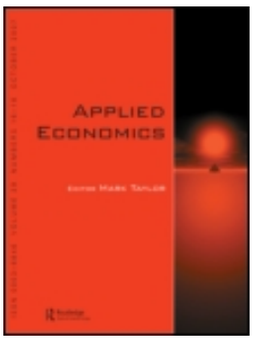

Applied Economics

ISSN: 0003-6846 (Print) 1466-4283 (Online) Journal homepage: https://www.tandfonline.com/loi/raec20

Fiscal composition and long-term growth

António Afonso & João Tovar Jalles

To cite this article: António Afonso & João Tovar Jalles (2014) Fiscal composition and long-term growth, Applied Economics, 46:3, 349-358, DOI: 10.1080/00036846.2013.848030

To link to this article: https://doi.org/10.1080/00036846.2013.848030

Applied Economics, 2014
Vol. 46, No. 3, 349–358, http://dx.doi.org/10.1080/00036846.2013.848030

Routledge
Taylor & Francis Group

Fiscal composition and long-term growth

António Afonso[a,b,*] and João Tovar Jalles[c]

[a]*Department of Economics, ISEG/UL – University of Lisboa, 1249-078 Lisbon, Portugal*
[b]*European Central Bank, Economics, D-60311 Frankfurt am Main, Germany*
[c]*OECD, Economics Department, 75775 Paris, France*

We assess the fiscal composition–growth nexus, using a large country panel, accounting for the usually encountered econometric pitfalls. Our results show that revenues have no significant impact on growth whereas expenditures have negative effects. The same is true for the OECD with the addition that government revenue has a negative impact on growth. From our results, taxes on income are less for growth enhancing, as well as public wages, interest payments, subsidies and government consumption, while spending on education and health boosts growth.

Keywords: budget deficit; budget decomposition; panel analysis

JEL Classification: C23; E62; H50

I. Introduction

According to conventional wisdom, in most countries (particularly developing ones), larger budget deficits have coincided in the past with less efficient government spending. Hence, among the factors that determine economic growth, government spending and fiscal policies in general are of particular interest. Such fiscal composition–growth nexus is particularly important in situations of economic downturns, where tax revenues tend to flee rather quickly and the spending side of the budget adjusts slowly, notably in view of the effect of automatic stabilizers and of possible counter-cyclical discretionary fiscal policies, which implies the building up of larger budget deficits and increased fiscal sustainability problems.

Although large fiscal imbalances can impose an unwarranted burden on the economy, not all government spending is created equal. Therefore, and in order to inform notably policy decision-making, the effects on economic activity and long-term growth of several spending and revenue budgetary components need to be assessed, which is the main objective of this article.

The empirical analysis of the impact of fiscal components on long-run growth includes the early works by Feder (1983), Landau (1983), Ram (1986), Grier and Tullock (1989), Romer (1990), Barro (1991) and Sala-i-Martin (1997). Most of these studies used cross-sectional data to link measures of government spending with economic growth rates. However, traditional OLS regression analysis is not sufficient to determine the direction of causality.

In this study, we use a large panel of developed and developing countries for the period 1970 to 2008. In the empirical estimations of growth specifications, we address several of the econometric caveats that usually plague analyses such as outliers, simultaneity, endogeneity, non-linearities and threshold effects. Specifically, we examine which budgetary components have a stronger influence in affecting per capita GDP growth rates; the change in coefficient signs (and magnitudes) with different budget deficit ratios thresholds; differences between country groups; the direction of causality; and the evidence favouring Keynesian (or non-Keynesian) effects of fiscal components.

*Corresponding author. E-mail: aafonso@iseg.utl.pt

Therefore, the main contributions of this article include a detailed assessment of the fiscal decomposition–growth nexus with a diversified variety of methods, providing sensitivity and robustness, the split between economic and functional government expenditure categories.

In a nutshell, our results comprise notably that for the full sample, government revenues have no significant impact on growth, whereas government expenditures have significant negative effects. The same is true for the OECD sub-sample with the addition that revenues have a negative impact on growth; taxes on income are less welcome for growth; public wages, interest payments, subsidies and government consumption have a negative effect on output growth; expenditures on social security and welfare are less growth enhancing; and government spending on both education and health boosts growth.

The article is organized as follows: Section II surveys the literature, Section III describes the analytical and econometric methodology, Section IV presents the data and our main results and Section V concludes.

II. Literature

The nexus between fiscal policy and growth has been a subject of several studies (see Zagler and Durnecker, 2003, for a survey). Some pioneer theoretical contributions, which serve as the underlying framework for our empirical analysis, are notably Modigliani (1961), Diamond (1965) and Saint-Paul (1992).

Papers looking at the economic decomposition of budgetary items usually find evidence of a negative relationship between government expenditures and growth (see, e. g., Barro's (1997) seminal contribution in which he found a significantly negative effect on growth from the ratio of government consumption to GDP).

Lee (1995) reported that government consumption was associated with slower growth for a sample of 89 developed and developing countries for the period 1960 to 1985. With opposing results, Slemrod *et al.* (1995) find a positive correlation between government expenditure to GDP ratio and the level of real GDP per capita across countries and no relationship for OECD countries alone. Landau (1983) and Grier and Tullock (1989) analyse a sample of 104 and 115 countries, respectively, and find that the growth of government consumption is negatively correlated with economic growth, including the OECD.

Focusing on 28 OECD countries, Afonso and Furceri's (2010) results suggest that social contributions, government consumption and subsidies have a sizeable negative and statistically significant effect on growth. Romero-Avila and Strauch (2008) conclude for the EU15 countries that the expenditure side of the budget appears to consistently affect long-run growth.

Additionally, in Afonso and Furceri (2010), government investment has a sizeable negative and statistically significant effect on growth. Hence, public investment effects have been crowded out, further adversely affecting productivity growth. Devarajan *et al*. (1996) found that for a sample of 43 developing countries increases in the share of public investment, expenditure have significant negative effects on growth. Prichett (1996) suggests the so-called 'white-elephant' hypothesis in which public investment in developing countries is often used for unproductive projects. Nelson and Singh (1994) looking at 70 developing countries for the periods 1970 to 1979 and 1980 to 1989 find that the effects of public investment on growth are mixed.

Slemrod *et al.* (1995) uncover a positive correlation between tax revenue-to-GDP ratios and the level of real GDP per capita across countries. Plosser (1992) found a significant negative correlation between the level of taxes on income and profits (as a share of GDP) and growth of real per capita GDP. Koester and Kormendi (1989), in a cross-country analysis of 63 countries in the 1970s, suggest that apparent negative effects of taxes on growth disappear upon controlling for potential endogeneity and the relation between growth and income per capita.

Turning to the functional decomposition of spending, Afonso and Alegre (2011), studying an Euro-area panel between 1970 and 2006, find a significant dependence of productivity on public expenditure on education, as well as a relevant role of social security and health for economic growth and the labour market. Folster and Henrekson (2001) find a robust negative relationship between social expenditures and economic growth. Baum and Lin (1993) taking a sample of 47 countries find that the growth rate of educational expenditures has a positive impact on growth.

III. Methodology

Analytical framework

In the context of a neoclassical growth model, the underlying basic aggregate production function can be written as $Y = F(L,K)$, with Y being the real aggregated output, L the labour force or population, and K capital (physical and human).

Nevertheless, the standard growth model is based on a conditional convergence equation that relates real growth of per capita GDP to the initial level of income per capita, investment-to-GDP ratio, a measure of human capital or educational attainment and the population growth rate,

augmented with government expenditures and revenues components.[1] The aggregate production function is $Y = F(L,K,G)$, with being G the relevant fiscal variable. Therefore, the empirical specification can be written as follows:

$$y_{it} - y_{it-1} = \alpha_{it} + \beta_0 y_{io} + \beta_1 x^j{}_{it} + \gamma G_{it} + \eta_t + \nu_i + \varepsilon_{it} \quad (1)$$

where i (i = 1,…, N) denotes the country; t (t = 1,…,T) indicates the period; $y_{it} - y_{it-1}$ represents the growth rate of real GDP per capita; y_{i0} is the value of real GDP per capita at the beginning of each 5-year period[2]; $x^j{}_{it}(j = 1,2)$ is a vector of control variables ($x^1{}_{it}$ comprises population growth, investment, education and trade openness – used in Table 1; $x^2{}_{it}$ includes $x^1{}_{it}$ – apart from trade openness – and adds labour force participation and the unemployment rate); G_{it} is a fiscal policy-related variable, either total government revenues or expenditures (or sub-components[3]); ν_i, η_t correspond to the country-specific and time effects, respectively. Finally, ε_{it} is a column vector of some unobserved zero mean white noise-type satisfying the standard assumptions. α, β_0, β_1 and γ are unknown parameters.

Econometric approaches

For long time spans, the level of government spending is likely to be influenced by demographics, particularly by an increasing share of elderly people. Therefore, a simultaneity issue arises, and errors in the growth variable will affect GDP, demographics and taxes or government spending as ratios, which are then correlated with the error term in the growth regression. Additional questions are endogeneity, both in terms of government spending and tax policies, and inefficiency due to the discarding of information on within-country variation.

Resorting to panel data can overcome (some of) these problems and has other advantages. We run within fixed effects as a benchmark model. Nonlinear effects of technological change on output growth are allowed for by using individual year indicator dummies in most estimated panel models.

Finally, we use two robust estimators: the method of moments (MM) (Yohai, 1987) and the least absolute deviation (LAD) to deal with outliers.

Bias and endogeneity. One needs to address the potential endogeneity problem of right-hand side regressors and while country-specific fixed effects might capture some of the omitted variables, it does not solve the problem and we may get biased coefficient estimates. Therefore, we also use the bias-corrected least-squares dummy variable (LSDV-C) estimator by Bruno (2005).

Moreover, we use a panel instrumental variable-generalized least squares (IV-GLS) approach, which is then complemented by estimating the main equations using generalized methods of moments (GMMs).

Although stationarity averages of investment rates and population growth rates are quite consistent with the Solow growth model, constant means of the per capita GDP series are clearly not. Fortunately, the inclusion of the time dummies (interpreted as the evolution of common TFP over time) solves the problem without violating the validity of the additional moment restrictions used by the system-GMM estimator which jointly estimates the equations in first differences, using as instruments lagged levels of the dependent and independent variables, and in levels, using as instruments the first differences of the regressors.

IV. Empirical Analysis

Data and descriptive analysis

Our main dependent variable is real GDP per capita retrieved from the World Bank's World Development Indicators (WDIs).

Fiscal variables come from the WDI and the IMF's International Financial Statistics (IFS). They comprise the Budget Balance (%GDP) and the Central Government Debt (%GDP). On the government revenue side, we have, as percentage of GDP, Total Government Revenue, Tax Revenue, Taxes on Goods and Services, Taxes on Payroll or work force, Taxes on Income, Profits and Capital Gains, Taxes on Property and Social Contributions. On the government expenditure side, we consider, as a percentage of GDP, Total Government Expenditure, Compensation of Employees, Interest Payments, Subsidies, Public Final Consumption Expenditure, and a functional decomposition comprising of Spending on Education, Spending on Health and Spending on Social Security and Welfare.

With respect to human capital proxies, we mainly rely on the average years of schooling for the population over 25 years old from Barro and Lee (2010). The other

[1] Based on the theoretical underpinnings from Landau (1983), Kormendi and Meguire (1985) or Ram (1986).
[2] Using cumulative 5-year nonoverlapping averages to smooth the effects of short-run fluctuations.
[3] On the revenue side, we have (all in %GDP): tax revenues, domestic taxes on goods and services, taxes on income, profits and capital gains, taxes on property, taxes on payroll or work force and social security contributions. On the expenditure side, we have (all in %GDP) compensation of employees, interest payments, subsidies, public final consumption expenditure as well as a functional decomposition comprising of public spending on education, health and social security and welfare.

Table 1. Baseline cross-country growth equations, 5-year averages

Dependent variable	gdppcgr									initot govexp	initot govrev
Estimation	FE (within)										
Sample	ALL										
Specification	1	2	3	4	5	6	7	8	9	10	11
inigdppc	−2.78***					−3.69***	−2.65***	−3.29***	−1.98***	−1.09	3.39**
	(0.459)					(0.603)	(0.502)	(0.650)	(0.443)	(1.847)	(1.309)
totgovexp_gdp		−0.06**				−0.07***		−0.07**			
		(0.023)				(0.022)		(0.027)			
totgovrev_gdp			−0.04				−0.02		−0.01		
			(0.038)				(0.043)		(0.040)		
totgovexpgr				1.39				−4.75			
				(7.249)				(7.903)			
totgovrevgr					27.01***				28.47***		
					(7.427)				(6.610)		
gfcf_gdp						0.14***	0.18***	0.14***	0.16***		
						(0.040)	(0.045)	(0.051)	(0.047)		
Obs.	1395	561	812	446	664	539	783	435	649	392	607
R^2	0.08	0.01	0.00	0.00	0.06	0.19	0.13	0.16	0.17	0.00	0.03

Notes: The models are estimated by within fixed effects (FE-within). The dependent variable is either real GDPpc growth (gdppcgr), the initial level of government expenditure (%GDP) or the initial level of government revenues (%GDP), as identified in the first row. Robust heteroscedastic-consistent SEs are reported in parentheses below each coefficient estimate. Time fixed effects were included, but are not reported. Also a constant term has been estimated, but it is not reported for reasons of parsimony.
** and *** denote significance at 5% and 1% levels, respectively.

regressors, mostly come from either the WDI or from the IMF's IFS: land area, population, real interest rate, interest rate spread (lending rate minus deposit rate), imports and exports of goods and services, labour participation rate, labour force, unemployment, fertility rate, urban population, short-term debt (percentage of exports of goods and services), terms of trade adjustment and real effective exchange rate index.

Baseline results

According notably to Gupta *et al*. (2005), the composition of public outlays has a bearing on the nexus between budget deficits and growth. Table 1 summarizes the results of a series of panel regressions of per capita GDP growth on four variables: total government expenditures (%GDP), total government revenues (%GDP) and their growth rates, using 5-year averages. When expenditure is included alone in the equation, the correlation between government size and growth is negative and significant. Government revenue appears with a negative, though insignificant, coefficient when included alone (specification 3). However, initial government revenues are strongly correlated with initial income per capita (specification 11), a variable which is itself negatively correlated with growth (specification 1). Hence, total government revenue could be capturing part of the effect of initial income when we omit this variable from the equation. Even after controlling for initial income, the coefficient of total government revenue remains negative and insignificant. The increase in government revenues, rather than its absolute size, seems to boost growth (specifications 5 and 9).

Results for the OECD sub-sample (available from the authors) show that both expenditures and revenues appear with statistically significant negative coefficients in almost all regressions. The coefficients of total government revenue and expenditure are negative and significant.

Taking the 'standard' regressors usually present in growth regressions – initial per capita GDP, population growth, trade openness, education and private investment – we explore how sensitive are total government expenditures and revenues when included together with this variable set. Table 2 shows that total government expenditures have a negative and statistically significant effect on output growth for the entire sample as well as for the OECD and emerging economies sub-groups when fixed-effects estimation is carried out. For emerging countries, government revenues have a detrimental effect to growth. Making use of outlier-robust LAD and MM techniques does not alter our results, nor if one controls for endogeneity issues with panel IV-GLS, DIFF-GMM and SYS-GMM.

Economic decomposition

In order to assess the impact of different budgetary sub-components on output growth, we estimate Equation 1, where the vector of controls variables now includes labour force participation rate, population growth, education and private investment.

Furthermore, an expansionary fiscal policy can stimulate aggregate demand and thus growth. To check the importance of these correlations a control variable unemployment has been included in the model, because it is the variable that mostly varies with the business cycle.

Table 3 adds different sub-components of government revenues and expenditures in the estimation process. In Panel A, we include each item, one at a time.

Inspecting first the revenues' (Panel A1), we observe that each component does not significantly affect growth in OECD countries. However, domestic taxes on goods and services have a positive effect on output growth for the full sample and emerging economies sub-group, but not for the OECD. This may seem counter-intuitive, but Helms (1985) and Mofidi and Stone (1990) found that taxes spent on publicly provided productive inputs tend to enhance growth. For the emerging economies group, taxes on income, profits and capital gains have a statistically significant negative impact on growth, whereas taxes on payroll or workforce has a reverse effect.

Turning to the expenditure side (Panel A2), final government consumption has a significantly negative effect on output growth for the full and OECD samples. Indeed, economic theory suggests a variety of explanations for the negative relationship between government spending and growth. First, government spending can crowd out private spending. Second, the level of government spending may proxy other government intrusions into the workings of the private sector. Empirically, our results are in line with the works by Landau (1983, 1986), Grier and Tullock (1989), Barro (1991) and Barro and Sala-i-Martin (1995).

Still in Table 3 (Panel A2), for the OECD sub-group, apart from public investment, which appears with a positive but insignificant coefficient, all remaining spending components adversely affect growth, in particular expenditures with wages and consumption spending. For the full sample and emerging economies sub-group, public investment appears with a significantly negative coefficient. Possibly inefficient and bureaucratic public sectors may generate lobbying, rent-seeking and other nonproductive outcomes and activities that erode potentially the positive contribution coming from such investment. This is also in line with the literature reviewed before (Devarajan *et al*., 1996; Prichett, 1996). In addition, we observe that interest payments and subsidies have a negative effect on GDP per capita growth.

As a next step, we include all components of each budgetary block simultaneously in the regression.

Table 2. Total general government revenue and expenditure and growth

Dependent variable: real GDPpc growth	Fixed effects (within)						FE-LAD		MM		LSDV-C		DIFF-GMM		SYS-GMM	
Sample	All		OECD		Emerging		All									
Specification	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
inigdppc	−4.96***	−6.00***	−2.53***	−2.45***	−3.87***	−7.15***	−4.22***	−4.94***	−0.68***	−0.35*	−5.17***	−5.40***	−4.61***	−8.66***	−0.71***	−0.07
	(0.768)	(0.820)	(0.439)	(0.343)	(1.308)	(1.535)	(0.733)	(0.805)	(0.097)	(0.180)	(0.577)	(0.611)	(1.373)	(1.446)	(0.222)	(0.289)
popgr	−0.48*	−0.31	−0.91**	−1.27***	−1.00**	−1.68**	−0.56***	−0.45***	−0.87***	−0.55**	−0.46*	−0.23	−0.30	0.01	−0.36**	−0.33
	(0.267)	(0.192)	(0.339)	(0.359)	(0.463)	(0.716)	(0.208)	(0.164)	(0.155)	(0.227)	(0.274)	(0.300)	(0.429)	(0.206)	(0.153)	(0.231)
trade_gdp	0.04***	0.05***	0.04**	0.02***	0.02	−0.00	0.04***	0.04***	0.01***	0.01***	0.04***	0.05***	0.12***	0.09***	0.01*	0.01
	(0.012)	(0.013)	(0.014)	(0.009)	(0.022)	(0.038)	(0.012)	(0.011)	(0.002)	(0.002)	(0.010)	(0.009)	(0.025)	(0.022)	(0.006)	(0.005)
gfcf_gdp	0.16***	0.11***	0.13**	0.11**	0.30***	0.32**	0.15***	0.10***	0.15***	0.15***	0.14***	0.13***	0.10	0.01	0.30***	0.25***
	(0.045)	(0.039)	(0.052)	(0.046)	(0.108)	(0.120)	(0.044)	(0.037)	(0.028)	(0.044)	(0.029)	(0.032)	(0.071)	(0.076)	(0.043)	(0.039)
education	0.04***	0.04***	0.02**	0.02***	0.05**	0.04	0.04***	0.03***	0.03***	0.02***	0.05***	0.03**	0.01	0.06***	0.04***	0.02
	(0.010)	(0.010)	(0.006)	(0.006)	(0.020)	(0.030)	(0.009)	(0.010)	(0.006)	(0.007)	(0.014)	(0.014)	(0.027)	(0.021)	(0.010)	(0.011)
totgovrev_gdp	−0.03		−0.03		−0.18***		−0.02		−0.05***		−0.02		−0.06		−0.03	
	(0.040)		(0.035)		(0.041)		(0.033)		(0.015)		(0.027)		(0.067)		(0.032)	
totgovexp_gdp		−0.08***		−0.12***		−0.26***		−0.08***		−0.05***		−0.07**		−0.10***		−0.07***
		(0.024)		(0.022)		(0.086)		(0.023)		(0.014)		(0.029)		(0.036)		(0.023)
Obs.	746	515	202	191	173	113	732	504	746	515	733	503	564	389	746	515
R^2	0.23	0.30	0.27	0.38	0.32	0.35	0.20	0.24								
Hansen (*p*-value)													0.09	0.50	0.37	0.25
AB AR(1) (*p*-value)													0.01	0.00	0.00	0.00
AB AR(2) (*p*-value)													0.46	0.15	0.54	0.07

Notes: The models are estimated by OLS (OLS-pooled), OLS with Least Absolute Deviation robust version (OLS-LAD), MM estimator a la Yohai (1987) which efficiently makes uses of both the S and Huber-type M estimators using iteratively reweighted least squares (IRWLS), Bias-Corrected Least Squares Dummy Variable (LSDV-C), within fixed effects (FE-within), Two-Step robust Difference GMM (DIFF-GMM) and Two-Step robust System GMM (SYS-GMM). For the latter two methods lagged regressors are used as suitable instruments. The dependent variable is real GDPpc growth. Robust heteroscedastic-consistent SEs are reported in parentheses below each coefficient estimate. The Hansen test evaluates the validity of the instrument set, i.e. tests for over-identifying restrictions. AR(1) and AR(2) are the Arellano–Bond autocorrelation tests of first and second order (the null is no autocorrelation), respectively. A constant term has been estimated but it is not reported for reasons of parsimony.

*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

Table 3. Growth equations with budgetary economic decomposition, fiscal variables are introduced one at a time in the benchmark equations

Dependent variable: real GDPpc growth	Fixed effects (within)					
Sample	All	OECD	Emerging	All	OECD	Emerging
	Panel A1			Panel B1		
Specification	1	2	3	4	5	6
Revenue variables						
taxrev_gdp	0.06	0.01	0.03			
	(0.127)	(0.192)	(0.211)			
domtaxesgs_gdp	0.39***	0.01	0.39*	0.50***	−0.28	
	(0.117)	(0.242)	(0.210)	(0.163)	(0.489)	
taxesincome_gdp	−0.07	−0.06	−0.81**	−0.40*	−0.22	−2.24
	(0.060)	(0.091)	(0.378)	(0.205)	(0.355)	(1.425)
taxproperty_gdp	−0.52	−0.31	0.08	−0.85	0.67	
	(0.693)	(0.505)	(1.972)	(0.760)	(0.541)	
taxpayroll_gdp	0.65	0.88	10.30***	−0.05	0.50	−12.96
	(1.089)	(0.538)	(1.841)	(0.763)	(0.766)	(8.861)
taxsscgovrev_gdp	0.03	−0.01	0.20	0.11	−0.02	2.57**
	(0.044)	(0.069)	(0.182)	(0.173)	(0.218)	(1.050)
	Panel A2			Panel B2		
Expenditure variables						
govexpwages_gdp	−0.03	−0.57***	0.15	−0.23	−0.18	−0.20
	(0.159)	(0.153)	(0.225)	(0.177)	(0.197)	(0.218)
intpay_gdp	−0.00	−0.26**	−0.01	0.08	0.55	−0.12
	(0.003)	(0.127)	(0.010)	(0.051)	(0.390)	(0.422)
subs_gdp	0.00	−0.08***	−0.00	−0.04**	−0.11**	0.17**
	(0.001)	(0.019)	(0.003)	(0.019)	(0.042)	(0.064)
govcons_gdp	−0.19***	−0.45***	0.02	−0.28***	−0.34	−0.22
	(0.051)	(0.147)	(0.142)	(0.084)	(0.220)	(0.134)
pubinv_gdp	−0.25***	0.69	−0.38**	−0.28*	−0.46**	−0.68***
	(0.080)	(0.748)	(0.169)	(0.139)	(0.199)	(0.176)

Notes: The models are estimated by within fixed effects (FE-within). The dependent variable is real GDPpc growth. Different individual regressions using the set of 'standard' regressors and controls performed and only coefficients of interest are reported for economy of space. Revenue and expenditure variables were included individually in each regression in Panel A. Simultaneously, inclusion of different budgetary components was performed in Panel B. Full results are available from the authors upon request. Robust heteroscedastic-consistent SEs are reported in parentheses below each coefficient estimate. Time fixed effects were included, but are not reported. Also a constant term has been estimated, but it is not reported for reasons of parsimony.
*, ** and *** denote significance at 10%, 5% and 1% levels.

As when included individually, domestic taxes on goods and services appear with a statistically significant positive coefficient in the growth regression (Panel B1). Regarding taxes on income, profits and capital gains, the negative significance is absent in the emerging economies sub-group, but it is present for the full sample. As regards the OECD sub-group, revenue variables are never significant in per capita GDP growth equations. Taking account of endogeneity problems increases the significance level in most coefficients.

Regarding the expenditure items in Panel B2, evidence suggests a higher importance attributed to government expenditures than to revenues. Apart from expected signs on the basic set of controls as already discussed, a closer inspection indicates that wage spending keeps its negative impact on growth equations, similarly as to when it is included individually in the regression, although not statistically significant. Government final consumption expenditure is detrimental to growth.

Functional decomposition

In terms of the functional decomposition of government expenditures, we differentiate the effects from spending on education, health and social security (and welfare) which constitute the main items of government spending.

In Table 4, Panel A, each of the above spending categories is included in the regression one at a time. For reasons of parsimony, we do not report the full set of coefficient estimates. Regarding social security spending, it has a statistically negative effect on growth in the OECD

Table 4. Growth equations with functional spending: fiscal variables are introduced simultaneously (Panel A) and one at a time (Panel B), benchmark equations

Dependent variable: real GDPpc growth	Fixed effects (within)		
Sample	All	OECD	Emerging
Specification	1	2	3
Panel A			
govexpedu_gdp	0.29	0.11	−0.44
	(0.358)	(0.306)	(0.724)
govexphea_gdp	−0.30	−0.26	2.55
	(0.302)	(0.286)	(2.117)
govexpss_gdp	−0.10	−0.42***	0.49
	(0.115)	(0.093)	(0.283)
Obs.	223	96	56
R^2	0.24	0.32	0.67
Panel B			
govexpedu_gdp	0.04	−0.00	0.62*
	(0.169)	(0.128)	(0.332)
govexphea_gdp	−0.24	−0.30	1.18
	(0.334)	(0.387)	(1.812)
govexpss_gdp	−0.09	−0.42***	0.06
	(0.119)	(0.087)	(0.200)

Notes: The models are estimated by within fixed effects (FE-within). The dependent variable is real GDPpc growth. Different individual regressions using the 'standard' set of regressors and controls were performed and only coefficients of interested are reported for economy of space. Expenditure components (education, health and social security) were included individually in each regression. Full results are available from the authors upon request. Robust heteroscedastic-consistent SEs are reported in parentheses below each coefficient estimate. Time fixed effects were included, but are not reported. Also a constant term has been estimated but it is not reported for reasons of parsimony. *, *** denote significance at 10%, and 1% levels, respectively.

sub-group. This is in accordance with, e.g., Landau (1983, 1986), Barro (1991) and Grier and Tullock (1989).

In Panel B, the three variables of interest are included simultaneously in each regression. In Panel B, the same conclusions apply with the addition that government expenditure on education now affects positively growth in the emerging economies sub-group. It has been argued that investment in human capital like education (Barro and Sala-i-Martin, 1995) and health (Devarajan *et al.*, 1996) has positive effects on growth.

Nonlinearities in budgetary decomposition

The results in the previous sections suggest that the reduction of budget deficits can be conducive to higher growth. Of interest is whether these results hold for all countries (and sub-groups) in the sample(s), in particular, for countries that have already achieved a modicum of macroeconomic (fiscal) stability.[4] Therefore, we split the sample(s) into countries labelled 'above' or 'below', based on a given fiscal threshold. Specifically, an 'above' type country is defined as a country that maintained on average (over time) a budget deficit below 3% of GDP.[5] Conversely, a 'below' type country is such that it maintained an average budget deficit above 3% of GDP.

In Table 5, we report the results with the 3% deficit threshold. First, both the unemployment rate and the dependency ratio appear with a negative and statistically high coefficient in several regressions.

In the fixed-effects specifications for the revenue panel both in the full sample and in the emerging economies sub-group, the case of the below 3% threshold deficit, for the full sample, now registers a statistically positive coefficient on the contributions to social security, which previously were insignificant (but positive still) in Table 3.

Furthermore, for the OECD sub-sample (not shown), coefficient estimates which were entirely insignificant in Table 3 now appear with statistically meaningful coefficients. Moreover, it is interesting to observe that depending whether we take the below or above 3% threshold set of economies, coefficient signs may be reversed (e.g. negative impact of taxes on income, profits and capital gains as well as taxes on payroll or workforce for the above 3% group, but positive ones for the below 3% group). For instance, this can imply that with higher fiscal imbalances, additional taxes on income depress growth.

For the expenditure set of regressions, results are less controversial or dubious in their 'expected' or 'right' coefficient signs. As before, we have negative effects of government spending on wages, final consumption and public investment (the latter notably for the emerging economies sample, regardless of the deficit threshold).

V. Conclusion

We have used a panel of 155 developed and developing countries for the period 1970 to 2008, in order to assess the potential linkage between fiscal policy developments and economic growth.

Our evidence also suggests that for the full sample revenues have no significant impact on growth (though their growth rate has a positive impact), whereas government expenditures appear with highly significant negative signs. If we decompose revenues, our empirical evidence is weak and unclear as to concrete effects, with the more general conclusion that taxes on income are usually detrimental to growth. Regarding expenditures, results are

[4] On the same line, see Adam and Bevan (2001) and Gupta *et al.* (2005).
[5] The 3% value stems from the European Union Stability and Growth Pact (SGP) rationale.

Table 5. Growth equations with budgetary decomposition of public budget balance (revenue and expenditure – nonlinear effects of fiscal policy, according to the 3% budget deficit threshold

Dependent variable: real GDPpc growth	Fixed effects (within)					
Sample	All		All		All	
	>3%	<3%	>3%	<3%	>3%	<3%
Specification	1	2	7	8	13	14
inigdppc	−3.83***	−5.31***	−5.95*	−16.35***	−4.15	−6.25***
	(1.042)	(1.210)	(3.181)	(2.565)	(4.787)	(1.697)
lfp	0.06	−0.12	0.08	−0.32**	−0.19	0.26
	(0.100)	(0.112)	(0.214)	(0.117)	(0.533)	(0.162)
unemp	−0.06	−0.14	−0.58***	0.01	0.32	−0.12
	(0.065)	(0.085)	(0.123)	(0.155)	(0.427)	(0.115)
popgr	0.23	−0.14	0.12	1.64	−0.14	−0.31**
	(0.900)	(0.183)	(0.685)	(0.997)	(2.054)	(0.108)
gfcf_gdp	0.17***	0.18***	0.06	0.36**	0.38**	−0.23
	(0.053)	(0.063)	(0.229)	(0.139)	(0.179)	(0.139)
education	0.04***	0.02	0.07**	0.10***	0.02	−0.04
	(0.013)	(0.019)	(0.031)	(0.026)	(0.017)	(0.052)
depratio_wa	−0.09***	−0.24***	−0.16***	−0.13**	−0.18	−0.30**
	(0.031)	(0.043)	(0.049)	(0.051)	(0.127)	(0.128)
Revenue variables						
domtaxesgs_gdp			0.52*	0.30		
			(0.269)	(0.257)		
taxesincome_gdp			−0.40	−0.25		
			(0.265)	(0.348)		
taxproperty_gdp			−0.35	0.72		
			(0.768)	(2.020)		
taxpayroll_gdp			−0.96	0.35		
			(1.602)	(1.578)		
taxsscgovrev_gdp			0.09	0.58***		
			(0.164)	(0.167)		
Expenditure variables						
govexpwages_gdp					−0.25	−0.19
					(0.285)	(0.233)
intpay_gdp					−4.09	0.18*
					(5.100)	(0.095)
subs_gdp						−0.08**
						(0.034)
govcons_gdp					−0.06	−0.58***
					(0.157)	(0.198)
pubinv_gdp					−0.18	−0.05
					(0.157)	(0.228)
Observations	202	346	48	48	47	58
R^2	0.27	0.29	0.57	0.78	0.61	0.75

Notes: The models are estimated by within fixed effects (FE-within). The dependent variable is real GDPpc growth. 'Above' and 'below' performers are classified as those having maintained an average (over the country's time span) budget deficit below 3% or over 3%, respectively. Robust heteroscedastic-consistent SEs are reported in parentheses below each coefficient estimate. Time fixed effects were included, but are not reported. Also a constant term has been estimated but it is not reported for reasons of parsimony. *, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

more robust and consistent across samples and econometric specifications; in particular public wages, interest payments, subsidies and government consumption are found to negatively affect output growth. Concerning the functional classification of government spending, expenditures on social security and welfare are less growth enhancing, whereas both government spending on education and health boosts growth.

Acknowledgements

The authors are grateful to comments from participants in an ECB seminar. Most of the research was conducted while João Tovar Jalles was visiting the ECB, whose hospitality was greatly appreciated. The opinions expressed herein are those of the authors and do not necessarily reflect those of the OECD, its member countries, the ECB or the Eurosystem. UECE is supported by

Fundacão para a Ciência e a Tecnologia (Portuguese Foundation for Science and Technology) through the project PEst-OE/EGE/UI0436/2011.

References

Adam, C. S. and Bevan, D. L. (2001) *Nonlinear Effects of Public Deficits on Growth*, Paper Prepared at the Cornell/ISPE Conference, September, Ithaca, NY.

Afonso, A. and Alegre, J. (2011) Economic growth and budgetary components: a panel assessment for the EU, *Empirical Economics*, **41**, 703–23.

Afonso, A. and Furceri, D. (2010) Government size, composition, volatility and economic growth, *European Journal of Political Economy*, **26**, 517–32.

Barro, R. J. (1991) Economic growth in a cross section of countries, *Quarterly Journal of Economics*, **106**, 407–44.

Barro, R. J. (1997) *Determinants of Economic Growth: A Cross-Country Empirical Study*, MIT, Cambridge, MA.

Barro, R. and Lee, J. W. (2010) *International Data on Educational Attainment*, *Updates and Implications*, WP 42, Center for International Development, Harvard University.

Barro, R. and Sala-i-Martin, X. (1995) *Economic Growth*, McGraw-Hill, New York, NY.

Baum, N. D. and Lin, S. (1993) The differential effects on economic growth of government expenditures on education, welfare, and defence, *Journal of Economic Development*, **18**, 175–85.

Bruno, G. (2005) Approximating the bias of the LSDV estimator for dynamic unbalanced panel data models, *Economics Letters*, **87**, 361–6.

Devarajan, S. V., Swaroop, V. and Zou, H. (1996) The composition of public expenditure and economic growth, *Journal of Monetary Economics*, **37**, 313–44.

Diamond, P. (1965) National debt in a neoclassical growth model, *American Economic Review*, **55**, 1125–50.

Feder, G. (1983) On exports and economic growth, *Journal of Development Economics*, **12**, 59–73.

Fölster, S. and Henrekson, M. (2001) Growth effects of government expenditure and taxation in rich countries, *European Economic Review*, **45**, 1501–20.

Grier, K. B. and Tullock, G. (1989) An empirical analysis of cross-national economic growth: 1951–80, *Journal of Monetary Economics*, **24**, 259–76.

Gupta, S., Baldacci, E., Clements, B. *et al.* (2005) What sustains fiscal consolidations in emerging market countries?, *International Journal of Finance and Economics*, **10**, 307–21.

Helms, L. J. (1985) The effect of state local taxes on economic growth: a time series cross-section approach, *Review of Economics and Statistics*, **67**, 574–82.

Koester, R. B. and Kormendi, R. (1989) Taxation, aggregate activity and economic growth: cross-country evidence on some supply-side hypotheses, *Economic Inquiry*, **27**, 367–86.

Kormendi, R. C. and Meguire, P. G. (1985) Macroeconomic determinants of growth: cross-country evidence, *Journal of Monetary Economics*, **16**, 141–64.

Landau, D. (1983) Government expenditure and economic growth: a cross-country study, *Southern Economic Journal*, **49**, 783–92.

Landau, D. (1986) Government and economic growth in the less developed countries: an empirical study for 1960–1980, *Economic Development and Cultural Change*, **35**, 35–75.

Lee, J.-W. (1995) Capital goods imports and long-run growth, *Journal of Development Economics*, **48**, 91–110.

Modigliani, F. (1961) Long-run implications of alternative fiscal policies and the burden of the national debt, *Economic Journal*, **71**, 730–55.

Mofidi, A. and Stone, J. (1990) Do state and local taxes affect economic growth?, *Review of Economics and Statistics*, **72**, 686–91.

Nelson, M. A. and Singh, R. D. (1994) Deficit–growth connection: some recent evidence from developing countries, *Economic Development and Cultural Change*, **43**, 167–91.

Plosser, C.I. (1992) The search for growth, in *Policies for Long-Run Economic Growth*, Federal Reserve Bank of Kansas City, Kansas City.

Prichett, L. (1996) Mind Your p's and q's: the cost of public investment is not the value of public capital, World Bank Working Paper 1660, World Bank, Washington, DC.

Ram, R. (1986) Government size and economic growth: a new framework and some evidence from cross-section and time series data, *American Economic Review*, **76**, 191–203.

Romer, P. M. (1990) Endogenous technological change, *Journal of Political Economy*, **98**, 71–102.

Romero-Avila, D. and Strauch, R. (2008) Public finances and long-term growth in Europe – evidence from a panel data analysis, *European Journal of Political Economy*, **28**, 172–91.

Saint-Paul, G. (1992) Fiscal policy in an endogenous growth model, *Quarterly Journal of Economics*, **107**, 1243–59.

Sala-i-Martin, X. (1997) I just ran two million regressions, *American Economic Review*, **87**, 178–83.

Slemrod, J., Gale, W. and Easterly, W. (1995) 'What do cross-country studies teach about government involvement, prosperity, and economic growth?', *Brookings Papers on Economic Activity*, **2**, 373–431.

Yohai, V. J. (1987) High breakdown-point and high efficiency robust estimates for regression, *The Annals of Statistics*, **15**, 642–56.

Zagler, M. and Durnecker, G. (2003) Fiscal policy and economic growth, *Journal of Economic Surveys*, **17**, 397–418.