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Fiscal composition and long-term growth

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FISCAL COMPOSITION AND LONG-TERM GROWTH

António Afonso and João Tovar Jalles

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I ABSTRACT

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 not growth enhancing, as well as public wages, interest payments, subsidies and government consumption. Spending on education and health boosts growth; and there is weak evidence supporting causality running from expenditures and revenues to output.

JEL Classification C23, E62, H50.

Keywords Budget deficit, budget decomposition, panel analysis, panel causality

2 NON-TECHNICAL SUMMARY

In this study we use a large panel of developed and developing countries for the period 1970-2008. In the empirical estimations we use growth specifications and address extensively several econometric caveats that usually plague such empirical work: outliers, simultaneity, endogeneity, cross-sectional dependence, causality, nonlinearities and threshold effects.

Specifically, we examine the following issues: the influence of which budgetary components have a stronger influence in affecting (positively or negatively) per capita GDP growth rates; the change in coefficient signs (and magnitudes) with different government debt and budget deficit ratios thresholds; differences in these relationships between country groups and robustness to different econometric specifications; the direction of causality; is there evidence in favour of Keynesian (or non-Keynesian) effects or supporting the existence of Wagner's Law?

Therefore, the contributions of our paper include: i) the assessment of the fiscal composition-growth nexus with a diversified variety of methods, providing sensitivity and robustness and dealing notably with model uncertainty; ii) the study of the relevance of economic and functional government expenditure categories and of revenue sub-components; iii) panel Granger causality tests, and the assessment of the existence of cross-sectional dependence within homogeneous groups of countries.

Our evidence 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 significant negative signs. The same is true for the OECD subsample with the addition that now total government revenues have a negative impact on growth (however, when included together with other regressors it loses significance).

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 less welcome for growth. An increase in any kind of taxes is usually beneficial for public investment though. As for expenditures, results are 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. Public investment, perhaps oddly, has a negative effect on GDP growth. Regarding the functional classification of government spending, expenditures on social security and welfare are detrimental to growth, whereas both government spending on education and health boosts growth. Most results are confirmed even after we address cross-sectional dependence.

Granger causality tests find relatively weak evidence supporting causality running for expenditures or revenues to GDP per capita, but the reverse appears to be consistently stronger, that is, evidence

of the Wagner Law notably on the spending side. For the OECD these effects are usually more pronounced.

Interestingly, and depending whether we take the below or above 3% threshold budget deficit set of economies, we observe a negative impact, on growth, of taxes on income, profits and capital gains as well as taxes on payroll or workforce for the above 3% group, but a positive one for the below 3% group of countries.

"…history makes clear that countries that continually spend beyond their means suffer slower growth in incomes and living standards and are prone to greater economic and financial instability. Conversely, good fiscal management is a cornerstone of sustainable growth and prosperity."

Ben Bernanke, Annual Meeting of the Rhode Island Public Expenditure Council, October 4, 2010.

3 INTRODUCTION

According to conventional wisdom, in most countries (particularly developing ones), larger budget deficits have coincided in the past with less efficient government spending, large bureaucracies, and other counterproductive economic policies. Hence, among the factors that determine economic growth, government spending and fiscal policies in general are of particular interest. Such fiscal-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 stabilisers and of possible counter-cyclical discretionary fiscal policies, which implies the building up of larger budget deficits and possible 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 paper.

The empirical analysis of the impact of fiscal components on long-run growth include the early works by Feder (1983), Landau (1983), Ram (1986), Grier and Tullock (1989), Romer (1990), Barro (1990, 1991), Derajavan et al. (1996) and Sala-i-Martin (1997). Most of these studies used cross-section 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. When economic growth is regressed on government spending, researchers tend to interpret this as an eventual confirmation of causality from the latter to the former. Nevertheless, a significant coefficient can be equally compatible with the Keynesian view (causality from government expenditure to growth), Wagner's Law (from growth to spending) and/or a bi-directional causality between the two variables.

In this study we use a large panel of developed and developing countries for the period 1970-2008. In the empirical estimations of growth specifications we address several of the econometric caveats that usually plague such analyses: outliers, simultaneity, endogeneity, cross-sectional dependence, causality, nonlinearities and threshold effects. Specifically, we examine: which budgetary

components have a stronger influence in affecting (positively or negatively) 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; evidence favouring Keynesian (or non-Keynesian) effects of fiscal components or supporting the existence of Wagner's Law?

Therefore, the main contributions of this paper include: i) a detailed assessment of the fiscal decomposition-growth nexus with a diversified variety of methods, providing sensitivity and robustness; ii) the split between economic and functional government expenditure categories; iii) panel Granger causality tests..

In a nutshell, our results comprise notably: i) for the full sample revenues have no significant impact on growth whereas government expenditures have significant negative effects; ii) the same is true for the OECD sub-sample with the addition that total government revenues have a negative impact on growth; iii) taxes on income are less welcome for growth; iv) public wages, interest payments, subsidies and government consumption have a negative effect on output growth; v) expenditures on social security and welfare are less growth enhancing; vi) both government spending on education and health boosts growth; vii) there is weak evidence supporting causality running for expenditures or revenues to GDP per capita; viii) there is evidence supporting Wagner's Law.

The paper is organised as follows. Section 2 surveys the literature on the effects of fiscal policy and budget composition on economic growth. Section 3 describes the analytical and econometric methodology. Section 4 presents the data and discusses our main results. The last section concludes.

4 LITERATURE

The nexus between fiscal policy and growth has been a subject of several previous studies (see Zagler and Durnecker, 2003, for a survey). Likewise, Gemmell (2004) has summarised several empirical work and explains that it is important to distinguish between productive and non-productive expenditure, and that results depend on whether the simultaneous effects of different revenue and expenditure categories as well as the budget deficit decisions have been taken into account or not. Nevertheless, it is not so clear whether and to what extent public spending on education and health should be considered as productive expenditure because of their effects on human capital accumulation. On the other hand, Amsden (1989) and Epstein and Gintis (1995) provide two reviews suggesting that the government, via appropriate policies, can foster productive activities and decrease unproductive ones.

Some pioneer theoretical contributions, which serve as the underlying framework for our empirical analysis, are notably Modigliani (1961), Diamond (1965), and Saint-Paul (1992). For instance, Carlstrom and Gokhale (1991) argue, by means of simulations, that when government expenditures increase permanently they undermine long-run output. On the other hand, with an endogenous growth model, Cashin (1994) reports that increased government spending on productive items generate positive externalities, raising private investment and economic growth. However, additional spending has to be covered by additional taxes that reduce the marginal return to private capital and so dampen economic growth. Nevertheless, Slemrod, Gale and Easterly (1995) did not find conclusive correlations between taxes and the level of per capita income in their theoretical model.

Regarding empirical studies, 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). Easterly and Rebelo (1993) take 100 countries from 1970 to 1988 and find that i) there is a strong association between the development level and the fiscal structure in poor countries relying heavily on international trade taxes, while income taxes are only important in advanced countries; ii) investment in transport and communication is consistently correlated with growth; iii) while the effects of taxation are difficult to isolate empirically.

Lee (1995) found that government consumption was associated with slower growth for a sample of 89 developed and developing countries for the period 1960-1985. With opposing results, Slemrod et al. (1995) report 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.[1] Engen and Skinner (1992) mention that a balanced-budget increase in government spending reduces output growth in a sample of 107 countries from 1970 to 1985. 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 advanced countries, by means of time series techniques for 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 over the business cycle. Regarding advanced economies, Folster and Henrekson (1999) report a tendency towards a negative growth effect of large public expenditures, which is robust across different econometric specifications. Conte and Darrat (1988) study OECD countries between 1960 and 1984 find that government growth has had mixed effects on economic growth rates.

Hakro (2009) finds evidence of a positive relationship between government expenditure and GDP per capita growth for 21 Asian countries. On the other hand, Ghura (1995) finds a negative relationship between government consumption and economic growth in 33 Sub-Saharan African countries. Bairam (1990) using a sample of 20 African countries from 1960 to 1985 finds that the effects of government expenditure cannot be generalized.

It is interesting to notice that when it comes to public investment one would expect it to boost growth. However, 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 two distinct time periods (1970-79; 1980-89) and find that the effects of public investment on growth are mixed.[2] One the one hand, higher public investment raises the national rate of capital accumulation above the level chosen (in a presumed rational fashion) by private sector agents. Therefore, public capital spending may crowd out private expenditures on capital goods on an ex-ante basis as individuals seek to re-establish an

[1] However, they found a negative correlation between changes in expenditure ratios and growth in OECD countries.

[2] As a consequence, the share of public investment can be a very poor measure of the actual increase in economically productive public capital.

optimal inter-temporal allocation of resources. On the other hand, public capital – particularly infrastructure capital – is likely to bear a complementary relationship with private capital in the private production technology. Thus, higher public investment may raise the marginal productivity of private capital and thereby crowd-in private investment and adversely affect output growth in net terms (see Afonso and St. Aubyn, 2009). Even when public investment affects output positively it does not imply that increases in public investment represent an effective growth strategy.

Slemrod et al. (1995) found a positive correlation between the tax revenue-to-GDP ratio and the level of real GDP per capita across countries, particularly when developing countries were included in the sample. 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. For Khan and Ahmed (1999) improved health conditions contribute positively to economic growth in several ways, enhancing the quality of work and labour productivity. Baum and Lin (1993) taking a heterogeneous sample of 47 countries find that the growth rate of educational expenditures has a significant positive impact on growth. The growth rate of welfare expenditures has a negative and insignificant impact on growth. Differently, Landau (1986) reports that government educational expenditure has noticeably reduced economic growth.

5 METHODOLOGY

5.1 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,[3] investment-to-GDP ratio (a proxy for physical capital), a measure of human capital or educational attainment and the population growth rate, augmented with government expenditures and revenues components.[4] As a result, the aggregate production function is *Y=F(L,K,G)* 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;[5] $x^j{}_{it}$ *j=1,2* is a vector of control variables ($x^1{}_{it}$ comprises of 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);[6] G_{it} is a fiscal policy-related variable, either total government revenues or expenditures (or their respective sub-components7); 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 to be estimated. In addition, and in order to assess an eventual non-linear relationship, a squared term can also be included for the relevant fiscal variable

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[3] The initial level of income per capita is a robust and significant variable for growth (in terms of conditional or beta convergence).

[4] Based on the theoretical underpinnings from Landau (1983), Kormendi and Meguire (1985) or Ram (1986).

[5] Using cumulative 5-year non-overlapping averages to smooth the effects of short-run fluctuations

[6] For more details refer to Section 4.1 (“Data and Descriptive Statistics”).

[7] 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.

5.2 ECONOMETRIC APPROACHES

Panel Techniques

Cross-country regressions are usually based, in this context, on average values of fiscal variables and growth over long time periods. For instance, 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 Given that technological change occurs over time, a time index is a logical way to control for the effect of technological progress on the evolution of per capita GDP growth. However, the effect of technological change on output growth would likely not be well captured by a simple time trend that assumes a constant effect over time.[8] Therefore, non-linear effects of technological change on output growth are allowed for by using individual year indicator dummies in most estimated panel models.

Finally, another contribution in our study is the use of two robust estimators: the Method of Moments(MM) (Yokai, 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 (if we miss out an important variable it not only means our model is poorly specified it also means that any estimated parameters are likely to be biased),[9] it does not solve the problem and we may get may get biased coefficient estimates. Moreover, panel data estimations may yield biased coefficient estimates when lagged dependent variables are included. In our case, initial income (or lagged income when using annual observations) is a regressor which is also present in the dependent variable, the rate

[8] Indeed, a Lowess smoothing of per capita GDP against government expenditure and revenue (not shown) suggests that there are some non-linear relationships.

[9] If the variables are uncorrelated with the omitted variables, then our results my be unbiased. Thus, by not using predictors that might be correlated with a possible important omitted variable, we may reduce the bias. Therefore, if we put a predictor that is correlated with an omitted variable into our model, we generate endogeneity bias. On the other hand, the more variables that we have in our model, the less likely it is that we are omitting something.

growth of per capita GDP. Therefore, we also use the bias-corrected least-squares dummy variable (LSDV-C) estimator by Bruno (2005).

Moreover, we use a panel Instrumental Variable-Generalised Least Squares (IV-GLS) approach, which is then complemented by estimating the main equations using Generalised Methods of Moments (GMM). The first-differenced GMM estimate can be poorly behaved if the time series are persistent. This problem can get very serious in practice and authors like Bond et al.(2001) suggest the use of a more efficient GMM estimator, the system estimator, to exploit stationarity restrictions.

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, also here, the inclusion of the time dummies solves the problem without violating the validity of the additional moment restrictions used by the system GMM estimator. In the type of convergence regressions to be analysed, the succession of time dummies can be interpreted as the evolution of common TFP over time.[10]

Hence, we estimate the growth specifications by system-GMM (SYS-GMM) 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. Regarding the information on the choice of lagged levels (differences) used as instruments in the difference (level) equation, as work by Roodman (2009) has indicated, when it comes to moment conditions more is not always better.[11]

Panel Granger causality

We also perform a panel version of a Granger-causality test between per capita GDP (and TFP) and fiscal variables, similarly to Huang and Temple (2005).[12]

Since causality can run in either direction, one cannot take government expenditures and government revenues as strictly exogenous. Alternatively, we run partial adjustment specifications which allow feedback by means of sequential moment conditions to identify the model (see

[10] Since the empirical model assumes that production technology is homogeneous across countries there is nothing inherently inconsistent with the assumption that TFP growth is the same across countries. The period covered by the data includes a number of characteristic slumps (e.g. the two oil crises in the 1970s), but nevertheless one is able to identify a generally upward movement of TFP, particularly in the 1990s.

[11] The GMM estimators are likely to suffer from "overfitting bias" once the number of instruments approaches (or exceeds) the number of groups/countries. In the present case, the choice of lags was directed by checking the validity of different sets of instruments and we rely on comparisons of first stage R-squares.

[12] These authors applied the same technique to study the trade-finance relationship in a panel of heterogeneous countries.

Arellano, 2003). The standard approach in the literature would be to specify an AR(1) model as follows:

$$y_{it} = \alpha_1 y_{it-1} + \beta_1 x_{it-1} + \eta_i + \phi_t + v_{it}, \quad (2)$$
$$i = 1,2,...N; t = 1,2,...T$$

where in our case y_{it} is real per capita GDP and x_{it} will be independent government expenditures and revenues (deflated and in per capita terms). The reverse relationship is also explored to test notably the hypothesis of the Wagner's Law holding for the full sample and OECD sub-sample.

The model in (3) allows for unobserved heterogeneity through the individual effect η_i that captures the joint effect of time-invariant omitted variables. ϕ_t is a common time effect, while v_{it} is the disturbance term. We also assume that x_{it} is potentially correlated with η_i and may be correlated with v_{it}, but is uncorrelated with future shocks $v_{it+1}, v_{it+2}, ...$ The model can be estimated by first-differencing (3) to get rid of the individual effects, and then using lagged levels of y_{it} and x_{it} dated *t-2* (and earlier) as instruments. However, a more efficient GMM estimator can be employed by using more of the available moment conditions, as suggested by Arellano and Bond (1991), who proposed the use of all available lagged levels of y_{it} and x_{it} dated *t-2* (and earlier). We name this estimator DIF-GMM. In this context, we also use Hansen J's test to assess the model specification and overidentifying restrictions.

As there are a number of limitations of DIF-GMM estimation[13], under the assumptions set in Arellano and Bover (1995), the system-GMM estimator can be used to alleviate the weak instruments problem. In our setting, the SYS-GMM uses the standard moment conditions, while SYS-GMM1 (modified 1) only uses the lagged first-differences of y_{it} dated *t-2* (and earlier) as instruments in levels and SYS-GMM2 (modified 2) only uses lagged first-differences of x_{it} dated t-2 (and earlier) as instruments in levels.

In the AR(1) model, one hypothesis of economic interest is the null $\beta_1 = 0$ – this can be interpreted as a panel data test for Granger causality. Even though a Wald-type test of this restriction (a standard t-ratio) could be used, we make use of an alternative methodology. Specifically, we estimate both the unrestricted and the restricted models using the same moment conditions, and then compare their (two-step) Hansen J statistics using an incremental Hansen test defined as:

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[13] For instance, the lagged levels of the series may be weak instruments for first differences, especially when they are highly persistent, or the variance of the individual effects is high relative to the variance of the transient shocks

$$D_{RU} = n(J(\tilde{\gamma}) - J(\hat{\gamma})) \qquad (3)$$

where $J(\tilde{\gamma})$ is the minimized GMM criterion for the restricted model, $J(\hat{\gamma})$ for the unrestricted model, and *n* is the number of observations.[14] The intuition is that, if the parameter restriction ($\beta_1 = 0$) is valid, the moment conditions should keep their validity even in the restricted model.[15]

There are some additional issues of interpretation worth discussing in the context of the use of the above model. One may be interested in the stability of the estimated model. If our model is stable, we can compute a point estimate for the long-run effect of x_{it} on y_{it}:

$$\beta_{LR} = \beta_1 / (1 - \alpha_1), \qquad (4)$$

and we can estimate an approximate standard error for this long-run effect using the Delta Method.

Lastly, we can test for unobserved heterogeneity. In the absence of individual effects, the following additional moment conditions become valid, corresponding to the use of lagged-levels as instruments in the levels equation:

$$\begin{aligned} &E[y_{it-1}(y_{it} - \alpha_1 y_{it-1} - \beta_1 x_{it-1} - \phi_t)] = 0 \\ &E[x_{it-1}(y_{it} - \alpha_1 y_{it-1} - \beta_1 x_{it-1} - \phi_t)] = 0 . \quad (5) \\ &t = 2,...,8 \end{aligned}$$

The validity of these additional set of moment conditions (that can be tested using an incremental Hansen test relative to difference or system GMM), can be evaluated with a test for the presence of unobserved heterogeneity (where the null is no heterogeneity). The motivation for using this test is that, if individual effects are absent, the pooled OLS will be a consistent estimator, despite not fully efficient given the presence of heteroskedasticity.

Cross-sectional dependence

We are aware of the potential issue (in particular, bias in coefficient estimates) induced by a significant cross-sectional dependence (within similar groups of countries in our sample) in the error term of the model. As put forward by Eberhardt et al. (2010), the so-called unobserved common factor technique relies on both latent factors in the error term and regressors to take into account the existence of cross-sectional dependence. Developed with the panel-date/time-series econometric literature over the course of the past few years, this method has been largely employed in macroeconomic panel data exercises (see, e.g., Pesaran (2004, 2006), Coakley et al. (2006),

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[14] Under the null, D_{RU} is asymptotically distributed as χ_r^2 where *r* is the number of restrictions.

[15] For more details see Bond and Windmeijer (2005).

Pesaran and Tosetti (2007), Bai (2009), Kapetanios et al. (2009), Afonso and Rault (2010) and Eberhardt and Teal (2011 and references therein)). This common factor methodology takes cross-sectional dependence as the outcome of unobserved time-varying omitted common variables or shocks which influence each cross-sectional element in a different way. Cross-sectional dependence in the error term of the estimated model results then in inconsistent coefficient estimates if independent variables are correlated with the unspecified common variables or shocks.[16]

With this in mind, we test for the presence of cross-sectional dependence Pesaran's (2004) CD test statistic based on a standard normal distribution. We then run some of the most important regression equations with Driscoll-Kraay (1998) robust standard errors.[17] Given the particular nature of the dependent variable and the possibility of error dependence we also rely on the Pesaran (2006) common correlated effects pooled (CCEP) estimator. This isa generalization of the fixed effects estimator that allows for the possibility of cross section correlation. Including the (weighted) cross sectional averages of the dependent variable and individual specific regressors is suggested by Pesaran (2006, 2007, 2009) as an effective way to filter out the impacts of common factors, which could be common technological shocks or macroeconomic shocks, causing between group error dependence.

[16] There are different ways to account for such error cross-sectional dependences (see, e.g., Sarafidis and Wansbeek (2010) for an overview).

[17] This non-parametric technique assumes the error structure to be heteroskedastic, autocorrelated up to some lag and possibly correlated between the groups.

6 EMPIRICAL ANALYSIS

6.1 DATA AND DESCRIPTIVE ANALYSIS

The dataset was collected from several sources (see the Appendix for definitions, acronyms and sources). Our main dependent variable is real GDP per capita retrieved from the World Bank's Word Development Indicators (WDI).

Fiscal variables come from the WDI, the IMF's International Financial Statistics (IFS) and Easterly's (2001) data. They comprise the Budget Balance (% GDP) and the Central Government Debt (% GDP) – the latter retrieved from the IMF's historical debt database due to Abas et al. (2010). On the government revenue side we have, as % 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 % 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.

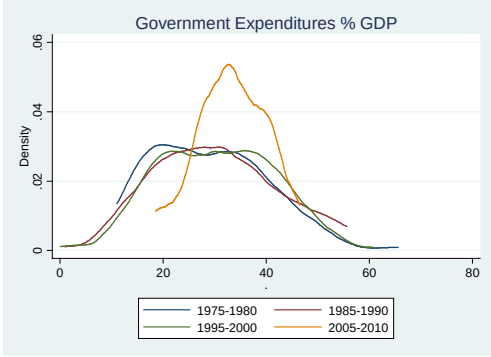
With respect to human capital proxies we mainly rely on the average years of schooling for the population over 25 years old from the international data on educational attainment by Barro and Lee (2010), but we also take the literacy rate (% of people ages 15 to 24), primary school enrolment (% gross), primary school duration (years), secondary school enrolment (% gross), secondary school duration (years), tertiary school enrolment (% gross) and tertiary school duration (years) from the WDI, for robustness purposes.

As for other controls and regressors, most come from either the WDI or from the IMF's IFS, as follows: land area (in square kilometres), population, real interest rate (%), interest rate spread (lending rate minus deposit rate), imports and exports of goods and services (BoP, current USD), labour participation rate (% of total labour force), labour force, unemployment, (% of total labour force), fertility rate (births per woman), urban population (% of total), short-term debt (% of exports of goods and services), terms of trade adjustment (constant LCU), real effective exchange rate index (2000=100).

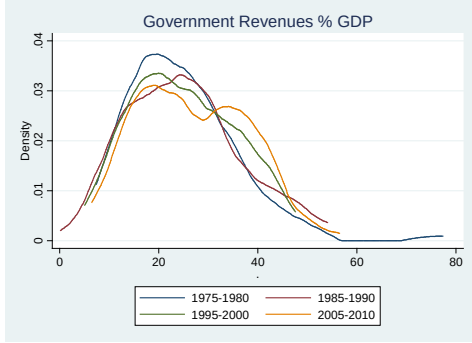
It is also interesting to see how these three aggregates evolved over time. For this purpose we plot the Kernel density estimates (Figure 1). We see that government spending and revenue have increased throughout time, which implies an increase of the size of the government notably when trying to provide the additional services related to the welfare state. This result is particularly clear for the case of government spending, in all country sub-groups.

Figure 1 Kernel Density estimates Expenditures and Revenues (% GDP)

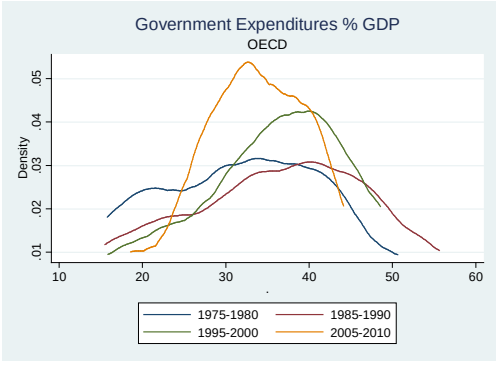
(a)



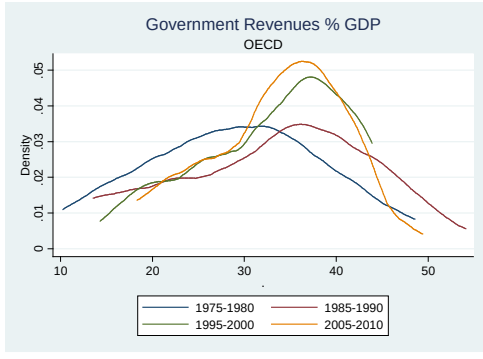
(d)



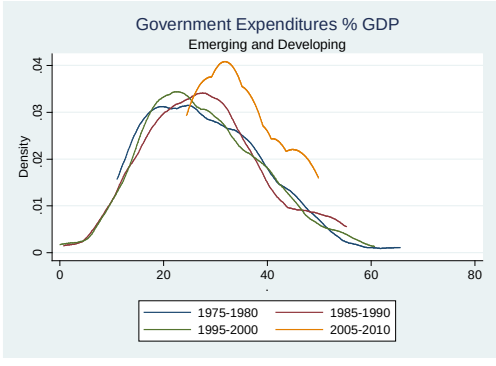
(b)



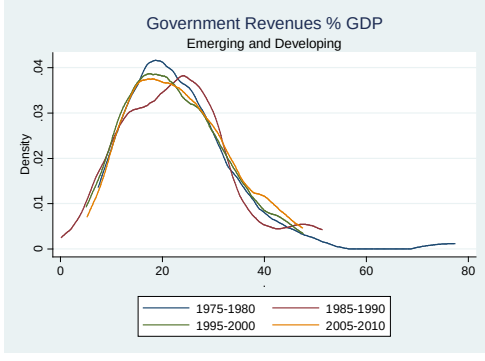
(e)



(c)



(f)



Source: Authors' estimates.

6.2 PRELIMINARY 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 at the 1 percent level. 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). If instead of fixed-effects we accounted for endogeneity problems and ran an IV-GLS regression results don't change.

[Table 1]

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. Moreover, and even if both variables are strongly correlated with initial income per capita, after controlling for initial income, we still get the same result. The coefficients of total government revenue and expenditure are negative and significant. Contrary to the full sample case, government revenue growth is detrimental to economic growth. The same is true for spending growth (previously insignificant for the full sample).[18]

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.[19] Making use of outlier-robust LAD and MM techniques does not alter our results[20], nor if one controls for endogeneity issues with panel IV-GLS, DIFF-GMM and SYS-GMM. Therefore, the statistically significant negative coefficient of total government expenditures is robust across econometric specifications, whereas less clear results (insignificance) are attributed to the effects of government revenues on output growth. As an additional robustness exercise, conducting the same analysis with annual data instead doesn't alter qualitatively our previous findings.

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[18] An IV-GLS estimation does not alter the main findings.

[19] Running an IV-GLS estimator strenghtens our results and increases the magnitude of the coefficient estimates.

[20] Given that outliers do not seem to strongly affect the total number of observations nor the coefficient estimates, for the remainder of the paper we shall focus solely on fixed-effects and on endogeneity-related econometric techniques (mostly panel IV-GLS and GMM).

[Table 2]

6.3 BUDGETARY 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, private investment.

We know that a typical business cycle correlation might imply that when growth falls, government expenditure increases and tax revenues would typically decrease. 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 presents the results for our benchmark equation using fixed-effects and system-GMM.[21] It is worthwhile mentioning the negative effect of the unemployment rate on growth when running fixed-effects (specification 1).

[Table 3]

Subsequently we move to the inclusion of different sub-components of government revenues and expenditures in the estimation process. In Table 4 (panel A) we include each item, one at a time.

[Table 4]

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 counterintuitive, but Helms (1985) and Mofidi and Stone (1990) found that taxes spent on publicly provided productive inputs tend to enhance growth.[22] 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. [23]

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

[21] IV-GLS estimation does not alter the results.

[22] Theoretically, in Barro-style models, increases in taxes can enhance, have no effect or impede growth depending, in particular, on the initial level of taxes as well as how revenues are spent.

[23] Most growth models predict that taxes on investment and income have a detrimental effect on growth. These taxes affect the growth rate through a direct channel, reducing the private returns to accumulation. On empirical grounds, the effects of taxes on growth are not so clear and most research has focused on OECD countries.

a variety of explanations for the negative relationship between government spending and growth. First, government spending can crowd out private spending.[24] Second, the level of government spending may proxy other government intrusions into the workings of the private sector, especially regulations which restrain economic growth and efficiency. Empirically, our results are in line with the works by Landau (1983, 1986), Grier and Tullock (1989), Barro (1991), Barro and Sala-i-Martin (1995), who have found a negative effect of government consumption on growth.

Still in Table 4 (panel A), 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 non-productive outcomes and activities that erode potentially the positive contribution coming from such investment. This is also in line with the literature reviewed before (notably Devarajan et al., 1996, and Prichett, 1996).

In addition, we observe that interest payments and subsidies have a negative effect on GDP per capita growth, the latter eventually due to the fact that it creates deadweight loss inefficiencies when distorting the market from its own natural equilibrium.

As a sensitivity exercise (not shown) we have repeated the analysis without labour force participation and unemployment. A few differences are worth mentioning. On the revenue side the statistical significance is lower, particularly with respect to domestic taxes on goods and services, which are no longer significant in any regression. Taxes on income become statistically significant and negative in specification 1, thereby adversely affecting output growth. On the expenditure side results are kept qualitatively unchanged.

As a next step we include all components of each budgetary block simultaneously in the regression. Table 4, Panel B, reports the results for both the revenue and expenditure blocks. As when included individually, domestic taxes on goods and services appear with a statistically significant positive coefficient in the growth regression. 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 (with a corresponding panel IV-GLS approach – not shown) increases the significance level in most coefficients, in particular the basic set of controls

[24] In theory, government expenditure can be allocated to growth enhancing infrastructure and education but outlays also go for redistribution or government-mandated consumption, which does not improve productivity.

(negative effect of unemployment for both the full and OECD samples; negative effect of population growth. Most revenues' coefficients for the OECD sub-group remain insignificant.[25]

Regarding the expenditure items in Panel B2, on average, the R-squares are somewhat higher than when disaggregated revenues are included in the regressions. Overall, 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. As with the case of government revenues, when endogeneity is taken into account, most coefficients increase their significance levels with "right" sign estimates. Moreover, R-squares increase from FE to IV-GLS estimation in every specification.

6.4 BUDGETARY FUNCTIONAL DECOMPOSITION

Government spending can play an essential role in economic development by maintaining law and order, providing economic infrastructure, harmonizing conflicts between private and social interests, increasing labour productivity through education and health and enhancing export industries. Hence, 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 5, 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 sub-group. This is in accordance with e.g. Landau (1983, 1986), Barro (1991) and Grier and Tullock (1989) who found a negative relationship between social expenditures and growth.

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.

[Table 5]

[25] Alternatively, running system-GMM for the full sample (not shown) removes any statistically significance out of the revenue's categories, confirming Easterly and Rebelo's (1993) claim that taxes are difficulty to isolate empirically.

6.5 CROSS-SECTIONAL DEPENDENCE

As discussed in Section 3 it is natural to suspect about the existence of cross-sectional dependence across homogeneous groups of economies. Therefore, we use Pesaran's CD test[26] for the OECD sub-samples and we find a statistic of 15.26, corresponding to a p-value of zero (the null hypothesis is cross-sectional independence).

In Table 6 we run benchmark type growth regressions for this OECD sample using both a Driscoll-Kraay robust estimation approach and the Pesaran's Common Correlated Effects Pooled Estimator (CCEP).[27] Similarly to our earlier results we find negative and statistically significant coefficients for the effect of total government expenditures and revenues on output growth (the latter only true when running the Driscoll-Kraay regression). We find a negative effect of revenues' growth rate, confirming previous results. As for specifications 5 and 10 both government spending on education and health yield insignificant coefficients, though social security spending yields a statistically negative coefficient – reinforcing our previous results.

[Table 6]

6.6 NON-LINEARITIES IN BUDGETARY DECOMPOSITION

An additional exercise is to further explore possible effects coming from non-linearities in the context of the 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.[28] Therefore, we spit 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. Conversely, a "below" type country is such that it maintained an average budget deficit above 3% of GDP.[29] In Table 7 we report the results with the 3% deficit threshold.[30]

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[26] A standard growth equation including a basic set of controls and the debt ratio is estimated with within fixed effects.

[27] We restrict ourselves to the examination of seven main variables of interest: total government expenditures and revenues (% GDP), their respective growth rates, and the functional decomposition of government expenditures (education, health, and social security and welfare).

[28] On the same line see Adam and Bevan (2001) and Gupta et al. (2005).

[29] The 3% value is an ad-hoc number stemming from the European Union Stability and Growth Pact (SGP) rationale. For the OECD sub-group, countries classified as being "above" average, lower deficits, are: Australia, Canada, Czech Republic, Denmark, Finland, France, Germany, Iceland, Korea, Luxembourg, Netherlands, New Zealand, Norway, Poland, Slovakiam Spain, Switzerland, UK and US. The "below" average ones, higher deficits, are: Austria, Greece, Hungary, Ireland, Italy, Japan, Mexico, Portugal, Sweden and Turkey.

[30] Needless to say that some of these results require care in interpretation given the truncated nature of the resulting sample and reduced number of available observations.

First, both the unemployment rate and the dependency ratio appear with a negative and statistically high coefficient in several regressions.

[Table 7]

In the fixed-effects specifications 7-12 for the revenue panel both in the full sample and in the emerging economies sub-group, some points are worthwhile emphasizing. Apart from retaining the positive coefficient on domestic taxes on goods and services that we have commented on before, the case of the below 3% threshold, for the full sample, now registers a statistically positive coefficient on the contributions to social security, which previously where insignificant (but positive still) in Table 4. For the case above 3%, the emerging economies sub-group retain the statistically negative impact of social security contributions allocated in Table 4 for the entire emerging group (though now with an increased magnitude of the estimate). For this group of countries, taxes on income, profits and capital gains is detrimental to growth in the below 3% deficit set of economies.

Furthermore, for the OECD sub-sample, coefficient estimates which were entirely insignificant in Table 4 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.

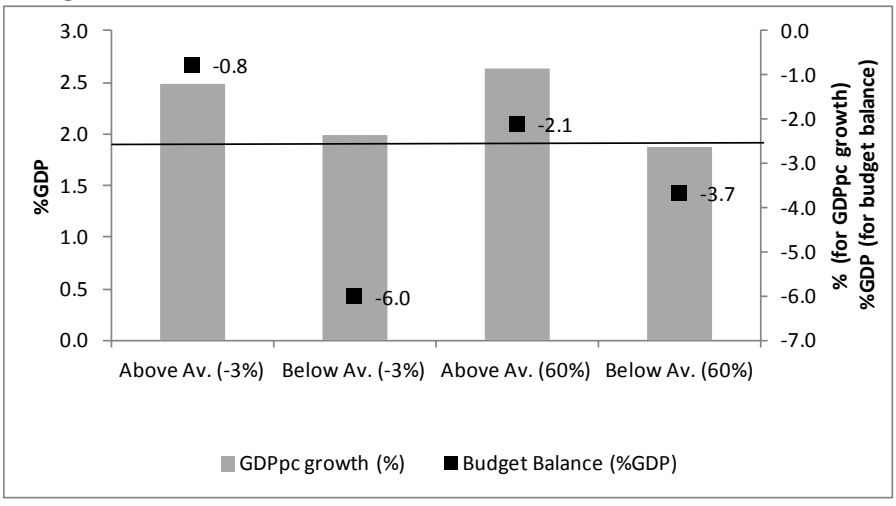
Third, for the expenditure set of regressions, results are less controversial or dubious in their "expected" or "right" coefficient signs. As before, we have negative effects of government spending on wages, final consumption and public investment (the latter notably for the emerging economies sample,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

As a robustness exercise we have conducted a sensitivity analysis based on the exclusion of labour force participation, unemployment and dependency ratio (not shown). Whereas coefficients, magnitudes and statistical significance levels in the expenditure-based regressions are kept unchanged, the same does not apply to specifications 7-12, concerning revenues. In particular, we lose significance in all revenue components for the OECD below 3% sub-group (the results of Table 3). For the OECD above 3% case, domestic taxes on goods and services have a statistically negative coefficient and taxes on property a statistically positive coefficient, both of which were absent before (we loose significance on the remaining variables) though. All in all, results with revenue components are sensitive to the inclusion/exclusion of particular controls, and hence should be interpreted with care.

Finally, we have redefined our deficit threshold such that now instead of averaging over the countries time span, we take each 5-year average period to assess/determine the above and below 3% classification. Moreover, as before but now based on the new criterion, we did the analysis with the labour force participation, unemployment and dependency ratio excluded from the set of regressors. Reporting all these would lead us far off-track. A typical result is the confirmation that government expenditures' components are generally detrimental to growth irrespectively of the country group and deficit threshold classification. As for revenues' components, results are mixed, unclear or contradictory depending on the set of regressors included, geographical sample and deficit rule used.

In addition, Figure 2 summarizes the relationship between output growth and the budget balance ratio according to the 3% fiscal thresholds classification. The pattern arising is that countries with average lower budget deficits are associated with higher GDP real growth rates.

Figure 2 "Above" and "Below" Average Performers, GDP growth per capita and the budget balance



Source: Authors' estimates.

To gain further perspective on the relationship between fiscal variables and economic performance we briefly review some country-specific details related to the regression results reported before. The main purpose of this exercise is to see if any definite trend could be observed with respect to government debt and budget deficits and the level of economic performance of the so-called "above-average performers" and "below-average performers" (countries).

For the entire time span we identified "above-average" and "below-average" performing countries on the basis of the difference between their actual and predicted values of the per capita GDP growth rates. In line with Nelson and Singh (1994) countries whose actual growth rates exceeded

their predicted growth rates by 1% or more were classified as "above-average performers", and countries that fell short of the predicted growth by a similar percentage (or more) were categorized as "below-average performers". The list of countries in both categories is reported in Table 8 where we estimated the regression using total government expenditures as the included fiscal variable for the full sample.31

[Table 8]

Table 8 shows the residual of the per capita GDP growth rate estimation and budget balance ratio for these groupings of countries. Of interest is whether there is any clear-cut connection between these aggregates that is evident from these results. In particular, we want to assess if we can conclude that the above-average performers (higher residuals in this case) have had necessarily lower budget deficits and that the below-average performers generally experienced larger deficits.

From Table 8 we see, for example, that there are below-average countries (negative residuals) with low budget deficits. Conversely in the above-average category we find countries such as Morocco or Israel both with substantial budget deficits. If one isolates the group of OECD countries (not shown) we also have a mixed picture with Greece falling in the above-average category but showing a budget deficit of 8.1% of GDP. On the other hand, Australia appears in the below-average category although it had a budget balance deficit of only 0.8% GDP.

Therefore, it is not obvious to find a definite connection, between the level of economic achievement and the magnitude of budgetary deficits. It is evident that "above" average performers must have had more favourable conditions contributing to a high rate of output growth for a given level of investment than the "below" average countries.

6.7 PANEL GRANGER-CAUSALITY TESTS

It is also important to understand whether expenditures (revenues) Granger cause per capita GDP, or the reverse applies or even if one finds two-way bidirectional causality. In previous studies, Hakro (2009) finds evidence suggesting that government expenditures are growth inducing, and a larger size of the government will certainly create opportunities of employment and hence growth, and subsequently higher income per capita. In a related sample Kumar (2009) infers instead that Wagner's Law does hold.[32] Yuk (2005) takes a long term perspective on UK time series and, although support for Wagner's Law is sensitive to the choice of the sample period, there is

[31] For robustness we re-estimated with total government revenues to assess whether the list of countries falling in each category changed or was the same. Results (not shown) did not change significantly.

[32] A stylised fact of public economics about the long-run tendency for public expenditure to grow relative to some national income aggregate such as GDP.

evidence that GDP growth Granger-causes the share of government spending in GDP. Loizides and Vamvoukas (2004) using a bivariate ECM conclude that government size Granger causes economic growth in all countries in the short and long run; economic growth Granger causes increases in the relative size of government in Greece, and when inflation is included, in the UK.

In Table 9a we report the results from the per capita GDP to government expenditure[33] causality test, for the full sample, as described in Section 3. We find little evidence of robust Granger causality across econometric specifications, only with model (3) indicating a negative short and long-run effect of total government expenditure on output growth.

However, there is stronger evidence supporting the reverse relationship, that is, from GDP to expenditures, therefore favouring the idea of Wagner's Law. In particular, there are significant short and long-run effects, we reject the null of no Granger-causality using our two-step Hansen incremental test, and diagnostics are well behaved (Table 9b). Redoing the analysis for the OECD sub-sample (not shown), we get slightly stronger results favouring Granger causality from government spending to GDP for a positive short-run effect in 3 out of 6 models. Nevertheless, there does not seem to be a significant long-run effect. For the OECD the reverse relationship still holds with evidence of Granger-causality from GDP to government spending, as well as positive and significant short and long-run effects in both the pooled OLS and FE models.

[Table 9a-b]

[33] Both total government expenditures and revenues (% GDP) were converted to nominal levels, deflated using the CPI and scaled by population. Hence, we have real GDP per capita and either real total government expenditures or revenues in per capita terms as well (so that both variables of interest are comparable).

7 CONCLUSION

We have used a panel of 155 developed and developing countries for the period 1970-2008, in order to assess the potential linkage between fiscal policy developments and economic growth. More specifically, we focused on a number of econometric issues that can have an important bearing on the results, notably simultaneity, endogeneity, causality, the relevance of nonlinearities, cross-section dependence, and threshold effects.

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 coefficients. The same is true for the OECD subsample with the addition that now total government revenues have a negative impact on growth (however, when included together with other regressors it looses significance).

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 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. Most results are confirmed even after we address cross-sectional dependence.

Granger causality tests find relatively weak evidence supporting causality running for expenditures or revenues to GDP per capita, but the reverse appears to be consistently stronger notably for spending, that is, evidence of the Wagner Law. For the OECD these effects are usually more pronounced.

Interestingly, and depending whether we take the below or above 3% threshold budget deficit set of economies, we observe a negative impact, on growth, of taxes on income, profits and capital gains as well as taxes on payroll or workforce for the above 3% group, but a positive one for the below 3% group of countries.

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9 APPENDIX – SAMPLE, VARIABLES AND SOURCES

Countries in the dataset (155)

Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, The, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Cayman Islands, Chad, Chile, China, Colombia, Comoros, Congo, Dem. Rep., Congo, Rep., Costa Rica, Cote d'Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran, Islamic Rep., Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Korea, Rep., Kuwait, Kyrgyz Republic, Lao, Latvia, Lebanon, Lesotho, Liberia, Libya, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russian , Federation, Rwanda, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovak Republic, Slovenia, Solomon Islands, Somalia, South Africa, Spain, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Tanzania, Thailand, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, Yemen, Rep., Zambia, Zimbabwe.

Variable	Definition/Description	Acronym	Source
real GDP per capita		*Gdppc*	World Bank's Word Development Indicators (WDI)
gross fixed capital formation (% GDP)		*Gfcf_gdp*	WDI
public investment (% GDP)		*Pubinv_gdp*	WDI
Government budget surplus or deficit (% of GDP)	The government budget surplus or deficit as a percentage of GDP.	*Govbal_gdp*	WDI, IMF IFS, Easterly (2001)
Total Government Revenue (% GDP)		*Totgovrev_gdp*	WDI, IMF IFS, Easterly (2001)
Tax revenue (% GDP)		*Taxrev_gdp*	WDI, IMF IFS, Easterly (2001)
Domestic taxes on goods and services (% GDP)	This includes VAT, excises, profits of fiscal monopoly etc.	*Domtaxesgs_gdp*	WDI, IMF IFS, Easterly (2001)
Taxes on payroll or work force (% of GDP)	This category consists of taxes that are collected from employers or the self-employed and that are not earmarked for social security schemes.	*Taxpayrool_gdp*	WDI, IMF IFS, Easterly (2001)
Taxes on income, profits and capital gains (% GDP)		*Taxincome_gdp*	WDI, IMF IFS, Easterly (2001)
Taxes on property (% of GDP)	Taxes on the use, ownership, or transfer of wealth	*Taxproperty_gdp*	WDI, IMF IFS, Easterly (2001)
Tax and social security contributions government revenue (% of GDP)	Total government revenue from taxes and social security contributions	*Taxssgovrev_gdp*	WDI, IMF IFS, Easterly (2001)
Total Government Expenditure (% GDP)		*Totgovexp_gdp*	WDI, IMF IFS, Easterly (2001)
Compensation of employees (% GDP)		*Govexpwages_gdp*	WDI, IMF IFS, Easterly (2001)
Interest Payments (% GDP)		*Inpay_gdp*	WDI, IMF IFS, Easterly (2001)
Subsidies (% GDP)		*Subs_gdp*	WDI, IMF IFS, Easterly (2001)
Public Final Consumption Expenditure (% GDP)		*Govcons_gdp*	WDI, IMF IFS, Easterly (2001)
Public spending on Education (% GDP)		*Govexpedu_gdp*	WDI, IMF IFS, Easterly (2001)
Public spending on Health (% GDP)		*Govexphea_gdp*	WDI, IMF IFS, Easterly (2001)
Public spending on Social Security and Welfare related (% GDP)		*Govexpss_gdp*	WDI, IMF IFS, Easterly (2001)
School attainment	average years of schooling in the population over 25 years old from the international data on educational attainment	*Edu*	Barro and Lee (2010)
literacy rate (% of people ages 15 to 24)		*Literates*	WDI
primary school enrolment (% gross)		*Primary_enrol*	WDI
primary school duration (years)		*Primary_dur*	WDI
secondary school enrolment (% gross)		*Secondaru_enrol*	WDI
secondary school duration (years)		*Secondary_dur*	WDI
tertiary school enrolment (% gross)		*Tertiary_enrol*	WDI
tertiary school duration (years)		*Tertiary_dur*	WDI
land area (in square kilometres)		*Land_area*	WDI
population		*Pop*	WDI
imports and exports of good and services (BoP, current USD)		*Imp, exp*	WDI
labour participation rate (% of total)		*Lfp*	WDI
labour force		*Laborf*	WDI
unemployment, total (% of total labour force)		*Unemp*	WDI
fertility rate (births per woman)		*Fertility*	WDI
age dependency ratio (% of working age population)		*Depratio_wa*	WDI
urban population (% of total)		*Urban_pop*	WDI
Short-term debt (% of exports of goods and services)		*Short_debt_gdp*	WDI
terms of trade adjustment (constant LCU)		*Terms_trade*	WDI
real effective exchange rate index (2000=100)		*Reer*	WDI

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

Dependent Variable	gdppcgr									initot govexp	initot govrev
Estimation	FE (within)										
Sample	ALL										
Spec.	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.	1,395	561	812	446	664	539	783	435	649	392	607
R-squared	0.08	0.01	0.00	0.00	0.06	0.19	0.13	0.16	0.17	0.00	0.03

Note: 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 heteroskedastic-consistent standard errors are reported in parenthesis 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, 5 and 1% levels

Table 2 Total General Government Revenue and Expenditure and Growth, 5-year averages

Dependent Variable: Real GDPpc growth	Fixed-Effects (within)						FE-LAD		MM		LSDV-C		DIFF-GMM		SYS-GMM	
Sample	All		OECD		Emerging		All									
Spec.	*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-squared	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

Note: 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 heteroskedastic-consistent standard errors are reported in parenthesis 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. *, **, *** denote significance at 10, 5 and 1% levels.

Table 3	**Benchmark cross-country growth equations, 5-year averages (including time period dummies) – Fixed Effects and System-GMM**					
Dependent Variable: Real GDPpc growth	FE (within)			SYS-GMM		
Sample	All	OECD	Emerg	All	OECD	Emerg
Spec.	*1*	*2*	*3*	*4*	*5*	*6*
inigdppc	-3.23***	-1.18*	-4.36**	-0.83***	-0.46	-0.69
	(0.763)	(0.678)	(1.735)	(0.295)	(0.729)	(1.752)
lfp	0.04	-0.15	-0.07	-0.04	-0.17	0.05
	(0.077)	(0.100)	(0.147)	(0.038)	(0.141)	(0.103)
unemp	-0.10*	-0.07	-0.12	-0.15***	-0.13	-0.09
	(0.058)	(0.103)	(0.138)	(0.050)	(0.202)	(0.134)
popgr	-0.57	-0.86**	-2.74***	-0.29	-1.19	-0.71
	(0.387)	(0.382)	(0.963)	(0.218)	(1.031)	(0.628)
gfcf_gdp	0.20***	0.15**	0.27***	0.27***	0.02	0.13
	(0.036)	(0.070)	(0.077)	(0.047)	(0.131)	(0.126)
education	0.06***	0.02***	0.08	0.04**	0.02	-0.03
	(0.016)	(0.008)	(0.048)	(0.017)	(0.014)	(0.109)
Obs.	575	175	148	575	175	148
R-squared	0.14	0.14	0.26			
Hansen (p-value)				0.18	0.23	0.30
AB AR(1) (p-value)				0.01	0.11	0.02
AB AR(2) (p-value)				0.25	0.24	0.83

Note: The models are estimated by either Within Fixed Effects (FE-within) or Two-Step robust System GMM (SYS-GMM). For the latter method lagged regressors are used as suitable instruments. The dependent variable is real GDPpc growth,. Robust heteroskedastic-consistent standard errors are reported in parenthesis 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. *, **, *** denote significance at 10, 5 and 1% levels.

Table 4	Growth equations with Budgetary Economic Decomposition when fiscal variables are introduced one at a time in the benchmark equations, 5-year averages					
Dependent Variable: Real GDPpc growth	Fixed Effects (within)					
Sample	All	OECD	Emerg	All	OECD	Emerg
	Panel A1			Panel B1		
Spec.	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)

Note: The models are estimated by Within Fixed Effects (FE-within). The dependent variable is real GDPpc growth. Different individual regressions using the set of regressors and controls present in table 6 were 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 heteroskedastic-consistent standard errors are reported in parenthesis 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, 5 and 1% levels.

Table 5	Growth equations with functional spending: fiscal variables are introduced simultaneously (Panel A) and one at a time (Panel B), benchmark equations, 5-year averages		
Dependent Variable: Real GDPpc growth	Fixed Effects (within)		
Sample	All	OECD	Emerg
Spec.	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-squared	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)

Note: The models are estimated by Within Fixed Effects (FE-within). The dependent variable is real GDPpc growth. Different individual regressions using the set of regressors and controls present in table 14b. (in bold) 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 heteroskedastic-consistent standard errors are reported in parenthesis 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, 5 and 1% levels.

Table 6 **Growth equations with Government Expenditures and Revenues – accounting for Cross-Sectional Dependence, 5 year averages data – OECD**

Dependent Variable: Real GDPpc growth	Discroll Kraay Robust Estimation					CCEP				
Model	1	2	3	4	5	6	7	8	9	10
Sample	OECD									
inigdppc	-0.81***	-0.77***	-0.12	-0.65***	-0.54*	-2.45***	-2.53***	-2.12***	-2.83***	-2.47***
	(0.221)	(0.251)	(0.249)	(0.169)	(0.267)	(0.522)	(0.555)	(0.719)	(0.509)	(0.802)
popgr	-0.46*	-0.23	0.39**	0.02	-0.14	-1.27***	-0.91***	-0.05	-0.83***	-0.18
	(0.245)	(0.187)	(0.159)	(0.167)	(0.183)	(0.285)	(0.296)	(0.384)	(0.291)	(0.415)
gfcf_gdp	0.01**	0.01**	-0.00	0.01	0.02**	0.02**	0.02*	0.01	0.02*	0.03**
	(0.004)	(0.003)	(0.004)	(0.006)	(0.006)	(0.009)	(0.009)	(0.011)	(0.009)	(0.013)
openness	0.09***	0.11***	0.20***	0.13***	0.10***	0.11***	0.13***	0.26***	0.14***	0.16***
	(0.022)	(0.029)	(0.029)	(0.029)	(0.032)	(0.038)	(0.040)	(0.049)	(0.039)	(0.056)
education	0.01***	0.01***	0.01***	0.01***	0.02***	0.02***	0.04***	0.04***	0.04***	0.06***
	(0.003)	(0.003)	(0.002)	(0.003)	(0.004)	(0.008)	(0.009)	(0.013)	(0.008)	(0.015)
totgovexp_gdp	-0.06***					-0.12***				
	(0.012)					(0.024)				
totgovrev_gdp		-0.04***					-0.03			
		(0.010)					(0.033)			
totgovrevgr			-35.41***					-35.49***		
			(6.735)					(9.042)		
totgovexpgr				17.45*					15.19	
				(9.007)					(9.498)	
govexpedu_gdp					0.00					-0.31
					(0.035)					(0.193)
govexphea_gdp					-0.05					-0.19
					(0.036)					(0.155)
govexpss_gdp					-0.10***					-0.14*
					(0.018)					(0.078)
Obs.	191	202	142	195	133	191	202	142	195	133
R-squared	0.28	0.27	0.31	0.23	0.26	0.38	0.27	0.40	0.29	0.39

Note: The models are estimated with either Driscoll Kraay robust estimator or the Pesaran's Common Correlated Effects Pooled estimator (CCPE) to correct for the existence of cross-sectional dependence in the OECD. The dependent variable is real GDPpc growth. Standard errors are reported in parenthesis below each coefficient estimate. A constant term has been estimated but it is not reported for reasons of parsimony. *, **, *** denote significance at 10, 5 and 1% levels.

Table 7 — Growth equations with Budgetary Decomposition of Public Budget Balance (Revenue and Expenditure), 5-year averages – different samples with non-linear effects of fiscal policy, according to the 3% Budget Deficit threshold

Dependent Variable: Real GDPpc growth	Fixed Effects (within)																	
Sample	All		OECD		Emerg		All		OECD		Emerg		All		OECD		Emerg	
	>3%	<3%	>3%	<3%	>3%	<3%	>3%	<3%	>3%	<3%	>3%	<3%	>3%	<3%	>3%	<3%	>3%	<3%
Spec.	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
inigdppc	-3.83***	-5.31***	-2.66	-3.40**	-2.02	-8.27***	-5.95*	-16.35***	-21.15***	-5.14	-3.82**	-20.83***	-4.15	-6.25***	-4.43	-3.05**	-7.47***	-13.06***
	(1.042)	(1.210)	(1.640)	(1.322)	(1.526)	(2.813)	(3.181)	(2.565)	(3.905)	(2.962)	(1.417)	(2.893)	(4.787)	(1.697)	(2.763)	(1.037)	(1.341)	(1.651)
lfp	0.06	-0.12	-0.02	-0.23	0.02	-0.24	0.08	-0.32**	0.79**	-1.57***	0.20	-0.04	-0.19	0.26	0.19	-0.23	0.06	0.37***
	(0.100)	(0.112)	(0.166)	(0.158)	(0.041)	(0.215)	(0.214)	(0.117)	(0.226)	(0.277)	(0.236)	(0.140)	(0.533)	(0.162)	(0.132)	(0.141)	(0.109)	(0.058)
unemp	-0.06	-0.14	-0.07	-0.18	-0.01	-0.15	-0.58***	0.01	-1.74***	-0.80***	0.28	0.11	0.32	-0.12	0.05	-0.24**	0.37	-0.20
	(0.065)	(0.085)	(0.265)	(0.105)	(0.097)	(0.194)	(0.123)	(0.155)	(0.101)	(0.194)	(0.259)	(0.182)	(0.427)	(0.115)	(0.171)	(0.105)	(0.291)	(0.112)
popgr	0.23	-0.14	-1.20*	0.14	-1.62**	-1.34	0.12	1.64	-1.19	5.90***	-2.92**	-7.12**	-0.14	-0.31**	-2.23**	-2.08***	-9.36***	-6.45**
	(0.900)	(0.183)	(0.554)	(0.812)	(0.666)	(0.853)	(0.685)	(0.997)	(1.178)	(1.187)	(1.090)	(2.334)	(2.054)	(0.108)	(0.795)	(0.496)	(1.990)	(2.262)
gfcf_gdp	0.17***	0.18***	0.16	-0.03	0.18***	0.37***	0.06	0.36**	-1.44***	-0.82***	0.38*	0.59***	0.38**	-0.23	0.21	-0.02	0.38**	0.66***
	(0.053)	(0.063)	(0.203)	(0.099)	(0.053)	(0.103)	(0.229)	(0.139)	(0.101)	(0.219)	(0.183)	(0.095)	(0.179)	(0.139)	(0.176)	(0.095)	(0.158)	(0.108)
education	0.04***	0.02	0.01	0.03**	0.02	0.09	0.07**	0.10***	0.12***	0.00	0.04	-0.05	0.02	-0.04	0.04	0.02*	0.01	-0.18*
	(0.013)	(0.019)	(0.011)	(0.010)	(0.015)	(0.085)	(0.031)	(0.026)	(0.021)	(0.019)	(0.052)	(0.094)	(0.017)	(0.052)	(0.022)	(0.010)	(0.017)	(0.085)
depratio_wa	-0.09***	-0.24***	-0.09	-0.22*	-0.05	-0.23***	-0.16***	-0.13**	-0.21	-0.32**	0.03	-0.19*	-0.18	-0.30**	-0.18**	-0.09**	0.25**	-0.06
	(0.031)	(0.043)	(0.055)	(0.110)	(0.047)	(0.066)	(0.049)	(0.051)	(0.153)	(0.099)	(0.103)	(0.088)	(0.127)	(0.128)	(0.061)	(0.035)	(0.108)	(0.064)
Revenue Variables																		
domtaxesgs_gdp							0.52*	0.30	-0.44	2.70***	1.17	0.00						
							(0.269)	(0.257)	(0.455)	(0.474)	(0.638)	(0.374)						
taxesincome_gdp							-0.40	-0.25	-0.92**	4.14***	-0.44	-0.60*						
							(0.265)	(0.348)	(0.331)	(0.933)	(0.706)	(0.304)						
taxproperty_gdp							-0.35	0.72	1.91	12.72***	-2.81	-1.93						
							(0.768)	(2.020)	(1.143)	(2.770)	(2.385)	(1.113)						
taxpayroll_gdp							-0.96	0.35	-1.91*	5.74***								
							(1.602)	(1.578)	(0.933)	(1.543)								
taxsscgovrev_gdp							0.09	0.58***	0.68***	-3.52***	-1.19***	-0.09						
							(0.164)	(0.167)	(0.134)	(0.695)	(0.317)	(0.416)						
Expenditure Variables																		
govexpwages_gdp													-0.25	-0.19	-0.32***	-0.44**	-0.43	-0.66
													(0.285)	(0.233)	(0.073)	(0.198)	(0.251)	(0.620)
intpay_gdp													-4.09	0.18*				
													(5.100)	(0.095)				
subs_gdp														-0.08**				
														(0.034)				
govcons_gdp													-0.06	-0.58***	-0.39***	-0.15**	-0.53**	-0.01
													(0.157)	(0.198)	(0.100)	(0.060)	(0.159)	(0.150)
pubinv_gdp													-0.18	-0.05	-0.12	0.04	-1.16***	-0.53***
													(0.157)	(0.228)	(0.266)	(0.311)	(0.223)	(0.088)
Observations	202	346	66	109	50	98	48	48	20	23	26	34	47	58	47	68	21	30
R-squared	0.27	0.29	0.25	0.27	0.48	0.39	0.57	0.78	0.99	0.95	0.83	0.90	0.61	0.75	0.66	0.45	0.99	0.87

Note: 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 heteroskedastic-consistent standard errors are reported in parenthesis 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, 5 and 1% levels.

Table 8	"Above" and "below" Growth Performers and Budget Deficits: full sample (expenditures' equation)	
	"Residual" GDP growth rate	Budget deficit (-) or Surplus (+) (%GDP)
Below average		
Guinea-Bissau	-3.2	-0.3
Guyana	-2.7	-23.9
Congo, Dem. Rep.	-2.0	-5.9
Australia	-1.9	-0.8
Jamaica	-1.6	-10.0
Haiti	-1.6	-2.9
Kuwait	-1.6	0.4
Switzerland	-1.4	-0.4
Suriname	-1.2	-8.3
Peru	-1.2	-2.4
Bahamas, The	-1.1	-1.6
Bolivia	-1.1	-1.7
Above average		
Korea, Rep.	2.0	-0.2
Pakistan	1.9	-6.4
Israel	1.8	-8.1
Dominican Republic	1.8	-0.7
Malta	1.5	-2.4
Cyprus	1.4	-5.4
Malaysia	1.4	-4.3
Thailand	1.2	-1.4
Ireland	1.2	-4.9
Luxembourg	1.1	2.0
Morocco	1.1	-5.7
Turkey	1.1	-4.2
Panama	1.0	-3.0
Syrian Arab Republic	1.0	-3.3
Egypt, Arab Rep.	1.0	-7.6
Mauritania	1.0	-5.4
Rwanda	1.0	-2.9

Note: see text for definition of "above" and "below" performers. Countries that do not fall in either of the two groups are excluded. Gross domestic product residuals are based on an OLS regression of GDPpc growth rate on initial GDPpc, population growth, secondary school enrolment, private investment, openness and government expenditures (%GDP). The residual is computed as actual minus predicted. A complete list of all countries in the dataset with residuals and deficits is available upon request. Positive (negative) residuals imply that actual growth is above (below) the predicted growth via equation (7).

Table 9a — Panel Granger-Causality - GDPpc and Total Government Expenditures (full sample)

Dep.Var. real GDPpc	OLS levels	Within Group (FE)	DIF-GMM	SYS-GMM	SYS-GMM-1	SYS-GMM-2
Model	(1)	(2)	(3)	(4)	(5)	(6)
Instrument set	none	none	Full	Full	Reduced	Reduced
Lag1 GDPpc	1.02***	0.90***	0.48***	1.07***	1.08***	0.99***
	(0.005)	(0.044)	(0.133)	(0.020)	(0.028)	(0.018)
Lag1 totgovexppc	0.00	-0.00	-0.0002**	-0.00	-0.00	-0.00
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Obs.	426	426	320	426	426	426
R-squared	0.99	0.78				
AB AR(1) (p-value)			0.37	0.29	0.28	0.40
AB AR(2) (p-value)			0.96	0.02	0.02	0.04
Hansen p-value			0.24	0.20	0.20	0.29
Granger causality p-value	0.95	0.47	0.00	0.00	0.00	0.00
Unobs. Heterogeneity				0.44	0.02	1.00
LR effect point estimate	-0.0004	-0.001	-0.0004*	0.001	0.003	-0.01
(standard error)	(0.007)	(0.0019)	(0.0002)	(0.002)	(0.008)	(0.026)

Note: Our five-year averages dataset was used for the purpose of assessing Granger causality. Year dummies are included in all models (coefficients not reported). Figures in parenthesis below point estimates are standard-errors. The GMM results reported here are two-step estimates with heteroskedasticity-consistent standard errors. The Hansen test is used to assess the overidentifying restrictions; the test uses the minimized value of the corresponding two-step GMM estimator. The difference Hansen test is used to test the additional moment conditions used by the system GMM estimators in which SYS GMM uses the standard moment conditions, while SYS GMM-1 only uses the lagged first-differences of GDPpc dated t-2 (and earlier) as instruments in levels and SYS-2 only uses lagged first-differences of totgovexp_gdp dated t-2 (and earlier) as instruments in levels. The heterogeneity test is used to test the null that there are no individual effects (see text). The Granger causality test examines the null hypothesis that GDPpc is not Granger-caused by totgovexp_gdp; the test statistic is criterion based, using restricted and unrestricted models (see main text for details). The LR effect is the point estimate of the long-run effect of totgovexp_gdp on GDPpc. Its standard error is approximated using the delta method. *, **, *** denote significance at 10, 5 and 1% levels.

Table 9b — Panel Granger-Causality - Total Government Expenditures and GDPpc (full sample)

Dep.Var. totgovexppc	OLS levels	Within Group (FE)	DIF-GMM	SYS-GMM	SYS-GMM-1	SYS-GMM-2
Model	(1)	(2)	(3)	(4)	(5)	(6)
Instrument set	none	none	Full	Full	Reduced	Reduced
Lag1 totgovexppc	0.04	-0.98**	-1.63***	-0.14	-0.12	-1.68***
	(0.201)	(0.395)	(0.476)	(0.127)	(0.073)	(0.166)
Lag1 GDPpc	2.43**	32.76***	25.28	6.45*	9.49***	12.29**
	(0.950)	(8.946)	(24.939)	(3.635)	(2.941)	(6.223)
Obs.	320	320	226	320	320	320
R-squared	0.01	0.19				
AB AR(1) (p-value)			0.26	0.29	0.29	0.25
AB AR(2) (p-value)			0.65	0.31	0.31	0.60
Hansen p-value			0.01	0.03	0.28	0.31
Granger causality p-value	0.01	0.00	1.00	0.13	0.00	0.00
Unobs. Heterogeneity				0.00	0.00	0.00
LR effect point estimate	2.51*	16.54***	9.62	5.67	8.47***	4.59**
(standard error)	(1.287)	(3.053)	(10.053)	(3.649)	(2.682)	(2.166)

Note: See Table 8a. Mutatis mutandis.