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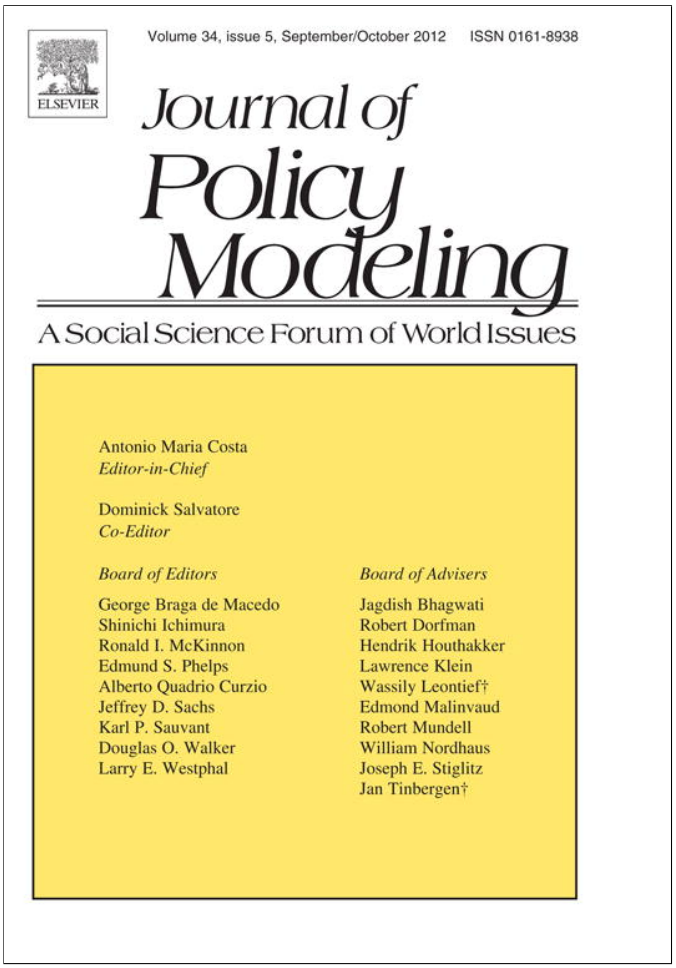

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Boom–bust cycles and procyclical fiscal policy in a small open economy☆

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Abstract

The PIGS countries have suffered economic instability and fiscal havoc in the aftermath of the Financial Crisis. We argue this is the consequence of pursuing procyclical fiscal policies. We add a fiscal rule, which varies public spending with the cycle, to an otherwise standard RBC model of a small open economy. This procyclical reaction of fiscal policy to output distorts intertemporal allocation decisions. Procyclical spending generates very volatile cycles in investment and the current account. 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 we observe in OECD countries. A policy that let automatic stabilisers work can effectively smooth economic fluctuations, especially after structural reforms that raise the responsiveness of the economy.
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1. Introduction

Textbook macroeconomics tells us that for a given level of public spending, taxes should be smoothed along the cycle in order not to exacerbate the distortionary effect of taxation, or the government should let taxes and spending adjust in a countercyclical fashion to stabilise income. Automatic stabilisers fulfil these functions. Discretionary intervention might strengthen the countercyclical response under some specific circumstances. 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. They also often raise taxes – but omit reducing spending – in an economic crisis. Evidence for OECD countries shows that procyclical fiscal policies are mostly driven by government expenditure (Hauptmeier, Sanchez-Fuentes, & Schuknecht, 2011; Hercowitz & Strawczynski, 2004; Lane, 2003). Lavish spending is possible as the economic boom provides the treasury with plenty of additional tax revenues. In particular, in countries like Portugal, Ireland, Greece or Spain, public spending has often continued to grow during the economic boom as it was fuelled by buoyant tax receipts flowing to the treasury.[3] 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 fiscal imbalances in the Financial Crisis is much harder for the PIGS countries. Shrinking tax bases makes tax revenues dwindle, and forces cuts in spending at a time fiscal support would probably be needed most. Efforts to keep deficits in check set off the reverse procyclical mechanism and further aggravate the bust.

In this paper, we develop a simple RBC model to analyse the effect of procyclical fiscal policies in a small open economy. We model fiscal policy with a simple reaction function in which the government changes spending in response to the economic cycle.[4] The cyclical response of public spending distorts economic decisions. A boost to spending during a boom further inflates the economic outlook and spurs consumption and investment. The additional need for external financing of this domestic boom deepens the current account deficit. Unsurprisingly then, such policies contribute to economic imbalances and create a boom–bust cycle. A calibration of the model on Ireland shows that consumption is about a quarter more volatile than if the government would simply let the automatic stabilisers do their work. Our model is able to replicate the positive relationship between the degree of cyclicality of fiscal policy, and the volatility of consumption, investment and the current account observed in OECD countries. There is substantial evidence that large governments display less volatile economies (Fatas & Mihov, 2001; Galí, 1994). As in Andrès, Domenech, and Fatas (2008), a shift in the composition of total output towards public spending reduces economic volatility. But in addition to this composition effect, we find that the procyclical use of fiscal policy may offset this effect of government size.

Procyclical policy also has long-term consequences. As procyclical policy result in less economic stabilisation, it also discourages capital accumulation. Our model therefore establishes a link between two empirical regularities: (a) bad macroeconomic policies induce higher

[3] See Afonso, Claeys, and Sousa (2011) for evidence on Portugal, Lane (1998) on Ireland, Alesina, Campante, and Tabellini (2008) on Greece or Woo (2009) on Spain.

[4] A fiscal rule has become common to analyse determinacy of the economy in a monetary model (Aloi, Lloyd-Braga, & Whitta, 2003; Christiano & Harrison, 1999; Guo & Lansing, 1998; Schmitt-Grohe & Uribe, 2000), or to look at the response of the economy to changes in government behaviour (Forni, Monteforte, & Sessa, 2009) or to technology shocks (Malley, Philippopoulos, & Woitek, 2009).

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macroeconomic volatility (Acemoglu, Johnson, Robinson, & Tchaicharoen, 2003; Woo, 2009), and (b) countries with highly volatile output grow at a lower rate (Ramey & Ramey, 1995).

Reform of fiscal policy that ensures the working of automatic stabilisers in the PIGS countries would pay off with substantial gains in economic stability in the short run, which would translate also in increased economic activity in the long term. Rigid labour and closed financial markets in the PIGS countries might have reduced the effect of procyclical policies in the past, but integration into the EMU reveals the cost of sticking to procyclical policies. Structural reforms must therefore be accompanied by a fiscal reform too.

The paper is organised as follows. In Section 2, we review the evidence on procyclical policies. In Section 3 we present the RBC model of a small open economy and introduce the spending rule. Section 4 then analyses the macroeconomic effects of varying spending over the cycle. Robustness checks are presented in Section 5. We conclude in Section 6.

2. Some evidence of procyclical fiscal policies

Built-in features of the budget make it respond to the economic cycle. On the spending side, the most important category of automatic stabilisers are unemployment schemes that preserve workers' income after job loss. Most other spending categories are not sensitive to the cycle. Most of the automatic stabilisation comes from the tax side, and this reflects the progressivity of tax schedules in most OECD countries. The strength of automatic stabilisers can be measured by the cyclical elasticity of the different budget components. Table 1 (columns 1 and 2) reports these computed elasticities for a sample of OECD countries (Girouard & André, 2005). Spending elasticities are negative and typically not very large, with a size that varies between −0.23 (for The Netherlands) and −0.02 (for Iceland). These differences are mostly due to the varied structure of unemployment schemes across countries. Total revenues are procyclical and the revenue elasticities show quite some variety. This occurs because in each country revenues are raised from a diverse mix of tax categories, each one having a different cyclical elasticity.[5]

In addition to these automatic stabilisers, the budget responds to economic conditions because of discretionary interventions of the government to steer the economy. The government may wish to lean against an economic crisis by cutting taxes or raising expenses. However, a common finding is that governments do not reinforce the working of automatic stabilisers, but overturn them. 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 (column 3) 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.

Instead of dampening cyclical swings in output by letting the automatic stabilisers work over the cycle, governments give an additional boost to the economic cycle in a boom with spending hikes or tax cuts. Evidence for OECD countries shows that procyclical fiscal policies are mostly driven by government expenditure (Hauptmeier et al., 2011; Hercowitz & Strawczynski, 2004; Lane, 2003). Lavish spending is possible as the economic boom provides the treasury with plenty of additional

[5] For example, personal or corporate tax revenues – with a few exceptions – react more than proportionally to the economic cycle. Social security contributions are procyclical but do not respond as strongly. VAT responds in proportion to economic fluctuations. See Girouard and André (2005) for details.

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

	Automatic stabiliser (Girouard & André, 2005)		Estimated elasticity (Lane, 2003)
	(1) Total spending	(2) Total revenues	(3) Government consumption
Australia	−0.16	0.65	0.10
Austria	−0.08	1.03	0.14
Belgium	−0.14	1.05	−0.18
Canada	−0.12	0.94	−0.34
Denmark	−0.21	1.04	0.37
Finland	−0.18	0.92	−0.03
France	−0.11	0.98	−0.16
Germany	−0.18	0.97	−0.08
Greece	−0.04	1.07	0.45
Iceland	−0.02	1.01	0.91
Ireland	−0.11	1.14	0.57
Italy	−0.04	1.17	−0.14
Japan	−0.05	0.97	0.08
Netherlands	−0.23	1.01	0.40
Norway	−0.12	1.00	0.60
New Zealand	−0.15	0.61	−0.12
Portugal	−0.18	1.08	0.61
Spain	−0.11	1.09	0.68
Sweden	−0.15	1.01	0.13
Switzerland	−0.19	1.04	0.35
UK	−0.05	1.14	−0.54
US	−0.09	1.00	0.03

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

tax revenues.[6] Governments do not further depress an economic crisis with contractionary policies. 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 (Giuliodori & Beetsma, 2008; Manasse, 2006). Hence, procyclical policy is largely a boom phenomenon. The consequence of this asymmetric response over the cycle is a debt bias.

Procyclical policies come at the cost of economic stability. We plot in Fig. 1 the observed elasticities of government consumption (column 3 in Table 1) against the volatility of private consumption and investment. More procyclical budgets are associated with higher volatility in both variables. We additionally 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.

[6] We can likewise measure the degree of cyclicality of the surplus. It is weakest in Japan and the US (0.34), but much stronger in countries with an extensive welfare system, like Denmark (0.59). 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). 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, so procyclical spending does not have much of an effect on the overall elasticity of the (primary) surplus.

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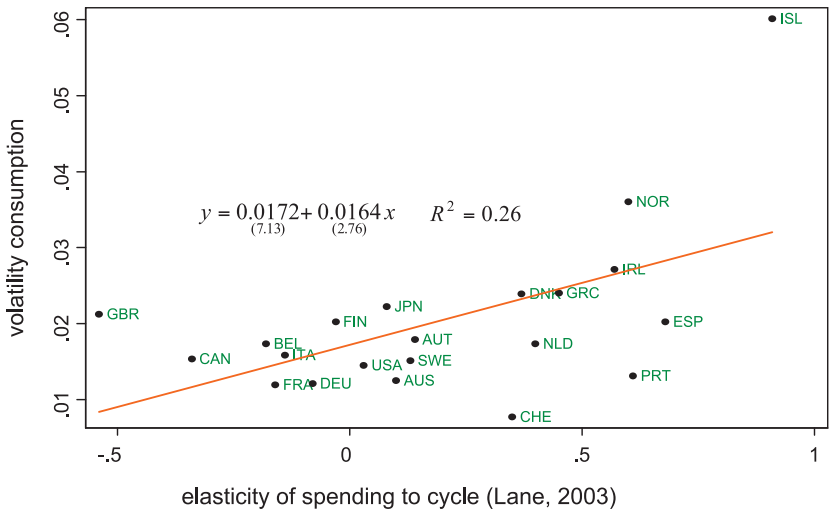
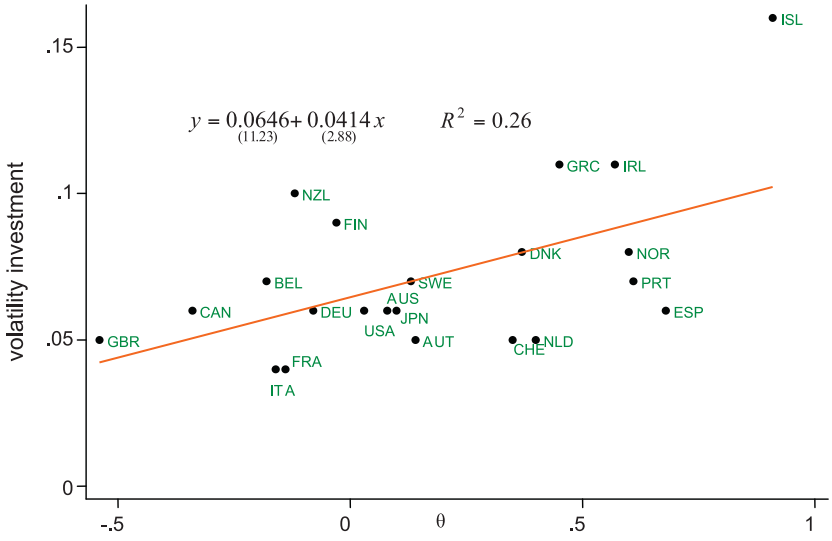
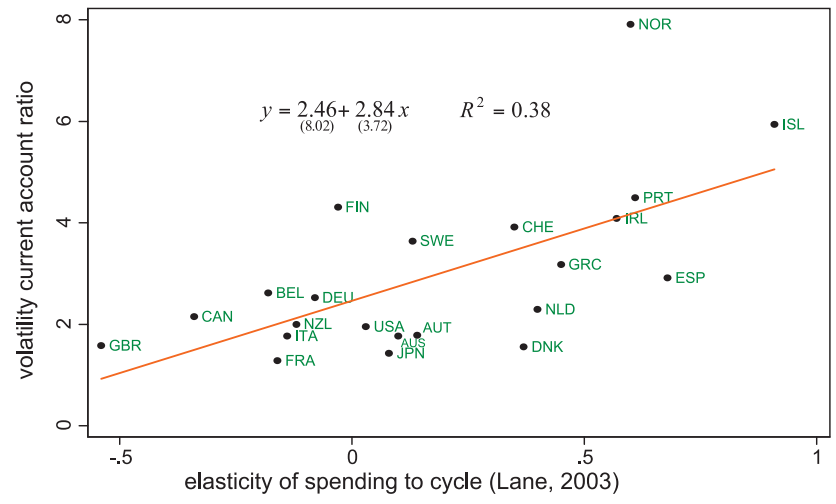


(a) spending elasticity v volatility private consumption



(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.

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

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Spain, Greece and also Portugal have run highly procyclical policies, and experienced quite high macro-economic volatility. A simple OLS regression of the volatility measure against a constant and the elasticity of government consumption shows that each positive relationship is significant (at 1%). A plot of other measures of changes in fiscal policy (such as the volatility of government consumption, or the difference between the observed and structural budget elasticities) against the same macro-economic 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.

3. The model

3.1. Building blocks of a small open economy model

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 this section and go the description of the expenditure rule. The economy is inhabited by an infinitely lived population of identical households who share the same preferences and allocate consumption c_t and labour supply h_t intertemporally to maximise the expected value of the stream of instantaneous utility:[7]

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

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

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

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

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

Firms produce a single good and we assume production technology follows 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 labour and capital used in production, and $A_t > 0$ is total factor productivity. TFP is exogenous and shocks

[7] 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.

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to technology follow an AR(1) stochastic process, with the coefficient ρ measuring the degree of persistence of the technology shock:

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

Firms can internationally trade the single good, and households have access to an internationally traded one-period riskless bond d_t to finance their consumption and investment choices. In this small open economy, the domestic cost of borrowing from abroad is set at the level of the world real interest rate r^*, and augmented by a premium that depends on the quantity borrowed d_t on international financial markets:

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

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 ($d_t > \bar{d}$).[8] We assume the function $p(\cdot)$ takes the following form (Schmitt-Grohe & Uribe, 2003):

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

The ease with which the portfolio of borrowings can be adjusted in any period is determined by the parameter $\psi > 0$. An economy that is more closely integrated in world financial markets will be able to find finance or lend abroad at a rate closer to the world interest rate (a lower ψ).

The government sector in the baseline model is very simple. 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 G which are paid for by lump sum taxes T_t. The budget is perfectly balanced by in every period, so the government does not issue debt domestically, nor does it borrow from abroad:

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

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 uses is traded between the country and the rest of the world. The trade balance TB_t is 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)–(4) and the resource constraint (11) of the economy that is obtained from aggregating the individual budget constraints over the entire population:

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

[8] This assumption is necessary to obtain stationary wealth in a small open economy (Schmitt-Grohe & Uribe, 2004).

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

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

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

3.2. The expenditure rule

In the baseline 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 reaction function that describes the cyclical behaviour of spending G_t. This expenditure rule looks as follows:

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

The government initially fixes spending at the steady state level G, but then varies G_t when output Y_t deviates from its steady state level (Y_{ss}).[9] The parameter θ is the elasticity of government spending with respect to the business cycle. The baseline model comes out as a special case when $\theta = 0$ and $G_t = \bar{G}$. In case $\theta < 0$, spending is cut during an upswing in the cycle, and we call spending countercyclical. Instead, if $\theta > 0$, spending is procyclical.[10] A less than proportional reaction of spending implies that in case the output gap is 1%, government spending would change by less than 1%. We call this a weakly cyclical policy. Instead, when fiscal policy is strongly cyclical, the response of government spending is more than proportional to the change in output. The size of government G_t falls in absolute terms for countercyclical policies under a boom and for procyclical policies in a recession.[11]

The cyclical behaviour of the spending ratio to output varies under a boom or a recession. In a recession, this ratio falls only when fiscal policy is strongly procyclical ($\theta > 1$); in a boom, it falls when the government follows any policy but a strongly procyclical one ($\theta < 1$). 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 ($\theta = 1$),[12] and as procyclical the policies for which the spending ratio rises in booms, which holds only for $\theta > 1$ (Alesina et al., 2008). Our definition also matches the measures of the elasticity of government spending to economic growth that have typically been tested in the empirical literature (Giuliodori & Beetsma, 2008; Lane, 2003).

[9] 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.

[10] As we consider a balanced budget, the results would be equivalent under a tax rule in which the tax rate responds to the cycle.

[11] The degree of cyclicality may be compatible with different government objectives, which may be based on welfare or political considerations.

[12] Kaminsky, Reinhart, and Vegh (2004) call this policy acyclical instead.

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3.3. Static and dynamic effects

3.3.1. The wedge

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 U_{C_t} and leisure U_{h_t} 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] We see that the marginal productivity of labour MP_{h_t} is multiplied by the factor in square brackets in (14a):

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

The same factor also drives a wedge into the Euler equation (14b) between the optimal intertemporal allocation of consumption and savings.

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

The modified first order conditions (14a) and (14b) imply a distortion that changes the incentives to work and to invest. As we can see in (15), this wedge depends on three terms: the output gap, the size of government spending and the elasticity of spending over the cycle.

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

3.3.2. The distortionary effect

When $\theta = 0$, the factor in (15) is 1, and we have the baseline model with acyclical fiscal policy of Mendoza (1991). The transmission of a temporary technology – also supply – shock in the small open economy is standard and goes as follows.[14] A positive supply shock pushes up the marginal productivity of capital and labour, but due to adjustment costs investment rises only 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 and part of the additional income is saved. In a closed economy, the investment boom would be financed entirely by giving up consumption, and the economic expansion is limited due to the rise in interest rates. In the small open economy, by contrast, additional financing can be obtained from international markets, and this decouples the saving/investment decision. Domestic savings may now fall short of investment and so a current account deficit results. The country borrows on international markets, and becomes a net debtor.

[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).

[14] We discuss the baseline results, and refer to Mendoza (1991) for a more extensive discussion.

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The cyclical use of fiscal policy modifies the incentives to invest and consume and thereby changes the transmission mechanism of supply shocks. The eventual effect on the economy depends on how the distortion varies over the cycle. We illustrate the mechanism for a countercyclical policy ($\theta < 0$). In the boom phase following a positive supply shock the distortion shrinks, decreasing the incentive to supply more labour and to invest. This counters the effect of higher total factor productivity and so cools down the economy. As a result, consumption and investment increase less relative to the baseline policy. Given that domestic saving can finance most of the rise in investment, the current account improves. 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, additional spending during the economic boom further inflates investment and working prospective, and so increases the need for external financing. Consumption and investment expand and the current account worsens. As a result, procyclical policies amplify the effect of technology shocks and increase economic volatility.

3.3.3. The crowding out effect

However, the distortionary effect of fiscal policy is not linear in the degree of cyclicality. The reason is an additional crowding out effect of public spending. Since there is a single tradable good in this economy, and the public good has no direct utility or productive effects, the fewer resources are taken away from the economy for the purchase of the public good, the more goods remain for productive activities. This crowding out effect depends on the ratio of government spending to output, which varies with θ. With countercyclical fiscal policy the government size (as a ratio to GDP) always falls after a positive supply shock, freeing up additional resources to employ in private activity. This fall in public spending implies an instantaneous reduction in taxes 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. 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 even more. In this case, the wealth effect and the distortionary effect move into opposite directions. The net effect depends on the functional form and parametrisation of the model. In Section 4, we calibrate the model to derive the dynamic effects on the economy.

The transmission mechanism under procyclical policies is not simply the reverse, but depends on the level of the crowding out of private activity. A weakly procyclical policy implies just a partial crowding out as the government raises spending during the economic boom, but by less than the change in output. Hence, the crowding out effect of a reduction in the ratio of government spending to output is similar as under a countercyclical policy. This effect weakens as the degree of procyclicality becomes stronger. When $\theta = 1$, the government spending ratio does not vary after a technology shock, and there is no additional 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. The more procyclical is policy, the more economic activity is curbed. The positive impact of the technological shock can even be offset.

3.3.4. Comparative statics

For any given degree of cyclicality of fiscal policy, these dynamic effects are amplified when the other two components of the wedge are larger. First, the wider are output fluctuations (Y_t/Y_{ss}),

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the stronger is the impact of the distortion.[15] Second, the larger the size of government in steady state ($\bar{G}/Y_{ss}$), the larger the absolute value of the wedge. There is substantial evidence that large governments display less volatile economies (Fatas & Mihov, 2001; Galí, 1994). Andrès et al. (2008) show in an RBC model with nominal rigidities that the shift in the composition of total output towards public spending reduces economic volatility. We agree that a larger size of government is associated with less economic volatility due to a composition effect. But there need not be a linear relationship between the size of the public sector and economic volatility as the cyclical use of fiscal policy may offset this effect. The negative relationship between government size and economic volatility is conditional on the degree of cyclicality of fiscal policy.

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-Grohe 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 selection of parameter values is based on: (a) the restrictions imposed by the model on the steady state solution, (b) their match with stylised facts 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.

We illustrate the transmission mechanism and its effects with the example of a small open economy with a procyclical fiscal policy. Ireland has a very open economy: over the sample period 1970–2008 its average export and import ratio is 80% and 74% of GDP respectively. Ireland has a documented history of procyclical policy. The study by Lane (1998) shows that government spending has been mostly procyclical. In the robustness checks of Section 5, we show how the parameters can be adapted to the situation of the other PIGS countries. The data we use for calibrating the model are 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 set of parameters are in Table 2 and the in-sample values are in Table 3, panel (a). A first group of parameters (α, β, δ, r^*, $\bar{G}$, $\bar{d}$) is set to values that make the steady state of the model roughly consistent with some stylised regularities of the Irish economy. 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% and the subjective discount rate β is $1/(1+r^*)$. 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. In Ireland, this ratio is rather low, at just 18% of GDP.

A second group of parameters (ρ, σ_a) is set to match the standard deviation of output Y_t, investment I_t and hours worked h_t. We transform these series to per capita terms, take logs and

[15] Garcia, Restrepo, and Tanner (2011) compare the effect of a balanced budget versus a structural surplus rule in a New-Keynesian version of this model. In contrast to our model, the government seeks to protect consumers from economic volatility and hence does not further destabilise the cycle.

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Table 2
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	0.0010
r^*	Real interest rate	0.04
θ	Elasticity of government spending to the output gap	0.57

Table 3
Steady state values.

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

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

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 standard deviation of the cyclical component of each series.[17] We use total factor productivity (TFP) as a proxy for technology, and we estimate a first order autoregressive stochastic process and use ρ to measure its persistence. Given that Ireland has known fast economic growth over the period 1989–2007, 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] As a consequence, these shocks are quite persistent ($\rho = 0.80$). The value of the standard error of the supply shock σ_a is set to match the standard deviation of output.

A third group of parameters (ψ, ϕ) characterises financial and capital markets. 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. A fourth group of parameters (ω, γ) characterises the consumption and labour market choices of households. The value of the elasticity of substitution

[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 suggested by Ravn and Uhlig (2002)). The corresponding cyclical component should match that of a band pass filter that selects cycles with a frequency between 1.5 and 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.

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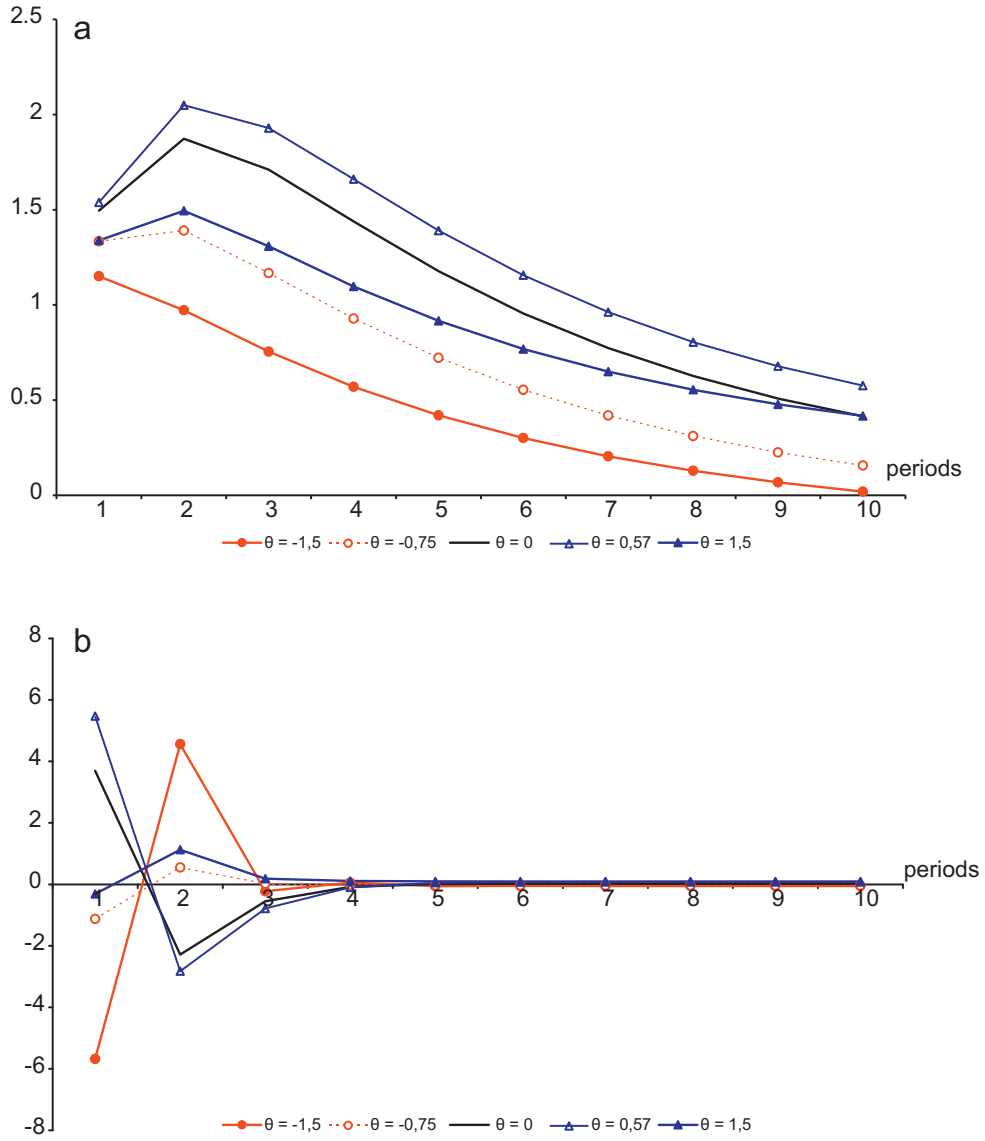

Fig. 2. (a) Impulse response function: 1% deviation technology shock, response of output. (b) Impulse response function: 1% deviation technology shock, response of investment.

in labour supply (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. It is common practice in the literature to set the inverse of the elasticity of substitution γ equal to 2. Its exact value is hard to estimate and widely debated, yet always larger than 1 (King & Rebelo, 1990). Finally, we need to chose the stance of fiscal policy. An estimate of the elasticity of government spending to the cycle is taken from Lane (2003), and implies on average a weakly procyclical stance in Ireland ($\theta = 0.57$).

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 benchmark calibration is based on the weakly procyclical policy we observe in Ireland (for $\theta = 0.57$), but we vary θ to analyse neutral and procyclical policies. Fig. 2a reports the effects on output of a positive supply shock for the acyclical policy ($\theta = 0$) and a weak and a strong variant for either pro- or countercyclical

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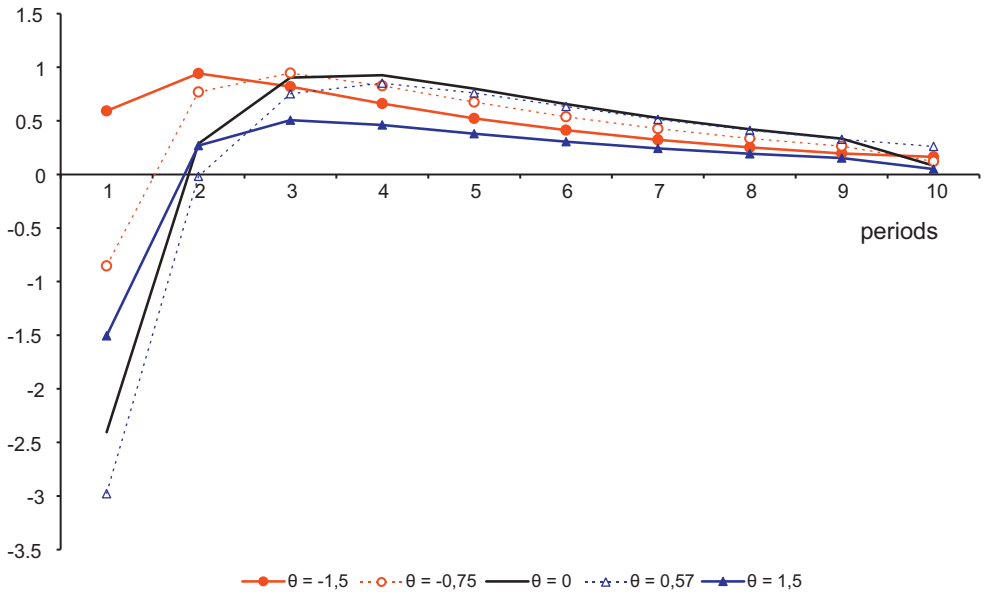

Fig. 3. Impulse response function: 1% deviation technology shock, response of current account ratio.

expenditure. As the responses for hours worked and consumption are similar to those of output, we have not repeated these. Fig. 2b compares the effects on investment.

In Fig. 2a, we observe how output responds positively but displays a hump shape before going back to zero as the effect of the supply shock gradually dies out. The reason is that the capital stock can only gradually adjust to the shock, so investment initially shoots up but then falls gradually over time. Following a pro- or countercyclical expenditure policy would not alter the form of the output response. Nonetheless, and in contrast to the acyclical policy ($\theta = 0$), the impulse response under any countercyclical policy would be more moderate. This stabilising effect is economically sizeable as the output response is still lower than under an acyclical policy after ten years. The more countercyclical is public spending, the more the output response is curbed. A strongly countercyclical policy would even eliminate the hump shaped response as investment replies even negatively to the initial shock, to increase only gradually over time.

Procyclical fiscal policy instead boosts the output response. It gives a stronger impulse to investment initially and hence causes a much stronger boom in output. For the weakly procyclical fiscal policy pursued in Ireland, the impulse response to a technology shock is about 10% stronger than under an acyclical policy at all horizons. But procyclical policies only have a boosting impact on the economy up to a certain limit. The reason is that for strongly procyclical policies, the output response is curbed due to the rise in the government spending ratio. The crowding out effect of additional spending dampens also the investment outlook, and so the response of the capital stock is limited.

The responses of consumption and investment determine the behaviour of the current account (Fig. 3). Under an acyclical fiscal policy, the initial boom in investment is nearly completely financed by borrowing abroad as households consume their additional income. The effect on the current account deficit is very pronounced. Once the need for investment tapers off and domestic savings increase, the current account deficit turns into a surplus. The small open economy becomes a net creditor to the rest of the world. A countercyclical policy smoothes out both investment and consumption, hence domestic savings meet to some extent domestic investment needs and the current account deficit does not fall as much. For strongly countercyclical policies, the fall in investment makes external financing even redundant and households' savings can be lent abroad

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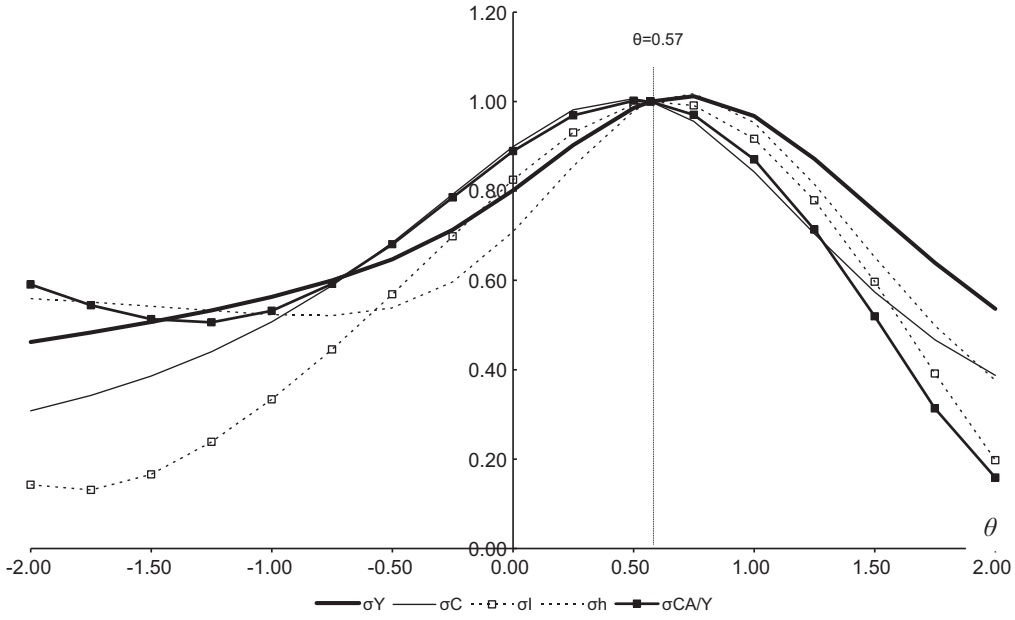

Fig. 4. The effect of θ on second moments.

as from the first period after the shock. By contrast, under a weakly procyclical fiscal policy rule, the destabilisation of investment and consumption responses of the economy is magnified. External financing needs rise strongly, and the current account goes to deficit. Recall that under the parametrisation of the model, this is precisely the case for Ireland. This mechanism explains why small open economies – like the PIGS countries – might suffer large current account deficits when they experience positive supply shock over prolonged periods.

4.3. The effects on the second moments of the economy

The type of expenditure policy determines the volatility of macro-economic quantities. 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 ($\theta = 0.57$). If the ratio is smaller than 1, that particular fiscal policy stabilises the series more than the benchmark policy. On the contrary, if the ratio is larger than 1, we conclude that fiscal policy is poorer at stabilisation. Fig. 4 plots these ratios for different series over the range of possible policies.

The first observation on Fig. 4 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 crowding out 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

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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. We can see that the degree of cyclicality for which the marginal gain in stability starts to level off is reached for $\theta = -0.50$.

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 $\theta = 0.50$, 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 crowding out effect of the additional spending kicks in for values above $\theta = 1$, 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.

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 cyclical policies, there should be a linear relationship between the fiscal spending elasticities and economic volatility observed in OECD countries. Our Fig. 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 conclusion from Fig. 4 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] Pursuing an acyclical policy would pay off with a 20% gain in output stability, a reduction of more than 10% in consumption variability and even up to 30% 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 (Girouard & André, 2005). By letting automatic stabilisers work, output stability would increase with an additional 5%.[20]

5. Robustness checks

The gains from following a countercyclical policy have become even larger for the PIGS countries that have been pursuing procyclical policy at least since their integration into the EU and especially in the EMU. The reason is that accession to the Eurozone has opened up financial markets in these countries, and has made it possible to access international financial markets more easily. Financial integration has lowered the costs of financing of domestic investment.

We perform a sensitivity analysis on the interaction between financial markets and the cyclical use of fiscal policy. 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). As the effects are rather similar for each parameter, we report results for the latter only. As we would expect, a more favourable environment for investment – a lower ϕ than the baseline value of 0.01365 – increases its variability and also that of the

[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.

[20] A more procyclical policy would bring more stability, but at the cost of more crowding out. As countercyclical policies never raise the size of government but always increase economic stability, there is no trade-off between economic efficiency and stability in our model.

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Table 4
Sensitivity analysis: cost of adjustment of capital (for $\theta = 0.57$).

	$\phi = 0.001365$	$\phi = 0.00273$	$\phi = 0.01365$	$\phi = 0.0273$	$\phi = 0.1365$	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

current account ratio, as can be seen from Table 4. 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 that important, but as households can more easily smooth their consumption through financial markets, 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 needs to supply the financing needs of firms.

Fig. 5 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 every period as the initial effect of the investment boom on the balance would otherwise neutralise the future effect of increased domestic savings. 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. But integration in the Eurozone has large effects on the current account. We have indeed observed large current account deficits for all PIGS countries since 1999.

The PIGS countries – with the exception of Ireland – are known for their rigid labour markets. We can perform a similar robustness check on the model by varying the parameter ω: the higher

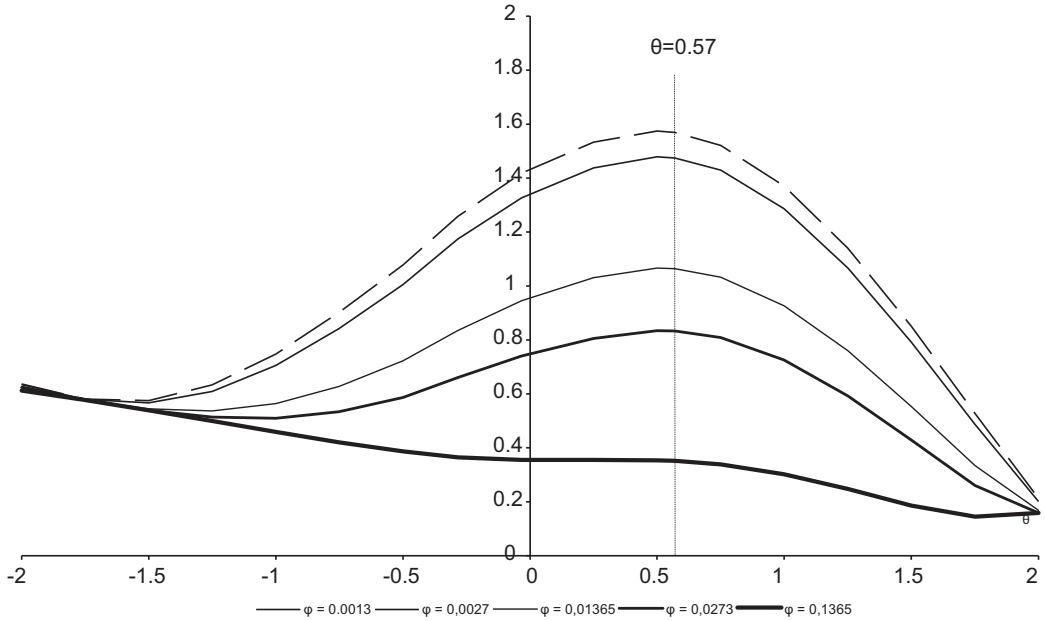

Fig. 5. Cost of adjustment of capital, ten year impact response on current account ratio.

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Table 5
Sensitivity analysis: flexible labour markets (for $\theta = 0.57$).

	$\omega = 1.30$	$\omega = 1.50$	$\omega = 2.05$	$\omega = 3.00$	$\omega = 4.00$	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

the inverse of the Frisch elasticity of substitution in labour supply, the less flexible is the labour market. 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 ($\theta = 0.68$). But unlike Ireland, the Spanish labour market is rather rigid since it is segmented into a protected and a temporal job market (Cabrales & Hopenhayn, 1997). Table 5 compares the volatility of the main series for both countries, and the ones implied by the model for varying degrees of labour market flexibility. A more rigid labour market moderates the response of hours worked to a supply shock. The limited reaction of labour supply requires investment 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. If Ireland had a rigid labour market like Spain, there would be less variation in hours worked, consumption and the current account. The last two columns of Table 5 seem to support the lower predicted volatilities observed in the data. The table also tells us that if Spain 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 volatility of the current account.

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.[21] 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. Ireland became especially prone to suffer high current account deficits, and strong investment booms, by keeping its fiscal policy procyclical after entering EMU. Similarly, the results imply an important trade-off for governments in deciding on fiscal policy and structural reform measures to facilitate economic adjustment. Reform of labour markets urges also a reform of fiscal policy to reduce the type of boom-bust cycles we observe in the PIGS countries. As in Noren (2009), our results show that structural reform must be supported by short run measures to stabilise the economy.

6. Conclusions

This paper presents a model that shows why some small open economies – like Ireland or Spain – that pursued procyclical fiscal policies have suffered such wide swings between economic boom

[21] Alternative detrending methods usually give a somewhat lower degree of persistence of the technology shock. If this shock is temporary, the weaker is the wealth effect on consumption and capital accumulation. Investment and saving decisions are not decoupled as much as a temporary boom does not allow for strong responses of consumption. The investment boom induces agents to borrow on international financial markets mainly at the start, but savings rises too. The effect on the current account is small as a result. Investment, consumption, hours worked and the current account are less volatile.

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and bust. We include a fiscal rule that let expenditure 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.

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 high macroeconomic volatility and reduced economic growth for which there is also empirical support (Acemoglu et al., 2003; Woo, 2009).

If the government would simply let the automatic stabilisers on the spending side do their work, consumption would be about a quarter less volatile. 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 of the PIGS countries in the last two decades. Their economies have become very much integrated in international financial markets, especially since its participation in EMU. Rigid labour markets have somewhat reduced the impact of procyclical policy. But labour market reform requires fiscal reform too that makes spending countercyclical. Sorting out the economic crisis in the PIGS countries may require fiscal adjustment in the short term, but the long-term goal should be to reduce the distortions in fiscal policy. This reform may either seek to tackle the procyclicality in spending directly, for example by restraining fiscal policy by an expenditure rule (Hauptmeier et al., 2011) or a deficit rule (Tanner, 2004), or set up institutions that promote fiscal sustainability, such as a Fiscal Council.

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