

# Fiscal stimulus in a small euro area economy

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# Outline

## Motivation

## The model

A DSGE called *PESSOA*

Households

The fiscal block

Model calibration

A stylized example, using government consumption ( $G$ )

## Multipliers without credibility issues

Temporary, without implementation lags

Temporary, with implementation lags

A permanent increase in  $G$

## Multipliers with credibility issues

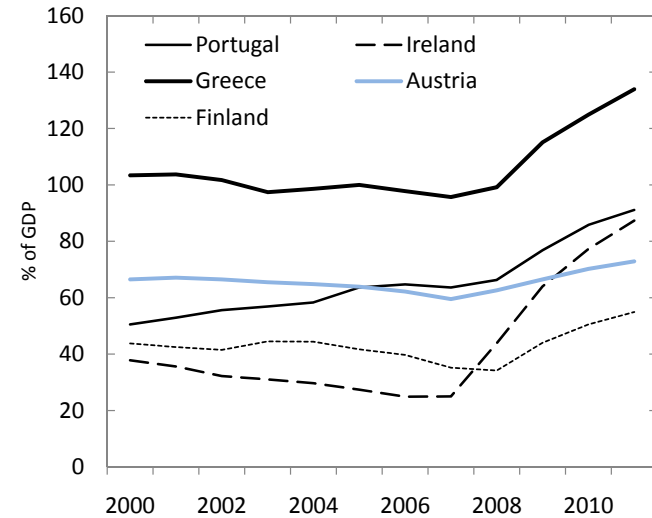
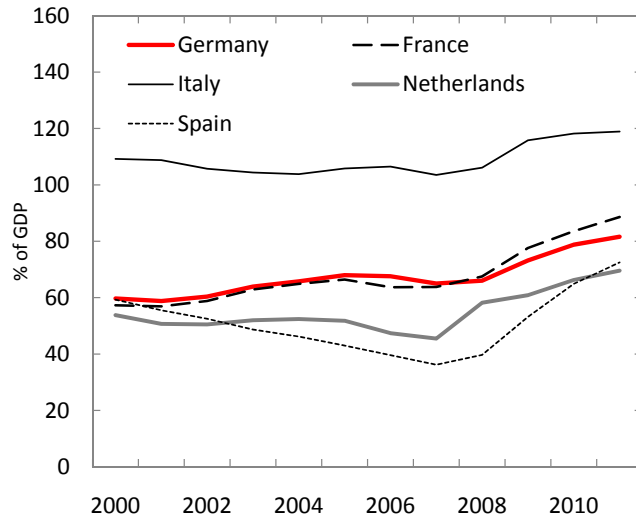
A temporary increase in  $G$ , taken initially as permanent

A temporary increase in  $G$  with higher risk premium

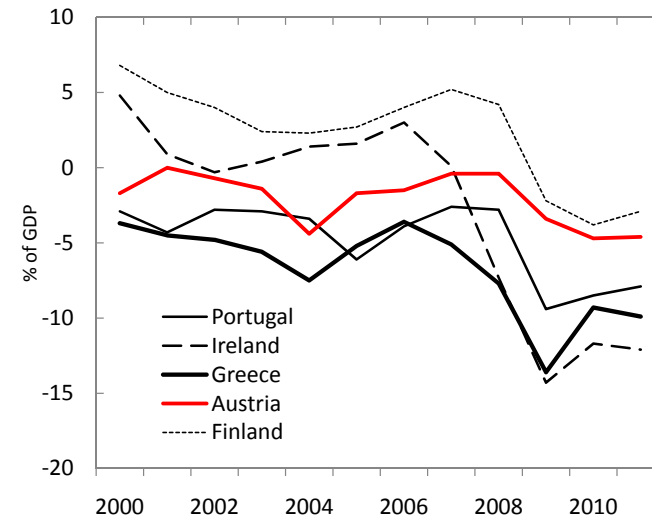
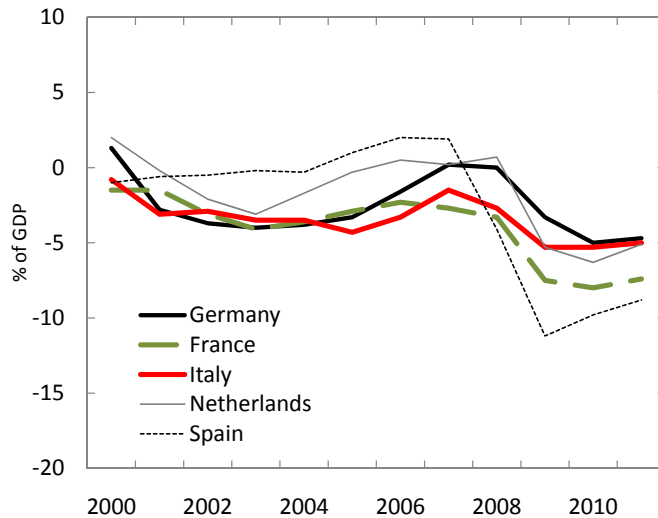
## Conclusions

# Motivation (EC - May 10 forecasts)

## DEBT/GDP

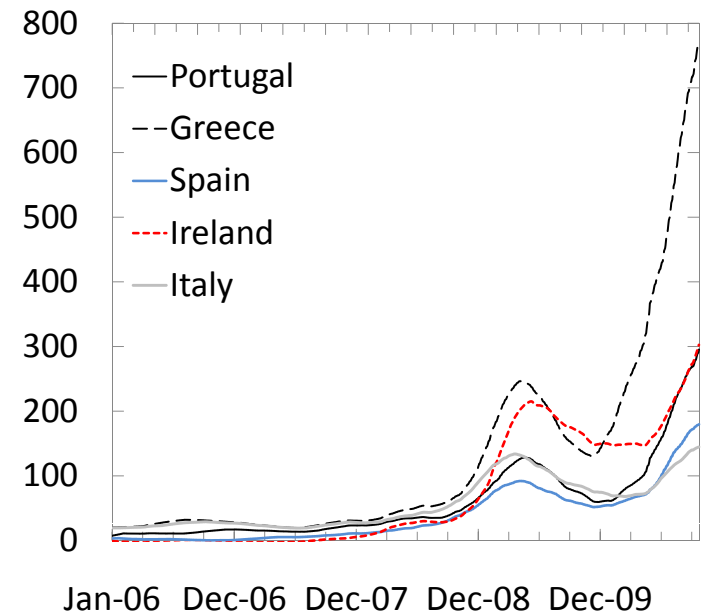
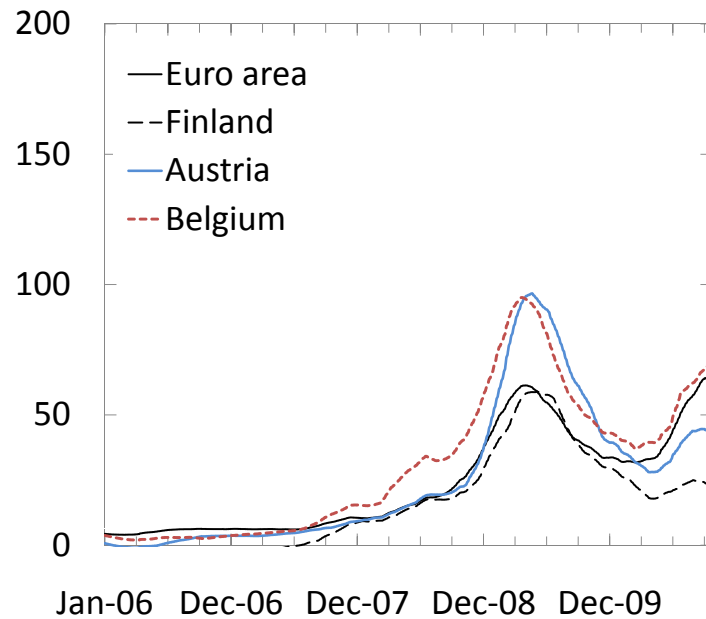


## DEFICIT/GDP



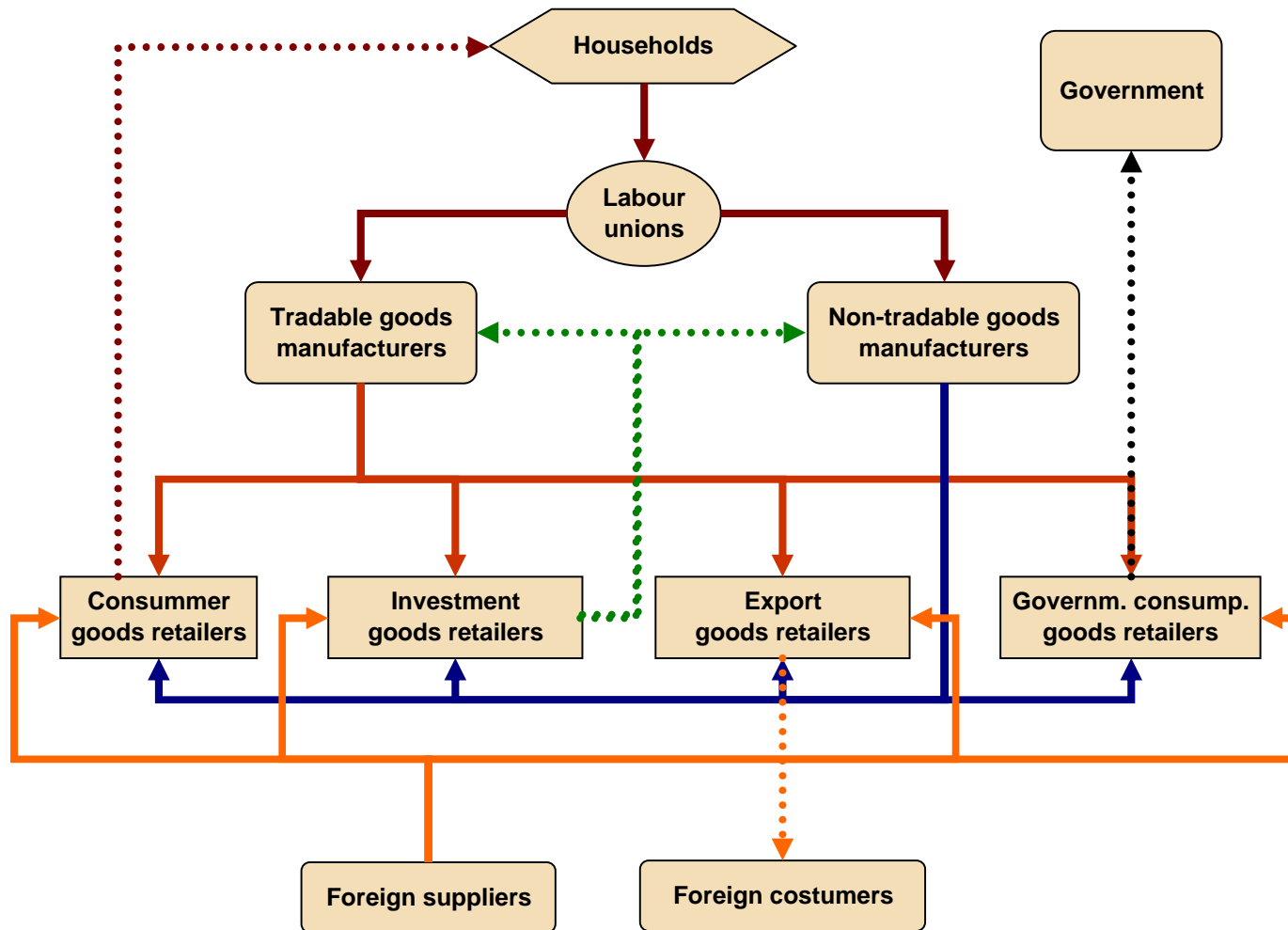
# Motivation (Reuters)

## Long term yield spreads (vis-à-vis Bunds)



(Daily data until end Sep 10, moving average of previous 90 days)

# The model: A DSGE called *PESSOA*



# Households

## The utility function

$$\max_{\substack{C_{a,t}(h), L_{a,t}(h), \\ B_{a,t}(h), B_{a,t}^*(h)}} E_t \sum_{s=0}^{\infty} (\beta_t \theta)^s \frac{1}{1-\gamma} \left[ \left( \frac{C_{a+s,t+s}(h)}{Hab_{a+s,t+s}} \right)^{\eta^H} (1 - L_{a+s,t+s}(h))^{1-\eta} \right]^{1-\gamma}$$

$\theta$  is the probability of surviving between  $t$  and  $t + 1$

$$Hab_{a,t} = \left( \frac{C_{t-1}}{n(1-\psi)} \right)^v \quad \dots \text{if type } \mathcal{A}: \text{ with access to debt markets}$$

$$Hab_{a,t} = \left( \frac{C_{t-1}}{n\psi} \right)^v \quad \dots \text{if type } \mathcal{B}: \text{ without access}$$

# Fiscal instruments under analysis

## HH type $\mathcal{A}$

$$\begin{aligned} P_t C_{a,t}(h) + B_{a,t}(h) + B_{a,t}^*(h) &= \frac{1}{\theta} [i_{t-1} B_{a-1,t-1}(h) + i_{t-1}^* \Psi_{t-1} B_{a-1,t-1}^*(h)] \\ &+ W_t \Phi_a L_{a,t}(h) (\mathbf{1} - \tau_{\mathbf{L},t}) \\ &+ \sum_{D=N,T,C,} \int_0^1 D_{a,t}^D(h, d) dd + \mathbf{Transf}_{a,t}(h) \\ &G,I,X,U \end{aligned}$$

## HH type $\mathcal{B}$

$$P_t^C (\mathbf{1} + \tau_{\mathbf{C},t}) C_{a,t}^{\mathcal{B}}(h) = (\mathbf{1} - \tau_{\mathbf{L},t}) W_t \Phi_a L_{a,t}^{\mathcal{B}}(h) + \mathbf{Transf}_{a,t}^{\mathcal{B}}(h)$$

## Labour Unions

$$\max_{V_t(h)} E_0 \sum_{t=0}^{\infty} \tilde{R}_t (\mathbf{1} - \tau_{\mathbf{L},t}) [(V_t(h) - W_t) U_t(h) - P_t \Gamma_t^U(h)]$$

# The fiscal block

## Public sector account

Expenditure	Revenue
Govt. Consumption ( <b>G</b> )	Labour income tax ( $\tau_l$ )
Transfers to HH ( <b>Trf</b> )	Consumption tax ( $\tau_c$ )
Interest outlays $(i_t - 1)B_t$	Corporate income tax ( $\tau_k$ )
	SS contributions ( $\tau_{SP}$ )
	EU transfers ( $Trf_{EU}$ )
<b>Fiscal balance</b> ( $SG_t$ )	

Debt accumulation:  $B_t = i_{t-1}B_{t-1} - SG_t$

The fiscal rule on primary surplus to GDP ratio

$$\left(\frac{SG}{GDP}\right)_t = \left(\frac{SG}{GDP}\right)_t^{tar} + d_{tax} \left(\frac{RV_t - RV_t^{ss}}{GDP_t^{ss}}\right) + d_{debt} \left(\frac{B_t}{GDP_t^{ss}} - \left(\frac{B}{GDP}\right)_t^{tar}\right)$$



# Labour unions

## General features

- ▶ Unions hire labour from HH and rent it to manufacturing firms by charging a markup over the HH wage rate.
- ▶ The labour market operates in a monopolistic competition setup, where monopoly rents are distributed to HH.
- ▶ To feature sticky wage growth, quadratic adjustment costs were imposed (Kim, 2000; Laxton and Pesenti, 2003).
- ▶ The charged wage maximise the PDV of future dividend stream subject to labour demand and adjustment costs.

# Firms: manufacturers and distributors

**Manufact.** Produce intermediate goods  $(T, N)$  using  $K$  and  $L$ .

**Distribut.** Produce final goods  $(C, G, I, X)$  using domestic intermediate goods and imports.

## General features

- ▶ CES tech. to produce differentiated goods. Monopolistic compet. (output markets). Perfect compet. (input markets). Price markups uniquely depend on the EoS between varieties.
- ▶ Quadratic price adjustment costs mechanism (Rotemberg).
- ▶ Fixed cost ensures negligible profits in steady-state.
- ▶ Firms maximise PDV of future dividend stream, subject to technology, price and real rigidities, and demand.

# Rest of the world (the rest of the euro area)

The model features ...

- ▶ Real imports, demanded by domestic (final goods) distributors
- ▶ Real exports, demanded by euro area (final goods) distributors.

$$Y_t^X = \alpha^* \left( \frac{P_t^X}{\varepsilon_t P_t^*} \right)^{-\xi^*} Y_t^{A^*}$$

- ▶ Financial flows, which respect the NFA condition, where domestic saving is met the change in foreign bond holdings

$$B_t^* = i_{t-1} B_{t-1}^* + P_t^X X_t - P_t^* M_t + TRE_t + TRX_t$$

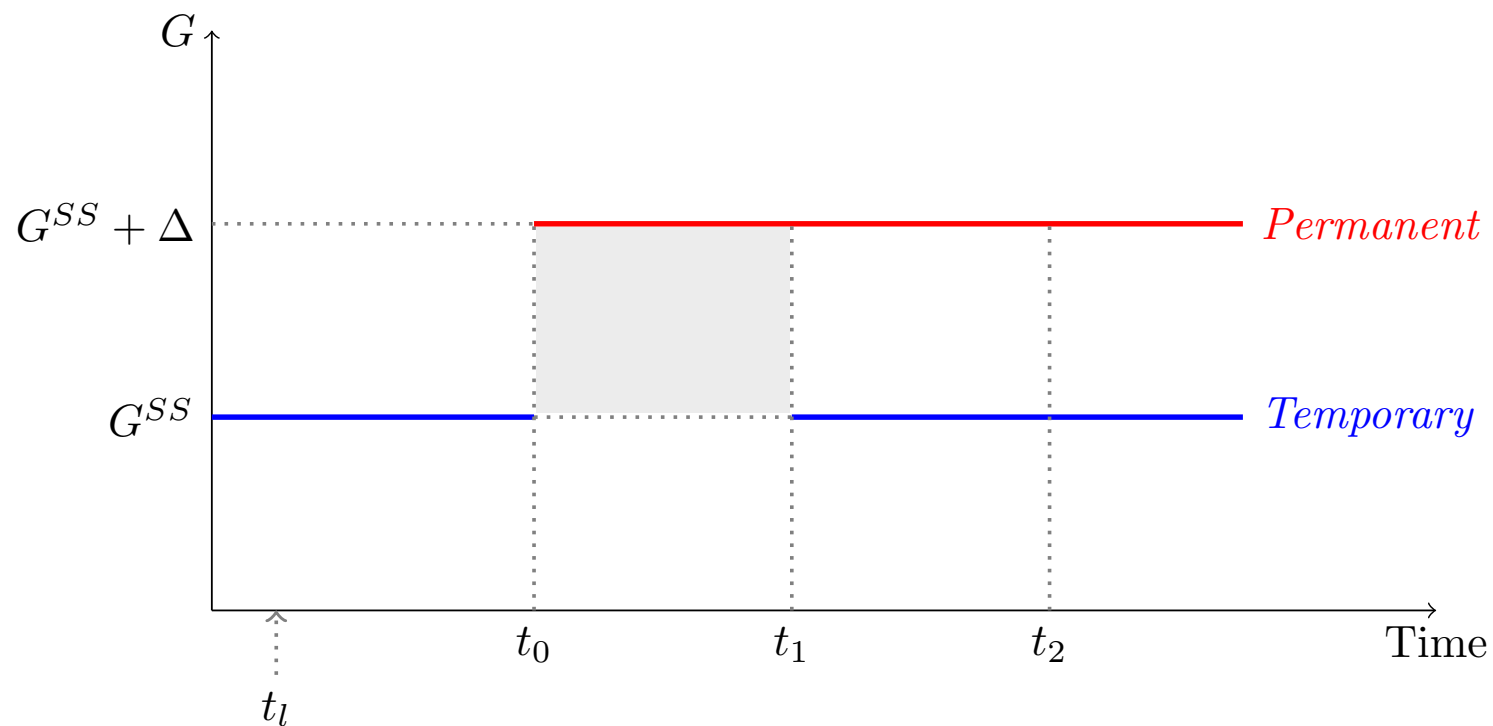
- ▶ Exogenous and unchanged foreign variables ( $i^*$ ,  $P_t^*$ ,  $Y_t^{A^*}$  ...)
- ▶ Nominal  $\varepsilon$  is fixed and fully credible

## Model calibration

- ▶ **Euro area parameters:** ECB targets, DSGE literature
  - ▶ Labour-augmenting productivity's annual growth rate: 2 per cent, consistent with estimates for the euro area's long-run potential output growth [Musso(2005),Proietti(2007)]
  - ▶ ECB inflation at 2 per cent (it's our “below but close”)
  - ▶ The euro area nominal interest rate in the steady-state: 4.5 per cent [Coenen(2007)]
- ▶ **Steady-state key ratios:** National Accounts, 1995-2006;
- ▶ **Structural parameters:** DSGE literature, studies for Portugal;
  - ▶ Probability of death and decay in productivity calibrated as in Kumhof et. al (2007)
  - ▶ The EoS in the pf of manufacturers and distributors, wage & price markups,adjustment costs, fiscal rule parameters [Coenen et al.(2007), Kumhof et. al (2007), estimates for Portugal]
  - ▶ **Nominal and real rigidities:** DSGE literature as initial educated guesses and available estimates for Portugal.

# A stylized change in $G$

## The alternative experiments



This paper: exit after  $t_2$  always based on  $\tau_L$ .

# Temporary stimulus, without implementation lags

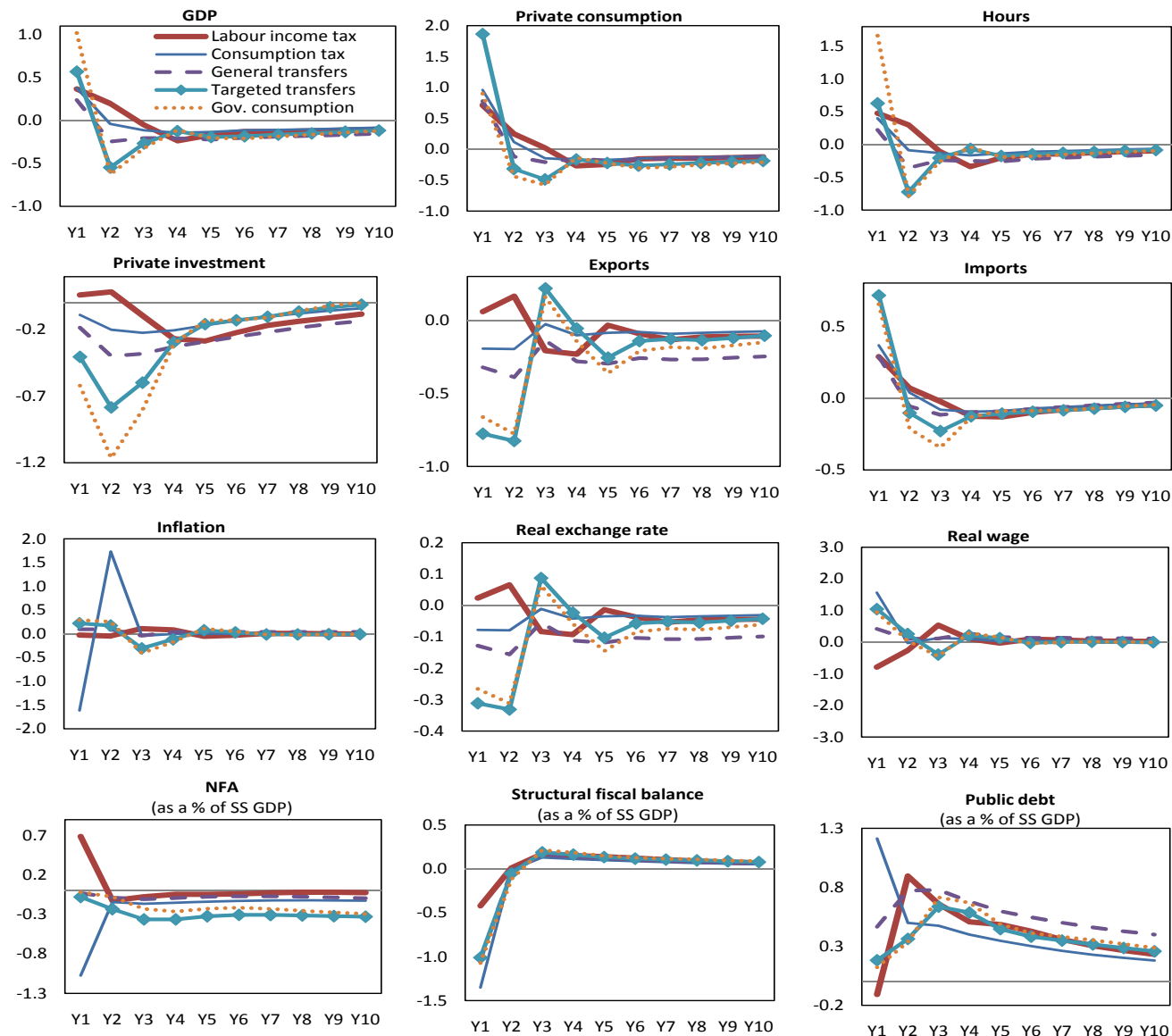
## Impact multipliers

	$G$	$TRG$	$TRG^B$	$\tau_l$	$\tau_c$
GDP	1.02	0.24	0.57	0.37	0.38
Private consumption	0.90	0.78	1.86	0.71	0.96
Government consumption	4.37	0.00	0.00	0.00	0.00
Private investment	-0.62	-0.18	-0.40	0.06	-0.09
Exports	-0.66	-0.32	-0.78	0.06	-0.19
Imports	0.65	0.29	0.71	0.29	0.37
Hours	1.66	0.23	0.63	0.48	0.40
Real wage rate	0.94	0.42	1.04	-0.79	1.56
Real exchange rate	-0.27	-0.13	-0.31	0.02	-0.08
Inflation (in %)	0.29	0.09	0.22	-0.03	-1.62
NFA (as a % of SS GDP)	-0.02	-0.03	-0.08	0.69	-1.07
Public debt (as a % of SS GDP)	0.12	0.46	0.18	-0.11	1.21

$\therefore$  Impact multipliers are sufficient to discriminate between instruments. The Government has to decide!

# Temporary stimulus, without implementation lags

## Medium-terms impacts

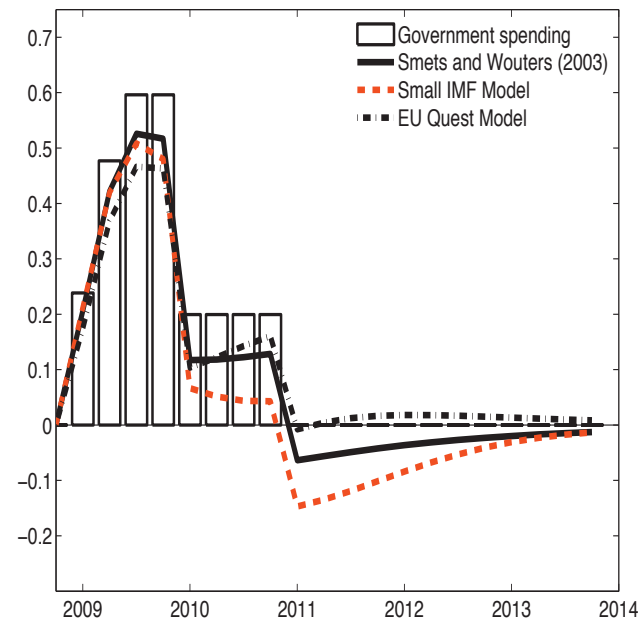


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## Other DSGE models

Figure 1: Estimated GDP impact of government spending stimulus

New-Keynesian DSGE models of ECB, IMF and EU researchers



Notes: Quarterly annualized government spending is depicted by the bars in percent of GDP: 0.24 in 2009Q1, 0.48 in 2009Q2, 0.60 in 2009Q3 and 2009Q4 and 0.20 in 2010.

**NOTES:** Cwik and Wieland 2010, p. 14. EU-QUEST Model [Ratto et al. (2009)].

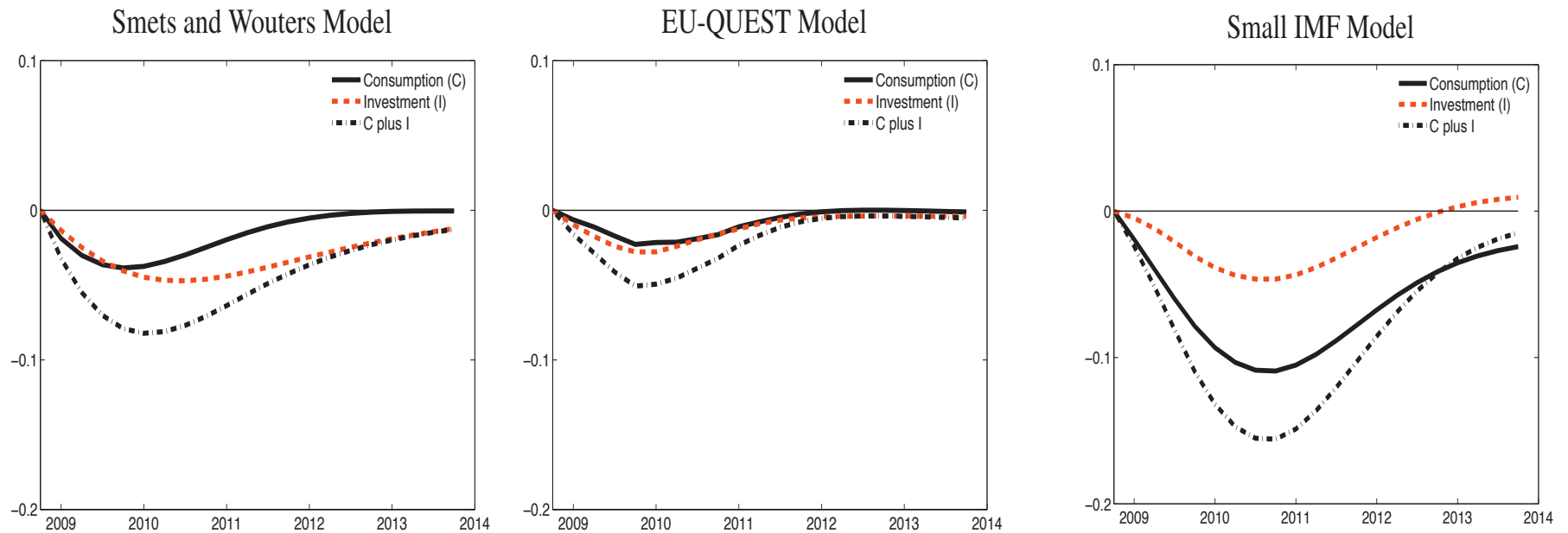
Small IMF Model [Laxton and Pesenti (2003)]



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Other DSGE models: higher crowding-out effects

Figure 2: Consumption and investment responses to government spending stimulus

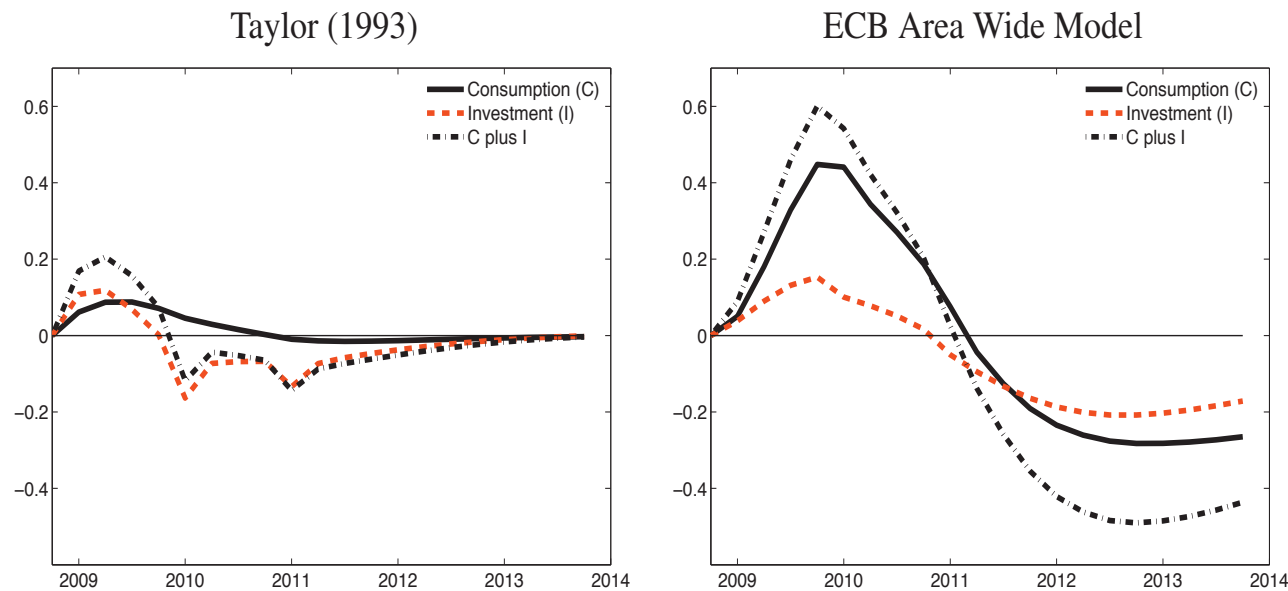


**NOTES:** Cwik and Wieland 2010, p. 15. EU-QUEST Model [Ratto et al. (2009)].  
Small IMF Model [Laxton and Pesenti (2003)]

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## Other models

Figure 4: Consumption and investment responses in Taylor and ECB Area-Wide Model



Notes: Consumption and investment deviations from steady-state are in percent of GDP.

**NOTES:** Cwik and Wieland 2010, p. 18.

# Temporary stimulus, with implementation lags

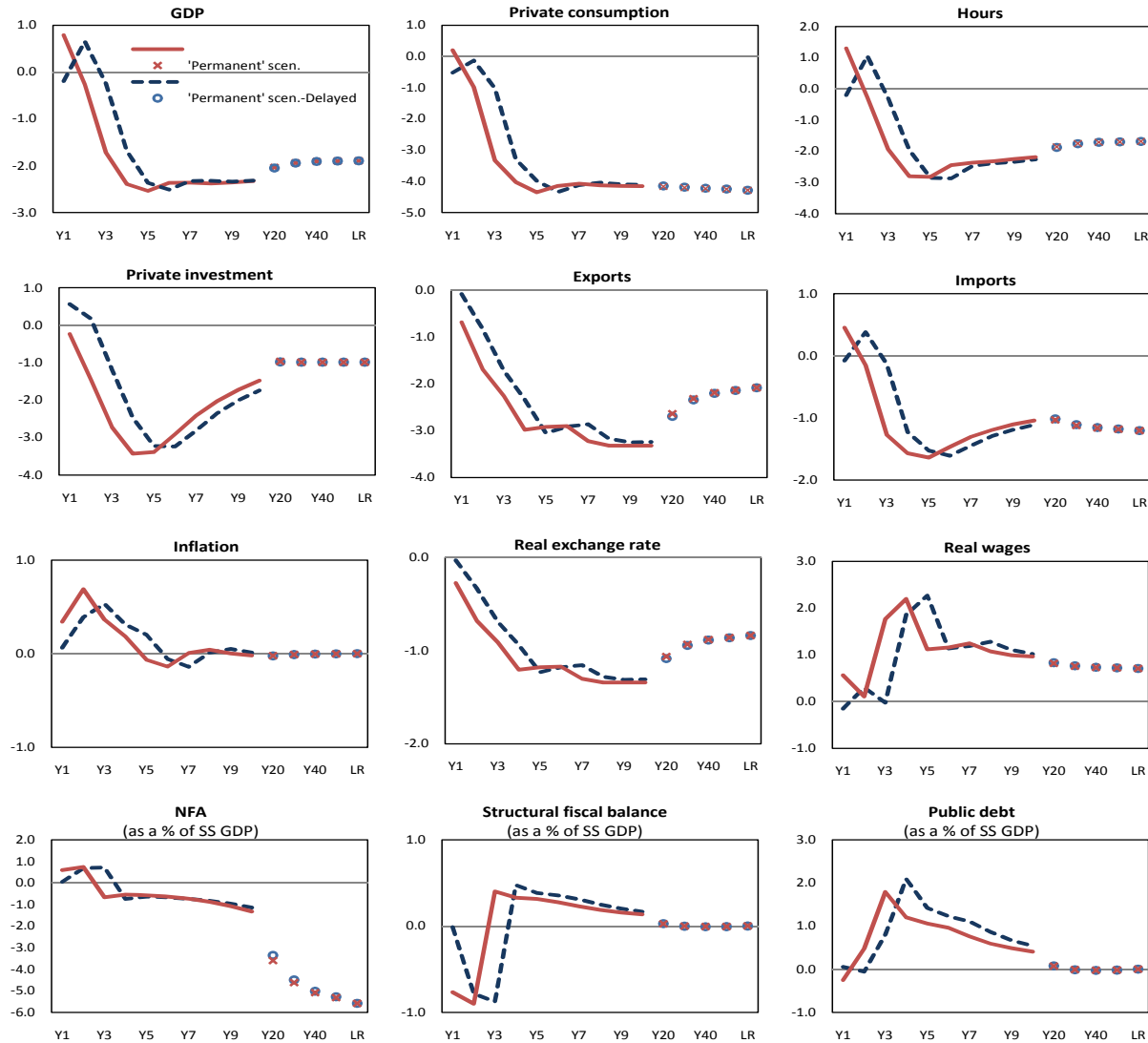
## Impact multipliers

	Benchmark			Delayed		
	Y1	Y2	Y3	Y0	Y1	Y2
GDP	1.02	-0.63	-0.32	-0.13	0.73	-0.69
Consumption	0.90	-0.44	-0.58	-0.09	0.56	-0.55
Government consumption and investment	4.37	0.00	0.00	0.00	4.37	0.00
Private investment	-0.62	-1.16	-0.80	-0.27	-1.08	-1.40
Exports	-0.66	-0.78	0.16	-0.20	-0.92	-0.71
Imports	0.65	-0.21	-0.34	-0.11	0.40	-0.31
Hours	1.66	-0.79	-0.26	-0.19	1.19	-0.83
Real wage rate	0.94	0.04	-0.45	0.08	0.81	-0.24
Real exchange rate	-0.27	-0.31	0.06	-0.08	-0.37	-0.28
Inflation (in %)	0.29	0.25	-0.41	0.09	0.37	0.09
NFA (as a % of SS GDP)	-0.02	-0.08	-0.23	0.06	0.11	0.00
Public debt (as a % of SS GDP)	0.12	0.34	0.71	-0.02	0.21	0.62

**NOTE:** The benchmark is given by  $G$ , without lags. The time lag occurs during Y0.

# A permanent increase in $G$

## Medium-terms impacts



# A temporary increase in $G$ , taken initially as permanent

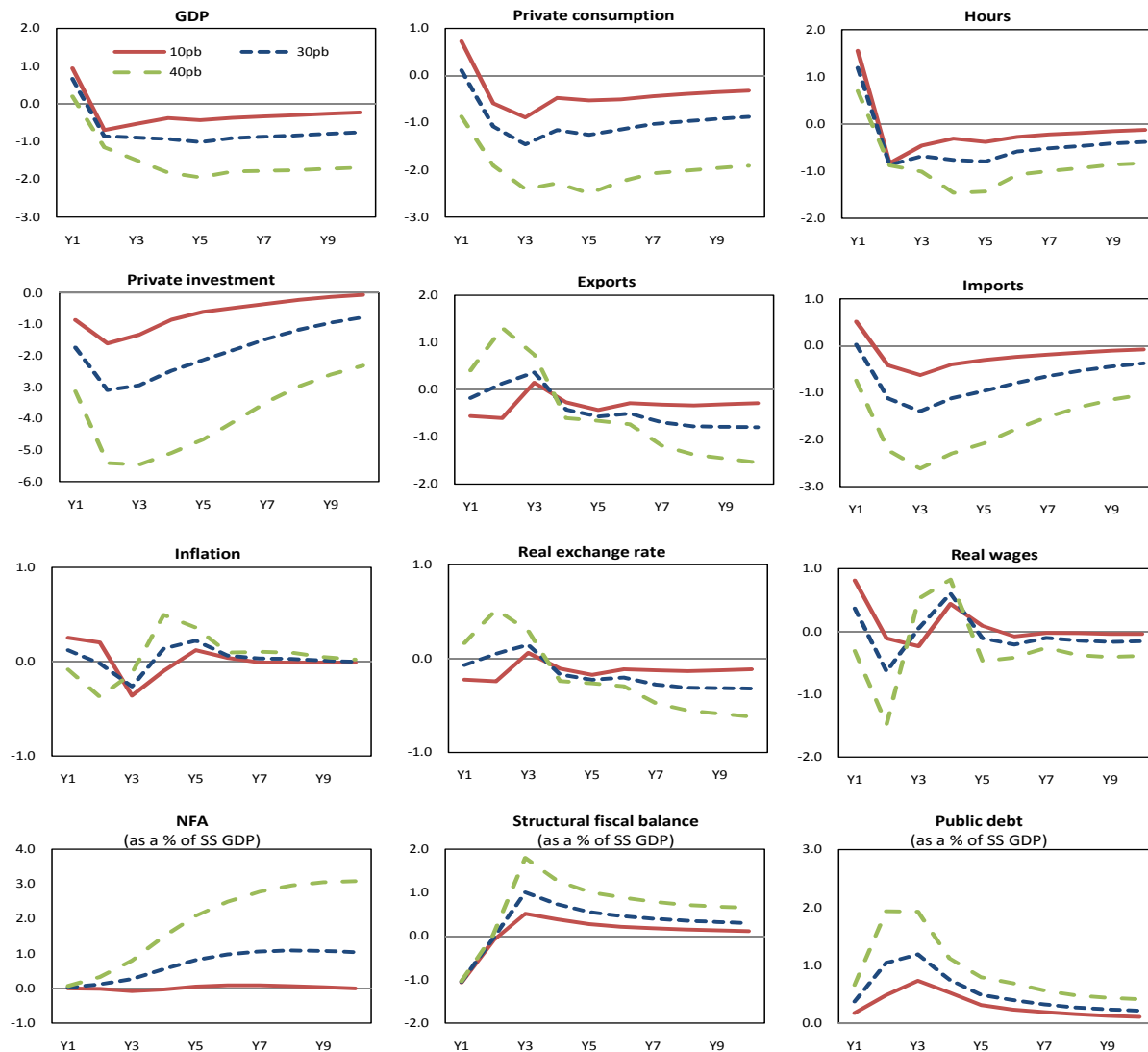
## Impact multipliers

	Benchmark			Mis-perception		
	Y1	Y2	Y3	Y1	Y2	Y3
GDP	1.02	-0.63	-0.32	0.79	-0.73	-0.30
Private consumption	0.90	-0.44	-0.58	0.20	-0.79	-0.64
Government consumption and investment	4.37	0.00	0.00	4.37	0.00	0.00
Private investment	-0.62	-1.16	-0.80	-0.24	-0.96	-0.66
Exports	-0.66	-0.78	0.16	-0.69	-0.87	0.06
Imports	0.65	-0.21	-0.34	0.45	-0.36	-0.38
Hours	1.66	-0.79	-0.26	1.30	-0.97	-0.33
Real wage rate	0.94	0.04	-0.45	0.56	-0.45	-0.46
Real exchange rate	-0.27	-0.31	0.06	-0.28	-0.35	0.03
Inflation (in %)	0.29	0.25	-0.41	0.34	0.30	-0.53
NFA (as a % of SS GDP)	-0.02	-0.08	-0.23	0.59	0.07	-0.15
Public debt (as a % of SS GDP)	0.12	0.34	0.71	-0.25	0.64	1.09

**NOTE:** The benchmark is given by  $G$  (fully credible).

# A temporary increase in $G$ with higher risk premium

## Medium-terms impacts



# Main conclusions

1. The SOE integrated in the EA can use fiscal policy for stabilization purposes
2. Impact multipliers are sufficient to discriminate between alternative instruments
3. Fiscal policy is a multidimensional object, for example:
  - 3.1 Use  $G$  to maximize impact on GDP
  - 3.2 Use targeted transfers to maximize impact on consumption
  - 3.3 Leaks: savings and imports
4. Implementation lags decrease impact multipliers
5. Don't increase  $G$  permanently!
6. Be credible! If agents do not believe in the temporary nature of the programme, the impact multipliers will decrease
7. Higher public debt with higher risk premium decreases the multipliers
8. With higher risk premium, the stimulus may backfire: the economy may end up worse and for a longer period of time (don't do anything?)

Thank you very much!