Forward guidance and Fiscal Policy with preferences over wealth

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Forward guidance puzzle

- "Forward guidance puzzle": GDP and inflationary effect of Central Bank FG very large in DSGE models, explode in length of announced fixed interest rate period (Del Negro et al. (2015), Carlstrom et al. (2015)) .
- This paper:
  - Adds Preferences Over Wealth (POW) to the simple NK model of Woodford (2011) to deal with the puzzle.
  - Explores consequences of this feature for fiscal policy.
- Why POW? Allow replication of microeconomic evidence on households' inter-temporal choices (Carroll (2000), Francis (2009), Kumhof et al. (2014)):
  - MPS out of permanent income >>0 (Carroll (2000), Dynant et al. (2004), Kumhof et al. (2014)).
  - Individual discount rates >> relevant market interest rates (e.g. Harrison et al. (2002) and Warner and Pleeter (2001)).

Main Results

- POW limit effective horizon of households ("discounting wedge") and adds a consumption wealth effect.
- FG has much smaller effects with POW.
- Multiplier of permanent fiscal expenditure change during a downturn increases. Effect of temporary and permanent expenditure changes become more alike.
- Both results even stronger with share of constrained households.
- Results carry over to a medium scale DSGE model.

Why does it matter to policymakers?

- Intertemporal substitution mechanism at the heart of quantitative DSGE models used by the ECB and other Central Banks to evaluate forward guidance policies.
- "Riccardian" effects of permanent government expenditure cuts features prominently in analyses of the EU commission (2012) of the impact of the Euro Area fiscal consolidation over the 2011-2013 period.

Relation to the literature

- First paper to explore fiscal policy at ZLB with discounting wedge.
- Campbell et al. (2016) investigate FG in an estimated large scale model with similar preferences. But small effect:
  - Calibration not linked to micro-evidence (=small discounting in Euler equation).
  - No role for curvature as financial wealth constant.
  - Other model features lower effect of FG.
- Del Negro et al. (2015): Blanchard-Yaari type model.
  - ...need counterfactually high death probabilities.
- Incomplete markets (IM) and FG
  - McKay et al. (2016): IM weaken effect of FG....
  - Verning (2015): ...only with procyclical income risk, countercyclical liquidity.

Outline

Model overview

- Households:
  - Share ω of constrained households who consume their disposable income.
  - **Share $(1-\omega)$ of unconstrained households "rich". Save in form of government bonds. POW.**
  - Common wage set by union.
- Firms
  - Produce output using labor.
  - Monopolistic competition and sticky prices: NKPC.
- Government:
  - Consumes G_t units of GDP.
  - Lump sum taxes taxes on households T_t follow fiscal rule to keep government debt B_t stationary.
- Central Bank: Taylor rule (outside ZLB).

Equations simple model

$$\hat{Y}_t - \left(\sigma_g \hat{G}_t - \sigma_T \hat{T}_t\right) = -\tilde{\sigma}\left[\theta\left[\hat{R}_t - E_t\hat{\Pi}_{t+\mathbf{1}} - r_t^{net}\right] - \tilde{\sigma}_b \hat{b}_t\right] + \theta\left(E_t\hat{Y}_{t+\mathbf{1}} - \left(\sigma_g E_t \hat{G}_{t+\mathbf{1}} - \sigma_T E_t \hat{T}_{t+\mathbf{1}}\right)\right) \quad (1)$$

$$\hat{\Pi}_t = \kappa(\hat{Y}_t - \Gamma\hat{G}_t) + \beta E_t\hat{\Pi}_{t+\mathbf{1}} \quad (2)$$

$$\hat{R}_t = max\left(\phi_\pi\hat{\Pi}_t + \phi_y\left(\hat{Y}_t - \Gamma\hat{G}_t\right), -i_L\right) \quad (3)$$

$$\hat{b}_t = \frac{R}{\Pi}\left(\hat{b}_{t-\mathbf{1}} + \frac{b}{Y}\left(\hat{R}_{t-\mathbf{1}} - \hat{\Pi}_t\right)\right) + \hat{G}_t - \hat{T}_t \quad (4)$$

$$\hat{T}_t = \tau_y\hat{Y}_t + \tau_b\hat{b}_{t-\mathbf{1}} \quad (5)$$

- Without credit constraint households ($\omega = 0$): $\sigma_g = 1$, $\tilde{\sigma} = \frac{C}{Y}\sigma_H$, $\sigma_T = 0$

Unconstrained Households: POW

$$E_t\left\{\sum_{i=0}^{\infty}\beta^i\left[\frac{C_{j,t+i}^{1-1/\sigma_H}}{1-1/\sigma_H}-\chi N_{j,t+i}^{1+\eta}+\phi_B\left(\frac{B_{j,t+i}}{P_{t+i}}\right)^{1-\sigma_B}\right]\right\}$$

- Liquidity preference (Krishnamurthy and Vissing Jorgenson (2012)).
- "Capitalist spirit"(Carrol (2000), Dynant et al. (2004), Francis (2009)).

$$FOC:\ 1-\frac{\phi_B}{\Lambda_{O,t}}\left(\frac{B_{O,t}}{P_t}\right)^{-\sigma_B}=R_tE_t\left\{\frac{\beta\Lambda_{O,t+\mathbf{1}}}{\Lambda_{O,t}\Pi_{t+\mathbf{1}}}\right\}\Leftrightarrow R_t\leq\frac{1}{E_t\left\{\frac{\beta\Lambda_{O,t+\mathbf{1}}}{\Lambda_{O,t}\Pi_{t+\mathbf{1}}}\right\}}\equiv DIS_t$$

- $R_t\leq DIS_t$: HH derive benefits from saving over and above the future consumption opportunity it entails. DIS_t =Gross nominal individual discount rate.

$$\hat{C}_{O,t}=E_t\left\{\sum_{i=\mathbf{0}}^{n}\theta^i\sigma_H\left[-\theta\left(\hat{R}_{t+i}-\hat{\Pi}_{t+\mathbf{1}+i}\right)+(1-\theta)\sigma_B\hat{b}_{O,t+i}\right]\right\}+\theta^{n+\mathbf{1}}E_t\hat{C}_{O,t+\mathbf{1}+n}$$

- "Discounting wedge" $\theta=\beta\frac{R}{\Pi}\leq 1$, and wealth effect $(1-\theta)\sigma_H\sigma_B$.

POW: Calibration of steady state discounting wedge θ

- β unobservable. But microeconometric point estimates of the (time varying) nominal individual discount rate $DIS_t = \frac{1}{E_t\left\{\frac{\beta \Lambda_{O,t+1}}{\Lambda_{O,t}\Pi_{t+1}}\right\}}$ exist.
- For small weight on wealth (θ close to one), $\frac{R_t}{DIS_t}$ approximately constant across time.
  - $\Rightarrow$Intertemporal substitution: Increase in R_t shifts consumption from t to $t+1$, thus increasing DIS_t.
- Hence $\theta \approx \frac{R_t}{DIS_t}$.

POW: Evidence on discounting wedge θ

Sample period	$DIS_t - 1$(APR)	$R_t - 1$ (APR)	θ	Source of DIS_t
1929-1948	33.0*	0.8*	0.82	Friedman (1962,1957)
1960	19.6*	2.0*	0.96	Heckman (1976)
1979	27.4	9.5	0.96	Cylke et al. (1982)
1972-1980	54.7-72.1*	1.9-2.9	0.88-0.90	Ruderman et al. (1984)
1982-1989	18.3	8.6	0.98	Ausubel (1991)
1992-1993	18.7	6.3	0.97	Warner and Pleter (2001)
1996	22.5	4.2	0.96	Harrison et al. (2002)

POW: Calibration of curvature $\tilde{\sigma}_b$

- Use partial equilibrium approach:
  - Exogenize unconstrained household income. Set $\tilde{\sigma}_b$ such that the MPS out of a one-off permanent increase in income about 0.4 (Kumhof et al. (2014)).
  - MPS of top 5% of households about 0.4 according to Dynant et al. (2004) and Kumhof et al. (2014).

Parameters

Table: Parameters in the stylized model

σ	$\frac{R}{\Pi}$	η	α	Γ	ϕ_y	ϕ_π
0.8621	1/0.997	1.6	1	0.4203	0.5/4	1.5

$\frac{b}{4y}$	τ_y	τ_b	$\frac{C}{Y}$	ω	θ	$\tilde{\sigma}_b$
100.0%	0.34	0.0530	0.8	0; 0.15	0.96 – 1.0	0; 0.0040

Assumptions ZLB/ downturn

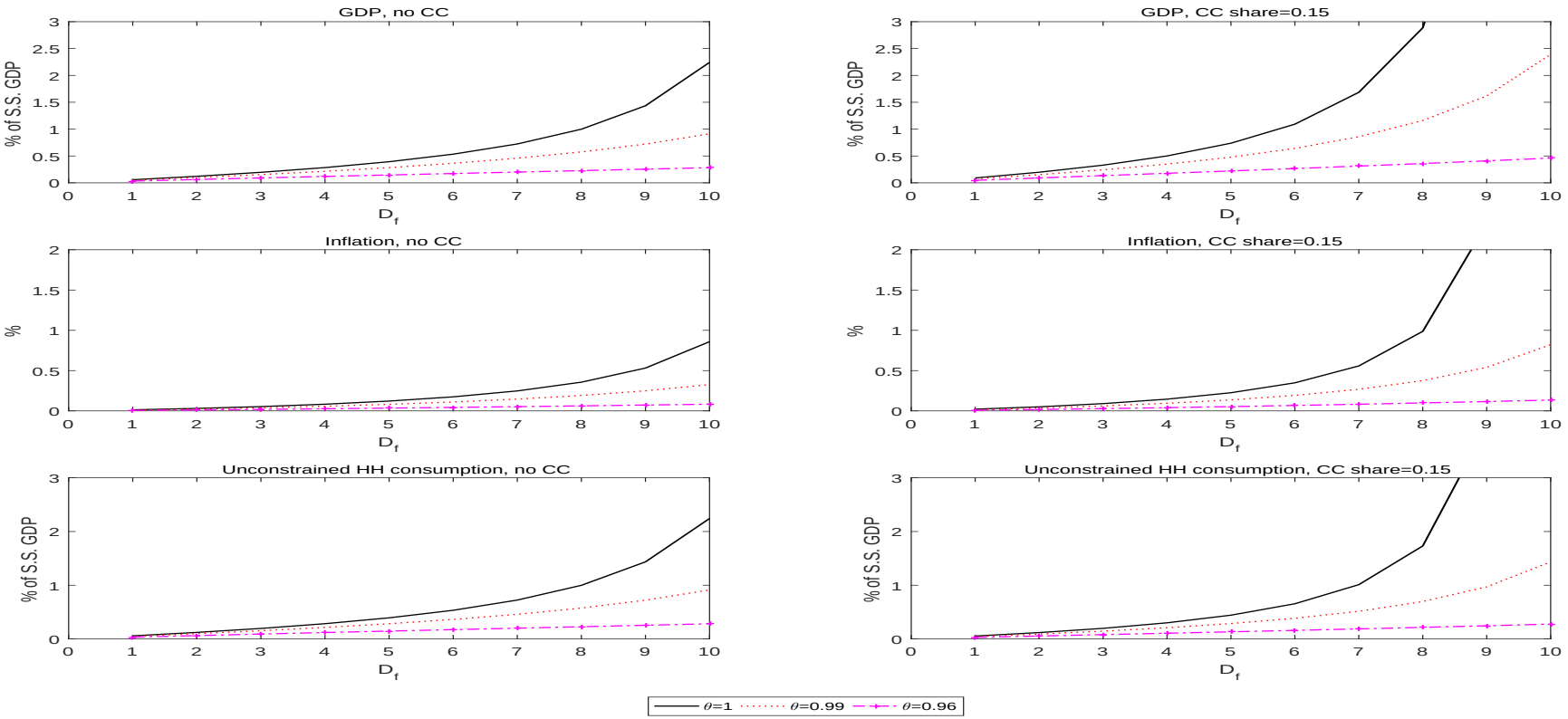
- Adverse saving shocks hits the economy (Woodford (2011), Eggertsson (2009)), unconstrained households save more:
  - Sufficiently contractionary for $\hat{R}_L = -i_L$ (=ZLB).
  - Saving shock persists in the next period with probability μ, vanishes with probability $1-\mu$.
  - Expected duration of low state $D_L = \frac{1}{1-\mu}$.

Outline

Assumptions

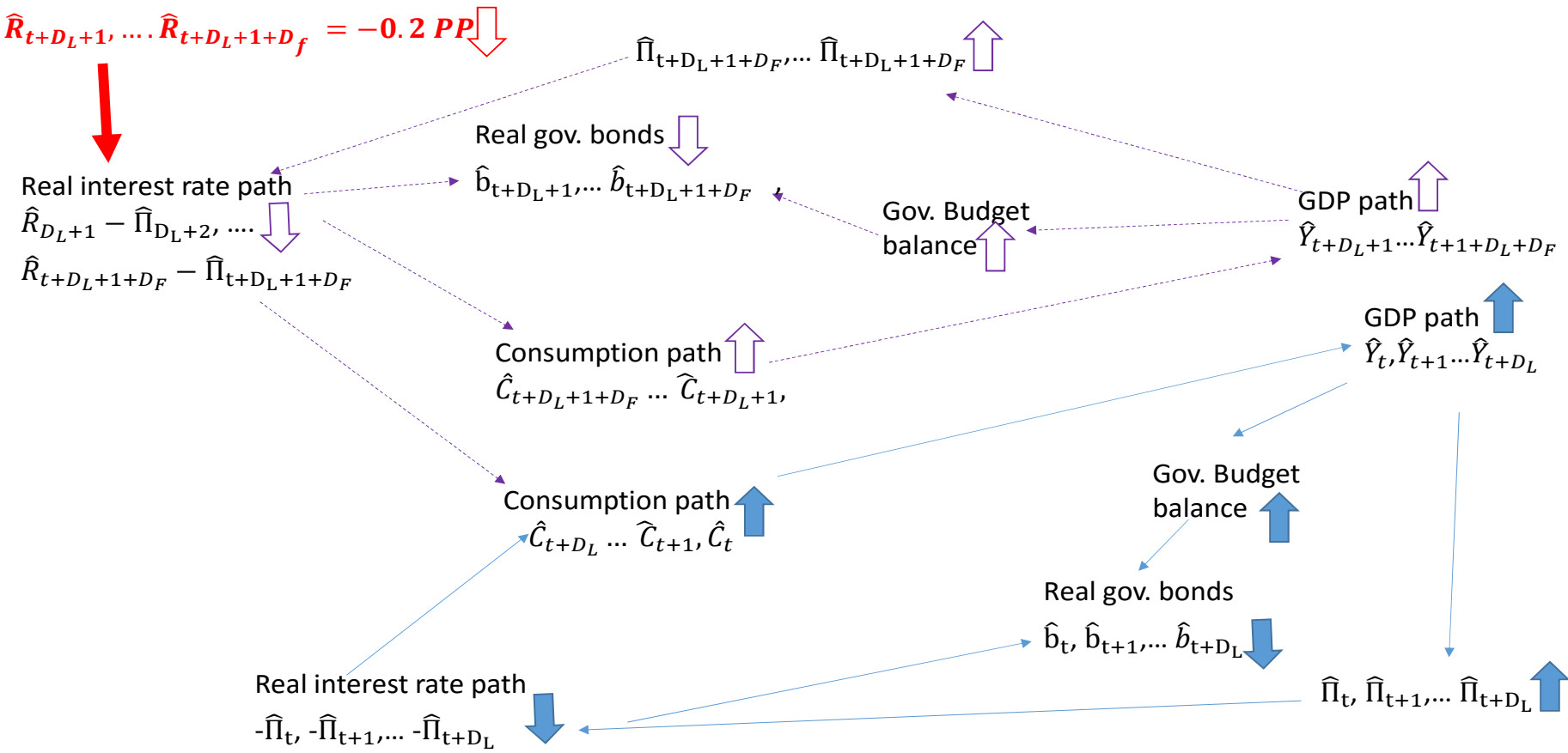
- Central Bank announces: Once the economy exits ZLB state, interest rate fixed at a (quarterly) level of $\hat{R}_f$.
- Central Bank keeps the interest rate at $\hat{R}_f$ in subsequent periods with probability μ_f.
- With probability $1-\mu_f$ reverts to the Taylor rule.
- Assume $D_L = 6$, $\hat{R}_f = \frac{-0.2}{4}$.
  - Consistent with Del Negro et al. (2015)'s evidence on market expectations regarding timing of exit from ZLB prior to the Feds FG announcements in September 2011, January 2012 and September 2013.
  - ... and the announcement's effect on private sector forecasts of three month treasury bond yields.

POW alleviate forward guidance puzzle



Note: Effects of fixing the annualized interest rate at 0.2% below it's path in the absence of the policy for an expected length of D_f quarters. $D_L = 6$, all other parameters are as detailed in Table 1.

FG: Policy rate reduced starting in $t + D_L + 1$ for D_F quarters



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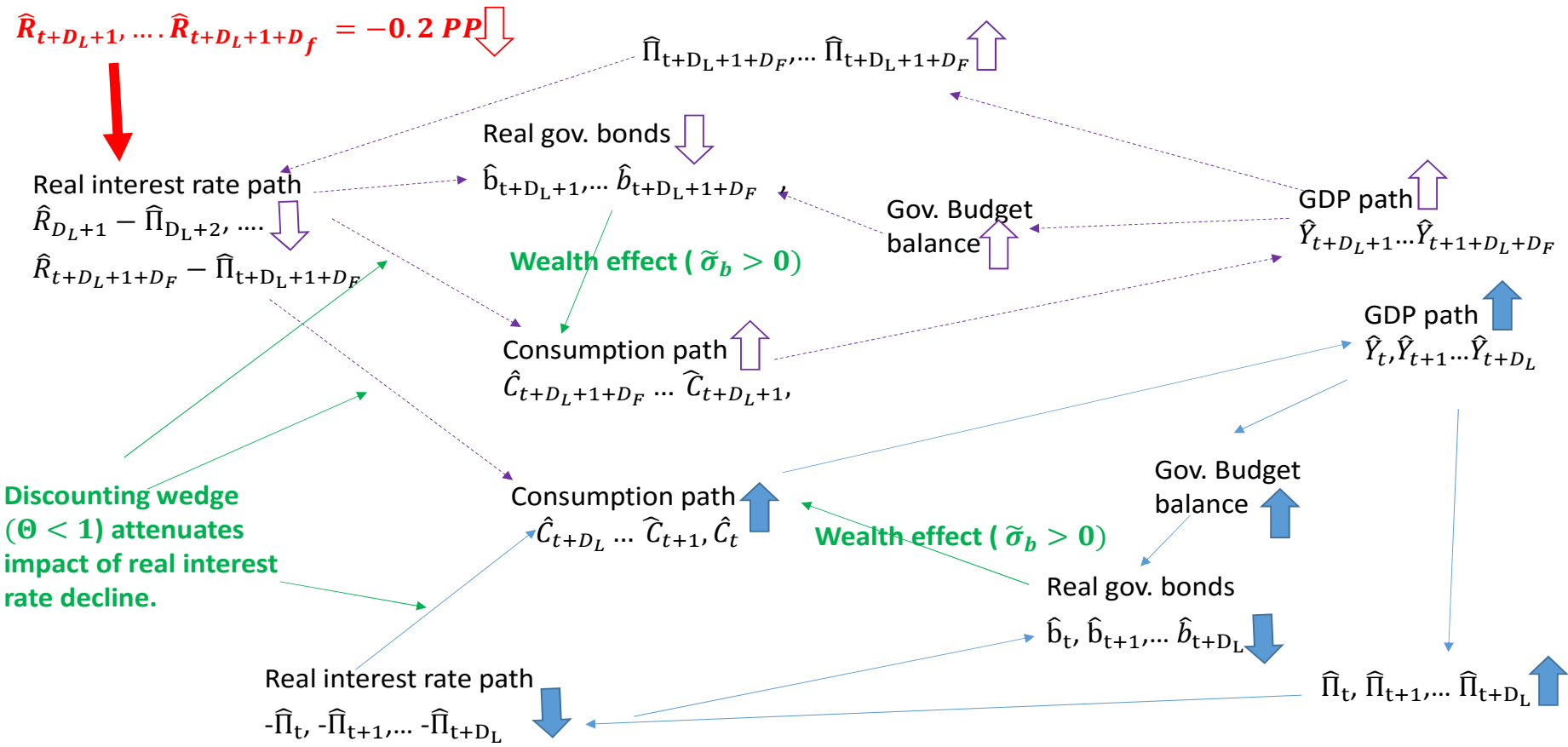
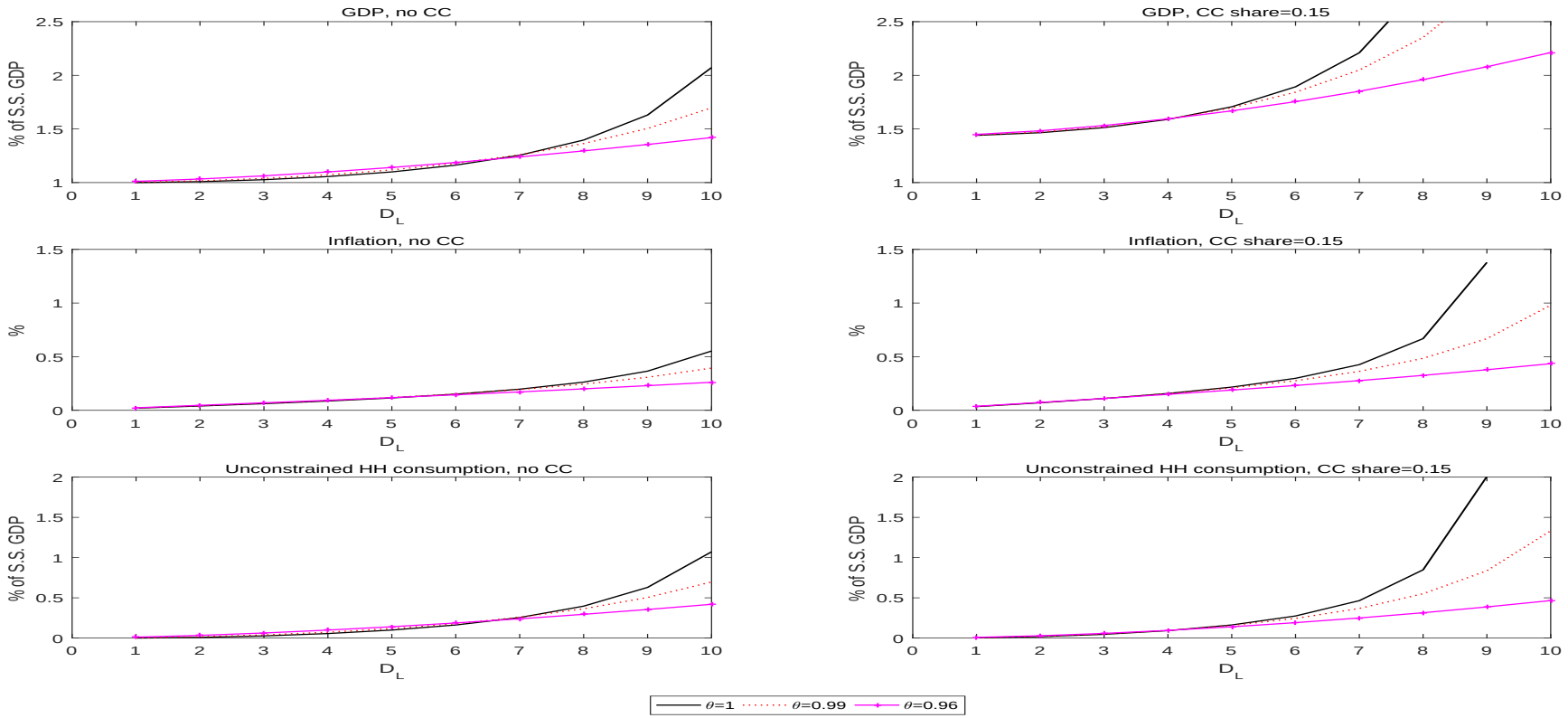


Outline

Assumptions gov. spending increase

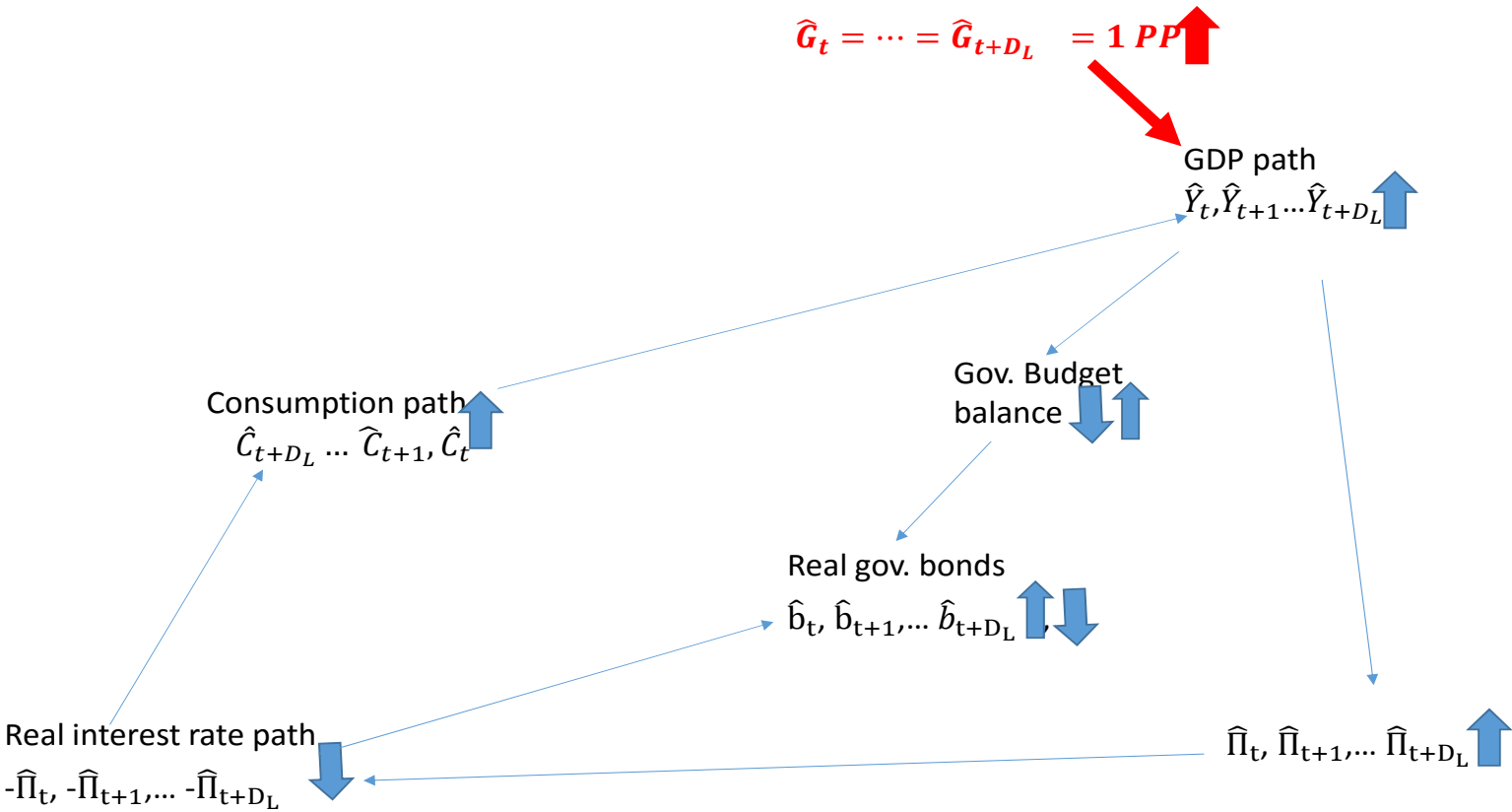
- Gov spending:
  1. Perfectly timed: government consumption increases by a percentage $\hat{G}_L$ of steady state output for the duration of low state D_L.
  2. Gov. spending increases permanently.

POW make fiscal multiplier less responsive to ZLB length



Note: Effects of increasing government spending by 1% of GDP during the low state only. The horizontal axis depicts the expected duration of the low state D_L. All other parameters are as in Table 1.

Perfectly timed fiscal expansion during ZLB period



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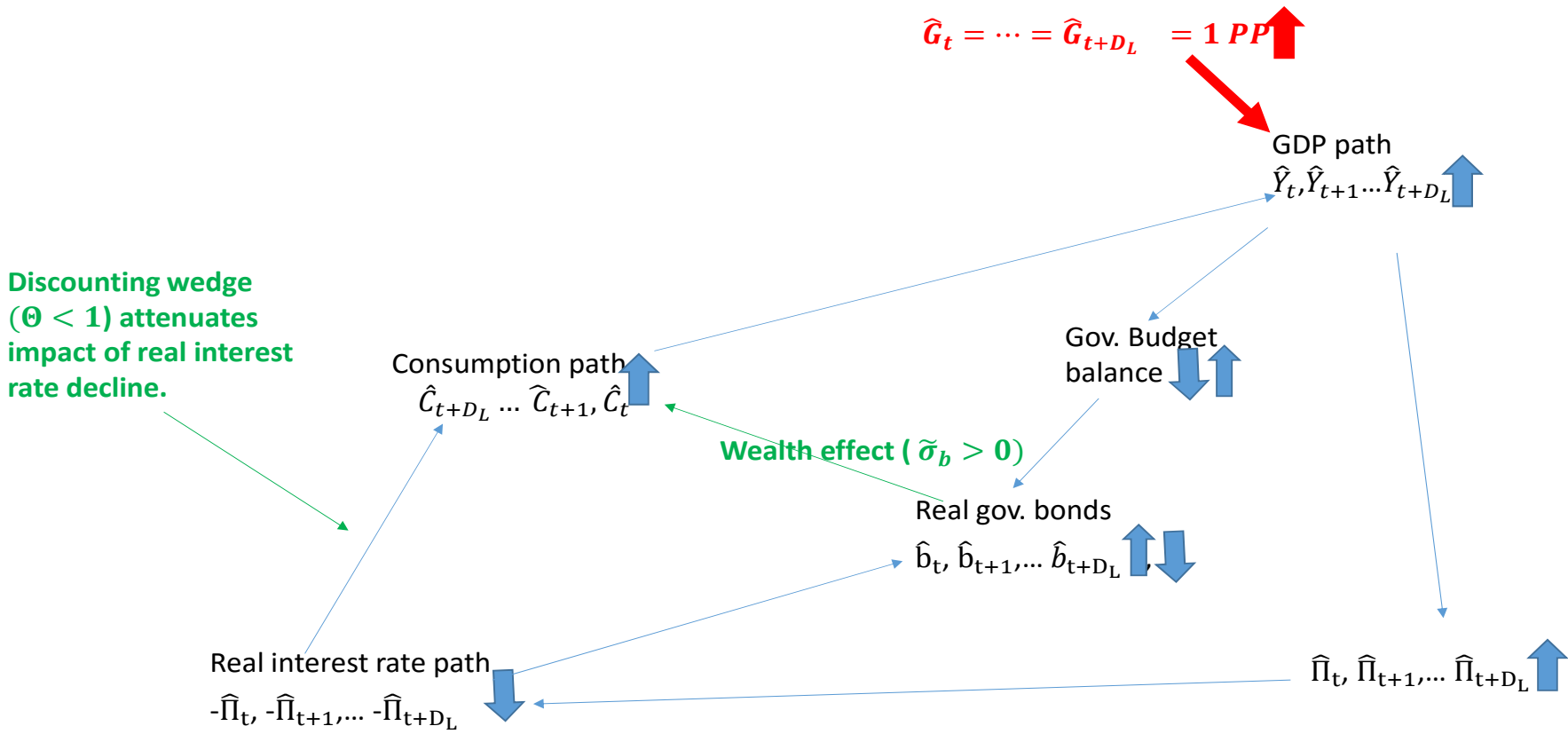
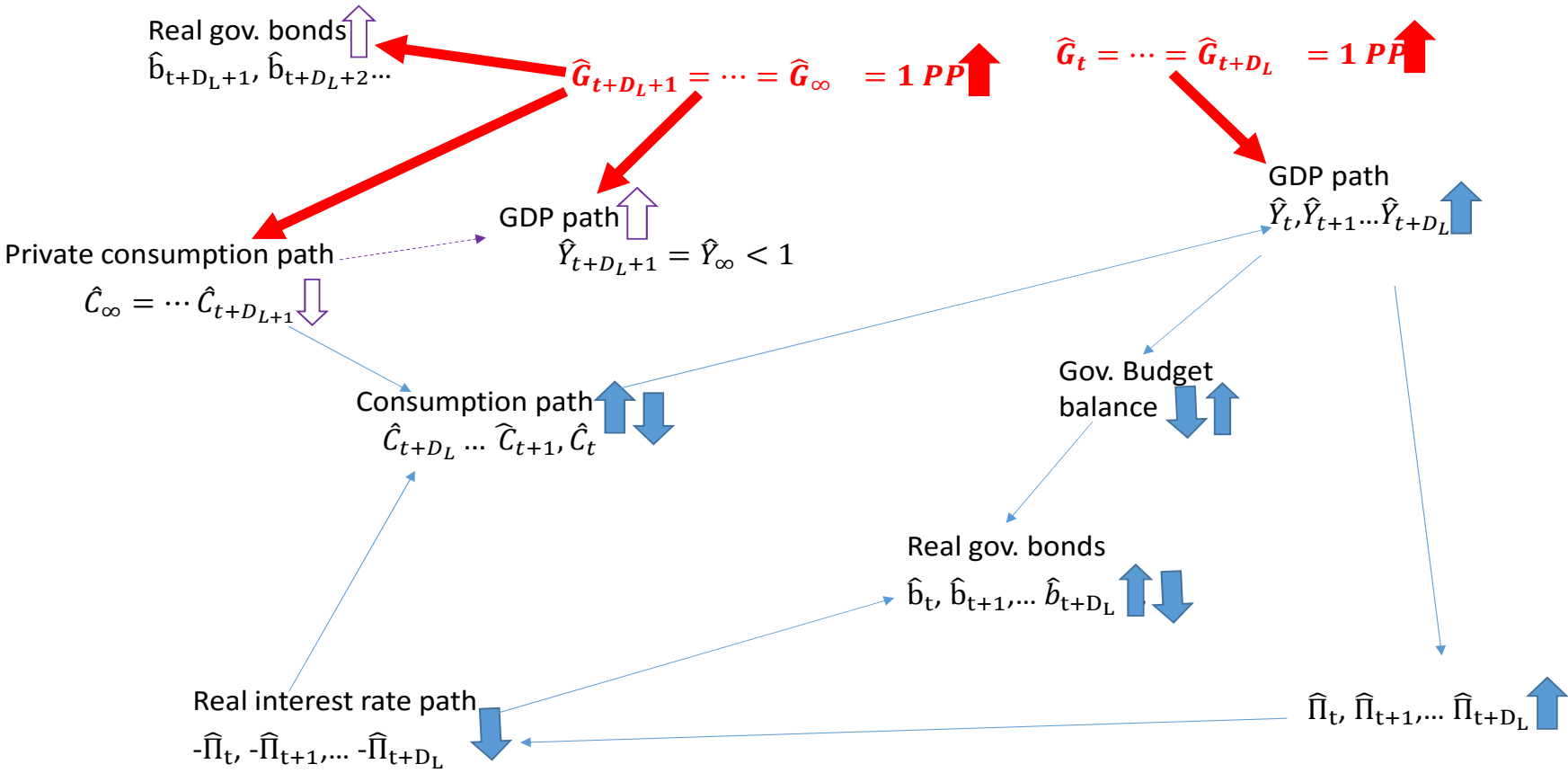


Multipliers of temp. and perm. spending change more similar

Table: Fiscal multiplier overview, 2 year downturn ($D_L = 8$)

	No constrained HH		**Constrained HH=0.15**	
	Perfectly timed	Permanent	Perfectly timed	Permanent
$\theta = 1$	1.4	0.4	2.8	0.6
$\theta = 0.96$	1.4	1.1	2.0	1.6

Permanent fiscal expansion (maintained after ZLB ends)



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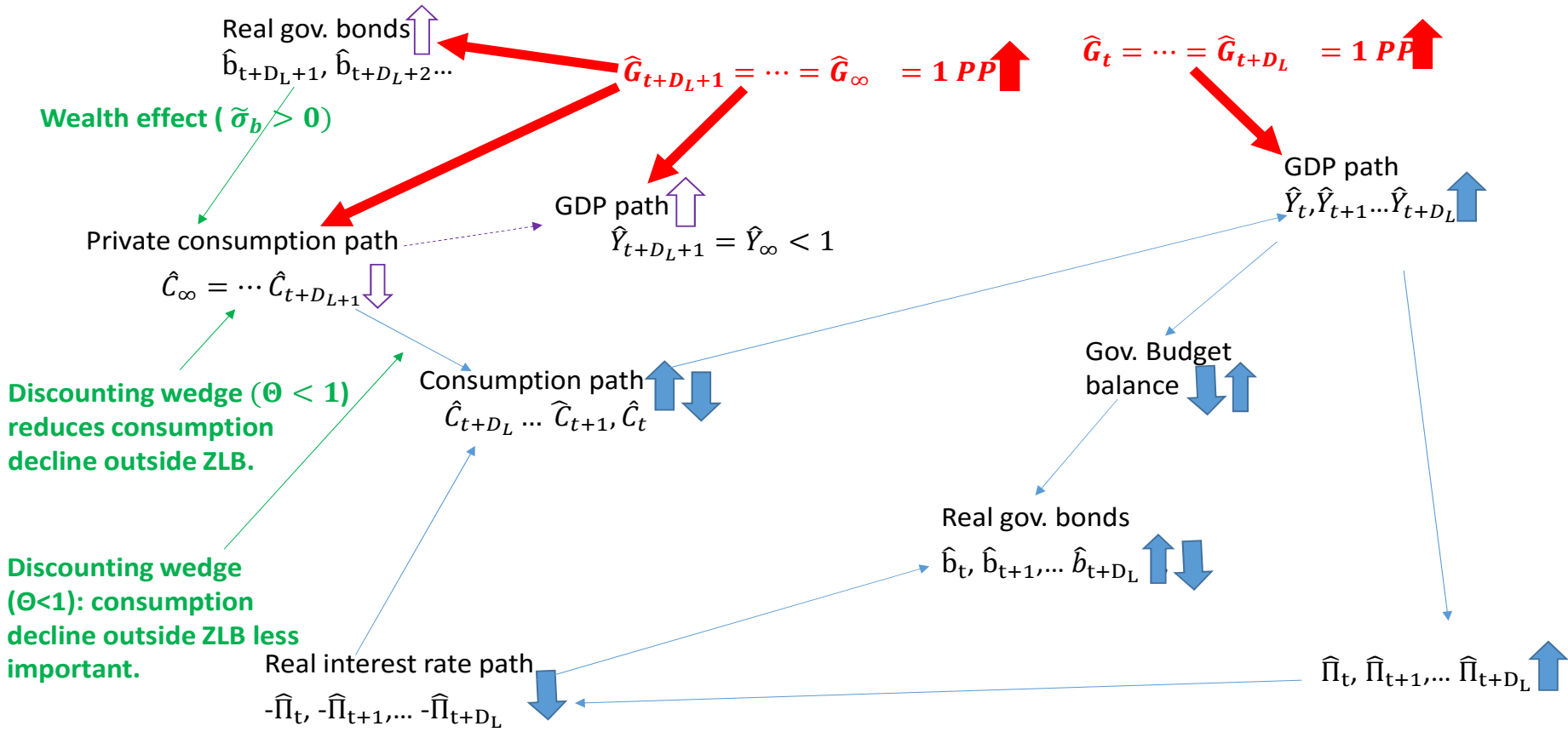
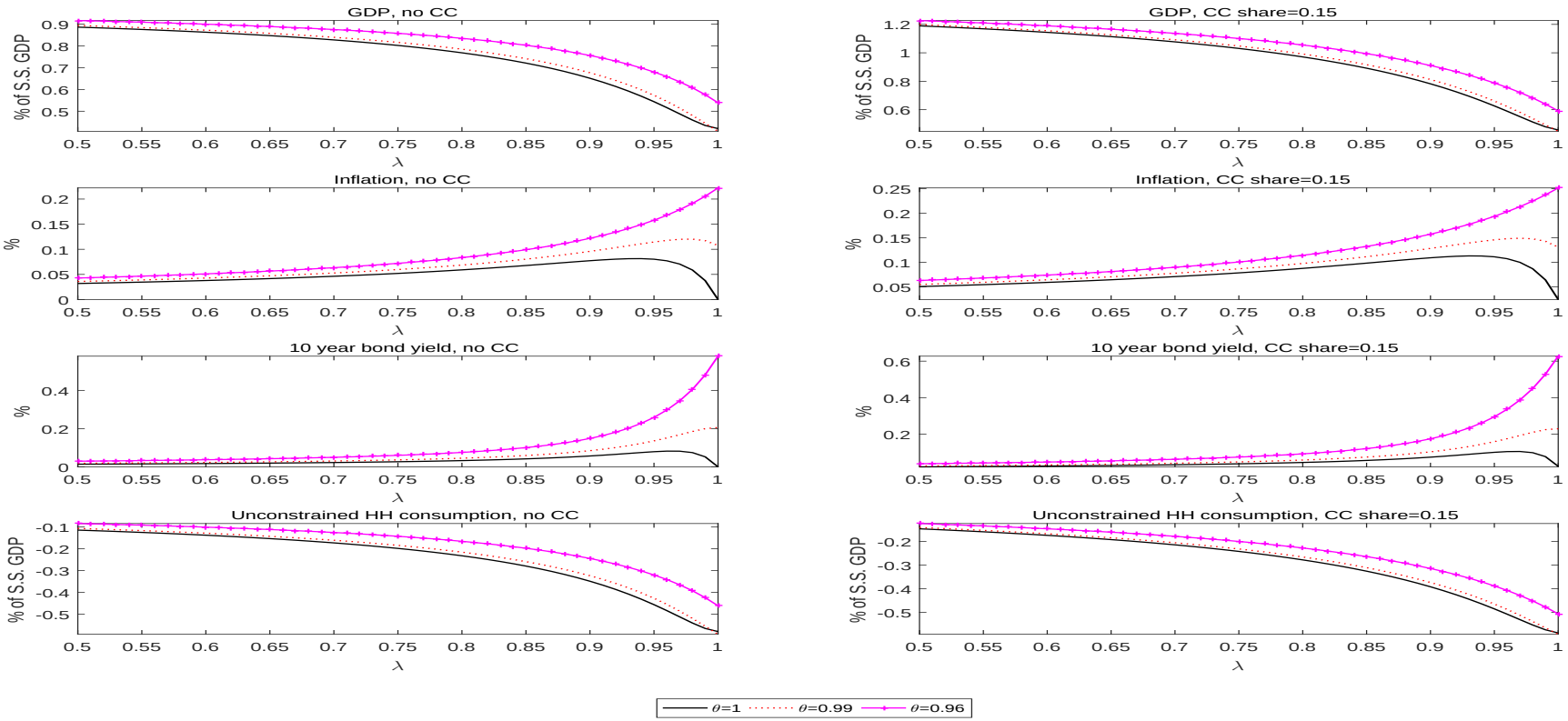


Conclusion

- Preferences over wealth limit the effective horizon of forward looking households ("discounting wedge") and create a consumption wealth effect.
- Much smaller effect of forward guidance policies. Forward guidance puzzle strongly alleviated.
- Multiplier of permanent government expenditure change during recession increases. Multiplier of temporary and permanent expenditure changes become much more alike.

With POW, less crowding out outside ZLB

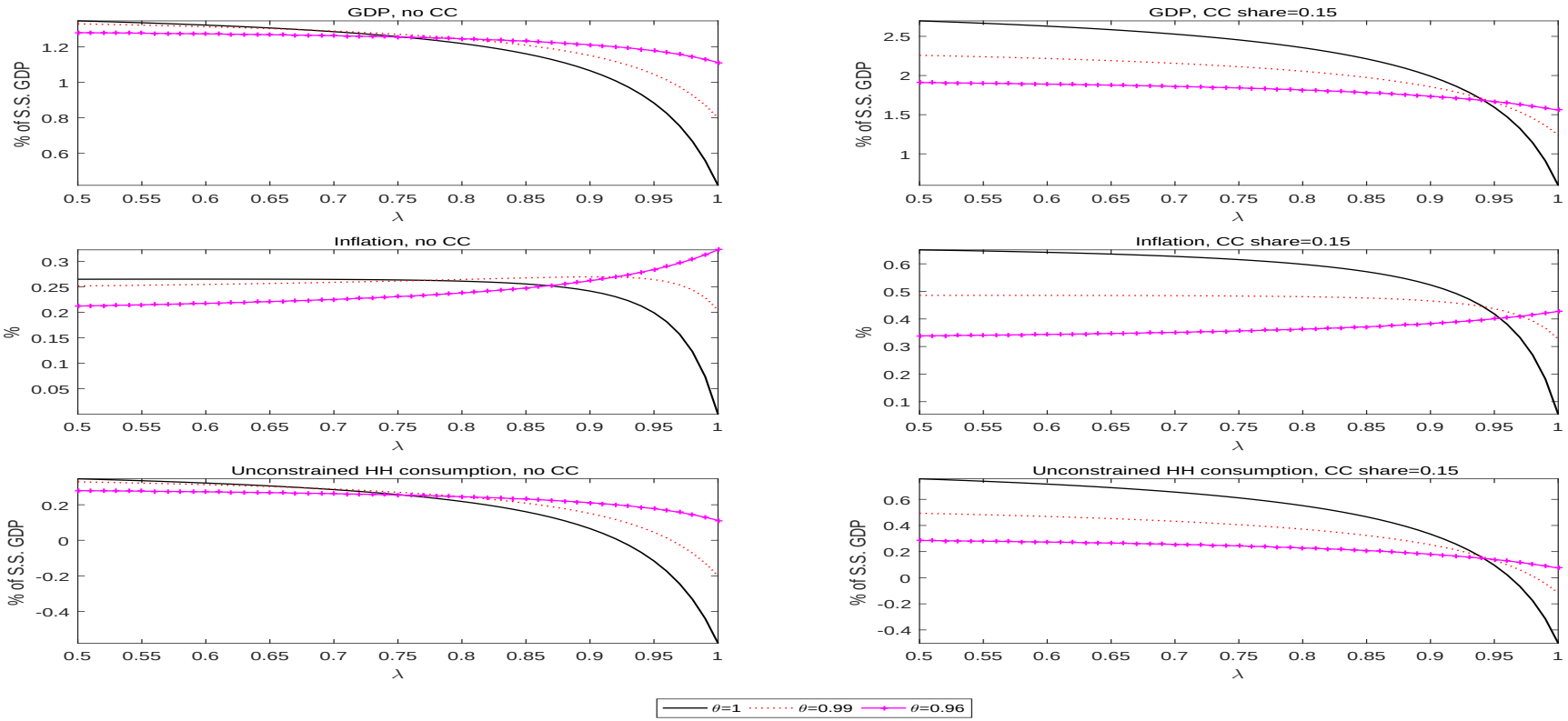


Note: Effects of increasing government spending by 1% of GDP during the high state, with AR(1) coefficient of λ. Table 1.

With POW, less crowding out outside ZLB

- Unconstrained households less responsive to future real interest rates and less responsive to lower steady state consumption.
- With curvature ($\tilde{\sigma}_b > 0$): Increase in government debt increases unconstrained household consumption directly.
- Higher monetary policy interest rate needed to crowd out private spending: long term interest rate increases by more.
- **Do preferences over wealth affect Riccardian equivalence?**Without constrained households and...
  - Linear preferences ($\tilde{\sigma}_b = 0$): Path of taxes and gov. debt does not matter.
  - With curvature ($\tilde{\sigma}_b > 0$): Path of government debt and taxes matters.

With POW, persistence of spending change matters less



Note: Effects of increasing government spending by 1% of GDP during the low state only ($\lambda = 0$).λ=probability that stimulus persists after the economy's exit from the ZLB. $D_L = 8$. All other parameters as in Table 1.

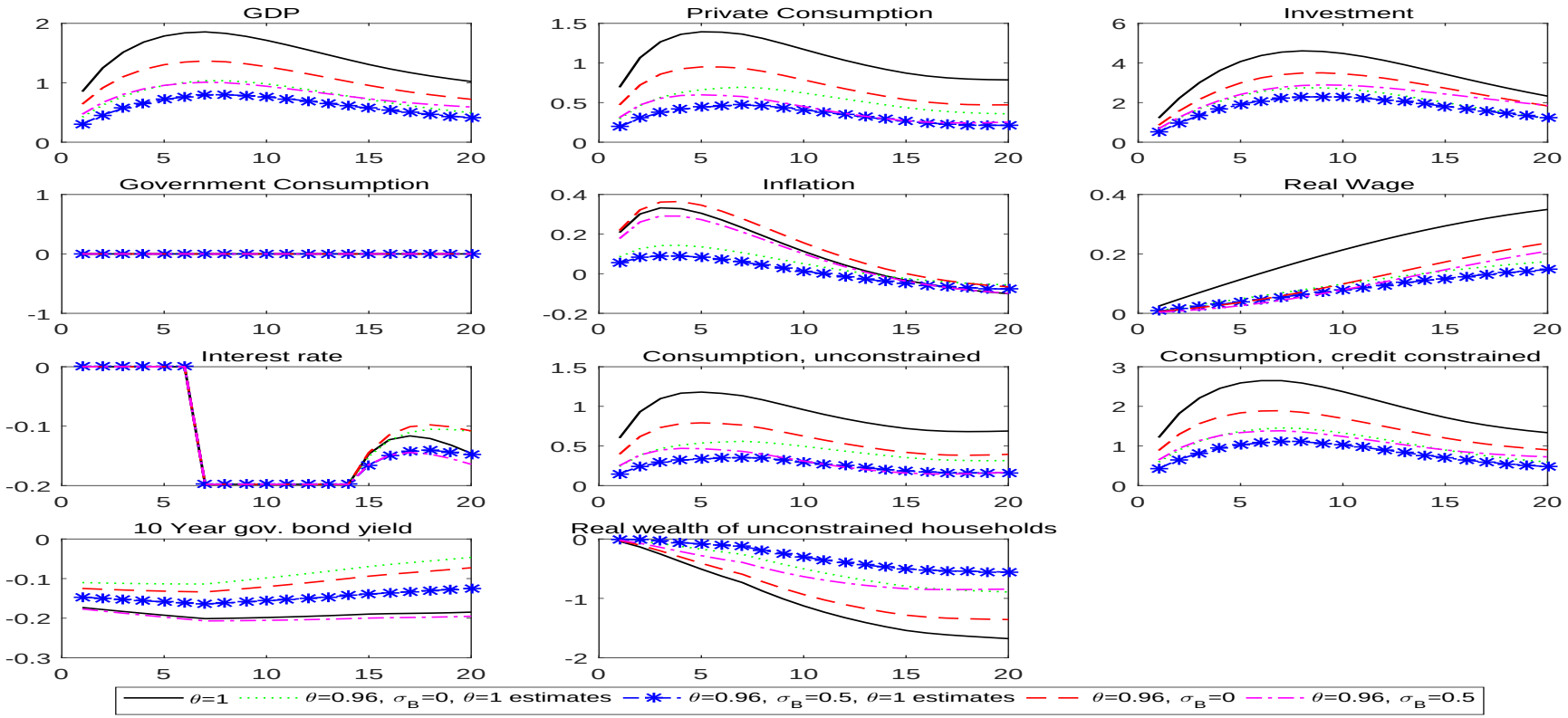
Model overview

- Households:
  - Unconstrained with preferences over wealth (government bonds and financial intermediary deposits).
  - Constrained households 25%.
  - Sticky wages.
- Entrepreneurial sector (Bernanke et al. (1999)):
  - Owns physical capital stock.
  - EFP increases in leverage due to CSV problem.
  - Consumes net worth when dying.
- Retailers produce output using capital and labor: sticky prices.
- Central Bank: Taylor rule.
- Government:
  - Fiscal rule adjusts consumption tax rate in response to gov. debt.

Forward guidance announcement: Assumptions

- Central bank constrained by ZLB for six quarters. Captured by switching off the interest feedback rule.
- Starting in quarter 7, Central Bank voluntarily fixes nominal interest rate at 0.2% (annualized) below its expected level before the announcement.

POW imply smaller effects of FG



Note: The figure displays the effects of FG regarding the short term interest rate in the medium scale model ($D_f = 8$). Vertical axes display percentage deviations of the respective variable from its steady state, unless the respective variable is naturally expressed in percentage points.

Effect of FG increases less in horizon

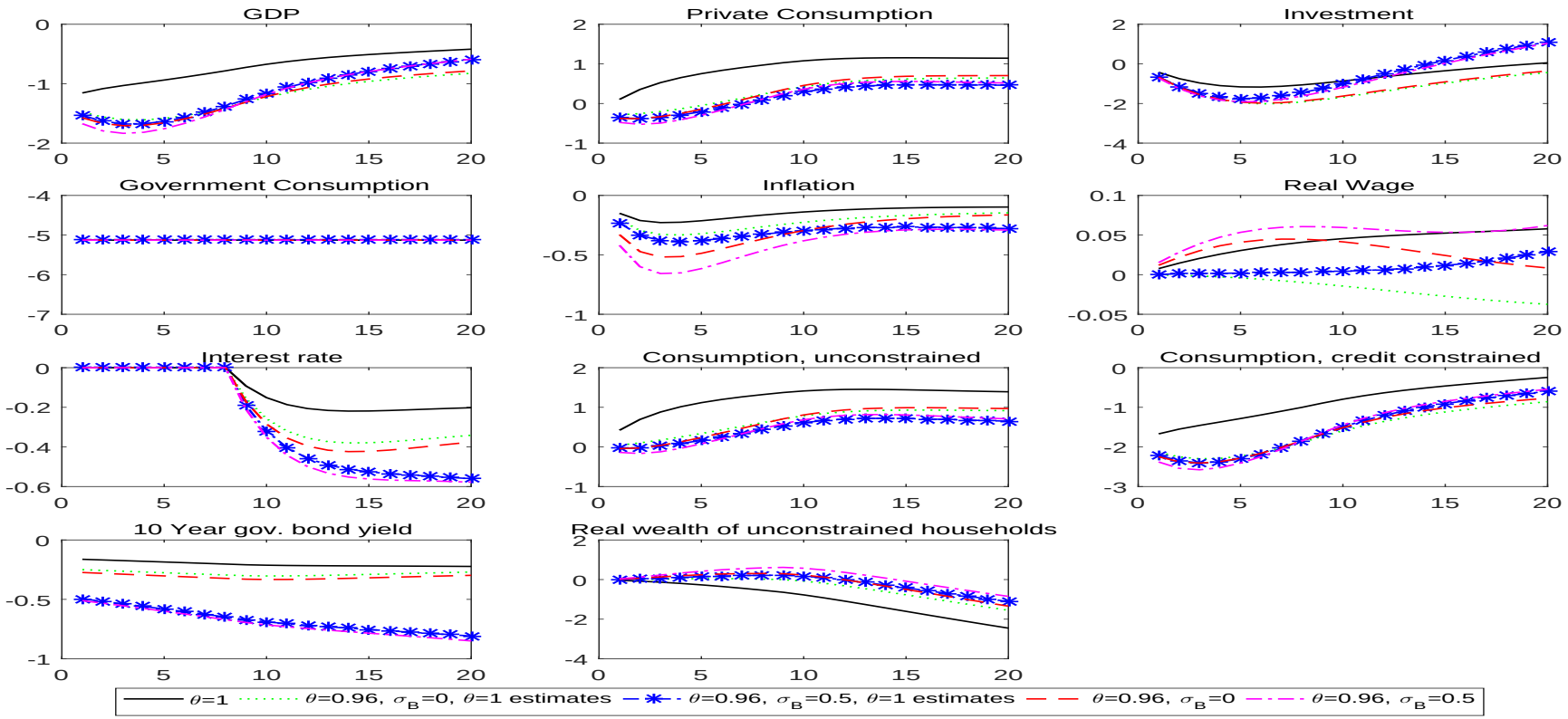
Table: Peak GDP effect of FG for varying duration of fixed interest rate period

Baseline model			
	$D_f = 6$	$D_f = 8$	$D_f = 10$
$\theta = 1$	**1.3**	**1.9**	**2.2**
$\theta = 0.96, \sigma_B = 0$, estimates for$\theta = 1$	0.8	1.0	1.2
$\theta = 0.96, \sigma_B = 0.5$, estimates for$\theta = 1$	0.7	0.8	0.9
$\theta = 0.96, \sigma_B = 0$	**1.0**	**1.4**	**1.7**
$\theta = 0.96, \ \sigma_B = 0.5$	**0.8**	**1.0**	**1.1**

Government spending cut: Assumptions

- Permanent cut in Gov. Consumption.
- Interest feedback rule switched off for 8 quarters.
- Fiscal rule switched off for 8 quarters.

POW: Bigger effect of permanent fiscal contraction



Note: The figure displays the effect of a permanent contraction of government consumption of 1% of GDP ($T_G = \infty$). in the baseline model. Vertical axes display percentage deviations of the respective variable from its steady state, unless the respective variable is naturally expressed in percentage points.