On Ricardian Equivalence and Twin Divergence: The Spanish Experience in the 2009 Crisis

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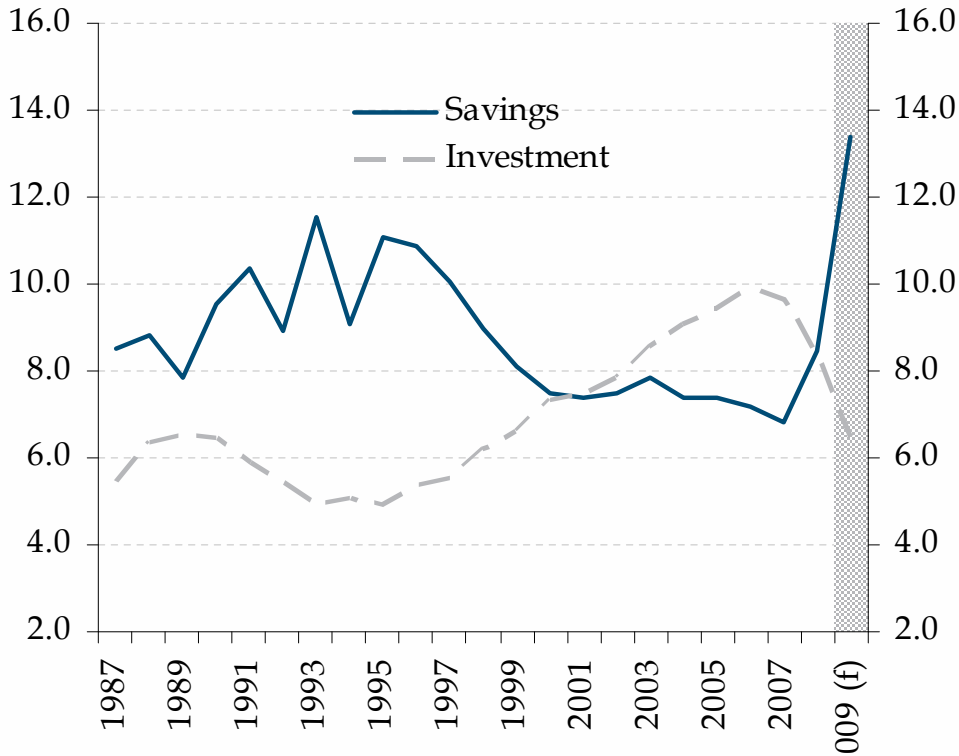
Introduction

- A case study: during the current economic crisis in the Spanish economy, households are increasing very quickly their saving rate, the government budget has changed from surplus to a huge deficit and the current account deficit is adjusting rapidly.
- In this paper we explore a possible explanation of this evidence.
- Using a DGE model for the Spanish economy, we find that expansionary fiscal policies have small negative effects on the current account, even assuming a large proportion of non-Ricardian consumers.
- Our findings do not support the twin divergence found in the data.
- Alternative explanations for the strong change in consumption and saving patterns within the economy (output loss, deleveraging, uncertainty), seem like better candidates to explain the twin divergence.

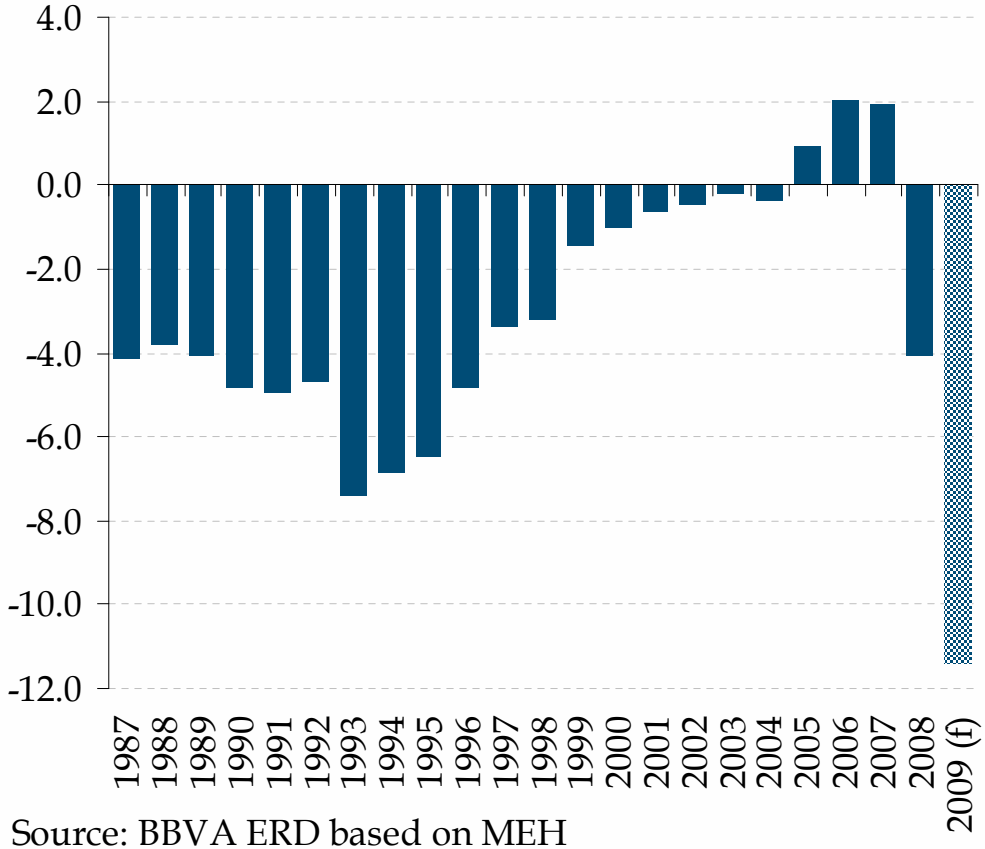
Some preliminary evidence



Source: BBVA ERD based on INE

- With the current economic crisis there has been a dramatic change: the households saving rate has increased enormously, above 13% of GDP, ...

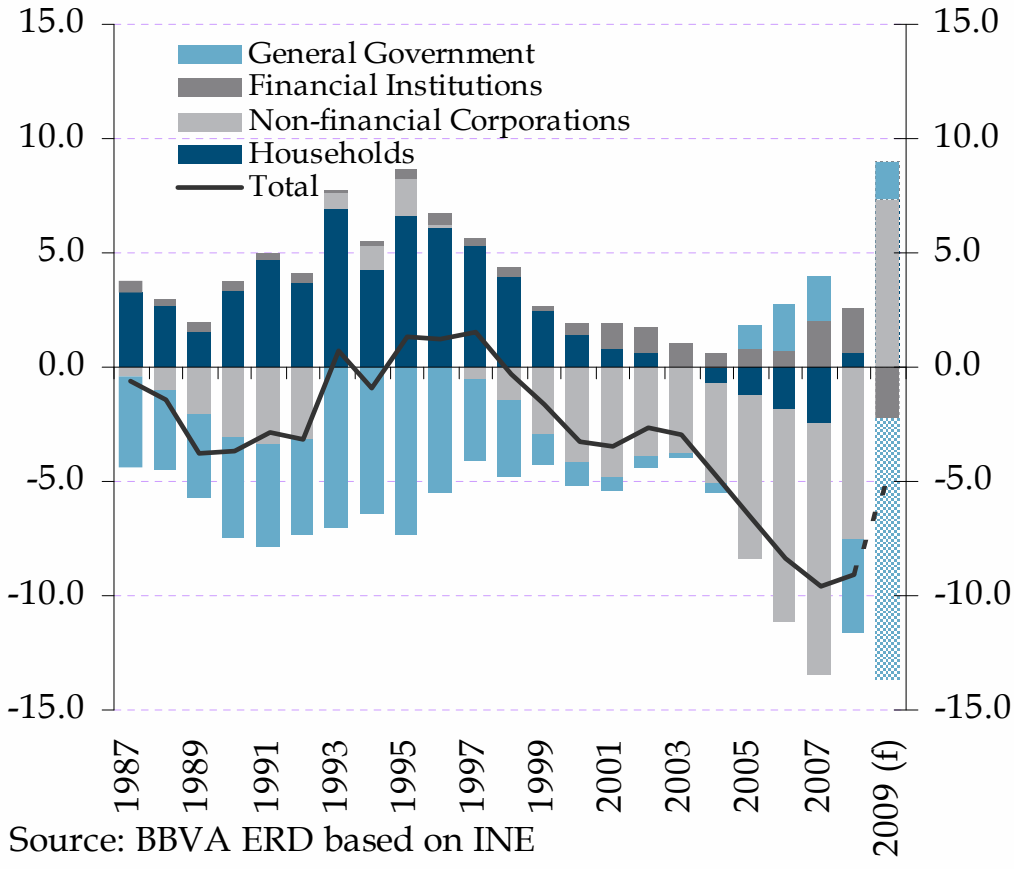
Some preliminary evidence



Source: BBVA ERD based on MEH

... the public budget surplus has turned into a huge deficit, that the government currently estimates at 11.5% of GDP ...

Some preliminary evidence

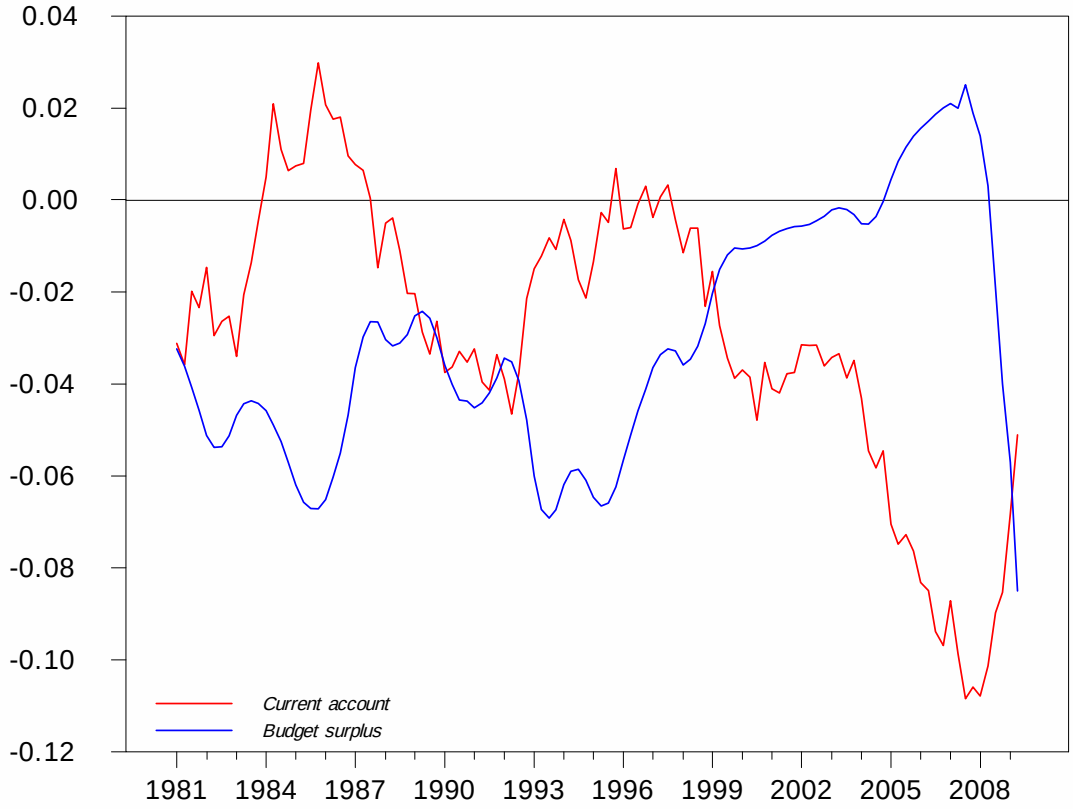


Source: BBVA ERD based on INE

... and the current account is correcting very quickly (below 5% of GDP at the end of 2009).

Some preliminary evidence

Current account and the budget surplus (% of GDP).

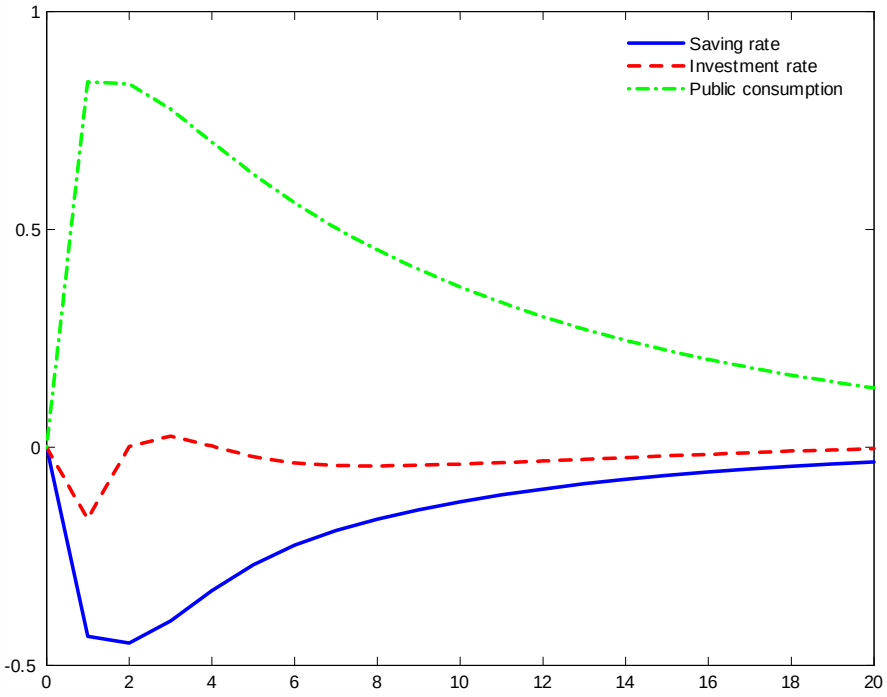


The correlation between both variables is -0.74 (-0.67 controlling for the output gap).

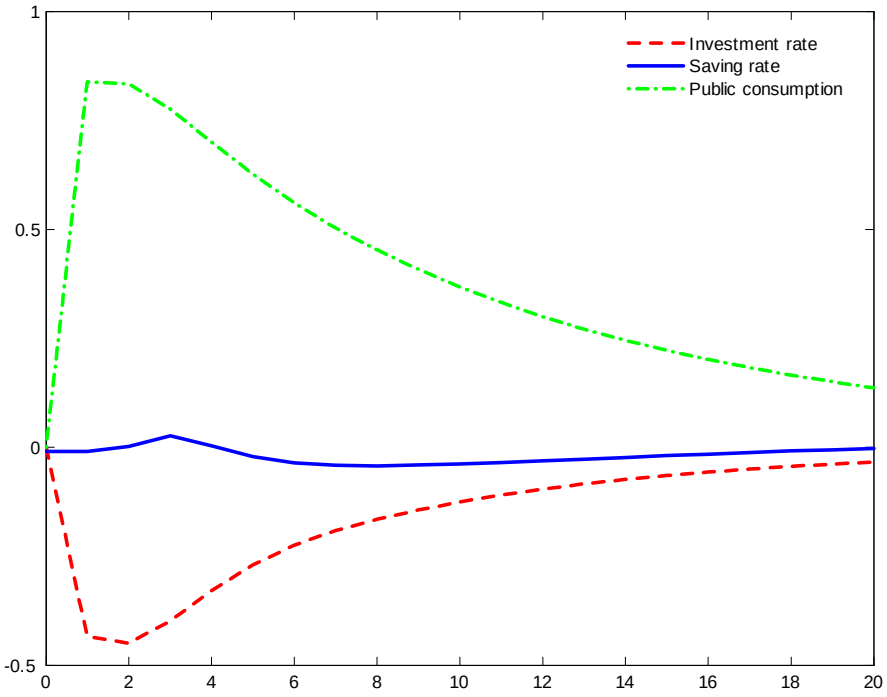
Introduction

- This empirical evidence seems to contradict well-known hypothesis of twin deficits.
- The rise in private savings and the accumulation of fiscal deficits is observationally equivalent to the Ricardian equivalence hypothesis, for which it is difficult to find robust empirical support (see Seater, 1993).
- The recent experience of the Spanish economy seems to corroborate the empirical findings by Kim and Roubini (2008) about what they call twin divergence: when the public budget worsens the current account improves and vice versa (Corsetti and Müller, 2007, and Cavallo, 2005 and 2007).
- In a related paper, Erceg, Guerrieri and Gust (2005), using an open economy DGE model (SIGMA) for the USA, find that fiscal deficits have relatively small effects on the trade balance, irrespective of whether its source is a spending increase or a tax cut, even introducing non-Ricardian consumers (Galí, López-Salido and Vallés, 2007, and Andrés, Doménech and Fatás, 2008).

Two alternative hypothesis



Twin defficits: no ricardian equivalence and no crowding-out effects.



Twin divergence: ricardian equivalence and crowding-out effects.

Introduction

- The objective of this paper is to evaluate the effects of government shocks on households' behaviour and the current account in a small open economy in a currency area, as it is case of Spain.
- We use REMS, a Rational Expectations Model of the Spanish economy designed by Boscá et al (2007), to analyse the effects of expansionary fiscal policies.
- REMS builds on recent advances in DGE models, sharing many features of SIGMA, such as nominal and real rigidities or the presence of constrained households, but departs from SIGMA in two important aspects:
  - REMS models a small open economy (Spain) in a monetary union (EMU).
  - REMS includes a richer and deeper characterization of the labour market, distinguishing between the intensive and extensive margin in a search and matching model.

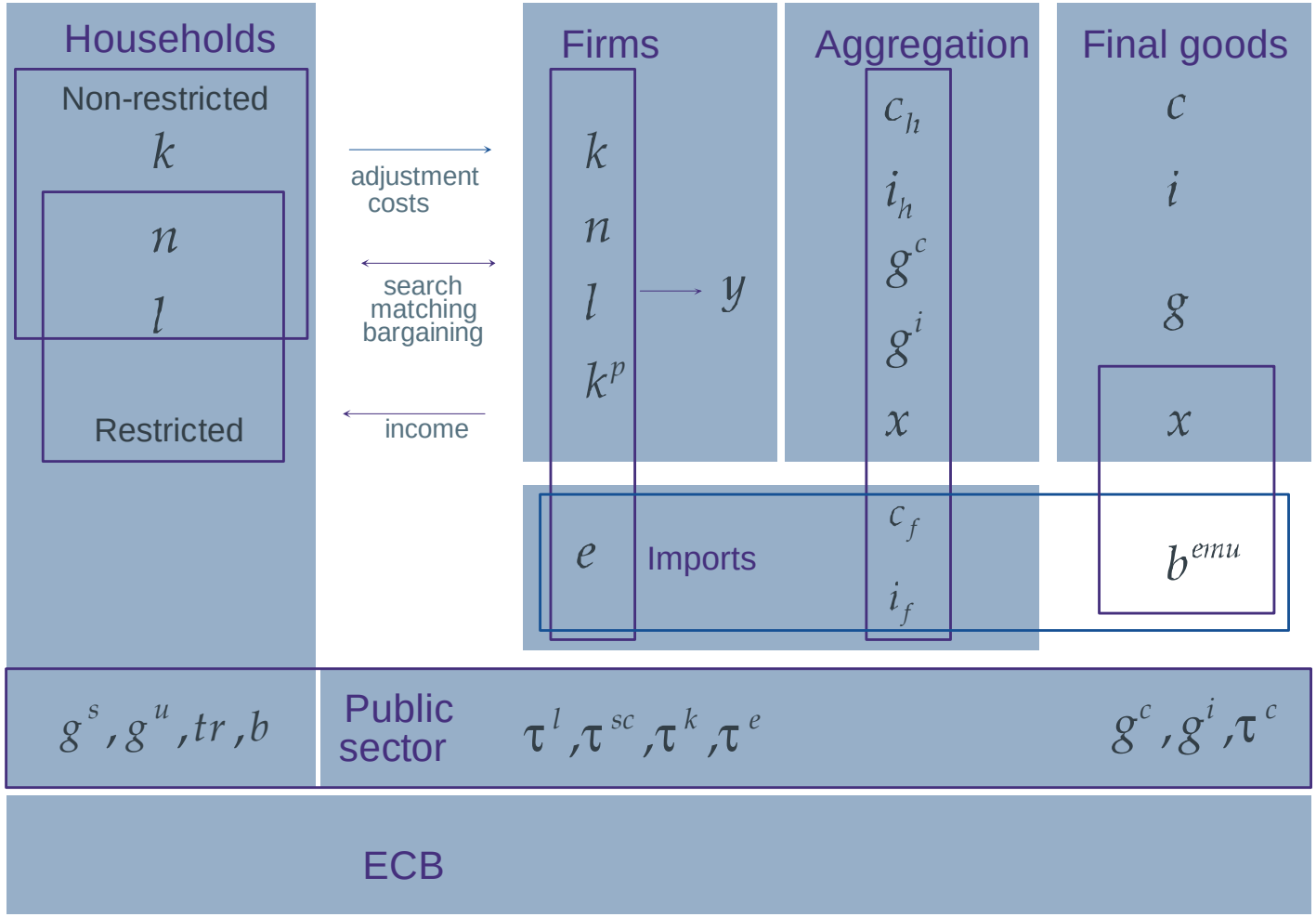
Main results

- Despite the presence of a large share of non-Ricardian consumers , the expansionary fiscal policy has small negative effects on the current account.
- Partial Ricardian equivalence: only a fraction of the increase in households saving rate is explained by the large deficit in government's budget.
- The emphasis on future fiscal consolidation should be based more on the sustainability of government debt than on the effects on external imbalances.
- The current negative correlation between the government balance budget and the current account or twin divergence could be appropriately explained by the presence of a large negative output shock as suggested by Kim and Roubini (2008) for the US.
- Future work should emphasize the role of alternative explanations for the large increase in the households saving rate, like precautionary saving in response to the greater uncertainty and the high unemployment rate (above 18% in 4Q2009), and the desire of reducing their levels of debt, after the dramatic fall in their wealth and the expectations of future higher real interest rates.

The model

- DGE model: REMS is influenced by the New Keynesian modellization strategy.
- Non-walrasian goods and labour markets. Agents have market power.
- Two types of consumers: optimizing and non-Ricardian (restricted in capital markets).
- Nominal rigidities (inflation), real rigidities (capital adjustment costs) and unemployment due to search inefficiencies.
- Phillips curve is derived under the assumption of monopolistic competition.
- Small open economy in a currency area.
- Public expenditures and revenues are carefully detailed.
- ECB monetary policy: interest rule.

The model: agents and markets



The model

- Optimization problem of Ricardian consumers:

$$\max_{c_t,n_t,j_t,k_t,b_t,b_t^w,m_t} E_t \sum_{t=0}^{\infty} \beta^t \left[\begin{array}{c} \ln(c_t) + n_{t-1}\phi_1 \frac{(1-l_{1t})^{1-\eta}}{1-\eta} + \\ (1-n_{t-1})\phi_2 \frac{(1-l_2)^{1-\eta}}{1-\eta} + \chi_m \ln(m_t) \end{array} \right]$$

subject to

$$\begin{aligned} &\left(r_t(1-\tau_t^k)+\tau_t^k\delta\right)k_{t-1} + w_t\left(1-\tau_t^l\right)\left(n_{t-1}l_{1t} + rr_t\left(1-n_{t-1}\right)l_2\right) \\ &+ (g_{st} - trh_t) + \frac{m_{t-1}}{\pi_t} + \left(1+r_t^n\right)\frac{b_{t-1}}{\pi_t} + er_t^n\left(1+r_{t-1}^{nw}\right)\frac{b_{t-1}^w}{\pi_t} \\ &= (1+\tau_t^c)c_t\frac{P_t^c}{P_t} + j_t\left(1+\frac{\phi}{2}\left(\frac{j_t}{k_{t-1}}\right)\right) + \gamma_A\gamma_N\left(m_t + b_t + \frac{er_t^n b_t^w}{\phi_{bt}}\right) \end{aligned}$$

$$\gamma_A\gamma_N k_t = j_t + (1-\delta)k_{t-1}$$

$$\gamma_N n_t = (1-\sigma)n_{t-1} + \rho_t^w(1-n_{t-1})$$

- In equilibrium $\rho_t^w(1-n_{t-1}) = \chi_1 v_t^{\chi_2}\left[\left(1-n_{t-1}\right)l_2\right]^{1-\chi_2}$.

The model

- Optimization problem of RoT consumers:

$$\max_{c_t^r, n_t^r} E_t \sum_{t=0}^{\infty} \beta^t \left[\begin{array}{c} \ln\left(c_t^r - hc_{t-1}^r\right) \\ +n_{t-1}^r \phi_1 \frac{(T-l_{1t})^{1-\eta}}{1-\eta} + (1-n_{t-1}^r)\phi_2 \frac{(T-l_{2t})^{1-\eta}}{1-\eta} \end{array} \right]$$

subject to:

$$w_t\left(1-\tau_t^l\right)\left(n_{t-1}^r l_{1t} + rr_t s\left(1-n_{t-1}^r\right) l_{2t}\right) + g_{st}\left(1-\tau_t^l\right) - trh_t - (1+\tau_t^c)c_t^r \frac{P_t^c}{P_t} = 0$$

$$\gamma_N n_t^r = (1-\sigma)n_{t-1}^r + \rho_t^w s(1-n_{t-1}^r)$$

The model

- Intermediate good firms operate in a monopolistically competitive environment.
- Following Calvo (1983), each period a measure $1-\theta$ of firms set their prices, $\widetilde{P}_{it}$, to maximize the present value of future profits.
- The aggregate price index at t is

$$P_t = \left[\theta \left(\pi_{t-1}^{\varkappa} P_{t-1}\right)^{1-\varepsilon} + (1-\theta)\widetilde{P}_t^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}}$$

- As it is standard in the literature, we obtain an expression for aggregate inflation

$$\pi_t = \beta^f E_t \pi_{t+1} + \lambda \widehat{mc}_t + \beta^b \pi_{t-1}$$

The model

- Technology

$$y_t = z_{it}\left(\left[ak_{t-1}^{-\rho} + (1-a)e_t^{-\rho}\right]^{-\frac{1}{\rho}}\right)^{1-\alpha}(n_{t-1}l_{1t})^{\alpha}\left(k_{t-1}^{p}\right)^{\zeta} - \kappa_f$$

- Cost minimization problem

$$\min_{k_t,n_t,v_t,e_t} E_t \sum_{t=0}^{\infty} \beta^t \frac{\lambda_{1t+1}}{\lambda_{1t}} \left(\begin{array}{c} r_t k_{t-1} + w_t\left(1+\tau^{sc}\right) n_{t-1} l_{1t} + \kappa_v v_t + \\ \frac{P_t^e}{P_t} e_t \left(1+\tau^{e}\right) \end{array} \right)$$

subject to

$$y_t = z_{it}\left(\left[ak_{t-1}^{-\rho} + (1-a)e_t^{-\rho}\right]^{-\frac{1}{\rho}}\right)^{1-\alpha}(n_{t-1}l_{1t})^{\alpha}\left(k_{t-1}^{p}\right)^{\zeta} - \kappa_f$$

$$\gamma_N n_t = (1-\sigma)n_{t-1} + \rho_t^f v_t$$

The model

- The search process in the labour market takes time and is resource consuming.
- Search models thus use a wage and hours determination scheme suitable for a bilateral monopoly framework.
- We assume a Nash bargaining scheme. The solution is given by

$$(1+\tau_t^{sc})w_t l_{1t} = \frac{\lambda^w}{\left[1-(1-\lambda^w)\,rr_t\frac{l_2}{l_{1t}}\right]}\lambda^w\left(\alpha mc_t\frac{y_t}{n_{t-1}}+\frac{\kappa_v v_t}{(1-n_{t-1})}\right)$$
$$+\frac{(1-\lambda^w)}{\left[1-(1-\lambda^w)\,rr_t\frac{l_2}{l_{1t}}\right]}\left(\frac{(1-\lambda^r)}{\lambda^o_{1t}}+\frac{\lambda^r}{\lambda^r_{1t}}\right)\left(\phi_2\frac{(1-l_2)^{1-\eta}}{1-\eta}-\phi_1\frac{(1-l_{1t})^{1-\eta}}{1-\eta}\right)$$
$$+\frac{(1-\lambda^w)}{\left[1-(1-\lambda^w)\,rr_t\frac{l_2}{l_{1t}}\right]}(1-\sigma-\rho_t^w)\lambda^r E_t\beta\frac{\lambda^r_{ht+1}}{\lambda^r_{1t+1}}\left(\frac{\lambda^o_{1t+1}}{\lambda^o_{1t}}-\frac{\lambda^r_{1t+1}}{\lambda^r_{1t}}\right)$$

$$\alpha mc_t\frac{y_t}{n_{t-1}l_{1t}} = \left[\frac{1-\lambda^r}{\lambda^o_{1t}}+\frac{\lambda^r}{\lambda^r_{1t}}\right]\phi_1(1-l_{1t})^{-\eta}$$

The model

- Government expenditure is financed through direct and indirect taxes:

$$\begin{aligned} t_t &= trh_t + (\tau^l + \tau^{sc}) w_t (n_{t-1} l_t) + \tau^k \left(r_t - \delta\right) k_{t-1} \\ &\quad + \tau^c \frac{P_t^c}{P_t} c_t + \tau_e \frac{P_t^e}{P_t} e_t + \tau_t^l r r_t w_t (1 - n_{t-1}) \end{aligned}$$

- Total receipts and outlays are made consistent through the government's intertemporal budget constraint

$$\gamma_A \gamma_N \left(b_t + m_t\right) = g_t^c + g_t^i + g_{ut}(1 - n_{t-1}) + g_{st} - t_t + \frac{(1 + r_t^n)}{\pi_t} b_{t-1} + \frac{m_{t-1}}{\pi_t}$$

- To enforce the government's intertemporal budget constraint, the following fiscal policy reaction function is imposed

$$trh_t = trh_{t-1} + \psi_1 \left[\frac{b_t}{gdp_t} - \overline{\left(\frac{b}{gdp} \right)} \right] + \psi_2 \left[\frac{b_t}{gdp_t} - \frac{b_{t-1}}{gdp_{t-1}} \right]$$

The model

- In REMS, monetary authorities -represented by the European Central Bank (ECB)- conduct monetary policy by targeting short-term interest rates according to the following interest rate policy reaction function

$$\ln \frac{1+r_t^{emu}}{1+\overline{r^{emu}}} = \rho^r \ln \frac{1+r_{t-1}^{emu}}{1+\overline{r^{emu}}} + \rho^{\pi}(1-\rho^r)\ln(\pi_t^{emu} - \overline{\pi^{emu}})$$

- Finally, the real appreciation/depreciation of the exchange rate is driven by the inflation differential vis-à-vis the euro area:

$$\frac{rer_{t+1}}{rer_t} = \frac{1+\pi_{t+1}^{emu}}{1+\pi_{t+1}}$$

The model

- SOE: all goods (both consumption and investment) are tradables.
- Aggregate consumption (and aggregate investment) is a composite basket (CES) of home and foreign produced goods:

$$c_t = \left((1-\omega_c)^{\frac{1}{\sigma_c}} c_{ht}^{\frac{\sigma_c-1}{\sigma_c}} + \omega_c^{\frac{1}{\sigma_c}} \left(c_{ft}\right)^{\frac{\sigma_c-1}{\sigma_c}} \right)^{\frac{\sigma_c}{\sigma_c-1}}$$

- The consumer price index is:

$$P_t^c = \left((1-\omega_c) P_t^{1-\sigma_c} + \omega_c P_t^{m1-\sigma_c} \right)^{\frac{1}{1-\sigma_c}}$$

- Domestic demand of home and foreign consumption goods (demand for investment goods is similar):

$$c_{ht} = (1-\omega_c) \left(\frac{P_t}{P_t^c} \right)^{-\sigma_c} c_t$$

$$c_{ft} = \omega_c \left(\frac{P_t^m}{P_t^c} \right)^{-\sigma_c} c_t$$

The model

- Aggregate imports in our model is the sum of consumption and investment of foreign goods:

$$im_t = c_{ft} + i_{ft}$$

- Exports are given by (some degree of pricing to market is assumed):

$$ex_t = s_t^x \left(\frac{P_t^x}{\overline{PFM}_t} \right)^{-\sigma_x} \overline{y}_t^w$$

- Net foreign assets accumulation is given by:

$$\frac{\gamma_A \gamma_N b_t^{oemu}}{\phi_{bt}} = \frac{(1 + r_t^{emu})}{1 + \pi_t^c} b_{t-1}^{oemu} + \frac{P_t^x}{P_t} ex_t - \frac{P_t^m}{P_t} im_t$$

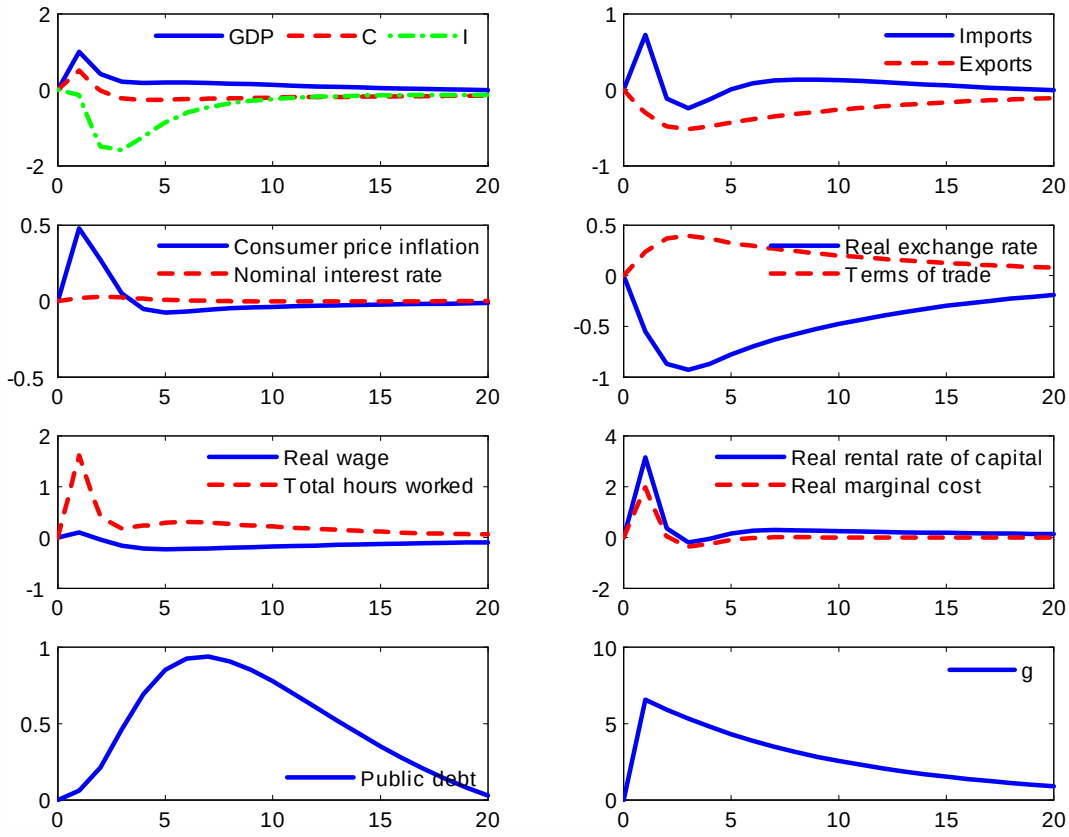
A temporary increase of public consumption

- Initial shock in public consumption equivalent to 1 per cent of GDP:

$$g_t^c = 0.9 g_{t-1}^c + 0.1 \overline{g^c} + \varepsilon_t^g$$

  $\overline{g^c}$ is the steady-state level of public consumption and ε^g is the shock.
- Similar to the size of the expansionary policies implemented through public expenditure in 2008 and 2009 by the Spanish government.
- Positive response of output: short term multiplier is equal to 1.0, slightly higher than Cwik and Wieland (2009)
- As expected, the response of private consumption is also positive, due to the presence of rule-of-thumb consumers.
- Negative wealth effect: the consumption of optimizing households falls and labor rises.
- Private investment decreases driven by the fall in Tobin's q.

A temporary increase of public consumption

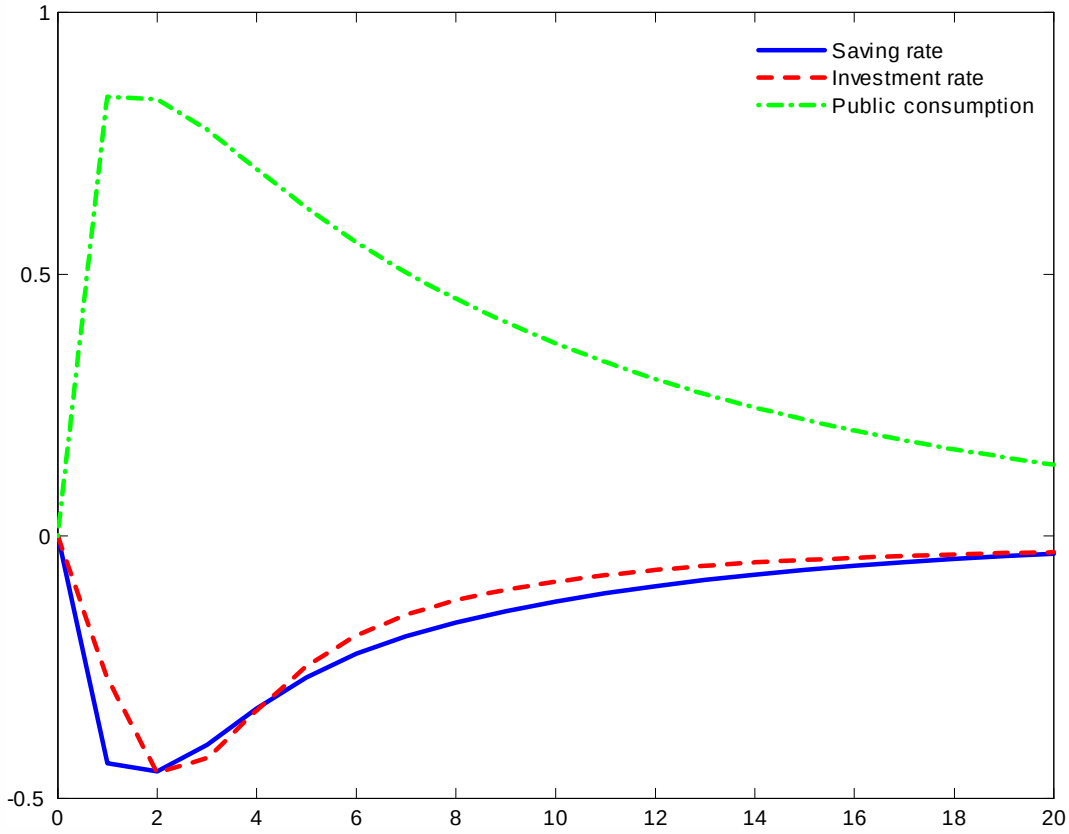


Impulse-response functions after a temporary shock in public consumption.

A temporary increase of public consumption

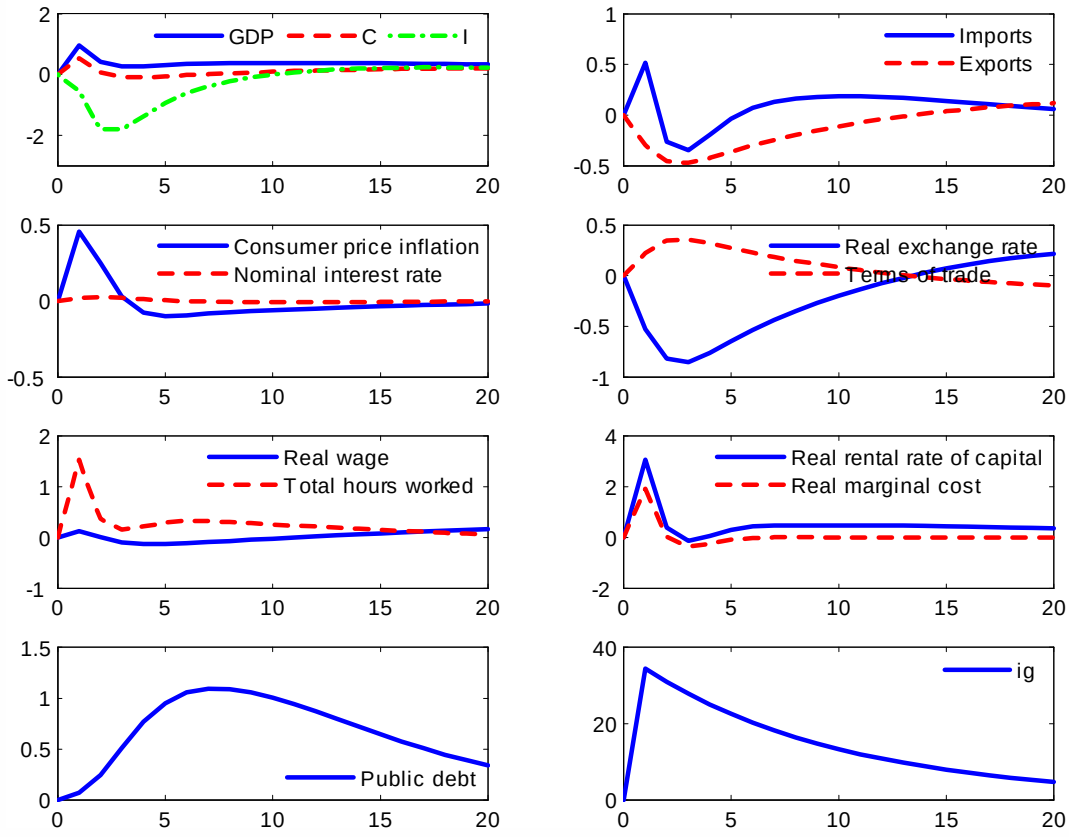
- Higher domestic prices as well as higher levels of output and private consumption cause an increase in imports on impact.
- The increase of imports has a short life since imports are more sensitive to private investment.
- The increase in domestic prices also affects negatively foreign competitiveness, reducing exports.
- The real exchange rate appreciates and the terms of trade (P^x/P^m) increase.
- Public consumption rate (as % of GDP) increases above 0.8pp
- The saving rate almost falls 0.6pp (partial Ricardian equivalence).
- The fall in the investment rate compensates partially the fall of the saving rate $\rightarrow$ the increase in the current account deficit is very small: on impact is equal to 0.2pp of GDP, as in Erceg, Guerrieri and Gust (2005).
- Although there is some evidence of twin deficits, only a small fraction of the government budget deficit translates into a current account deficit.

A temporary increase of public consumption



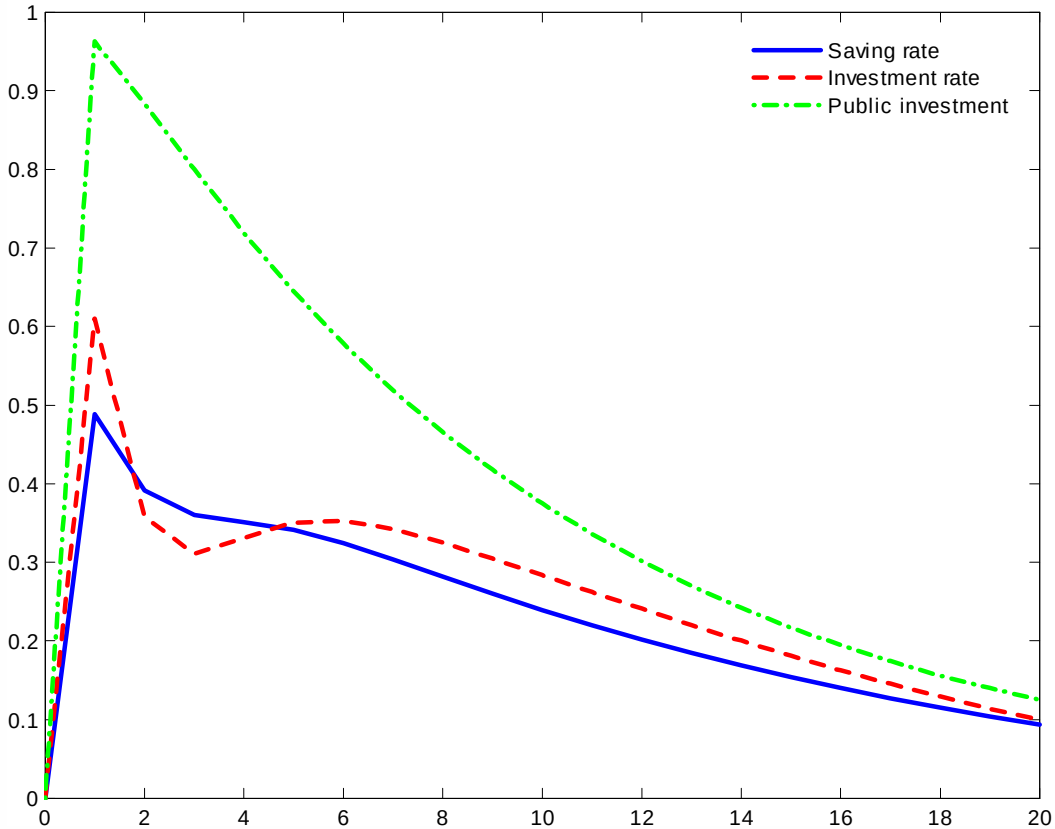
The response of saving, investment and public consumption rates after a temporary shock in public consumption. Absolute deviations from their steady-state values.

A temporary increase in public investment



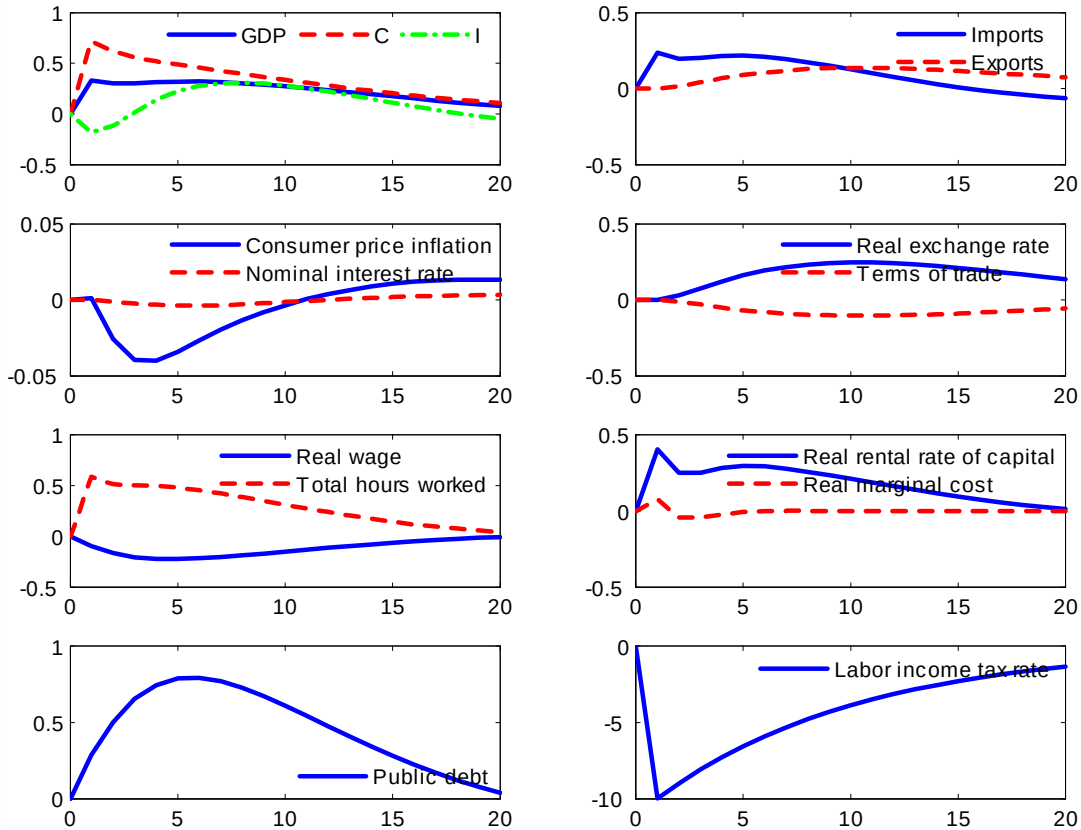
Impulse-response functions after a temporary shock in public investment.

A temporary increase in public investment



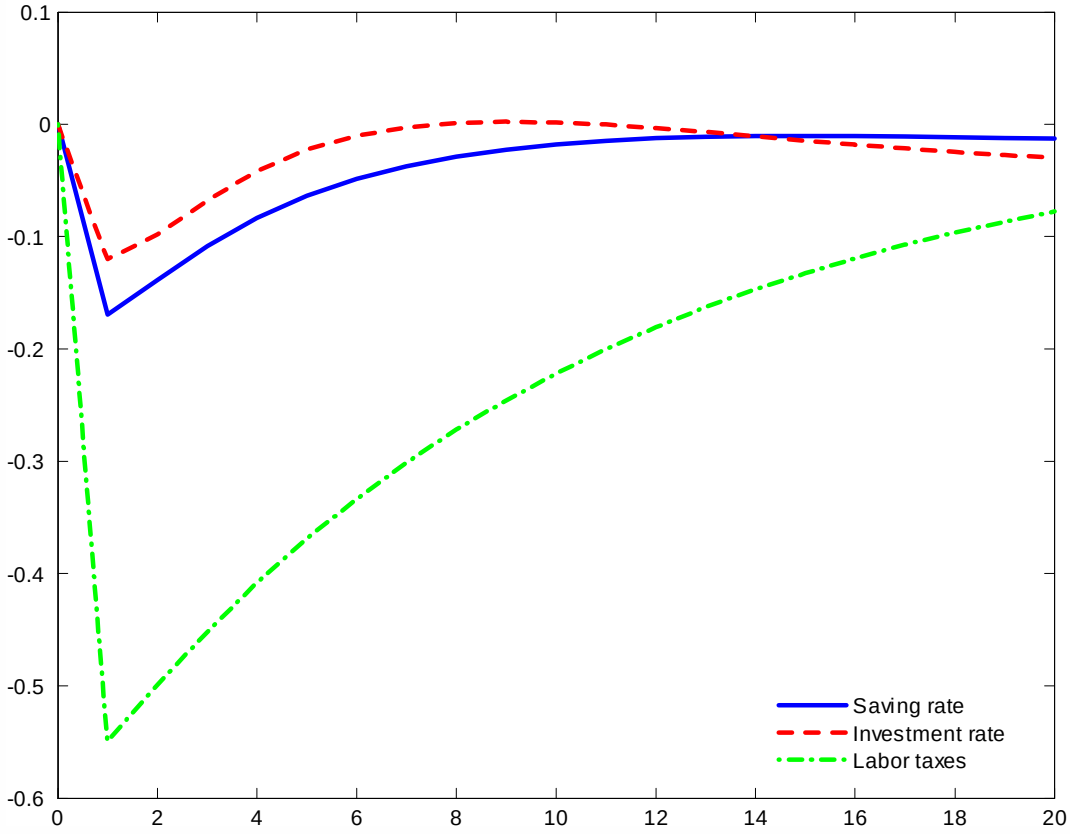
The response of saving, investment and public investment rates (in percentage point of GDP) after a temporary shock in public investment. Absolute deviations from their steady-state values.

A temporary fall in labor income taxes



Impulse-response functions after a temporary reduction in the labor income tax rate.

A temporary fall in labor income taxes



The response of saving and investment rates, and revenues from labor income taxes over GDP after a temporary reduction of the labor income tax rate. Absolute deviations from their steady-state values.

Sensitivity analysis

TABLE 3 – SENSITIVITY ANALYSIS

	Multiplier	CA/GDP
(1) Baseline	1.01	-0.17
(2) $\lambda^r = 0.8$	1.19	-0.23
(3) $\lambda^r = 0.0$	0.82	-0.09
(4) $\lambda^w = 0.9$	1.08	-0.25
(5) $ptm = 0.0$	0.96	-0.16
(6) $\sigma_x.\sigma_c, \sigma_i \times 2$	0.81	-0.20
(7) $s^x, \omega_c, \omega_i \times 0.5$	1.01	-0.08
(8) $h = 0.0$	0.94	-0.15
(9) $\rho^w = 0.9$	1.05	-0.16
(10) $\phi_b = 0.06$	0.96	-0.13
(11) $\lambda^r = \lambda^w = 0.9, \phi_b = 6 \times 10^{-6}$	1.53	-0.46
(12) Spending reversal fiscal rule (C&M, 2009)	1.06	-0.22
(13) Independent central bank	0.60	-0.01

Conclusions

- We have explored the effects of different expansionary fiscal policies upon the trade deficit in Spain, a small open economy in a currency union.
- Using a DGE model for the Spanish economy, we find that expansionary fiscal policies have only small negative effects on the current account, even assuming a large proportion of non-Ricardian consumers.
- Although Ricardian equivalence holds only partially, the crowding-out effects upon private investment compensate the behaviour of national savings.
- The current negative correlation between the large government deficit and the quick correction of the current account cannot be explained by the twin divergence hypothesis.
- The current increase in the households saving rate seems to be motivated by precautionary saving and the desire of reducing debt levels.
- The emphasis on the future fiscal consolidation should be based more on the sustainability of government debt than on the effects on external imbalances.