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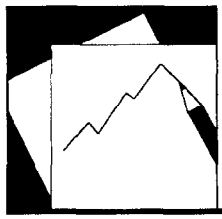

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Expenditure Composition, Fiscal Adjustment, and Growth in Low-Income Countries

Sanjeev Gupta, Benedict Clements, Emanuele Baldacci, and Carlos Mulas-Granados

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Prepared by Sanjeev Gupta, Benedict Clements, Emanuele Baldacci, and Carlos Mulas-Granados[1]

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Abstract

This paper assesses the effects of expenditure composition as well as fiscal adjustment on economic growth in a sample of 39 low-income countries during the 1990s. The paper finds that strong budgetary positions and fiscal consolidation are generally associated with higher economic growth in both the short and long terms. The composition of public outlays also matters: Countries where spending is concentrated on wages tend to have lower growth, while those that allocate higher shares to capital and nonwage goods and services enjoy faster output expansion. Expenditure composition, along with the size of the fiscal consolidation and initial fiscal conditions, affects the sustainability of adjustment. Initial fiscal conditions also have a bearing on the nexus between fiscal deficits and growth.

JEL Classification Numbers: E62, E23, H50

Keywords: Fiscal Policy, Economic Growth, Public Expenditure Composition, Duration of Fiscal Consolidations

Author's E-Mail Addresses: sgupta@imf.org; bclements@imf.org; ebaldacci@imf.org

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I. INTRODUCTION

A large body of empirical research supports the notion that healthy budgetary balances are, over the long run, good for growth (Easterly, Schmidt-Hebbel, and Rodriguez, 1994). The effect of fiscal adjustment on growth in the short run, however, remains open to question, as a number of studies—largely for industrial countries—have drawn the conclusion that under some circumstances, fiscal contractions can stimulate growth.[2] A central theme in these works is that the composition of fiscal adjustment plays a key role in determining whether fiscal contractions lead to higher growth and are also sustainable over time. These studies show that improving fiscal positions through the rationalization of the government wage bill and public transfers, rather than increasing revenues and cutting public investment, can foster higher growth, even in the short run.

The purpose of this paper is to assess whether fiscal adjustment and improvements in the composition of public expenditure have positive repercussions for growth in low-income countries. While some aspects of this issue have been assessed in other studies,[3] an in-depth econometric evaluation—drawing on a wide sample of low-income countries—has yet to be undertaken. For example, in the group of 36 different empirical studies that Kneller, Bleaney, and Gemmell (1998) identify as the core of the empirical research on the effects of fiscal policy on growth, only three studies (including Landau, 1986 and Easterly, Rodriguez, and Schmidt-Hebbel, 1994) were based on developing countries, and none were based on low-income countries alone.

A number of important related issues have not yet been fully examined in the literature. None of these studies, for example, have addressed whether deficits that are financed from abroad have a different impact on growth than those financed from domestic sources. In addition, the important issue of whether the macroeconomic effects of fiscal policy differ in low-deficit countries—as opposed to those that have yet to achieve a modicum of macroeconomic stability—has yet to be assessed for a wide sample of countries.[4]

This paper attempts to fill some of these gaps and aims to provide some empirical evidence of the effects of fiscal adjustment and expenditure composition on economic growth. More specifically, the paper addresses the following three questions:

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[2] See, for example, McDermott and Wescott (1996); Alesina and Perotti (1996); Alesina, Perotti, and Tavares (1998); Alesina and Ardagna (1998); Buti and Sapir (1998); Alesina, Ardagna, Perotti, and Schiantarelli (1999); and Von Hagen, Hallett, and Strauch (2001).

[3] See Mackenzie, Osmond, and Gerson (1997); Abed and others (1998); and Kneller, Bleaney, and Gemmell (1999).

[4] See Adam and Bevan (2000) for a study based on 17 low-income countries.

- What is the impact of the fiscal stance, expenditure composition, and the nature of budget financing on economic growth in low-income countries?
- Are these effects independent of initial fiscal conditions?
- What is the effect of these and other accompanying factors on whether fiscal adjustments are sustainable?

This paper does not restrict its analysis to episodes of fiscal adjustment, as has been done in studies for industrial countries. Instead, it assesses the effects of both fiscal expansions and fiscal consolidations on growth in 39 low-income countries with Fund-supported programs in the 1990s.[5] These programs, on average, have targeted relatively small reductions in budget deficits.[6] Furthermore, the elimination of budget imbalances has not been the sole aim of these Fund-supported programs, which also sought, inter alia, to improve the composition of public expenditure and revenues. As such, an exclusive focus on episodes of fiscal adjustment—defined as periods of sharp deficit reduction—would be of only limited interest in examining the impact of fiscal policy on growth in low-income countries.

The results of this study confirm that there is a strong link between public expenditure reform and growth, as fiscal adjustments achieved through curtailing current expenditures are, in general, more conducive to growth. Fiscal consolidations tend to have the most positive effects on growth when they lead to a reduction in the domestic borrowing requirement of the government. When public investment is also protected, the positive effect of fiscal adjustment on growth is further accentuated. Fiscal adjustments that protect capital outlays are also more sustainable, that is, less likely to be aborted. The fiscal adjustment-growth nexus is also influenced by a country's initial fiscal conditions—in particular, whether a country has reached a certain degree of macroeconomic stability or not.

The rest of the paper is structured as follows: Section II surveys the literature on the effects of fiscal policy and budget composition on economic growth; Section III describes the data used in the empirical sections; and Section IV presents some baseline econometric results of the effects of fiscal policy and expenditure composition on economic growth. Particular attention is given to examining the robustness of the results, and whether results differ for low-deficit ("post-stabilization") countries. The factors underlying the sustainability of fiscal

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[5] This includes countries that have obtained concessional loans from the Fund since 1999 under the Poverty Reduction and Growth Facility (PRGF), which replaced the Enhanced Structural Adjustment Facility (ESAF). One of the basic tenets of the PRGF is that a stable macroeconomic position is critical for promoting growth and reducing poverty. For further information on the characteristics of PRGF, see http://www.imf.org/external/np/exr/facts/prgf.htm.

[6] For example, for ESAF-supported programs over the 1986–95 period, the deficit was targeted, on average, to decrease by about 1 percentage point of GDP relative to the preprogram year (Abed and others, 1998).

consolidation episodes are discussed in Section V. Finally, Section VI concludes the paper and elaborates on some policy implications of the results.

II. Literature Review

The effects of fiscal policy on economic growth have been the subject of long debate. With respect to **short-term effects**, a large body of empirical research, primarily for industrial countries, has been devoted to understanding under which conditions fiscal multipliers can be small (and even negative) (Alesina and Perotti, 1996; Alesina and Ardagna, 1998; Perotti, 1999). Perotti (1999), for example, shows that consolidations tend to be expansionary when debt is high or growing rapidly, while Alesina and Perotti (1995) and Alesina and Ardagna (1998) find that in addition to the size and persistence of the fiscal impulse, budget composition matters in explaining different private sector responses to fiscal policy (and hence the effect on growth). Fiscal adjustments that rely primarily on cuts in transfers and the wage bill tend to last longer and can be expansionary, while those that rely primarily on tax increases and cuts in public investment tend to be contractionary and unsustainable (Von Hagen, Hallett, and Strauch, 2001).

The potential effects of fiscal policy on long-term growth has also generated substantial attention (Tanzi and Zee, 1996). Most recently, the burgeoning work in the field of endogenous growth suggests that fiscal policy can either promote or retard economic growth, as investment in physical and human capital—both of which can be affected by taxation and government expenditures—can affect steady-state growth rates (Barro, 1990 and 1991; Barro and Sala-i-Martin, 1995; and Mendoza, Milesi-Ferretti, and Asea, 1997).

In both strands of the literature, the effect of fiscal policy on growth can be nonlinear. This may occur, for example, because the private sector's response to fiscal policy may be nonlinear, implying a complex relationship between the size and the composition of public spending and revenues and growth. Giavazzi, Jappelli, and Pagano (2000), for example, find that in industrial and developing countries, the nonlinear effects of fiscal policy on national savings tend to be associated with large and persistent increases in the primary deficit.

There are good reasons to believe that for some (but not all) low-income countries, fiscal contractions may also be expansionary. As in the industrial countries, expansionary contractions are more likely to be observed in countries that have not yet achieved a degree of macroeconomic stability.[7] For these countries, the overriding imperative of reining in inflation and achieving low budget deficits are such that increases in public spending—even if potentially productive—may not have a salutary effect on growth. By contrast, countries in a "post-stabilization" phase can exercise more choice over expenditure priorities, including by allocating resources to important structural reforms, such as the decompression of the civil

[7] For an empirical analysis of the impact of initial conditions on the effectiveness of fiscal policy during recessions in industrial and middle-income countries, see Baldacci and others (2001).

service payscale. In these countries, higher public spending—even if it results in higher deficits—could raise, rather than contract, economic activity. In sum, the relationship between the fiscal policy stance and growth will differ across countries, depending on their initial fiscal conditions. This also has important implications for the econometric specifications used to link fiscal policy and growth (see below).

The empirical literature has also found that the composition of fiscal adjustment is critical to the persistence of consolidations. Many studies have analyzed episodes of fiscal adjustment in industrial countries, including Alesina and Perotti (1995, 1996), Alesina and Ardagna (1998), and Alesina, Perotti, and Tavares (1998). The main conclusion of these studies is that fiscal adjustments that rely primarily on reducing outlays on transfers and the wage bill are more likely to be sustainable than those based on tax increases and cuts in capital spending. Ardagna (2001) replicates these empirical results using a dynamic general equilibrium model calibrated with averaged data from ten European economies in the period 1965–95. Her results indicate that fiscal stabilizations that rationalize public employment can stimulate the economy, provided that public employment does not have a positive effect on the productivity of capital and labor.

In sum, the theoretical framework underlying the empirical analysis carried out in this paper assumes that **fiscal policy can affect the steady-state and short-run growth rate** through its effects on private sector behavior and on human and physical capital formation. It also acknowledges that **initial and accompanying macroeconomic and fiscal conditions are important**. Finally, it is assumed that the composition of the budget influences not only economic growth, but also the **sustainability of fiscal consolidations**.

III. Statistical Data and Descriptive Analysis

A. Data

In this paper, three aspects of a country's fiscal policy are examined in relation to their impact on growth: the fiscal policy stance, as measured by the level and changes in the general government budgetary balance; the financing of budgetary deficits; and expenditure composition. Data for these variables were constructed on the basis of the WEO database, as well as a database for 39 ESAF and PRGF-supported countries during the period 1990–2000.[8]

[8] The countries are: Albania, Armenia, Benin, Bolivia, Burkina Faso, Cambodia, Cameroon, the Central African Republic, Chad, Djibuti, Ethiopia, The Gambia, Ghana, Georgia, Guinea, Guinea-Bissau, Guyana, Honduras, Kenya, the Kyrgyz Republic, Laos, Lesotho, Macedonia (FYR), Madagascar, Malawi, Mali, Mauritania, Moldova, Mozambique, Nicaragua, Niger, Rwanda, São Tomé and Príncipe, Senegal, Tajikistan, Tanzania, Vietnam, Yemen, and Zambia.

The fiscal policy stance is measured by the general government budget balance on a cash basis. This is defined as total revenues and grants minus total expenditures and net lending.[9] A positive change in the budget balance can be interpreted as a consolidation, and a negative change as an expansion. As reported in Table 1, the average budget balance for the sample is 6.3 percent of GDP. Deficits were generally reduced during the period, with an average annual improvement of approximately ½ percentage point of GDP.

The deficit can be financed either from domestic or external sources. Domestic financing includes both bank and nonbank financing, with the latter measure including privatization receipts. For the countries included in the sample, external financing predominated, while domestic financing averaged less than 2 percent of GDP.

Fiscal deficits are also used to identify "post-stabilization" countries. Post-stabilization countries are defined as those that had an average budget deficit (after grants) below 2.5 percent of GDP in the 1990–2000 period.[10] Based on this criterion, only seven countries can be considered poststabilizers (Benin, The Gambia, Lesotho, Macedonia, Mauritania, Senegal, and Tanzania).

Macroeconomic indicators have also been extracted from the WEO database. Following earlier studies, growth is measured on a real per capita basis.[11] Other variables used in the regression analysis to control for initial and accompanying conditions include: the labor force (as a percentage of total population); terms of trade; and private investment. These variables are used to control the effects of private sector and external sector activity on growth. We also control the level of initial primary and secondary enrollment as indicators of human capital endowment in each country. Data are taken from World Development Indicators of the World Bank.[12]

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[9] The difference between revenues and expenditures can be different from the cash deficit for countries which measure expenditures on a commitment basis.

[10] This roughly corresponds to the low-deficit country group identified in the ESAF Review (Abed and others, 1998).

[11] Growth of per capita GDP is used most frequently in the empirical literature assessing the effects of fiscal policy on growth, as this controls for differences among countries in the population growth rate. See, for example, Aschauer (1989); Barro (1990, 1991); Easterly and Rebelo (1993); Devarajan, Swaroop, and Zou (1996); Easterly, Loayza, and Montiel (1997); and Kneller, Bleaney, and Gemmell (1999, 2000).

[12] Descriptive statistics of all the nonfiscal variables used in this study are reported in the appendix.

Table 1. Descriptive Statistics

(As percent of GDP, unless otherwise specified)

Variable	Observations	Mean	Standard Deviation
Budget balance	429	-6.30	7.9
Tax revenue	425	15.00	7.5
Nontax revenue	423	2.50	2.2
Grants	426	4.20	4.6
Current spending	425	19.70	9.5
Capital spending	425	9.00	7.2
Domestic financing	372	1.70	4.9
External financing	372	4.60	6.1
Per capita real GDP growth	429	-0.50	8.3
Change in:			
Budget balance	390	0.40	5.8
Tax revenue	386	0.02	3.2
Non-tax revenue	384	-0.06	1.2
Grants	386	0.03	2.6
Current spending	386	-0.50	4.8
Capital spending	386	0.05	3.4
Domestic financing	333	-0.20	4.8
External financing	333	-0.10	5.2
Per capita GDP growth	390	0.50	10.1

Source: Authors' calculations.
Note: Sample averages using data from 1990 until 2000.

Table 2. Bivariate Correlations

(Variables expressed as percent of GDP, unless otherwise specified)

Variables	Per Capita Real GDP Growth	Observations
Budget balance	0.23***	429
Tax revenue	-0.03	425
Nontax revenue	0.03	423
Grants	0.05	425
Current spending	-0.24***	425
Capital spending	0.16***	425
Domestic financing	-0.25***	372
External financing	-0.07	372
Change in:		
Budget balance	0.20***	390
Tax revenue	0.09**	386
Nontax revenue	0.08*	386
Grants	0.11**	384
Current spending	-0.16***	386
Capital spending	0.12***	386
Domestic financing	-0.16***	333
External financing	-0.01	333

Source: Authors' calculations.

Note: Bilateral correlations using annual data from 1990 through 2000.

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

B. Fiscal Policy and Growth: Bivariate Analysis

Simple correlations reported in Table 2 show **a significant association between fiscal adjustment, expenditure composition, and growth,** consistent with previous findings in the literature on industrial countries. For example, stronger budget balances are strongly and positively associated with per capita growth. The composition of public expenditure also matters for growth; higher capital outlays are associated with more buoyant growth, while higher current expenditures and domestic financing of the deficit are associated with less favorable economic performance.

These results hold for the short-run correlations as well. Annual changes in the budget balance are positively correlated with changes in per capita growth. Correlation coefficients[13] are also significant for the various measures of public expenditure (including capital outlays) and for domestic financing.

These preliminary findings (and those from bivariate simple regressions reported in Figure 1) are consistent with the empirical results obtained by Easterly and Rebelo (1993) and Kneller, Bleaney, and Gemmel (1999, 2000), who found that balanced budgets and investment in transport and communications are consistently correlated with growth in a sample of low-income countries.

IV. Econometric Analysis

A. The Econometric Models

The relationship between expenditure composition, fiscal adjustment, and growth can be estimated by regressing the annual rate of real per capita GDP growth on a set of regressors, including fiscal variables and other control variables. Three specifications of the relationship are used here. In Model A, fiscal variables are measured as a share of GDP, without a variable included on the fiscal balance; this allows us to capture the effects of particular expenditure items (e.g., wages) not only on the composition of expenditure, but also on the deficit. In model B, we measure fiscal variables in relation to total expenditures or total revenues, so as to assess directly the impact of expenditure or revenue composition on growth, while at the same time including a variable for the budget balance. In Model C, we address how the nature of the financing of the deficit affects growth, by substituting the budget balance variable with variables for domestic and external financing of the deficit. Each of the three models is formulated as follows:

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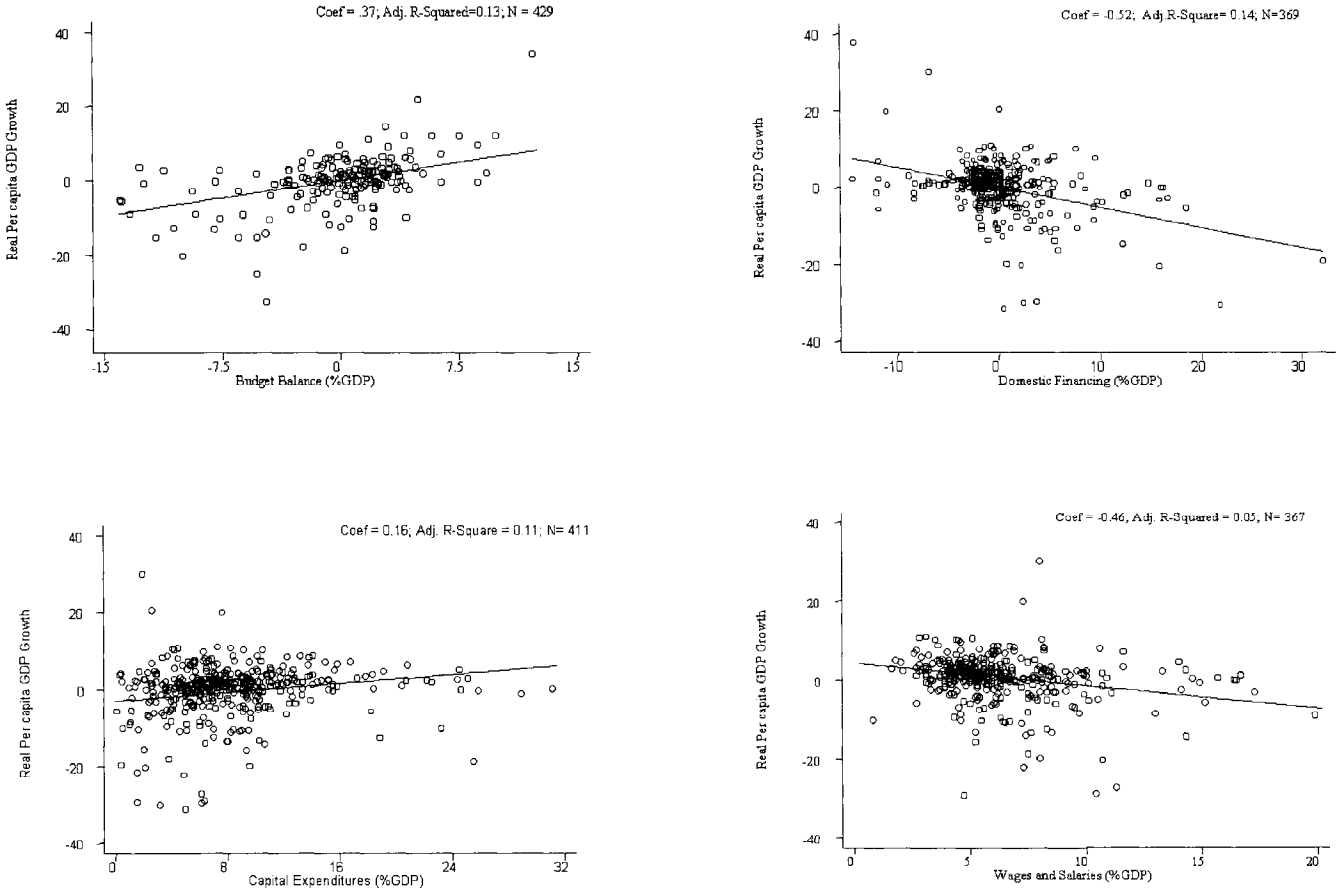
[13] Correlation coefficients are calculated using the Spearman rank correlation formula to avoid the effect of outliers.

Figure 1. Budget Balance, Budget Composition, and Growth, 1990–2000



Source: Authors' calculations.

Budget components (revenue and expenditure) measured as a share of GDP (Model A):

$$g_{i,t} = \alpha + \sum_{l=1}^{k} \beta_l Y_{ilt} + \sum_{h=1}^{q} \beta_h XGDP_{iht} + u_{it} \qquad (1)$$

where $g_{i,t}$ is the growth rate of real per capita GDP; Y_{ilt} is a vector of nonfiscal independent variables (initial level of GDP per capita growth, private investment ratio, terms of trade, labor force, initial level of primary and secondary enrollment rates); and $XGDP_{iht}$ is a vector of independent fiscal variables aimed at capturing the effect of the composition of the budget. These variables are measured in percent of GDP and include: public sector wages and salaries, expenditures on other goods and services, transfers and subsidies, interest payments

on government debt, capital expenditures, tax revenues, nontax revenues, and grants. In order to avoid perfect collinearity among regressors, the budget balance is not included.[14] [15]

- Fiscal balance as share of GDP and expenditure composition by economic category (Model B):

$$g_{i,t} = \alpha + \sum_{l=1}^{k} \beta_l Y_{ilt} + \sum_{h=1}^{q} \beta_h XBALEXP_{iht} + u_{it} \quad (2)$$

where $g_{i,t}$ and Y_{ilt} are defined as before and $XBALEXP_{iht}$ is a vector of independent fiscal variables aimed at capturing the effect of the budget balance and the composition of expenditures. The budget balance is measured as a percentage of GDP, while all expenditure items are measured as shares of total public expenditures. The expenditure categories include: public wages and salaries, public transfers and subsidies, interest payments on government debt, public expenditures on other goods and services, and public capital expenditures.

- Source of deficit financing expressed as a share of GDP and expenditure composition by economic category (Model C):

$$g_{i,t} = \alpha + \sum_{l=1}^{k} \beta_l Y_{ilt} + \sum_{h=1}^{q} \beta_h XFINEXP_{iht} + u_{it} \quad (3)$$

where $g_{i,t}$ and Y_{ilt} are defined as before and $XFINEXP_{iht}$ is a vector of independent fiscal variables aimed at capturing the effect of the deficit financing (both domestic and external financing in percent of GDP), and the composition of expenditures as shares of total public expenditures. This specification is the same as the previous one, but it replaces the budget balance with its financing sources (expressed as ratios to GDP).

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[14] Theoretical models have generally incorporated the government budget constraint, which implies that a change in revenues or spending of a given magnitude has to be matched by offsetting changes elsewhere. This has not, however, been the approach taken in the empirical literature. In many cases, applied studies estimate the effect of selected expenditures and revenues on growth, which implicitly assumes that the effect of the excluded items on growth is neutral. We avoid this by including all budget items in the specification. In this respect we follow Kneller, Bleaney, and Gemmel (1999), who emphasize the need to include all fiscal policy variables in the equations to avoid omitted variables bias.

[15] For example, adjustment based on selective increases in import tariff rates would most likely have a more adverse effect on growth than raising revenues from a broad-based VAT.

B. Baseline Regressions

The models above are estimated in levels and in first differences (changes), in order to capture both long- and short-run effects of fiscal policy on growth. In estimating models based on panel data, it is important to assess whether the distribution of the error term is such that the presence of serial correlation and heteroskedasticity can be excluded. In our sample, growth rates are likely to be influenced by economic performance in previous periods. Moreover, one cannot presume that the variance of the error term in the regression is zero among countries and constant within countries. In order to produce consistent estimates of the parameters in light of these potential problems, the models presented above are estimated using a feasible generalized least squares estimator (FGLS), controlling for heteroskedasticity and serial correlation.[16] The estimated coefficients for the three models are reported in Table 3.

Results from the baseline regressions are consistent with the empirical literature and show that **on average, fiscal adjustments have not been harmful for growth, both in the long and in the short term.** According to these results, a one percent improvement in the fiscal balance has a positive and significant impact in the long term on the rate of GDP growth, raising it by ¼ of one percentage point (model B). A similar result is obtained for the short-term effect of a change in the fiscal balance on growth. **The composition of deficit financing also matters**. Domestic financing of the budget tends to be more harmful for growth than external financing (model C): In the long term, an increase in domestic financing by one percent reduces the per capita growth rate by one-third of a percentage point. The estimated coefficient for the short-term relationship is even larger.

Expenditure composition is also critical for growth. Expenditure composition affects growth significantly. In Model A, a one percent increase in spending on wages and salaries has a negative impact on long-term growth by more than one-fourth of a percentage point, while expenditures on other goods and services and capital expenditures tend to raise the growth rate significantly. It is worth noting that the coefficient of capital expenditure is smaller than that for nonwage goods and services. Interest payments, transfers and subsidies, and tax revenues have a statistically insignificant impact on growth. Finally, when we look at the models that assess the impact of expenditure composition directly (models B and C), we notice that the coefficients for spending on wages and other goods and services turn insignificant. Nonetheless, the share of capital expenditures in total expenditures is positively related to growth. The results suggest that a one percent increase in the allocation of public spending to capital outlays can raise the growth rate by 0.1 percentage point in the long term and by almost ½ of one percentage point of GDP in the short term.

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[16] Both Cook-Weisberg and Lagrange multiplier tests indicate the presence of serial correlation in the residuals. Therefore, the FGLS estimator assumes that the error term is of the AR(1) form. The results reported in the text are based on the specification of a heteroskedastic error process with no cross-sectional correlation. The autocorrelation process is common to all the countries. An alternative specification with an unrestricted country-specific autocorrelation coefficient did not yield significantly different results.

Table 3. Fiscal Policy, Budget Composition, and Growth in Low-Income Countries, 1990–2000

	Model A: Budget Composition (In percent of GDP)		Model B: Budget Balance and Composition of Expenditures		Model C: Budget Financing and Composition of Expenditures	
	Real Pc. GDP Growth (GLS) (h-arl)	Change In GDP Growth (GLS) (h-arl)	Real Pc. GDP Growth (GLS) (h-arl)	Change In GDP Growth (GLS) (h-arl)	Real Pc. GDP Growth (GLS) (h-arl)	Change in GDP Growth (GLS) (h-arl)
Initial per capita GDP growth	-0.156	-0.059	-0.016	-0.030	0.011	0.026
	(0.88)	(0.97)	(0.22)	(0.43)	(0.12)	(0.27)
Labor force	0.183*	1.164***	0.140***	1.100***	0.132**	0.915***
	(1.73)	(3.15)	(2.92)	(3.07)	(2.43)	(2.65)
Terms of trade	-0.001	0.001	-0.002	-0.001	-0.002	-0.002
	(0.24)	(0.14)	(1.19)	(0.22)	(1.27)	(0.48)
Private investment	0.235**	0.115*	0.152***	0.241**	0.142***	0.467***
	(2.33)	(1.69)	(3.50)	(2.33)	(2.75)	(3.17)
Initial primary enrollment	-0.006	-0.016**	-0.015*	-0.008	-0.011	-0.005
	(0.25)	(2.05)	(1.70)	(0.73)	(1.07)	(0.36)
Initial secondary enrollment	0.043	0.003	0.073***	-0.003	0.061***	-0.002
	(1.47)	(0.23)	(5.77)	(0.21)	(3.95)	(0.08)
Budget balance (as percent of GDP)			0.251***	0.254***		
			(5.41)	(2.92)		
Domestic financing (as percent of GDP)					-0.333***	-0.491***
					(4.26)	(3.34)
External financing (as percent of GDP)					-0.247***	-0.294**
					(3.91)	(2.51)
Wages and salaries (as percent of GDP)	-0.318***	-0297				
	(3.42)	(1.23)				
Wages and salaries (as percent of total expenditure)			-0.064*	-0.069	-0.071*	-0.081
			(1.88)	(0.98)	(1.91)	(0.98)
Transfers and subsidiaries (as percent of GDP)	0.150	-0.020				
	(0.74)	(0.10)				
Transfers and subsidiaries (as percent of total exp.)			0.020	0.134	0.027	0.147
			(0.45)	(1.44)	(0.52)	(1.29)
Interest payments (as percent of GDP)	-0.278	-0.092				
	(1.56)	(0.41)				
Interest payments (as percent of total expenditure)			-0.032	-0.033	-0.062	-0.003
			(0.83)	(0.37)	(1.37)	(0.03)
Other goods/services (as percent of GDP)	0.375**	1.235***				
	(2.03)	(5.05)				
Other goods/services (as percent of tot. expenditure)			0.007	0.129*	0.001	0.188**
			(0.20)	(1.76)	(0.03)	(2.09)
Capital expenditure (as percent of GDP)	0.117**	0.431***				
	(2.02)	(3.78)				
Capital expenditure (as percent of total expenditure)			0.077**	0.232***	0.067**	0.246***
			(2.51)	(3.91)	(2.06)	(3.54)
Tax revenue (as percent of GDP)	0.114	0.079				
	(1.31)	(0.64)				
Nontax revenue (as percent of GDP)	-0.034	0.816***				
	(0.14)	(2.92)				
Grants (as percent of GDP)	-0.125)	0.277**				
	(0.69)	(2.16)				
Constant	-13.590**	1.125*	-7.554*	0.474	-6.247	
	(2.18)	(1.80)	(1.86)	(0.72)	(1.36)	(0.30)
Number of observations	255	225	256	226	231	202
Log-likelihood	-825.61	-652.81	-674.65	-658.00	-619.66	-602.70
Regression test—Wald χ^2 (14)	46.34	107.02	184.92	51.54	129.81	55.86
Regression significance	0.000	0.000	0.000	0.000	0.000	0.000

Note: Absolute value of t and z statistics in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

C. Sensitivity Analysis

In order to assess the sensitivity of the econometric results presented above, this section **reports the main results of the robustness analysis** (detailed results are presented in the appendix). The following summarizes the most important findings:

Reverse causality is not found to affect significantly the parameter estimates. A common issue in the literature on fiscal policy and growth is the likely presence of endogeneity or reverse causality. It could be the case that economic growth itself influences fiscal variables. For example, when economic growth slows down, the ratio of government spending to GDP is likely to increase if the nominal level of expenditure is fixed, or if the revenue effort is sensitive to cyclical developments. Moreover, some degree of reverse causality could also be present in the relationship between growth and investment.[17] If economic growth is a determinant of any of the right-hand side variables in our model, estimation techniques that do not take into account this endogeneity will yield biased and inconsistent parameter estimates. To address this concern, we estimate the previous models using a Generalized Method of Moments (GMM) estimator,[18] instrumenting for the investment rate, fiscal balance ratio and the shares of government spending and revenues to GDP, we use as instruments the lagged values of these variables and the other exogenous variables in the model. Results are presented in Table 4 and broadly confirm the findings of the previous section.[19] Accounting for the endogeneity of fiscal balance, however, does lead to a slightly more positive effect of fiscal consolidations on growth. The minor difference in the results is that a reduction in the share of wages and salaries has a larger impact on growth than under the FGLS estimate. The effect of capital outlays on growth is not affected.

Another important problem that is encountered in panel data estimation is the presence of **unobserved country-specific effects** (Easterly, Loyza, and Montiel, 1997).[20] Excluding

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[17] A related issue is whether the model fully captures the effect of the budget balance on growth, as the inclusion of private investment (as an independent variable) de facto blocks the indirect effects of the budget deficit on growth via its effects on private investment. FGLS estimates that omit private investment from the specification, however, do not lead to significantly different results, including for the fiscal balance. Furthermore, preliminary regressions in which private investment (rather than growth) is specified as the dependent variable indicate a statistically insignificant effect for the fiscal balance on private sector capital formation. This assessment should be viewed as preliminary, however, given the need to assess the deficit-investment relationship in a model especially specified for that purpose.

[18] The GMM estimator used here deals with a heteroskedastic error process, but not with autocorrelation of an unknown form. This GMM estimator is more efficient than the traditional instrumental variables estimator with a heteroskedasticity-consistent covariance matrix.

[19] The validity of the set of instruments used is tested using Hansen's J statistic. The test cannot reject the null hypothesis that additional moment conditions are approximately satisfied, indicating the validity of the model.

[20] Unobservable time-specific effects are less common. In fact, following Greene (2000), when such effects do exist, it would be more efficient to include an explicit linear or nonlinear time trend in the equation.

unobservable country-specific effects could lead to serious biases in the econometric estimates, notably when these effects are correlated with the other covariates. The country-specific effect can be assumed to be either correlated with the vector of exogenous variables (a fixed effect) or a random variable uncorrelated to the right hand side variables (a random effect). Given the presence of serial correlation, we estimate models A–C using unobserved country-specific effects and allow for the lagged growth rate to be included among the determinants of economic growth. Models A–C can then be estimated using the GMM estimator proposed by Arellano and Bond (1991). The GMM estimate also controls for endogeneity by using the lagged values of the levels of the endogenous and the predetermined variables as instruments. Both the validity of the instruments and the presence of serial correlation in the residual, which would eliminate the consistency of the estimator, can be tested once the equation is estimated.

Introducing a dynamic specification does not lead to significantly different results. GMM estimates of the dynamic model with country-specific effects are reported in Table 4. Once again, the results are, in general, consistent with the FGLS estimates presented in the previous section. The effect of fiscal consolidation on growth is larger and more significant than under the GMM and FGLS estimates of the static model. The contributions of capital outlays and government spending on wages are still correctly signed and statistically significant, and larger in size than in the previous section. The negative effect on growth of an increase in domestic financing is larger, while the effect of external financing of the deficit is broadly unchanged. Finally, the coefficient of the lagged dependent variable is negative and significant, as expected,[21] for models (B) and (C), but is not significantly different from zero for model (A). Finally, both the Sargan test for the validity of instruments and the test for the serial correlation of residuals confirm that GMM provides consistent estimate of the parameters.

Additional sensitivity analysis in the estimation of models A–C is reported in Tables 9–11 in the appendix.[22] In the tables we present the results of the Least Square Dummy Variable (LSDV) estimate of the fixed effect model and the Generalized Least Square (GLS) estimate of the random effect model (in the case where no lagged dependent variable is included). The results confirm the main findings of the previous section.

Results are also consistent with these estimates when we use a robust technique to control for the possible presence of outliers in the data. The method is based on an iterative algorithm that first runs OLS estimates and calculates Cook's D statistics for the

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[21] A negative coefficient for the lagged growth rate can be interpreted as the tendency of the annual growth rate to converge toward an average long-run trend. Countries would still tend toward different, specific growth rates as a result of the error component structure in the equation.

[22] In the tables we also report the results for the FGLS estimate to facilitate comparison with alternative estimators.

Table 4. Fiscal Policy, Budget Composition, and Growth in Low-Income Countries: Controlling for Reverse Causality, 1990-2000

	Model A. Budget Composition (As percent of GDP)				Model B. Budget Balance and Composition of Expenditures				Model C: Budget Financing and Composition of Expenditures			
	Real Per Capita Growth (GMM-Static)	*Real Per Capita* Growth (GMM ABond)	*Change in Growth* (GMM-Static)	*Change in Growth* (GMM-ABond)	*Real Per Capita* Growth (GMM-Static)	*Real Per Capita* Growth (GMM ABond)	Change in Growth (GMM-Static)	Change in Growth (GMM-ABond)	Real Per Capita Growth (GMM-Static)	Real Per Capita Growth (GMM ABond)	Change in Growth (GMM-Static)	Change in Growth (GMM-ABond)
Per Capita Growth (t-1)		-0.087		-0.248**		-0.267***		-0.378***		-0.279		-0.410***
		(1.63)		(6.40)		(27.24)		(18.02)		(10.52)		(15.19)
Initial GDP growth	-0.176		-0.027		0.100		0.031		0.216		*0.118*	
	(1.09)		(0.20)		(0.81)		(0-.21)		(1.29)		(0.70)	
Labor force	0.207*	1.693***	2.183**	2.576***	0.023	0.989***	2.214**	2.309	-0.001	1.000***	1.619*	2.198***
	(1.92)	(7.94)	2.51	(11.19)	(0.25)	(5.32)	(2.11)	(14.64)	(0.01)	(4.85)	(1.72)	(7.65)
Terms of trade	-0.001	0.002***	0.000	0.009**	-0.001	-0.001	-0.001	0.003	-0.001	-0.005***	-0.005	-0.003
	(0.57)	(2.71)	(0.06)	(2.24)	(0.89)	(0.90)	(0.26)	(0.98)	(1.03)	(3.35)	(1.18)	(1.42)
Private investment	0.183*	0.126*	0.247	0.123	0.203	0.316***	0.527***	0.589***	*0.165**	*0.486****	0.569**	0.693***
	(1.96)	(1.84)	(1.46)	(1.05)	(2.34)	(4.08)	(2.77)	(6.43)	(1.89)	(2.70)	(2.43)	(4.77)
Primary enrollment	-0.008		-0.013		-0.009		-0.011		-0.006		-0.005	
	(0.57)		(0.82)		(0.72)		(0.66)		(0.38)		(0.22)	
Secondary enrollment	0.032*		-0.003		0.064***		-0.003		0.062		-0.001	
	(1.71)		(0.12)		(3.92)		(0.12)		(2.87)		(0.03)	
Budget balance (as percent of GDP)					0.346***	0.471***	0.481	0.604***				
					(3.62)	(6.14)	(2.46)	(12.42)				
Domestic financing (as percent of GDP)									-0.453***	-0.827***	-0.896**	-1.004***
									(3.09)	(5.29)	(2.43)	(7.01)
External financing (as percent of GDP)									-0.361***	-0.362***	-0.478**	-0.554*
									(3.11)	(4.85)	(2.50)	(7.90)
Wages and salaries (as percent of GDP)	-0.079	-0.327	-0.356	-0.225								
	(0.56)	(1.83)	(0.55)	(0.89)								
Wages and salaries (as percent of total expenditure)					-0.148*	-0.307***	-0.198	-0.216***	-0.166*	-0.274***	-0.229*	-0.223**
					(1.74)	(5.37)	(1.54)	(4.80)	(1.88)	(3.72)	(1.70)	(2.43)
Transfers and subsidies (as percent of GDP)	0.249	0.019	-0.140	-0.450*								
	(1.59)	(0.13)	(0.21)	(1.65)								
Transfers and subsidies (as percent of total expenditure)					-0.011	0.012	-0.035	*-0.020*	*-0.015*	*0.096*	*-0.074*	-0.033
					(0.12)	(0.33)	(0.13)	(0.34)	(0.19	(1.45)	(0.23)	(0.34)
Interest payments (as percent of GDP)	-0.185	-0.051	-0.328	-0.015								
	(1.23)	(0.43)	(0.71)	(0.08)								
Interest payments (as percent of total expenditure)					-0.145	-0.300***	-0.327*	-0.388***	-0.196*	-0.230**	-0.340*	-0.305***
					(1.56)	(5.89)	(1.85)	(6.40)	(1.84)	(2.50)	(1.67)	(3.51)
Other goods and services (as percent of GDP)	0.525**	1.472***	1.557	0.921***								
	(2.15)	(7.43)	(2.85)	(4.56)								
Other goods and services (as percent of total expenditure)					-0.067	0.107**	0.074	0.039	-0.082	0.177***	0.131	-0.021
					(0.91)	(2.38)	(0.65)	(0.87)	(1.03)	(3.12)	(1.09)	(0.23)
Capital expenditure (as percent of GDP)	0.516***	0.566***	0.750**	0.808***								
	(2.78)	(4.45)	(2.03)	(5.27)								
Capital expenditure (as percent of total expenditure)					0.025	0.153***	0.214**	0.308***	*0.004*	*0.144****	*0.136*	*0.250****
					(0.33)	(4.93)	(1.97)	(5.83)	(0.06)	(2.62)	(1.01)	(3.53)
Tax revenue (as percent of GDP)	0.184	0.004	0.039	0.031								
	(2.20)	(0.06)	(0.14)	(0.13)								
Nontax revenue (as percent of GDP)	-0.227	1.703***	1.260*	1.306***								
	(1.07)	(5.13)	(1.86)	(3.41)								
Grants (as percent of GDP)	-0.330*	0.281*	0.106	0.664***								
	(1.68)	(1.69)	(0.33)	(6.23)								
Constant	-3.739*	0.385**	1.275	0.057	4.304	-0.274*	0.467	-0.299	8.083	-0.298	0.174	0.578
	(1.74)	(2.27)	(1.02)	(0.17)	(0.41)	(1.67)	(0.38)	(1.64)	(0.73)	(0.50)	(0.14)	(1.21)
Number of observations	255	206	225	176	256	206	226	176	231	184	202	155
Regression test	6.09	15.31	7.61	13.71	5.89	17.98	8.21	12.85	6.07	7.07	8.22	16.95
Regression significance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Absolute value of t and z statistics in parentheses. * significant at 10 percent; ** significant at 5 percent; and *** significant at 1 percent.

Model A: Hansen-J Test for overidentifying restrictions: (GMM 0-levels p = 0.55), (GMM 0-changes) p = 1.00; Sargan Test for overidentifying restrictions: (GMM-ABond-levels) p = 0.99; (GMM-ABond-changes) p = 0.99; Arellano-Bond Test for autocovariance in residuals (GMM-ABond-levels) p =0.53; (GMM-ABond-changes) p = 0.37. Model B: Hansen-J Test for overidentifying restrictions: (GMM 0-levels p = 0.70), (GMM 0-changes) p = 0.30; Sargan Test for overidentifying restrictions: (GMM-ABond-levels) p = 0.99; (GMM-ABond-changes) p = 0.99; Arellano-Bond Test for autocovariance in residuals (GMM-ABond-levels) p = 0.10, (GMM-ABond-changes) p = 0.21. Model C: Hansen-J Test for overidentifying restrictions: (GMM 0-levels p = 0.61), (GMM 0-changes) = 1.00; Sargan Test for overidentifying restrictions: (GMM-ABond-levels) p = 0.99; (GMM-ABond-changes) p = 0.99; Arellano-Bond Test for autocovariance in residuals (GMM-ABond-levels) p = 0.07; (GMM-ABond-changes) p = 0.15

residuals, eliminating those observations for which D>1. The second step of the algorithm is to run a regression on the new dataset, and calculate case weights based on the inverse of the residual.[23] The results of this robust estimation are presented in the last column of Tables 10-12 in the appendix and show that the effect of outliers in our data is not substantial. Nonetheless, the estimated coefficient for the fiscal balance is smaller than in the previous section and the coefficients for both domestic and external financing turn insignificant. The effect of expenditure composition on growth is consistent with the previous findings, with the coefficient for government spending on wages and capital outlays significant and correctly signed.

Finally, results do not change much when the possible effects of the business cycle and time trends are removed from the data. The possible effects of the business cycle are partially eliminated by smoothing the data using a three-year moving average filter.[24] Once again, the results are not sensitive to this transformation of the original data. The reason why business cycle effects may be weaker in low-income countries than in the industrial countries is the absence of automatic stabilizers. This feature makes it very unlikely that business cycles affect tax collection or public expenditures, and thus the overall budget balance. Moreover, in our sample we do not find sufficient evidence that unobservable time effects are a serious problem, as evidenced by the results for regressions that include time dummies to control for nonlinear time trends in the data.[25]

D. Nonlinear Effects of Fiscal Policy on Growth: Pre- and Post-Stabilization Countries

The results in the previous sections suggest that fiscal consolidation is not harmful for growth in low-income countries. Quality fiscal adjustments based on the reallocation of public expenditure to more productive uses, and the reduction of the budget deficit, were found to be conducive to higher growth. Of interest is whether these results hold for all countries in the sample, in particular, for countries that have already achieved a modicum of macroeconomic stability (i.e., "post-stabilization" countries).

With the purpose of assessing the effect of initial fiscal conditions on the fiscal policy-growth nexus, **we split the sample into post- and pre-stabilization countries**. A post-stabilization country is defined as a country that maintained an average fiscal deficit (after grants) below

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[23] For a full description of this procedure, see Hamilton (1991).

[24] These results are available from the authors on request.

[25] We also tested whether the use of the fiscal balance on a commitment basis rather than on a cash basis would affect our results. We found that both the sign and the statistical significance of the deficit variable remained unaffected by this change.

2.5 percent of GDP during the period 1990–2000.[26] [27] As discussed in Section III, only seven countries in our sample can be classified as post-stabilization according to this definition.

Results for post-stabilization countries point to the positive effects of capital outlays and selected current expenditures on growth. Econometric results for the two subgroups are reported in Table 5 using FGLS.[28] Interestingly, the results suggest that for countries with low budget deficits, additional fiscal consolidation may not yield higher growth. Even more importantly, domestic financing is not harmful for growth in these countries, unlike the case of countries that have not yet achieved stabilization. The expansion of selected expenditures, such as nonwage current spending on goods and services and public investment, is compatible with higher growth. Results for pre-stabilization countries, though, are fully consistent with the "expansionary contractions" thesis.

V. The Sustainability of Fiscal Adjustments

Following Von Hagen and Strauch (2001) and others, we define fiscal adjustments as sustainable if they persist over an adequate period of time. This definition of sustainability is somewhat different from the more common use of the term. In general, the term "sustainability" is linked to the long-term implications for public debt of the current fiscal stance (see Ize, 1991).

There is a wide consensus among researchers that fiscal consolidations need to be persistent in order to have a positive effect on growth. In general, the persistence of high-quality fiscal adjustment can affect macroeconomic stability and reduce the expectations that higher taxes and interest rates will be needed in the future to finance fiscal disequilibria. Short-lived fiscal consolidations, though, can be harmful for growth, as they signal that the initial improvement in the fiscal budget cannot be maintained and could even be reversed in the medium term. An understanding of what makes fiscal consolidations sustainable is therefore essential to unraveling how fiscal adjustment influences growth (Von Hagen and Strauch, 2001).

Survival analysis is the appropriate statistical method to assess which factors affect the persistence of fiscal consolidations. Most empirical studies on the sustainability of fiscal

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[26] The criterion used to group the countries in the sample is similar to the one used in a study of ESAF-supported programs from 1986–95 (see Abed and others, 1998), where "low initial deficit" countries were defined as those with initial deficits (before grants) of 5 percent, with grants of approximately 2½ percent of GDP. Post-stabilization countries are: Benin, The Gambia, Lesotho, Macedonia (FYR), Mauritania, Senegal, and Tanzania.

[27] We also applied the same threshold to the 1996–2000 averages in order to test the robustness of our results to alternative definitions of "post-stabilization." The results confirm the findings of this section.

[28] Results for Model A are reported in Appendix Table 8.

Table 5. Fiscal Policy, Budget Composition, and Growth in Low-Income Countries (Pre- and Post-Stabilization Countries), 1990-2000

	Model B: Budget Balance and Composition of Expenditures						Model C: Budget Balance and Composition of Expenditures					
	Real Per Capita GDP Growth (GLS) (h-arl)			Change Real Per Capita GDP Growth (GLS) (h-arl)			Real Per Capita GDP Growth (GLS) (h-arl)			Change Real Per Capita GDP Growth (GLS) (h-arl)		
	All sample	Pre-stabilization countries	Post-stabilization countries	All sample	Pre-stabilization countries	Post-stabilization countries	All sample	Pre-stabilization countries	Post-stabilization countries	All sample	Pre-stabilization countries	Post-stabilization countries
Initial GDP growth	-0.016	0.032	-0.739*	-0.030	-0.029	-0.201	0.011	0.029	-1.306**	0.026	0.090	-0.199
	(0.22)	(0.35)	(1.95)	(0.43)	(0.27)	(1.21)	(0.12)	(0.26)	(2.22)	(0.27)	(0.7)	(1.21)
Labor force	0.140***	0.155**	0.329**	1.100***	0.985**	-0.229	0.132**	0.097	0.536***	0.915***	0.870**	2.670
	(2.92)	(2.10)	(2.52)	(3.07)	(2.54)	(0.18)	(2.43)	(1.12)	(3.16)	(2.65)	(2.56)	(1.59)
Terms of trade	-0.002	-0.001	0.041	-0.001	-0.002	0.051	-0.002	-0.001	0.029	-0.002	-0.004	0.068*
	(1.19)	(0.72)	(1.50)	(0.22)	(0.26)	(1.17)	(1.27)	(0.81)	(0.96)	(0.48)	(0.62)	(1.82)
Private investment	0.152***	0.244***	-0.179	0.241**	0.503***	-0.382***	0.142***	0.231***	-0.084	0.467***	0.770***	-0.346***
	(3.50)	(3.85)	(2.23)	(2.33)	(3.34)	(3.75)	(2.75)	(2.91)	(0.9)	(3.17)	(4.03)	(3.54)
Primary enrollment	-0.015*	-0.010	0.121	-0.008	-0.009	0.02	-0.011	-0.004	0.172**	-0.005	-0.010	0.007
	(1.70)	(0.89)	(2.58)	(0.73)	(0.68)	(0.91)	(1.07)	(0.3)	(2.34)	(0.36)	(0.72)	(0.32)
Secondary enrollment	0.073***	0.061***	-0.307**	-0.003	-0.001	-0.035	0.061***	0.053***	-0.540**	-0.002	-0.001	-0.029
	(5.77)	(3.88)	(2.25)	(0.21)	(0.06)	(0.67)	(3.95)	(2.66)	-2.34	(0.08)	(0.06)	(0.57)
Budget balance (as percent of GDP)	0.251***	0.310***	0.091	0.254***	0.387***	0.042						
	(5.41)	(4.90)	(1.33)	(2.92)	(3.28)	(0.48)						
Domestic financing (as percent of GDP)							-0.333***	-0.500***	-0.100	-0.491***	-0.693***	-0.010
							(4.26)	(3.83)	(1.14)	(3.34)	(3.8)	(0.07)
External financing (as percent of GDP)							-0.247***	-0.292***	-0.307***	-0.294**	-0.366***	-0.232**
							(3.91)	(3.47)	(3.13)	(2.51)	(2.67)	(2.29)
Wages and salaries (as percent of total expenditure)	-0.064*	-0.118***	0.087	-0.069	-0.133	0.011	-0.071*	-0.122**	0.179**	-0.081	-0.168	0.103
	(1.88)	(2.67)	(1.54)	(0.98)	(1.29)	(0.14)	(1.91)	(2.46)	(2.21)	(0.98)	(1.48)	(1.63)
Transf. and subsidies (as percent of total expenditure)	0.020	-0.025	0.346***	0.134	-0.017	0.354***	0.027	-0.045	0.430***	0.147	-0.003	0.478***
	(0.45)	(0.40)	(5.16)	(1.44)	(0.13)	(4.10)	(0.52)	(0.52)	(5.53)	(1.29)	(0.02)	(7.21)
Interest payments (as percent of total expenditure)	-0.032	-0.067*	0.192*	-0.033	-0.059	0.325*	-0.062	-0.109**	0.152	-0.003	-0.126	0.115
	(0.83)	(1.71)	(1.70)	(0.37)	(0.54)	(1.77)	(1.37)	(1.97)	(1.1)	(0.03)	(0.97)	(0.68)
Other goods and services (as percent of total expend.)	0.007	-0.010	0.118*	0.129*	0.095	0.198***	0.001	-0.001	0.041	0.188**	0.140	0.143**
	(0.20	(0.20)	(1.92)	(1.76)	(0.93)	(2.65)	(0.03)	(0.03)	(0.57)	(2.09)	(1.20)	(2.1)
Capital expenditure (as percent of total expenditure)	0.077**	0.023	0.109**	0.232***	0.208**	0.188***	0.067**	0.01	0.199***	0.246***	0.177**	0.280***
	(2.51)	(0.57)	(2.09)	(3.91)	(2.5)	(2.66)	(2.06)	(0.23)	(2.98)	(3.54)	(1.96)	(5.08)
Constant	-7.554*	-4.601	-33.191***	0.474	0.352	-0.603	-6.247	-0.926	-45.05***	0.228	0.504	0.032
	(1.86)	(0.79)	(3.43)	(0.72)	(0.42)	(0.49)	(1.36)	(0.14)	(3.95)	(0.3)	(0.6)	(0.03)
Number of observations	256	207	49	226	183	43	231	190	41	202	166	36
Log-likelihood	-674.65	-563.50	-93.29	-658.00	-554.74	-91.42	-619.66	-529.37	-76.98	-602.7	-511.20	-67.19
Regression test	184.92	171.55	66.59	51.54	51.48	45.98	129.81	94.5	78.48	55.86	59.99	152.33
Regression significance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0	0.000	0.000	0.000

Note: Absolute value of t and z statistics in parentheses. * significant at 10 percent; ** significant at 5 percent; and *** significant at 1 percent. Regression tests: Wald χ^2 (12).

consolidations, in contrast, have used a descriptive and indirect approach to measure the determinants of sustainable fiscal adjustments. The approach consists of a two-step procedure: first, the authors preselect consolidation episodes according to a predefined threshold; and second, they provide a description of their main characteristics. Survival analysis provides a superior approach, as it allows for a multivariate analysis of the determinants of the persistence of fiscal adjustments and makes use of all the information available in the data, rather than constraining the analysis to consolidation episodes only. As such, this technique can be seen as a generalization of the previous approaches based on fiscal adjustment episodes.[29]

A. Data Description

Fiscal adjustment periods are based on the observed change in the fiscal deficit as a share of GDP. Based on annual budget balance data, we generate a dummy variable called "*failure*," which takes a value of zero when the annual variation of the budget balance is above 1½ percentage point of GDP (years of fiscal consolidation), and takes a value of one when the annual change is equal or lower than this threshold (lack of adjustment). Note that this criterion is arbitrary. One could define as a fiscal consolidation any year when a positive change in the budget balance is observed. One reason to use the threshold mentioned above, however, is to avoid labeling as "fiscal consolidations" years in which minor improvements of the budget balance took place, reflecting unintended variations of the budget, or measurement errors.[30] This definition makes our results broadly comparable with previous empirical studies.[31]

Using the dates in which a failure event occurs, we create a new variable called "*duration*," that counts the intervening years between two consecutive failures, that is, the time span that the fiscal consolidation lasts. Under the definition of consolidation described above, the minimum length of an adjustment is one year, while the maximum length is five years. The average probability of ending a consolidation is 47 percent and the average duration of a fiscal adjustment is slightly above one year.

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[29] For other examples of survival analysis, see Von Hagen, Hallett, and Strauch, 2001; and Maroto and Mulas-Granados, 2001.

[30] As a robustness check, the analysis was also conducted using an alternative threshold of ½ percentage point of GDP, with broadly similar results being obtained.

[31] For example, Alesina and Perotti (1995); Perotti (1998); and Von Hagen, Hallett, and Strauch (2001), define episodes of fiscal consolidation as those periods in which the fiscal impulse (measured by the average cyclically adjusted primary balance) falls by at least 1¼ percent of GDP over two consecutive years, or when it increases by more than 1½ percent of GDP in one year. A successful adjustment is defined by two alternative conditions: (i) the fiscal impulse in the three years after the consolidation remains on average 2 percent of GDP above the level achieved in the last year of consolidation; or (ii) the ratio of public debt to GDP three years after the consolidation is at least 5 percent of GDP below the level observed in the last year of consolidation.

The database on duration data can be described using nonparametric analysis, where the most relevant characteristics of the data are presented in a univariate framework. The duration data can be easily summarized using three variables: the hazard rate, the survival rate and the cumulative failure rate. The unconditional hazard function expresses the relative risk that a fiscal consolidation ends at time t, provided it was still ongoing in the previous period. The hazard function (Kaplan and Meier, 1958) is calculated as follows:

$$\hat{h}(t) = \frac{d_t}{n_t} \tag{4}$$

where d_t represents the number of failures registered in moment t, and n_t is the surviving population in moment t, before the change in status (e.g., the end of the consolidation) takes place. Intuitively, this is the failure ratio. From the hazard function, it is possible to obtain the cumulative hazard function with an estimation procedure proposed by Nelson (1972) and Aalen (1978). This hazard function is given by the following expression:

$$\hat{H}(s) = \sum_{s=1}^{t} \hat{h}(s) \tag{5}$$

The Kaplan-Meier survivor function for duration t is calculated as the product of one minus the existing risk until period t:

$$\hat{S}(t) = \prod_{j|t_j \leq t} \left(\frac{n_j - d_j}{n_j}\right) \tag{6}$$

In Table 6 we report the survival function, the hazard function, and the cumulative failure function for our sample, together with the corresponding standard errors and confidence intervals. According to the results, only 43 percent of the fiscal adjustment periods last until the end of the second year. The relative risk that a consolidation episode is discontinued at the end of the first period (the hazard rate) is only 10 percent, but it increases rapidly to 71 percent at the beginning of the second period. Finally, in the third period more than 80 percent of the adjustment episodes have already been reversed.

B. Parametric Analysis

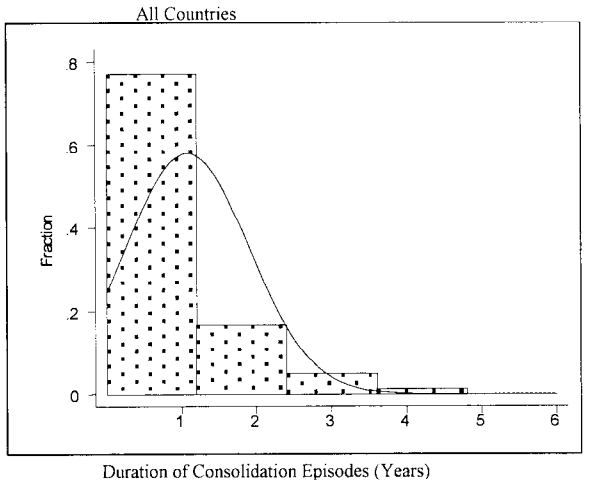
This section reports the results of the parametric analysis on the determinants of fiscal adjustment persistence. We regress the probability of interrupting a fiscal adjustment on a set of variables that, according to the literature, are likely to have an effect on the duration of the adjustment. The fiscal variables include: (1) the size of the adjustment, measured as the cumulative change in the budget balance during the entire period of analysis. The larger the size of the consolidation, the longer the effort is hypothesized to last. In fact, a larger adjustment size signals the willingness to bring fiscal policy onto a sustainable path; (2) the

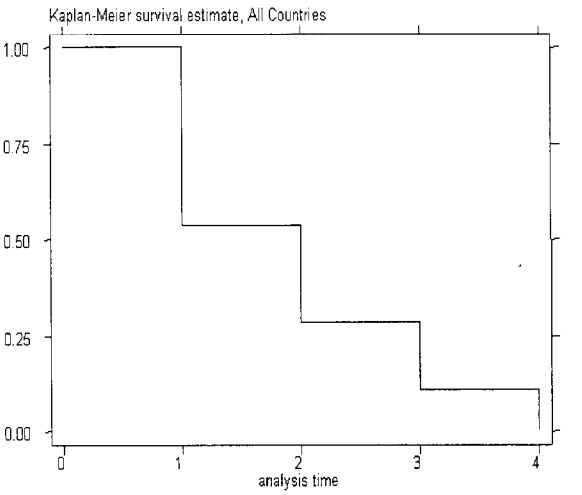
Table 6. Sustainability of Fiscal Consolidations in Low-Income Countries and Survival Analysis: Descriptive Results

		Survival Function				Cumulative Failure				Hazard Function			
				95% Confidence				95% Confidence				95% Confidence	
Interval		Estimate	S.E.	Interval		Estimate	S.E.	Interval		Estimate	S.E.	Interval	
0	1	0.903	0.015	0.869	0.928	0.097	0.015	0.072	0.131	0.102	0.016	0.070	0.134
1	2	0.428	0.027	0.374	0.481	0.572	0.027	0.519	0.626	0.713	0.054	0.608	0.818
2	3	0.197	0.026	0.148	0.250	0.804	0.026	0.750	0.852	0.742	0.102	0.543	0.941
3	4	0.063	0.021	0.030	0.112	0.937	0.021	0.888	0.970	1.032	0.221	0.599	1.466
4	5	0.000				1.000				2.000	0.000	2000	2.000

Source: Authors' calculations.

Figure 2. Sustainability of Fiscal Consolidations in Low-Income Countries: Hazard and Survival Functions





Source: Authors' calculations.

composition of government spending, including both the share of current spending in total government spending and the share of transfers in current spending. The composition of the adjustment is assumed to have a critical role in the persistence of the consolidation. Fiscal adjustments based on curtailing current expenditure have been found to be more sustainable than those based on reduced capital outlays in the empirical literature on industrial countries; (3) the initial level of the fiscal deficit, and the change in tax revenues and social spending, all expressed as ratios to GDP. These variables control for initial fiscal conditions and the contributions of investment in human capital and improvements in tax collection to the consolidation effort. In particular, the social spending variable is a proxy for how willing the government is to support pro-poor spending and garner broad support for the adjustment process. As such, these variables account for the possible trade-off between fiscal consolidation and the need to protect the poor from the possibly negative effect of government spending cuts; (4) we also include in the regression the change in per capita GDP growth and the previous number of failures in the adjustment process in the period considered; this is meant to control for the effect of exogenous growth shocks and past adjustment performance at the country level.

In the literature, the model that has been widely used to estimate the hazard function is the *Model of Proportional Hazard* (PH), which assumes that the hazard function can be described as follows:

$$h(t,X) = h_0(t) * g(X) \tag{7}$$

where $h_0(t)$ is the baseline hazard function and $g(X)$ is a function of individual covariates. This is usually defined as $g(X)=exp(X'\beta)$. Note that in this proportional specification, regressors rescale the conditional probability of ending the period of fiscal consolidation. This model can be estimated without imposing any specific functional form to the baseline hazard function, following Cox (1972):[32] [33]

$$h(t,X) = h_0(t) * \exp(X'\beta) \tag{8}$$

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[32] Mathematically, the baseline hazard function, $h0(t)$, is defined for all time t in which a change has taken place, and is not defined for other moments of time. But the survivor function $S0(t)$ is defined for all values of t.

[33] An alternative specification can be obtained by imposing one specific parametric form to the function $h0(t)$. In this case, the models most commonly used are the *Weibull Model* and the *Exponential Model*. In the first one, $h0(t)=pt^{p-1}$, where p is a parameter to be estimated. When $p=1$, the *Weibull Model* is equal to the *Exponential Model*. This model assumes the absence of any dependency on duration. The conditional probability of failure in a given interval is the same, regardless of when the observation is made. When $p>1$, there is a positive duration dependency, and a negative one when $p<1$. Therefore, by estimating p, it is possible to test the hypothesis of duration dependency during fiscal consolidations. We prefer the Cox-proportional model to a parametric specification based on the better fit of the former model. An additional advantage of using this specification is that we do not need to make any assumption about the distribution of the hazard function.

We use this model to estimate three alternative specifications: (1) we include the effect of the change in external financing as a share of GDP to take into account the effect of mostly concessional borrowing on the probability of ending an adjustment period; (2) we omit any variable related to the composition of financing; and (3) we include the change in the ratio of domestic financing to GDP. Results are reported in Table 7 and provide the following conclusions:

- **The reallocation of current expenditures to capital outlays is positively related to the persistence of the adjustment**. Large levels of wages and salaries, transfers, and subsidies increase the probability of ending a fiscal adjustment. At the same time, allocating more public spending on capital outlays is not harmful for the sustainability of adjustment. This may be due to the positive effects of these expenditure reallocations on growth (Chu and others, 1995). Reallocating current spending away from transfers and subsidies has a positive impact on the probability of continuing the fiscal consolidation effort, while spending more on health and education is not harmful to the persistence of the adjustment.

- **The size of the fiscal adjustment effort also matters**. The coefficient for the size of the adjustment is negative and highly significant. Thus, there appears to be little evidence of "adjustment fatigue": Countries with larger cumulative reductions in the deficit are less likely to abandon their adjustment efforts than others. This may reflect the fact that larger fiscal adjustments—including that secured in the past—signal the commitment of the authorities to continue the fiscal consolidation process.

- **Initial fiscal conditions are also important for the persistence of fiscal consolidations**. A country with unfavorable initial fiscal conditions is more likely to end a fiscal consolidation; furthermore, a history of past failures at fiscal consolidation also foreshadows failure.[34]

- **When fiscal consolidations are supported by more buoyant tax revenues, the probability of ending an adjustment is lower.** Results in Table 7 show that higher tax revenues increase the probability that the consolidation effort will be sustained. This result is at variance with the findings for industrial countries, where adjustments based on higher tax revenue were found to be less successful. However, in the context of low-income countries—where revenue ratios to GDP are generally modest—higher tax revenue collection can be triggered by improvements in tax administration, elimination of exemptions and curbing of tax evasion, rather than an increase in tax rates. These factors are likely to have a positive effect both on the fiscal stance and on growth, thereby increasing the probability that an adjustment will last longer.

[34] This result is consistent with the findings for a sample of low-income countries with ESAF-supported programs (Abed and others, 1998), which showed that countries which experienced a high number of interruptions of Fund-supported programs tended to have higher levels of current expenditures and lower capital outlays (relative to program targets) than countries with few or no interruptions.

Table 7. Sustainability of Fiscal Consolidations and Budget Composition in Low-Income Countries: Results from Cox Proportional-Hazard Model, 1990–2000 1/

	Coefficient	*z*-Test	Coefficient	*z*-Test	Coefficient	*z*-Test
Size of adjustment	-0.04	-3.06***	-0.03	-3.67***	-0.04	3.68***
Initial deficit	0.01	1.20	0.01	1.60	0.02	1.74*
Δ Growth	-0.02	-1.99**	-0.02	-2.42**	-0.02	-1.95*
Δ Social spending/GDP	-0.04	-1.07	0.01	0.08	0.02	0.47
Number of previous failures	0.01	3.75***	0.01	4.46***	0.01	4.01***
Δ Tax revenues/GDP	-0.08	-2.51**	-0.11	-4.71***	-0.06	1.82*
Δ Transfers/current spending	0.03	2.18**	0.02	1.72*	0.02	1.79*
Δ Current/ total spending	0.12	3.92***	0.12	5.05***	0.11	3.13***
Δ External financing/GDP	0.07	4.22***				
Δ Domestic financing/GDP					0.01	0.07
Number of episodes	167		188		167	
Number of failures	107		118		107	
Time at risk	239		272		239	
Log likelihood	-467.43		-532.03		-472.07	
Wald test	86.62		75.66		65.24	
Probability	0.00		0.00		0.00	

Note: Significance levels at 10 percent, 5 percent, and 1 percent are indicated by *, **, and ***, respectively.

1/ ML estimates with robust standard errors.

The availability of external financing tends to reduce the probability of continuing a fiscal consolidation, while there is no evidence that this is true for domestic financing. The coefficient for external financing is significant at the 5 percent level, even though including the share of either external or domestic financing in total deficit financing fails to lead to significant coefficients.

Finally, we find moderate empirical support in favor of an independent effect of economic growth on the duration of the fiscal adjustment. The probability of ending a fiscal consolidation effort is negatively related to per capita growth, as expected, but the coefficient is significantly different from zero only at the 5–10 percent level.

VI. Conclusions and Policy Implications

The empirical evidence provided in this study suggests that **in low-income countries fiscal consolidations were not harmful for long- as well as short-term growth** in the period 1990–2000. This paper sought to shed light on the relationship between fiscal adjustment, expenditure composition and economic growth in low-income countries. Consistent with the previous findings in the literature on industrial countries, the results point to a significant relationship between fiscal adjustment and per capita growth. A reduction of one percentage point in the ratio of the fiscal deficit to GDP leads to an average increase in per capita growth of ¼ to ½ of a percentage point both in the long and in the short term. This implies that a reduction in the average deficit in low-income countries from about 4 percent of GDP to 2 percent of GDP could boost per capita growth by about ½ to 1 percentage point per annum.

Tilting the overall composition of public expenditure toward more productive uses is particularly important for boosting growth and achieving more sustained fiscal adjustments. Fiscal consolidations achieved through cutting selected current expenditures tend to trigger higher growth rates than adjustments based on revenue increases and cuts in more productive spending—a result consistent with the findings for industrial countries. According to the results of our analysis, protecting capital expenditures during a fiscal adjustment leads to higher growth, as does an increase in the share of current spending on nonwage goods and services. Reductions in the public sector wage bill are not harmful for growth for the sample as a whole. Reallocating government expenditure to more productive uses is also correlated with more persistent fiscal consolidation episodes.

The composition of deficit financing is also a key factor affecting growth in low-income countries. Fiscal adjustments, especially those leading to a sizeable reduction in domestic financing of the deficit are likely to trigger higher growth rates. The empirical estimates indicate that adjustments based on reducing domestic financing have about 1½ times the effect on growth as adjustments based on reductions in both domestic and external financing.

The effects of fiscal policy on growth tend to be nonlinear. The results above hold for countries that have not yet achieved stable macroeconomic conditions. However, in post-stabilization economies, increases in public investment and public consumption tend to exhibit, at least in part, more typical Keynesian effects. In these countries, fiscal policies

leading to an increase in the share of spending on transfers and nonwage goods and services are likely to be supportive of growth. In post-stabilization countries, fiscal adjustments no longer have a salutary effect on growth, and domestic financing of the deficit is also not adverse for growth. In this context, an expansion of selected current expenditures for these countries is compatible with higher growth. The design of fiscal frameworks in PRGF-supported programs is consistent with these results, as post-stabilization countries target relatively larger increases in public spending and in the fiscal deficit (IMF, 2002).

These results have several policy implications for the appropriate fiscal stance in low-income countries. Many low-income countries have ongoing Fund-supported programs that target only minor fiscal adjustments, while assigning high priority to expenditure reforms that will improve the composition of public spending. The empirical evidence reported in this paper **reinforces the active role of expenditure composition in promoting economic growth in low-income countries**. These results point to a positive link between expenditure composition and growth, as fiscal adjustments that reduce unproductive expenditures and protect public investment are more sustainable and conducive to higher growth.

The results also suggest that the correct sequencing of expenditure reforms is critical to ensure that they support higher economic growth. For example, civil service reforms entailing a decompression of the pay scale, and other measures aimed to attract more skilled workers to the public sector, could be too costly for countries with large fiscal imbalances. In contrast, these reforms may have a positive payoff for growth, once a country has achieved a sound fiscal position.

Additional research is needed to disentangle the channels through which fiscal policy affects growth. Given the reduced form model tested here, the paper has not examined the demand and supply side channels through which fiscal policy affects growth, nor the role of accompanying policies (such as monetary and external sector policies) which have been underscored in previous work in this field (Baldacci and others, 2001; Thomas, 2001). Additional research is needed in this area.

Appendix Table 8. Descriptive Statistics: Nonfiscal Variables

Variable	Observations	Mean	Standard Deviation
Initial per capita real GDP growth (in 1990)	429	-2.7	6.5
Labor force (in percent of population)	429	46.0	6.3
Terms of trade	429	115.6	122.4
Private investment (in percent of GDP)	382	10.8	5.3
Initial primary enrollment rate (in 1990)	418	77.4	26.4
Initial secondary enrollment rate (in 1990)	418	32.5	29.6
Change in labor force (in percent of population)	390	-0.1	2.3
Change in terms of trade	390	-1.1	62.1
Change in private investment	346	0.2	3.2

Source: Authors' calculations.

Appendix Table 9. Budget Composition and Growth: Results from Alternative Estimation Techniques, 1990–2000 (Model A)

	Real Per Capita GDP Growth (Fixed-Efs)	Real Per Capita GDP Growth (Rand-Efs)	Real Per Capita GDP Growth (GLS)	Real Per Capita GDP Growth (Robt-Reg)	Change Per Capita GDP Growth (Fixed-Efs)	Change Per Capita GDP Growth (Rand-Efs)	Change Per Capita GDP Growth (GLS)	Change Per Capita GDP Growth (Robt-Reg)
Initial per capita GDP growth	-0.499	0.094	-0.156	0.113	-0.130	-0.011	-0.059	-0.037
	(0.62)	(0.60)	(0.88)	(1.30)	(0.20)	(0.06)	(0.97)	(0.40)
Labor force	0.829***	0.147	0.183*	0.032	2.875***	2.603***	1.164***	0.689**
	(2.90)	(1.55)	(1.73)	(0.61)	(5.30)	(5.27)	(3.15)	(2.58)
Terms of trade	-0.003	-0.001	-0.001	-0.000	0.002	0.001	0.001	0.001
	(0.52)	(0.32)	(0.24)	(0.22)	(0.18)	(0.12)	(0.14)	(0.14)
Private investment	0.264**	0.199**	0.235**	0.089*	0.281*	0.297*	0.115*	0.037
	(1.97)	(2.14)	(2.33)	(1.78)	(1.68)	(1.66)	(1.69)	(0.40)
Initial primary enrollment	-0.112	-0.009	-0.006	-0.013	-0.042	-0.024	-0.016**	-0.001
	(0.60)	(0.42)	(0.25)	(1.18)	(0.47)	(0.95)	(2.05)	(0.11)
Initial secondary enrollment	0.016	0.044*	0.043	0.055**	-0.009	-0.002	0.003	-0.004
	(0.19)	(1.67)	(1.47)	(3.83)	(0.07)	(0.06)	(0.23)	(0.24)
Wages and salaries (as percent of GDP)	-0.484*	-0.047	-0.318***	-0.319***	-0.346	-0.197	-0.297	-0.604***
	(1.73)	(0.34)	(3.42)	(4.02)	(0.80)	(0.50)	(1.23)	(2.91)
Transfers and subsidies (as percent of GDP)	0.110	0.181	0.150	0.125	-0.427	-0.476	-0.020	-0.226
	(0.43)	(0.96)	(0.74)	(1.22)	(1.09)	(1.34)	(0.10)	(1.24)
Interest payments (as percent of GDP)	-0.298	-0.278*	-0.278	-0.167*	-0.375	-0.392	-0.092	-0.095
	(0.92)	(1.74)	(1.56)	(1.91)	(0.76)	(0.85)	(0.41)	(0.40)
Other goods & services (as percent of GDP)	0.425	0.314*	0.375**	0.007	1.698***	1.602***	1.235***	0.244
	(1.40)	(1.85)	(2.03)	(0.07)	(3.98)	(4.13)	(5.05)	(1.21)
Capital expenditure (as percent of GDP)	0.568***	0.365***	0.117	0.037	0.878***	0.849***	0.431***	0.018
	(3.01)	(2.69)	(2.02)	(0.48)	(3.61)	(3.74)	(3.78)	(0.97)
Tax revenue (as percent of GDP)	-0.057	-0.089	0.114	0.055	0.063	0.108	0.079	0.139
	(0.30)	(1.13)	(1.31)	(1.21)	(0.21)	(0.40)	(0.64)	(0.99)
Nontax revenue (as percent of GDP)	0.089	-0.062	-0.034	0.177	1.483***	1.317**	0.816***	0.432
	(0.23)	(0.28)	(0.14)	(1.47)	(2.64)	(2.53)	(2.92)	(1.61)
Grants (as percent of GDP)	0.060	-0.146	-0.125	0.105	0.191	0.212	0.277**	0.293**
	(0.26)	(0.85)	(0.69)	(1.07)	(0.65)	(0.77)	(2.16)	(2.08)
Constant	0.154	-10.375*	-13.590	-1.483	1.103	1.948	1.125	0.277
	(0.73)	(1.84)	(2.18)	(0.47)	(0.13)	(1.20)	(1.80)	(0.33)
Number of observations	255	255	255	255	225	225	225	224
R-square	0.25	0.22		0.28	0.45	0.42		0.12
Log-likelihood			-825.61				-652.81	
Regression test	3.81	44.48	46.34	6.51	3.83	153.13	107.02	2.00
Regression Significance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001

Notes: Absolute value of t and z statistics in parentheses. Fixed effects model is LSDV with country dummies.

* significant at 10 percent; ** significant at 5 percent; and ***significant at 1 percent.

Hausman Specification Test: $X^2(7)=13.85$; Prob> $X^2=0.0539$; F-test for the joint significance of the fixed effects: $F(31, 255) = 1.31$; Prob > F =0.1307.

Appendix Table 10. Budget Composition and Growth: Results from Alternative Estimation Techniques, 1990–2000 (Model B)

	Real Per Capita GDP Growth (Fixed-Efs)	Real Per Capita GDP Growth (Rand-Efs)	Real Per Capita GDP Growth (GLS)	Real Per Capita GDP Growth (Robt-Reg)	Change Per Capita GDP Growth (Fixed-Efs)	Change Per Capita GDP Growth (Rand-Efs)	Change Per Capita GDP Growth (GLS)	Change Per Capita GDP Growth (Robt-Reg)
Initial per capita GDP growth	-1.042	0.015	-0.016	0.054	-0.114	0.023	-0.030	-0.024
	(1.08	(0.10)	(0.22)	(065)	(0.16)	(0.12)	(0.43)	(0.26)
Labor force	0.605**	0.065	0.140***	0.067	2.834***	2.597***	1.100***	0.795***
	(2.20)	(0.81)	(2.92)	(1.58)	(4.83)	(4.87)	(3.07)	(2.91)
Terms of trade	-0.005	-0.002	-0.002	-0.001	-0.000	-0.001	-0.001	-0.001
	(0.89)	(0.71)	(1.19)	(0.85)	(0.05)	(0.09)	(0.22	(0.17)
Private investment	0.390***	0.189	0.152***	0.095**	0.562***	0.579***	0.241**	0.021
	(2.73)	(2.18)	(3.50)	(2.07)	(2.77)	(3.09)	(2.33)	(0.22)
Initial primary enrollment	0.093	-0.003	-0.015)*	-0.013	-0.023	-0.008	-0.008	-0.006
	(0.62)	(0.16)	(1.70)	(1.15)	(0.16)	(0.31)	(0.73)	(0.43)
Initial secondary enrollment	-0.001	0.059**	0.073***	0.055***	-0.034	-0.009	-0.003	-0.002
	(0.01)	(2.39)	(5.77)	(4.14)	(0.35)	(0.29)	(0.21)	(0.14)
Budget balances (in percent of GDP)	0.446***	0.350***	0.251***	0.182***	0.532***	0.539***	0.254***	0.206**
	(4.18)	(4.08)	(5.41)	(3.99)	(3.33)	(3.62)	(2.92)	(2.05)
Wages and salaries (in percent of total expenditures)	-0.194**	-0.139**	-0.064*	-0.076**	-0.212	-0.189	-0.069	-0.041
	(2.12)	(2.20)	(1.88)	(2.27)	(1.44)	(1.38)	(0.98)	(0.62)
Transfers and subsidies (in percent of total expenditures)	0.057)	-0.017	0.020	0.067	0.030	0.029	0.134	0.073
	(0.51)	(0.20)	(0.45)	(1.55)	(0.17)	(0.18)	(1.44)	(0.93)
Interest payments (in percent of total expenditures)	-0.114	-0.138**	-0.032	-0.011	-0.373**	-0.376**	-0.033	-0.063
	(1.08)	(2.13)	(0.83)	(0.31)	(2.24)	(2.42)	(0.37)	(0.82)
Other goods & services (in percent of total expenditures)	0.021	-0.041	0.007	0.026	0.076	0.102	0.129*	0.128*
	(0.23)	(0.68)	(0.20)	(0.79)	(0.50)	(0.74)	(1.76)	(1.90)
Capital expenditure (in percent of total expenditures)	0.159**	0.140*	0.077**	0.075***	0.279**	0.272**	0.232***	0.184***
	(2.04)	(1.96)	(2.51)	(2.69)	(2.26)	(2.35)	(3.91)	(3.23)
Constant	-35.833**	1.278	-7.554*	-4.091	1.552	0.533	0.474	0.448
	(2.21)	(0.19)	(1.86)	(1.14)	(0.17)	(0.31)	(0.72)	(0.53)
Number of observations	256	256	256	256	226	226	226	225
Adj. R-squared	0.29	0.20		0.34	0.34	0.32		0.13
Log-likelihood			-674.65				-658.00	
Regression test	2.43	59.90	184.92	10.26	2.58	99.25	51.54	2.59
Regression significance	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*

Notes: Absolute value of t and z statistics in parentheses. Fixed effects model is LSDV with country dummies.

* significant at 10 percent; ** significant at 5 percent; and ***significant at 1 percent.

Hausman Specification Test: $X^2(6)=11.25$; Prob> $X^2=0.0622$; F-test for the joint significance of the fixed effects: $F(31, 256) = 8.1$; Prob > F =0.1501.

Appendix Table 11. Budget Composition and Growth: Results from Alternative Estimation Techniques, 1990–2000 (Model C)

	Real Per Capita GDP Growth (Fixed-Efs)	Real Per Capita GDP Growth (Rand-Efs)	Real Per Capita GDP Growth (GLS)	Real Per Capita GDP Growth (Robt-Reg)	Change Per Capita GDP Growth (Fixed-Efs)	Change Per Capita GDP Growth (Rand-Efs)	Change Per Capita GDP Growth (GLS)	Change Per Capita GDP Growth (Robt-Reg)
Initial per capita GDP growth	-1.564	0.144	0.011	0.056	0.313	0.153	0.026	0.049
	(1.52)	(0.77)	(0.12)	(0.57)	(0.29)	(0.69)	(0.27)	(0.43)
Labor force	0.671**	0.033	0.132**	0.078*	2.382***	2.191***	0.915***	0.750***
	(2.31)	(0.38)	(2.43)	(1.71)	(4.01)	(4.09)	(2.65)	(2.63)
Terms of trade	-0.006	-0.002	-0.002	-0.001	-0.005	-0.005	-0.002	-0.002
	(1.00)	(0.70)	(1.27)	(1.04)	(0.57)	(0.61)	(0.48)	(0.38)
Private investment	(0.384**	0.157	0.142***	0.073	0.717***	0.716***	0.467***	0.077
	(2.27)	(1.60)	(2.75)	(1.43)	(3.20)	(3.42)	(3.17)	(0.71)
Initial primary enrollment	0.183	0.002	-0.011	-0.008	-0.041	-0.001	-0.005	-0.009
	(1.14)	(0.07)	(1.07)	(0.67)	(0.29)	(0.05)	(0.36)	(0.61)
Initial secondary enrollment	-0.075	0.055*	0.061***	0.042***	-0.017	-0.006	-0.002	0.008
	(0.52)	(1.80)	(3.95)	(2.63)	(0.18)	(0.14)	(0.08)	(0.39)
Domestic financing (as percent of GDP)	-0.781***	-0.5522***	-0.333***	-0.191***	-1.306***	-1.261***	-0.491***	-0.377***
	(5.06)	(4.32)	(4.26)	(2.87)	(5.90)	(6.17)	(3.34)	(3.48)
External financing (as percent of GDP)	-0.368***	-0.327***	-0.247***	-0.175***	-0.563***	-0.553***	-0.294**	-0.150*
	(2.87)	(3.10)	(3.91)	(3.19)	(3.11)	(3.28)	(2.51)	(1.73)
Wages and salaries (in percent of total expenditures)	-0.226**	-0.163**	-0.071*	-0.070	-0.217	-0.216	-0.081	-0.051
	(2.26)	(2.39)	(1.91)	(1.97)	(1.42)	(1.53)	(0.98)	(0.70)
Transfers and subsidies (in percent of total expenditures)	-0.045	-0.036	0.027	0.085*	-0.016	-0.012	0.147	0.072
	(0.36)	(0.40)	(0.52)	(1.82)	(0.08)	(0.07)	(1.29)	(0.81)
Interest payments (in percent of total expenditures)	-0.224*	-0.191**	-0.062	-0.024	-0.420**	-0.438***	-0.003	0.074
	(1.92)	(2.53)	(1.37)	(0.61)	(2.40)	(2.69)	(0.03)	(0.87)
Other goods & services (in percent of total expenditures)	0.049	-0.067	0.001	0.032	0.186	0.201	0.188**	0.196***
	(0.50)	(1.03)	(0.03)	(0.94)	(1.18)	(1.40)	(2.09)	(2.66)
Capital expenditure (in percent of total expenditures)	0.077	0.001	0.067**	0.074**	0.230*	0.209*	0.246***	0.223***
	(0.88)	(0.01)	(2.06)	(2.46)	(1.79)	(1.73)	(3.54)	(3.60)
Constant	-38.993**	6.205	-6.247	-4.603	3.328	0.176	0.228	0.429
	(2.30)	(0.82)	(1.36)	(1.17)	(0.35)	(0.10)	(0.30)	(0.47)
Number of observations	231	231	231	231	202	202	202	201
Adj. R-squared	0.18	0.20		0.28	0.31	0.41		0.21
Log-likelihood			-619.66				-602.70	
Regression test	2.32	52.71	129.81	6.64	3.43	132.38	55.86	3.85
Regression significance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Absolute value of t and z statistics in parentheses. Fixed effects model is LSDV with country dummies.

* significant at 10 percent; ** significant at 5 percent; and ***significant at 1 percent.

Hausman Specification Test: X^2 (6)=13.45; Prob> X^2=0.0832; F-test for the joint significance of the fixed effects: $F(31, 256) = 9.1$; Prob > F =0.1501.

Appendix Table 12. Budget Composition, Model A (Pre/Post-Stabilization)

	Real Per Capita GDP Growth (GLS) (h-arl)			Change Per Capita GDP Growth (GLS) (h-arl)		
	All countries	Pre-stabilization countries	Post-stabilization countries	All countries	Pre-stabilization countries	Post-stabilization countries
Initial per capita GDP growth	-0.156	0.132	0.793*	-0.059	0.019	-0.112
	(0.88)	(1.14)	(1.91)	(0.97)	(0.23)	(0.58)
Labor force	0.183*	0.136*	-0.002	1.164***	1.069***	0.035
	(1.73)	(1.84)	(0.01)	(3.15)	(2.79)	(0.03)
Terms of trade	-0.001	-0.000	0.003	0.001	0.000	0.052
	(0.24)	(0.20)	(0.07)	(0.14)	(0.08)	(1.10)
Private investment	0.235**	0.246***	-0.248***	0.115*	-0.005	0.000
	(2.33)	(3.29)	(3.21)	(1.69)	(0.48)	(0.01)
Initial primary enrollment	-0.006	-0.017	-0.032	-0.016**	-0.006	-0.002
	(0.25)	(1.41)	(0.65)	(2.05)	(0.32)	(0.02)
Initial secondary enrollment	0.043	0.064***	0.307**	0.003	0.274**	-0.305***
	(1.47)	(2.74)	(2.32)	(0.23)	(1.96)	(3.67)
Wages and salaries (as percent of GDP)	-0.318***	-0.394***	-0.647**	-0.297	-0.575*	-0.483
	(3.42)	(2.94)	(2.53)	(1.23)	(1.87)	(0.93)
Transfers and subsidies (as percent of GDP)	0.150	-0.305	0.539***	-0.020	-0.936***	0.877***
	(0.74)	(1.53)	(2.92)	(0.10)	(2.67)	(3.55)
Interest payments (as percent of GDP)	-0.278	-0.263**	-1.163**	-0.092	-0.016	0.491
	(1.56)	(2.16)	(2.23)	(0.41)	(0.07)	(0.66)
Other goods & services (as percent of GDP)	0.375**	0.049	0.692***	1.235***	1.668***	0.734***
	(2.03)	(0.28)	(3.63)	(5.05)	(4.90)	(2.95)
Capital expenditure (as percent of GDP)	0.117**	0.028	-0.059	0.431***	0.523***	-0.029
	(2.02)	(0.24)	(0.36)	(3.78)	(3.05)	(0.21)
Tax revenue (as percent of GDP)	0.114	0.111	-0.241*	0.079	0.453**	-0.388***
	(1.31)	(1.37)	(1.77)	(0.64)	(2.16)	(2.62)
Nontax revenue (as perecent of GDP)	-0.034	0.244	0.542**	0.816***	1.190***	0.556*
	(0.14)	(0.87)	(2.57)	(2.92)	(2.97)	(1.73)
Grants (as percent of GDP)	-0.125	0.091	0.381	0.277**	0.360*	0.364
	(0.69)	(0.66)	(1.02)	(2.16)	(1.94)	90.85)
Constant	-13.590**	-7.045*	3.793	1.125*	0.648	0.019
	(2.18)	(1.68)	(0.41)	(1.80)	(0.87)	(0.01)
Number of observations	255	206	49	225	182	43
Log-likelihood	-825.61	-570.72	-98.65	-652.81	-542.12	-91.99
Regression test	46.34	89.27	46.29	107.02	99.48	48.67
Regression significance	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Absolute value of *t* and *z* statistics in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

1/ Pre-stabilization countries are defined as those with an average budget balance between 1990–2000 above -2.5 percent of GDP. Pre-stabilization countries are: Albania, Armenia, Bolivia, Burkina Faso, Cambodia, Cameroon, Central African Republic, Chad, Djibouti, Ethiopia, Georgia, Ghana, Guinea, Guinea-Bissau, Guyana, Honduras, Kenya, Kyrgyz Republic, Laos, Madagascar, Malawi, Mali, Moldova, Mozambique, Nicaragua, Niger, Rwanda, São Tomé and Principe, Tajikistan, The Gambia, Vietnam, and Yemen.

2/ Post-stabilization countries defined as those with average budget balance between 1990–2000 below -2.5 percent of GDP. Post-stabilization countries are: Benin, The Gambia, Lesotho, Macedonia (FYR), Mauritania, Senegal, and Tanzania.

REFERENCES

Aalen, Olivier, 1978, "Nonparametric Inference for Family of Counting Processes," *Annals of Statistics*, Vol. 6, pp. 701–26.

Abed, George and others, 1998, *Fiscal Reform in Low-Income Countries: Experience Under IMF-Supported Programs*, IMF Occasional Paper No. 160 (Washington: International Monetary Fund).

Adam, Christopher S., and David L. Bevan, 2000, "Fiscal Policy Design in Low-Income Countries," paper prepared for UNU/WIDER research project on "New Fiscal Policies for Poverty Reduction and Growth," (unpublished: November 2000).

———, 2001, "Nonlinear Effects of Public Deficits on Growth," paper prepared at the Cornell/ISPE Conference, New York, September.

Akaike, Hirotugu, 1974, "A New Look at the Statistical Model Identification," *IEEE Transactions on Automatic Control*, AC-19, pp. 716–23.

Alesina, Alberto, and Silvia Ardagna, 1998, "Tales of Fiscal Adjustment," *Economic Policy: A European Forum,* No. 27, pp. 487–546.

Alesina, Alberto, Silvia Ardagna, Roberto Perotti, and Fabio Schiantarelli, 1999, "Fiscal Policy, Profits, and Investment," NBER Working Paper No. W7207 (Cambridge, Massachusetts: National Bureau of Economic Research).

Alesina, Alberto, and Roberto Perotti, 1995, "Fiscal Expansion and Fiscal Adjustments in OECD Countries," *Economic Policy*, Vol. 21, pp. 205–48.

———, 1996, "Fiscal Adjustments in OECD Countries: Composition and Macroeconomic Effects," IMF Working Paper 96/70 (Washington: International Monetary Fund).

———, and Jose Tavares, 1998, "The Political Economy of Fiscal Adjustments," *Brookings Papers on Economic Activity: 2,* Brookings Institution, Spring.

Ardagna, Silvia, 2001, " Fiscal Policy Composition, Public Debt, and Economic Activity," *Public Choice*, Vol. 109, pp. 301–25.

Arellano, Manuel, and Stephen Bond, 1991, "Some Tests of Specific Action for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, Vol. 58, pp. 277–97.

Aschauer, David A., 1989, "Is Public Expenditure Productive?" *Journal of Monetary Economics*, Vol. 23, pp. 177–200.

Baldacci, Emanuele, Marco Cangiano, Selma Mahfouz, and Axel Schimmelpfennig, 2001, "The Effectiveness of Fiscal Policy in Stimulating Economic Activity: An Empirical Investigation," paper presented at the IMF Annual Research Conference (Washington: International Monetary Fund).

Barro, Robert J., 1990, "Government Spending in a Simple Model of Endogenous Growth," *Journal of Political Economy*, Vol. 98 (1), pp. 103–17.

———, 1991, "Economic Growth in a Cross Section of Countries," *Quarterly Journal of Economics*, Vol. 106, pp. 407–43.

———, and Xavier Sala-ì-Martin, 1995, *Economic Growth* (New York: McGraw-Hill).

Buti, Marco, and Andre Sapir, 1998, *Economic Policy in EMU* (Oxford: Oxford University Press).

Chamley, C., 1986, "Optimal Taxation of Capital Income Equilibrium with Infinite Lives," *Econometrica*, Vol. 54 (3), pp. 607–22.

Chu, Ke-young, and others, 1995, *Unproductive Public Expenditure: A Pragmatic Approach to Policy Analysis*, IMF Pamphlet Series, No. 48 (Washington: International Monetary Fund).

Cox, D., 1972, " Regression Models and Life Tables," *Journal of the Royal Statistical Society,* Series B, Vol. 34, pp. 406–24.

Devarajan, Shantayanan, Vinaya Swaroop, and Heng-fu Zou, 1996, "The Composition of Public Expenditure and Economic Growth," *Journal of Monetary Economics*, Vol. 37, pp. 313–44.

Easterly, William, and Sergio Rebelo, 1993, "Fiscal Policy and Economic Growth: An Empirical Investigation," NBER Working Paper No. 4499 (Cambridge, Massachusetts: National Bureau of Economic Research).

Easterly, William, Carlos A. Rodríguez, and Klaus Schmidt-Hebbel, 1994, *Public Sector Deficits and Macroeconomic Performance* (Washington: The World Bank).

Easterly, William, Norman Loayza, and Peter Montiel, 1997, "Has Latin America's Post-reform Growth Been Disappointing?" *Journal of International Economics*, Vol. 43, pp. 287–311.

Fischer, Stanley, 1983, "Inflation and Growth," NBER Working Paper No. 1235 (Cambridge, Massachusetts: National Bureau of Economic Research).

Gerson, Philip, 1998, "The Impact of Fiscal Policy Variables on Output Growth," IMF Working Paper 98/1 (Washington: International Monetary Fund).

Giavazzi, Francesco, Tullio Jappelli, and Marco Pagano, 2000, "Searching for Nonlinear Effects of Fiscal Policy: Evidence from Industrial and Developing Countries," NBER Working Paper No. 7460 (Cambridge, Massachusetts: National Bureau of Economic Research).

Greene, William, 2000, *Econometric Analysis* (Upper Saddle River, N.J.: Prentice Hall).

Hamilton, L.C., 1991, "How Robust is Robust Regression," *Stata Technical Bulletin,* Vol. 2, pp. 21–26.

International Monetary Fund, 1986, *A Manual on Government Finance Statistics.* (Washington).

_____, 2002, "Review of the Key Features of the Poverty Reduction and Growth Facility—Staff Analyses," SM/02/51 (unpublished; Washington).

Ize, Alain, 1991, "Measurement of Fiscal Performance in IMF-Supported Programs: Some Methodological Issues," in *How to Measure the Fiscal Deficit,* ed. by M.I. Blejer and A. Cheasty (Washington: International Monetary Fund).

Jones, Larry E., Rodolfo E. Manuelli, and Peter E. Rossi, 1993, "On the Optimal Taxation of Capital Income," NBER Working Paper No. 4525 (Cambridge, Massachusetts: National Bureau of Economic Research).

Judd, K., 1995, "On the Performance of Patents," *Econometrica*, Vol. 53 (3), pp. 567–85.

Khan, Mohsin S., and Abdelhak S. Senhadji, 2001, "Threshold Effects in the Relationship Between Inflation and Growth," *Staff Papers*, International Monetary Fund, Vol. 48, No. 1, pp. 1–21.

King, Robert G., and Sergio Rebelo, 1990, "Public Policy and Economic Growth: Developing Neoclassical Implications," NBER Working Paper No. 3338 (Cambridge, Massachusetts: National Bureau of Economic Research).

Kneller, Richard, Michael Bleaney, and Norman Gemmell, 1998, "Growth, Public Policy and the Government Budget Constraint: Evidence from OECD Countries," University of Nottingham, Department of Economics Discussion Paper No. 98/14.

_____, 1999, "Fiscal Policy and Growth: Evidence from OECD Countries," *Journal of Public Economics*, Vol. 74, pp. 171–90.

_____, 2000, "Testing the Endogenous Growth Model: Public Expenditure, Taxation and Growth Over the Long Run," University of Nottingham, Department of Economics Discussion Paper No. 00/25.

Landau, Daniel, 1986, "Government and Economic Growth in the Less Developed Countries: An Empirical Study for 1960–80," *Economic Development and Cultural Change*, Vol. 35, pp. 35–75.

Mackenzie, Gordon A., David Orsmond, and Philip Gerson, 1997, *The Composition of Fiscal Adjustment and Growth: Lessons from Fiscal Reforms in Eight Economies,* IMF Occasional Paper No. 149 (Washington: International Monetary Fund).

Maroto, Reyes, and Carlos Mulas-Granados, 2001, "The Duration of Fiscal Consolidations in the European Union," Fundación de Estudios de Economia Aplicada (FEDEA) Working Paper No. 2001/19 (Madrid, Spain).

Mendoza, E., Gian Maria Milesi-Ferretti, and P. Asea, 1997, "On The Ineffectiveness of Tax Policy in Altering Long-run Growth: Harberger's Superneutrality Conjecture," *Journal of Public Economics,* Vol. 66, pp. 99–126.

McDermott, C. John, and Robert F. Wescott, 1996, "An Empirical Analysis of Fiscal Adjustments," *Staff Papers*, International Monetary Fund, Vol. 43 (December), pp. 725–53 (Washington: International Monetary Fund).

Nelson, William, 1972, "Theory and Applications of Hazard Plotting for Censured Failure Data," *Technometrics*, Vol. 14, pp. 945–65.

Perotti, Roberto, 1998, "The Political Economy of Fiscal Consolidations," *Scandinavian Journal of Economics*, Vol. 100 (1), pp. 367–94.

————, 1999, "Fiscal Policy in Good Times and Bad," *Quarterly Journal of Economics*, Vol. 114 (4), pp. 1399–1436.

Phillips, Steven, 1999, "Inflation: The Case for a More Resolute Approach," in *Economic Adjustment and Reform in Low-Income Countries*, ed. by Hugh Bredenkamp and Susan Schadler (Washington: International Monetary Fund).

Skinner, Reinhard J., 1987, "Taxation and Output Growth: Evidence from African Countries," NBER Working Paper No. 335 (Cambridge, Massachusetts: National Bureau of Economic Research).

Solow, Robert M., 1956, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, Vol. 71 (1), pp. 65–94.

Swan, T.W., 1956, "Economic Growth and Capital Accumulation," *Economic Record*, Vol. 32 (3), pp. 334–61.

Tanzi, Vito, and Howell H. Zee, 1996, "Fiscal Policy and Long-Run Growth," IMF Working Paper 96/119 (Washington: International Monetary Fund).

Thomas, Alun, 2001, "An Exploration of the Private Sector Response to Changes in Government Saving Across OECD Countries," IMF Working Paper 01/69 (Washington: International Monetary Fund).

Von Hagen, Jürgen, Hughes Hallett, and Rolf Strauch, 2001, "Budgetary Consolidation in EMU," *Journal of Japanese and International Economics*, forthcoming.

Von Hagen, Jürgen, and Rolf Strauch, 2001, "Fiscal Consolidations: Quality, Economic Conditions, and Success," *Public Choice*, Vol. 109, pp. 327–46.