On the Merits of Conventional vs. Unconventional Fiscal Policy

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Motivation

Relative merits of coventional and unconventionalf fiscal policies at the ZLB

- In the context of high initial debt levels and monetary constraints (ZLB), a recent literature has promoted *unconventional fiscal policy* (**UFP**)
  - See Correia et al. (2013, AER) for a closed economy analysis (Unwinding the ZLB), and Farhi et al. (2014, ReStud) for open economy extension (Fiscal Devaluation).
  - **One important component of UFP is a gradual increase of the sales tax.**
- We compare such a policy with *conventional fiscal policy* (**CFP**) based on **hikes of government investment**.
  - Data suggest historically low levels of public and private infrastructure investment in recent years in many EA countries (IMF issued support for increased public investment in Germany May 14th).

Key Findings

Conventional fiscal policy is more robust to adding realistic frictions

- **UFP is appealing in a stylized New Keynesian model with sticky prices and flexible wages, especially in a liquidity trap.**
  - Both policies are expansionary, but UFP has the virtue of reducing public debt (as both tax rate and base go up).
- **Advantage of UFP does not necessary hold up in a richer TANK model with sticky wages.**
  - Contrary to CFP, UFP is not expansionary anymore unless labor (or capital) income taxes are adjusted aggressively.

Presentation outline

- Stylized Model
- Impulses to Gradual Sales Tax Hike
- Impulses to Higher Government Investment
- Analysis in a Fully-Fledged TANK Model
- Tentative Conclusions

Stylized Model

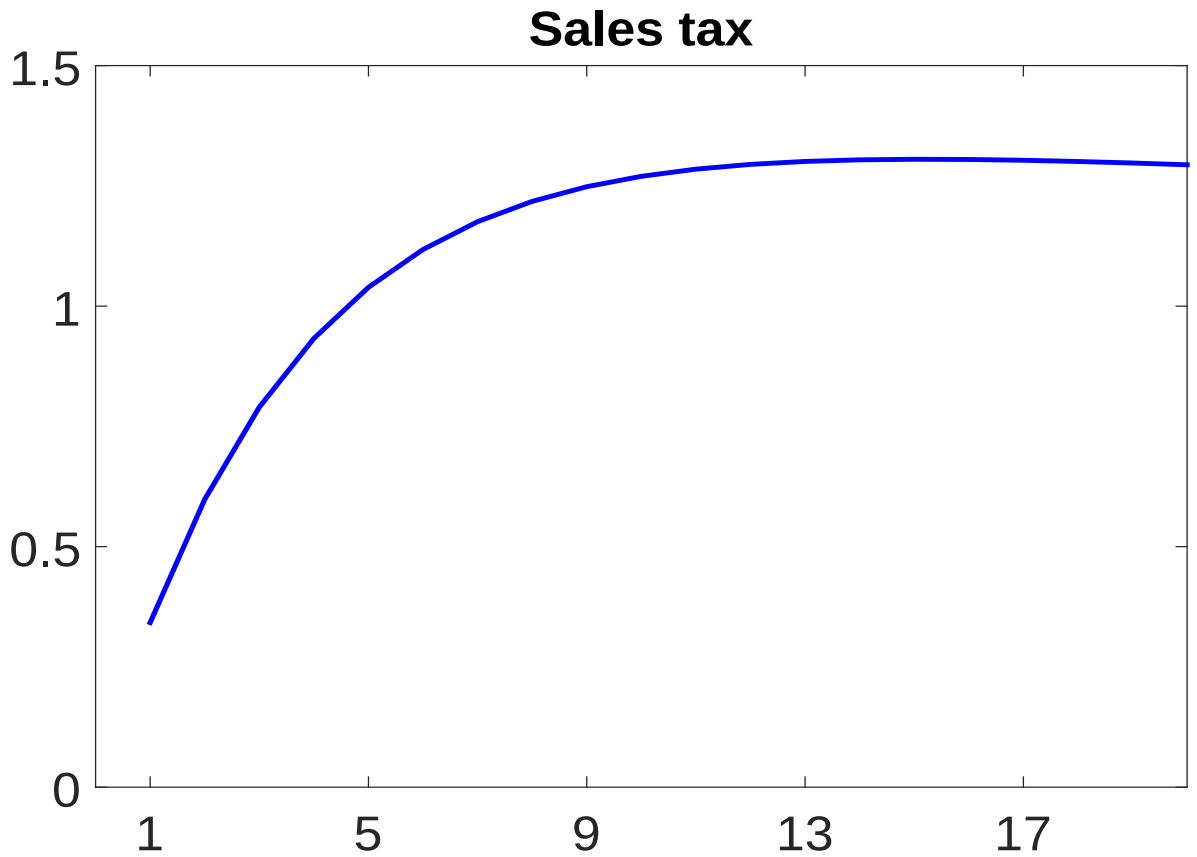
Overview

- A standard log-linearized version of the **New Keynesian DSGE model with a lower bound constraint on interest rates** following Eggertsson and Woodford (2003)
  - Separability between consumption and labor
  - Production function with fixed private capital but variable public capital subject to time-to-build
  - Sticky prices, flexible nominal wages
  - Government consumes/invests part of final domestic good
  - Sales taxes exogenous
  - Monetary policy use simple rule s.t. ZLB constraint
  - Labor income tax rule stabilizes gov't debt
- Standard calibration intended to be relevant for US and EA

Sales Tax Hike in Stylized Model

Setting of simulations

Experiment with higher sales tax: announced gradual increase of sales taxes by 1pp of GDP in normal times (MP unconstrained) and in a 10-quarter liquidity trap (triggered by negative consumption demand shock ν_t)



Gradual Sales Tax Hike in Stylized Model

Key ingredients driving responses

Effects of Higher Sales Tax

Key equation: the dynamic IS curve extended with sales tax $\tau_{C,t}$

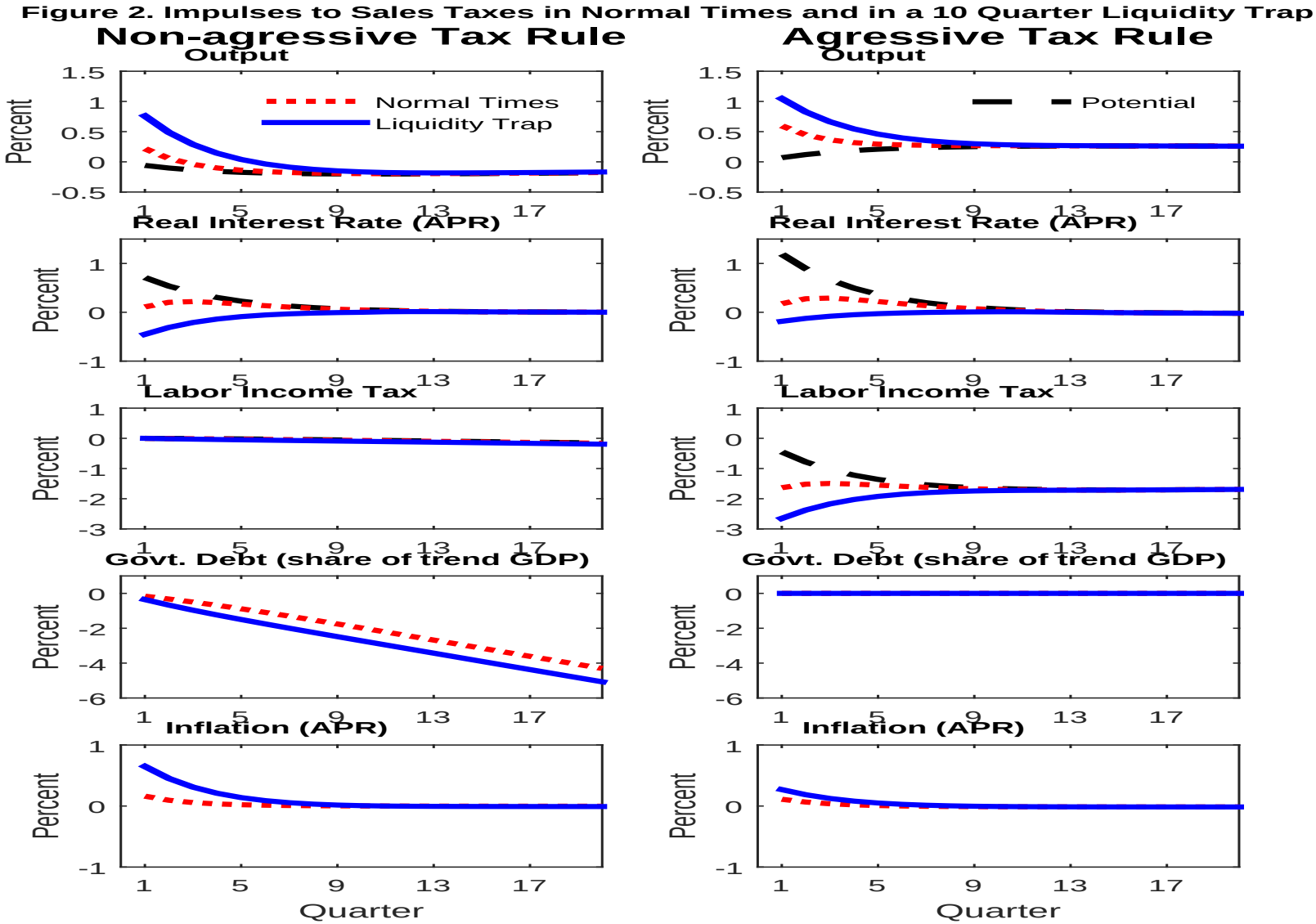
$$\frac{(C_t - Cv_t)^{-1/\sigma}}{1+\tau_{C,t}} = \beta E_t \frac{1+i_t}{1+\pi_{t+1}} \frac{(C_{t+1} - Cv_{t+1})^{-1/\sigma}}{1+\tau_{C,t+1}}$$

Key responses

- Because of expected increase of $\tau_{C,t}$, **strong incentive to shift future to current consumption.**
- Triggers a positive output gap (especially in a liquidity trap).
- Core inflation (excl. tax) stimulated by the increased output gap (Phillips curve).
- Extra tax receipts and output expansion imply either lower govt debt or labor tax depending on fiscal rule; large output gap expansion not contingent on quick labor tax adj.

Impulses to Gradual Sales Tax Hike in Stylized Model

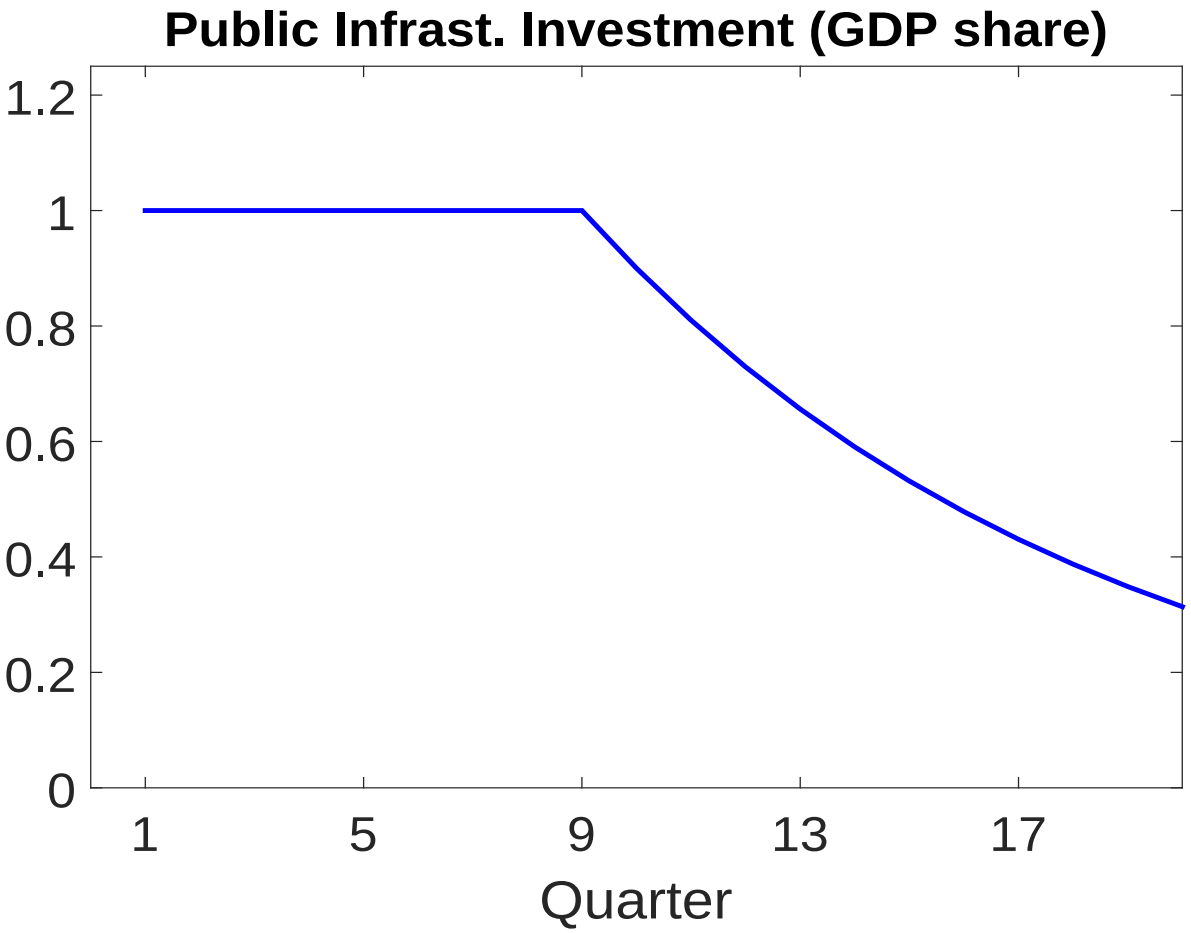
1 percent of baseline GDP hike



Higher Government Investment in Stylized Model

Setting of simulations

Experiment with higher I_t^G: increase of gov't investment by 1pp of baseline GDP in normal times and in a 10-quarter liquidity trap.



Higher Government Investment in Stylized Model

Key ingredients driving responses

Key equations: supply/demand role of gov't investment $G_{I,t}$

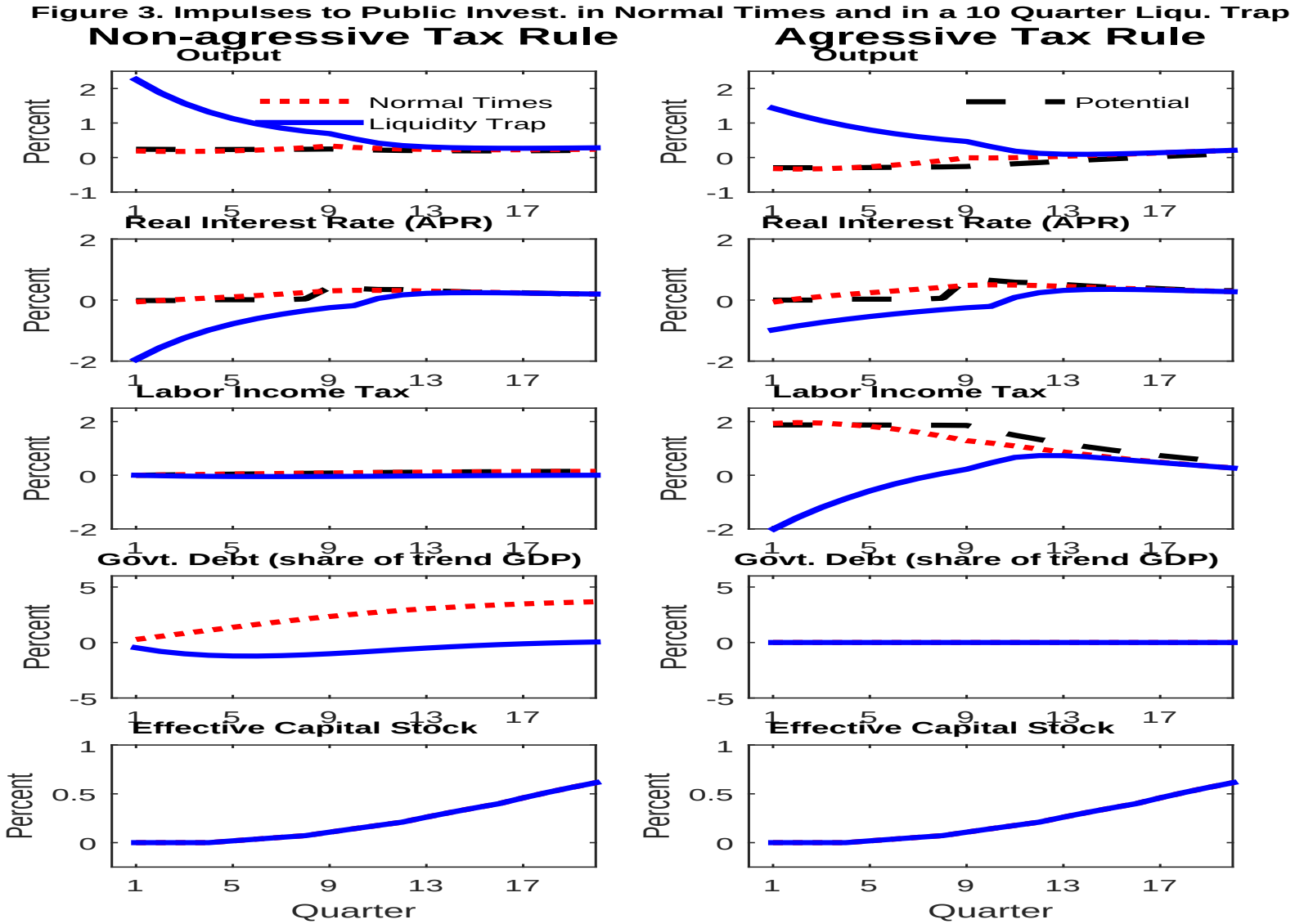
$$\begin{aligned} Y_t &= Z_t \left[K_P^{\vartheta} K_{G,t}^{1-\vartheta} \right]^{0.3} N_t^{0.7} = C_t + G_{C,t} + G_{I,t}, \\ K_{G,t} &= (1-\delta_G) K_{G,t-1} + I_{G,t}, \; I_{G,t} = \frac{1}{6} \Sigma_{i=1}^{6} G_{I,t-4i}. \end{aligned}$$

Key responses

- Potential real rate only start to rise in the phasing out period.
- Actual real interest rate falls directly because of rising output gap and inflation expectations.
- Output effect larger than sales tax hike, and higher $G_{I,t}$ self-financed in a long-lived liquidity trap.

Impulses to Higher Gov't Investment in Stylized Model

1 percent of baseline GDP hike



Analysis in the Fully-Fledged Model

Overview of model

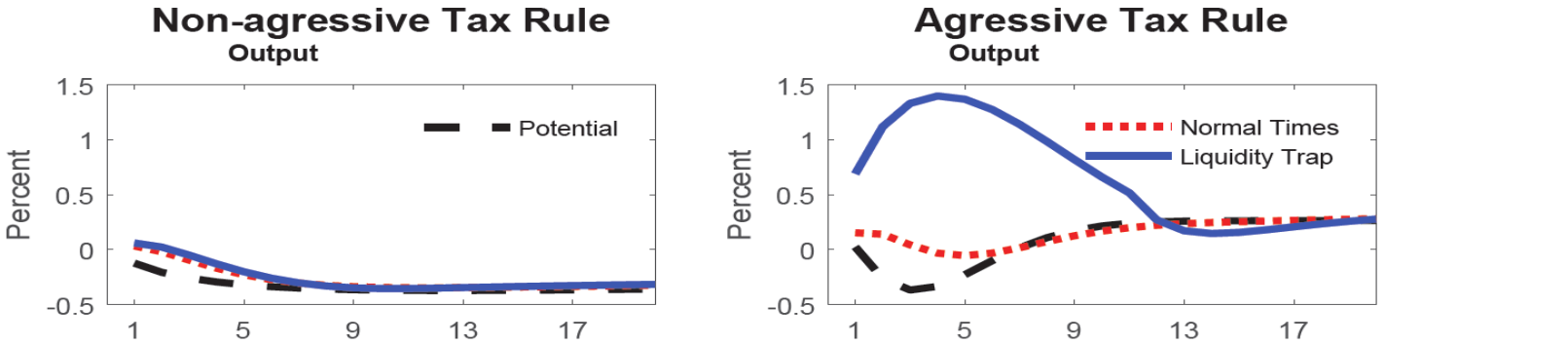
- TANK model of Erceg and Lindé (2013), building on CEE/SW
- Endogenous private capital
- Nominal and real rigidities CEE (2005), SW (2003, 2007):
  - Staggered price and **wage contracts**, dynamic indexation
  - External habit persistence in consumption
  - CEE type of investment adjustment costs
- "Hand-to-mouth" households following EGG (2006)
- Financial accelerator mechanism; CMR (2007) variant of BGG (1999)
- More realistic modelling of tax bases and positive steady state debt
- Other aspects identical to **stylized model** (modelling of $\tau_{C,t}$ and $G_{I,t}$)

Impulse Responses to Both Shocks in TANK Model

1 percent of baseline GDP hike in both instruments

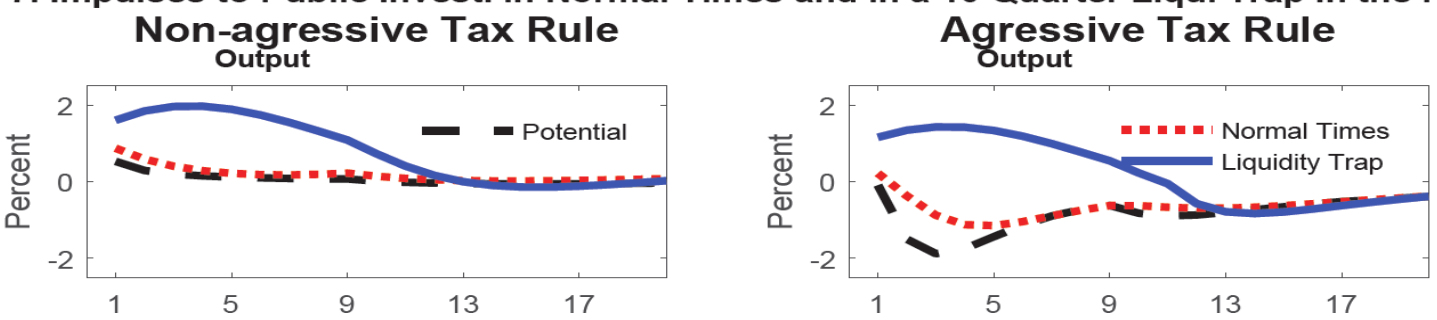
Sales tax hike: not expansionary anymore, unless aggressive tax rule

Figure 4. Impulses to Sales Taxes in Normal Times and in a 10 Quarter Liquidity Trap in the Full Model



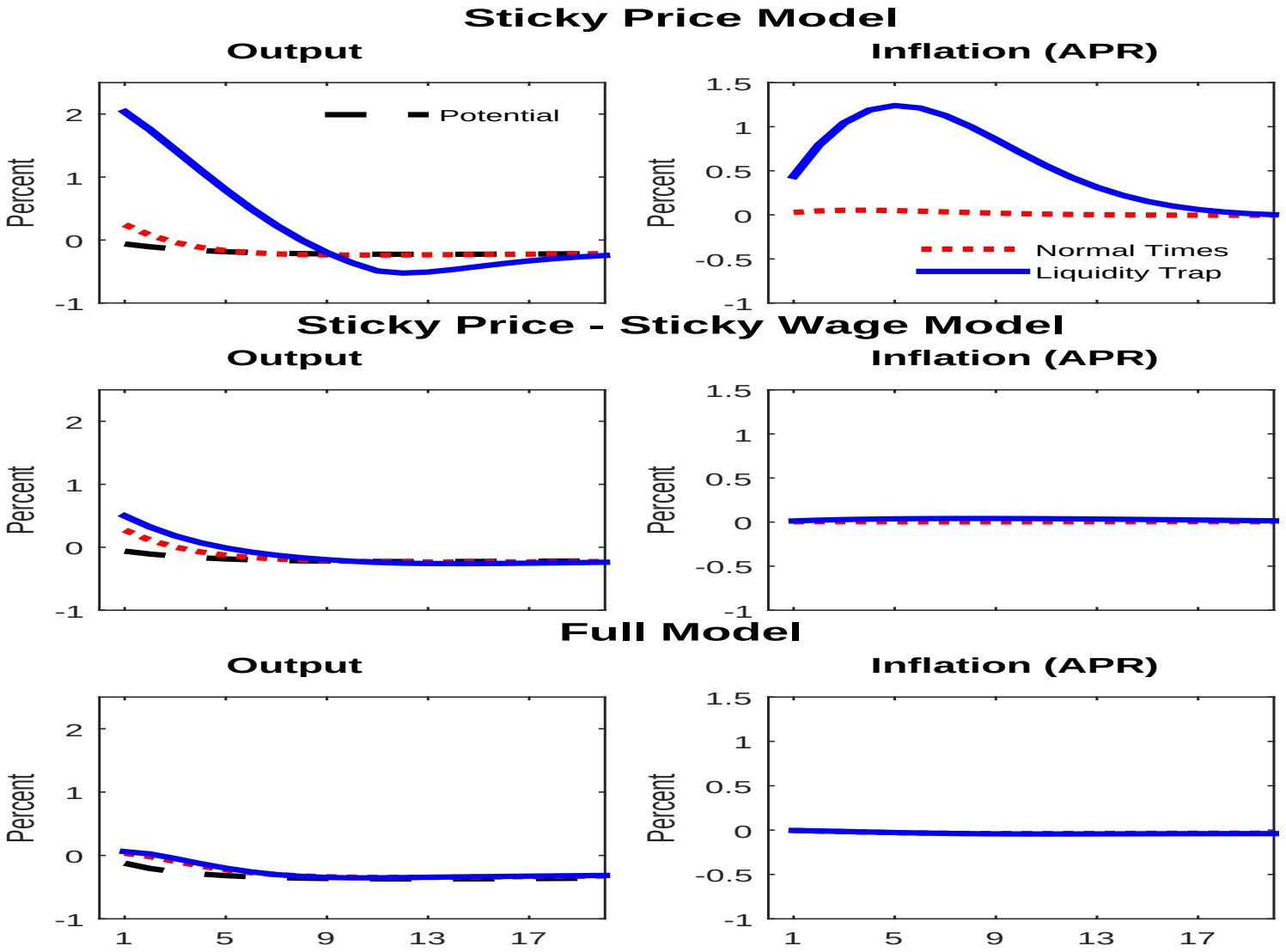
Gov't inv. stimulus: still expansionary effects, regardless of tax rule

Figure 7. Impulses to Public Invest. in Normal Times and in a 10 Quarter Liqu. Trap in the Full Model



Impulse Responses to Gradual Sales Tax Hike

What drives the difference w.r.t. the stylized model?



Tentative Conclusions

- For an economy with economic slack and facing a prolonged liquidity trap, there is a **strong argument for temporarily increasing government infrastructure spending.**
  - Such a policy would boost demand in the near-term which is useful, and potential output in the longer term when the economy has recovered.
  - Given the slack in the Euro area, there is still a strong case for stimulus for members with fiscal space.
- **Benign effects of unconventional fiscal policy dependent on "grand tax bargains."**
  - The sales tax part of "Abenomics" not necessarily stimulative.
  - Potential lessons for design of ongoing empirical work (e.g. by D'Acunto et al., 2017, and 2018).

Stylized Model

Log-linearized representation

- IS curve ($x_t \equiv y_t - y_t^{pot}$)

$$x_t = x_{t+1|t} - \hat{\sigma}(i_t - \pi_{t+1|t} - r_t^{pot})$$

- Pricing schedule (NKPC)

$$\pi_t = \beta \pi_{t+1|t} + \kappa_{mc} \left(\phi_{mc} x_t + \frac{1}{1-\tau_N} \left(\tau_{N,t} - \tau_{N,t}^{pot} \right) \right)$$

- Potential output y_t^{pot}

$$y_t^{pot} = \frac{1}{\phi_{mc}\hat{\sigma}} [g_y g_t + (1-g_y)\nu_c \nu_t - \frac{\hat{\sigma}}{1-\tau_N} \tau_{N,t}^{pot} - \frac{\hat{\sigma}}{1+\tau_C} \tau_{C,t}]$$

- Potential real interest rate r_t^{pot}

$$r_t^{pot} = \frac{1}{\hat{\sigma}} \mathrm{E}_t \Delta y_{t+1}^{pot} - \frac{g_y}{\hat{\sigma}} \mathrm{E}_t \Delta g_{t+1} - \frac{1-g_y}{\hat{\sigma}} \nu \mathrm{E}_t \Delta \nu_{t+1} + \frac{1}{1+\tau_c} \mathrm{E}_t \Delta \tau_{C,t+1}$$

Stylized Model

Monetary policy specification

- Monetary policy rule

$$i_t = \max\left\{-i, (1-\gamma_i)\left(\gamma_\pi \pi_t + \gamma_x x_t\right) + \gamma_i i_{t-1}\right\}$$

  ZLB binding when log-linearized interest rate reach $-i$

- The taste shock ν_t follows a AR(1) process

$$\nu_t = (1-\rho_\nu)\nu_{t-1} + \varepsilon_{\nu,t}$$

  Add negative shock $\varepsilon_{\nu,t}$ to make ZLB binding for 10 quarters in the baseline scenario.

Stylized Model

Fiscal Policy specification

- Gov't debt $b_{G,t}$ as a share of trend output ($b_G = 0$) evolves as

$$\begin{aligned} b_{G,t} &= (1+r)b_{G,t-1} + g_y g_t - c_y \left[\tau_{C,t} + \frac{\tau_C}{c_y}\left(y_t - g_y g_t\right)\right] \\ &\quad - s_N \left[\tau_{N,t} + \tau_N(y_t + \phi_{mc} x_t)\right] - \tau_t \end{aligned}$$

  where $(y_t + \phi_{mc} x_t)$ equals real labor income, τ_t lump-sum tax, and s_N is the steady state labor share

- Fiscal policy rule based on the labor income tax

$$\tau_{N,t} - \tau_N = \varphi_b b_{G,t-1} + \varphi_{bb} \tilde{\tau}_{N,t}$$

  where $\tilde{\tau}_{N,t}$ is the labor income tax which keeps gov't debt $b_{G,t}$ fully stabilized. Non-agressive rule for a low value of φ_b ($\varphi_{bb} = 0$) and complete stabilization rule for $\varphi_b = 0$ and $\varphi_{bb} = 1/s_N$

- Sales tax evolves according to a AR(2) process, written on error-correction form

$$\Delta\tau_{C,t} = \rho_{\tau,1}\Delta\tau_{C,t-1} - \rho_{\tau,2}\tau_{C,t-1} + \varepsilon_{C,t}$$

Parameterization

Calibration of key parameters

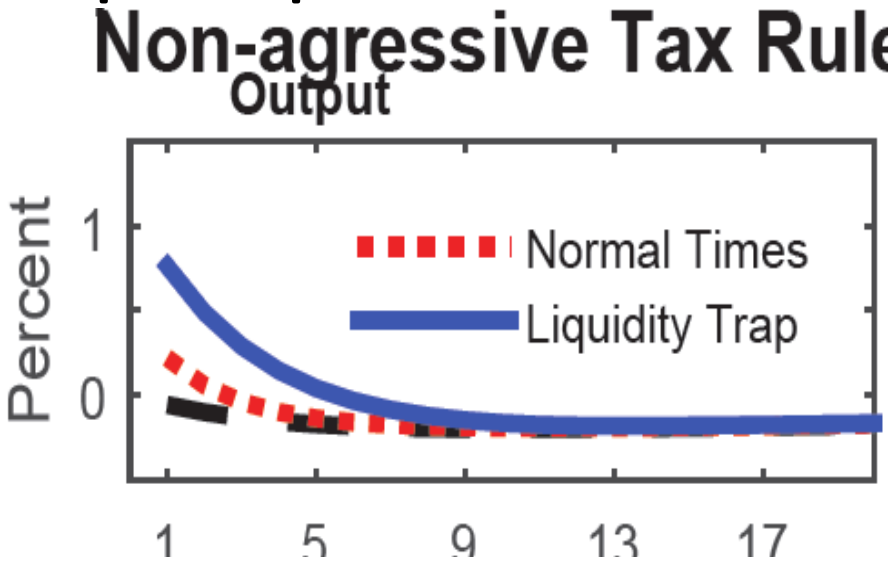
Standard calibration intended to be relevant for the US and the euro area

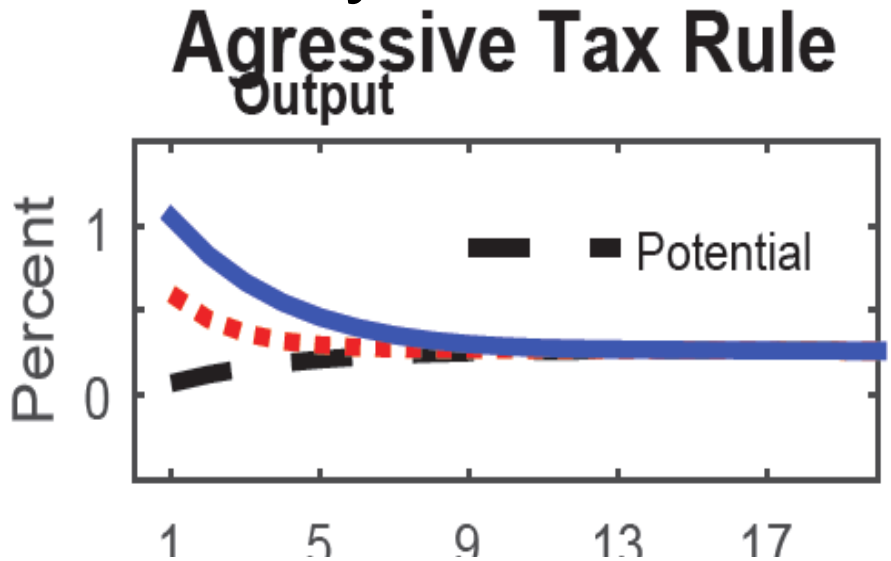
- $\kappa_{mc} = 0.011$, in line with empirical estimates for the U.S., e.g. GG (1999) and Altig et al. (2011)
- Assume standard simple rule for monetary policy unconstrained by ZLB ($\gamma_i = 0.7$, $\gamma_\pi = 2.5$, $\gamma_x = 0.25$)
- Other parameters assume standard values; Frisch elasticity $= 0.4$, Labor share $= 0.7$, Government spending share $= 0.23$, log utility of consumption
- In the steady state, sales tax $\tau_C = 0.10$ as a compromise between levels in US and EA.
- Simplifying assumption that gov't debt $b_G = 0$ and $\tau_t = \tau = -.06$, so that income tax $\tau_N = .33$ when satisfying the steady state gov't budget constraint

Stylized Model

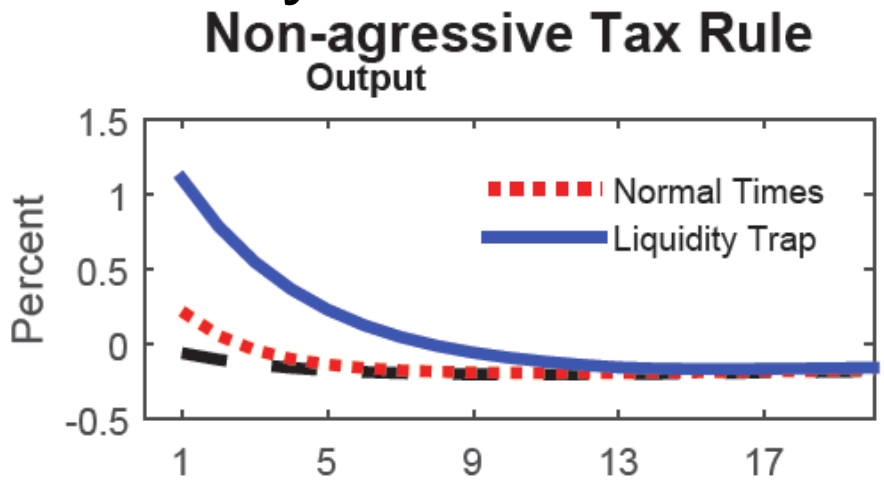
Sales tax hikes with and without discounting in Euler equation

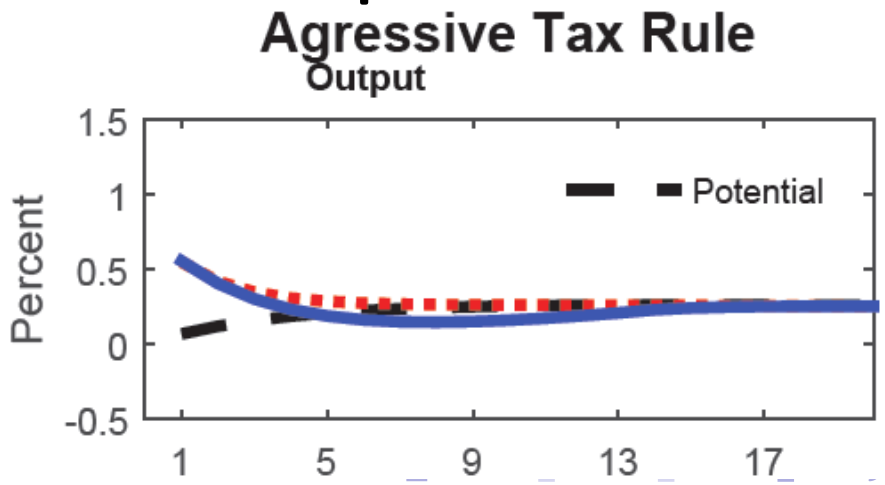
Output responses to sales tax hike in baseline stylized model





Same in stylized model with discounted Euler equation





Extending the stylized model with public investment

Non-linear equations

- Instead of being fixed, total capital now affected by gov't capital:

$$\begin{aligned} Y_t &= Z_t \left(K_t^{tot}\right)^{\alpha} N_t^{1-\alpha} \\ K_t^{tot} &= \left(K_P\right)^{\vartheta} \left(K_{G,t}\right)^{1-\vartheta} \end{aligned}$$

  with $\vartheta = .833$ and $\alpha = .3$, output elasticity of gov't capital stock equals .05 as in Leeper et al. (2010).

- Accumulation of gov't capital stock with a depreciation rate $\delta_G = .02$

$$K_{G,t} = (1 - \delta_G) K_{G,t-1} + I_{G,t}$$

- Assumption of time-to-build, i.e. gov't spending turns into effective investment with delays (in a range of 1 to 6 years)

$$I_{G,t} = \frac{1}{6} \left(G_{I,t-4} + G_{I,t-8} + G_{I,t-12} + G_{I,t-16} + G_{I,t-20} + G_{I,t-24}\right)$$

Extending the stylized model with public investment

Log-linearized implications

- Key equations of the log-linearized model remain unaltered, except the equation for y_t^{pot} which now becomes

$$y_t^{pot} = \frac{1}{\varphi_{mc}} \left[\begin{array}{c} \frac{g_y}{\hat{\sigma}} g_t + \frac{1}{\hat{\sigma}}(1-g_y)\nu_c \nu_t - \frac{1}{1-\tau_N}\tau_{N,t} \\ -\frac{1}{1+\tau_C}\tau_{C,t} + \frac{1+\chi}{1-\alpha}\left(z_t + \alpha(1-\vartheta)k_{G,t}\right) \end{array} \right]$$

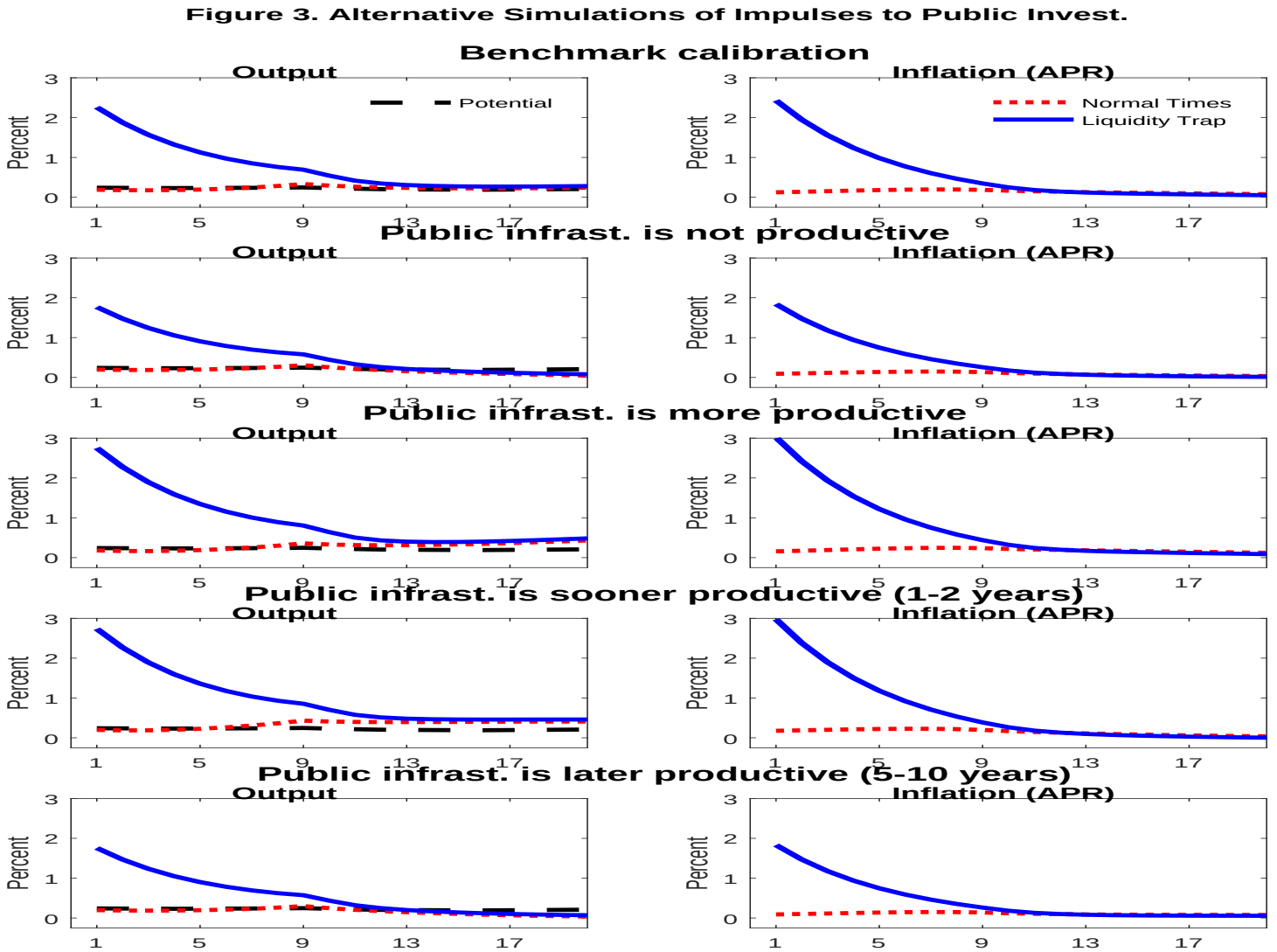
- Total government spending (in log-linearized terms) equals

$$g_t = g_C g_{Ct} + g_I g_{I,t}$$

where g_{Ct} is government consumption, $g_C = G_C / G$ and $g_I = 1 - g_C$. As gov't investment share of GDP equals 3 percent of GDP, against 23 percent for total gov't spending, we set $g_I = 0.13$.

Impulse Responses to Higher Government Investment

Robustness to alternative assumptions for non-aggressive rule



Analysis in the Fully-Fledged Model

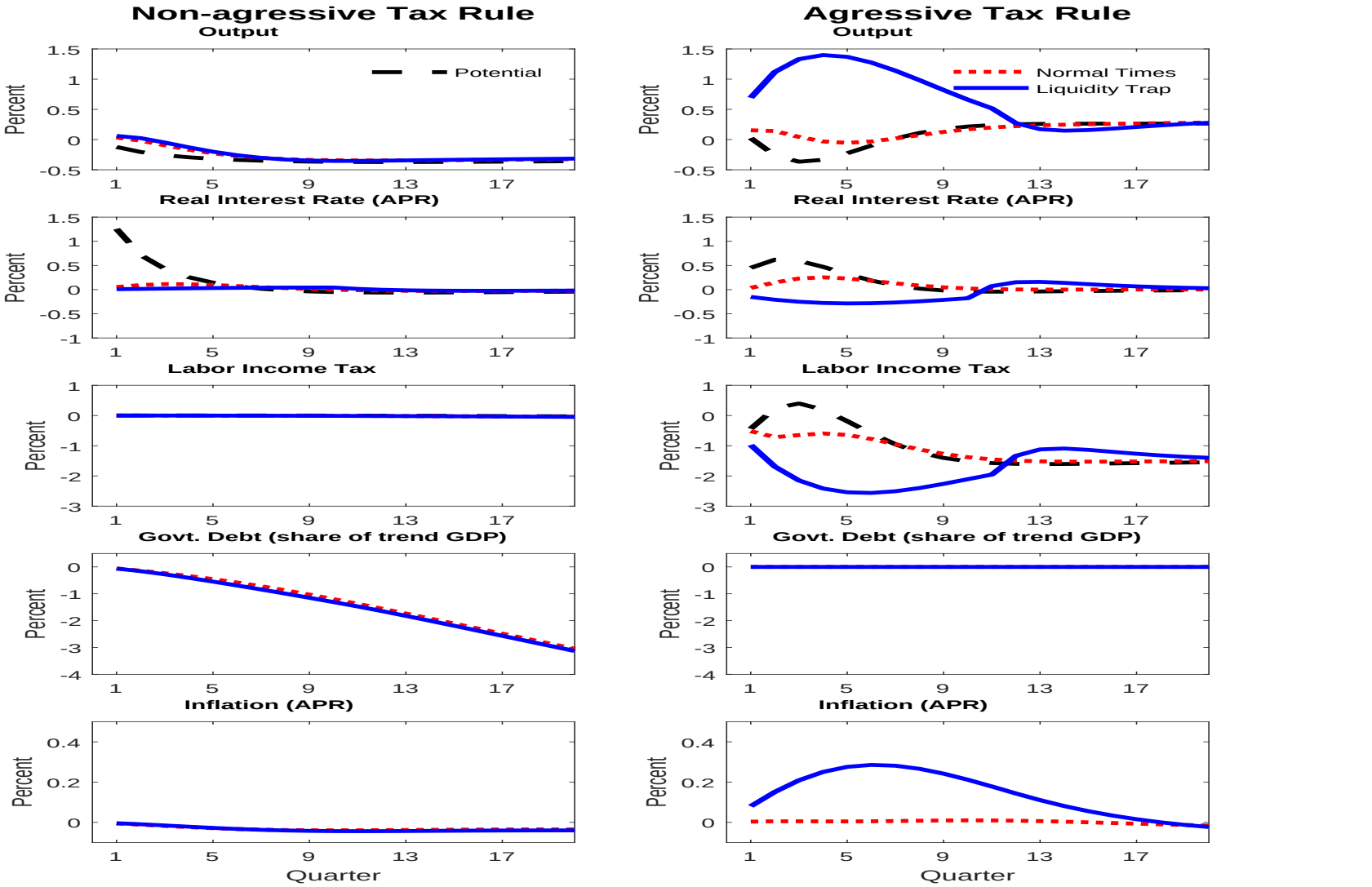
Parameterization

- We set the population share of the Keynesian households to optimizing households to 0.47, implies that the Keynesian households' share of total consumption is about 0.3
- Calibration of the parameters affecting the financial accelerator follow BGG (1999): the monitoring cost, μ, expressed as a proportion of entrepreneurs' total gross revenue, is 0.12. Default rate of entrepreneurs is 3 percent per year, and the variance of the idiosyncratic productivity to entrepreneurs is 0.28
- The share of total government spending of GDP is set equal to 23 percent. The government debt to GDP ratio is 1. The steady state private capital income tax rate, τ_K, is set to 0.25, while $\tau_C = 0.1$. Lump-sum transfers $-\tau$ equals 0.06. Given these choices, the government's intertemporal budget constraint implies that τ_N equals 0.33 in steady state.
- Same paths for $\tau_{C,t}$ and $G_{I,t}$ as in stylized model

Impulse Responses to Gradual Sales Tax Hike

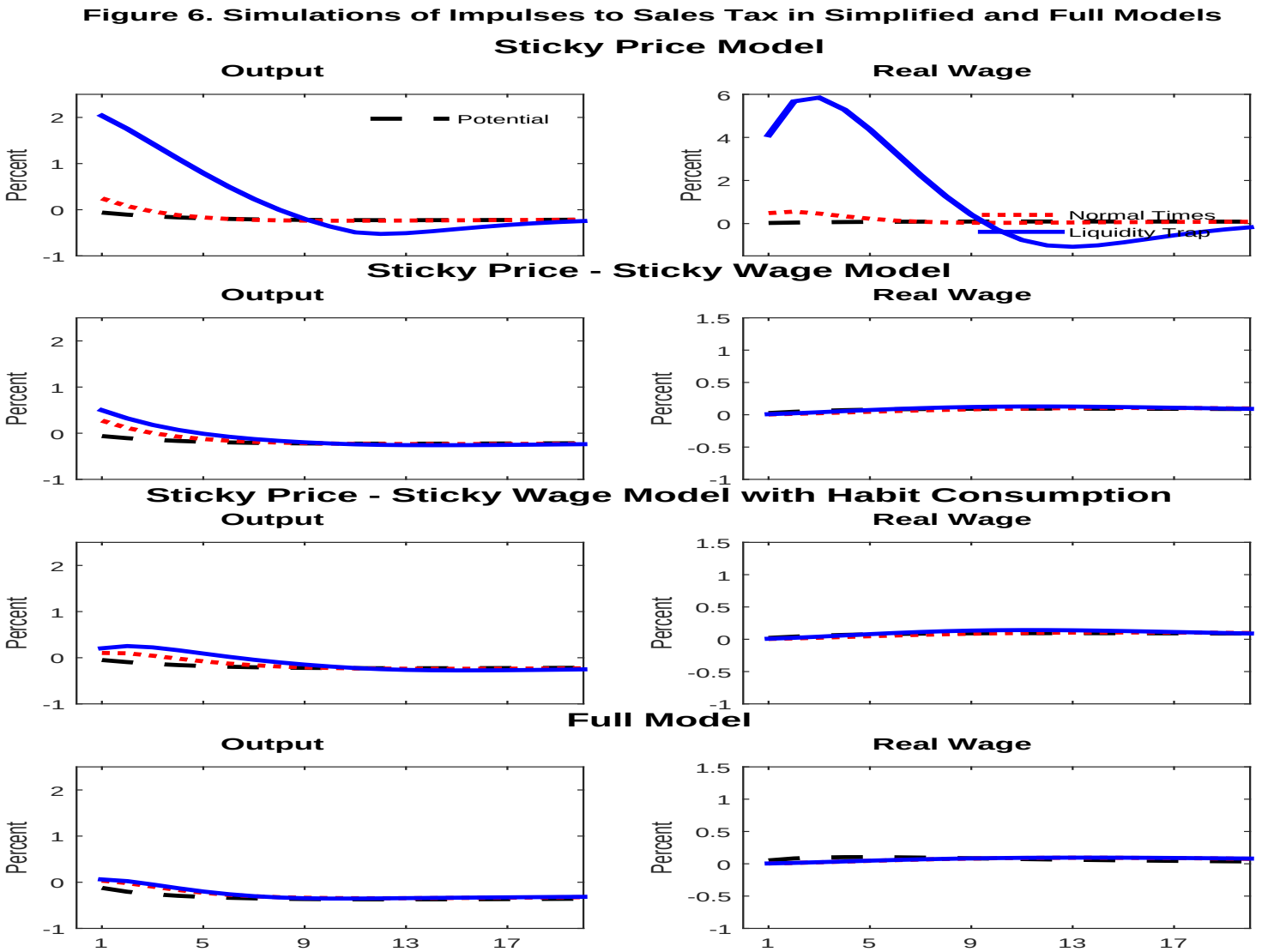
1 percent of baseline GDP hike in fully-fledged model

Figure 4. Impulses to Sales Taxes in Normal Times and in a 10 Quarter Liquidity Trap in the Full Model



Impulse Responses to Gradual Sales Tax Hike

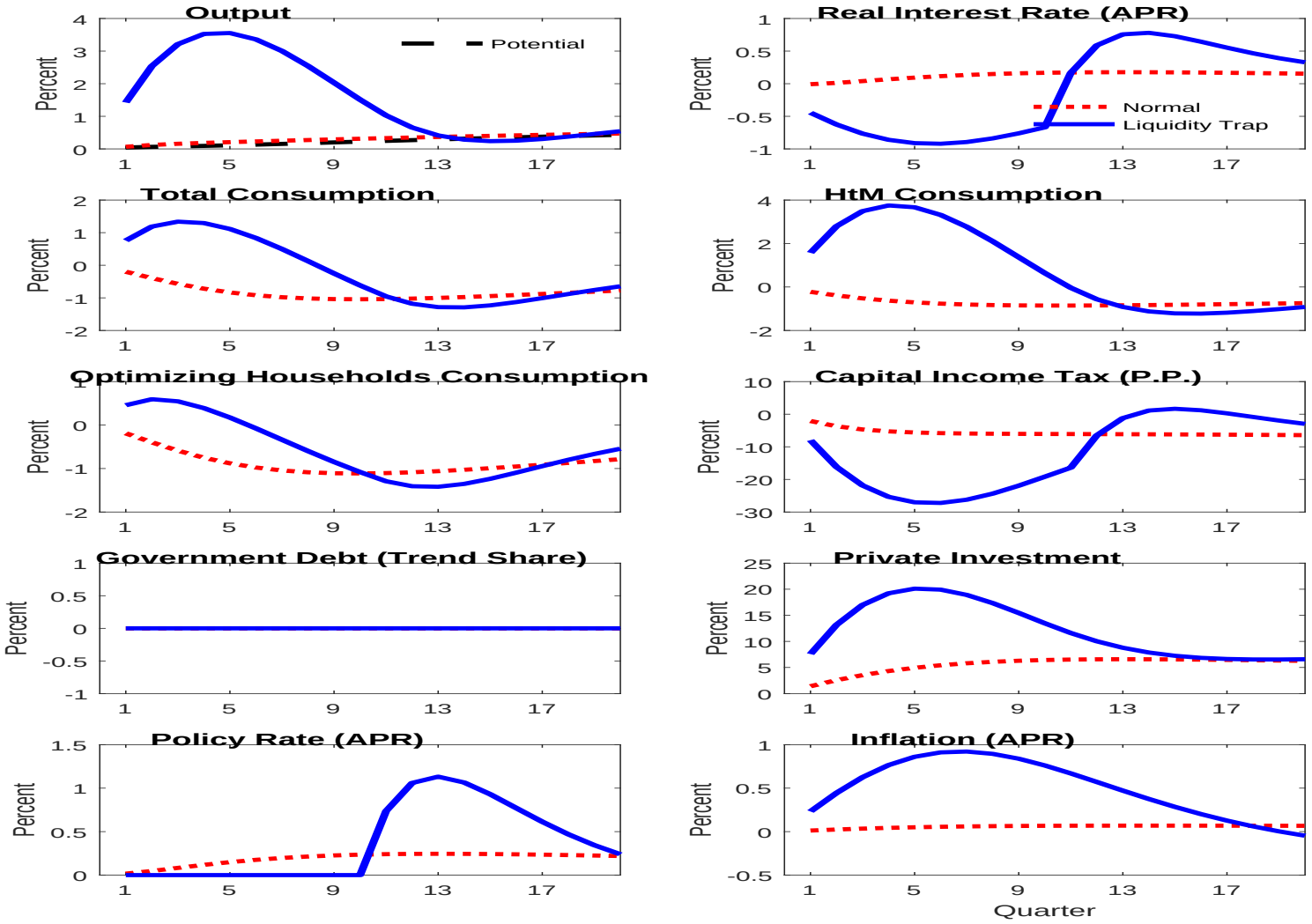
What drives the difference w.r.t. stylized model, focus on real wage



Impulse Responses to Gradual Sales Tax Hike

What if capital taxes are used aggressively to stabilize government debt?

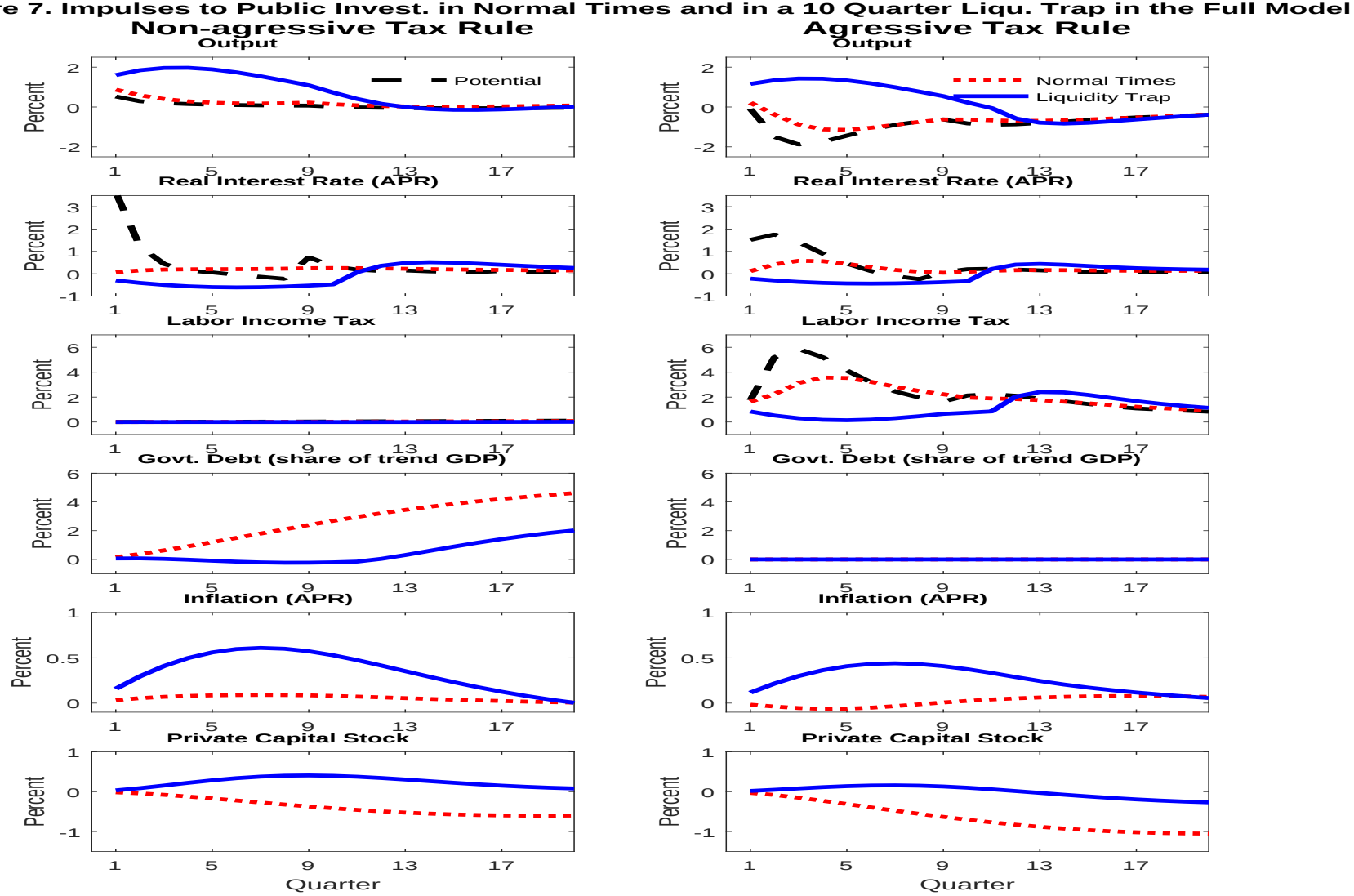
Figure 6. Impulses to Sales Taxes with Aggr. Rule on Cap. Income Tax in the Full Model



Impulse Responses to Higher Government Investment

1 percent of baseline GDP hike in fully-fledged model

Figure 7. Impulses to Public Invest. in Normal Times and in a 10 Quarter Liqu. Trap in the Full Model



Impulse Responses to Higher Government Investment

Robustness to alternative assumptions for non-aggressive rule in fully-fledged model