $\gamma = 2$



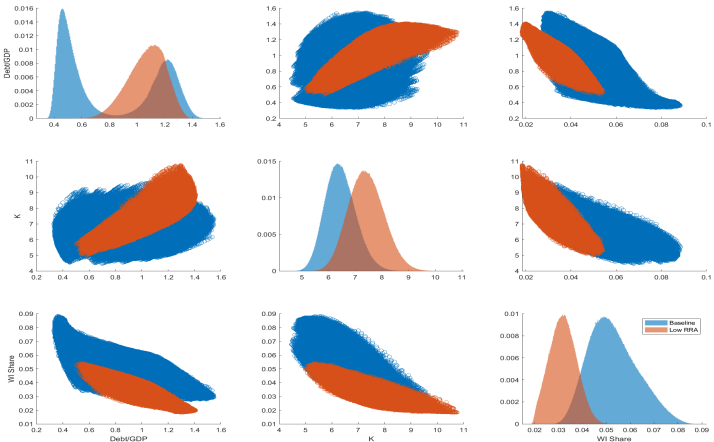
# Robustness: Low Risk Aversion Economy back

- $\gamma = 2$: different distribution of state variables despite matching $r$ & term spread



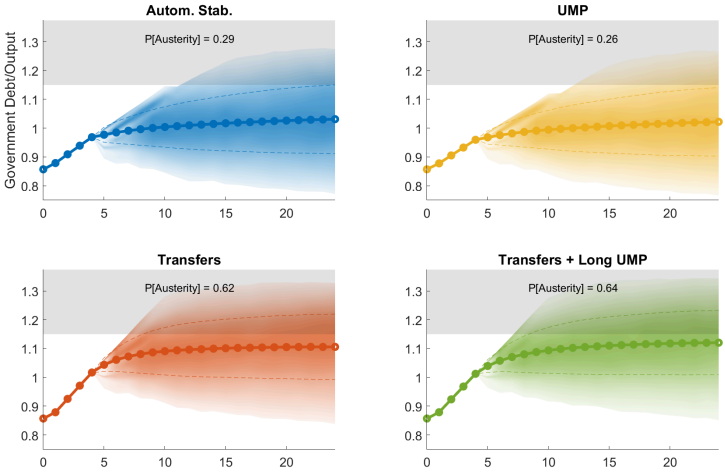
# Robustness: Low Risk Aversion Economy back

- Much higher avg. debt/GDP, since less negative Cov(deficit, interest rate)



# Robustness: Low Risk Aversion Economy back

- Transfers *and* UMP increase austerity probability



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