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Government Size, Composition, Volatility and Economic Growth

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Government Size, Composition, Volatility and Economic Growth*

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Abstract

This paper analyses the effects in terms of size and volatility of government revenue and spending on growth in OECD and EU countries. The results of the paper suggest that both variables are detrimental to growth. In particular, looking more closely at the effect of each component of government revenue and spending, the results point out that *i*) indirect taxes (size and volatility); *ii*) social contributions (size and volatility); *iii*) government consumption (size and volatility); *iv*) subsidies (size); and *v*) government investment (volatility) have a sizeable, negative and statistically significant effect on growth.

JEL: E62, H50, O40.

Keywords: Fiscal Policy, Government Size, Fiscal Volatility, Economic Growth.

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Non-technical summary

Public spending is widely seen as having an important role in supporting economic growth. On the other hand, a lower level of spending implies that fewer revenues are needed to achieve balanced budgets, which means that lower taxes can be levied, therefore contributing to stimulate growth and employment. Public spending is a key variable that influences the sustainability of public finances via effects on fiscal balances and government debt, and this is relevant for the success of common monetary areas such as the European Monetary Union. Additionally, in the European Union, the so-called Lisbon Agenda also assigned a relevant role to the reform of public finance in order to foster economic growth. For those reasons, a firm control and, where appropriate, reduction of public expenditure is important and a balance has to be drawn between running down public debt, cutting taxes and financing public investment in key areas.

Therefore, in this paper we examined the effect of government size and fiscal volatility on growth for a set of OECD and EU countries, from 1970 to 2004. The overall results suggest that both dimensions tend to hamper growth in both country samples. Total revenue and total expenditure seem to impinge negatively on the real growth of per capita GDP both for the OECD and the EU countries. In particular, a percentage point increase in the share of total revenue (total expenditure) would decrease output by 0.12 and 0.13 percentage points respectively for the OECD and for the EU countries. It is worthwhile mentioning that the magnitude of the effect is almost identical in absolute terms to the effect of total investment (private and public) share on growth. Moreover, total expenditure volatility also has a negative and statistically significant effect on growth, at least for the EU countries.

Breaking up total revenue into direct taxes, indirect taxes and social contributions, our results suggest that among total revenue the variables that are most detrimental to growth, both in terms of size and volatility, are indirect taxes and social contributions. At the same time, analysing the components of total spending (transfers, subsidies, government consumption and government investment) the results suggest that, while for both set of countries both subsidies and government consumption have a significantly negative impact on growth, government investment does not significantly affect growth, and transfers have a positive and significant effect only for the EU countries. Moreover, for the EU countries, public consumption and investment volatility have a sizeable, negative and statistically significant effect on growth. These results are also in line with some available related empirical evidence pointing to the negative effects on growth of public spending, particularly in the case of developed countries.

There are relevant policy implications to be drawn from these results. It seems that revenue reductions that occur mainly in terms of indirect taxes and social contributions, and cuts in government consumption and subsidies may contribute positively to fostering economic growth in the country samples analysed. Moreover, public capital formation may indeed turn out to be less productive if devoted to inefficient projects, or if it crowds out private investment. These conclusions also provide useful indications to policy makers when deciding which components of public finances to adjust (namely by redirecting spending towards more growth enhancing activities, in a context of limited public resources and fiscal constraints).

1. Introduction

Public spending is widely seen as having an important role in supporting economic growth. On the other hand, a lower level of spending implies that fewer revenues are needed to achieve balanced budgets, which means that lower taxes can be levied, therefore contributing to stimulate growth and employment. Public spending is a key variable that influences the sustainability of public finances via effects on fiscal balances and government debt, and this is relevant for the success of common monetary areas such as the European Monetary Union. Additionally, in the European Union, the so-called Lisbon Agenda also assigned a relevant role to the reform of public finance in order to foster economic growth. For those reasons, a firm control and, where appropriate, reduction of public expenditure is important and a balance has to be drawn between running down public debt, cutting taxes and financing public investment in key areas.

Moreover, a better control of fiscal variables would eliminate or at least reduce the possibility that fiscal policy itself is a source of macroeconomic volatility. In fact, if we accept that fiscal policy is in some cases driven by considerations which are not linked to macroeconomic stability, then there is the possibility that by limiting such actions the society will gain by having less economic volatility (both in terms of output and investment) and thereby higher economic growth. Generally speaking, one would like to redirect public expenditure towards increasing the importance of capital accumulation – both physical and human – and support such areas as research, development, and innovation.

However, in order to understand how to restrict fiscal policy volatility and check government size, it is particularly important to understand which components of

government revenue and spending are most detrimental to growth. In fact, understanding the channel through which fiscal policy affects growth can help us to understand how to redirect public spending and revenue, and which components should be limited. Therefore, in the main contributions of the paper we provide some answers to this composition issue, and we address the effects of both government size and fiscal policy volatility on economic growth using the volatility of the cyclical components of the budgetary variables. Moreover, we also look into several budgetary revenue components in our analysis, something seldom done in the literature.

We analyse, for a set of OECD and a subset of EU countries, from 1970 to 2004, the effect of total public revenue and expenditure and of their components on growth. In particular, for each of these components we consider two measures of fiscal activity: the relative size of each fiscal variable as a percentage of GDP, and business cycle volatility. The results of the paper suggest that for several components of general government revenue and spending both size and volatility measures have a negative effect on growth, and that restrictions on these variables should be seen as favourable.

The remainder of the paper is organized as follows. In Section Two we position our paper in the related existing literature. In Section Three we explain our methodology. In Section Four we present the empirical analysis and discuss its results. Section Five summarises the paper's main findings and provides some policy implications.

2. Motivation and Literature

One of the frequently quoted stylised facts of public sector economics is that of "Wagner's Law" about the long-run tendency for public expenditure to grow relative to some national

income aggregate such as GDP.[1] This implies that public expenditure can be treated as an outcome, or an endogenous factor, rather than a cause of growth in national income. On the other hand, Keynesian propositions treat public expenditure as an exogenous factor, which could be utilised as a policy instrument. In the former approach, the causality runs from national income to public expenditure whereas in the latter proposition, causality runs from public expenditure via domestic demand to national income. Evidence concerning this topic is not conclusive.[2]

Additionally, Lucas (1988) argues that public investment in education increases the level of human capital and this can be seen as a main source of long-run economic growth. Moreover, Barro (1990) mentions the importance of government expenditure in public infrastructure for economic growth and Romer (1990) stresses the relevance of research and development expenditure. Therefore, composition of public spending is also a relevant issue, and if the aim is to promote growth, the focus should be put on the more productive items of the budget, even if the balance between the various functional items of the budget can vary according to the particular circumstances and priorities of each country.[3]

The increase in total expenditure in most developed countries (see Table 1 for an illustration) must be seen against a background where governments gradually tried to fulfil "Musgravian" goals: macroeconomic stabilization, income redistribution, and more efficient resource allocation. In fact, it was during the 1970s and 1980s that most European

[1] Adolf Wagner formulated in the 19th century a "law" regarding the expansion of government. Based on the data he had he argued that as the wealth of society increases, so does the size of government.
[2] A number of time series empirical studies have in the past found support for the so-called Wagner's Law. These, however, might not be reliable due to measurement errors and because they did not employ co-integration tests to establish stationarity in the relevant variables (see for example, Peacock and Wiseman (1961), Musgrave (1969), Bird (1971) and Beck (1982)). More recent work seems to point to the existence of a positive relation between per capita income and public spending (see Martinez-Mongay (2002)).
[3] For a survey on fiscal policy and economic growth see Zagler and Durnecker (2003), while Hemming, Kell and Mahfouz (2002) review the effectiveness of fiscal policy in economic activity.

countries increased the coverage of social benefits such as unemployment insurance. In addition, pension benefits related to public pension insurance were also reinforced in the 1970s and in the 1980s. On the other hand, from Table 1 from 1995 onwards expenditure ratios declined in most countries in order to contain rising public debt ratios.

[Insert Table 1]

Some increase in the size of the public sector is to be expected when taking into account past rising population and also to meet the broadening requirements of the welfare state in most countries. However, a larger public sector, as measured here by the share of government expenditures in GDP, does not necessarily imply a better satisfaction of public requirements or, for that matter, a more efficient approach to providing the minimum required benefits of the welfare state.[4]

Fiscal volatility is another important issue regarding fiscal policy and its effect on growth. From a theoretical point of view, restrictions on government expenditure volatility may have both positive and negative effects on long-run growth. A crucial variable to determine the sign of these effects is business-cycle volatility.[5] On the one hand, since governments can smooth out business-cycle fluctuations by the use of discretionary changes in fiscal policy and by the use of automatic stabilisers[6], fiscal policy may positively affect private investment and long-run growth. On the other hand, fiscal policy itself might be a source of business-cycle fluctuations and exacerbate macroeconomic volatility, e. g. in case of pro-cyclical measures.

[4] Afonso, Schuknecht and Tanzi (2005) report that so-called "big governments" seem to perform less efficiently than "smaller governments." See also Afonso et al. (2005) for a discussion on spending composition and growth.

[5] In fact, as documented by several studies, business-cycle volatility is harmful for growth and its determinants. See, for example, Altman (1992, 1995), Aghion et al. (2005), Fatás (2002) and Furceri (2007a), Ramey and Ramey (1995).

[6] See, for example, Sachs and Sala-i-Martin (1991), Bayoumi and Masson (1995), Asdrubali, Sorensen and Yosha (1996), von Hagen (1998), Afonso and Furceri (2007).

Several papers have looked at the specific mechanism through which fiscal policy can affect business cycles. Most of these papers have analysed the effects of government expenditure restrictions on the ability to smooth economic fluctuations. For example, Roubini and Sachs (1989), Alt and Lowry (1994), Poterba (1995), Levinson (1998) and Lane (2003) show that restrictions on government expenditure, and thus lower government expenditure volatility, result in a slower adjustment of the economy to unexpected shocks. However, other papers that have directly addressed the effects of fiscal restrictions on the volatility of business cycles provide contradictory results. For example, Alesina and Bayoumi (1996) show that fiscal policy restrictions tend to have a negligible effect on business cycles, and they argue that the positive and negative effects discussed above cancel each other out.[7] In addition, Canova and Pappa (2005) show, for the US states, that the presence of tighter budget constraints, debt related or institutional restrictions, does not appear to matter much for business cycle fluctuations.

In contrast, Fatás and Mihov (2006) illustrate that although the two effects are statistically significant, the first effect predominates. In particular, Fatás and Mihov (2003) show that the volatility of output caused by discretionary changes in fiscal policy lowers economic growth by more than 0.8 percentage points for every percentage point increase in volatility. However, it is important to stress that not only discretionary changes but also transitory (and cyclical) changes in fiscal policy may increase output volatility and thereby reduce output growth. In fact, as has been suggested by Ayagari, Christiano and Eichenbaum (1992), temporary changes in fiscal policy may have a significant impact on

[7] For instance, a report from the EC (2007) on the euro area mentions that fiscal criteria and the Stability and Growth Pact have dampened growth volatility in European and Monetary Union (EMU).

interest rate volatility and this, in turn, will reduce long-run growth.[8] To this point, Furceri (2007b) analyzing a panel of 99 countries from 1970-2000, shows that a 1 percent increase in government expenditure business cycle volatility determines a decrease of 0.78 percentage points in the long-run rate of growth.

However, although the effect of government expenditure volatility has been widely analysed, the effect of volatility in the components of public spending and revenue has not so far been widely addressed in the literature.[9] This paper tries to fill this gap. In particular, it analyses the effect on growth of several government spending and revenue items, both in terms of government size and volatility.

3. Methodology

Several studies in the growth literature have found a negative bivariate relationship between growth and the measure of government size.[10] It is well known that the inclusion of particular control variables in a growth regression can wipe out this bivariate relationship (e.g., Easterly and Rebelo, 1993). Thus, it is necessary to consider which information to include in such growth regressions as control variables. Sala-i-Martin (1997) running two million regressions found 60 variables to be significant in at least one growth regression. In a more robust analysis, Levine and Renelt (1992), applying the Extreme Bound Analysis initially proposed by Leamer (1983), found robust cross-country growth correlates to be: (i) the average investment share of GDP; (ii) the initial log of GDP per capita; (iii) initial human capital; and (iv) the average growth rate of the population. The initial level of GDP is not only a robust and significant variable for growth (in terms

[8] For example, Bernanke (1983), Pindyck and Solimano (1993), and Blackburn and Varvarigos (2005) show that in models with investment irreversibility and financial frictions, higher uncertainty regarding investment prices will determine a lower level of investment and growth.
[9] Some examples of somewhat similar analysis are provided by Brunetti (1998) and Gong and Zou (2002).
[10] See Plosser (1993).

of conditional convergence, Barro and Sala-i-Martin, 1995), but output is generally correlated with tax revenues and government expenditure.

Openness is another variable found to be significant in many cross-country growth regressions, moreover it is somewhat related to fiscal policy. In fact, if open economies are especially exposed to shocks, as argued by Rodrick (1998), it may be especially important for the government to facilitate private consumption smoothing by operating a countercyclical policy. On the other hand, integrated international financial markets may offer more scope to absorb shock through risk sharing, suggesting there is less need for government to step in.

In the same way output volatility (defined as the standard deviation of output business cycle) has been found to negatively affect growth (e.g. Ramey and Ramey, 1995) and is usually correlated with government expenditure volatility (e.g. Zimmerman, 1995; Lane, 2003; Fatás and Mihov, 2006). Moreover, since volatility of government expenditure is a combination of output volatility and policy measures, we need to consider output volatility in order to identify the effect of government expenditure volatility on growth.

Thus, in order to take into account robustly the determinants of growth, and to control simultaneity between growth and government size, and growth and fiscal volatility, in our empirical model we include in addition to the fiscal variables the initial log of GDP per capita (Y_0), the average total investment share of GDP (*I/Y*), initial human capital (h), the average growth rate of the population (n), openness $(OPEN)$, and output

volatility (σ_Y).[11] We also include a country dummy for Germany and Finland to account for breaks, and a year dummy for EMU and the EU single market (*SM*), to see if EMU and the creation of the single market were important determinants for growth among the EMU and EU countries, respectively.[12]

Another relevant issue to be discussed using cross-country growth regression is the time span to be used. Usually studies in the growth literature make use of large time spans (30-40 years) and consider the average value of growth determinants over this time period. However, when fiscal and other policy variables are included, this could raise several problems, such as endogeneity and significant simultaneity. In particular, regarding fiscal policy, over long time spans the level of government spending and income are likely to be influenced by demographics, in particular an increasing share of elderly people. Thus, errors in the growth variable will affect GDP, demographics, and taxes or government spending. As a result, the independent variables, government revenue or government spending as a share of GDP, are correlated with the error term in the growth regression, and this will produce biased estimates.

A second problem is that such cross-section studies, using long observation periods, give rise to an endogenous selection of fiscal policy[13]. For instance, over a long time span growth is likely to influence tax revenues. Countries that initially raise taxes and experience lower growth during the observation period are more likely to reduce taxes. In a similar way, countries that raise taxes without experiencing a negative growth effect are

[11] See Appendix 1 for a detailed descripition on how we construct output and public spending and revenue volatility.
[12] Eventually, events such as EMU could also be considered endogenous outcomes of growth.
[13] In order to check for robustnwess of our results,in section 4.3 we address the problem of simultaneity using different empirical specifications.

more likely to continue having high taxes. This means that cross-section studies over long time spans may fail to capture growth causality effects of taxation.

A third important issue is that growth regressions over long time spans may be inefficient since they discard all information on within-country variation both in terms of growth and production, and in terms of government size. Moreover, the inclusion of period dummies help to control for the fact that most countries experienced a reduction in the growth rate in the 1970s and 1980s. Country dummies take into account specific country-effects.

For all those reasons we will focus mainly on combined cross-section time-series regressions using seven five-year periods from 1970 to 2004 (e.g. 1970-1974, …, 2000-2004), and we use pooled country and time fixed effects, and robust standard errors to control for heteroscedasticity between countries.

Therefore, we estimate the two following growth equations, respectively for general government revenue and expenditure:[14]

$$g_{i,t} = \alpha_1 + \beta_1 R_{i,t} + \gamma_1 R_{i,t}^2 + \partial_1 \sigma_{i,t}^R + \vartheta_1 X_{i,t} + \phi_1 T_t + \upsilon_1 S_i + \varepsilon_{i,t} \quad (1)$$

$$g_{i,t} = \alpha_2 + \beta_2 E_{i,t} + \gamma_2 E_{i,t}^2 + \partial_2 \sigma_{i,t}^E + \vartheta_2 X_{i,t} + \phi_2 T_t + \upsilon_2 S_i + \xi_{i,t} \quad (2)$$

where the index i (i=1, …, 28) denotes the country, the index t (t= 1970-1974, 1975-1979, …, 1999-2004) indicates the period, and α_1 and α_2 stand for the individual effects to be estimated for each country i. g is the growth rate of real GDP per capita, R is the set of

[14] We analyse two separate sets of equations since revenue and expenditure are usually quite correlated (the correlation is 0.91 for total revenue and total spending, but lower for sub-components), and this would create serious problems of multicollinaerity and would not allow to identify which expenditure and revenue variables (both in terms of share and in terms of volatility) matter for growth. For the complete set of correlations between spending and revenue items see Table A3 in Appendix 2. Moreover, at least in terms of total expenditure and revenue, one should be aware that symmetric effects for revenue and expenditure could be expected if both are linked to economic growth.

general government revenue variables as percentage of GDP, E is the set of general government expenditure variables as percentage of GDP, σ^R is the vector of revenue volatility variables, and σ^E is the vector of expenditure volatility variables. X includes a set of control variables (initial level of output per capita, output volatility, investment share, human capital, population growth, and openness), and T and S are year and country dummies. Additionally, regressions (1) and (2) also include square terms for R and E in order to test the possible effect on economic growth of different government sizes.

4. Empirical Analysis

4.1 Data

In this paper we focus on OECD and EU countries. The countries included in the analysis are the EU15 members, thereafter indicated as EU (Austria, Belgium, Denmark, France, Finland, Germany, Greece, Italy, Ireland, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the UK), and for the rest of OECD: Australia, Canada, Czech Republic, Hungary, Iceland, Japan, Korea, New Zealand, Norway, Poland, Slovakia, Switzerland and the United States.

Studying just these two samples of countries offers several advantages. Firstly, a longer span of data is available for the OECD and the EU than for a broader set of countries, including for instance, developing countries. Secondly, data quality and cross-country comparability are also likely to be of a higher standard for the OECD, and this is extremely important when we consider the measure of fiscal volatility, since volatility would increase in presence of measurement errors. Thirdly, as argued by Grier and Tullock (1989), data from the OECD and the rest of the world do not share a common set of coefficients in cross-country growth regressions and thus should not be pooled.

Fiscal data for the general government are obtained from the OECD Economic Outlook database (see Appendix 2 for details). For the computation of the volatility measures, all fiscal variables are converted into constant prices using the GDP deflator, since we do not want to eliminate any growth in government spending that takes the form of an increase in the relative price of public sector outputs, and since for most aggregates there is not a well defined deflator.

In terms of public spending, we examine the following variables: Total Expenditure (*E*) and its breakdown in Transfers (*TRA*), Subsidies (*SUB*), Government Investment (*GINV*), and Government Consumption (*GCON*). For the latter variable we differentiate also between Wage (*GWAGE*) and Non-Wage components (*GNONWAGE*). In terms of revenue variables we analyse Total Revenue (*R*), and its main components: Direct Taxes (*DIR*), Indirect Taxes (*IND*) and Social Contributions (*SOC*).

For all these variables we construct two measures. The first is the relative size of each variable as a percentage of GDP. The second considers cyclical volatility, which is computed as the standard deviation of the cyclical component of each variable.[15] In Table 2 we report the results for the average volatility.

[Insert Table 2]

Human capital (*h*) is taken from the Barro-Lee (2001) data set. The rest of the control variables described in the next section are taken from the from the Heston-Summers-Aten (2006) dataset (Penn World Table 6.2).[16]

[15] See Appendix 1 for a more detailed discussion about the filtering methods.
[16] See Appendix 2 for a detailed description of all the variables and their availability.

4.2. Results and Discussion

In Table 3 we report the estimates of the effect of general government total revenue, both in terms of GDP's share and volatility, on output growth (using the HP filter for annual data with the smoothness parameter, λ, equal to 6.25). The results suggest that revenues-to-GDP seem to impinge negatively on the real growth of per capita GDP both for the OECD and the EU countries. In particular, a percentage point increase in the share of total revenue in GDP would decrease output growth by 0.12 percentage points both for the OECD and the EU countries. In contrast, revenue volatility does not seem to significantly affect growth.[17] In addition, it seems that effect of government revenues ratios squared does not depend on the relative size of government.

[Insert Table 3]

Similar implications emerge from analysing the effect of general government total spending. In Table 4 we report the estimates of the effect of total spending, both in terms of GDP's share and volatility, on output growth. As in the case for total revenue, countries with a higher share of expenditure in GDP tend to grow more slowly. In particular, for the OECD (EU) countries an increase of one percentage point in the share of total expenditure to GDP would decrease growth by 0.13 (0.09) percentage points. The magnitude of the coefficient is almost identical in absolute terms to the effect of total investment on growth. Again, the effect of government spending ratios squared does not seem to depend on the relative size of government.

[Insert Table 4 here]

[17] The effect of the control variables is generally significant (except for the dummies EMU and SM), and their sign is consistent with the one expected.

A different pattern emerges in terms of spending volatility. While it has no effect on growth for the OECD countries, it has a negative and significant effect for the EU countries. For these countries in particular, an increase of one percent in spending volatility (on average) would decrease growth by 0.76 percentage points.[18]

Analysing the effect of each component of general government revenue on growth (Table 5), we can see that both indirect taxes and social contributions as a percentage of GDP have a negative effect on growth for both the OECD and the EU countries. In particular, while an increase of one percentage point in indirect taxes ratio lowers growth by 0.30 (0.40) percentage points for the OECD (EU) countries, an increase of the same magnitude in social contributions ratio decreases growth by 0.34 (0.38) percentage points for the OECD (EU) countries. Thus, it seems that while for the OECD countries social contributions are more detrimental to growth, for the EU countries indirect taxes are more harmful. In contrast, direct taxes and size do not seem to affect growth significantly for either set of countries.[19] This could suggest that direct taxes (such as income taxes) are less distortionary than indirect taxes (such as VAT, sales taxes, goods and services taxes) and social contributions.

[Insert Table 5]

In terms of volatility it emerges that while the volatility of indirect taxes negatively affects growth in the OECD sample, the volatility of social contributions has a negative impact on growth for the EU country sample. In particular, a one percent increase in indirect taxes

[18] The effect on growth is computed by multiplying the estimated coefficient for the average volatility with the average volatility (see Table 2). Values in the text and those obtained by multiplication may differ due to rounding .

[19] One has to notice that we are examining average tax burden and not marginal tax burden.

volatility (social contribution) lowers growth for the OECD (EU) countries by 0.07 (0.27) percentage points.

Repeating the same analysis for the main components of general government expenditure, we can observe that for both sets of countries, subsidies and government consumption as a percentage of GDP have a significant negative impact on growth.[20] This negative effect could be explained by the fact that subsidies could provide in some cases did-incentives and be distortionary. From columns one and three in Table 6, it is possible to see that while an increase of one percentage point in subsidies lowers growth by 0.44 (0.71) percentage points in the OECD (EU) countries, an increase of one percentage point in government consumption decreases growth by 0.23 (0.31). Thus, although the effect is more pronounced in the EU countries, subsidies seem to be more detrimental to growth than government consumption. Moreover, in the OECD countries, although government consumption hampers growth, it seems to have a less negative effect for countries with relatively bigger governments.[21] However, this improvement is quite negligible in terms of magnitude, with the result that even for these countries government consumption is detrimental to growth. In contrast, while government investment does not seem to affect growth significantly for both sets of countries, transfers have a positive and significant effect for the EU countries.

[Insert Table 6]

In terms of volatility, while all the measures of spending volatility generally do not have a significant effect in the OECD countries, both government consumption and investment

[20] One should be aware that there could be reverse causality between growth and subisidies, in the sense that in a situation of lower growth governments may choose to increase the amount of subsidies given.
[21] This could be partially explained by the fact that among these countries there are transition economies such as the Czech Republic and Hungary where government consumption could have helped in the initial restructuring process of the economy.

volatility have a negative and statistically significant effect on growth in the EU countries. For this set of countries in particular, an increase of one percent in government consumption (investment) volatility lowers growth by 0.41 (0.46) percentage points.This could be explained by the fact, that higher government consumption and investment volatility will enchance macroeconomic uncertainty, reducing thereby growth and private investment, also through an upward effect on the interest rate (Ayagari et al. 1992).

Splitting government consumption into wage and non-wage components, both variables as a percentage of GDP turn out to affect growth negatively for both sets of countries (Table 7). However, while in the OECD countries the magnitude of these effects is quite similar, in the EU countries non-wage components of government consumption seem to be more detrimental, and this result persists when we consider volatility measures. Moreover, in the EU countries the negative effect of wages is less relevant for those countries where the government wage share is higher than 18 percent.[22] However, this size effect is very modest, with the result that also for these countries government wage is detrimental to growth.

[Insert Table 7]

4.3. Robustness Analysis

A relevant issue when specifying a panel growth equation is whether or not to include country dummies. While the inclusion of country specific effects has the advantage of controlling for unobserved country heterogeneity, it could lead to misleading conclusion in the analysis of the results. In fact, it has to be kept in mind that the fixed effect estimator is equivalent to the OLS estimator after applying the "within" transformation. Therefore,

[22] The variable $GWAGE^2$ is not significant when we drop all the observations with government wage share higher than 18%. These countries are: Belgium (1970-1974), Denmark (1980-1984) and Sweden (1975-1979, 1980-1984).

what is measured empirically is the deviation from country averages and not the long-run growth effect.

In order to control for possible misspecification due to the inclusion of country dummies, we re-estimate equations (1) and (2) using only time dummies. Analyzing the results reported in Table 8, it clearly emerges that they are also robust when we exclude country specific fixed effects. In particular, as we have mentioned in the previous section, the effect of general government total revenue and expenditure in term's of GDP's share and volatility (for the expenditure variable) are detrimental for growth in both the OECD and in the EU set of countries.

[Insert Table 8]

A second concern regarding our econometric specification is the possible reverse causality between growth and government size and growth and fiscal volatility. Regarding the first issue, one should bear in mind that if the elasticities of government spending and taxation with respect to output variations are less than 1 (which seems reasonable), then a five-year period of fast growth will determine a decrease of the ratios *E/Y* and *R/Y*. Thus, in order to control for a possible endogeneity problem in our regression, we have re-estimated equations (1) and (2) using only the initial level of government spending and revenue-to-GDP ratios, in other words, the shares for the first year of each of the 5-year periods (see Table 9).

[Insert Table 9]

Similarly to this point, the direction of causality between fiscal volatility and growth in the simple OLS estimation is not very clear. Even if control variables as output volatility,

initial level of GDP, and time and country effects can account for simultaneity, in the case of both fiscal volatility and growth they are determined by the same set of explanatory variables. Therefore, in addition to the initial level of government and expenditure ratios, we also used the one lag value for our measure of fiscal volatility (σ^{R}_{-1} and σ^{E}_{-1}). Again, the results are robust to these different specifications. Moreover, using the one lagged measures of fiscal volatility, it comes out that also government total revenue volatility (in addition to expenditure volatility) is detrimental for growth.

5. Conclusion

Over the last three decades until the mid-1990s there has been a significant expansion of government participation in the economy in all industrialized countries. Regarding this point, many studies have claimed that restrictions on fiscal policy could be favourable to growth. In fact, from a theoretical point of view, government size is likely to be detrimental to economic growth, for instance, due to inefficiency of government activities, while government volatility is likely to increase macroeconomic uncertainty. Thus, in order to understand how to restrict fiscal policy volatility and limit government size, it is quite relevant to assess which components of general government spending and revenue (both in terms of size and volatility) have a negative effect on growth.

Therefore, in this paper we examined the effect of government size and fiscal volatility on growth for a set of OECD and EU countries. The overall results suggest that both dimensions tend to hamper growth in both country samples. Total revenue and total expenditure seem to impinge negatively on the real growth of per capita GDP both for the OECD and the EU countries. In particular, a percentage point increase in the share of total revenue (total expenditure) would decrease output by 0.12 and 0.13 percentage points

respectively for the OECD and for the EU countries. It is worthwhile mentioning that the magnitude of the effect is almost identical in absolute terms to the effect of total investment (private and public) share on growth. Moreover, total expenditure volatility also has a negative and statistically significant effect on growth, at least for the EU countries.

Breaking up total revenue into direct taxes, indirect taxes and social contributions, our results suggest that among total revenue the variables that are most detrimental to growth, both in terms of size and volatility, are indirect taxes and social contributions. At the same time, analysing the components of total spending (transfers, subsidies, government consumption and government investment) the results suggest that, while for both set of countries both subsidies and government consumption have a significantly negative impact on growth, government investment does not significantly affect growth, and transfers have a positive and significant effect only for the EU countries. Moreover, for the EU countries, public consumption and investment volatility have a sizeable, negative and statistically significant effect on growth. These results are also in line with some available related empirical evidence pointing to the negative effects on growth of public spending, particularly in the case of developed countries.[23]

There are relevant policy implications to be drawn from these results. It seems that revenue reductions that occur mainly in terms of indirect taxes and social contributions, and cuts in government consumption and subsidies may contribute positively to fostering economic growth in the country samples analysed. Moreover, public capital formation may indeed turn out to be less productive if devoted to inefficient projects, or if it crowds out private

[23] For instance, de Ávila and Strauch (2003), in a panel framework, report that government consumption and transfers are detrimental for growth in the EU, while Fölster and Henrekson (2002) also conclude that there is a negative relationship between government expenditure and growth.

investment.[24] These conclusions also provide useful indications to policy makers when deciding which components of public finances to adjust (namely by redirecting spending towards more growth enhancing activities, in a context of limited public resources and fiscal constraints).

Finally, regarding possible further empirical research, one could envisage looking more closely at the optimal size and the nature of the relationship between the role of the various components of government spending and revenue and growth.

[24] Afonso and St. Aubyn (2007) report that crowding-in effects of public investment on private investment can vary considerably across countries.

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Appendix 1 – Cyclical Volatility

Business cycle measures are obtained by detrending the series of real GDP, and of real government expenditure and revenue items. Four different methods are used to detrend the series of each country *i* and estimate its cyclical component. Letting $y_{i,t} = \ln(Y_{i,t})$, the first measure is simple differencing (growth rate):

$$c_{i,t} = y_{i,t} - y_{i,t-1}\,. \tag{A1}$$

The second and the third method use the Hodrick-Prescott (HP) filter, proposed by Hodrick and Prescott (1997). The filter decomposes the series into a cyclical $(c_{i,t})$ and a trend $(g_{i,t})$ component, by minimizing with respect to $g_{i,t}$, for the smoothness parameter $\lambda > 0$ the following quantity:

$$\sum_{t=1}^{T}(y_{i,t} - g_{i,t})^2 + \lambda\sum_{t=2}^{T-1}(g_{i,t+1} - g_{i,t-1})^2\,. \tag{A2}$$

The methods differ because the second one consists of using the value recommended by Hodrick and Prescott for annual data for the smoothness parameter (λ) equal to 100, while the third method considers the smoothness parameter (λ) to be equal to 6.25. In this way, as pointed out by Ravn and Uhlig (2002), the Hodrick-Prescott filter produces cyclical components comparable to those obtained by the Band-Pass filter.

The fourth method makes use of the Band-Pass (BP) filter proposed by Baxter and King (1999), and evaluated by Stock and Watson (1999) and Christiano and Fitzgerald (2003) (who also compare its properties to those of the HP filter). The Low-Pass (LP) filter $\alpha(L)$, which forms the basis for the band pass filter, selects a finite number of moving average weights α_h to minimize:

$$Q = \int_{-\pi}^{\pi}\left|\delta(\omega)\right|^2 d\omega\,, \tag{A3}$$

where $\alpha(L) = \sum_{h=-K}^{K}\alpha_h L^h$ and $\alpha_K(\omega) = \sum_{h=-K}^{K}\alpha_h e^{-i\omega h}$.

The LP filter uses $\alpha_K(\omega)$ to approximate the infinite MA filter $\beta(\omega)$. Defining $\delta(\omega) \equiv \beta(\omega) - \alpha(\omega)$, and then minimizing *Q,* we minimize the discrepancy between the ideal LP filter $\beta(\omega)$ and its finite representation $\alpha_K(\omega)$ at frequency ω. The main objective of the BP filter as implemented by Baxter and King (1999) is to remove both the high frequency and low frequency components of a series, leaving the business-cycle frequencies. This is obtained by subtracting the weights of two low pass filters. We define ω_L and ω_H, the lower and upper frequencies of two low pass filters, as eight and two respectively for annual data. We therefore remove all fluctuations shorter than two or longer than eight years. The frequency representation of the band pass weights becomes $\alpha_K(\omega_H) - \alpha_K(\omega_L)$, and forms the basis of the Baxter-King filter, which provides an alternative estimate of the trend and the cyclical component.

The four filters yield substantially similar results, with only minor differences (differencing generally produces the most volatile series, while the HP6.25 the smoothest). For example, analysing the effect of total expenditure volatility on growth for the EU countries (results of the third column in Table 3), we can see that the effect is negative and significant for all filtering methods. Moreover, as suggested also by Ravn and Uhlig (2002), the choice of the HP6.25 seems to be the most sensible for annual data. In fact, and for the EU country sample for instance, the associated effect is very close to the average of the effects obtained with the other filtering methods (see Table A1).

Table A1 - Robustness Check (EU)

	HP6.25	HP100	Diff	BP
σ^E	-46.337***	-50.119***	-20.426**	-31.683***
	(-2.74)	(-3.31)	(-2.13)	(-2.31)
Average volatility	0.017	0.023	0.0269	0.018
Effect	-0.765	-1.134	-0.550	-0.556

Notes: t-statistics are in parenthesis.
, * - Statistically significant at the 5, and 1 percent level respectively.

Appendix 2 – Data Sources

Initial Output (Yo) - The log of Heston-Summers-Aten (2006) variable "Real GDP per capita at the beginning of each time period, 2000 international prices; Laspeyres index".

Growth-rate (g) - The five-year average of the Heston-Summers-Aten (2006) annual growth rate variable.

Population Growth (n) - The average of the annual log difference of Heston-Summers-Aten (2006) population variable.

Investment Share of GDP (I/Y) - Heston-Summers-Aten (2006) variable "Real Gross Domestic Investment, private and public, % Real GDP per capita, 2000 international prices".

Human Capital (h) - Barro-Lee (2001) variable "Average schooling years in the total population over age 25 at the beginning of each time period".

Openness (OPEN) - Heston-Summers-Aten (2006) variable "Exports plus Imports divided by Real GDP".

Total Revenue (R), Direct Taxes (DIR), Indirect Taxes (IND), Social Contributions (SOC), Total Expenditure (E), Government Consumption (GCON), Government Investment (GINV), Transfers (TRA), Subsidies (SUB), Government Wages (W), GDP, GDP Deflator. Source: OECD Economic Outlook, current prices.

Non-Wage Components of Government Consumption (NW). Source: OECD Economic Outlook and author calculations, current prices.

See the OECD *Economic Outlook: Sources and Manual*, for details on the definition and construction of the variables.

Table A2 – Data Availability

	Y	*n*	*h*	*I/Y*	*OPEN*	*R*	*DIR*	*IND*	*SOC*	*E*	*GCON*	*GINV*	*TRA*	*SUB*	*W*	*NW*
Australia	70	70	70	70	70	70	70	70	70	70	70	70	70	70	-	-
Austria	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Belgium	70	70	70	70	70	70	70	70	70	70	70	70	85	70	70	70
Canada	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Czech Republic	90	70	90	90	90	92	93	93	93	92	92	92	92	92	92	92
Denmark	70	70	70	70	70	71	71	71	71	70	70	70	70	70	70	70
Finland	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
France	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Germany	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Greece	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Hungary	70	70	70	70	70	91	91	91	91	91	91	91	91	91	91	91
Iceland	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Ireland	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Italy	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Japan	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Korea	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Luxembourg	70	70	70	70	70	90	90	90	90	90	90	90	90	90	90	90
Netherlands	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
New Zealand	70	70	70	70	70	86	86	86	86	86	86	86	86	86	86	86
Norway	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Poland	70	70	70	70	70	95	95	95	95	95	95	95	95	95	95	95
Portugal	70	70	70	70	70	77	77	77	77	77	77	77	77	77	77	77
Slovakia	86	70	90	86	87	94	94	94	94	94	94	94	94	94	94	94
Spain	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Sweden	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Switzerland	70	70	70	70	70	90	90	90	90	70	70	70	70	70	70	70
United Kingdom	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70
United States	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70

Note: In the table we report the first year of data availability for each variable.

Table A3 – Correlation Matrix for Fiscal Variables

	R	*DIR*	*IND*	*SOC*	*E*	*GCON*	*GINV*	*TRA*	*SUB*	*W*	*NW*
R	1										
DIR	0.67	1									
IND	0.51	0.25	1								
SOC	0.40	-0.23	-0.15	1							
E	0.91	0.54	0.43	0.48	1						
GCON	0.84	0.59	0.50	0.29	0.86	1					
GINV	-0.30	-0.34	-0.06	-0.11	-0.34	-0.24	1				
TRA	0.72	0.40	0.41	0.25	0.60	0.47	-0.13	1			
SUB	0.36	0.08	0.41	0.14	0.35	0.22	0.09	0.31	1		
W	0.75	0.67	0.47	0.04	0.70	0.82	-0.22	0.44	0.29	1	
NW	0.50	0.17	0.26	0.45	0.58	0.68	-0.13	0.24	0.02	0.13	1

Tables

Table 1 – Total public expenditure as a % of GDP
(General government)

	1970	1975	1980	1985	1990	1995	2000	2005	Change in pp 05-70	Change in pp 05-95
Australia	25.9	31.7	33.2	39.7	35.7	38.3	34.8	34.9	9.0	-3.4
Austria	39.7	46.2	49.4	53.0	51.5	56.0	51.4	49.9	10.2	-6.1
Belgium	41.0	48.9	54.7	58.3	52.2	51.9	49.0	49.8	8.8	-2.1
Canada	36.0	41.1	41.6	48.3	48.8	48.5	41.1	39.3	3.2	-9.2
Czech Republic	..	..	..	..	..	54.0	41.7	43.6	..	-10.3
Denmark	..	46.5	53.6	55.8	55.9	59.5	53.9	52.8	..	-6.7
Finland	30.9	38.5	40.1	46.4	48.0	61.5	48.3	50.1	19.2	-11.4
France	39.2	43.8	45.6	51.0	49.4	54.4	51.6	53.9	14.7	-0.6
Germany	38.4	48.7	46.9	45.1	43.6	48.3	45.1	46.8	8.4	-1.5
Greece	26.5	30.2	32.1	45.1	49.2	50.1	51.2	46.7	20.1	-3.5
Hungary	..	..	..	..	..	55.4	46.6	49.9	..	-5.5
Iceland	31.1	37.5	35.7	38.0	41.5	42.7	42.1	43.4	12.3	0.7
Ireland	44.8	49.0	54.6	54.2	43.1	41.3	31.6	34.1	-10.7	-7.1
Italy	32.5	39.3	40.8	49.8	52.9	52.5	46.1	48.2	15.8	-4.2
Japan	20.8	27.4	32.1	32.1	31.8	36.5	39.2	37.0	16.2	0.5
Korea	. ..	18.7	21.2	20.0	20.0	20.8	23.9	29.1	..	8.2
Luxembourg	..	..	..	..	37.7	39.7	37.6	43.2	..	3.5
Netherlands	43.7	50.5	54.2	55.7	52.9	50.0	44.0	45.5	1.7	-4.6
New Zealand	..	..	..	..	53.2	42.0	39.6	38.2	..	-3.8
Norway	39.1	43.3	46.1	44.0	54.0	51.5	42.7	42.8	3.7	-8.7
Poland	..	..	..	..	..	47.7	41.0	42.7	..	-5.0
Portugal	..	..	34.2	39.3	40.3	43.1	43.1	47.7	..	4.7
Slovakia	..	..	..	..	..	47.0	51.7	37.1	..	-9.9
Spain	23.0	25.7	33.5	42.3	42.6	44.2	39.0	38.2	15.2	-6.0
Sweden	43.9	47.4	64.1	64.8	61.3	67.1	56.8	56.3	12.4	-10.8
Switzerland	.	.	.	.	30.0	34.5	33.9	36.2	..	1.6
United Kingdom	42.0	49.8	46.4	47.4	42.4	44.9	37.5	44.9	2.8	-0.1
United States	32.3	33.3	34.3	35.3	36.3	37.3	38.3	39.3	7.0	2.0
Minimum	20.8	18.7	21.2	20.0	20.0	20.8	23.9	29.1	8.3	8.2
Maximum	44.8	50.5	64.1	64.8	61.3	67.1	56.8	56.3	11.5	-10.8
Simple average	35.0	39.9	42.6	46.0	44.8	47.3	43.1	43.8	9.1	-3.5

Source: OECD (complemented with AMECO and National Bank of Belgium data).

Table 2 – Average volatility for Output and Fiscal Variables (HP 6.25)

	EU	OECD
Output	0.014	0.015
Total spending	0.017	0.054
Total revenue	0.017	0.054
Transfers	0.030	0.062
Subsidies	0.071	0.132
Government consumption	0.016	0.078
Government investment	0.057	0.106
Gov. cons. wages	0.016	0.050
Gov. cons. non-wage	0.026	0.055
Direct taxes	0.037	0.070
Indirect taxes	0.027	0.084
Social contributions	0.026	0.070

Table 3 – Total General Government Revenue and Growth
(including country and period dummies)

		OECD		EU	
Control variables	Y_0	-4.541***	-4.196***	-3.002	-2.669
		(-4.22)	(-3.73)	(-1.33)	(-1.15)
	σ^Y	-3.302	-8.434	29.987	21.393
		(-0.23)	(-0.56)	(1.02)	(0.67)
	I/Y	0.130***	0.136***	0.102	0.105
		(3.14)	(3.26)	(1.24)	(1.28)
	OPEN	3.098***	3.254***	4.543**	4.767**
		(3.09)	(3.21)	(2.42)	(2.55)
	N	-49.082	-68.211	-62.885	-81.559
		(-1.16)	(-1.48)	(-0.91)	(-1.07)
	H	0.581**	0.539**	0.451*	0.425*
		(2.62)	(2.39)	(1.8)	(1.62)
	FIN	-3.987***	-4.058***	-4.402***	-4.440***
		(-3.25)	(-3.30)	(-4.87)	(-4.92)
	GER	0.965	1.063	1.067*	1.137*
		(0.82)	(0.90)	(1.80)	(1.87)
	SM	0.459	0.406	-0.878	-0.985
		(1.23)	(1.08)	(-0.95)	(-1.06)
	EMU	-0.404	-0.382	-0.432	-0.434
		(-0.83)	(-0.79)	(-0.63)	(-0.63)
Revenue variables	*R/Y*	-0.122***	-0.269*	-0.117***	-0.259
		(-3.43)	(-1.88)	(-2.97)	(-1.51)
	$(R/Y)^2$		0.002		0.002
			(1.06)		(0.92)
	σ^R	0.177	0.182	-21.669	-21.318
		(0.63)	(0.65)	(-1.44)	(-1.42)
No. obs.		159	159	95	95
R-square		0.74	0.74	0.72	0.72
Adj. R-square		0.64	0.64	0.59	0.59

Notes: t-statistics are in parenthesis. Robust standard errors to control for heteroscedasticity.
*, **, *** - Statistically significant at the 10, 5, and 1 percent level respectively.
FIN – dummy variable that assumes the value 1 for the period 1990.
GER – dummy variable that assumes the value 1 for the period 1991.
SM – dummy variable that assumes the value 1 after year 1991 for the EU15 countries.
EMU– dummy variable that assumes the value 1 after year 1998 for the EMU countries.
The HP6.25 filter was used to decompose the series.

Table 4 – Total General Government Expenditure and Growth
(including country and period dummies)

		OECD		EU	
Control variables	Y_0	-5.399***	-5.103***	-4.210**	-4.017**
		(-5.17)	(-4.85)	(-2.20)	(-2.16)
	σ^Y	-5.028	-10.572	29.422	17.701
		(-0.27)	(-0.77)	(1.04)	(0.54)
	I/Y	0.115***	0.113***	0.056	0.056
		(2.91)	(2.89)	(0.78)	(0.79)
	OPEN	2.988***	3.109***	4.348***	4.735**
		(3.16)	(3.30)	(2.61)	(2.86)
	N	-68.675*	-88.000**	-38.436	-61.258
		(-1.70)	(-2.10)	(-0.61)	(-0.83)
	H	0.672***	0.658**	0.293	0.302
		(3.17)	(3.12)	(1.19)	(1.20)
	FIN	-3.398 ***	-3.505***	-4.303***	-4.289***
		(-2.89)	(-3.00)	(-5.02)	(-4.82)
	GER	0.830	0.962	0.903*	1.017*
		(0.74)	(0.86)	(1.80)	(1.91)
	SM	0.486	0.407	1.626	-0.581
		(1.38)	(1.15)	(1.47)	(-0.38)
	EMU	-0.431	-0.437	-0.390	-0.466
		(-0.94)	(-0.96)	(-0.46)	(-0.57)
Expenditure variables	*E/Y*	-0.130***	-0.304***	-0.085**	-0.270**
		(-5.12)	(-2.78)	(-2.39)	(-1.96)
	$(E/Y)^2$		0.002*		0.002
			(1.63)		(1.46)
	σ^E	0.139	0.142	-46.337***	-43.372***
		(0.53)	(0. 54)	(-2.74)	(-2.63)
No. obs.		159	159	95	95
R-square		0.77	0.77	0.77	0.77
Adj. R-square		0.68	0.68	0.66	0.66

Notes: t-statistics are in parenthesis. Robust standard errors to control for heteroscedasticity.
*, **, *** - Statistically significant at the 10, 5, and 1 percent level respectively.
FIN – dummy variable that assumes the value 1 for the period 1990.
GER – dummy variable that assumes the value 1 for the period 1991.
SM – dummy variable that assumes the value 1 after year 1991 for the EU15 countries.
EMU– dummy variable that assumes the value 1 after year 1999 for the EMU countries.
The HP6.25 filter was used to decompose the series.

Table 5 – General Government Revenue Composition and Growth
(including country and period dummies)

		OECD		EU	
Controls		n.r.	n.r.	n.r.	n.r.
Revenue variables	*DIR*	-0.039	-0.101	0.095	0.124
		(-0.80)	(-0.08)	(1.27)	(0.68)
	DIR^2		0.002		-0.001
			(0.52)		(-0.16)
	IND	-0.297***	-0.126	-0.404***	0.117
		(-3.80)	(-0.35)	(-3.13)	(0.21)
	IND^2		-0.006		-0.022
			(-0.46)		(-1.08)
	SOC	-0.338**	-0.687***	-0.382***	-0.570*
		(-3.77)	(-2.71)	(-3.20)	(-1.88)
	SOC^2		0.014*		0.007
			(1.66)		(0.75)
	σ^{DIR}	4.209	5.015	0.636	0.333
		(1.25)	(1.42)	(0.12)	(0.06)
	σ^{IND}	-0.821***	-0.795***	-10.816	-11.070
		(-4.81)	(-4.62)	(-1.12)	(-1.13)
	σ^{SOC}	-2.944	-3.782	-10.552**	-8.918
		(-0.86)	(-1.05)	(-2.14)	(-1.53)
No. obs.		153	153	95	95
R-square		0.80	0.81	0.78	0.79
Adj. R-square		0.72	0.72	0.66	0.65

Notes: t-statistics are in parenthesis. Robust standard errors to control for heteroscedasticity.
*, **, *** - Statistically significant at the 10, 5, and 1 percent level respectively.
n.r. - not reported. Full results regarding these variables are available upon request.
The HP6.25 filter was used to decompose the series.

Table 6 – General Government Expenditure Composition and Growth
(including country and period dummies)

		OECD		EU	
Controls		n.r.	n.r.	n.r.	n.r.
Expenditure variables	*TRA*	0.039	-0.831	0.386**	-0.134
		(0.20)	(-1.14)	(2.09)	(-0.20)
	TRA^2		0.083		0.053
			(1.12)		(0.71)
	SUB	-0.438**	-0.868*	-0.708***	-1.062*
		(-2.24)	(-1.83)	(-3.84)	(-1.69)
	SUB^2		0.106		0.082*
			(0.94)		(0.50)
	GCON	-0.227***	-0.943***	-0.313***	-0.719**
		(-2.61)	(-2.91)	(-4.41)	(-2.46)
	$GCON^2$		0.020**		0.011
			(2.47)		(1.50)
	GINV	-0.019	-0.141	-0.164	0.277
		(-0.10)	(-024)	(-0.74)	(0.46)
	$GINV^2$		0.040		-0.048
			(0.47)		(-0.54)
	σ^{TRA}	1.467*	1.059	-5.215	-6.334
		(1.89)	(1.55)	(-1.11)	(-1.22)
	σ^{SUB}	-0.370	0.706	-2.193	-1.946
		(-0.17)	(0.32)	(-0.89)	(-0.69)
	σ^{GCON}	1.558	1.529	-26.343**	-24.993*
		(0.46)	(0.36)	(-2.14)	(-1.89)
	σ^{GINV}	-2.605	-3.552	-8.021*	-8.653**
		(-0.62)	(-0.76)	(-1.74)	(-1.96)
No. obs.		148	148	85	85
R-square		0.77	0.79	0.87	0.89
Adj. R-square		0.66	0.67	0.79	0.79

Notes: t-statistics are in parenthesis. Robust standard errors to control for heteroscedasticity.
*, **, *** - Statistically significant at the 10, 5, and 1 percent level respectively.
n.r. - not reported. Full results regarding these variables are available upon request.
The HP6.25 filter was used to decompose the series.

Table 7 – General Government Expenditure Composition (wage and non-wage disaggregation) and Growth (including country and period dummies)

		OECD		EU	
Controls		n.r.	n.r.	n.r.	n.r.
Expenditure variables	*TRA*	-0.192	-1.022	0.302	-0.060
		(-0.09)	(-1.37)	(1.35)	(-0.09)
	TRA^2		0.101		0.044
			(1.33)		(0.56)
	SUB	-0.415**	-0.971**	-0.727***	-.0.686
		(-2.07)	(-2.15)	(-3.73)	(-0.96)
	SUB^2		0.102		-0.022
			(0.93)		(-0.13)
	GWAGE	-0.256**	-1.679***	-0.318***	-1.534***
		(-2.56)	(-3.78)	(-3.17)	(-2.99)
	$GWAGE^2$		0.060***		0.042**
			(3.42)		(2.44)
	GNONWAGE	-0.252*	-0.211	-0.429**	0.307
		(-1.87)	(-0.42)	(-2.42)	(0.57)
	$GNONWAGE^2$		-0.001		-0.042
			(-0.04)		(-1.43)
	GINV	0.048	0.436	-0.141	0.829
		(0.25)	(0.66)	(-0.63)	(1.13)
	$GINV^2$		-0.035		-0.116
			(-0.36)		(-1.16)
	σ^{TRA}	-0.655	-1.747	-7.740	-6.759
		(-0.14)	(-0.36)	(-1.53)	(-1.17)
	σ^{SUB}	-0.595	-0.329	-3.070	-3.172
		(-0.28)	(-0.16)	(-1.25)	(-1.26)
	σ^{GWAGE}	1.851	2.624	-3.070	-5.209
		(0.47)	(0.66)	(-0.22)	(-0.39)
	$\sigma^{GNONWAGE}$	-0.010	0.019	-16.715*	-11.705
		(-0.09)	(0.14)	(-1.66)	(-1.17)
	σ^{GINV}	-0.444	0.643	-7.47	-6.377
		(-0.24)	(-0.39)	(-1.52)	(-1.22)
No. obs.		141	141	85	85
R-square		0.78	0.82	0.88	0.89
Adj. R-square		0.66	0.71	0.78	0.79

Notes: t-statistics are in parenthesis. Robust standard errors to control for heteroscedasticity.
*, **, *** - Statistically significant at the 10, 5, and 1 percent level respectively.
n.r. - not reported. Full results regarding these variables are available upon request.
The HP6.25 filter was used to decompose the series.

Table 8 – Total General Government Expenditure and Revenue and Growth (Including Only Period Dummies)

		OECD		EU	
Control variables	Y_0	-1.609***	-1.509***	-1.067	-1.895**
		(-4.02)	(-4.13)	(-1.24)	(-2.37)
	σ^Y	5.931	1.767	49.467**	47.587
		(0.42)	(0.13)	(2.02)	(2.12)
	I/Y	0.104***	0.0655***	0.044	0.005
		(4.28)	(2.62)	(1.04)	(0.12)
	OPEN	2.965***	3.427***	3.662**	4.357***
		(3.06)	(3.88)	(2.51)	(3.16)
	N	5.877	-16.657	-20.398	-22.869
		(0.22)	(-0.64)	(-0.50)	(-0.59)
	H	0.224***	0.1.83***	0.106	0.132
		(3.06)	(2.67)	(0.81)	(1.17)
	FIN	-4.580***	-4.132***	-5.006***	-4.829***
		(-3.45)	(-3.27)	(-3.77)	(-3.90)
	GER	0.364	0.384	0.954	0.754
		(0.29)	(0.32)	(0.78)	(0.67)
	SM	1.239***	1.203***	1.888**	1.660**
		(3.78)	(3.87)	(2.26)	(2.15)
	EMU	-0.033	-0.160	-0.466	-0.453
		(-0.07)	(-0.33)	(-0.61)	(-0.64)
Fiscal variables	*R/Y*	-0.053***		-0.055**	
		(-3.06)		(-2.10)	
	σ^R	0.028		-10.043	
		(0.012)		(-0.70)	
	E/Y		-0.081***		-0.067***
			(-5.03)		(-2.94)
	σ^E		0.034		-36.072**
			(0.16)		(-2.46)
No. obs.		159	159	95	95
R-square		0.57	0.61	0.60	0.66
Adj. R-square		0.51	0.56	0.51	0.58

Notes: t-statistics are in parenthesis. Robust standard errors to control for heteroscedasticity.
*, **, *** - Statistically significant at the 10, 5, and 1 percent level respectively.
FIN – dummy variable that assumes the value 1 for the period 1990.
GER – dummy variable that assumes the value 1 for the period 1991.
SM – dummy variable that assumes the value 1 after year 1991 for the EU15 countries.
EMU– dummy variable that assumes the value 1 after year 1998 for the EMU countries
The HP6.25 filter was used to decompose the series.

Table 9 – Total General Government Expenditure and Revenue and Growth, Robustness Check for Endogeneity (including country and period dummies)

		OECD		EU	
Control variables	Y_0	-2.216***	-2.596***	-0.644	-5.477***
		(-2.22)	(-3.46)	(-0.38)	(-3.53)
	σ^Y	-25.487	-20.957	14.482**	35.471
		(-1.47)	(-1.28)	(0.46)	(1.18)
	I/Y	0.148***	0.110**	0.143*	0.132
		(2.88)	(2.23)	(1.80)	(1.64)
	OPEN	4.174*	6.728***	10.516**	0.554
		(1.82)	(4.24)	(2.07)	(0.16)
	N	-50.103	-47.595	-79.333	-33.850
		(-1.10)	(-1.15)	(-1.36)	(-0.58)
	H	0.893***	0.553***	0.313	0.632***
		(3.54)	(4.22)	(1.21)	(2.72)
	FIN	-4.497***	-4.422***	-4.682***	-5.073***
		(-3.68)	(-3.70)	(-3.36)	(-3.60)
	GER	0.427	0.734	0.921	1.072
		(0.36)	(0.64)	(0.78)	(0.83)
	SM	1.276***	0.839**	1.023	2.085**
		(3.34)	(2.29)	(1.03)	(2.40)
	EMU	-0.330	-0.003	-0.026	0.405
		(-0.67)	(-0.01)	(-0.03)	(0.50)
Fiscal variables	R/Y_0	-0.071**		-0.079**	
		(-2.14)		(-2.31)	
	σ^R_{-1}	-23.662**		-23.556	
		(-2.02)		(-1.44)	
	E/Y_0		-0.068***		-0.064**
			(-3.16)		(-1.99)
	σ^E_{-1}		-35.752***		-35.072*
			(-2.81)		(-1.75)
No. obs.		159	159	95	95
R-square		0.57	0.61	0.60	0.66
Adj. R-square		0.51	0.56	0.51	0.58

Notes: t-statistics are in parenthesis. Robust standard errors to control for heteroscedasticity.
*, **, *** - Statistically significant at the 10, 5, and 1 percent level respectively.
FIN – dummy variable that assumes the value 1 for the period 1990.
GER – dummy variable that assumes the value 1 for the period 1991.
SM – dummy variable that assumes the value 1 after year 1991 for the EU15 countries.
EMU– dummy variable that assumes the value 1 after year 1998 for the EMU countries
The HP6.25 filter was used to decompose the series.
R/Y_0, E/Y_0 – ratios for the first year of each of the 5-year periods.