Cyclical Ratcheting in Government Spending: Evidence from the OECD

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Abstract

This paper studies the role of business cycles in the phenomenon of increasing government spending/GDP ratios in the OECD countries. An empirical framework that includes both welfare and short-sighted considerations is applied to panel data set covering the 1975-1998 period. The main finding is that the prolonged rise in the government spending/GDP ratio is partially explained by cyclical ratcheting: the spending/GDP ratio increases during recessions and its reduction in expansions is only partial. The long-run ratcheting effect is estimated as approximately 2 percent of GDP. Also analyzed are the cyclical changes in the composition of government spending (goods and services, transfers and subsidies, and capital expenditure), as well as a possible link between cyclical ratcheting and government weakness.

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1 Introduction

Government spending in the OECD countries rose from an average of 27.4 percent of GDP in 1974 to 35.9 percent in 1998, i.e., by 8.5 percentage points. The increasing share of government spending in output is a phenomenon observed since the beginning of the twentieth century.[1] However, from the middle 1970s the spending drift is accompanied by deficits and a growing public debt. This feature was linked in the literature to political and institutional mechanisms. For example, the influence of budgetary institutions was studied by Von Hagen and Harden (1996), Alesina and Perotti (1999) and others, and electoral rules and party and government structures were analyzed by Roubini and Sachs (1989), Kontopoulos and Perotti (1999), and others.

This paper focuses on asymmetric government spending over the business cycle, leading to cyclical ratcheting in government spending. The hypothesis is that while countercyclical spending is performed in recessions, high tax revenues in expansions make difficult for governments to resist pressure from interest groups to reduce spending symmetrically. The results indicate that cyclical ratcheting of government spending in the OECD countries can explain an increase of about 2 percent of GDP.

The cyclical pattern of government expenditure in industrial economies has been studied by Backus, Kehoe and Kydland (1995), Talvi and Vegh (1996), Gavin and Perotti (1997) and others. In particular, Gavin and Perotti present evidence of asymmetrical fiscal behavior over the cycle: government consumption is moderately procyclical in expansions, while in contractions government consumption and transfers are strongly countercyclical. The contribution of this paper to this literature is to test the link between this asymmetry and the spending/output drift.

A relevant question is whether cyclical ratcheting is related to government weakness. Roubini and Sachs (1989) find a tendency to larger deficits in industrial democracies with weaker governments after 1973. Recent studies assessing the importance of political institutions for fiscal policy outcomes include Hallerberg and Von Hagen (1997) and Kontopoulos and Perotti (1999)—who consider the cabinet size as an indication of government

[1] A documentation of the long-term developments in presented in Tanzi and Schuknecht (1995).

weakness. A test of whether cyclical ratcheting is enhanced by government weakness, measured similarly as in Roubini and Sachs, is performed here, but no support is found for such a link.

The paper is organized as follows. Section 2 presents an empirical framework for the dynamic determination of government spending. Section 3 reports the results regarding total government spending, and in particular the estimate of a cyclical ratcheting coefficient. This section also includes a separate analysis of the main spending components—goods and services, transfers and subsidies, and capital expenditure. Section 4 reports two tests about cyclical ratcheting: (a) an interaction with an index of government weakness and (b) a change in regime in the 1990s. Section 5 has concluding remarks.

2 Dynamic determination of the government spending/output ratio

In the following framework the dynamics of government spending are determined by (1) basic considerations (equalization of marginal benefit to marginal cost) and (2) cyclical considerations. The specification is empirically oriented, aimed at the estimation of the degree to which cyclical spending behavior affects the long-run level of the government spending/output ratio, denoted $g_t = G_t/Y_t$.

2.1 Basic considerations

The basic criterion affecting the dynamics of g is the long-run equalization of marginal benefit to marginal cost from the policymaker's point of view—which may or may not coincide with those of society. Long-run marginal benefit is specified as $\beta(\overline{g} - g_t)$, $\overline{g}, \beta > 0$. Marginal benefit decreases with g_t, and $\overline{g}$ is the bliss level beyond which government expenditures have negative marginal benefit. The parameters β and $\overline{g}$ capture the desirability of government spending. Marginal cost is formulated as $c + \omega g_t$, $\omega > 0$. Increasing marginal cost may follow from the marginal deadweight loss of taxation, or from a relative price response to government demand.

The basic dynamics are formulated as

$$(\widehat{g}_t)^* = \pi[\beta(\overline{g} - g_{t-1}) - (c + \omega g_{t-1})], \tag{1}$$

where $0 < \pi < \infty$. The spending/output ratio increases when last period marginal benefit exceeds marginal cost (decreases in the opposite case). The positive but finite nature of π captures adjustment costs in changing g. Equating marginal benefit to marginal cost yields the basic long-run ratio: $g^* = \frac{\overline{g}\beta - c}{\beta + \omega}$.

Along the basic considerations, an increasing spending/output ratio—as in the OECD since 1974—could be rationalized by an upward shift in β or $\overline{g}$ or by a downward shift in c at that time, triggering a process of convergence to a higher g^*.

2.2 Cyclical considerations

The cyclical pattern of government spending may have two alternative forms: (a) symmetric behavior in expansions and contractions, (b) asymmetric behavior. Defining $\Delta_t \equiv \widehat{Y}_t - avg(\widehat{Y})$—where $\widehat{x}$ is the growth rate of variable x—positive and negative deviations of output growth from average growth are given by

$$\begin{aligned} \Delta_t^p &\equiv \Delta_t d_t, \\ \Delta_t^n &\equiv \Delta_t (1 - d_t), \end{aligned}$$

where

$$\begin{aligned} d_t &= 1 \text{ if } \Delta_t > 0, \\ d_t &= 0 \text{ if } \Delta_t < 0. \end{aligned}$$

The cyclical spending behavior is specified as

$$(\widehat{g}_t)^c = \alpha_1 \Delta_t^p + \alpha_2 \Delta_t^n, \tag{2}$$

where α_1 and α_2 capture the spending pattern in expansions and contractions, respectively.

(a) Symmetric behavior

In this case, g reacts in the same way to Δ_t^p and to Δ_t^n, i.e., $\alpha_1 = \alpha_2 = \alpha$. When $\alpha = 0$, the evolution of g is unrelated to the cycle. If $\alpha > 0$, g increases in "expansions" and decreases in "contractions" (procyclical), and the opposite (countercyclical) when $\alpha < 0$.[2] A special case is $\alpha = -1$, in which case cyclical spending collapses to a constant growth rate at the average growth rate of output.[3]

In the terminology of Buchanan and Wagner (1978), symmetric cyclical spending can result from the implementation of Keynesian economic policies in an idealized environment—i.e., policies that would be implemented by a benevolent Keynesian planner who is free of short-sighted considerations. This planner would generate deficits in recessions by increasing spending, and symmetric surpluses in expansions by reducing spending. This type of behavior could reflect, for example, an optimal cyclical pattern of public investment, or unemployment benefits that produce a more efficient job search.

(b) Asymmetric behavior

Buchanan and Wagner stress the asymmetry that emerges from attempting to implement Keynesian economic policies in a **realistic** environment, in which policy is also affected by short-sighted considerations.. Increasing spending during recessions is likely to be politically attractive. In expansions, however, a symmetric reduction of spending is hard to implement since tax revenues abound: powerful interest groups, which may represent acute needs from their points of view, are unlikely to be convinced that available tax revenues should be put aside because then is the right time to be thrifty on spending.

The asymmetric behavior described above implies that $\alpha_1 > \alpha_2$. In this case, fluctuations in output growth are accompanied by an **increasing** spend-

[2]Under this definition, expansions and contractions are relative to average growth, while in the standard definition they are relative to zero (i.e., an expansion is a movement from trough to peak, $\widehat{Y}_t > 0$, and a contraction is a movement from peak to trough, $\widehat{Y}_t < 0$). The definition adopted has the characteristic that expansions and contractions offset each other over time. An analysis based on the standard definition of expansions/contractions is reported in Appendix C.

[3]To see this, note that

$$(\widehat{G}_t)^c - \widehat{Y}_t \equiv (\widehat{g}_t)^c = -(\Delta_t^p + \Delta_t^n) = -\Delta_t = avg(\widehat{Y}) - \widehat{Y}_t.$$

Hence, $(\widehat{G}_t)^c = avg(\widehat{Y})$.

When $\alpha < -1$, $\widehat{G}_t > avg(\widehat{Y})$ in recessions and $\widehat{G}_t < avg(\widehat{Y})$ in expansions.

ing/output ratio over time. The quantitative importance of this mechanism can be measured by the ratcheting coefficient $\phi \equiv \alpha_1 - \alpha_2$.

2.3 Empirical formulation

The basic and the cyclical considerations are included together in the regression equation

$$\widehat{g}_t = (\widehat{g}_t)^* + (\widehat{g}_t)^c + \varepsilon_t = \alpha_o + \alpha_1 \Delta_t^p + \alpha_2 \Delta_t^n + \lambda g_{t-1} + \varepsilon_t, \tag{3}$$

where $\alpha_o = \pi(\beta\overline{g} - c)$, $\lambda = -\pi(\beta + \omega)$ and ε_t is a white noise error.

To illustrate the ratcheting mechanism, let us consider the following numerical example, which can be considered as a benchmark case. Assume that the elasticity of tax revenues with respect to output is one. In recessions, spending grows at the normal rate, and correspondingly $\alpha_2 = -1$. In expansions all additional tax revenue is spend, and hence, given unitary elasticity of tax revenue, g remains constant. This implies that $\alpha_1 = 0$. In this case, the ratcheting coefficient ϕ is $\alpha_1 - \alpha_2 = 1$. In terms of the drift of g over time, after two years with $\Delta_t^p = 0.01$ in one and $\Delta_t^n = -0.01$ in the other, the spending/output ratio is higher than previously by one percent.

The regression coefficients can be used to compute the basic level of g in the long-run:

$$g^* = \frac{(\beta\overline{g} - c)}{(\beta + \omega)} = -\alpha_o/\lambda \tag{4}$$

The actual long-run ratio can be obtained from (3) by equating $\widehat{g}_t$ and ε_t to zero, the cyclical variables to their average levels, and solving for g_{t-1} in the long run. The resulting ratio is

$$\widetilde{g} = -\left[\alpha_o + \alpha_1 avg(\Delta_t^p) + \alpha_2 avg(\Delta_t^n)\right]/\lambda$$

Given that $avg(\Delta_t^p) = -avg(\Delta_t^n) \equiv \Delta$, $\widetilde{g}$ can be written as

$$\widetilde{g} = g^* + \phi\Delta/(-\lambda) \tag{5}$$

Hence, the long-run spending/output ratio is higher than g^* if there is cyclical ratcheting. Besides ϕ, the magnitude of the additional term depends positively on the amplitude of the cycle, Δ, and negatively on $|\lambda| = \pi(\beta + \omega)$, which determines the speed of convergence to the long-run. The higher π, β or ω, the sooner upward ratcheting is balanced by the downward effect of the higher level of spending.

The possibility of a lag between the timing of the economic activities being taxed and actual tax collection makes desirable to include also lagged cyclical variables. Hence, equation (3) is generalized as follows:

$$\widehat{g}_t = \alpha_o + \alpha_{11}\Delta_t^p + \alpha_{12}\Delta_{t-1}^p + \alpha_{21}\Delta_t^n + \alpha_{22}\Delta_{t-1}^n + \lambda g_{t-1} + \varepsilon_t \qquad (6)$$

The ratcheting coefficient is now defined as $\phi \equiv (\alpha_{11} + \alpha_{12}) - (\alpha_{21} + \alpha_{22})$.

3 Estimation results

3.1 The data

The panel data set used to estimate equation (6) includes the 22 OECD countries that appear in Table 1. The data, from Government and Financial Statistics (GFS), are annual figures over the period 1975-1998.[4] The variable G is matched to consolidated central government spending (including interest payments) and Y is represented by GDP. Both variables are calculated by deflating nominal values by the GDP deflator.[5] The average growth rate, $avg(\widehat{Y}_t)$, is country specific, i.e., Δ_t^p and Δ_t^n are the deviations of output growth in a given country from the average in the same country over the 1975-1998 period.

Given that the hypothesis refers to the cyclical pattern of government spending, it is important to have large cyclical variation in the sample. The use of panel data with 22 countries contributes in this respect, since in each individual country the degree of cyclical variation during the 23-year sample is small. Appendix B includes diagrams of the output growth data in the

[4] There are some changes in the GFS definitions during the sample period, two of the major changes being for Japan, 1991, and Greece, 1991. All the regressions reported in the paper exclude 1991 for these two countries. All other changes (in 8 out of more than 400 data points) are minor. Excluding these observations does not affect the results.

[5] An alternative counterpart of G is government spending at constant prices, as usually measured. The problem with the usual measure is that changes in public sector wages are not captured because they are considered price changes, while changes of this type may constitute one of the mechanisms for increasing politically induced spending.

panel countries. Output growth across countries is not strongly correlated: the average correlation of GDP growth across the 22 countries is 0.21.

Spending by the consolidated central government includes central government and social security funds, but excludes regional governments.[6] In terms of composition, it includes four categories: (i) expenditure on goods and services, (ii) transfers and subsidies, (iii) capital expenditure, and (iv) interest payments.

Table 1: Government expenditure (percentage of GDP)

Country	1975	End of sample	Increment
United States	21.0	19.8 (1998)	-1.2
United Kingdom	38.9	36.7 (1998)	-2.2
Austria	34.8	40.5 (1997)	0.7
Belgium	44.4	46.4 (1997)	2.0
Denmark	34.6	41.6 (1995)	7.0
France	36.6	46.1 (1997)	9.5
Germany	29.6	32.6 (1998)	3.0
Italy	35.0	44.1 (1998)	9.1
Netherlands	48.4	48.0 (1997)	-0.4
Norway	35.0	35.7 (1997)	0.7
Sweeden	29.4	40.7 (1998)	11.3
Switzerland	18.5	27.9 (1997)	9.4
Canada	21.0	24.1 (1995)	3.1
Japan	14.7	23.7 (1993)	9.0
Finland	28.0	34.5 (1997)	6.5
Greece	30.5	33.7 (1997)	3.2
Ireland	40.6	35.3 (1996)	-5.3
Portugal	32.7	40.6 (1997)	7.9
Spain	20.7	36.1 (1996)	15.4
Australia	22.2	27.1 (1998)	4.9
New Zealand	33.2	33.4 (1998)	0.2
Turkey	16.4	29.9 (1997)	13.5

[6]Transfers from central governments to regional governments are included in central government data.

Table 1 shows some basic statistics from the data set. In most countries (all except the United States, the United Kingdom, Ireland and the Netherlands), the spending/GDP ratio increased during the sample period. Additionally, there is a wide heterogeneity of government spending levels: the approximate ranges are 15-48 percent of GDP in 1975 and 20-48 percent at the end of the sample.

3.2 Total government expenditure

Motivated by the heterogeneity in Table 1, the panel estimation of equation (6) includes idiosyncratic constants (α_0). This allows for the computation of the optimal g^* for each country, capturing different preferences about public goods.[7] A GLS procedure is adopted to deal with cross-section heteroskedasticity, with weights computed from the residual variances for each country in a preliminary regression. As a robustness check, the basic equations for total government expenditure are also estimated by OLS. The estimates of the cyclical parameters are presented in Table 2. The country-specific constants, along with the long-run implications of the model, are reported in Table 3.

[7] Appendix B reports the results when also the cyclical parameters are allowed to be country specific.

Table 2: Total government expenditure			
Dependent variable: $\widehat{g}_t$			
Sample: 1976-1998 (standard errors in parentheses)			
Variable*		Weighted - using cross-section variances	OLS**
Δ_t^p	α_{11}	-0.700 (0.150)	-0.580 (0.224)
Δ_{t-1}^p	α_{12}	-0.038 (0.158)	0.219 (0.237)
Δ_t^n	α_{21}	-1.425 (0.129)	-1.232 (0.255)
Δ_{t-1}^n	α_{22}	-0.348 (0.118)	-0.315 (0.195)
g_{t-1}	λ	-0.417 (0.042)	-0.435 (0.073)
R^2		0.236	0.245
D.W.		1.96	1.94
Ratcheting coefficient ϕ		1.035	1.185
Significance level		0.001	0.001
Observations: 23; Number of countries: 22			
Total panel observations: 469			
* Country-specific constants included			
** White heteroskedasticity-consistent standard errors			

The results can be elaborated as follows:[8]

- The results indicate the presence of cyclical ratcheting. The estimates of ϕ in the two regression forms are 1.03 and 1.18. According to Wald tests, these coefficients are significantly different from zero at very low percentage levels. In what follows we refer only to the weighted-regression estimate 1.03. Similarly as in the benchmark example in Section 2, where $\phi = 1$, this estimate implies that following an artificial two-year cycle of 1 percent amplitude (1 percent above $avg(\widehat{Y})$ in the first year and 1 percent below $avg(\widehat{Y})$ in the second), the spending/output ratio is 1.03 percent higher than prior to the cycle.[9]

[8] When the cyclical variables lagged two years are included, their coefficients turn out statistically insignificant.

[9] Table B1, in Appendix B, reports the estimation of equation 6 with country-specific constants and cyclical variables. Therefore, this estimation allows for country-specific ratcheting coefficients. The estimates of ϕ are positive in 16 countries out of 22, but

- Although the estimated ϕ is close to the benchmark example, the cyclical pattern is quite different. While in the example the contraction coefficient was -1 (meaning that when output growth is lower than average, spending grow remains at the average growth rate), the corresponding estimate of $\alpha_{21}+\alpha_{22}$ is -1.77. Hence, spending growth in contractions is actually higher than normal (by 0.77 percent for each percentage point of output growth below $avg(\widehat{Y}_t)$). Spending in contractions, therefore, can be described as an active Keynesian-type countercylical policy. For expansions, the coefficient in the example was 0—implying that spending grows at the same, higher-than-normal, rate as output—the corresponding estimate of $\alpha_{11}+\alpha_{12}$ is -0.74. This means that spending is actually expanded by only 0.26 percent for each percentage point of output growth above normal. These coefficients can be interpreted as reflecting sizeable surpluses in expansions, rather than by balanced budget as in the benchmark example. However, the surpluses are not enough to offset the deficits incurred in contractions.

- Finally, a remark is in order about the starting year of the sample for the regressions—1976. In 1974 and 1975, following the oil shock, there were sharp increases in government spending. Given that these were recession years, including them in the regressions would increase the magnitude of the coefficient on contractions and the estimate of ϕ.

One may think of cyclical ratcheting as reflecting welfare considerations for increasing g, implemented for some reason over the cycle. However, if there are tax smoothing considerations, this interpretation seems inconsistent with the observed deficits during the period. Since ratcheting generates permanent increases in spending, tax smoothing implies that it should be accompanied by parallel tax increases.[10]

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statistically significant only in 3. Low significance seems related to small time series variation within each country. Panel estimation of common cyclical coefficients with fixed effects increases materially the degree of time series variation in the sample.

Except for Norway, all countries exhibit contemporaneous countercyclical policy in recessions (negative coefficients on Δ_t^n). These coefficients are significant in 12 countries.

[10] According to Barro's (1979) tax smoothing hypothesis, if the spending trend is planned in advance, a welfare-maximizing government should raise the tax rate at the beginning of the planning period, generating a surplus which declines thereafter. If the spending shifts are unexpected, the tax rate should increase one-to-one with increasing spending, keeping the budget balanced.

The estimates in Table 2 can be used to derive the optimal long-run spending ratio, g^*, and accumulated ratcheting, $\widetilde{g} - g^* = \phi\Delta/(-\lambda)$, for each country in the sample. These magnitudes, computed using equations (4) and (5), are reported in Table 3.

Table 3: Optimal long-run g and accumulated ratcheting

Country	α_0	g^*	Δ	$\phi\Delta/(-\lambda)$
United States	0.09	0.21	0.007	0.018
United Kingdom	0.15	0.37	0.009	0.019
Austria	0.16	0.39	0.009	0.017
Belgium	0.21	0.49	0.011	0.018
Denmark	0.17	0.40	0.012	0.022
France	0.18	0.44	0.008	0.014
Germany	0.12	0.28	0.008	0.032
Italy	0.19	0.46	0.011	0.019
Netherlands	0.22	0.52	0.008	0.014
Norway	0.16	0.37	0.009	0.019
Sweden	0.18	0.43	0.008	0.017
Switzerland	0.11	0.26	0.010	0.021
Canada	0.10	0.23	0.011	0.022
Japan	0.08	0.20	0.009	0.020
Finland	0.13	0.32	0.013	0.028
Greece	0.19	0.45	0.013	0.022
Ireland	0.16	0.38	0.021	0.032
Portugal	0.17	0.40	0.013	0.025
Spain	0.15	0.35	0.009	0.016
Australia	0.11	0.26	0.010	0.021
New Zealand	0.15	0.36	0.015	0.026
Turkey	0.09	0.22	0.017	0.037
Average		0.36		0.021

According to the estimates, the average optimal spending is 35.5 percent of GDP, and the average accumulated ratcheting is 2.1 percent of GDP.

To check the robustness of the results, we proceed as follows. First, interest payments, which depends on past events and thus cannot be considered as fiscal policy, are excluded from g. The results, not reported, are very similar to those in Table 2. Second, the upward trends in unemployment and in the dependency ratio during the sample, which affect spending via their impact on unemployment benefits and pension payments, are controlled for.[11] Third, government spending is decomposed into three categories in order to analyze the differential impact of cyclical ratcheting.

3.3 Upward trends in unemployment and the dependency ratio

Unemployment during the period under study has an upward trend. Therefore, part of the upward drift in the spending/output ratio can be expected to be related to increasing unemployment benefits payments. Given the strong correlation between unemployment and output growth, the Hodrick-Prescott trend is included—computed for each country separately—is included in the regression. The dependency ratio, defined as the population over 65 years old divided by the working age population, also increased during the sample period. The data on this ratio is available only through 1995. Table 3 reports the regressions that include these two additional variables.

[11] Both the unemployment rate and the dependency ratio have highly statistically significant positive time trends.

Table 4: Trends in unemployment and dependency ratio		
Dependent variable: $\widehat{g}_t$		
Weighted - using cross-section variances (standard errors in parentheses)		
Variable*	Sample: 1976-1995	Sample: 1976-1998
Δ_t^p	-0.656 (0.153)	-0.642 (0.148)
Δ_{t-1}^p	-0.055 (0.158)	0.006 (0.155)
Δ_t^n	-1.340 (0.131)	-1.356 (0.129)
Δ_{t-1}^n	-0.230 (0.120)	-0.276 (0.118)
g_{t-1}	-0.388 (0.045)	-0.385 (0.043)
d(dependency ratio)**	-0.087 (0.607)	—
d(unemployment trend)**	0.018 (0.006)	0.019 (0.005)
R^2	0.26	0.25
D.W.	2.15	2.01
Ratcheting coefficient ϕ	0.869	0.996
Significance level	0.005	0.002
Observations: 23; Number of countries: 22		
Total panel observations: 425 and 466		
* Country-specific constants included		
** First difference		

The first regression includes the first differences of both the unemployment trend and the dependency ratio. In the second regression only the change in the unemployment trend is added. The results show that the dependency ratio is statistically insignificant, but the unemployment trend contributes substantially to the spending/output ratio. The coefficients on the cyclical variables remain similar to those in Table 2. The estimates of ϕ are somewhat lower than in Table 2, but remain very significant.

3.4 Expenditure decomposition

We turn to the disaggregated analysis of government expenditures. The three components considered are: (1) goods and services, (2) transfers and subsidies, and (3) capital expenditure. The considerations for total spending in Section 2 are adapted here as follows. The ratio of spending in component i to output is denoted as g_t^i, $i = 1, 2, 3$. The social benefit of spending in component i is $\beta^i(\overline{g}^i - g_t^i)$, $\overline{g}^i, \beta^i > 0$, and the marginal social cost is $c^i +$

$\omega_i^i g_t^i + \omega_j^i g_t^j + \omega_k^i g_t^k$, $\omega's > 0$, $i = 1, 2, 3$, $j, k \neq i$. This formulation of the cost function allows for a crowding-out effect of spending in component i by spending in others. Similarly as for total spending—equation (1)—the basic evolution of government spending is described by

$$\begin{aligned} (\widehat{g}_t^i)^* &= \pi^i[\beta^i(\overline{g}^i - g_{t-1}^i) - (c^i + \omega_i^i g_{t-1}^i + \omega_j^i g_{t-1}^j + \omega_k^i g_{t-1}^k)], \\ i &= 1, 2, 3, \ j, k \neq i, \end{aligned}$$

or

$$\begin{aligned} (\widehat{g}_t^i)^* &= \pi^i(\beta^i\overline{g}^i - c^i) - \pi^i(\beta^i + \omega_i^i)g_{t-1}^i - \pi^i\omega_j^i g_{t-1}^j - \pi^i\omega_k^i g_{t-1}^k, \\ i &= 1, 2, 3, \ j, k \neq i. \end{aligned}$$

The empirical equations, counterpart of equation (3), are

$$\begin{aligned} \widehat{g}_t^i &= \alpha_o^i + \alpha_1^i\Delta_t^p + \alpha_2^i\Delta_t^n + \lambda^i g_{t-1}^i + \theta_j^i g_{t-1}^j + \theta_k^i g_{t-1}^k + \varepsilon_t^i, \\ i &= 1, 2, 3, \ j, k \neq i, \end{aligned} \tag{7}$$

where $\alpha_o^i = \pi^i(\beta^i\overline{g}^i - c^i)$, $\lambda^i = -\pi^i(\beta^i + \omega_i^i)$, $\theta_j^i = -\pi^i\omega_j^i$, $\theta_k^i = -\pi^i\omega_k^i$.

Finally, equations (7) are extended to include lagged cyclical variables, as in the estimation with total spending. Hence, the three equations to be estimated are

$$\begin{aligned} \widehat{g}_t^i &= \alpha_o^i + \alpha_{11}^i\Delta_t^p + \alpha_{12}^i\Delta_{t-1}^p + \alpha_{21}^i\Delta_t^n + \alpha_{22}^i\Delta_{t-1}^n \\ &\quad + \lambda^i g_{t-1}^i + \theta_j^i g_{t-1}^j + \theta_k^i g_{t-1}^k + \varepsilon_t^i, \\ i &= 1, 2, 3, \ j, k \neq i. \end{aligned}$$

The results are reported in Table 5. Cyclical ratcheting is found in the three components of spending, although for capital expenditure it is insignificant. For goods and services, the coefficient is 1.30 and for transfers and subsidies it is 1.63. The feature present in the basic regression, that total spending is strongly countercyclical in contractions, is also evident in the separated regressions. The sums of the coefficients for contractions, $\alpha_{21}^i + \alpha_{22}^i$, are -1.55, -2.07, and -1.1, for goods/services, transfers/subsidies and capital expenditure, respectively. The latter is barely significantly different from zero, and insignificantly different from -1. For goods/services and transfers/subsidies, the sums of coefficients are significantly lower than -1. Hence, active countercyclical policy in contractions is found for these two components.

The cross effects are mostly negative, as expected, but insignificantly different from zero. The cross effects on transfers/subsidies, however, are positive, and the one of capital expenditure is even significantly different from zero. We did not find a satisfactory explanation to this positive cross effect. One may speculate that capital spending in productive infrastructure has a positive effect on economic activity and thus on tax collection, beyond that captured by the cyclical variables. This consideration, however, should be consistent with positive effects on both goods/services and subsidies/transfers, while a positive effect was found only on the latter.

Table 5: Components of government expenditure			
Dependent variable: $\widehat{g}_t^i$, $i = 1, 2, 3$			
Sample: 1976-1998 (standard errors in parentheses)			
Variable*	Goods and services (1)	Transfers and subsidies (2)	Capital expenditure (3)
Δ_t^p	-0.467 (0.189)	-0.743 (0.196)	-0.098 (0.576)
Δ_{t-1}^p	0.205 (0.191)	0.292 (0.205)	-0.287 (0.571)
Δ_t^n	-1.245 (0.177)	-1.510 (0.177)	-1.059 (0.558)
Δ_{t-1}^n	-0.314 (0.152)	-0.571 (0.165)	-0.105 (0.465)
g_{t-1}^1	-0.735 (0.208)	0.220 (0.236)	-0.256 (0.432)
g_{t-1}^2	-0.121 (0.074)	-0.970 (0.100)	-0.091 (0.211)
g_{t-1}^3	-0.246 (0.317)	0.746 (0.312)	-4.708 (1.052)
R^2	0.06	0.08	0.01
D.W.	2.15	2.17	2.08
Ratcheting coefficients	1.296	1.630	0.779
Significance levels	0.001	0.000	0.525
Observations: 23; Number of countries: 22			
Total panel observations: 465			
* Country-specific constants included			

4 Additional tests

4.1 Government weakness

The hypothesis considered here is that cyclical ratcheting is higher in countries with weaker governments. For this purpose, we use a measure of government weakness of the type constructed by Roubini and Sachs (1989) who define an index between 0 and 3 for government weakness: 0 represents a one-party majority parliamentary government, 1 represents a majority coalition government with two or three coalition partners, 2 represents a majority coalition government with four or more coalition partners and 3 represents a minority parliamentary government. The political variable we use is taken from de Haan, Sturm and Beekhuis (1999), who apply the same method as Roubini and Sachs for all the countries in our sample (except Turkey) for the period 1979-1995. We then build a dummy variable ($WEAK$) which takes the value 1 when the political weakness index is higher than average (across countries and time) and 0 when it is lower than average.[12] The interaction terms between $WEAK$ and the cyclical variables should detect additional ratcheting associated with weak governments. The dummy variable itself captures the differential g^* associated with weak governments.

[12]Similar results are obtained when the government weakness index itself is used.

Table 6: Government weakness	
Dependent variable: $\widehat{g}_t$	
Sample: 1979-1995 (standard errors in parentheses)	
Variable*	Coefficient
Δ_t^p	-0.508 (0.152)
Δ_{t-1}^p	-0.188 (0.168)
Δ_t^n	-1.306 (0.097)
Δ_{t-1}^n	-0.288 (0.100)
g_{t-1}	-0.463 (0.042)
$WEAK$	-0.003 (0.004)
$WEAK \times \Delta_t^p$	-0.184 (0.213)
$WEAK \times \Delta_{t-1}^p$	-0.124 (0.240)
$WEAK \times \Delta_t^n$	-0.357 (0.246)
$WEAK \times \Delta_{t-1}^n$	-0.169 (0.206)
R^2	0.32
D.W.	2.07
Increase in ϕ	0.218
Significance level	0.62
Observations: 17; Number of countries: 21	
Total panel observations: 347	
* Country-specific constants included	

The results shown in Table 6 do not support the existence of a relationship between cyclical ratcheting and government weakness. According to the Wald test applied to the coefficients of the interaction variables with $WEAK$, the hypothesis that there is an additional bias related to government weakness cannot be accepted at standard significance levels. The coefficient of $WEAK$ itself is also insignificant at standard levels. It seems, therefore, that the cyclical ratcheting phenomenon is shared by countries with different types of governmental institutions.[13]

4.2 Regime change in the 1990s

The Maastricht Treaty, which is relevant for a large group of countries in our sample, was signed in 1991 and approved through referendums during

[13]Persson (2001) found a ratcheting effect in parliamentary systems. His result is consistent with the present one, since most OECD countries belong to this category.

the period 1992-1994.[14] This and other institutional arrangements that were set in place in the 1990s deal with the increasing share of government in the economy. From the point of view of the present framework, one may interpret these developments as a manifestation of the correction mechanism embedded in the dynamic equation, which leads to the stable long-run g. Alternatively, establishing such institutions can be considered a regime change, which either constraints short-sighted policies—thereby diminishing cyclical ratcheting—or changes optimal spending.

The hypothesis of a change in fiscal regime is tested by introducing interaction terms between the cyclical variables and a dummy for the period 1992-1998, $D92$, (or for 1994-1998, $D94$), and the dummy variable itself. The choice of 1992 (or 1994) is due to the Maastricht Treaty approval. The interaction with the cyclical variables tests an effective constraint to politically-induced spending, and the dummy variable itself captures a change in the benefits or costs of government spending.

[14]The countries joining the treaty are (in parenthesis we quote the date of referendum approval): Belgium (5.11.92), France (23.9.92), Italy (29.10.92), Luxembourg (2.7.92), Holland (15.12.92), Ireland (18.6.92), Greece (31.7.92), Portugal (10.12.92), Spain (25.11.92), Denmark (18.5.93), United Kingdom (23.7.93), Germany (12.10.93), Austria (12.6.94), Finland (16.10.94) and Sweden (13.11.94). Source: Kessing's Records of World Events.

Table 7: Regime change in the 1990s		
Dependent variable: $\widehat{g}_t$		
Sample: 1976-1998 (standard errors in parentheses)		
Variable*	$D92$	$D94$
Δ_t^p	-0.766 (0.166)	-0.767 (0.163)
Δ_{t-1}^p	-0.030 (0.174)	0.009 (0.168)
Δ_t^n	-1.269 (0.154)	-1.331 (0.141)
Δ_{t-1}^n	-0.299 (0.150)	-0.406 (0.135)
g_{t-1}	-0.391 (0.044)	-0.372 (0.043)
$DYEAR$	-0.011 (0.005)	-0.012 (0.006)
$DYEAR \times \Delta_t^p$	0.015 (0.420)	0.104 (0.470)
$DYEAR \times \Delta_{t-1}^p$	-0.418 (0.447)	-0.399 (0.501)
$DYEAR \times \Delta_t^n$	-0.489 (0.288)	0.216 (0.326)
$DYEAR \times \Delta_{t-1}^n$	-0.151 (0.251)	0.239 (0.246)
R^2	0.22	0.24
D.W.	2.00	1.99
Increase in ϕ	0.25	-0.50
Significance level	0.76	0.62
Observations: 23; Number of countries: 22		
Total panel observations: 469		
* Country-specific constants included		

The results are reported in Table 7. The coefficients of the dummy variables $D92$ and $D94$ are negative and significantly different from zero at the 5 percent level. This can be interpreted as a reduction in the optimal government spending, induced by a lower benefit or a higher social cost. The fact that the coefficient of $D94$ is larger than the one for $D92$ may suggest that there was a gradual change as the Maastricht Treaty was approved in the different countries. Additional ratcheting is insignificant in both regressions. This suggests that the short-sighted considerations remained unchanged.

Table 8 shows the implications of the coefficients of $D92$ and $D94$ for the average long-run spending/output ratios ($\widetilde{g}$) across the countries in the sample. Because these coefficients are negative, the computed $\widetilde{g}$ declines. For comparison, the actual average level of g at the end of the sample period is also included.

Table 8 - Average long-run government spending/output ratio ($\widetilde{g}$)			
No dummy	Dummy for 1992-98	Dummy for 1994-98	1998
0.376	0.364	0.349	0.359

The no-dummy estimate is from Table 3. The computation using $D92$ yields a lower level of spending, but it is still higher than the actual figure for 1998. When $D94$ is used, the computed $\widetilde{g}$ is lower than the actual g in 1998.

5 Concluding remarks

This paper reports evidence that the persistent increase in government spending/output ratios in OECD countries is partially explained by cyclical ratcheting, whose accumulated effect is estimated as 2 percent of GDP. The spending/output ratio tends to increase in contractions, and its reduction in expansions is only partial. A separate analysis of the components of government expenditure indicates that while cyclical ratcheting is present in the three main components—goods and services, transfers and subsidies, and capital expenditure—it is particularly high in transfers and subsidies.

The mechanism generating the asymmetric behavior was discussed by Buchanan and Wagner, who stress the consequences of attempting to implement Keynesian economic policies in a realistic environment. In such environment, increasing spending during recessions is likely to be politically attractive. In expansions, however, a symmetric reduction of spending is hard to implement since tax revenues abound, and it may be hard to stand against interest groups lobbying to use them to increase spending.

The possibility that cyclical ratcheting reflects welfare considerations for increasing g, implemented for some reason over the cycle, seems inconsistent with the observed accompanying deficits if there are tax smoothing considerations. Since ratcheting generates permanent increases in spending, tax smoothing implies that it should be accompanied by parallel tax increases. Thus, it is most likely that the ratcheting effect found in our paper reflects short-sighted considerations.

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Appendix A
Econometric considerations

Reverse causality from government spending to output implies positive correlation between the cyclical variables and ε_t, and hence the individual estimates are in principle biased. The important question in the present context, however, is whether the estimate of the difference $\phi = \alpha_{11} + \alpha_{12} - (\alpha_{21} + \alpha_{22})$, should also be biased.

The present discussion is based on the OLS estimate formulae:

$$a = (X'X)^{-1}X'\widehat{g} = \alpha + (X'X)^{-1}X'\varepsilon,$$

where X is the matrix

$$X \equiv \left[\mathbf{1}, \Delta^p, \Delta^p_{-1}, \Delta^n, \Delta^n_{-1}, g_{-1}\right], \tag{8}$$

with six $N \times 1$ vectors—the first with ones and the other five with the observations for the explanatory variables—$\widehat{g}$ is the $N \times 1$ vector of observations on the dependent variable, $\alpha \equiv [\alpha_o, \alpha_{11}, \alpha_{12}, \alpha_{21}, \alpha_{22}, \lambda]'$, and ε is the $N \times 1$ the vector of white-noise residuals. Correspondingly, the estimation-bias vector is

$$(X'X)^{-1}X'\varepsilon = (X'X)^{-1} \begin{bmatrix} \mathbf{1}'\varepsilon \\ (\Delta^p)'\,\varepsilon \\ (\Delta^p_{-1})'\varepsilon \\ (\Delta^n)'\,\varepsilon \\ \left(\Delta^n_{-1}\right)'\varepsilon \\ (g'_{-1})\varepsilon \end{bmatrix} \tag{9}$$

Under the assumption that ε is white noise, it should be uncorrelated with the lagged variables, or

$$E(\Delta^p_{t-1}\varepsilon_t) = E(\Delta^n_{t-1}\varepsilon_t) = E(g_{t-1}\varepsilon_t) = 0. \tag{10}$$

Hence, the elements in the vector (9) corresponding to the lagged variables should have expected value of zero, implying that the estimates of α_{12}, α_{22} and λ should be unbiased. Hence, the bias in the estimated ϕ equals $a_{11} - a_{21} - (\alpha_{11} - \alpha_{21})$, associated with the current variables Δ^p_t and Δ^n_t.

We turn then to the elements in the bias vector corresponding to Δ_t^p and Δ_t^n. These elements should be nonzero if there is reverse causality from government spending to output, but they depend not only on $(\Delta^p)' \varepsilon$ and $(\Delta^n)'\varepsilon$, which are presumed to be positive, but also on $X'X$, or the entire correlation structure.

A special case for assessing the estimate of $\alpha_{11} - \alpha_{21}$ is when Δ_t^p and Δ_t^n are uncorrelated with the lagged variables, and hence the dependence on the over-all correlation structure is eliminated. In this case, the elements in the vector $(X'X)^{-1}X'\varepsilon$ corresponding to Δ_t^p and Δ_t^n can be written as if these two were the only explanatory variables:

$$\begin{bmatrix} a_{11} \\ \\ a_{21} \end{bmatrix} - \begin{bmatrix} \alpha_{11} \\ \\ \alpha_{21} \end{bmatrix} = \begin{bmatrix} \frac{(\Delta^{p})^{\theta}\varepsilon}{(\Delta^{p})^{\theta}(\Delta^{p})} \\ \\ \frac{(\Delta^{n})^{\theta}\varepsilon}{(\Delta^{n})^{\theta}(\Delta^{n})} \end{bmatrix}$$

Correspondingly, the difference between the estimated and “true” ratcheting coefficient is

$$a_{11} - a_{21} - (\alpha_{11} - \alpha_{21}) = \frac{(\Delta^p)'\varepsilon}{(\Delta^p)'(\Delta^p)} - \frac{(\Delta^n)'\varepsilon}{(\Delta^n)'(\Delta^n)}$$

If reverse causality is symmetric, the numerators in this expression are equal, and if the distribution of $\widehat{Y}$ is symmetric, then the denominators are also equal. Hence, in this case this expression is asymptotically zero. However, as it is true in general, in the current sample the distribution of $\widehat{Y}$ is slightly skewed to the left, or $(\Delta^p)'(\Delta^p) < (\Delta^n)'(\Delta^n)$. This inequality generates a positive bias in the estimated ratcheting coefficient. However, this asymmetry suggests that positive shocks affect output less than negative shocks. If there is a corresponding asymmetric response to government spending, reverse causality from $\widehat{G}$ to $\widehat{Y}$ is stronger in recessions than in expansions, and then $(\Delta^p)'\varepsilon < (\Delta^n)'\varepsilon$ should also hold. This generates an offsetting negative bias in the estimate of ϕ.

One may summarize these arguments as follows. In the symmetric case the estimate of ϕ should be unbiased. In the asymmetric case a bias may exist, in an unknown direction, if the two opposite considerations above do not fully offset each other.

The previous discussion was based on Δ_t^p and Δ_t^n being uncorrelated with the lagged variables. In fact, the sample correlations between Δ_t^p, Δ_t^n

and the lagged variables $\Delta^p_{t-1}, \Delta^n_{t-1}, g_{t-1}$ are weak but nonzero. They range between -0.12 and 0.22. To gauge the quantitative implications of these nonzero correlations for the estimate of the ratcheting coefficient—relative to a situation of zero correlations—the following exercise was carried out.

Using again the OLS formulae $a = (X'X)^{-1}X'\widehat{g}$, the elements in the 6×6 matrix $X'X$ corresponding to $\sum_{t=1}^{N} x_{it}x_{jt}$, where $x_{it} = \Delta^p_t, \Delta^n_t$, $x_{jt} = \Delta^p_{t-1}, \Delta^n_{t-1}, g_{t-1}$, were replaced by $avg(x_i)avg(x_j)$. The latter expression would correspond to the elements in $X'X$ for which the sample correlations are zero. The vector a was computed twice: before and after this substitution. Before the substitution, the computed coefficients of the cyclical variables are -0.56 and 0.32 for expansions, and -1.14 and -0.18 for recessions. These estimates differ somewhat from the OLS estimates in Table 2 because the present simplistic computation abstracts from fixed effects. The corresponding ratcheting coefficient is 0.72. After the substitution, the coefficients change to -0.39 and 0.39 for expansions, and -1.24 and -0.46 for recessions. The resulting ratcheting coefficient is now 0.79. Hence, the correlation with the lagged variables does seem to affect materially the estimate of ϕ.

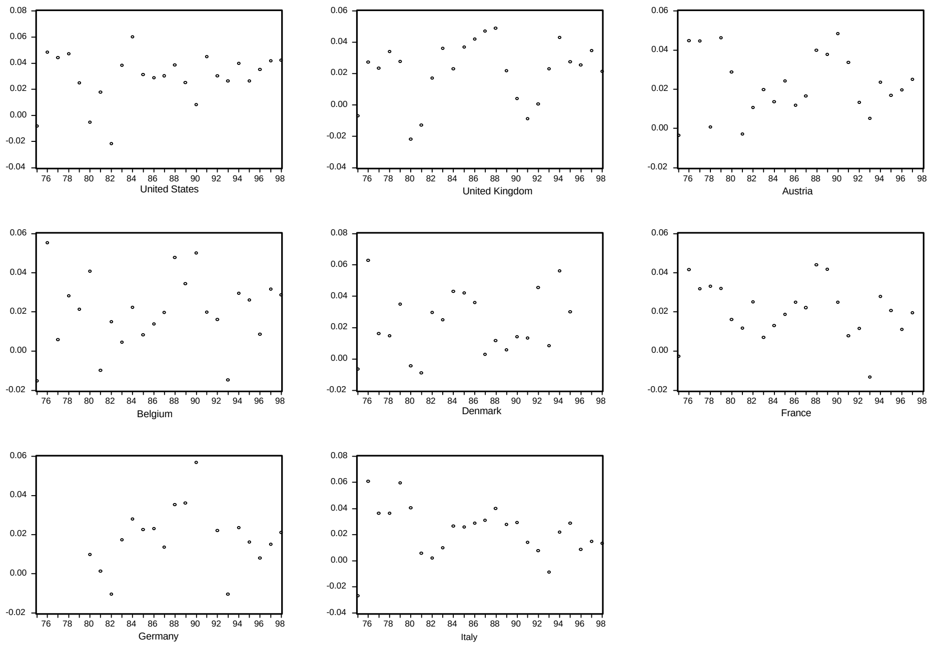

Figure 1:

Appendix B
Output growth data

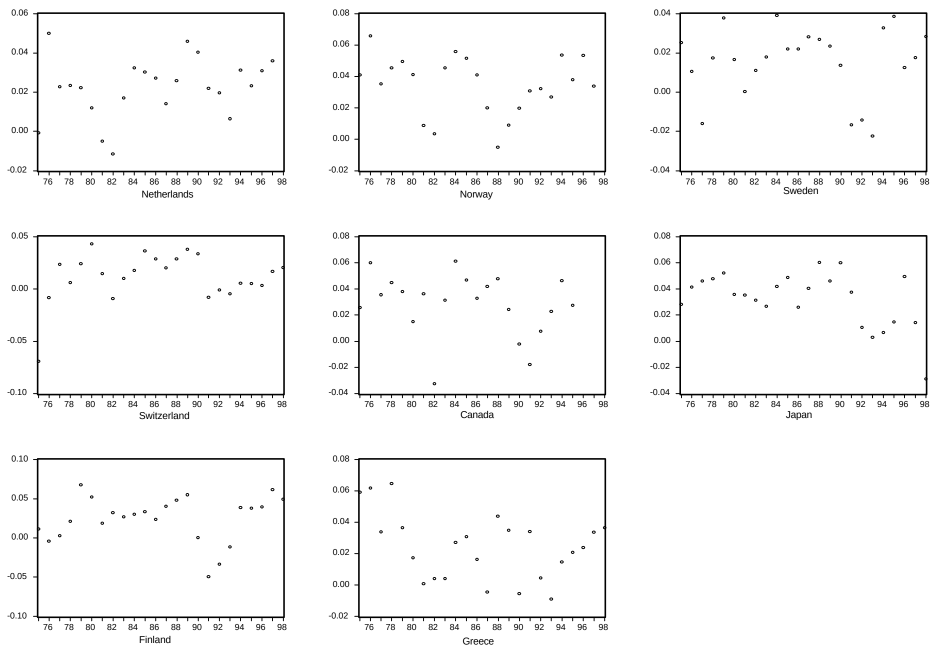
Netherlands
Norway
Sweden
Switzerland
Canada
Japan
Finland
Greece

Figure 2:

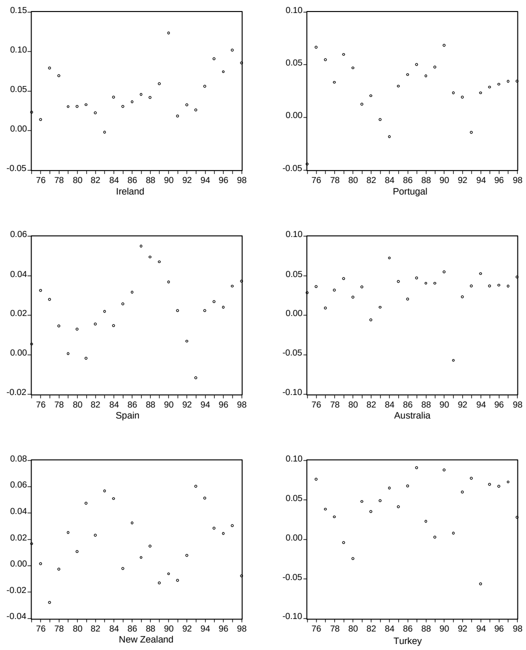
0.15
0.10
0.05
0.00
-0.05
76 78 80 82 84 86 88 90 92 94 96 98
Ireland
0.10
0.05
0.00
-0.05
76 78 80 82 84 86 88 90 92 94 96 98
Portugal
0.06
0.04
0.02
0.00
-0.02
76 78 80 82 84 86 88 90 92 94 96 98
Spain
0.10
0.05
0.00
-0.05
-0.10
76 78 80 82 84 86 88 90 92 94 96 98
Australia
0.08
0.06
0.04
0.02
0.00
-0.02
-0.04
76 78 80 82 84 86 88 90 92 94 96 98
New Zealand
0.10
0.05
0.00
-0.05
-0.10
76 78 80 82 84 86 88 90 92 94 96 98
Turkey

Table B1: Country-specific cyclical coefficients**					
Country	Δ_t^p	Δ_{t-1}^p	Δ_t^n	Δ_{t-1}^n	Ratcheting coefficient
US	-0.67	0.54	-1.85*	-1.23*	3.0*
UK	-1.00	-1.39	-1.66*	-0.25	-0.5
Austria	-0.62	0.02	-1.84*	-0.10	1.3
Belgium	-0.49	0.49	-1.57*	-0.53	2.1
Denmark	-0.72	-0.83	-1.47	0.05	-0.1
France	-1.24*	-0.33	-1.36*	-0.11	-0.1
Germany	0.89	-2.93*	-0.87*	0.05	-1.2
Italy	-0.85	-0.45	-0.71	1.35	-1.9
Netherlands	-1.53*	-0.08	-1.18*	-0.56	0.1
Norway	-0.65	-0.78	0.67	-0.39	-1.7
Sweeden	-0.43	-0.01	-2.53*	-0.21	2.3
Switzerland	0.31	-1.25*	-2.43*	-0.47	2.0
Canada	0.81	0.97	-2.01*	-0.43	4.2*
Japan	-1.27	1.82	-0.89	-3.95	5.4*
Finland	-1.00	-0.35	-1.90*	-0.34	0.9
Greece	-0.94	0.59	-2.44	0.33	1.8
Ireland	-0.74	0.07	-1.64	-0.09	1.1
Portugal	-1.27	0.97	-0.01	-1.41	1.1
Spain	-0.90	0.81	-1.52	-0.09	1.5
Australia	-0.50	0.13	-0.93*	-0.65	1.2
New Zealand	0.10	0.61	-1.72	-0.53	3.0
Turkey	0.90	2.21	-0.15	0.61	2.7
* Significant at 5 percent.					
** Country-specific constants included					

Appendix C

Here we consider the relationship between the definition of expansions and contractions used in the paper with the 'standard' one where expansions and contractions are defined by $\widehat{Y}_t > 0$ and $\widehat{Y}_t < 0$, respectively. The latter requirement for a contraction is a more stringent: growth has to be lower than zero, rather than lower than $avg\widehat{Y}_t$, which is positive. Hence, the range $0 < \widehat{Y}_t < avg\widehat{Y}_t$, which corresponds to a contraction in the paper, is included in the expansion range under the standard definition.

To facilitate the comparison of the results with those in the paper, the main regression (Table 2) is rerun with three, rather than two, ranges for output growth. The variable Δ_t^p is an expansion under the two definitions. The variable Δ_t^n is used along with the dummy variable D_t, which equals 1 when $0 < \widehat{Y}_t < avg\widehat{Y}_t$, i.e., low but still positive growth, and 0 when $\widehat{Y}_t < 0$. Hence, $\Delta_t^n \times D_t$ and $\Delta_t^n \times (1 - D_t)$ subdivide the Δ_t^n variable. The difference between the two definitions have to do with $\Delta_t^n \times D_t$. Under the definition used in the paper it is considered a contraction (i.e., it should affect g similarly as $\Delta_t^n \times (1 - D_t)$), and under the standard definition it is an expansion (i.e., it should affect similarly as Δ_t^p). The results, with the three ranges for output growth are presented in Table C1.

Table C1: Three ranges for output growth	
Dependent variable: $\widehat{g}_t$	
Sample: 1976-1998 (standard errors in parentheses)	
Variable	
Δ_t^p	-0.516 (0.225)
$\Delta_t^n \times D_t$	-1.483 (0.373)
$\Delta_t^n \times (1 - D_t)$	-1.187 (0.183)
Δ_{t-1}^p	0.291 (0.229)
$\Delta_{t-1}^n \times D_{t-1}$	-0.645 (0.379)
$\Delta_{t-1}^n \times (1 - D_{t-1})$	-0.296(0.167)
g_{t-1}	-0.426 (0.057)
R^2	0.24
D.W.	1.95
Observations: 23; Number of countries: 22	
Total panel observations: 469; Country-specific constants included	

It is evident for the contemporaneous variables, that the coefficients of $\Delta_t^n \times D_t$, (low but positive growth) are much more similar to the coefficients of the negative growth variable, $\Delta_t^n \times (1 - D_t)$, than to Δ_t^p. Using the Wald test, the hypothesis that sum of the current and lagged $\Delta_t^n \times D_t$ coefficients equal the sum of the corresponding $\Delta_t^n \times (1 - D_t)$ coefficients cannot be rejected at any reasonable significance level. In contrast, the hypothesis that the current and lagged $\Delta_t^p \times D_t$ coefficients equal those corresponding to Δ_t^p can be rejected at any reasonable significance level. One may conclude that low but positive output growth is treated by fiscal policy as a contraction, in a similar way as periods of negative growth. In other words, the definition of expansions and contractions used here seems more appropriate for the purposes of analyzing fiscal policy.