ISSN 1988-088X

Departamento de Fundamentos del Análisis Económico II

Department of Foundations of Economic Analysis II
University of the Basque Country
Avda. Lehendakari Aguirre 83
48015 Bilbao (SPAIN)
http://www.dfaeii.ehu.es

DFAE-II WP Series

2010-11

Peter Claeys and Alessandro Maravalle

Fiscal Policy and Economic Stability: Does PIGS stand for Procyclicality In Government Spending

Fiscal policy and economic stability: does PIGS stand for Procyclicality In Government Spending?

Alessandro Maravalle[#] *and Peter Claeys*[±]

December 2010[*]

Abstract

The Financial Crisis has hit particularly hard countries like Ireland or Spain. Procyclical fiscal policy has contributed to a boom-bust cycle that undermined fiscal positions and deepened current account deficits during the boom. We set up an RBC model of a small open economy, following Mendoza (1991), and introduce the effect of fiscal policy decisions that change over the cycle. We calibrate the model on data for Ireland, and simulate the effect of different spending policies in response to supply shocks. Procyclical fiscal policy distorts intertemporal allocation decisions. Temporary spending boosts in booms spur investment, and hence the need for external finance, and so generates very volatile cycles in investment and the current account. This economic instability is also harmful for the steady state level of output. Our model is able to replicate the relation between the degree of cyclicality of fiscal policy, and the volatility of consumption, investment and the current account observed in OECD countries.

Keywords: RBC, current account, small open economy, fiscal rule, spending.
JEL classification: E32, E62, F41, H62.

#. University of the Basque Country, Economics Department, Avenida Lehendakari Aguirre, 83, E-48015 Bilbao, Spain. Email: alessandro.maravalle@ehu.es. Alessandro Maravalle acknowledges financial support from the Departamento de Educación Universidades e Investigación del Gobierno Vasco (IT-313-07).

± Universitat de Barcelona, Facultat de Econòmia i Empresa, Grup AQR IREA, Avinguda Diagonal, 690, E-08034 Barcelona, Spain. Email: peter.claeys@ub.edu.

[*] We thank Antonio Afonso, Andrea Barone, Stefanie Haller, Werner Roeger and participants at the EC Workshop on ‘External imbalances and public finances in the EU’ and a seminar at Universidad del Pais Vasco for their comments.

1. Introduction

Textbook macroeconomics tells us that taxes should be smoothed along the cycle, in order not to exacerbate the distortionary effect of taxation, or they suggest adjusting taxes and spending in a countercyclical fashion to stabilise income. Automatic stabilisers fulfil these functions. However, in practice governments do not reinforce the working of automatic stabilisers, but usually overturn them. Instead of dampening cyclical swings in output, governments give an additional boost to the economic cycle in a boom with spending hikes or tax cuts, or cool it down in an economic crisis with contractionary policies. Many OECD countries implement such procyclical policies (Lane, 2003; Hercowitz and Strawczynski, 2004; Darby and Mélitz, 2008).

We argue that such policies have contributed to building up economic imbalances over recent years. Public spending has often continued to grow during the economic boom as it was fuelled by buoyant tax receipts flowing to the treasury. The surge in tax revenues often triggered tax cuts, with apparently little effect on total revenues. This fiscal relaxation has given an excessively strong boost to internal and external demand. Unwinding these imbalances is much harder in a crisis, as a shrinking tax base makes tax revenues dwindle, and forces cuts in spending at a time fiscal support would be needed most. This reverse mechanism – due to efforts to keep deficits in check – further exacerbates the fall in output.

In this paper, we develop a simple RBC model of a small open economy to analyse the effect of procyclical fiscal policies. We model fiscal policy with a simple reaction function in which spending reacts to the economic cycle. We then analyse the effect of changes in the degree of the cyclical response.[2] These cyclical responses of fiscal policy distort economic decisions, and so modify both the business cycle and the long-run equilibrium of the economy. A boost to spending during a boom further inflates the economic outlook and spurs investment and – through the increased need for external financing – deepens the current account deficit. Procyclical fiscal policy amplifies economic instability, but only to a certain degree. Whenever public spending rises by more than output, it crowds out economic activity. As a consequence, procyclical policy has a nonlinear effect on economic volatility. A calibration exercise on Ireland – a typical small open economy with procyclical policies – shows that consumption is about a quarter more volatile than if the government would simply let the automatic stabilisers on the spending side do their work. As procyclical policy discourages capital accumulation, steady state output is lower.

[2] A fiscal rule – be it a tax or spending rule – has become common to analyse determinacy of the economy in a monetary model (Guo and Lansing, 1998; Christiano and Harrison, 1999; Schmitt-Grohé and Uribe, 2000; Aloi *et al.*, 2003), or to look at the response of the economy to changes in government behaviour (Forni *et al.*, 2009) or to technology shocks (Malley *et al.,* 2009).

This paper contributes in several ways to the literature. First, there is substantial evidence that large governments display less volatile economies (Galí, 1994, Fatas and Mihov, 2001). Andrès *et al.* (2008) set up an RBC model with nominal rigidities and costs of capital adjustment to explain this negative correlation, which is entirely due to a shift in the composition of total output. We show that in addition to this composition effect, government size exacerbates the effect of cyclical fiscal policy. Our model is able to replicate the relationship between the degree of cyclicality of fiscal policy, and the volatility of consumption, investment and the current account observed in OECD countries. Second, our model shows that procylical policies result in less economic stabilisation, and as a consequence, in lower steady state output levels. In this way, it also establishes a link between two empirical regularities: (a) bad macroeconomic policies induce higher macroeconomic volatility (Acemoglu *et al*., 2003; Woo, 2009), and (b) countries with highly volatile output grow at a lower rate (Ramey and Ramey, 1995).

The paper is organised as follows. In Section 2, we review the evidence on procyclical policies. Section 3 presents the RBC model of a small open economy. In Section 4 we introduce the spending rule and the results of the calibration. Robustness checks are presented in Section 5. We conclude in Section 6.

2. Some evidence on procyclical fiscal policies

Built-in features of the budget make it respond to the economic cycle. On the spending side, these automatic stabilisers include mainly unemployment schemes that support income for some time, and act as an insurance scheme, thus preserving income and providing consumption smoothing for credit-constrained consumers. We can calculate the strength of automatic stabilisers by the cyclical elasticity of different budget components. Table 1 (column 1 to 3) reports these computed elasticities for a sample of OECD countries (Girouard and André, 2005). The size of the spending elasticities is typically not very large, and varies between -0.23 (for the Netherlands) and -0.02 (for Iceland). Most of the automatic stabilisation comes from the tax side, and this reflects the progressivity of most OECD countries tax schedules. Overall revenues show quite some variety in their response, due to differences in the underlying responses of different tax categories.[3,4]

In addition to these automatic stabilisers, the budget responds to economic conditions because of systematic discretionary interventions of the government to steer the economy. The

[3] For example, personal or corporate tax revenues – with a few exceptions – react more than proportionally to the economic cycle. Social security contributions do not respond as strongly and their output elasticity ranges from 0.55 in Japan to 0.91 in the UK. VAT responds in proportion to economic fluctuations.
[4] As a consequence, the elasticity of the primary surplus varies substantially between OECD countries. It is weakest in Japan and the US (0.34), but much stronger in countries with an extensive welfare system, like Denmark (0.59).

government may wish to lean against an economic crisis by cutting taxes or raising expenses. However, in practice governments do not reinforce the working of automatic stabilisers, but usually overturn them. Instead of dampening cyclical swings in output, governments give an additional boost to the economic cycle in a boom with spending hikes or tax cuts, or cool it down in an economic crisis with contractionary policies. We can measure the degree of procyclicality in spending by looking at the response of government consumption to economic growth. Lane (2003) estimates a fiscal rule in which government consumption responds to output.

Table 1. Budget elasticities to the cycle, for spending, taxes and primary surplus.

	automatic stabiliser (computed by OECD, 2005)			estimated elasticity (Lane, 2003)	
	(1) total spending	(2) revenues	(3) primary surplus[a]	(4) government consumption	(5) primary surplus
Australia	-0.16	0.65	0.39	0.10	0.30
Austria	-0.08	1.03	0.47	0.14	0.18
Belgium	-0.14	1.05	0.52	-0.18	0.14
Canada	-0.12	0.94	0.38	-0.34	0.59
Denmark	-0.21	1.04	0.59	0.37	0.04
Finland	-0.18	0.92	0.48	-0.03	0.44
France	-0.11	0.98	0.53	-0.16	0.33
Germany	-0.18	0.97	0.51	-0.08	0.40
Greece	-0.04	1.07	0.47	0.45	-0.07
Iceland	-0.02	1.01	0.37	0.91	0.17
Ireland	-0.11	1.14	0.38	0.57	-0.03
Italy	-0.04	1.17	0.53	-0.14	0.09
Japan	-0.05	0.97	0.33	0.08	0.10
Netherlands	-0.23	1.01	0.53	0.40	0.23
Norway	-0.12	1.00	0.53	0.60	0.73
New Zealand	-0.15	0.61	0.37	-0.12	0.31
Portugal	-0.18	1.08	0.46	0.61	0.16
Spain	-0.11	1.09	0.44	0.68	0.14
Sweden	-0.15	1.01	0.55	0.13	0.85
Switzerland	-0.19	1.04	0.37	0.35	-
UK	-0.05	1.14	0.45	-0.54	0.37
US	-0.09	1.00	0.34	0.03	0.37

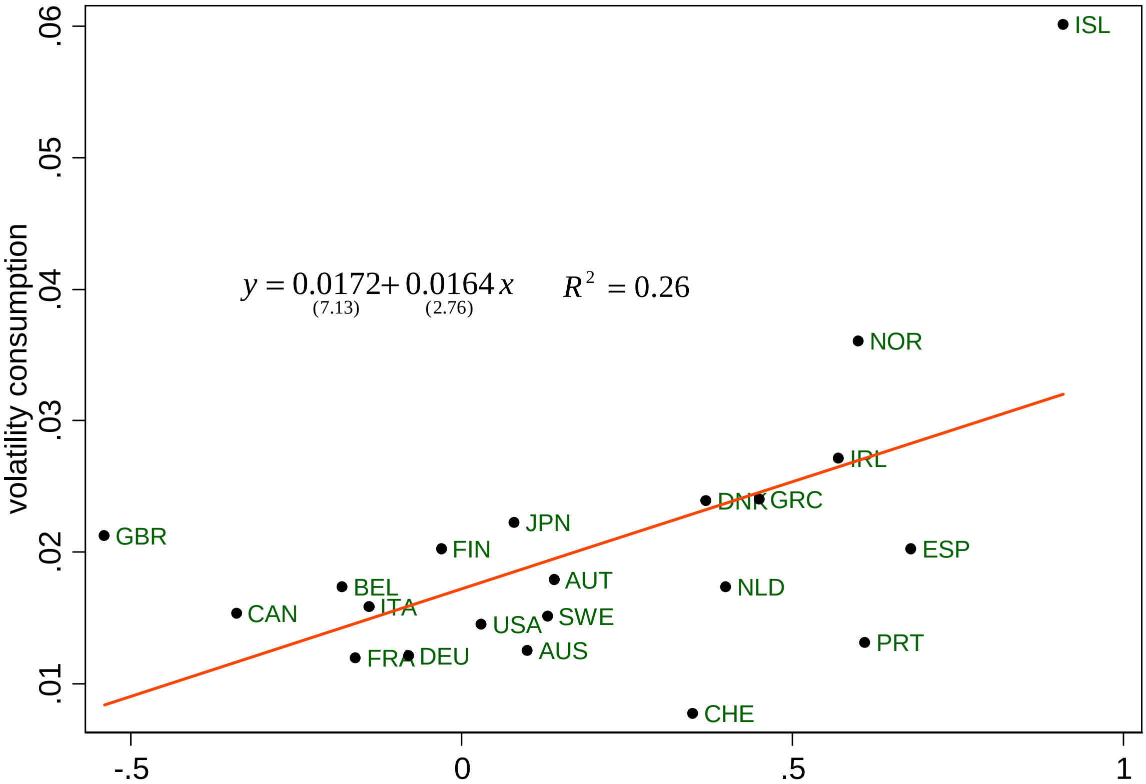
Notes: data from Lane (2003)(Table 1, p. 2669), and Girouard and André (2005)(Table 9, p. 22); (a) the semi-elasticity measuring the change of the budget balance as a per cent of GDP, for a one per cent change in GDP.

Table 1 (column 4) reports these estimated budget elasticities. We observe that government consumption is procyclical in many countries, and that the difference to the underlying elasticity of spending (column 1) is positive in most cases. We can likewise measure the degree of cyclicality of the surplus. Overall, the cyclical response of the surplus also falls short of what we would expect from the automatic stabilisers in all but a few countries (US, Canada, Sweden and Norway)(column 3 and 5). In Greece or Ireland, the deficit even increases when economic conditions improve. The difference is less outspoken than for government spending. The reason is that the cyclical response of tax revenues is usually much larger (column 2), so procyclical spending does not have much of an effect on the overall elasticity of the (primary) surplus. Evidence for OECD countries shows that procyclical fiscal policies are mostly driven by government expenditure (Lane, 2003; Hercowitz and Strawczynski, 2004; Darby and Mélitz, 2008). Lavish spending is possible as the economic boom provides the treasury with plenty of additional tax revenues.[5]

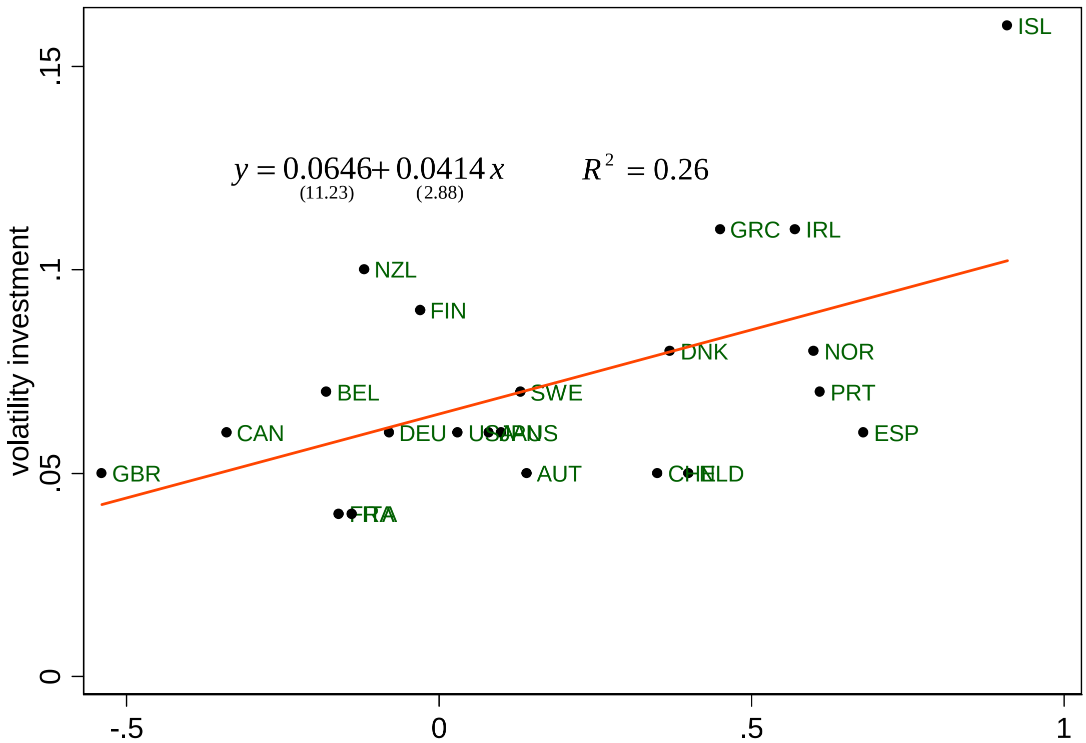
Procyclical policies come at the cost of economic stability. We can see the negative effect of procyclical policy on economic stability in Figure 1. We plot the coefficients of column 4 in Table 1 of the Lane-regressions against the volatility of private consumption and private investment. More procyclical budgets are associated with higher volatility in both. We also find a positive relationship between the spending elasticity and the volatility of the current account. We observe that Ireland can be grouped together with some other small open economies that have experienced dramatic falls in the budget balance over the last crisis. Spain, Greece and also Portugal have run highly procyclical policies, and experienced quite high volatility in consumption, investment and the external balance. A simple OLS regression of the volatility measure against a constant and the spending elasticity shows that the relationship is significant (at 1 per cent) and positive. A plot of other measures of changes in fiscal policy (such as the volatility of government consumption, or the difference between 'realised' and 'structural' budget elasticities) against the same variables, results in a similar pattern. Woo (2009) provides more comprehensive evidence for a larger sample of countries on the positive link between procyclicality and macroeconomic volatility.

5 We would expect that procyclical policies stabilise the deficit over the cycle at the cost of economic stability. Taxation is increased – or spending cut – during an economic slump. There is ample evidence that a procyclical fiscal relaxation in good times is not offset by a similar procyclical tightening in downturn. Spending goes up during booms, but it does not come down in recessions again (Turrini, 2008). Governments loosen the fiscal stance by spending the additional tax revenues in good times, but let the balance deteriorate as soon as economic conditions start to worsen again (Manasse, 2006, Giuliodori and Beetsma, 2008). Hence, procyclical policy is largely a boom phenomenon. The consequence of this asymmetric response over the cycle is a debt bias.

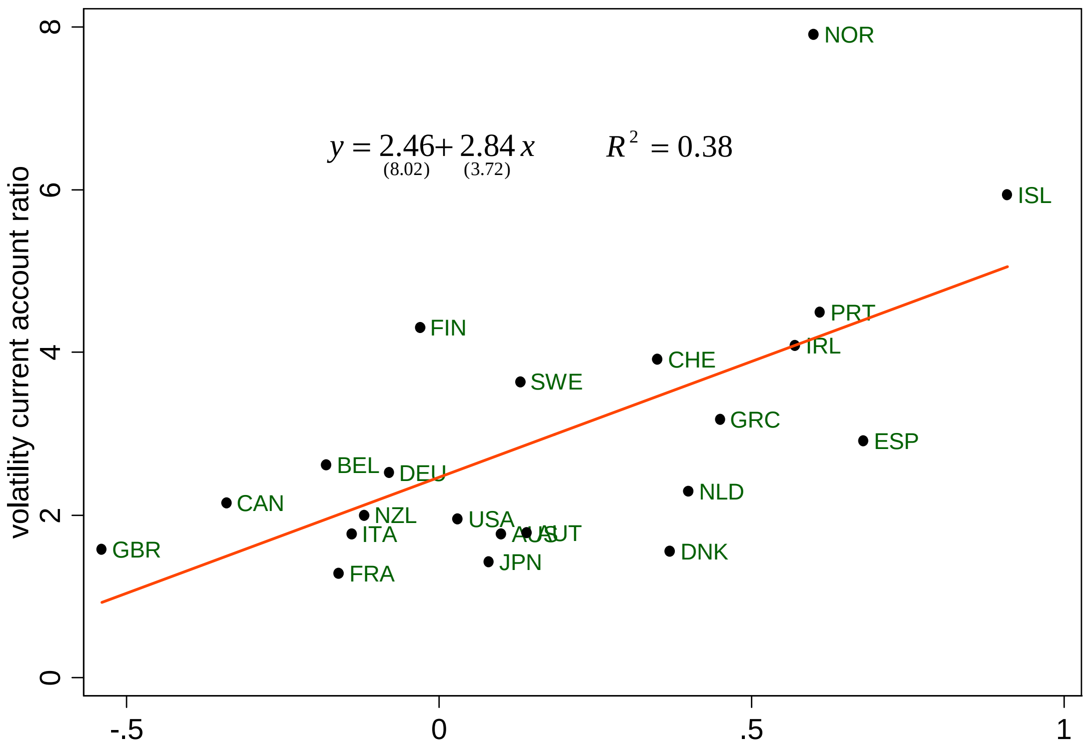
Figure 1. Spending elasticity, and volatility of consumption, investment and current account



(a) spending elasticity v volatility private consumption



(b) spending elasticity v volatility private investment



(c) spending elasticity v volatility current account ratio to GDP

Notes: coefficients of Table 1 (Lane, 2003), data are from OECD Economic Outlook June 2009.

3. The model

3.1. Building blocks for a model of a small open economy

The model we build is standard, and similar to the small open economy RBC model of Mendoza (1991). Readers familiar with that model may want to skip to the next section. The economy is inhabited by an infinitely lived population of unit density. Households share the same preferences and have to allocate consumption c_t and labour supply h_t intertemporally to maximise the expected value of the stream of instantaneous utility:[6]

$$E_t \sum_{t=0}^{\infty} \beta^t \left[\frac{\left(c_t - \omega^{-1} h_t^{\omega}\right)^{1-\gamma} - 1}{1-\gamma} \right] \qquad (1)$$

where $\beta \in [0,1]$ is the subjective discount rate, $\gamma>0$ is the inverse of the elasticity of intertemporal substitution in consumption and ω-1 is the inverse of the Frisch elasticity of substitution in labour supply. Households own the perfectly competitive firms and choose every period how much to invest (i_t) in the capital stock k_t. In this choice, they are subject to the law of motion of capital ($\delta > 0$ is the depreciation rate of capital k_t)

[6] The adoption of a CES utility function allows us to get steady state conditions that are independent of the initial level of wealth or net foreign asset position.

$$k_{t+1} = k_t(1-\delta) + i_t \quad . \tag{2}$$

We assume that firms incur some adjustment costs in their capital stock when they invest and that these costs increase with the speed of the required adjustment, thus making the adjustment to the desired level of capital a gradual one. We capture the convex adjustment costs with a quadratic function, in which the size of the costs is determined by the parameter ϕ>0:

$$\Phi(k_{t+1}-k_t) = \frac{\phi(k_{t+1}-k_t)^2}{2}, \Phi(0)=0,\ \Phi'(0)=0. \tag{3}$$

Firms produce a single good that is internationally tradable. Technology is represented by a constant returns to scale Cobb Douglas production function

$$y_t = A_t F(h_t, k_t) = A_t k_t^{\alpha} h_t^{1-\alpha}, \tag{4}$$

where $\alpha \in (0,1)$ is the capital share in output, h_t and k_t are, respectively, the amount of labor services and capital stock used in production, and $A_t > 0$ is total factor productivity, which is exogenous. Shocks to technology follow an AR(1) stochastic process:

$$\ln(A_t) = \rho \ln(A_{t-1}) + \varepsilon_{a,t}, \quad \varepsilon_{a,t} \sim N(0, \sigma_a). \tag{5}$$

The coefficient ρ is the degree of persistence of the technology shock. Households have acces to an internationally traded one-period riskless bond d_t to finance their consumption and investment choices. The domestic cost of borrowing from abroad is determined by the world real interest rate r^*, augmented by a premium that depends on the difference between the quantity borrowed and its target level:

$$r_t = r^* + p(d_t) \tag{6}$$

High levels of borrowing make it more costly to borrow even more. The increasing function $p(\cdot)$ determines this premium on r^* so that interest rates are higher ($r_t > r^*$) if the net foreign asset position is higher than in steady state ($d_t > \bar{d}$).[7] We assume the function takes the following form (Schmitt-Grohé and Uribe, 2003):

$$p(d_t) = \psi(e^{d-\bar{d}} - 1) \tag{7}$$

The ease with which the portfolio of borrowings can be adjusted in any period is determined by the parameter *ψ>0.* An economy that is more closely integrated in world financial markets will

[7]This assumption is necessary to obtain stationary wealth in a small open economy (Schmitt-Grohé and Uribe, 2004).

be able to find finance or lend abroad at a rate closer to the world interest rate, i.e. it is characterised by a lower *ψ.*

Government spending G_t consists entirely of domestic production and does not provide any utility to economic agents. In steady state, the government decides to set G_t at some level $\bar{G}$. The budget is perfectly balanced by lump sum taxes T_t in every period, so the government does not issue debt domestically, nor does it borrow from abroad, so that

$$T_t = G_t \tag{8}$$

Production y_t can be used to consume, invest, or pay taxes. Since there is only one good in this economy and goods and financial assets are interchangeable, the excess of domestic production over domestic absorption gives rise to trade between the country and the rest of the world. The trade balance TB_t is therefore defined as:

$$TB_t = y_t - c_t - i_t - \Phi(k_{t+1} - k_t) - T_t \tag{9}$$

A trade balance surplus can be invested in foreign assets (or a shortage financed by borrowing abroad) and we so obtain the link between the trade balance and the current account CA_t :

$$CA_t = -(d_t - d_{t-1}) = -\Delta NFA_t = TB_t - r_{t-1}d_{t-1}. \tag{10}$$

At time t, a country has a net debt (*credit*) foreign asset position if $d_t>0$ $(d_t<0)$, and lends (borrows) abroad if $CA_t>0$ $(CA_t<0)$.

We consider the social planner solution that maximises (1) subject to constraints (2) to (4) and the resource constraint (11) of the economy that is obtained from aggregating the individual budget constraint over the entire population:

$$d_t = d_{t-1}(1 + r_{t-1}) - [y_t - c_t - i_t - \Phi(k_{t+1} - k_t) - T_t]. \tag{11}$$

Finally, we also impose the no-Ponzi game constraint (12)

$$\lim_{j\to\infty} \frac{d_{t+j}}{\prod_{s=1}^{j}(1 + r_s)} \le 0 \tag{12}$$

that is always satisfied if the stock of debt is bounded, as is the case for approximations around the non-stochastic steady state.

The transmission of a temporary technology – also supply – shock to the economy is standard in an RBC model and goes as follows.[8] A positive supply shock pushes up the marginal productivity of capital and labour, and so raises investment. The introduction of adjustment costs in the capital stock makes investment react more gradually. Hours worked go up as households profit from the temporary higher real wage. As households feel wealthier, they also raise consumption. But this rise is smoothed over time as part of the additional income is saved. In a closed economy, the investment boom would be financed by giving up consumption. The economic expansion is limited due to the rise in interest rates. In contrast, in a small open economy, additional financing can be obtained from international markets, and this decouples the saving/investment decision.[9] If a positive technology shock produces a strong wealth effect on consumption, domestic savings fall short of investment and a current account deficit results. The country borrows on international markets, and becomes a net debtor.

3.2. The fiscal rule

In this benchmark model fiscal policy has no particular role to play. Government spending *G* just buys the domestic good, which has no utility, and is financed by a lump sum tax. We depart from that specification and introduce a fiscal policy rule. The behaviour of the government is modelled with a simple reaction function: spending G_t is initially fixed by the government at the steady state level $\overline{G}$, but then varies G_t when output deviates from its steady state level (Y_{ss}).[10] In particular, the fiscal rule is:

$$G_t = \left(\frac{y_t}{y_{ss}} \right)^{\theta} \overline{G}. \tag{13}$$

The parameter θ is the elasticity of government spending with respect to the business cycle. The benchmark model comes out as a special case when $\theta=0$ and $G_t = \overline{G}$. In case θ is negative, spending is cut during an upswing in the cycle, and we call spending countercyclical. Instead, if θ is positive, spending is procyclical.[11] A less than proportional reaction of spending implies that in case the output gap was 1 per cent, government spending would change by less than 1 per cent. We call this a weakly cyclical policy ($|\theta| \in [0,1]$). Instead, when fiscal policy is strongly cyclical, the response of government spending is more than proportional to the change

[8] We discuss the baseline results, and refer to Mendoza (1991) for a more extensive discussion.
[9] The interest rate is set at world level, and the domestic premium only depends on the net creditor position.
[10] Our fiscal rule is defined as a reaction of spending to a change in output (as in Aloi *et al.*, 2003), whereas most other papers have considered the reaction to the level of output.
[11] As we consider a balanced budget, the results would be equivalent under a tax rule in which the tax rate responds to the cycle.

in output $\left(|\theta| > 1\right)$. Although the size of government falls in absolute terms for countercyclical policies under a boom and for procyclical policies in a recession, the cyclical behaviour of the spending ratio to output is different: in a recession, the spending ratio falls only when fiscal policy is strongly procyclical; in a boom, it falls when the government follows any policy but a strongly procyclical one. Our terminology therefore encompasses several cases that have been considered in the literature before. Papers that strictly adhere to the definition of a tax smoothing policy consider as countercyclical the policy for which the spending ratio is constant over the cycle (*θ=1)*,[12] and as procyclical the policies for which the spending ratio rises in booms, which holds only for *θ>1* (Alesina *et al.*, 2008). Our definition matches the measures of the elasticity of government spending to economic growth that have typically been tested in the empirical literature (Lane, 2003; Giuliodori and Beetsma, 2008).

3.3. The distortionary and crowding out effect

The variation in government spending over the cycle modifies the marginal decisions of households and firms. In a standard RBC model, the marginal rate of substitution between consumption and leisure equals the wage, which in a competitive labour market equals the marginal productivity of labour. The variation in government spending over the cycle drives a wedge between these two values.[13] In (14a), the marginal rate of substitution between leisure and consumption is no longer identical to the marginal productivity of labour MP_{h_t} , but is multiplied by the factor in square brackets:

$$\frac{-U_{h_t}}{U_{C_t}} = MP_{h_t}\left[1-\theta\left(\frac{y_t}{y_{ss}}\right)^{\theta-1}\frac{\overline{G}}{y_{ss}}\right]. \qquad (14a)$$

The same factor also drives a wedge into the Euler equation (14b) between the optimal intertemporal allocation of consumption and savings. When *θ=0*, this factor is 1, and we are back to the benchmark case with acyclical fiscal policy. But whenever fiscal policy varies with the cycle (*θ≠0),* fiscal policy changes the incentives for investment at time t by affecting the expected marginal productivity of capital next period.

$$U_{C_t}\left(1+\Phi_{K_{t+1}}\left(\Delta K_{t+1}\right)\right)=\beta E_t U_{C_{t+1}}\left[MP_{K_{t+1}}\left(1-\theta\left(\frac{y_{t+1}}{y_{ss}}\right)^{\theta-1}\frac{\overline{G}}{y_{ss}}\right)+1-\delta+\Phi_{K_{t+1}}\left(\Delta K_{t+2}\right)\right]. \qquad (14b)$$

This wedge depends on three terms: the elasticity of spending over the cycle, the output gap

[12] Kaminsky *et al.* (2004) call this policy acyclical instead.
[13] The mechanism described here is similar to the effect of a government expenditure shock in the presence of distortionary taxation as described by Baxter and King (1993).

and the size of government.

$$-\theta \frac{G_t(\theta)}{y_t} = -\theta \left(\frac{y_t}{y_{ss}} \right)^{\theta - 1} \frac{\overline{G}}{y_{ss}} \tag{15}$$

The elasticity of spending over the cycle modifies the incentives to invest and consume and thereby changes the properties of the business cycle. From the modified first order conditions (14a) and (14b), we see that any cyclical policy implies a distortion that changes the incentives to work and to invest. The eventual effect on economic stabilization of the fiscal rule depends on how the distortion varies over the cycle. We illustrate the mechanism for a positive technology shock and a fiscal policy that is countercyclical ($\theta<0$). In a boom phase, the distortion shrinks, and decreases the incentive to supply work and to invest. This contrasts the effect of higher total factor productivity and so cools down the economy. As a result, consumption and investment increase less after a positive technology shock relative to a neutral fiscal policy. Given that domestic saving can finance most of the rise in investment, the current account deficit will be smaller. Countercyclical fiscal policies thus work as a buffer against a technological shock as they take the steam out of the boom.

In contrast, under a procyclical fiscal policy, the distortion in the boom phase increases for weakly procyclical policies ($0<\theta<1$) and shrinks for strongly procyclical policies ($\theta>1$). Thus, under a weakly procyclical policy, the reverse mechanism is at work. Additional spending in an economic boom inflates investment and working prospectives. The increased need for external financing reduces the current account surplus (or might even create a current account deficit). As a result, weakly procyclical policies amplify the effect of technology shocks and increase economic volatility. The opposite is true for strongly procyclical fiscal policies, which lessen the effect of technological shocks.

Thus, this distortionary effect is not linear in the degree of cyclicality. The reason is that the government spending to GDP ratio varies with θ too. Since there is a single tradable good in this economy, and the public good has no direct utility or productive effects, the more resources are taken away from the economy for the purchase of the public good, the fewer remain for productive activities. The change in spending creates a wealth effect that further modifies the economic responses. Take the same example of a positive supply shock and a countercyclical policy. The fall in public spending implies a reduction in taxes. This reduction is instantaneous as we assume budget balance. Lower taxation produces a positive wealth effect for households. They react to it by reducing their labour supply but raising consumption. This curbs incentives to invest. As savings fall relatively less than investment, the current account moves upward. Although government size (as a ratio to GDP) falls and so frees up additional resources to employ in private activity, countercyclical fiscal policy always leans against the cycle. In case the cut in aggregate demand by the public sector becomes very large – as under a strongly countercyclical policy – the fall in public demand does not compensate the increase in demand of the private sector, and so curbs economic activity.[14]

The mechanism under procyclical policies is not simply the reverse, but depends on the level of crowding out of private activity. The behaviour of the government spending to GDP ratio is crucial. Let us consider first the case in which the government raises spending during the economic boom, but by less than the change in output. This weakly procyclical policy implies just a partial crowding out and hence a similar smoothing effect of a reduction in government size as for countercyclical policies. This smoothing effect gets weaker as the degree of procyclicality of fiscal policy gets stronger. When θ=1, the government spending ratio does not vary after a technology shock, and there is no crowding out of private activity. Once fiscal policy is strongly procyclical, government spending increases more than proportionally to output. In this case, all additional output is entirely absorbed by public consumption. Moreover, government spends above the level of output prior to the shock. In this model, this means the government buys more of the single tradabe good, and crowds out private activity. Households see their disposable income fall, and therefore decide to cut their labor supply and consumption. This dampens the economic outlook, and hence firms cut investment too. The current account falls as a result. The more proyclical policy is, the more economic activity will be curbed, so that it may even offset the positive impact of the additional spending increase on the economy.

We can see the overall effect of a certain type of fiscal policy more formally by taking the first derivative of (15) with respect to the output gap:

$$\frac{\partial\left[-\theta\left(\frac{y_t}{y_{ss}}\right)^{\theta-1}\frac{\overline{G}}{y_{ss}}\right]}{\partial\left(\frac{y_t}{y_{ss}}\right)}=-\theta(\theta-1)\left(\frac{y_t}{y_{ss}}\right)^{\theta-2}\frac{\overline{G}}{y_{ss}}. \tag{16}$$

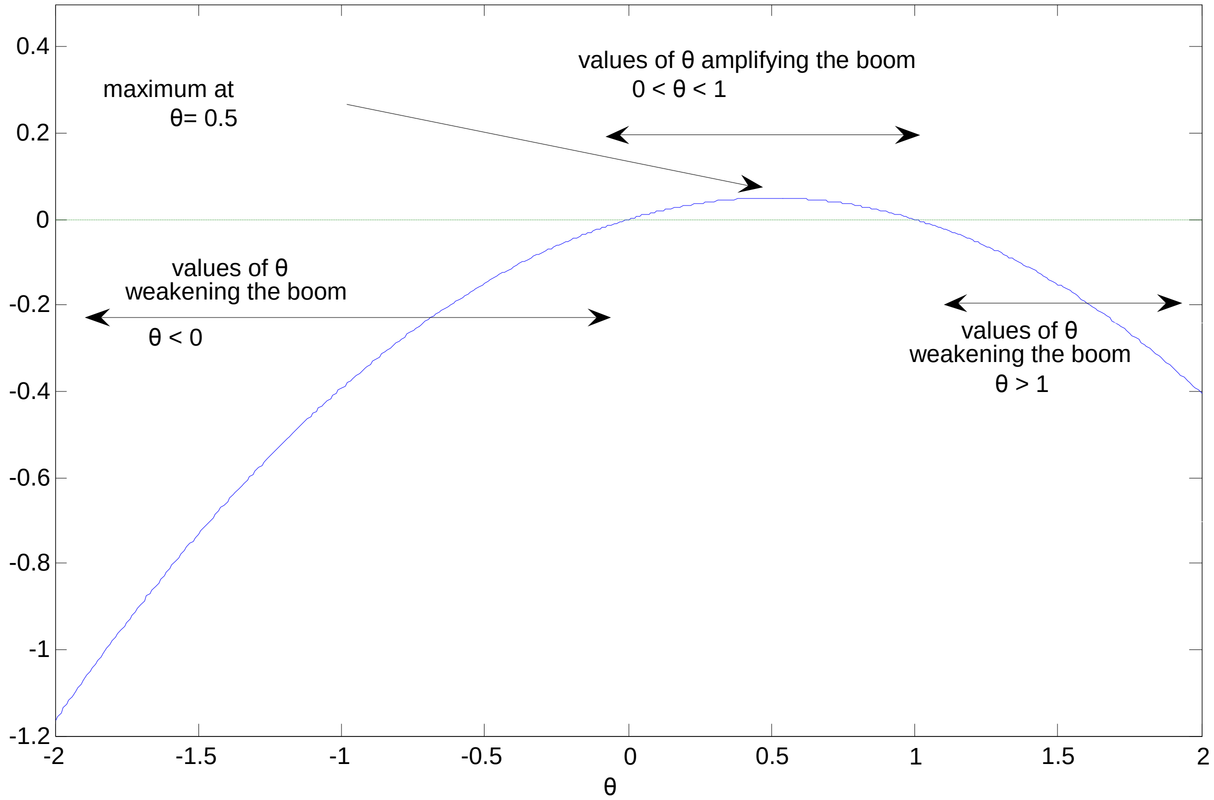
Equation (16) shows us how the distortionary factor varies along the economic cycle, where its sign depends on the government spending elasticity θ. To find the overall dynamic of the distortion over the cycle as a function of the fiscal rule, we take first derivates of (16) with respect to θ:

$$\frac{\partial(\bullet)}{\partial\theta}=-\frac{\overline{G}}{y_{ss}}\left[(2\theta-1)\left(\frac{y_t}{y_{ss}}\right)^{\theta-2}-\theta(\theta-1)(\theta-2)\left(\frac{y_t}{y_{ss}}\right)^{\theta-2}\ln\left(\frac{y_t}{y_{ss}}\right)\right]\approx-\frac{\overline{G}}{y_{ss}}(2\theta-1)\left(\frac{y_t}{y_{ss}}\right)^{\theta-2} \tag{17}$$

[14] As countercyclical policies never raise the size of government but always increase economic stability, there is no trade-off between efficiency and stability in this model.

We summarise results from (16) and (17) in Figure 2. When the first derivative (16) is positive, the policy amplifies the boom; when it is negative, it dampens the cycle. We observe that countercyclical policies ($\theta<0$) always reverse the effect of the supply shock. As the degree of countercyclicality falls, the distortion shrinks quite rapidly. In contrast, for positive values of θ the distortion first rises but then falls. Weakly procyclical policy raises the distortion and hence amplifies economic booms. The distortionary effect reaches its peak around $\theta\approx0.50$.[15] However, for strongly procyclical fiscal rules ($\theta>1$) the distortion decreases again and dampens economic fluctuations.

Figure 2. Evolution of the distortion for different fiscal rules.



Note: the figure is for a spending share $G_{ss}/Y_{ss}= 0.18$, and an output gap $Y_t/Y_{ss}=1.06$.

The model allows us to do some comparative statics. First, all dynamic effects are amplified when output fluctuations are stronger. I.e., the more pronounced is the economic cycle, the stronger is the impact of any given distortion. Second, the steady state government size, through the spending ratio to output in steady state ($\frac{\bar{G}}{Y_{ss}}$) ,affects the distortionary factor directly.

We observe in (15) that a larger government increases the absolute value of the wedge. This static size effect amplifies the distortionary effect of any given type of fiscal policy. Consequently, and in contrast to other papers that have examined the size of government in

[15] The approximation follows from the second term in (17).

RBC models (Galí, 1994; Andrès *et al.,* 2008), there is no linear relationship between the size of the public sector and economic stabilisation. A larger government is associated with less economic volatility only if policy is countercyclical or strongly procyclical.

4. The effects of cyclical fiscal policy

4.1. Calibration of the model

This DSGE model does not have a closed form solution. We log-linearise the equilibrium conditions around the non-stochastic steady state and solve the corresponding discrete time rational expectations model by applying the method by Schmitt-Grohé and Uribe (2004). Preferences, technology and the stochastic error process depend on parameters that must be set to some specific values to calibrate the model. The data we use for calibrating the model are for Ireland, and based on annual observations over the period 1970-2008. Data are from the OECD Economic Outlook no. 86; except data on total factor productivity, which we take from the EU KLEMS database.

The selection of parameter values is based on: (a) the restrictions imposed by the model on the steady state solution, (b) a match with some stylised facts of the main macroeconomic series of the Irish economy, and (c) some external estimates from the relevant empirical literature. We check the model findings for their robustness to changes in the main parameters. A first group of parameters $(\alpha, \beta, \delta, r^*, d)$ is set to values that make the steady state of the model roughly consistent with some stylised regularities of the Irish economy. The in sample values are in Table 2, panel (a), and the parameters in Table 3. We choose the value of α (capital's share of output) as one minus the average of labour compensation over total output: as around two thirds of total production goes to labour income, α is 0.32. The real interest rate *r** is set to a hypothetical world real interest rate of 4%. The subjective discount rate *β* is set equal to 1/(1+r*). The value of *δ* (depreciation rate) is set to 0.10, a standard value in the literature. The steady state value of government spending ($\overline{G}$) and the net foreign asset position ($\overline{d}$), are set to match the average ratio of both series over output. Government spending includes all current government spending, but not interest payments on debt.

A second group of parameters $(\rho, \sigma_a, \omega, \phi, \psi)$ is set to match the persistence of total factor productivity (as a proxy for technology) and the standard deviation of output, investment and hours worked. We transform the series to per capita terms, take logs and provide a range for the statistical moments by detrending with a HP filter with different smoothing parameters.[16] Panel (b) of Table 2 provides the corresponding values for the standard deviation of the cyclical component of the series.[17] To set the value of ρ we estimate a first order autoregressive stochastic process for the log of total factor productivity (TFP). Given that Ireland has known fast economic growth over the period 1989 to 2007, and quickly converged to average EU GDP per capita, it is no surprise that the average TFP growth rate is one of the highest in Europe.[18] Ireland experienced large and repeated positive supply shocks and as a consequence, these shocks are quite persistent (ρ=0.80). The value of the standard error of the supply shock σ_a is set to match the standard deviation of output. The imperfections in foreign and domestic capital markets – ψ (portfolio adjustment costs) and ϕ (capital adjustment costs) – usually take small values, and are set to match the standard deviation of investment and of the current account ratio. The value of ω is set within the range of empirical estimates available in the literature so as to match the variance of hours worked in the data.

Table 2. Steady state values.

	data		model
	panel (a)	ratio	
I/Y	0.21		0.22
G/Y	0.18		0.18
C/Y	0.59		0.59
d/Y	0.32		0.33
	panel (b)	standard deviation	
σ_Y	1.44 - 1.55		1.50
σ_I	5.34 - 5.71		5.48
σ_h	0.80 - 0.84		0.82
$\sigma_{CA/Y}$	1.07 – 1.14		1.07

Note: series detrended with HP filter, for a range of λ between 6.25 and 8.25.

A final set of parameters is chosen following common practice in the literature. The parameter γ (the inverse of the elasticity of substitution) is set equal to 2. Its exact value is hard to estimate and widely debated, yet always larger than 1 (King and Rebelo, 1990). An estimate of the elasticity of government spending to the cycle is taken from Lane (2003), and implies on

[16] We work with annual data and consider an upper and lower bound for the smoothing parameter λ of the HP filter (6.25 and 8.25, as in Ravn and Uhlig (2001)). The corresponding cyclical component should match that of a band pass filter that selects cycles with a frequency between 1.5 to 8 years.

[17] The use of TPF is based on Solow residuals, which may be criticised as a proxy for productivity shocks, since the assumptions underlying the derivation are not satisfied, especially not in a model with adjustment costs. For example, Evans (1992) casts doubt on the invariance property of technology; Burnside and Eichenbaum (1996) find that a variable rate of input utilization reduces the variance of TPF measures. We use alternative detrending techniques for deriving technology shocks in Section 5.

[18] TFP has grown annually by 1.22% which is second to Finland only, and double the TFP growth in France or Germany over the same period.

average a weakly procyclical stance in Ireland (θ=0.57). We summarise in Table 3 all parameters we use to calibrate the model.

Table 3. Parameter values.

parameter		value
α	capital share of output	0.32
β	subjective discount rate	0.96
γ	intertemporal elasticity of substitution	2.00
δ	depreciation rate	0.10
ψ	portfolio adjustment cost	0.0011
ρ	AR(1) technology shock	0.80
ω	inverse intertemporal elasticity of substitution in labour supply	2.05
ϕ	capital adjustment costs	0.001
r^*	real interest rate	0.04
θ	elasticity of government spending to the output gap	0.57

4.2. The effects on the economic responses to a supply shock

We calibrate the model to see how the distortionary effect of cyclical fiscal policy changes the dynamic response of the economy to a supply shock. The main calibration is based on the weakly procyclical policy we observe in Ireland (for θ=0.57), but we then vary θ to analyse different counter- and procyclical policies. We plot the responses for five specific values of θ: the acyclical policy (θ=0) and two examples - a weak and a strong one – for each type of policy. Figure 3a reports the effects on output. As the responses for hours worked and consumption are similar to those of output, we have not repeated these. Figure 3b compares the effects on investment.

In Figure 3a, we observe how output goes back to baseline as the effect of the supply shock gradually dies out. The responses of output under a countercyclical policy lie under those of the acyclical policy (θ=0). This effect is economically sizeable as the output response is still lower than under an acyclical policy after ten years. The more countercyclical is spending, the more the output response is curbed. In contrast, procyclical fiscal policy boosts the output response, but only to a certain limit. For the weakly procyclical fiscal policy pursued in Ireland, the impulse response to a technology shock lies about ten per cent higher than under an acyclical policy at all horizons. But for strongly procyclical policies, the output response is curbed as a result of the rise in the government spending ratio. The dampening effect of countercyclical and strongly procyclical fiscal policies is also visible from the investment response in Figure 3b. Without fiscal policy, a technology shock has positive effects on investment initially, but due to the costs of adjustment this response of investment is spread out in later periods. a weakly procyclical policy gives a supplementary boost to investment, reflecting the distortionary effect of additional spending. Instead, this investment response is switched – and may even be negative – for very countercyclical or procyclical policies, due to the disproportionate change in public purchases.

This dampening effect of a countercyclical or very procyclical policy spills over to the current account (Figure 4). Under an acyclical fiscal policy, the increase in investment is nearly completely financed by borrowing abroad. As a consequence, the effect on the current account is very pronounced. A countercyclical policy smoothes out both investment and consumption, hence domestic savings meet to some extent domestic investment needs. Similarly, for strongly countercyclical policies, the fall in investment again makes external financing less necessary. Savings can even be sufficient to lend abroad and the current account becomes strongly positive in the first period already. Under a weakly procyclical fiscal policy rule, the destabilisation of investment and consumption responses of the economy is magnified. External financing needs will rise even more, and the current account deficit will be much stronger initially. Recall that under the parameterisation of the model, this is precisely the case for Ireland. This mechanism explains why small open economies might suffer large current account deficits when they experience positive supply shock over prolonged periods.

Figure 3a. Impulse response function: 1% deviation technology shock, response of output

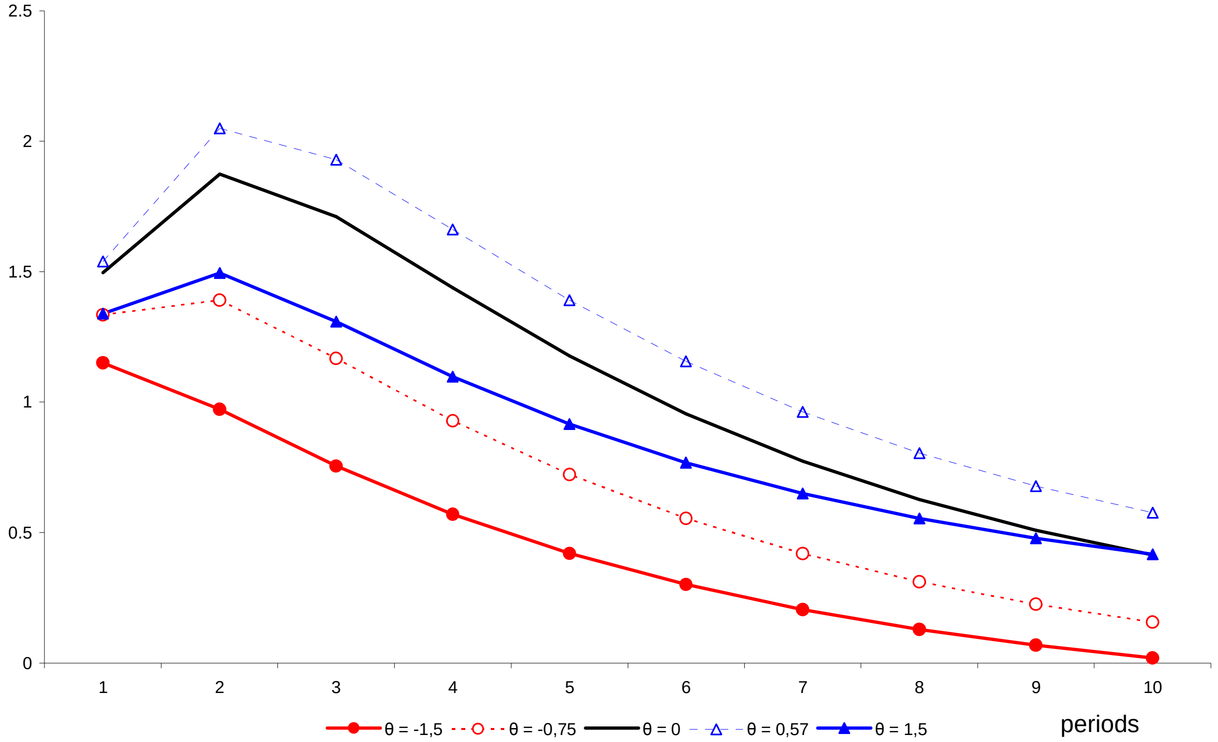


Figure 3b. Impulse response function: 1% deviation technology shock, response of investment

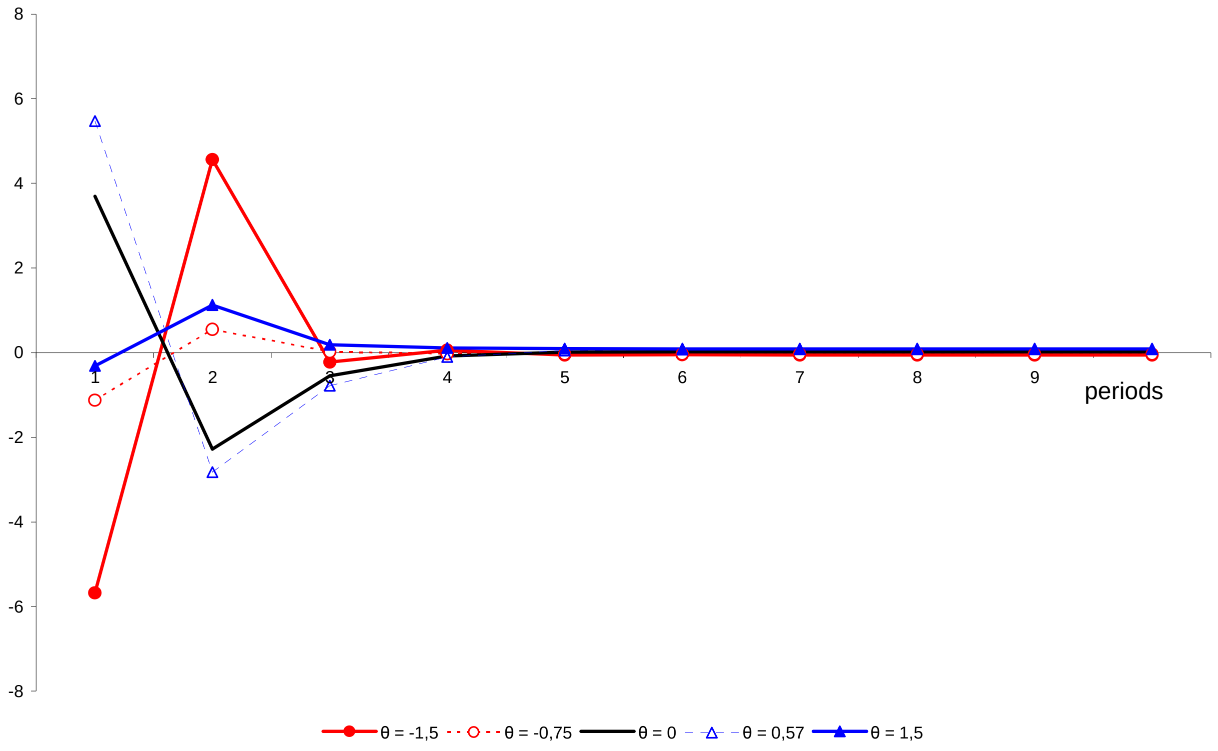
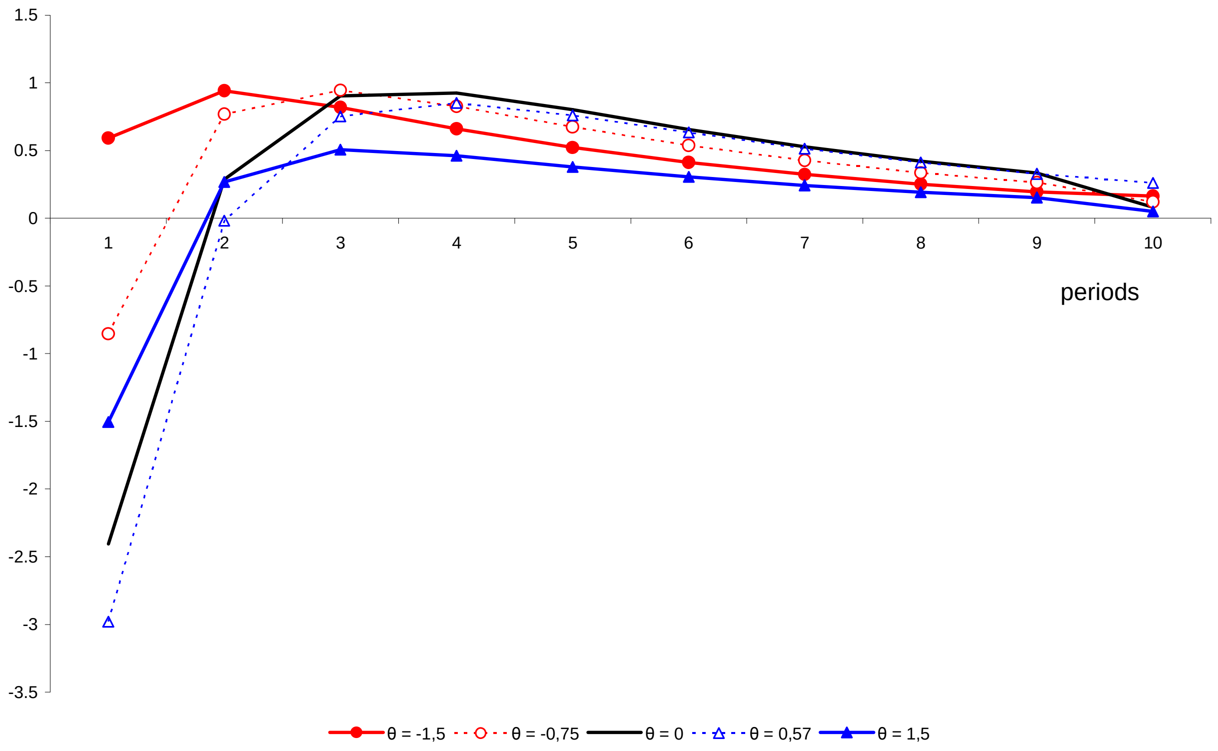


Figure 4. Impulse response function: 1% deviation technology shock, response of current account ratio

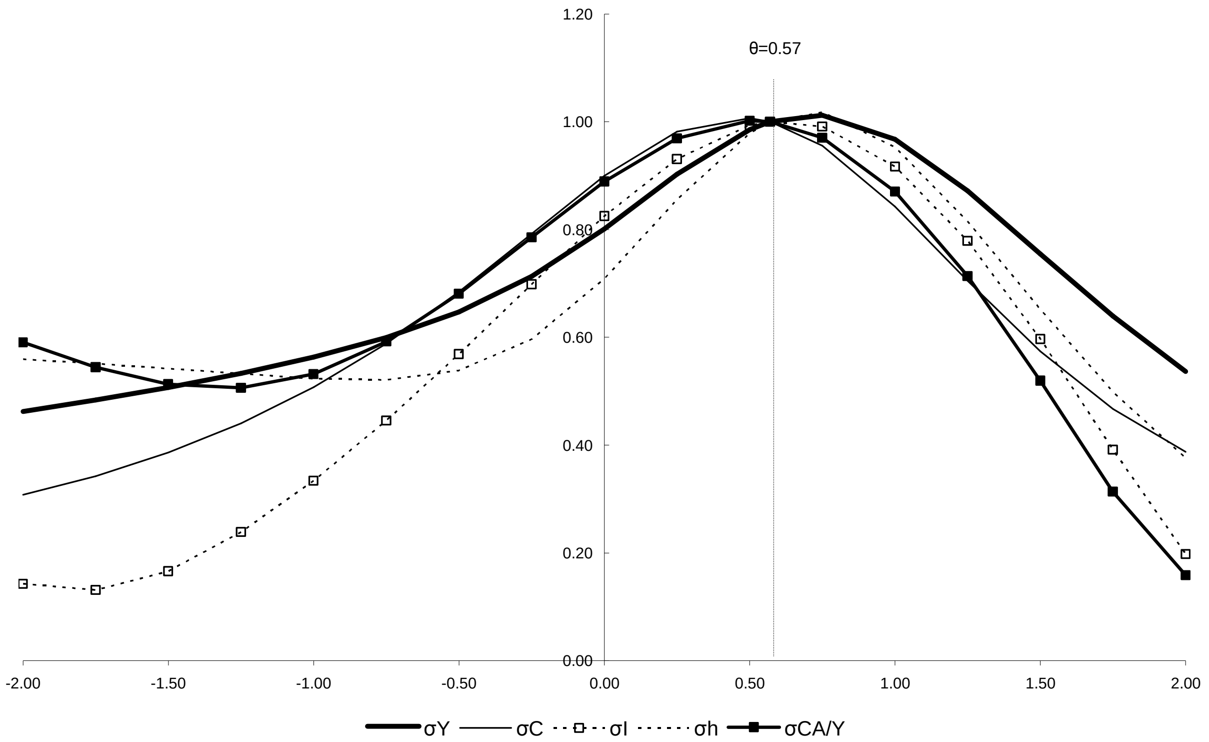


4.3. The effects on the second moments of the economy

One of the tasks of fiscal policy is economic stabilisation. The degree of cyclicality of fiscal policy affects the stabilization properties of the economy. To see this, we compare the second moments of the main series in the model for each possible degree of cyclicality of spending. For a given distribution of the technological shock (i.e. Gaussian white noise with a given standard deviation), we compute the theoretical second moments of the economy. We then scale the variance of the series – for some specific θ – to the variance at the benchmark policy (θ=0.57). If the ratio is smaller than 1, that fiscal policy stabilises the particular series more than the benchmark policy. On the contrary, if the ratio is larger than 1, we conclude that fiscal policy is poorer at stabilization. Figure 5 plots these ratios for different series over the range of possible policies.

The first observation on Figure 5 is that the effect on variability is not symmetric over the range of cyclical policies. This is easily explained by the dynamics of the wedge on marginal productivity of capital and labour over the cycle, and the implied distortionary effect of public purchases. Unsurprisingly, with countercyclical fiscal policy the variances of output, consumption, hours worked and investment are lower than at the benchmark policy. But this reduction is not linear in the degree of countercyclicality of spending, and the marginal gain in economic stability of adopting ever more countercyclical policies is small. The volatility of investment even veers back under such policies. The reason is that the more countercyclical the policy, the more it counters the effect of supply shocks. Eventually, a level at which fiscal policy reverses the effect of the supply shock is reached. The substitution of private for public resources drains investment and labour opportunities, so dampening economic activity. The overall result is an increase in the variability of investment and also of the current account, as domestic consumption rises little. As to procyclical policies, weakly procyclical policies amplify the effect of the supply shocks on the economy. The variances of consumption and investment reach their peak value around θ=0.50, which is the level of cyclicality at which fiscal policy has the strongest destabilising impact. Hours worked, and hence output, move slightly more as the negative wealth effect of the additional spending kicks in for values above θ=0.50, and then decreases rapidly as the distortionary and crowding out effect jointly curb economic activity. Strongly procyclical fiscal rules work as a shock buffer, and the stronger the absorption by public goods, the larger the dampening effect.

Figure 5. The effect of θ on second moments



Our model therefore predicts a non-linear relationship between the degree of cyclicality of fiscal policy, and the volatility of output and its main components. However, given that the empirical estimates of θ in Lane (2003) show no evidence of strongly procyclical policies, there should be a linear relationship between the fiscal spending elasticities and economic volatility observed in OECD countries. Our Figure 1 shows this to be the case. Further evidence by Woo (2009) shows there is indeed a positive link between procyclical policies and macroeconomic volatility.

A second observation on Figue 5 is that the gain of following countercyclical policies is potentially large in terms of economic stabilisation. Any fiscal policy that is different from the one pursued in Ireland would pay off with more stabilisation.[19] A more procyclical policy would bring more stability, but at the cost of more crowding out. There is no such trade-off between stability and government absorption for a less procyclical policy. Pursuing an acyclical policy would pay off with a 20 per cent gain in output stability, a reduction of more than ten per cent in consumption variability and even up to 30 per cent in hours worked. Implementing a policy that let the automatic spending stabilisers work over the cycle could pay off with even more stability gains. Recall that the structural spending elasticity for Ireland is -0.11 according to OECD figures (André and Girouard, 2005). With such a policy, output stability would increase with an additional 5 per cent.

[19] We do not look into the welfare consequences of increased stability and government size, and so cannot say anything on the desirability of one policy over the other without a more specific welfare criterion.

4.4. The effects on the steady state

Cyclical fiscal policy changes the intra- and intertemporal allocation of consumption and saving. Countercyclical policies, by inducing a positive wedge on the expected marginal productivity of capital and the marginal productivity of labour, increase these values with respect to the case of acyclical or procyclical fiscal rules. Consequently, they spur capital accumulation and allow for higher long-run values of output, consumption and hours worked.[20] Figure 6 shows that the relationship is linear. Unlike the non-linear effect of a higher government spending ratio on economic stability, once government spending is gradually substituted for investment under more countercyclical policies, resources that are relatively more productive than government spending are freed up. Consumption and hours worked therefore rise proportionally less than investment for more countercyclical policies. As a consequence, a procyclical policy reduces the steady state values for output, capital, hours worked, consumption and investment.[21]

We can easily see this long-term effect on the steady state in Figure 6 where we plot those values for different degrees of cyclicality. We set all variables to 1 under the current procyclical policy in Ireland (at θ=0.57). Values above 1 mean that for the fiscal policy corresponding to that value of θ the economy reaches a higher steady state. For the fiscal policy we observe in Ireland, steady state output (or consumption) is about seven per cent lower than under a neutral fiscal policy. If automatic stabilisers in the Irish budget were allowed to function fully, output and consumption would rise to even higher values.

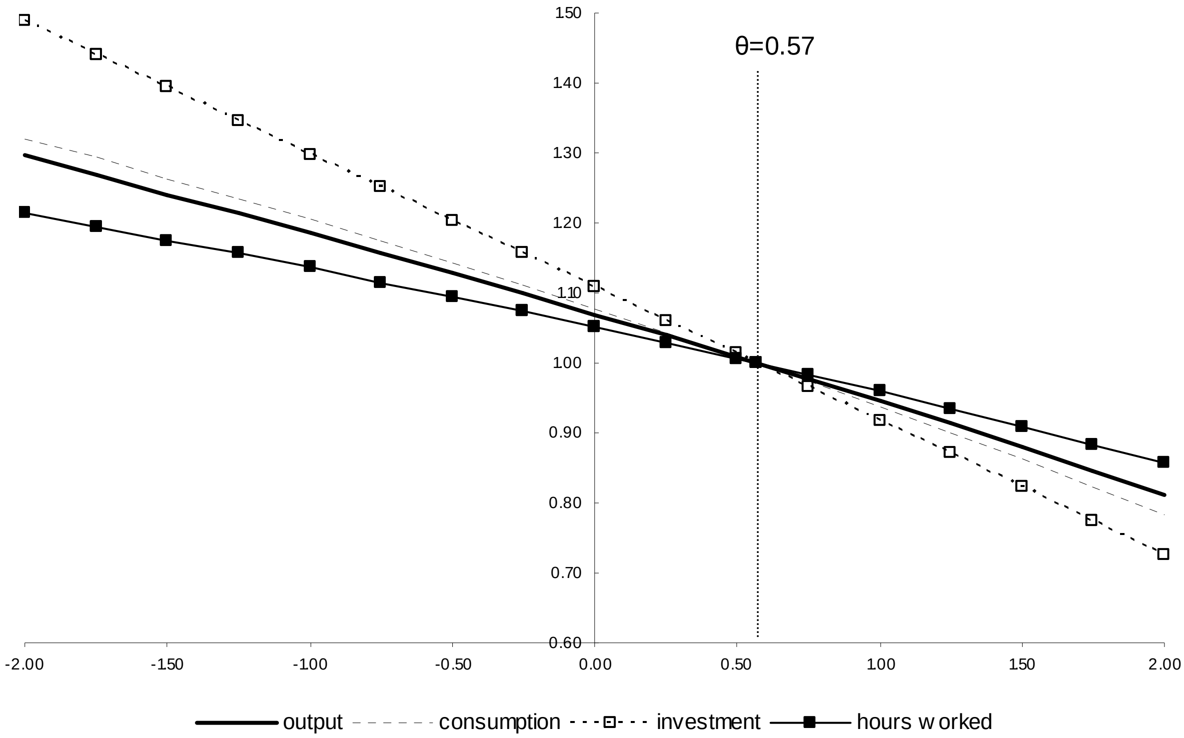
Figure 5 and 6 have important implications for the relationship between government size, economic volatility and growth. The model shows why it may be hard to replicate the negative relationship between government size and macroeconomic volatility encountered in the data (Galí, 1994, Fatas and Mihov, 2001). RBC models have a hard time matching this stylised fact and require the introduction of adjustment costs and nominal rigidities to find such a relationship (Andrès *et al.*, 2008). In our model, the steady state spending ratio to output rises linearly with θ. BUt from figure 5 we know that weakly procyclical fiscal policies, of the kind that have been followed by some OECD countries, imply less economic stability and a larger spending to output ratio. As a consequence, there is no trade-off between efficiency and stabilisation, as a smaller public sector is associated both with a higher steady state level of output and more stabilisation. Our model is also able to indirectly replicate the negative relationship between macroeconomic volatility and economic growth, as for example in Ramey and Ramey (1995).

---

[20] Micro evidence in Aghion *et al.* (2009) shows that firms in OECD countries with countercyclical fiscal policy favour investment in long-term projects, especially in sectors that rely on stock market or bank financing.

[21] The substitution of consumption and leisure for capital affects households' utility. We do not look into the tradeoff between current and future consumption, and so cannot decide on the optimality of one policy over the other without a specific welfare criterion.

Figure 6. Effect of cyclical spending policy on steady state.



5. Robustness checks

In this Section, we check the interaction between structural reforms, the transmission channel of supply shcok to the economy and cyclical fiscal policy with a sensitivity analysis on some parameters of the model. We find that the choice of a certain fiscal policy matters even more for economic stabilisation if the transmission of supply shocks to the economy is stronger. This result explains why different EU economies show contrasting responses to economic shocks. It also implies an important trade-off for governments in deciding on fiscal policy and structural reform measures to facilitate economic adjustment.

The persistence of the technology shock (ρ) drives the propagation of the investment and consumption responses. In the baseline model, we use a value of ρ=0.80, which is based on TFP. Although it is not unreasonable to suppose that Ireland has experienced a string of positive supply shocks over the last two decades, alternative detrending methods usually give a somewhat lower degree of persistence. We summarise the information for different values of ρ, by providing the second moments of all series, scaled to the variance of output. The benchmark in all cases is the weakly procyclical policy in Ireland (at θ=0.57). Table 4 shows that hours worked undergo little variation with varying persistence of the supply shock. However, investment and consumption are strongly affected, and hence the response of the current account is modified too. A more persistent shock raises the wealth effect of technological shocks on consumption, and also increases capital accumulation over a longer period of time. The investment boom induces agents to borrow more on international financial markets at the start, as consumption rises strongly too. Although this creates a current account deficit initially, savings gradually rise over time, eventually turning the country into a large net creditor.[22] This explains the more moderate increase in the volatility of the current account ratio. At lower degrees of persistence, investment and saving decisions are not decoupled as much as a temporary boom does not allow for strong responses of consumption. Domestic savings are more than sufficient to finance investment, and so the current account may show a surplus (even on impact).

Table 4. Sensitivity analysis: persistence of the supply shock (for θ=0.57)

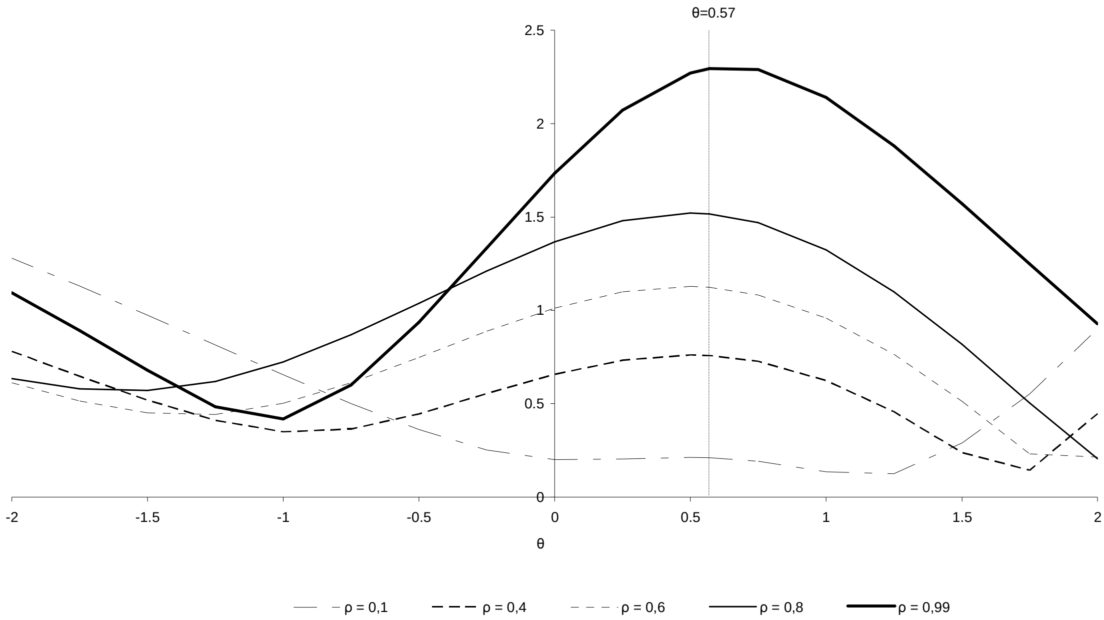
	ρ = 0.10	ρ = 0.40	ρ = 0.60	**ρ = 0.80**	ρ = 0.99	data
σ_I/σ_Y	1.78	3.91	4.31	**3.66**	1.50	3.67 – 3.70
σ_C/σ_Y	0.90	0.99	1.02	**1.08**	1.15	1.38 – 1.39
σ_H/σ_Y	0.53	0.54	0.54	**0.55**	0.57	0.54 – 0.55
$\sigma_{CA/Y}$	0.13	0.41	0.70	**1.07**	1.83	1.07 – 1.14

The impact on consumption or investment is modified for varying degrees of cyclicality of fiscal policy, but mostly goes in the same direction as the baseline model. In contrast, the effect of supply shocks on the current account is not linear. Figure 7 plots the ten year cumulative response of the current account to a supply shock for different θ. In order to assess the overall impact, we cumulate the absolute values of the response in very period as the initial effect of the investment boom on the balance would otherwise neutralise the later effect of increased domestic savings.

Procyclical policies magnify the response as they give an additional boost to investment, and this mechanism gets magnified for more persistent shocks. Only for very temporary shocks does investment never rise enough to offset the increase in domestic savings, and so has little impact on the external balance. The inverted U-shape for the countercyclical and strongly procyclical policies is due to the effect of a higher government spending ratio that cuts investment, and makes domestic savings flow abroad.

Figure 7. Persistence of supply shock, ten year impact response on current account ratio.

[22] For very persistent shocks, investment continues at a high level in later periods, and hence is not as volatile.



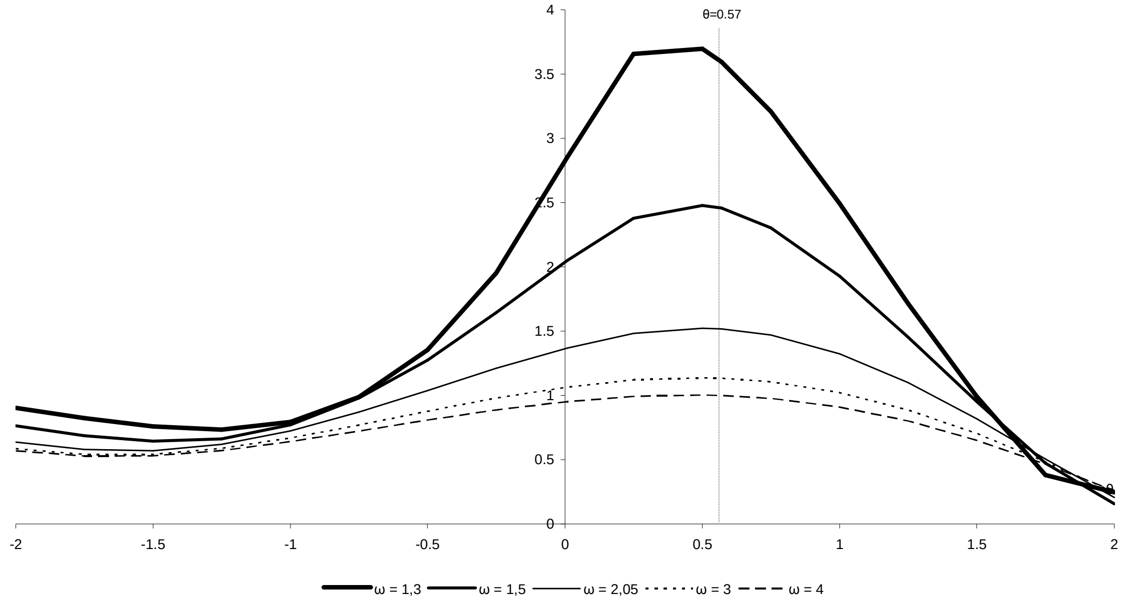
The effects of the type of fiscal policy on the business cycle property of the model depend as much on the persistence as on the transmission of the supply shock to the economy. Let us consider labour markets first. In the model, a more rigid labour market moderates the response of hours worked to a supply shock. Due to the limited reaction of labour supply, investment needs to adjust relatively more, making it more volatile. The dampening effect on consumption frees savings to finance investment and this offsets the possible rise in the variance of the current account. We measure labour market flexibility by ω. Variations in ω – where a higher ω corresponds to less flexible labour markets – could give reasonable descriptions for other economies. Spain is a good example as it also ran a (weakly) procyclical fiscal policy. Table 1 shows that the elasticity of government spending is even higher than in Ireland (θ=0.68). But unlike Ireland, the Spanish labour market is very rigid. If Ireland had a rigid labour market like Spain, there would be less variation in hours worked, and hence fewer changes in consumption. The volatility of the current account would also have been lower. The last two columns compare the second moments for Spain and Ireland, and the data seem to support the lower predicted volatilities. Figure 8 shows that the response of the current account ratio decreases with higher ω. This figure also tells us that if Ireland would make more flexible its labour markets, a contemporaneous effort to make fiscal policy more countercyclical would mitigate – albeit not fully eliminate – the impact on the current account.

Table 5. Sensitivity analysis: flexible labour markets (for θ=0.57)

	ω = 1.30	**ω** = 1.50	**ω = 2.05**	ω = 3.00	ω = 4.00	data Ireland	data Spain
σ_I/σ_Y	2.01	2.81	**3.66**	3.91	3.97	3.67 – 3.70	3.42 – 3.43
σ_C/σ_Y	1.09	1.11	**1.08**	1.04	1.02	1.38 – 1.39	0.97 – 0.99

σ_H/σ_Y	0.88	0.78	**0.55**	0.36	0.27	0.54 – 0.55	0.30 – 0.32
$\sigma_{CA/Y}$	2.41	1.69	**1.07**	0.81	0.72	1.07 – 1.14	0.89 – 1.00

Figure 8. Flexibility of the labour market, ten year impact response on current account ratio.

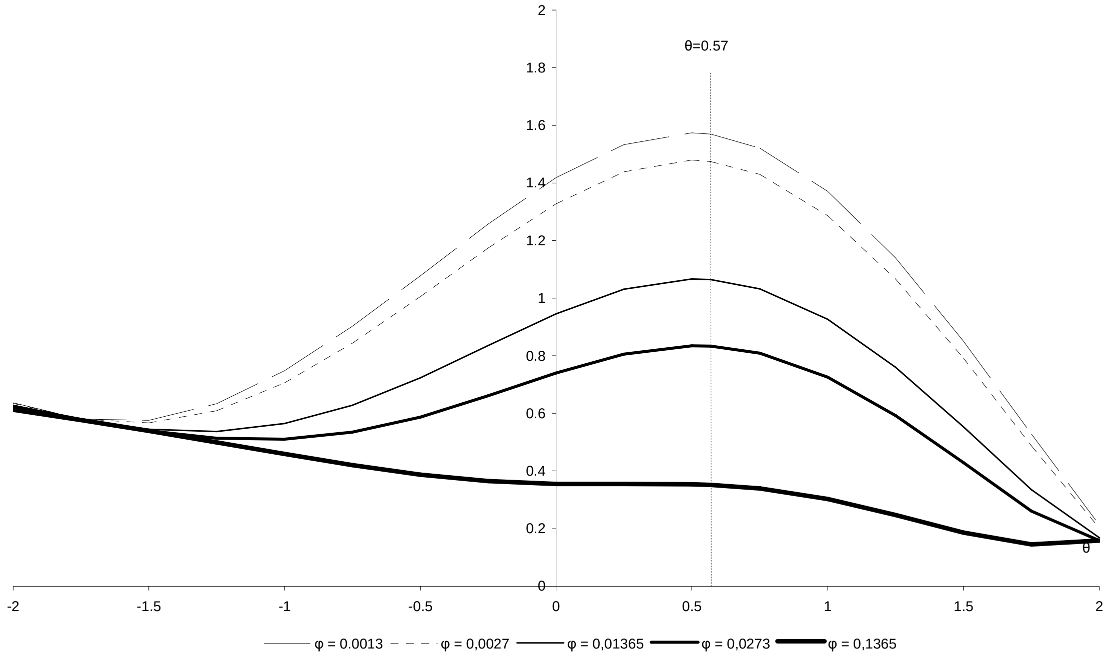


Ireland is a small open economy and is well integrated into capital markets, so it may tap easily from international financial markets. The introduction of the euro has likely improved the functioning of the Irish financial market, and its integration with the euro market. We can mimic the effect of increasing integration with a reduction in the premium on interest rates (lower ψ), and the effect of more efficient financial markets with a fall in capital adjustment costs (lower ϕ). The effects are rather similar for each parameter, so we report results for the latter only. As we would expect, a more favourable environment for investment increases its variability and also that of the current account ratio, as can be seen from Table 6. The capital stock can now be adjusted more quickly, hence investment booms become more pronounced and so are the needs for financing on international capital markets. The effect of more efficient financial markets on the labour market is not important, but there is a fall in the volatility of consumption. Instead, for very high adjustment costs, the financing channel is cut off and investment cannot be easily converted. In this case, investment can hardly respond to the supply shock and domestic saving supplies for the financing needs of firms.

Table 6. Sensitivity analysis: cost of adjustment of capital (for θ=0.57)

	ϕ= 0.001365	ϕ = 0.00273	ϕ= 0.01365	ϕ = 0.0273	ϕ = 0.1365	data
σ_I/σ_Y	4.84	4.62	3.66	3.12	1.98	3.67 – 3.70
σ_C/σ_Y	1.04	1.05	1.08	1.10	1.19	1.38 – 1.39
σ_H/σ_Y	0.55	0.55	0.55	0.55	0.57	0.54 – 0.55
$\sigma_{CA/Y}$	1.58	1.48	1.07	0.84	0.35	1.07 – 1.14

Figure 9. Cost of adjustment of capital, ten year impact response on current account ratio.



The change in the response of the current account ratio to a technology shock can be observed in Figure 9. As the adjustment cost of capital decreases, the cumulative response of the current account ratio for the benchmark rule increases. This suggests that a country like Ireland, before its integration into the EU, could maintain procyclical fiscal policies without suffering from large external imbalances.

The bottom-line of these robustness checks is that the gain in economic stability from adopting a weakly countercyclical policy increases with the strength of the transmission mechanism of a supply shock. Moreover, independently of the characteristics of the economy, a weakly countercyclical fiscal rule is more likely to outperform a procyclical policy in terms of the response of the current account. The cost of procyclical policies is larger after reforms that make labour or financial markets more efficient. Ireland became especially prone to suffer high current account deficits, and strong investment booms, by keeping its fiscal policy procyclical after entering EMU.

6. Conclusions

This paper presents a model that shows why some small open economies, like Ireland or Spain, which pursued procyclical fiscal policies, have suffered such wide swings between economic boom and bust. We include a fiscal rule that let spending vary with the cycle in a simple RBC model of a small open economy. We calibrate the model on data for Ireland, and simulate the effect of different spending policies in response to economic shocks. The main finding is that procyclical fiscal policy fuels the economic cycle, inflates investment and deepens the current account deficit, and so rolls the economy into wide boom-bust cycles. Countercyclical spending instead dampens the cycle. Consumption is about a quarter more volatile than if the government would simply let the automatic stabilisers on the spending side do their work. Such a procyclical policy also discourages the accumulation of capital, and so reduces the level of output in the longer term. The long-term economic cost for Ireland of keeping policy procyclical is about 7 per cent of GDP. These numbers are especially high as the economic transmission mechanism in Ireland exacerbates the effects of procyclical fiscal policy. EU membership has raised prospects of economic convergence in the last two decades. Labour markets are quite flexible, and the economy is very much integrated in international financial markets, especially since its participation in EMU. Sorting out the economic crisis in Ireland may require fiscal adjustment in the short term, but the long-term goal should be to reduce the distortions in policy.

Our model replicates the positive relationship between the degree of cyclicality of fiscal policy, and the volatility of consumption, investment and the current account that we detect in OECD countries. The model also establishes a link between a specific distortion to policy, probably rooted in political institutions, to macroeconomic volatility and economic growth for which there is also empirical support (Acemoglu *et al*., 2003; Woo, 2009). Some additional features could bring the model even closer to reality. First, the present model is a conservative estimate of the negative effect of procyclical policy. Fiscal policy is greatly simplified as spending is financed with lump sum taxes only. Distortionary taxation worsens the negative effects on economic volatility and growth (Andrès and Domenech, 2006). A model with distortionary taxation would allow evaluating the quantitatively more important automatic tax stabilisers. Second, in our model, we suppose budget balance. Debt finance in contrast would allow smoothing the cyclical adjustment, and minimise the distortions of taxation over time. Third, automatic stabilisers are more effective in response to demand than to supply shocks. An RBC model with nominal rigidities could therefore generate even larger economic gains from countercyclical policy (Malley *et al.*, 2009).

References

Acemoglu, D., Johnson, S., Robinson, J., Tchaicharoen, Y., (2003). "Institutional causes, macroeconomic symptoms: volatility, crisis and growth," *Journal of Monetary Economics* 50, 49-123.

Aghion P., Hemous D. and Kharoubbi, E. (2009). "Credit constraints, cyclical fiscal policy and industry growth," CEPR discussion paper 7359.

Alesina, A., Campante, F., and Tabellini, G. (2008). “Why is fiscal policy often procyclical?,” *Journal of the European Economic Association*, 6(5), 1006-1036*.*

Aloi M., Lloyd-Braga, T. and Whitta, H. (2003). Endogenous business cycles and systematic stabilisation policy, International Economic Review, 44(3), 895-915.

Andrès, J. and Domenech, R. (2006). “Automatic stabilizers, fiscal rules and macroeconomic stability,” *European Economic Review*, 50 (6), 1487-1506.

Andres, J., Domenech, R. and Fatas, A. (2008). “The stabilizing role of government size,” *Journal of Economic Dynamics and Control* 32(2), 571-93.

Baxter, M. and King, R. (1993). “Fiscal Policy in General Equilibrium” *American Economic Review*, 83(3) 315-34

Burnside, C. and Eichenbaum, M. (1996). “Factor-hoarding and the propagation of business-cycle shocks ,” *American Economic Review* 86(5) 1154-74

Christiano L., and Harrison, S. (1999). “Chaos, sunspots and automatic stabilisers,” *Journal of Monetary Economics,* 44, 3-31.

Darby, J. and Melitz, J. (2008). “Social spending and automatic stabilisers in the OECD," *Economic Policy*, 23(56), 715-756.

Evans, C. (1992), “Productivity Shocks and Real Business Cycle”, *Journal of Monetary Economics* 29(2), 191-208.

Fatas, A. and Mihov, I. (2001).”Government size and automatic stabilizers: international and intranational evidence,” *Journal of International Economics* 55(1), 3-28.

Forni, L., Monteforte, L., and Sessa, L. (2009) "The general equilibrium effects of fiscal policy: estimates for the euro area," *Journal of Public Economics*, 93(3-4), 559-585.

Galí, J., (1994). “Government size and macroeconomic stability,” *European Economic Review,* 38 (1), 117–132.

Girouard, N. and André, C. (2005). “Measuring cyclically adjusted budget balances for OECD countries,” OECD Economics Department Working Paper No. 434.

Giuliodori, M. and Beetsma, R. (2008). “On the relationship between fiscal plans in the European Union: An empirical analysis based on real-time data,” *Journal of Comparative Economics*, 36(2), 221-242.

Guo J., and Lansing, K. (1998). “Indeterminacy and stabilisation policy,” *Journal of Economic Theory*, 82, 481-90.

Hercowitz, Z. and Strawczynski, M. (2004). “Cyclical ratcheting in government spending: evidence from the OECD,” *Review of Economics and Statistics*, 86, 353-361.

Kaminsky, G., Reinhart, C., and Vegh, C. (2004). “When it rains it pours: procyclical capital flows and macroeconomic policies”, in Gertler, M. and Rogoff, K. (eds.) NBER Macroeconomic Annual, Cambridge: MIT Press, 19, 11-82.

King, R. and Rebelo, S. (1990) "Public policy and economic growth: developing neoclassical implications", *Journal of Political Economy*, 98(5), 127-150.

Lane, P. (2003). “The cyclical behaviour of fiscal policy: evidence from the OECD,” *Journal of Public Economics*, 87(12), 2661-2675.

Malley, J., Philippopoulos, A. and Woitek, U. (2009). “To react or not? Technology shocks, fiscal policy and welfare in the EU-3,” *European Economic Review*, 53(6), 689-714.

Manasse, P. (2006). “Procyclical fiscal policy: shocks, rules, and institutions: a view from MARS,” IMF Working Paper No. 27.

Mendoza E. (1991) “Real business cycles in a small open economy,” *American Economic Review* 81:4 797-818.

Ramey V., and Ramey G. (1995). "Cross country evidence on the link between volatility and growth," *American Economic Review*, 85(5), 1138-1159.

Ravn, M. and Uhlig, H. (2002). “On adjusting the Hodrick-Prescott filter for the frequency of observations,” *Review of Economics and Statistics* 84(2) 371-76.

Schmitt-Grohe, S. and Uribe, M. (2000). “Price level determinacy and monetary policy under a balanced-budget requirement,” *Journal of Monetary Economics* 45(1) 211-46

Schmitt-Grohe, S. and Uribe, M. (2003), "Closing small open economy models", *Journal of International Economics* 61, 163-185.

Schmitt-Grohe, S. and Uribe, M. (2004), "Solving dynamic general equilibrium models using a 2nd-order approximation to the policy function," *Journal of Economic Dynamics and Control* 28.

Turrini, A. (2008) “Fiscal policy and the cycle in the euro area: the role of government revenue and expenditure,” EC Economic Papers 323.

Woo, J. (2009). "Why do more polarized countries run more procyclical fiscal policy?" *Review of Economics and Statistics*, 91(4), 850-870.