

Volatility of public spending in EU Member States

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Executive summary

This paper discusses volatility in general government spending in EU countries. While this volatility has on average declined over time when measured by its standard deviation, a large cross-country variation in the degree of volatility can be observed. Estimates covering all EU-27 countries indicate that high volatility tends to be associated with fast growing government spending, with a small government sector, with high GDP volatility, and with unbalanced public finances. We also find some evidence that changes in revenues, which partly reflect cyclical effects, affect expenditure growth in a number of countries. Empirical estimates for EU-15 countries indicate that in some countries revenue changes partly “cause” expenditure changes, the precise countries concerned differing according to the methodology applied. Given that negative effects of public spending volatility on short- and long-run economic growth prevail in the literature, the conclusion that part of spending volatility is driven by revenue volatility argues in favour of strengthening domestic institutions that cut the link between revenue growth and spending growth, such as expenditure rules.

¹ The views expressed are those of the author and do not necessarily represent those of the ECB. Suggestions by A. Afonso, A. van Riet and P. Rother are gratefully acknowledged.

1. Introduction

While government spending in most countries of the EU as a percentage of GDP is on a downward trend, the expenditure path in some countries is far from smooth. Indeed, while in some EU countries spending has shown high volatility in recent times, in other countries the development has been much more gradual.

High government spending volatility can reflect various factors. One explanation warranting special attention is the possibility that tax buoyancy is used to finance expenditures, giving rise to a pro-cyclical fiscal policy. Similarly, low revenue growth reflecting subdued economic growth may give rise to anti-cyclical fiscal policies. Another cause for high spending variability can be the conduct of stop-and-go budgetary policies, leading to uncertainty about the future fiscal course and difficulties in assessing the underlying trend in public finances. Of course, spending volatility is not by definition a negative aspect, it can also reflect an appropriate response to volatile GDP developments or major crises, or large investment projects that by definition are hard to smoothen out over time.

This note aims to throw more light at determinants of public spending volatility, an issue which so far has received very little attention in the literature. Section 2 briefly summarises the theoretical and empirical findings on macroeconomic effects of spending volatility, indicating why spending volatility may be a source of concern. Section 3 then describes spending volatility from various perspectives: cross-country, long-term, and disaggregated. An empirical analysis of causes of spending volatility on the basis of panel regressions for expenditure volatility, estimates for expenditure growth and causality tests is presented in section 4, followed by conclusions and policy implications in section 5.

2. Effects of spending volatility

Little can be said *a priori* on the direction of effects of government spending volatility on macroeconomic growth. Negative effects can be expected to dominate in case spending volatility would reflect pro-cyclical discretionary fiscal policy measures. Such would translate in more economic volatility which is detrimental to longer-term economic growth. Also, frequent changes in the fiscal course, e.g. reflecting different attitudes of subsequent governments of different ideology, could create uncertainty in markets and reduce confidence, reflected in higher risk premia and interest rates. This hinders private commitment in investments and thereby longer-term economic growth. On the other hand, effective anti-cyclical fiscal policies, either active (discretionary) or passive (automatic stabilisers), will

cause some expenditure volatility but have growth-supporting effects by dampening the amplitude of the business cycle. Aghion and Marinescu (2006) argue that such policies contribute to growth and innovation by reducing the negative consequences of recessions for innovative investments of credit-constrained firms. As regards fiscal effects, if high spending volatility has its counterpart in high deficit volatility, investors may find it more difficult to gauge the trend in fiscal policies creating uncertainty, while volatile deficits also increase the likelihood of deviations from budgetary targets or surpassing the 3% of GDP reference value for EU countries.

Empirical studies usually point to negative effects of government spending volatility on medium- to longer-term economic growth. Carmignani et al (2007) argue that countries that rely heavily on discretionary policies show larger spending volatility, showing up in higher output volatility if fiscal policy is mainly pro-cyclical. In their estimates for output volatility, volatility of government spending indeed matters. Thus, government spending in their view affects output via spending volatility. The dominance of pro-cyclical fiscal policies is also confirmed in a study by the Commission (2006), indicating that faster growing expenditure in good times is the main source. Fatas and Mihov (2003), estimating for a panel of 91 countries, find that a 1% increase in spending volatility decreases economic growth by around 0.8 percent point via increased output volatility. Furceri (2007) also finds the negative effect of spending volatility dominating in his sample of 99 countries, but for OECD countries the effect is only small and not statistically significant. Afonso and Furceri (2007) find evidence that among spending categories, volatility in government consumption and investment have a negative impact on economic growth.

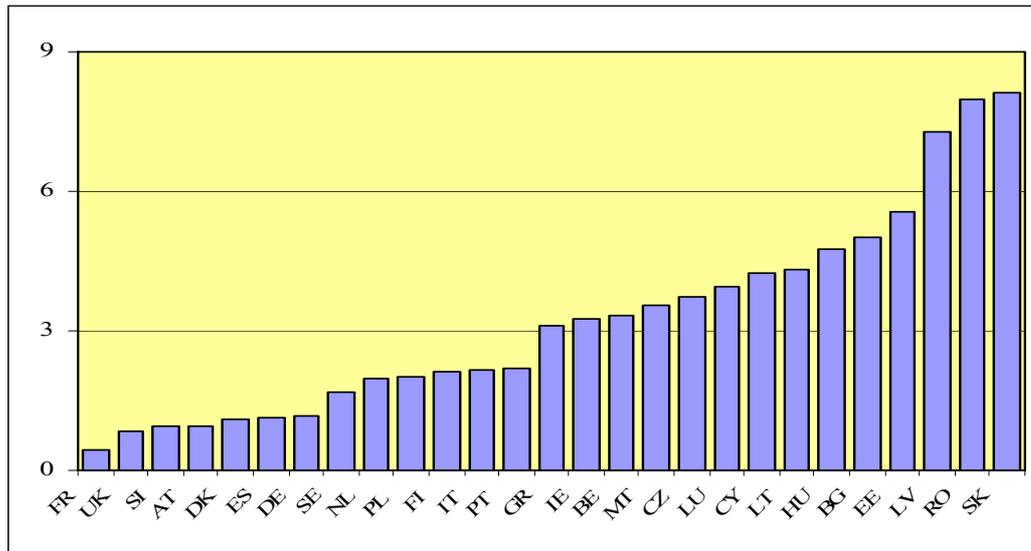
3. Government spending volatility: the data

Graph 1 below indicates spending volatility in EU Member States, defined as standard deviations of real government expenditure (nominal expenditure growth deflated by the GDP deflator) over the period 1999-2006.² In presenting these data, ideally, account should be taken of one-off measures that can disturb the picture. However, “one-off” is hard to define in the context of government spending (most government investment for instance is one-off by definition) and anyway quantitative information on that is very limited. We only correct the expenditure series for UMTS receipts, which in the ESA recording system are seen as negative capital expenditures. Furthermore, it would be preferable to use an own deflator for

² Shorter samples have been used for some countries reflecting data-availability.

government spending as using the GDP deflator instead of the more rapidly rising spending deflator causes real growth of spending to be somewhat overestimated. However, in view of lack of such data for all countries considered, we stick to the GDP-deflator as is common in public expenditure research.

Graph 1. Volatility in general government real spending growth in EU countries, 1999-2006.



Note: volatility reflects the standard deviation of the real growth rate of general government expenditures.

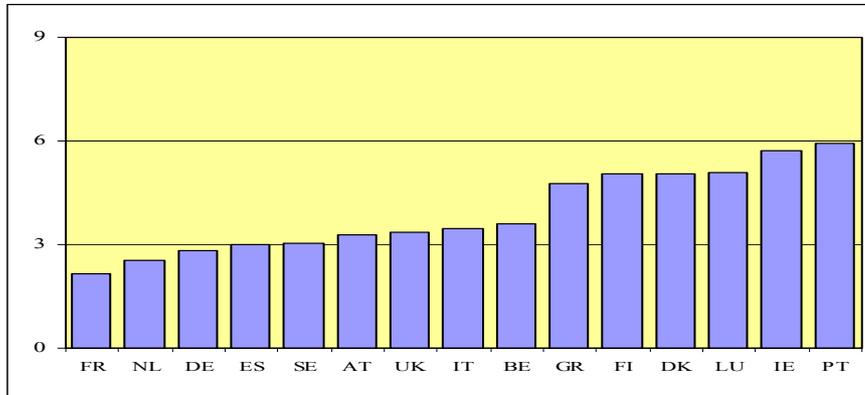
The graph reveals marked differences in the degree of volatility among countries, France ranking lowest and Slovakia highest. With exceptions, it appears that the new Member States have higher spending volatility than the first EU-15 countries, which could point to higher investment needs in the former or more experience with expenditure control in the latter. Also, spending volatility is lower in the larger countries than in the smaller ones. Note that the standard deviation says nothing about the direction of average real spending growth.

One possible explanation for these differences in volatility could be different GDP-sensitivities of government spending. However, the evidence, if anything, points to the opposite: countries with relatively large GDP-elasticities of spending (DK, DE, FI, NL) actually rank among those with very low spending volatility. Most likely, this reflects the mild but stretched business cycle in the years covered and the fact that expenditure elasticities anyway are quite small.³ We will more closely examine possible determinants of the cross-country variation in spending volatility in section 4.

³ In the Commission services' estimates, the cyclical component in government spending seldom exceeds 0.2% of GDP in the period under consideration.

Plotting the same picture for a longer period (1972-2006), for which only data for the EU-15 countries are available, gives the following picture.

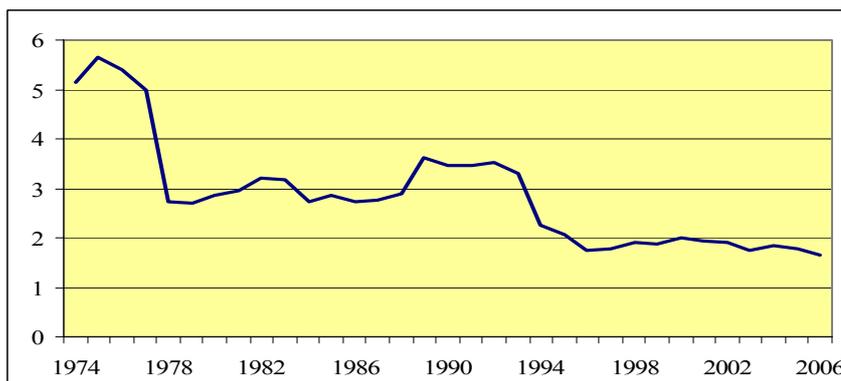
Graph 2. Volatility in general government real spending growth in EU-15 countries, 1972-2006.



Comparing this with graph 1, one still sees that larger countries have lower spending volatility. The ranking of countries changes somewhat over time, though France still scores best, and smaller countries have higher volatility in spending.

Putting spending volatility in longer-term perspective, it can be seen that average volatility decreases over time. Graph 3 shows the (unweighted) average of the centred 5-year moving averages of the standard deviation of government spending growth rates. For lack of data for the new EU countries, this refers to the average for EU-15 countries only.

Graph 3. Spending volatility in EU-15 countries, 1974-2006.



Note: Spending volatility is measured by the unweighted average of the standard deviation of 5 year centred moving averages of real general government spending growth rates of the EU-15 countries.

The line shows a declining tendency, starting from a high at the beginning of the 1970s when some governments rapidly increased government spending in an effort to dampen the

negative macroeconomic consequences of the oil crises, and the number of unemployment benefits rose quickly. Another upward jump can be seen in the 1990s, reflecting strong expenditure growth in Germany following unification, but also the fiscal consequences of housing market and macroeconomic crises in Finland and Sweden. After that, the average standard deviation drops below 2, and slightly increased around 2000.⁴

Having considered overall spending volatility so far, we now turn to the question which budget spending items account most for this. For that, we distinguish 6 major spending categories: wage compensation, interest payments, fixed capital investment, capital transfers, social transfers other than in kind, and all other spending. The table below shows that capital transfers by far are the most volatile item even though it is the smallest category identified. Government investment (“fixed capital investment”) ranks second on volatility. Given the usually discretionary nature of decisions in this area, this is in line with expectations. Interest payments come next, followed by other spending. Wage compensation and social transfers rank lowest in volatility. The latter outcome may be somewhat unexpected as it could be cyclically-sensitive, with the number of social benefits related to unemployment developments. Finally, the table also shows that on all categories selected, spending volatility on average is higher in the non-participating countries than in euro area countries. Also, spending volatility in the 3 main economies is below the euro area average for most categories. One may also notice that France has the lowest volatility in all spending categories of the three main EU economies except for capital transfers.

Table 1. Standard deviation of main real spending categories in euro area (13) and EU (27) countries.

	% of total spending	DE	FR	IT	Euro area*	EU*
Compensation	25.1	0.9	0.6	0.8	2.1	3.0
Interest payments	4.6	3.4	3.2	4.5	5.5	9.5
Fixed capital investment	7.5	5.0	4.2	20.1	9.0	17.8
Capital transfers	2.7	9.7	12.9	15.6	26.6	84.1
Social transfers	30.7	1.9	0.7	0.8	1.9	3.1
Other spending	29.4	1.7	1.4	2.2	3.5	5.5

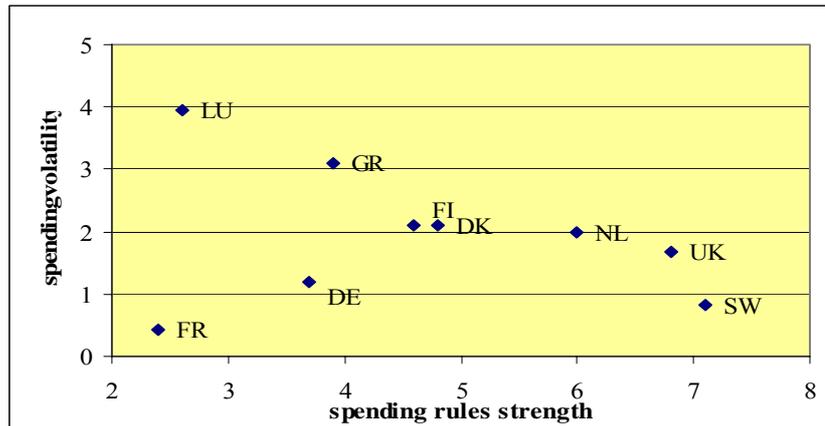
* Unweighted averages.

Finally, we present some information on the link between spending volatility and domestic institutions (graph 4) for a recent period (1999-2006). Using the index for the strength of

⁴ Note that the 5-year centred moving averages of standard deviations as of 2005 partly rely on Commission projections for 2007 and 2008, rather than on realisations.

expenditure rules as constructed in Deroose et al (2006), the graph indicates the expected negative correlation with spending volatility, especially when leaving out France. This country has low spending volatility despite a ‘weak’ expenditure rule.⁵ Possibly, the low volatility reflects some “spending inertia” in France, resulting in one of the highest government spending ratios in the EU.⁶

Graph 4: Strength of spending rules and spending volatility, 1999-2006



In interpreting this graph, it of course needs to be taken into account that national expenditure rules differ in their design, government coverage and degree of enforcement. Thus, variable inflation rates may cause strict adherence to a nominal spending rule to result in real spending volatility. Also, while expenditure volatility is measured over the entire EMU period, countries have introduced important changes to their expenditure rules in that period, e.g. in Germany in 2002.

4. Causes of spending volatility

After describing various aspects of spending volatility, we now turn to explanations of different degrees of spending volatility. We take a closer look at

- cross-country differences in spending volatility
- spending developments over time, and
- causality between government expenditures and revenues.

⁵ One might argue that France being a country following the delegation approach (Hallerberg et al, 2006), rules matter less than but rather a strong position of the minister of finance, but this is not consistent with repeated and sizeable spending overruns.

⁶ Deroose et al. (2006) do find evidence of a negative relation between the strength of expenditure rules and expenditure overruns as observed in stability programmes, the latter being especially large in Germany and France. Continuous spending overruns, although causing higher spending growth rates, may nevertheless cause limited spending volatility.

For the first item, all EU-27 countries are considered, but for the latter two approaches, lack of data over long time-spans caused us to restrict the analyses to EU-15 countries.

Cross-country differences in spending volatility

As regards cross-country differences in spending volatility, we take the standard deviation of the growth rate of real government spending for all EU-27 countries over the period 1999-2006 as dependent variable. This variable, which was shown in graph 1, was related to government size, the average growth rate of real spending, GDP volatility, openness of the economy, the deficit as percentage of GDP, and the number of general elections in the period covered. The most satisfactory result is reported below.

Table 2. Explaining real government spending volatility of EU countries, 1999-2006

Government expenditure ratio (% of GDP)	-0.07 (-3.1)***
Average growth of real government expenditures	0.61 (5.6)***
Number of elections	0.82 (2.0)*
Standard deviation of real economic growth	1.29 (3.4)***
Average budget balance ratio (% of GDP)	-0.22 (-2.6)**
R ² adj.	0.70
S.e. of regression	1.19
D-W statistic	2.03
Number of observations	27

***, **, * indicates significance at respectively the 1, 5 and 10%-significance level.

This leads us to the following findings:

- A higher share of government spending as percentage of GDP implies less spending volatility. This possibly reflects that small economies usually have a large government sector to absorb part of the shocks.⁷
- As is commonly the case, the higher is the average growth rate, the more elevated is its volatility.
- A higher number of general elections in the period under consideration may imply a stronger political business cycle effect and more changes in power, causing more spending volatility. The effect, however, is only statistically significant at the 10%-level.

⁷ Rodrik (1998) developed the argument that in economies much exposed to external risks (which often are smaller economies), government spending plays a risk-reducing role.

- A larger volatility in real GDP growth increases spending volatility. This may reflect built-in stabilisers (notably unemployment benefits) and/or government's attempts to fine-tune the economy. It may also reflect higher revenue volatility in case a revenue-constrained government uses revenue buoyancy for additional spending ("tax and spend"). Redoing the estimations with the standard deviation of the growth rate of cyclically-adjusted real expenditures as dependent variable gives very similar results (not shown here), indicating that cyclically-sensitive spending is at most part of the story.
- A higher deficit implies larger expenditure volatility. Large deficits may induce a stop-and-go policy to move to below the 3% of GDP reference value, based on real measures or on statistically operations. On the other hand, it could also reflect fast and variable growth of spending. Both the deficit and expenditure volatility may also be affected by a third factor, the fiscal framework, with effective fiscal rules leading both to sound public finances and to low spending volatility.

Based on these results, the relatively low volatility of real government spending in France can be related to a relatively low standard deviation of real growth (1.1 versus 1.4 on average in the EU), a relatively low growth rate of real spending (1.9% versus 3.8%), a large government sector (51% of GDP versus 43%) and there only having been 1 general election in the period under consideration (1.9 on average). The relatively large size of the average deficit in France (-2.6% of GDP versus -1.7% on average in the EU) is the only factor working in the opposite direction, i.e. raising volatility.

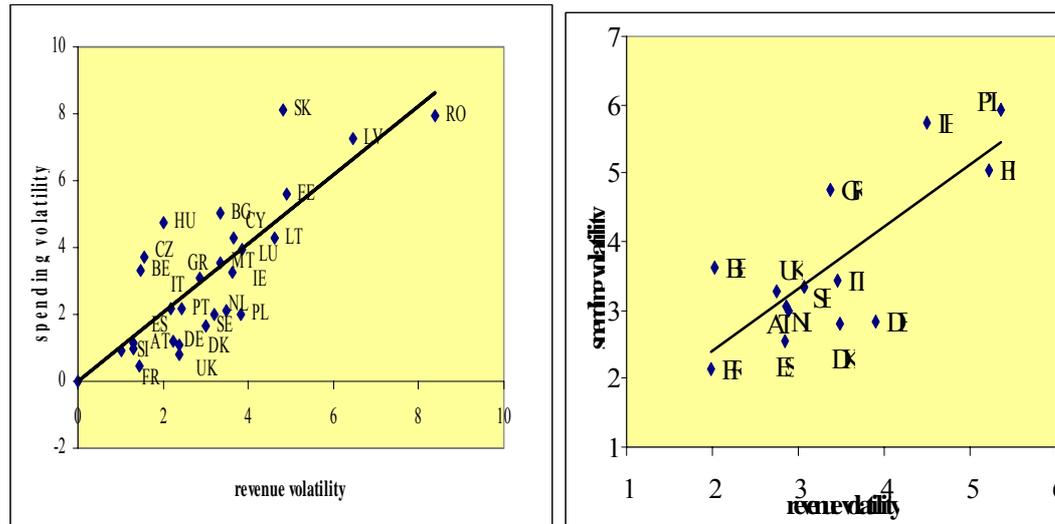
Inclusion of real GDP per person, measuring possible catching-up effects, did not deliver satisfactory results, as did the degree of openness, measured as the sum of the average import and export share in GDP. Political variables have also been tried but without success: this goes for the degree of fiscal decentralisation and for the delegation versus commitment approach.⁸

Revenue volatility would be another candidate as explanatory variable. Graph 5 plots expenditure volatility against revenue volatility, again measured by standard deviations, for the EU-27 over the period 1999-2006, and for the EU-15 over a longer time-period (1972-2006). Both charts strongly suggest a positive link between volatility of total expenditures and of total revenues (or a common factor driving both). However, links between volatility of government revenues and expenditures reveal no information on the direction of causality between spending and revenues, its strength or even its sign. Thus, close correlation may

⁸ See Hallerberg et al, 2006 for further information on and quantification of these concepts.

reflect a policy of spending all windfall receipts in a pro-cyclical fashion, but also a strong anti-cyclical expenditure policy would show up in high correlation. We abstain from including revenue volatility in the estimation-equation as causality might run from expenditure to revenues.⁹

Graph 5. Standard deviation of real government expenditure and revenue growth in EU-27 countries (1999-2006) and in the EU-15 countries (1972-2006) (left-hand and right-hand side graph respectively).



Spending developments over time

Further relevant information on volatility in government spending may be derived from regressing changes in expenditures on a number of explanatory variables including government revenues. This will give an idea on the extent to which changes in spending are fed through revenue changes.

Earlier research in the area includes the European Commission (2006), looking for determinants of changes in cyclically-adjusted primary spending, relating it to a number of variables including its lagged value, to government debt levels, to dummies for 1992 and 1999 (capturing the agreement on the EU Treaty and the start of EMU respectively), and to the output gap, distinguishing positive and negative gaps. It concluded that expenditure growth is larger in good times, indicating a pro-cyclical bias. For a group of 22 OECD countries, however, Hercowitz and Strawczynski (2004) reach a different conclusion, expenditure increasing rapidly in recessions but not reversing in good times. Lane (2003)

⁹ In principle, this could be overcome by using instrumental variables, but suitable instruments are very difficult to define in a cross-section analysis.

regressed government spending growth in OECD countries on GDP growth, a political dispersion measure, a measure of the openness of the economy, GDP per person, and the public sector size. He concluded that pro-cyclical fiscal policies are most likely if output is very volatile, and political power is dispersed. He also showed that pro-cyclical spending shows up especially in government wages and in government investment. Deroose et al. (2006) for a few euro area countries analyse spending developments, relating it a.o. to spending projections and to an expenditure rule index, showing that the stronger the rule, the lower spending growth. Wierts (2007) distinguished surplus and deficit EU countries in explaining real expenditure growth, basing the distinction on various indicators such as the budget balance and the (change in) the debt ratio. Covering the period 1980-2003, he found that expenditure growth in deficit countries moves simultaneously and of corresponding size with revenue growth, while there is no clear co-movement in surplus countries. Another difference between the two groups of countries is that the political business cycle plays a role in deficit countries but not in surplus countries.

We estimated a panel regression for the change in the log of real expenditures, over the period 1972-2006. Stationarity tests indicate that the change in the log of real spending is broadly stationary in all EU-15 countries with the exception of Spain (see annex 1). For that reason, Spain has been taken out of the sample of countries to be used in the following.

Regressing expenditure growth on revenue growth may cause biased and inconsistent coefficients in case revenue developments are not independent from spending growth. We tested for endogeneity of revenues using the Hausman test, which led to a rejection of the hypothesis of no endogeneity.¹⁰ Instrumental variables estimation was used to circumvent the problem, instruments used for revenue growth being the contemporaneous change in the log of real GDP, a trend, and the one-period lagged dependent variable. The fitted values from this equation were used in the spending change equation below.¹¹

¹⁰ First, revenues were regressed on a number of instruments (a trend, lagged revenues and current and lagged GDP growth). The residual of that equation was included in the expenditure growth equation with revenue growth as other independent variable. The residual of the revenue equation showed up significantly in the expenditure equation, indicating endogeneity.

¹¹ We abstained from using cyclically-adjusted revenues and expenditures for lack of long time-series.

Table 3. Panel estimations for changes in government spending in EU 15 countries, 1970-2006

	Without pass-through variable	With pass-through variable
Common intercept	0.022 (11.3)***	0.023 (11.6)***
Δ log real expenditure (-1)	0.133 (3.0)***	0.116 (2.6)***
Δ log real revenue [§]	0.24 (6.6)***	0.029 (0.4)
Δ log real revenue [§] * Pass		0.27 (3.1)***
Output gap (-1)	0.001 (3.4)***	0.001 (3.4)***
Δ debt ratio (-1)	-0.001 (-2.5)**	-0.001 (-2.5)**
Election year	0.004 (2.7)**	0.004 (3.0)***
Trend	-0.001 (-7.2)***	-0.001 (-7.5)***
R ² adj.	0.33	0.34
D-W	2.12	2.09
Nr. Of observations	462	462

***, **, * indicates significance at respectively the 1, 5 and 10%-significance level.

Country-fixed effects, a dummy for Germany for 1991 and a dummy for Sweden for 1992 and 1993 are included but not shown.

[§] Estimated value from separate revenue-equation.

The table indicate that current revenue growth has an immediate impact on spending, though less that proportional. Lagged values of revenue growth gave no good results, but the lagged value of the lagged expenditure growth, the dependent variable, did. The results furthermore indicate that spending growth is affected positively by general elections taking place, and by the 1-year lagged output gap. The positive effect of the latter indicates expenditures increasing in “good times” but less so in recessions. Test for an asymmetric effect over the cycle did not result in satisfactory outcomes. The lagged change in the debt ratio causes expenditure growth to decrease, reflecting a correction mechanism.¹² Included in the equation (but not shown) are the country-fixed effects, catering for country-specific determinants of expenditure growth not captured by the other explanatory variables, a dummy for breaks in the series due to German unification (1991) and for the severe economic recession in Sweden

¹² Estimates including the 1-year lagged deficit level instead of the change in debt gave very similar results.

in 1992-1993. Political-economic variables other than election dates, such as measures of the strength of spending rules, did not produce good results.¹³

The results above do not yet differentiate between countries. To allow for country-specificity, the equation was re-estimated using country-specific coefficients on the change in revenue-variable. The results (not shown) indicate that revenues affect expenditure growth significantly in some countries but have no immediate impact in others. In particular, revenue growth affects spending growth in Austria, Denmark, Finland, Ireland, and Luxembourg. Re-estimating the equation interacting revenue growth with a dummy taking value 1 in these countries and 0 for others confirms this (table 3, last column): the pass-through of revenue growth is significant in the countries mentioned but not in the other countries. The other results are not materially affected by this change in set-up.

While the pass-through indicates that revenue growth is partly reflected in additional spending, it does not directly give an answer to the question of causes of expenditure volatility. Indirectly, however, there is an indication that this channel might be behind elevated spending volatility as can be seen from comparing the list of countries with pass-through with the countries that have experienced largest volatility in government spending over the same period. Taking the standard deviation of the change in the log of real spending as the measure of volatility, the ranking of countries at the top is: Portugal, Ireland, Finland, and Luxembourg. The last 3 countries also show up in the list of countries where the pass-through is significant.

Robustness of results is tested by estimating the equation over the shorter 1990-2006 period. While for most coefficients no major changes can be reported, the list of countries with a significant pass-through of revenues to expenditures differs now. Denmark is still on the list, but Austria, Finland, Ireland, and Luxembourg no more, while Belgium and Italy can be added. This likely reflects the introduction of more stability-oriented fiscal frameworks in countries like Finland in the 1990s. Alternative estimates, e.g. using changes in cyclically-adjusted expenditures as dependent variable or using the change in the output gap rather than the output gap itself did not fundamentally change the results described above.

¹³ In particular, we used the rules-indicators of Hallerberg et al. (2006) and Deroose et al (2006). Lack of a significant result may well be explained by the fact that these indicators take stock of the strength or rules in one particular, recent year, and not over a long period as the one we use.

Causality between government revenues and expenditures

Finally, we take a closer look at linkages between revenues and expenditures, and in particular examine the question of causality between these two budgetary variables. We use Granger-causality tests to see whether revenues “cause” expenditures, in the sense of revenues temporally preceding expenditure increases.

Generally, four cases of causality between revenues and expenditures can be distinguished. The description below is for revenue and spending increases but can equally well be applied to decreases.

- The “tax-and-spend” hypothesis, suggesting that governments first await the receipt of additional revenues and then spend it. Such may reflect revenue limits or high non-tax revenues (e.g. oil-related) that are regarded as a costless resource (in electoral terms) that can be used for spending.
- The reverse causality, from expenditure to taxation, supposes that governments first make spending commitments and only later try to find revenues to finance that (“spend-and-tax hypothesis”). This could for instance reflect ‘emergency’ spending, forthcoming elections or a highly fragmented political system with low powers for the minister of finance.
- No relation. Lack of causality may reflect spending restraints, with additional revenues not mirrored in more spending but in improved fiscal balances.
- Simultaneous spending and taxation changes (“fiscal synchronisation”) may reflect strict deficit targets, with revenue changes being quickly reflected in spending and vice versa.

To see which hypothesis applies to the EU countries, we follow the approach of Chang et al (2002), with changes in the log of real expenditures and real revenues included in a VAR that also includes the change in the log of real GDP as control variable. GDP may have a strong effect on both revenues and expenditures via automatic stabilisers and via cyclical fine-tuning efforts. Omission of this third, common variable may cause biased results. Stationarity of first differences of the logs of changes in real spending, real revenues and real GDP was generally confirmed (see annex 1 for details) again with the exception of Spain which was excluded from our sample of countries. As a general caveat, it must be noted that tests for stationarity and causality are quite sensitive to the number of lags of variables included. No cointegration relationship was tested as the data series (1972-2006) is relatively short to detect such long-term relations.

The results of the Granger causality test estimates are summarised in table 4 below, while more detailed results are included in the annex.

Table 4. Granger causality test results, 1971-2006

Rev. → Spend.	Spend. → Rev.	No causality	Synchronisation
Belgium	Italy	Greece	Finland
Germany	Portugal	Ireland	The Netherlands
	Austria	Luxembourg	
	France	Sweden	
		Denmark	
		UK	

Note: Significance measured at 10% level.

The table shows large heterogeneity among countries as regards the direction of causality between spending and taxation. In six of the countries considered, a clear short-term relation between revenues and expenditures could not be found. In the countries where we do find evidence of a short-term causal relationship, the tax-and-spend hypothesis is confirmed in some (BE, DE) while the reverse causation appears to be present in some others (IT, PT, AT, FR). In Finland and the Netherlands, causality runs both ways. These results are partly in line with those of Koren and Stiassny (1998), being one of the very few having done empirical analysis on this issue for European countries. They find evidence for the spend-and-tax hypothesis for Italy, Austria and France, for the reverse causation for the UK, Germany, and the Netherlands, while no causality in either way applies to Sweden.

5. Conclusion and policy implications

Spending volatility in the EU as measured by the standard deviation of growth of general government expenditure has declined substantially over time but there is still much cross-country variation. High volatility tends to be associated with fast growing government spending and with high deficits. However, it should be noted that low spending volatility is not always a plus-point, for instance in case it reflects inertia to curb fast but steady growing expenditures in countries where the spending-to-GDP ratio already is quite high. We also find some evidence that changes in revenues, also reflecting cyclical effects, affect expenditure growth in some countries, though the list of countries depends on the exact approach taken and the time-span covered.

Strong fiscal rules can help preventing revenue growth being reflected in growth of general government expenditures. Reducing spending volatility via limiting pro-cyclical fiscal policies helps avoiding aggravation of business cycle amplitudes and a negatively impact on longer-term growth. These findings point to the usefulness of institutions/rules that cut the band between revenue windfalls and spending measures. Pre-set fiscal rules can limit

expenditure volatility. Various mechanisms can help here, including expenditure limits and ex-ante formulas for distributing revenue windfalls. Assessments and advice of independent fiscal councils may also be of help.

While this paper gives some ideas about causes of spending volatility, the empirical work could be extended in a number of ways. This includes using disaggregated revenue and expenditure categories to identify what are the main drivers of changes in expenditures. In addition, further work on one-offs would be helpful, as these show up in expenditure volatility but may have little macroeconomic effect and may not be related to the usual determinants of spending changes. Also, there are benefits in using different time-spans, to test for the robustness of results.

Annex: More detailed input and output results

Table A1. Data description, over 1999-2006 (growth rates 2000-2006)

(Countries concerned are listed in brackets)

	<i>Average</i>	<i>Minimum</i>	<i>Maximum</i>
Standard deviation of real government spending	3.22	0.44 (FR)	8.12 (SK)
Gov. expenditures (% of GDP)	43.1	30.3 (RO)	60.7 (SE)
Average growth of real government expenditures	3.76	1.27 (IT)	8.65 (EE)
Number of elections	1.96	1 (FR/IE/LT/ MT)	3 (AT/NL/PT)
Standard deviation of real economic growth	1.44	0.47 (HU)	2.91 (MT)
Average fiscal balance (% of GDP)	-1.71	-6.48 (HU)	3.63 (FI)
Average openness (export + import as % of GDP)	97.9	51.3 (IT)	276.2 (LU)

Sources: election years: Armingeon and Careja (2004)
other series: AMECO, Spring 2007 Commission forecasts.

Table A2. ADF-test on stationarity of fiscal and macroeconomic series, 1970-2006

	Level			First difference		
	Real expenditure	Real revenue	Real GDP	Real expenditure	Real revenue	Real GDP
AT	-5.85***	-4.63***	-1.96	-2.39**	-2.72***	-5.52***©
BE	-5.00***	-4.73***	-1.62	-2.22**	-2.27**	-1.85*
DE	-1.84	-2.08	-1.17	-2.93***	-3.69***	-2.82***
DK	-3.53**	-1.21	-0.44	-2.97***	-4.17***	-2.89***
ES	-5.30***	-3.18**	-0.10	-1.02	-1.79*	-1.45
FI	-2.82*	-2.83*	-0.03	-3.21***	-2.53**	-1.97**
FR	-2.80*	-4.69***	-2.73*	-3.20** ©	-3.99***©	-4.46***©
GB	-1.01	0.27	2.31	-2.36**	-2.89***	-2.25**
GR	-3.93***	-0.67	-0.43	-6.78***©	-6.09***©	-3.41**
IE	-0.95	-0.17	0.58	-5.40***©	-8.34***©	-3.26**©
IT	-5.16***	-2.90*	-3.61**	-1.78*	-5.30***©	-2.80***
LU	-1.44	-1.96	0.60	-3.24***	-2.35**	-4.43***©
NL	-4.94***	-3.33**	-0.26	-2.77***	-3.13***	-3.25***©
PT	-3.44**	-2.45	-1.95	-2.74***	-3.21***	-4.08***©
SW	-3.35**	-1.56	0.59	-2.94***	-2.93***	-3.77***©

***, **, * indicates significance at respectively the 1, 5 and 10%-significance level.

Note: level-estimates include an intercept, estimates in first difference do not unless indicated otherwise, by ©.

While for most countries the results support classifying expenditure, revenues and GDP as stationary after differencing once, there are border cases and exceptions. In Spain, real expenditure is stationary in levels but real revenues and real GDP are not stationary, neither in

levels nor in first differences. In Italy, results are mixed for expenditures and revenues but we opt for using differenced series.

Finally, Granger causality tests with the change in log of real GDP as additional control variable were estimated. We allowed up to 3 lags in all variables but took less lags of variables in the equation when Akaike's test-statistics indicated better results. Results as regards expenditures and revenues are reported in the tables below, respectively.

Table A3. Granger-causality test on government expenditures
(numbers represent the sum of the coefficients)

	Rev	Exp	GDP	R ²
AT	0.07	0.63*	0.29	0.24
BE	0.74*	0.18	0.86**	0.45
DE	0.95*	-0.15	-0.43	0.73
DK	-0.09	0.64**	-0.01	0.25
ES	-	-	-	-
FI	-0.77*	1.12**	1.16*	0.45
FR	0.11	0.59**	0.82**	0.53
GB	-0.22	0.67**	0.10	0.21
GR	0.14	-0.16	-0.27	-0.21
IE	-0.54	0.24	0.48	-0.15
IT	-0.33	0.77***	1.18***	0.62
LU	0.68	-0.04	0.68	0.02
NL	0.49*	0.37	0.35	0.47
PT	-0.28	0.50*	0.74	0.20
SW	0.13	0.49*	-0.35	0.19

***, **, * indicates significance at respectively the 1, 5 and 10%-significance level.

Table A4. Granger-causality test on government revenues
(numbers represent the sum of the coefficients)

	Rev	Exp	GDP	R ²
AT	-0.94**	1.08***	0.87*	0.38
BE	0.65**	-0.04	0.22	0.27
DE	-0.11	0.36	-0.07	0.65
DK	-0.13	0.30	0.31	0.13
ES	-	-	-	-
FI	-1.26***	1.56***	2.21***	0.35
FR	0.05	0.58*	0.22	0.28
GB	0.44**	0.07	0.25	0.29
GR	0.27	0.11	-0.33	-0.03
IE	-0.68	0.33	0.31	-0.01
IT	-0.18	0.70*	0.26	0.20
LU	0.41	0.01	0.05	-0.29
NL	-0.35	0.73*	0.38	0.23
PT	-0.56	-0.70**	0.61**	0.43
SW	0.05	0.06	0.21	0.03

Numbers in the tables indicate the sum of coefficients

***, **, * indicates significance at respectively the 1, 5 and 10%-significance level.

The joint significance of the coefficients on lagged government spending, on lagged revenues and on lagged GDP is tested by the Wald-statistic. Note that in the outcomes for Finland where all variables enter both equations significantly, lagged revenues enter both the equation for spending and for revenues with a negative sign.

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