

**Fiscal policy in open economies:
estimates for the Euro area**

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Preliminary. Usual disclaimers hold

Motivation

- Renewed interest in quantifying the macroeconomic impact of fiscal shocks taking into account the open economy dimension
 - US trade deficit and fiscal shocks
 - Fiscal stimulus and current crisis
- Empirical evidence (a) not conclusive on the effects of fiscal stimulus on trade balance, (b) focused on the effects of public expenditure
- Relatively scarce empirical evidence on euro area

Goal of the paper

- To assess the impact of alternative fiscal shocks on the trade balance in the euro area.
- We estimate a Bayesian new Keynesian small open economy DSGE model
- We allow for
 - Keynesian effects of fiscal policy (by adding non-Ricardian households)
 - distortionary taxation
 - multiple fiscal rules

Structure of the talk

- Related literature
- Preview of results
- Model setup
- Results
- Conclusions

Related literature. Evidence on the US

- Erceg, Guerrieri and Gust (2005): a rise in public expenditure of 1 pp of GDP induces a trade balance deterioration by 0.2 pp of GDP, by 0.15 in the case of a reduction of labor income tax rate
- Corsetti and Muller (2006): a typical fiscal expansion has a negligible or even positive effect on the external balance in the US
- Bems, Dedola and Smets (2007): positive spending shock has an immediate negative impact on the external balance (-0.30) For a tax shock the negative impact on net trade ranges from 0.01 for immediate impact to 0.30 for impact after 12 quarters (VAR evidence)
- Kim and Roubini (2008): expansionary fiscal shocks tend to improve current account (VAR evidence)
- Monacelli and Perotti (2009): a rise in government spending tend to induce a trade balance deficit by 0.5 pp of GDP (VAR evidence)

Related literature. Evidence

- Bussiere, Fratzscher and Mueller (2005): a 1 pp reduction in the government deficit leads to less than a 0.1 pp improvement of the current account (panel evidence for 21 OECD countries)
- Corsetti and Muller (2006): after a fiscal expansion, for Canada and the UK, external balance declines substantially (respectively -0.17 and -0.5 on impact).
- Beetsma, Giuliodori and Klaassen (2008): one-percent of GDP increase in public spending produces rising imports and falling exports. The trade balance falls by 0.5% of GDP on impact and a peak fall of 0.8% of GDP (panel VAR evidence).
- Ravn, Schmitt-Grohe and Uribe (2008): slight deterioration of trade balance after public expenditure shock (panel VAR evidence)

Preview of results

- Both an increase in spending and a tax cut have a negative effect on the net trade/GDP ratio
- For an increase in public expenditure, we observe an immediate significant negative impact on the external balance. In the first year the associated effect ranges from 0.1 p.p. (transfers) to 0.3 p.p. (public consumption)
- For a reduction of tax rate the negative impact on net trade takes longer to materialize. In the first year the effect ranges from -0.4 p.p. (labor income tax rate) to about zero (capital income and consumption tax rates)
- The real exchange appreciates by 0.10 percent in the case of the public consumption shock. For all other fiscal shocks, it depreciates

Preview of results/continued

- The output multiplier is 0.6 percent for public consumption shock
- We also find that fiscal shock play a small role in macroeconomic fluctuations

Model setup

- open economy features: similar to Adolfson et al. (2007), Coenen, Christoffel and Warne (2008). Differently from them, stylized but fully endogenous rest of the world economy (size of euro area relatively small)
- fiscal items: as in Coenen and Straub (2005) (non-Ricardian households), Forni, Monteforte and Sessa (2009) (non-Ricardian households and multiple fiscal rules)
- standard new keynesian small open economy model
 - home bias, local currency pricing, incomplete international financial markets
 - (relatively) stylized rest of the world
 - standard set of real and nominal frictions and shocks
 - we allow for keynesian effects of public expenditure (Ricardian and non-Ricardian households)
 - public sector borrowing, distortionary taxation, multiple fiscal rules

Firms (Final goods)

- Consumption bundle

$$C_t = \left[a_{HC}^{\frac{1}{\eta}} (C_{H,t})^{\frac{\eta-1}{\eta}} + (1 - a_{HC})^{\frac{1}{\eta}} (C_{F,t})^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}} \quad (1)$$

$$C_{H,t} = \left[\int_0^n C_{H,t}(h) \frac{\theta_{H,t}^{-1}}{\theta_{H,t}} dh \right]^{\frac{\theta_{H,t}}{\theta_{H,t}-1}}, \quad C_{F,t} = \left[\int_n^1 C_{F,t}(f) \frac{\theta_{F,t}^{-1}}{\theta_{F,t}} df \right]^{\frac{\theta_{F,t}}{\theta_{F,t}-1}} \quad (2)$$

- Investment bundle

$$I_t = \left[a_{HI}^{\frac{1}{\eta}} (I_{H,t})^{\frac{\eta-1}{\eta}} + (1 - a_{HI})^{\frac{1}{\eta}} (I_{F,t})^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}} \quad (3)$$

$$I_{H,t} = \left[\int_0^n I_{H,t}(h) \frac{\theta_{H,t}^{-1}}{\theta_{H,t}} dh \right]^{\frac{\theta_{H,t}}{\theta_{H,t}-1}}, \quad C_{F,t} = \left[\int_n^1 I_{F,t}(f) \frac{\theta_{F,t}^{-1}}{\theta_{F,t}} df \right]^{\frac{\theta_{F,t}}{\theta_{F,t}-1}} \quad (4)$$

- Public expenditure bundle

$$G_t = \left[\int_0^n G_{H,t}(h) \frac{\theta_{H,t}^{-1}}{\theta_{H,t}} dh \right]^{\frac{\theta_{H,t}}{\theta_{H,t}-1}} \quad (5)$$

Firms (intermediate goods)

- Production function

$$Y_{H,t}(h) = z_t^{1-\alpha} \epsilon_t K_{t-1}(h)^\alpha L_t(h)^{1-\alpha} \quad (6)$$

$$L_t(h) = \left[\int_0^n L_t(i)^{\frac{\theta_{L,t}-1}{\theta_{L,t}}} di \right]^{\frac{\theta_{L,t}}{\theta_{L,t}-1}} \quad (7)$$

- Price adj. costs

$$AC_{H,t}(h) \equiv \frac{\kappa_H}{2} \left(\frac{P_{H,t}(h) / P_{H,t-1}(h)}{(\pi_{H,t-1})^{\alpha_H} (\bar{\pi}_t)^{1-\alpha_H}} - 1 \right)^2 Y_{H,t} \quad (8)$$

$$AC_{H,t}^*(h) \equiv \frac{\kappa_H^*}{2} \left(\frac{P_{H,t}^*(h) / P_{H,t-1}^*(h)}{(\pi_{H,t-1}^*)^{\alpha_H} (\bar{\pi}_t^*)^{1-\alpha_H}} - 1 \right)^2 Y_{H,t}^* \quad (9)$$

Ricardian Households

- Preferences

$$E_t \left[\sum_{k=0}^{\infty} \beta^k \left(\xi_{t+k}^C \log(C_{t+k}(j)) - bC_{J,t+k-1} - \frac{\xi_{t+k}^L}{1 + \sigma_L} (L_{t+k}(j))^{1+\sigma_L} \right) \right] \quad (10)$$

- Budget constraint

$$\begin{aligned} & B_t(j) + S_t B_t^*(j) - B_{t-1}(j) R_{t-1} - S_t B_{t-1}^*(j) R_{t-1}^* \Phi(a_{t-1}, \tilde{\phi}_{t-1}) \\ & = (1 - \tau_t^w) W_t(j) N_t(j) + (1 - \tau_t^k) \left(R_{K,t} K_{i,t-1}(j) + \frac{\Pi_t}{n(1 - \lambda^{NR})} \right) \\ & \quad + TR_t(j) - (1 + \tau_t^c) P_{C,t} C_{i,t}(j) - P_{I,t} I_{i,t}(j) - \Gamma_W(j) \end{aligned}$$

Ricardian Households

- Capital accumulation

$$K_t(j) = (1 - \delta) K_{t-1}(j) + \left(1 - \frac{\gamma_I}{2} \left(\frac{\Upsilon_t I_t(j)}{I_{t-1}(j)} - 1\right)^2\right) I_t(j) \quad (11)$$

- Wage adj. costs

$$\Gamma_W(j) \equiv \frac{\kappa_W}{2} \left(\frac{W_t(j)/W_{t-1}(j)}{\pi_{W,t-1}^{\alpha_W} \bar{\pi}_t} - 1\right)^2 L_t \quad (12)$$

Non-Ricardian households and monetary authority

- Budget constraint of non-Ricardian households

$$P_t C_t(j') = (1 - \tau_t^W) W_t(j') L_t(j') + T R_t(j') \quad (13)$$

- Monetary policy rule

$$\hat{R}_t = \rho_R \hat{R}_{t-1} + (1 - \rho_R) (\hat{\pi}_t^C + r_\pi (\hat{\pi}_{t-1}^C - \hat{\pi}_t^C) + r_y \hat{y}_t) + r_{\Delta\pi} \Delta \hat{\pi}_t^C + r_{\Delta y} \Delta \hat{y}_t + \varepsilon_{R,t}$$

Fiscal authority

- Budget constraint

$$[B_t^G - B_{t-1}^G R_{t-1}] = P_{H,t} (1 + \tau_t^C) G_t + TR_t - T_t \quad (14)$$

$$T_t \equiv \tau_t^w W_t n L_t + \tau_t^c (P_t (1 - \lambda^{NR}) n C_t + P_t \lambda^{NR} n C_t + P_{H,t} G_t) + \tau_t^k R_t^k (1 - \lambda^{NR}) K_{t-1} + \tau_t^k \Pi_t$$

- Fiscal rules

$$\hat{g}_t = \rho_g \hat{g}_{t-1} + (1 - \rho_g) \eta_g \widetilde{B}_t + \varepsilon_{g,t} \quad (15)$$

$$\widehat{tr}_t = \rho_{tr} \widehat{tr}_{t-1} + (1 - \rho_{tr}) \eta_{tr} \widetilde{B}_t + \varepsilon_{tr,t} \quad (16)$$

$$\hat{\tau}_t^w = \rho_{\tau^w} \hat{\tau}_{t-1}^w + (1 - \rho_{\tau^w}) \eta_{\tau^w} \widetilde{B}_t + \hat{\varepsilon}_{\tau^w,t} \quad (17)$$

- Exogenous fiscal items

$$\hat{\tau}_t^k = \rho_{\tau^k} \hat{\tau}_{t-1}^k + \hat{\varepsilon}_t^{\tau^k} \quad (18)$$

$$\hat{\tau}_t^c = \rho_{\tau^c} \hat{\tau}_{t-1}^c + \hat{\varepsilon}_t^{\tau^c} \quad (19)$$

Rest of the world

- stylized setup
- Euler equation for aggregate demand
- aggregate demand bundles similar to those in the Home country
- labor is the only productive factor
- adjustment costs on goods prices similar to those in the Home country
- standard monetary policy rule
- markup, demand, monetary policy shocks

Calibrated parameters

Parameter	Description	Value
η	Substitution elasticity btw tradables	4.5
σ^L	Labor supply elasticity	2.0
$1 - a_{HI}$	Imported investment share	0.40
$1 - a_H$	Imported consumption share	0.32
τ^w	Labor income tax rate	0.45
τ^k	Capital and dividend income tax rate	0.19
τ^c	Private consumption tax rate	0.16
λ^{NR}	Share of rule-of-thumb agents	0.35
n	Size of the home economy	0.20

Implied steady state relationships

Parameter	Description	Value
$C/(p_Y Y)$	Consumption-to-output ratio	0.59
$I/(p_Y Y)$	Investment-to-output ratio	0.23
$M(X)/(p_Y Y)$	Imports (Exports)-to-output ratio	0.16
$B^F/(p_Y Y)$	Net foreign asset	0.00
$B^G/(p_Y Y)$	Public debt	2.40
$bb/(p_Y Y)$	Public deficit-to-output ratio	0.00
$P_H G/(p_Y Y)$	Public expenditure-to-output ratio	0.20
$tr/(p_Y Y)$	Lump sum transfers-to-output ratio	0.18
$\tau^w wl/(p_Y Y)$	Revenues on labor income tax-to-output ratio	0.23
$\tau^{r^k} r^k k/(p_Y Y)$	Rev. on capital income tax-to-output ratio	0.04
$\tau^c C/(p_Y Y)$	Rev. on consumption tax-to-output ratio	0.07

Data

Euro area observables

- real GDP
- total investment
- area imports
- consumption deflator
- GDP deflator
- nominal interest rate
- private consumption
- exports
- employment
- investment deflator
- compensation of employees
- real effective exchange rate

rest of the world observables

- foreign GDP
- foreign nominal interest rate
- foreign GDP deflator

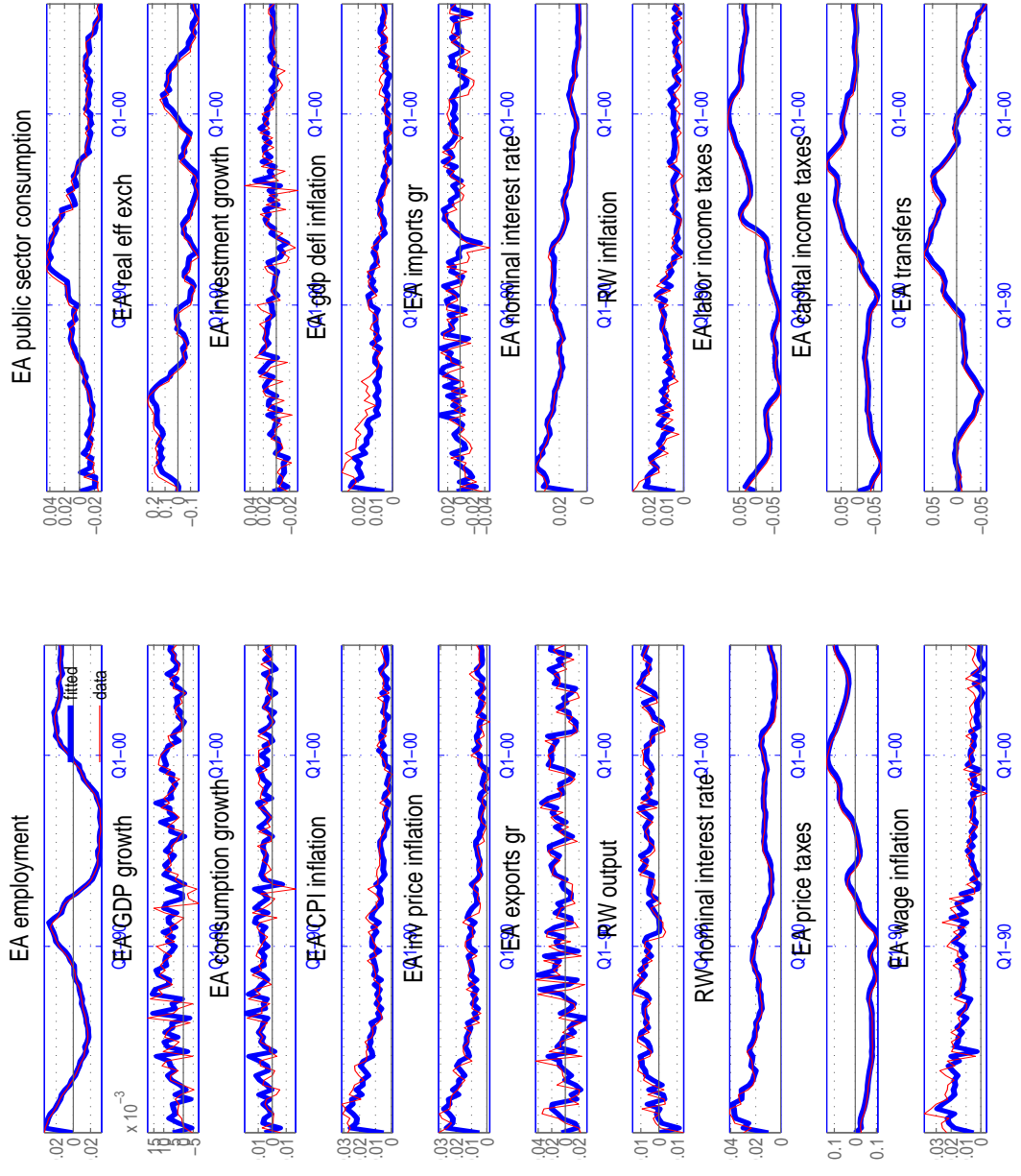
fiscal policy observables

- government consumption
 - government transfers
 - capital income tax rate
 - labor income tax rate
 - price tax rate
-

Data

- data on fiscal variables are from Forni, Monteforte and Sessa (2009), data on remaining variables from AWM dataset
- sample period 1980Q1-2005Q4
- data treatment
 - fiscal items and employment are linearly detrended
 - interest rates, inflation rates and real exchange rate are expressed as log-deviation from mean
 - remaining variables are expressed in log-difference terms (for exports and imports: before, excessive trend with respect to GDP is removed)
- Bayesian estimation of the log-linearized model, with prior distribution as in Adolfson et al (2007)

Fit. Data (red) and predicted values from the model (blue)



Results. Posterior estimates. Preferences and monetary policy (Euro area)

prior mean posterior mean

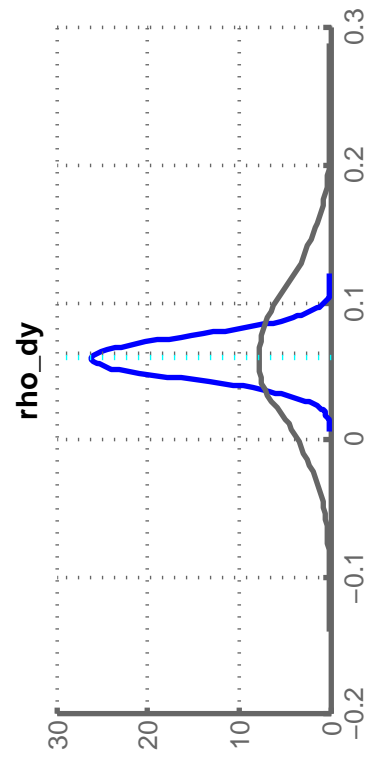
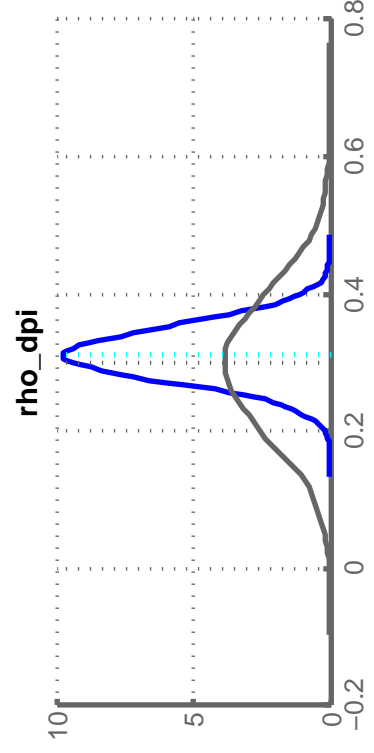
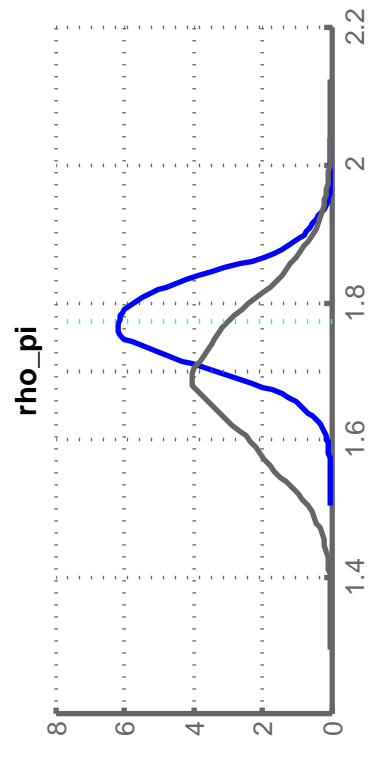
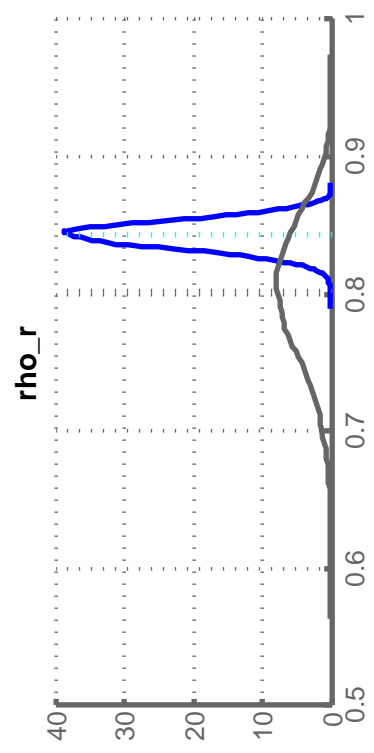
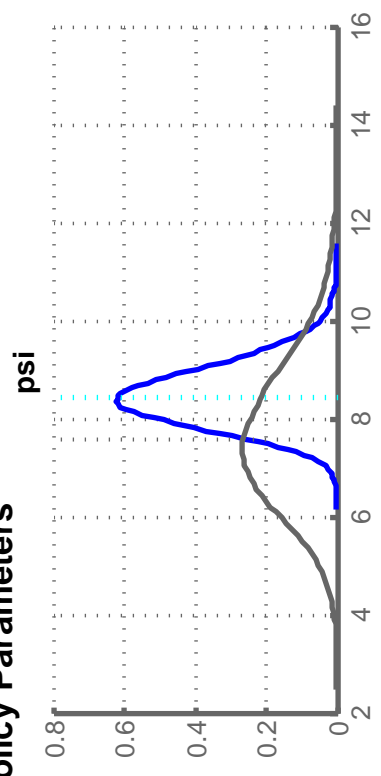
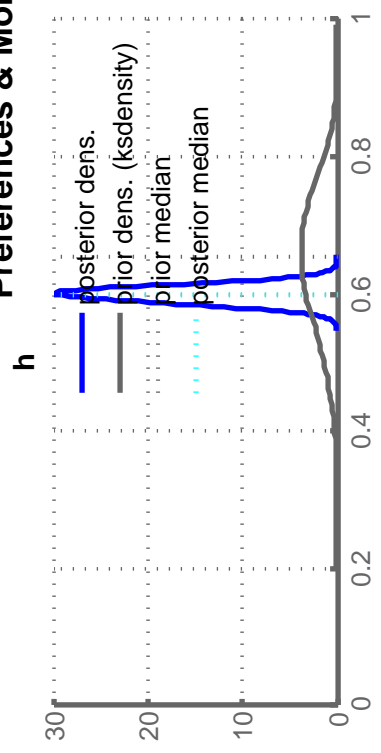
Preferences

Habit in formation	0.65	0.60
Invest. adj. cost	7.7	8.52

Monetary policy

Interest rate smoothing	0.8	0.84
Inflation response	1.7	1.78
Difference inflation response	0.3	0.31
Output response	0.125	-0.03
Difference output response	0.0625	0.06

Preferences & Monetary Policy Parameters



Results. Posterior estimates. Nominal rigidities (Euro area)

prior mean posterior mean

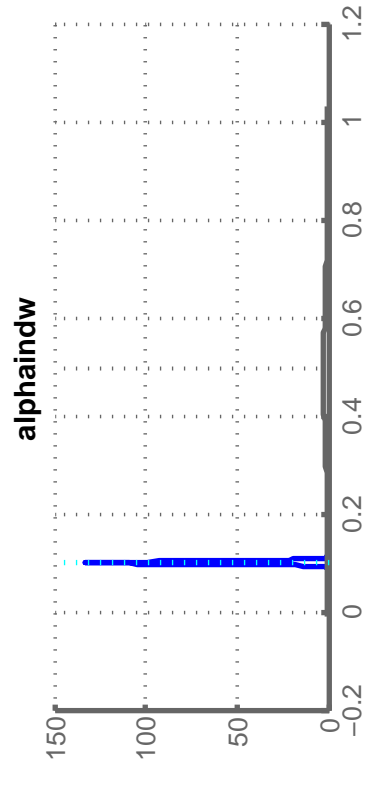
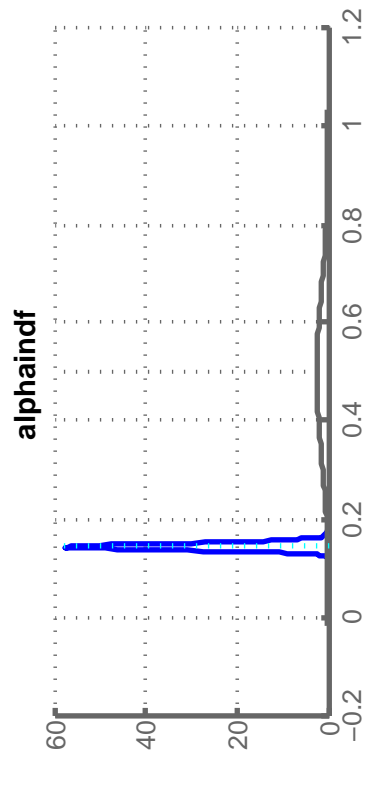
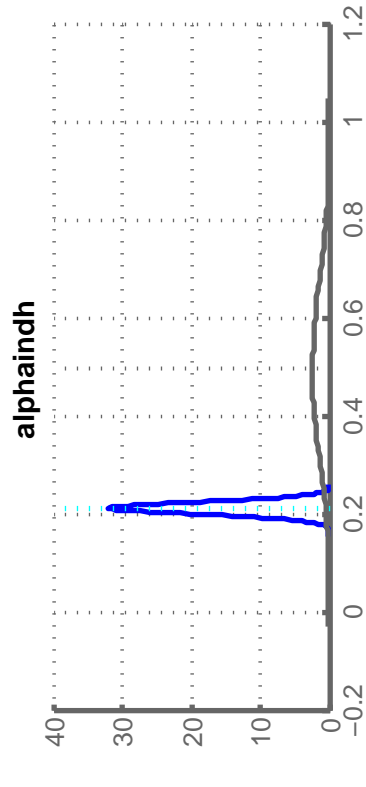
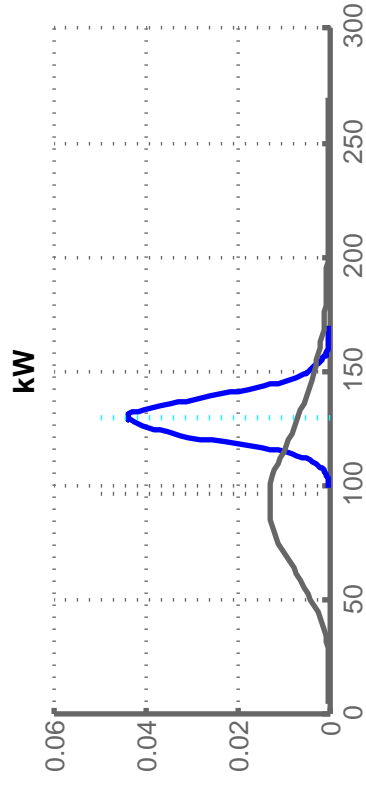
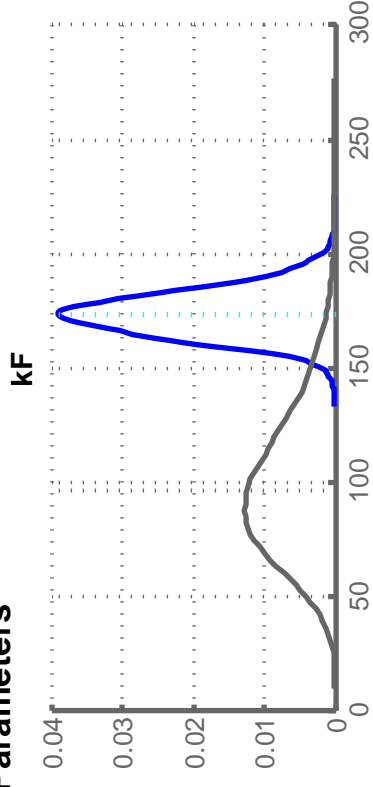
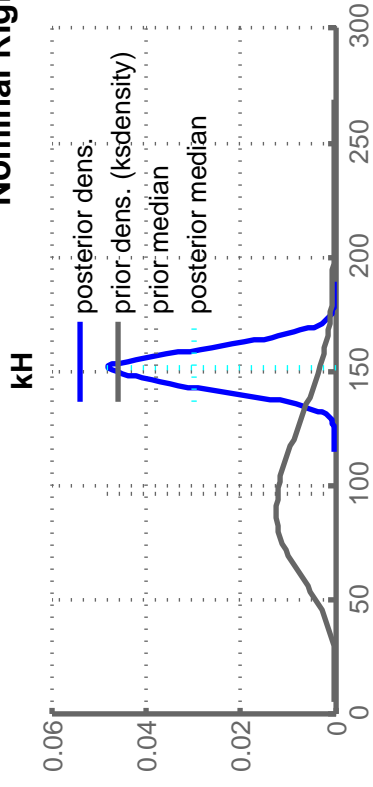
Rotemberg adjustment costs

Domestic prices	100	151.52
Import prices	100	173.83
Wages	100	130.36

Indexation

Index. dom. prices	0.5	0.215
Index. imp. prices	0.5	0.144
Index. wages	0.5	0.104

Nominal Rigidities Parameters



Results. Posterior estimates. Fiscal policy

prior mean posterior mean

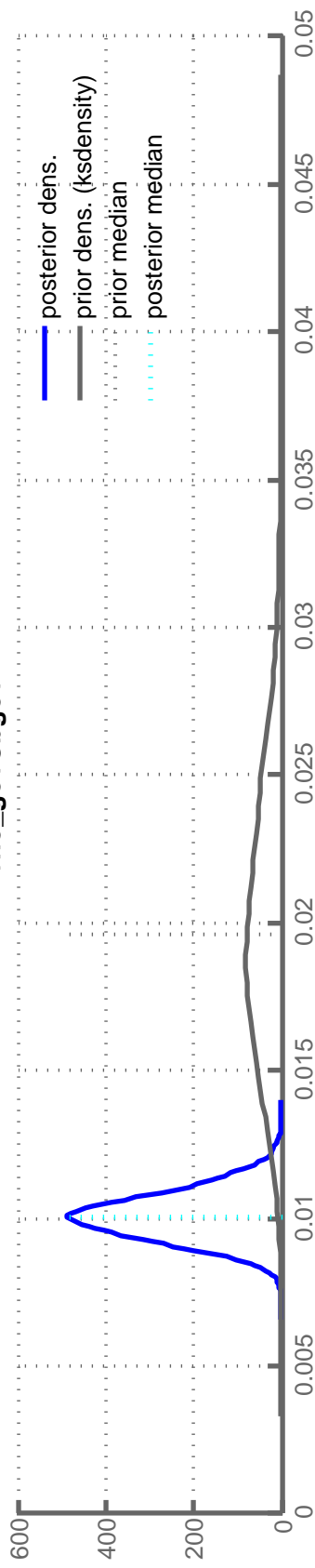
Persistence

Public expenditure	0.8	0.984
Lump-sum transfers	0.8	0.986
Wage tax	0.8	0.988
Capital income tax rate	0.8	0.980
Consumption tax rate	0.8	0.979

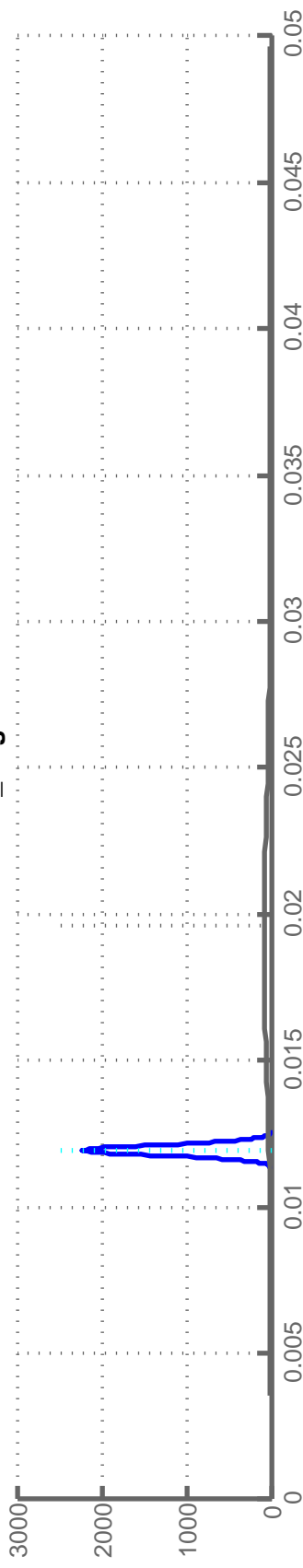
Debt response

Public expenditure	0.020	0.010
Lump-sum transfers	0.020	0.012
Wage tax rate	0.020	0.007

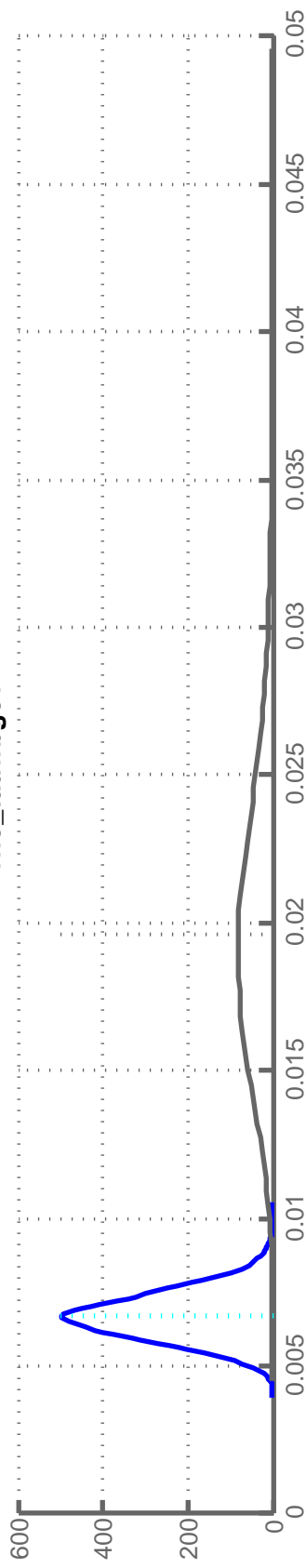
Fiscal Items Parameters



ρ_{trbgov}



ρ_{tauwbgov}



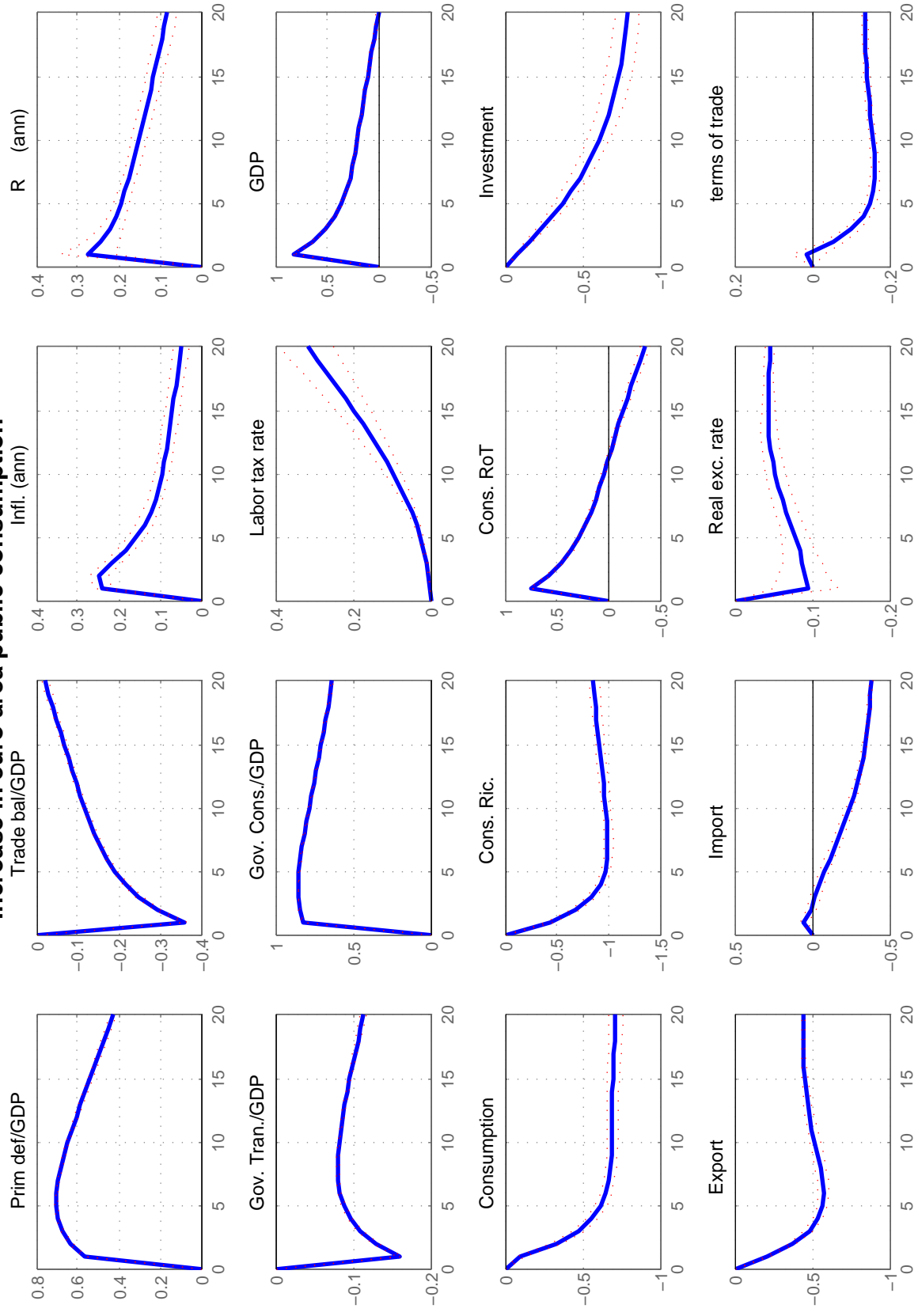
Results. Posterior estimates. Fiscal policy

	Benchmark	Low elast.	High NR share	Closed economy
Expenditure ρ_g	0.984	0.984	0.985	0.899
Lump-sum tr. ρ_{tr}	0.986	0.985	0.986	0.982
Wage tax ρ_{τ^w}	0.988	0.988	0.988	0.921
Expenditure η_{g_b}	0.010	0.011	0.010	0.017
Lump-sum tr. η_{tr_b}	0.012	0.013	0.012	0.015
Wage tax $\eta_{\tau_b^w}$	0.007	0.007	0.007	0.028
Expenditure σ_g	0.005	0.005	0.005	0.013
Lump-sum tr. σ_{tr}	0.005	0.005	0.005	0.005
Wage tax σ_{τ^w}	0.006	0.006	0.006	0.005

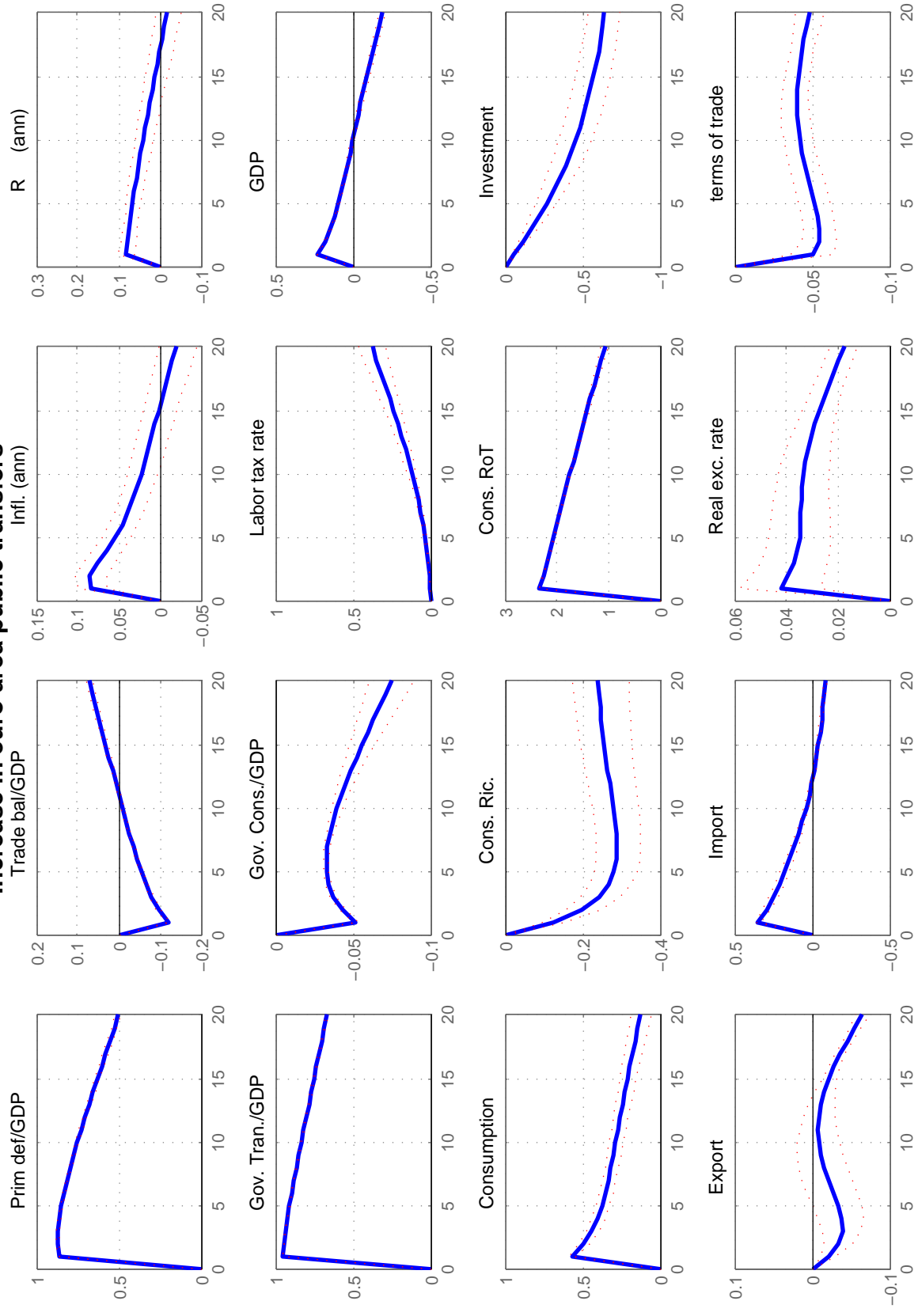
Results. Posterior estimates. Fiscal policy

	Benchmark	Low elast.	High NR share	Closed economy
Capital income tax rate ρ_{τ^k}	0.980	0.980	0.980	0.978
Cons. tax rate ρ_{τ^c}	0.979	0.978	0.978	0.976
Capital income tax rate σ_{τ^k}	0.009	0.009	0.009	0.009
Cons. tax rate σ_{τ^c}	0.007	0.007	0.007	0.007
Log-likelihood	-5180.79	-5622.41	-5164.39	-4275.96

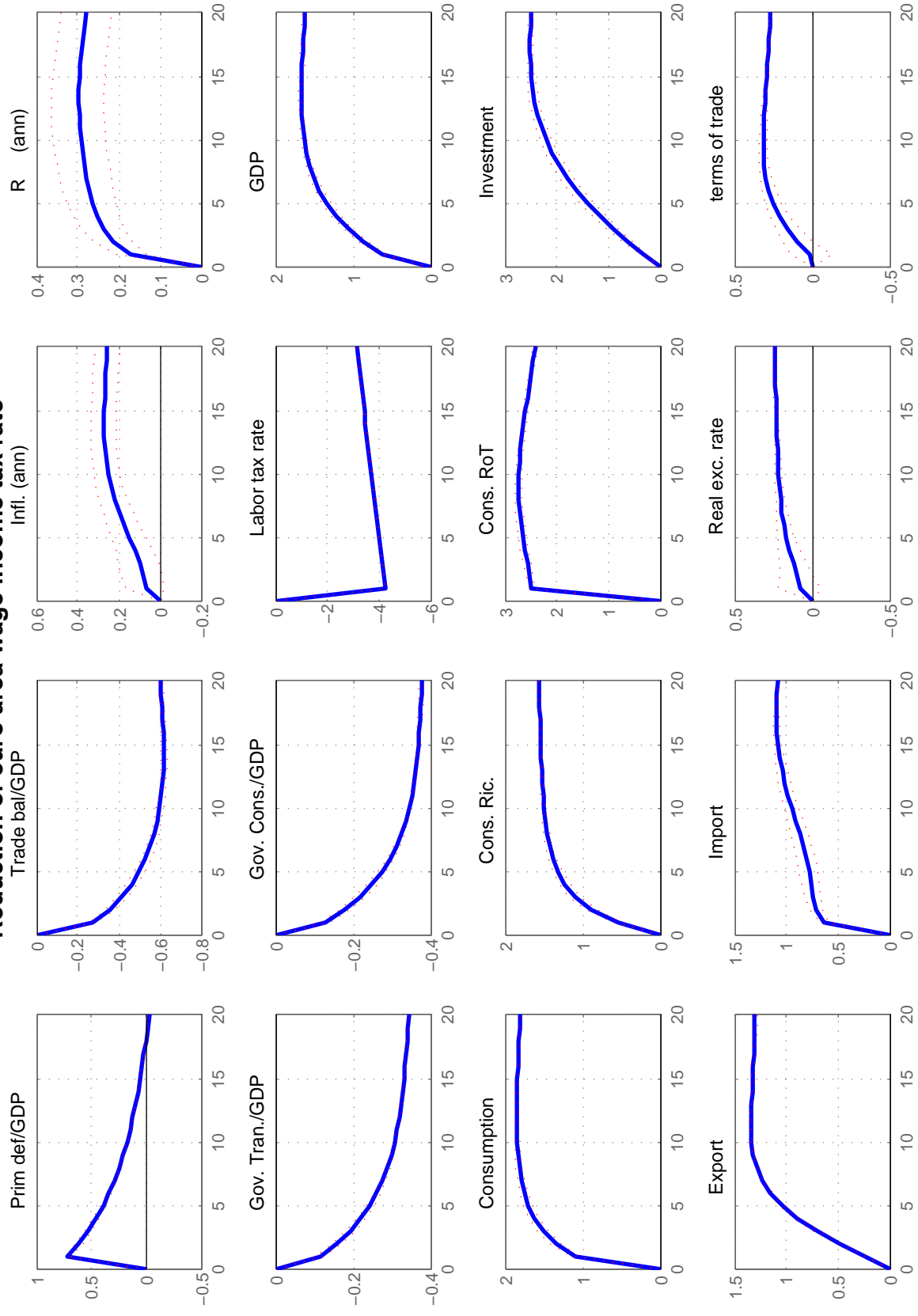
Increase in euro area public consumption



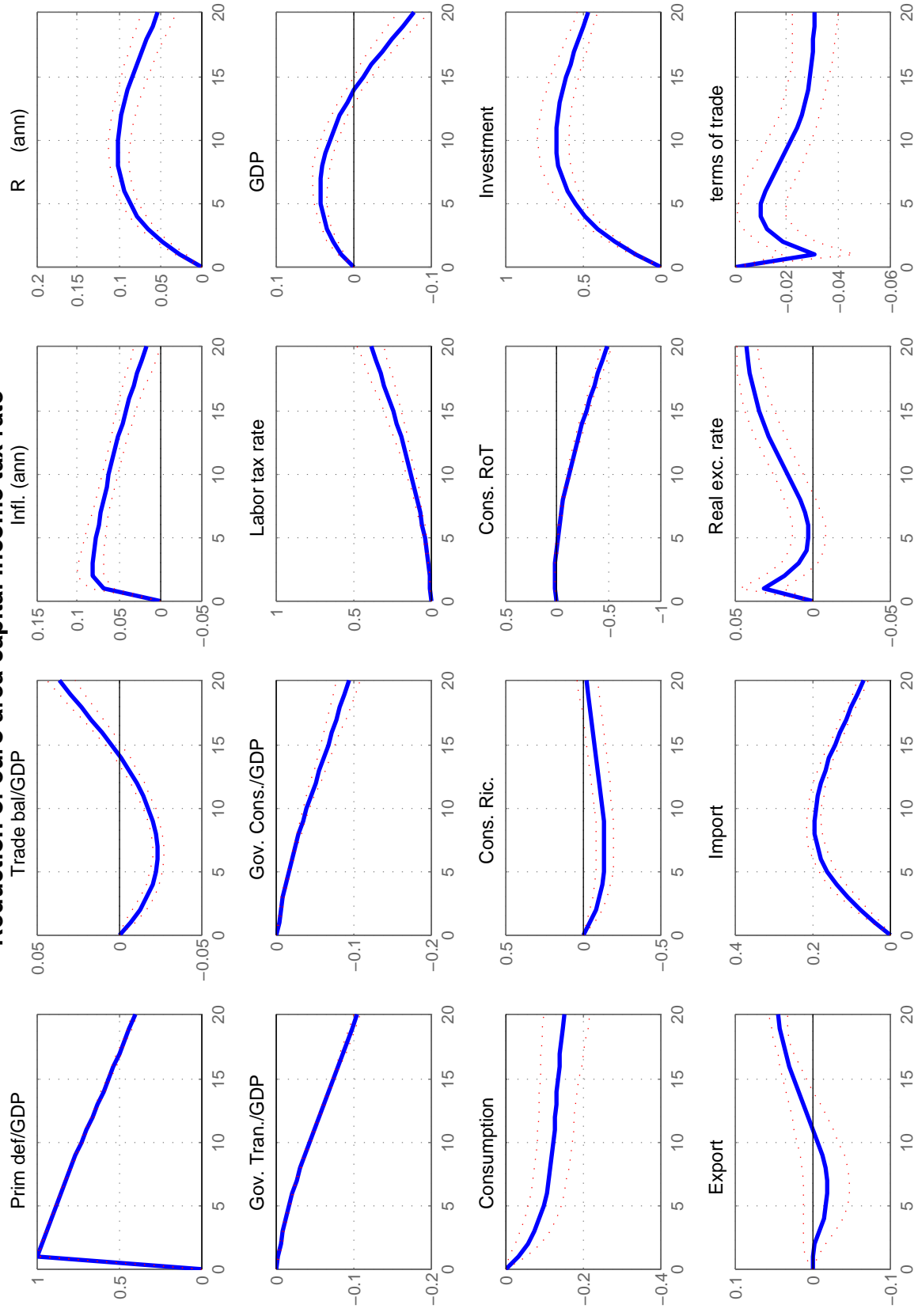
Increase in euro area public transfers



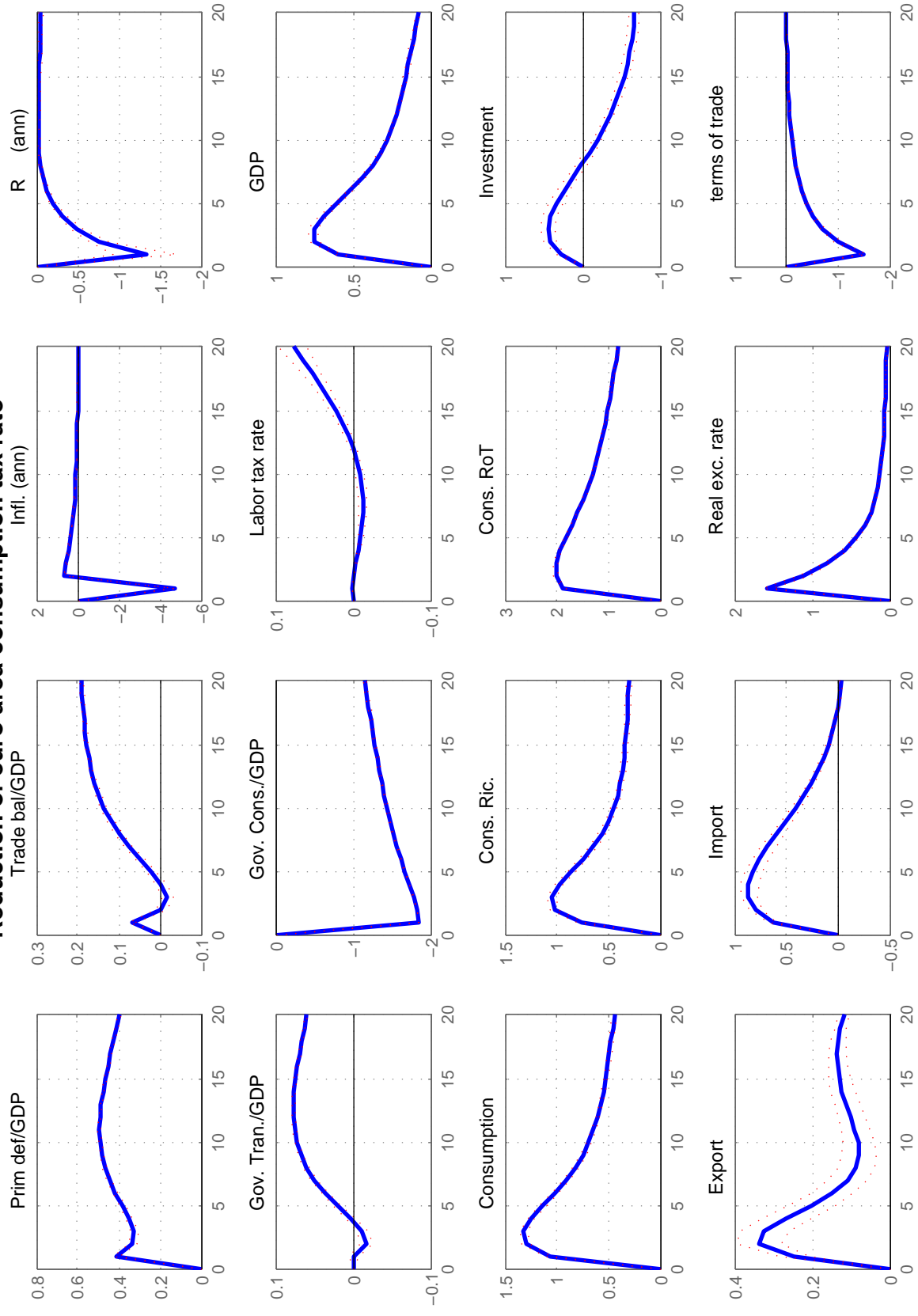
Reduction of euro area wage income tax rate



Reduction of euro area capital income tax rate

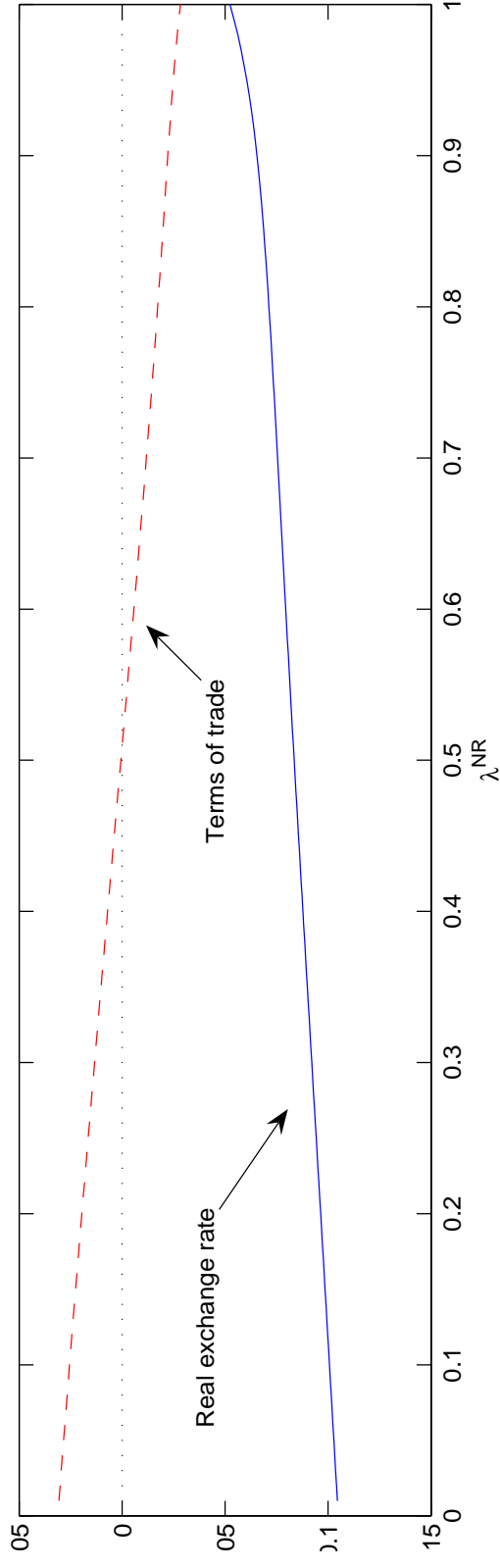
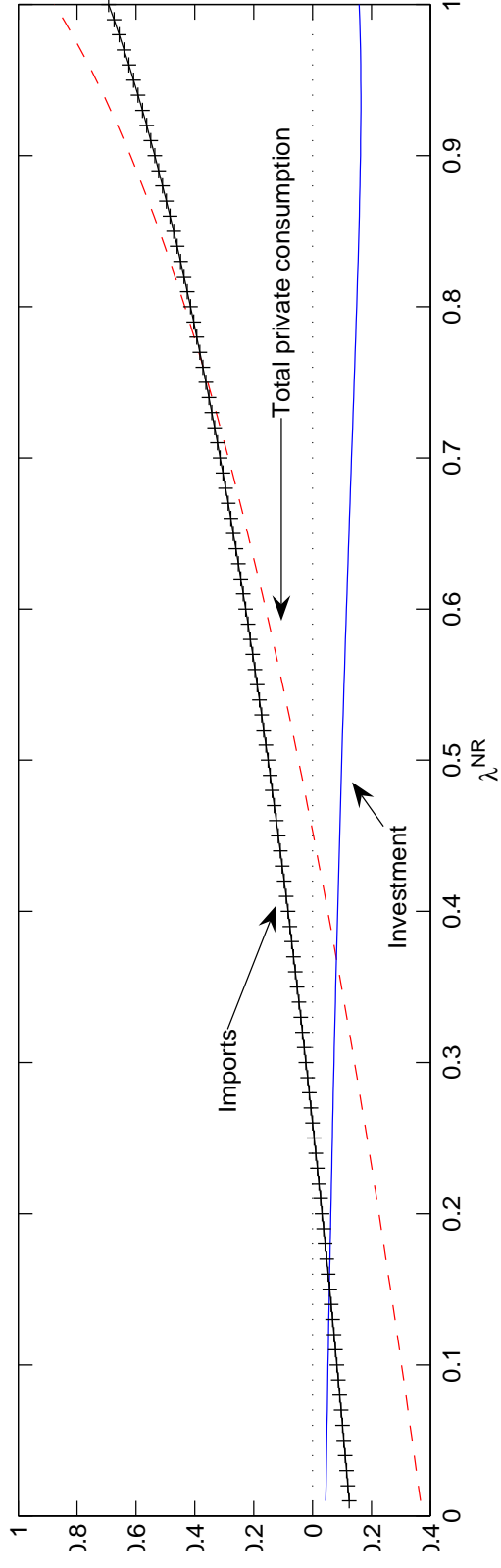


Reduction of euro area consumption tax rate

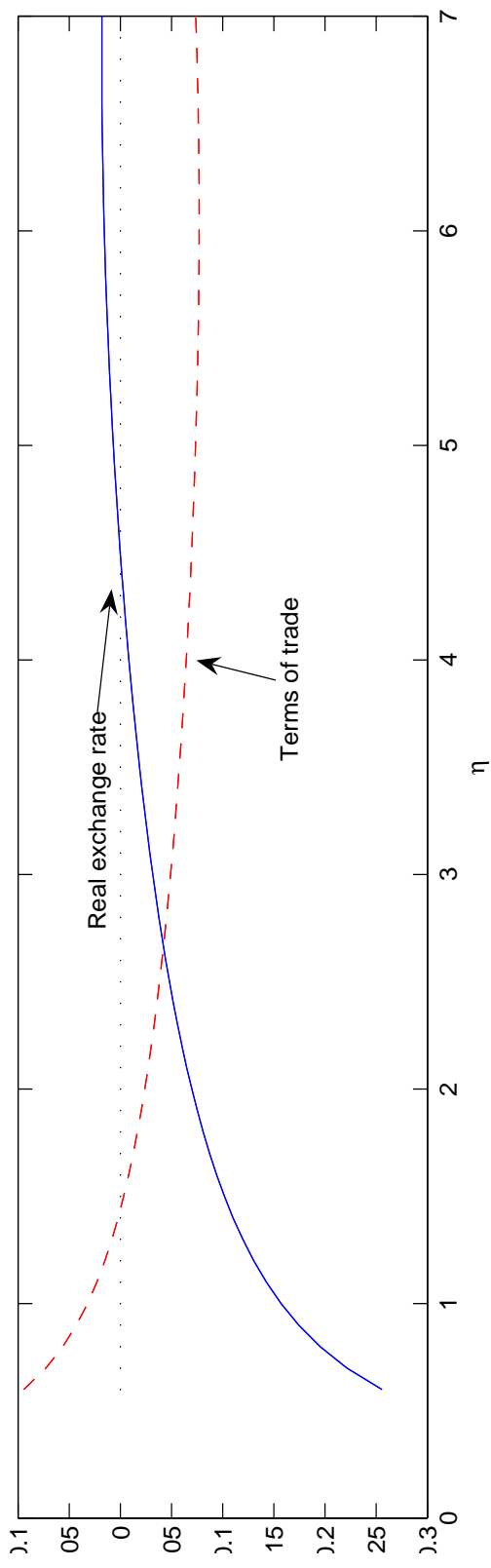
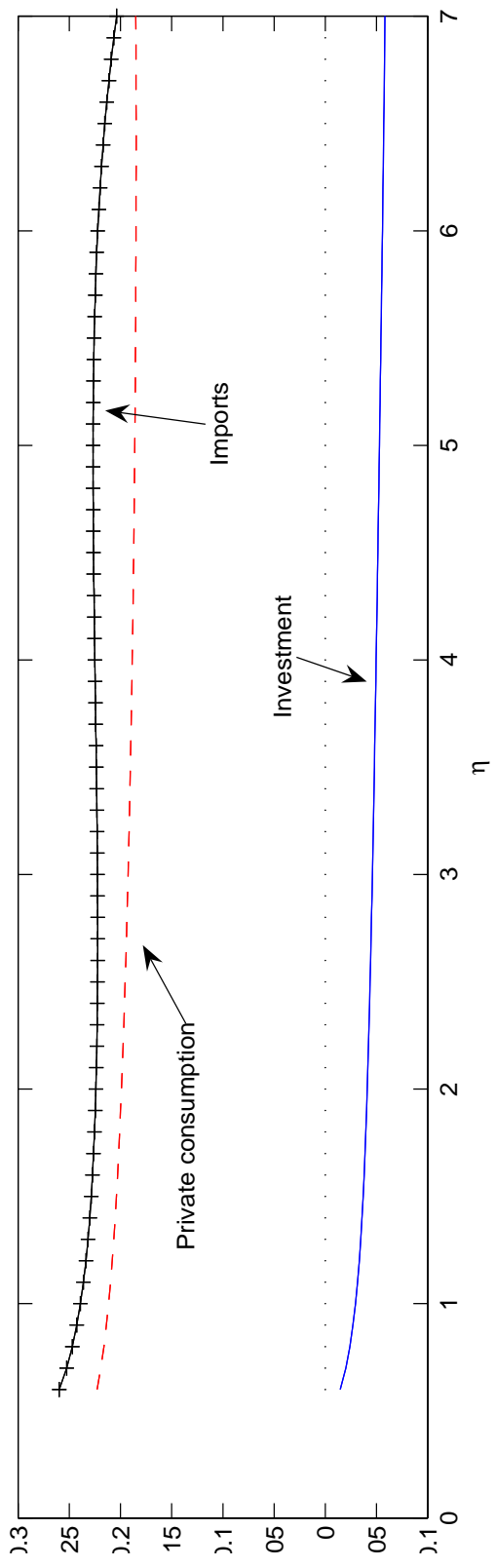


Results. Fiscal multipliers

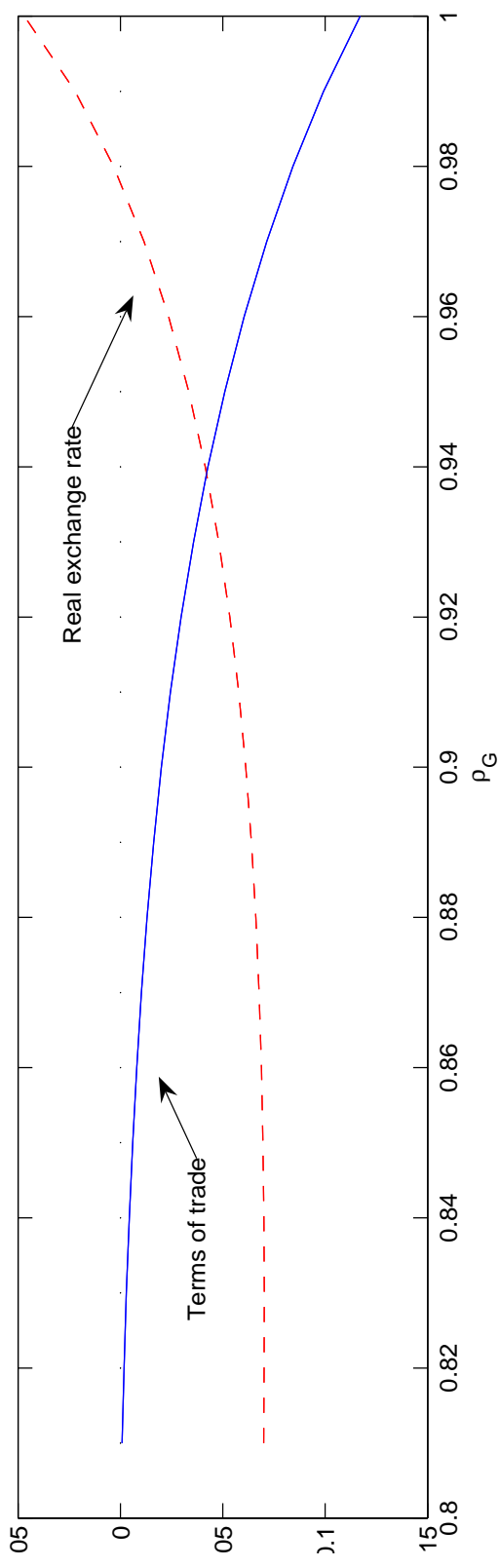
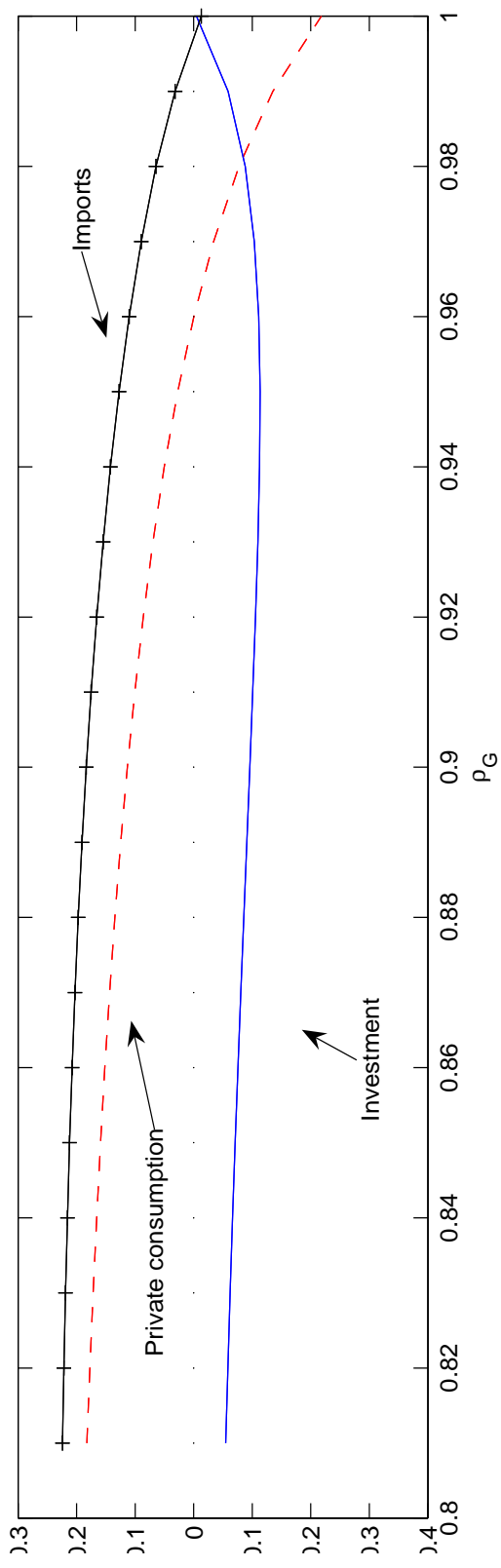
Increase in	Quarters	TB	Output	X	M	RER	ToT
pub. expend.	1	-0.36	0.83	-0.21	0.05	-0.10	0.02
	4	-0.28	0.60	-0.40	0.00	-0.09	-0.07
pub. transfers	1	-0.12	0.23	-0.02	0.35	0.04	-0.05
	4	-0.09	0.17	-0.03	0.28	0.04	-0.05
Reduction of							
labor tax rate	1	-0.27	0.62	0.23	0.63	0.08	0.01
	4	-0.38	0.94	0.58	0.71	0.11	0.12
capital tax rate	1	-0.01	0.01	0.00	0.04	0.03	-0.03
	4	-0.01	0.03	-0.01	0.09	0.02	-0.02
cons. tax rate	1	0.07	0.60	0.25	0.63	1.59	-1.50
	4	0.01	0.70	0.29	0.79	1.03	-0.93



Results. Sensitivity - Impact responses to a public expenditure shock of main variables for different values of the non-Ricardian households share



Results. Sensitivity - Impact responses to a public expenditure shock of main variables for different values of the elasticity of substitution between domestic and imported goods



Results. Sensitivity - Impact responses to a public expenditure shock of main variables for different values of the shock persistence

Concluding remarks

- Results are still preliminary.
- To better understand:
 - the issue of (estimated) strong persistence of fiscal shocks (we find it only in the open economy model, not in the closed model)
 - composition of public expenditure bundle
 - preferences (GHH)