

Do Public Finance Systems Matter for Growth?

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Governments actively use fiscal policies, whether public spending or taxation, to address market failures and achieve redistributive goals. These so-called classical functions of government—to correct externalities and ensure adequate provision of public goods and services—have a sound foundation and are conducive to higher long-run growth with social inclusion. In practice, however, it is often difficult to determine whether the optimal size of government has been reached. While the provision of public goods and services may promote growth, both the inefficient provision of these goods and revenue-raising mechanisms that distort the allocation of resources may impede growth (see, for example, Grossman 1990).

Based on evidence from countries in the Europe and Central Asia (ECA) region, the empirical analysis in this chapter explores four possible links between public finance policies and growth: (a) the effects of budget deficits and fiscal consolidation on growth; (b) the impact of the size of government on growth; (c) links with the quality of governance; and (d) the influence of the composition of expenditures and taxes on growth. In particular, the link between expenditure impact and governance has not been systematically investigated in previous empirical growth studies, although indirect evidence

suggests the quality of public institutions affects the impact of key potential drivers of growth (see, for example, Burnside and Dollar 2000, 2004).

Building a strong fiscal position requires a sustained fiscal consolidation effort. As discussed in chapter 2, sizeable fiscal consolidations—sometimes recurring—have been a defining characteristic of the transition to the market. Such consolidations have been undertaken across the whole ECA region, but with varying degrees of success. Successful fiscal adjustment is an important prerequisite for growth. Unsustainable fiscal consolidations are counterproductive and may undermine investor confidence because they fail to set the government's financial position on a sound footing. Sustained fiscal adjustments are needed also to create long-term fiscal space for expenditures that promote growth. There is extensive evidence from Organisation for Economic Co-operation and Development (OECD) countries that the composition of fiscal adjustments matters for their sustainability: consolidations that have relied primarily on tax increases and cuts in public investment have not been sustainable, while those underpinned by structural reforms in public expenditure programs have had more lasting effects, because they have tackled the main types of expenditures that show a strong upward drift (Alesina and Ardagna 1998; Alesina and Perotti 1997). These results have also been confirmed for developing countries, with the difference that when fiscal consolidations are supported by better mobilization of tax revenues (through tax base broadening), the probability of sustainability increases (Gupta et al. 2003).

Beyond the fiscal deficit, the size of government spending may have an impact on economic growth. High levels of public spending can adversely affect resource allocation and growth through various channels. They may add to rigidity in the budget, making it more difficult to keep the fiscal balance under control. They also usually lead to high levels of taxation that may reduce incentives to save, invest, innovate, and participate in the labor force. Large government spending programs are often supported by intrusive regulations that may stifle private participation and investment. Moreover, as they become larger, expenditure programs may become counterproductive if they are poorly designed as a result of limited government effectiveness or if they create more opportunities for corruption and rent seeking. The effect of government expenditure programs on growth may thus be particularly sensitive to the quality of governance—a link more systematically explored in this chapter.

Empirical evidence suggests that the composition of expenditures also matters for growth. Government spending that enhances the

efficiency and quantity of factors of production is considered “productive,” in the sense that it contributes directly to higher growth. Similarly, spending that helps enforce the rule of law, protect property rights, and facilitate transactions can be considered productive—although views differ as to what may be a reasonable level of spending on such core government functions. In contrast, large expenditures on general public services (which may be a sign of bloated bureaucracies and low government effectiveness) and on defense are likely to be less conducive to growth and in this sense may be termed “unproductive.” Similarly, sizeable spending on transfers and welfare services may create disincentives for participation in the labor force, while subsidies may distort the allocation of resources toward low-productivity activities. The evidence is still incomplete regarding the prevalence of such effects in transition economies, and one goal of this chapter is to add to our knowledge in this area.

Evidence also suggests that the structure of taxes matters for growth. Progressive personal income taxes and corporate income taxes reduce the net return to human or physical capital and thus may impair growth. High taxes on labor are particularly distorting because they deter formal employment while promoting employment in the untaxed informal sector—and thus deny the government sizeable revenues that could be used for financing productive spending.¹ By contrast, indirect taxes uniformly levied on consumption (such as the value added tax) may have less harmful impacts on growth, because they are relatively neutral toward saving and investment decisions and do not distort incentives to work.

Success in Fiscal Consolidation

Growing evidence from transition economies now shows that fiscal adjustments supported by expenditure cuts have been more successful and long-lasting than those supported by revenue-increasing measures (Purfield 2003; Afonso, Nickel, and Rother 2006). Based on the list of fiscal adjustment episodes in ECA countries over 1996–2004 identified in chapter 2, the analysis in this section looks at the characteristics of successful consolidations that have set public finances on a sustainable path.

Successful fiscal adjustments have been identified based on their duration and their effectiveness in restoring the fiscal balance and reducing the public debt.² Adjustments defined as successful have met three criteria simultaneously:

- Duration. In accordance with criteria adopted in previous studies, an adjustment is deemed successful if the average primary balance two years after the end of the adjustment was still lower by at least 2 percentage points of GDP relative to its level before adjustment.³
- Fiscal balance restored. An adjustment is deemed successful if the primary fiscal balance at the end of the adjustment is positive, or at least not significantly negative to a point that would have compromised the conditions for debt sustainability. Although the debt-stabilizing primary fiscal surplus depends on several factors that are country specific and thus difficult to assess in this exercise, a large primary fiscal deficit will not be consistent with long-term debt sustainability.
- Debt ratio effectively reduced. An adjustment is considered successful if the public debt ratio has declined in the two years after the end of the adjustment.

A majority of fiscal adjustments in ECA have been successful. According to these criteria, 18 episodes were successful, while 10 were unsuccessful. It is too early to assess whether 6 of the 34 adjustments analyzed will be successful (table 3.1). Successful fiscal adjustments were significantly bolder, amounting on average to 5 percentage points of GDP, against 3.7 percentage points when adjustments failed to deliver expected results (table 3.2). To the extent bolder adjustments indicate stronger commitment to fiscal discipline, the difference in size may explain the better outcomes from bold adjustments. Moreover, successful adjustments were based on expenditure cuts, accounting for about 85 percent of the improvement in the primary fiscal balance. By contrast, the contribution of tax revenue increases was higher when adjustments were unsuccessful.⁴

Expenditure downsizing was broadly based in episodes of sustained fiscal adjustment. Because successful adjustments were driven by expenditure cuts, these adjustments relied upon downsizing of spending across a wide array of economic categories (table 3.2). Cuts in capital spending accounted for about one-third of the expenditure adjustment effort. While such investment cuts were significant and could have a potentially harmful impact on long-term growth, the generally good infrastructure in transition economies may have mitigated these negative effects. Transfers, notably, were not cut significantly in either successful or unsuccessful adjustment efforts.

Post-adjustment, growth has been on average higher when the fiscal effort has been sustained. In both successful and unsuccessful fiscal adjustments, growth accelerated during the adjustment period compared to the year immediately preceding the start of the episode (figure 3.1). This is probably because most fiscal adjustments were

TABLE 3.1
Typology of Fiscal Adjustments in ECA, 1996–2004

Country	Initiation of adjustment	Assessment	Change in primary fiscal balance (%)	% Change in primary expenditure	% Change in revenue	Balance a year before adjustment (%)	Average balance two years after adjustment (%)
Russian Federation	1999	Successful	9.1	-14.6	-5.5	-5.5	4.7
Kyrgyz Republic	1997	Unsuccessful	8.8	-10.3	-1.5	-16.1	-9.4
Albania	1998	Successful	8.0	0.5	8.5	-8.5	-2.6
Moldova	1999	Successful	7.2	-15.3	-8.0	-7.8	1.8
Lithuania	2001	Successful	5.8	-9.1	-3.4	-5.7	0.3
Turkey	2001	Successful	5.7	0.7	6.4	0.4	5.7
FYR Macedonia	2000	Unsuccessful	5.6	-1.4	4.3	-1.3	-4.1
Azerbaijan	2000	Successful	5.5	-2.7	2.7	-5.3	-0.7
FYR Macedonia	2003	Successful	5.4	-1.6	3.8	-4.4	1.4
Bosnia and Herzegovina	2003	Successful	5.0	-1.1	3.9	-2.9	0.5
Bosnia and Herzegovina	2001	Successful	4.8	-15.3	-10.5	-7.7	0.1
Georgia	2004	TBD	4.7	1.3	5.9	-1.0	—
Estonia	2001	Successful	4.6	-5.6	-0.9	-3.8	2.1
Albania	2003	Successful	4.3	-2.2	2.1	-4.7	-0.9
Armenia	2002	Successful	4.2	-2.5	1.7	-5.5	-0.9
Moldova	2001	Successful	4.1	-4.8	-0.7	-0.5	2.9
Georgia	2000	Successful	4.1	-4.3	-0.2	-4.9	0.0
Kyrgyz Republic	2002	Successful	3.9	0.3	4.3	-8.4	-3.5
Lithuania	1997	Unsuccessful	3.7	-2.1	1.6	-3.9	-4.3
Kazakhstan	2000	Successful	3.7	0.2	3.8	-0.9	4.0
Slovak Republic	2002	Unsuccessful	3.5	-0.7	2.8	-4.7	-1.5
Romania	1999	Unsuccessful	3.5	0.2	3.6	-3.1	-0.9
Armenia	1997	Unsuccessful	3.5	-4.4	-0.9	-3.2	-4.2
Serbia and Montenegro	2004	TBD	3.3	-0.9	2.4	-2.1	—
Belarus	2004	TBD	3.2	0.1	3.3	-2.7	—
Russian Federation	2004	TBD	2.8	-2.8	0.0	-0.1	—
Azerbaijan	2004	TBD	2.7	-2.5	0.2	-3.1	—
Russian Federation	2000	Unsuccessful	2.6	0.5	3.1	3.7	1.2
Czech Republic	2004	TBD	2.5	-2.1	0.4	-5.2	—
Azerbaijan	1998	Unsuccessful	2.3	-1.9	0.4	-2.0	-2.6
Romania	2001	Successful	2.3	-0.9	1.4	-2.1	-0.2
Croatia	2000	Unsuccessful	2.1	-3.7	-1.6	-6.4	-3.4
Latvia	2000	Unsuccessful	1.8	-4.4	-2.6	-3.9	-1.9
Kazakhstan	2001	Successful	1.7	1.4	3.0	2.7	3.7
Average			4.3	-3.3	1.0		

Sources: IMF World Economic Outlook database; World Bank ECA fiscal database.

Notes: — = Not available; TBD = to be determined. Primary fiscal balance excludes privatization receipts. Data on primary balance in Albania, Bosnia and Herzegovina, and FYR Macedonia in 2005, and data on interest payments in Estonia in 2003 are taken from IMF World Economic Outlook database. The primary fiscal balance in Armenia in 2004 was computed without excluding privatization receipts from revenue.

initiated in “bad times” of large fiscal imbalances, debt distress, and slow growth. Growth during adjustments was on average slightly lower in successful episodes, possibly reflecting the comparatively bolder fiscal restraint documented earlier. The most notable pattern is, however, that successful fiscal adjustments had growth rewards: on average, growth

TABLE 3.2

Basic Features of Unsuccessful and Successful Fiscal Adjustments in ECA, 1996–2004

Outcome	Composition of adjustment (in % of GDP)				
	Change in primary fiscal balance	Change in primary expenditure	Change in revenue	Balance a year before adjustment	Average balance two years after adjustment
Successful adjustments	5.0	-4.3	0.7	-4.2	1.0
Unsuccessful adjustments	3.7	-2.8	0.9	-4.1	-3.1

Outcome	Composition of expenditure cuts (economic breakdown) (in % of GDP)						
	Change in primary expenditures	Capital expenditure	Current primary expenditures	Expenditures on goods and services	Wages and salaries	Subsidies	Transfers
Successful adjustments	-4.6	-1.3	-2.8	-2.1	-0.6	-0.5	0.1
Unsuccessful adjustments	-2.6	-0.7	-1.4	-0.9	-0.2	-0.3	-2

Source: World Bank, ECA fiscal database.

two years after the end of the adjustment was significantly higher when the fiscal effort was successful (7.6 percent per year) than when the fiscal consolidation failed (4.4 percent).

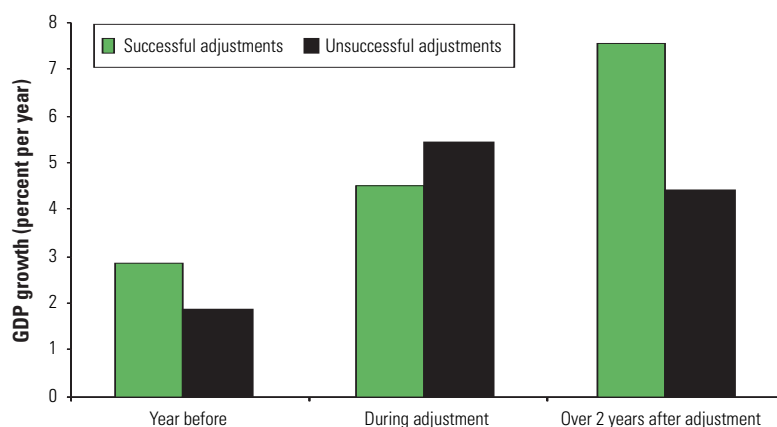
Fiscal Deficits

In ECA countries, lower fiscal imbalances have been associated with higher growth (figure 3.2a). This relationship holds even after excluding Turkey, where large fiscal imbalances have been notorious for triggering crises and sharp growth slowdowns. Obviously, the possibility of reverse causation cannot be ruled out, with stronger economic growth contributing to an improved fiscal stance as a result of independent factors, such as positive shocks in the terms of trade. And when growth is robust, government can finance more expenditure than in other circumstances, even without borrowing. However, this is unlikely to be the only causal link. The computations encompass averages over five years, a period long enough for additional revenue generated by faster-than-expected economic growth to be spent, thus removing most of the reverse causality from growth on the fiscal balance. The positive association also holds when the country-specific reverse causality between growth and the fiscal balance is removed by merging the yearly data across all ECA countries and sorting growth rates in decreasing order of magnitude. Lower fiscal imbalances are still significantly associated with higher rates of growth (figure 3.2b).

The adverse impact of deficits on growth has been abundantly investigated in theoretical and empirical studies (box 3.1). In addition

FIGURE 3.1

GDP Growth Before, During, and After Fiscal Adjustments in ECA, 1996–2004



Source: Authors.

to the impact on national savings, fiscal deficits heighten business uncertainty, with a potentially damaging impact on the investment climate at a time when ECA countries are exposed to strong forces of globalization and need to continue mobilizing high domestic and foreign investment. Policy uncertainty in ECA has for years been ranked as a top business constraint, although some progress is evident from recent business surveys (table 3.3).

The fact that taxes rank highest among major business constraints in most ECA countries suggests that the large size of government is

TABLE 3.3

Policy Uncertainty as a Major Business Constraint in ECA Countries

Countries	Percentage of managers surveyed ranking policy uncertainty as a major business constraint	Rank of policy uncertainty among major business constraints	Percentage of managers surveyed ranking policy uncertainty as a major business constraint	Rank of policy uncertainty among major business constraints	Business constraint more significant than policy uncertainty
EU-8 a	24.4	2	20.8	2	tax rates
Southeastern Europe	44.7	1	31.8	1	—
Middle-income CIS	39.0	2	22.5	2	tax rates
Low-income CISb	27.7	2	20.3	2	tax rates
Turkey	53.8	1	31.5	2	tax rates

Source: World Bank, Business Environment and Enterprise Performance Survey 2005.

Note:

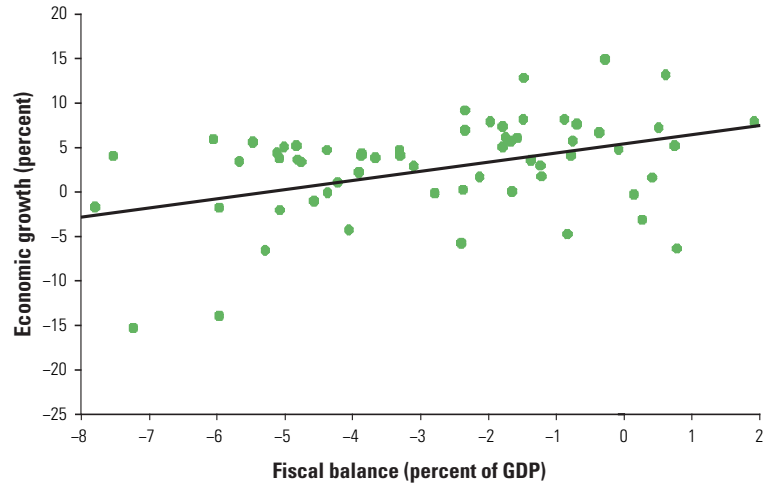
a. Data for EU-8 in 2002 does not include Poland.

b. Data for low-income CIS in 2002 include only Armenia, Azerbaijan, and Georgia. Data for 2005 do not include Turkmenistan.

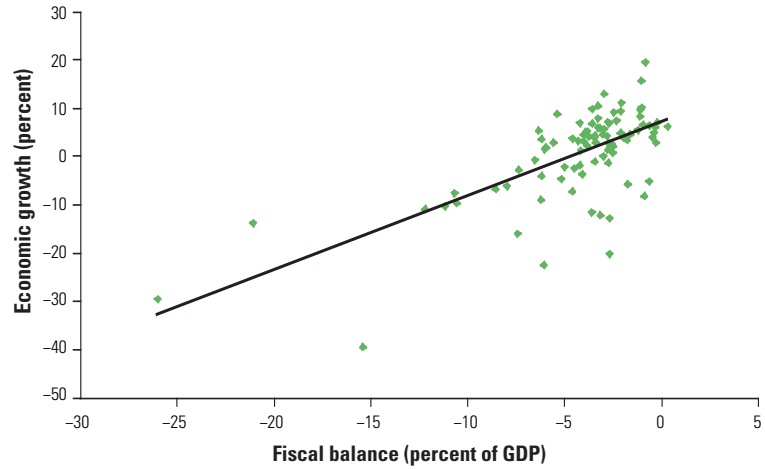
FIGURE 3.2

Fiscal Balance and Economic Growth in ECA Countries, 1989–2005

a. Fiscal balance and economic growth, based on five-year averages (Turkey excluded)



b. Fiscal balance and economic growth (based on five-year averages, with yearly data merged across countries and sorted by decreasing order of GDP growth)

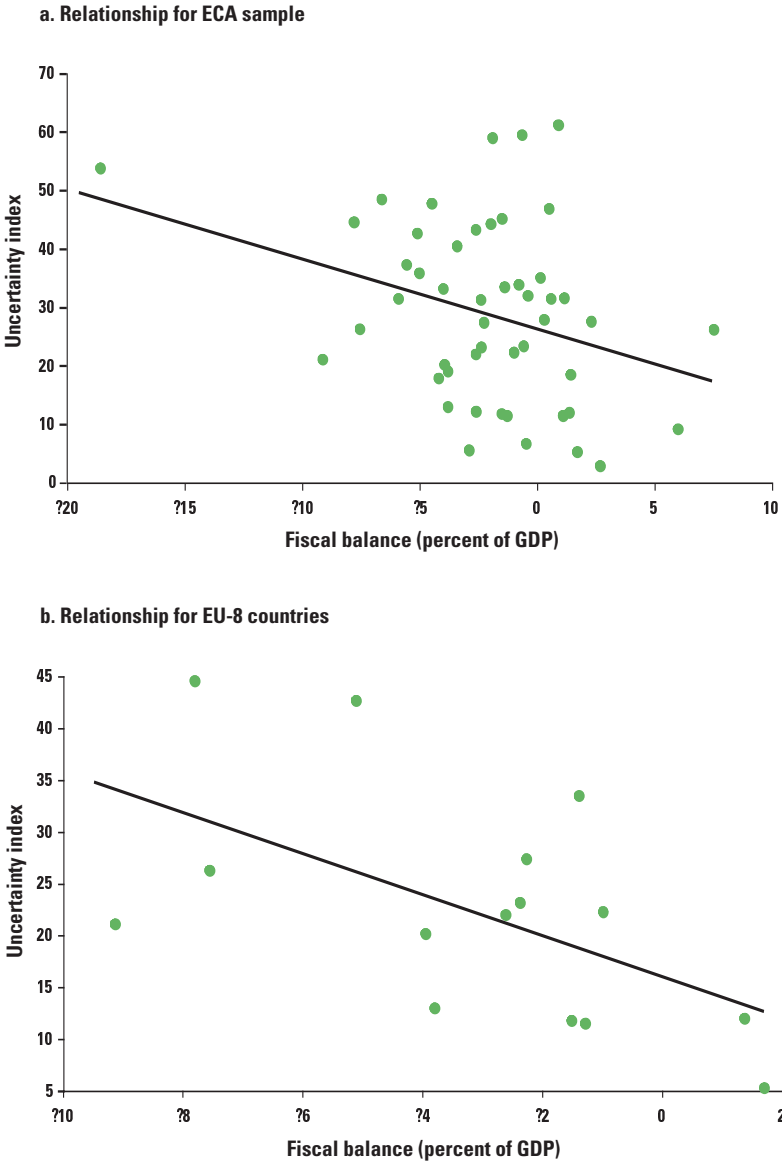


Source: IMF World Economic Outlook.

a. Fiscal balance and economic growth, based on five-year averages (Turkey excluded).

b. Fiscal balance and economic growth (based on five-year averages, with yearly data merged across countries and sorted by decreasing order of GDP growth).

FIGURE 3.3
Uncertainty as Perceived by Managers and Fiscal Balance in ECA, 2005



Sources: World Bank Business Environment and Enterprise Performance Survey 2005; IMF World Economic Outlook.

having an impact on growth (as discussed further below). Stronger fiscal frameworks seem to have played an important part in this decline, as shown by the negative association between perceived uncertainty and fiscal balances (figure 3.3). The correlation is most robust in EU-8,⁵ the group of countries that currently face the largest fiscal tensions.

BOX 3.1**Fiscal Deficits, Private Savings, and Economic Growth**

To finance a deficit, government has to borrow from the private sector. Some rational economic agents may be aware that a higher deficit today implies higher taxation in the future, and they may increase their savings today to have the means to pay those higher taxes. However, some economic agents may be subject to fiscal illusion or simply not care about higher taxes in the future. Thus, the increase in private savings may not be enough to meet additional government borrowing requirements, although empirical studies are inconclusive in this respect. A concise review of those studies can be found in Elmendorf and Mankiw (1998: 53–61).

According to neoclassical models, even if the fiscal deficit has an adverse effect on national savings, it does not reduce output growth in a lasting way, because in these models long-term economic growth is exclusively driven by technical progress, which is assumed to be exogenous. Lower savings will, however, result in a lower capital-to-labor ratio, which—due to the decreasing marginal productivity of capital—will lead to a higher real interest rate. A lower capital-to-labor ratio will also lead to lower productivity of labor and thus eventually to a lower real wage rate.

Contrary to this view, technical progress is endogenous in new growth theory (Barro and Sala-i-Martin 1995). These models rely on a broader definition of capital, incorporating positive externalities of capital accumulation (for example, learning by doing or technical progress driven by technologies embodied in new capital). As a result, in many endogenous growth models, the assumption of decreasing marginal productivity of capital is replaced by an assumption of constant marginal productivity. This enables changes in growth rates driven by changes in national savings to persist in the long run.

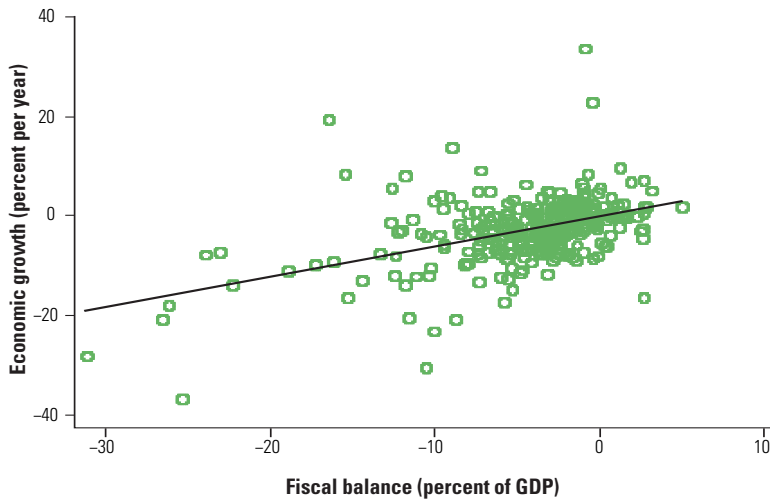
The negative impact of fiscal deficits on long-run growth has been empirically documented in several studies, such as Fischer (1993), Easterly and Rebelo (1993), Easterly, Rodriguez, and Schmidt-Hebbel (1994), Bleaney, Gemmell, and Kneller (2001).

Source: Authors.

The largest declines in uncertainty were in the Slovak Republic, where the fiscal deficit was reduced over this period, and in Bulgaria, where public finances were maintained more or less balanced. The fiscal burden also dropped significantly in both countries.⁶ In contrast, policy uncertainty increased in the Czech Republic and Hungary, where strong tensions in public finances were left largely unresolved.

Econometric evidence strongly confirms that lower fiscal imbalances are conducive to growth.⁷ Regression results underscore the broad findings from previous studies, namely that initial conditions, macroeconomic stabilization, and liberalization and structural reform

FIGURE 3.4

Fiscal Balances and Growth in ECA Countries, 1992–2004

Source: World Bank staff calculations.

Note: The values on the y-axis represent economic growth after controlling for the effects of all independent variables other than the fiscal balance (in percent of GDP). Based on regression (1), table 3A.1, annex 3A.

all matter for growth, and their impact is in the expected direction. The fiscal balance turns out to be a robust positive determinant of growth after controlling for other independent variables (annex 3A and figure 3.4). An improvement in the fiscal balance of 1 percentage point of GDP is associated, on average, with a 0.4–0.5 percent increase in the rate of GDP growth, or a compounded gain over 10 years of about 4.6 percentage points of GDP. Previous studies have produced mixed evidence on the importance of fiscal consolidation to growth. The significantly stronger results obtained here are associated with the notable progress in fiscal consolidation documented in the previous section, together with the strong rebound in growth observed in recent years in several ECA countries.⁸

The Size of Government

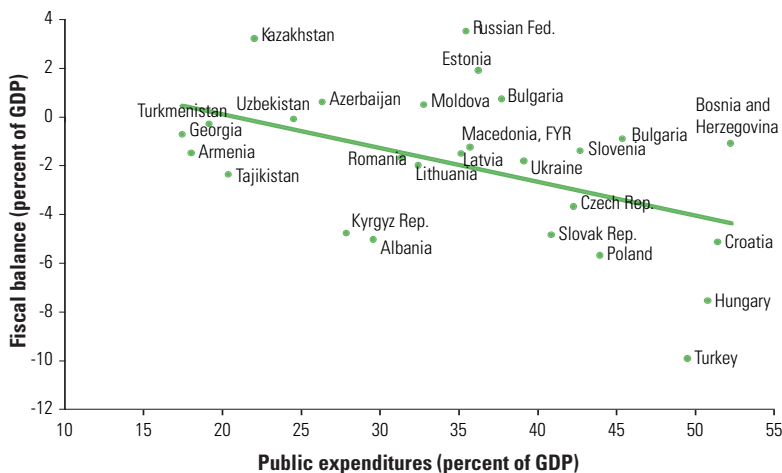
Significant parts of public expenditure programs aim to ensure adequate provision of public goods and services, but also to promote inclusion by protecting the vulnerable through social transfers. Public goods and services in sectors such as basic education, health care, and rural infrastructure typically strengthen human and physical assets

that are conducive to higher growth, while empowering lower-income people and the disadvantaged to overcome poverty. At the same time, well-designed transfers in the form of social assistance and pensions protect the vulnerable, and these safety nets have proven valuable in preventing even stronger increases in poverty during the transition. Although these functions are valuable, it is often difficult to determine whether the size of public expenditures “is right.” While the provision of public goods and services, as well as social transfers, may promote growth with inclusion, the inefficient design of these expenditure programs and revenue-raising mechanisms may distort the allocation of resources and impede growth. Because this would risk making efforts to reduce poverty self-defeating, the following sections focus on the way public expenditures affect growth in relation to the quality of public sector management.

The size of government, measured here by the share of public spending in GDP, can affect economic growth in various ways. First, large public expenditures can affect growth through their impact on the fiscal balance—fiscal deficits have proven to be more difficult to control in countries with high public spending as a share of GDP. In the early 2000s, for example, deficits averaged a high 5–6 percent of GDP where public spending exceeded 40 percent of GDP (figure 3.5). This negative association may reflect the impact on the fiscal balance of more expansionary fiscal policy driven by increases in public expenditures. However, it may also reflect the impact of automatic fiscal stabilizers if the budget is rigid because of a large share of nondiscretionary expenditure such as wages, interest payments, social entitlements, and subsidies.⁹ When large nondiscretionary spending prevents a swift adjustment in the budget in the face of declining fiscal revenues, a growth slowdown is likely to be reflected in larger fiscal deficits. Tensions in public finances are most evident in bad times, especially in countries where expenditure is high and rigid, nondiscretionary components are prominent.

Large public expenditures can also affect resource allocation and growth through various other channels. Large public expenditures must be financed by high levels of taxation if government solvency is to be preserved. High tax rates reduce the rate of return to saving and investment and may also distort incentives to work or create incentives to migrate, especially for highly skilled workers. The composition of spending also presumably matters, because sizeable spending on transfers and welfare services may create disincentives for participation in the labor force, while subsidies may distort the allocation of resources toward low-productivity activities. Large government spending programs in specific sectors—such as infrastructure, hous-

FIGURE 3.5

Public Expenditure and Fiscal Balance in ECA Countries, 2002–05

Source: World Bank staff calculations based on IMF World Economic Outlook data.

ing, or health care—are often supported by intrusive regulations that may stifle private participation and investment. Moreover, large public expenditure programs may become counterproductive if they are poorly designed as a result of limited government effectiveness or if they create more opportunities for corruption and rent seeking. Examples include poor targeting of transfer programs, inefficient selection of investment projects due to political interference, insufficient budgeting for operation and maintenance of public investments, or resource leakages owing to weak enforcement of procurement regulations. The evidence to date has been inconclusive regarding the prevalence of such effects in transition economies (box 3.2).

The impact of the size of government on economic growth is likely to be nonlinear for several reasons.

- While small governments tend to concentrate spending on the provision of key public goods (rule of law, defense, infrastructure) and efficiency-improving services (education, health care), large governments tend to spend more on “unproductive” core government functions and subsidies that are not conducive to growth (discussed further below). Large governments also spend more on social transfers, usually as part of a “social compact” to provide valued safety nets, but in many cases the design of these programs makes them fiscally unsustainable (see chapter 7 on pensions) or

BOX 3.2**Government Size and Economic Growth: Empirical Analysis to Date**

Overall, the literature linking size of government and economic growth has been inconclusive. Barro (1991) found that a larger size of government negatively affects growth. However, when Levine and Renelt (1992) used extreme bounds analysis to test the sensitivity of standard empirical models of growth, they were unable to find robust and significant links between government expenditure (whether total or consumption expenditures alone) and growth, although they agreed that the relationship appears generally negative. Other researchers have argued also that there may be thresholds in the links between size of government and growth (Chen and Lee 2005) and that the composition of government expenditure matters (Devarajan, Swaroop, and Zou 1996; also see box 3.4).

The literature on transition economies to date has also generally found ambiguous links between the size of government and growth. Chu and Schwartz (1994) found little evidence linking expenditure reductions to output decline. Campos and Coricelli (2000) tested the Barro (1991) growth model using data on transition economies and found a weak impact of government consumption on growth. Conversely, Beck and Laeven (2005) found a negative but insignificant link between government consumption and average GDP per capita growth over the period 1992–2002. The limited availability of relevant data seems to have hampered empirical work. Many of the reported regression results are based on small sample sizes as, for example, the analysis in Beck and Laeven, which is based on 24 observations.

Some very recent work provides stronger evidence in support of a significant negative link between public spending and growth. Using a panel sample of 120 observations, Åslund and Jenish (2005) suggest that expenditure reductions have underpinned economic growth in the region from 1999 onward, particularly among the Commonwealth of Independent States.

Source: Authors.

requires financing through high payroll taxes that stifle employment generation (see chapter 9 on labor taxes). During 2002–04 public spending was on average 46 percent of GDP in ECA countries with large governments, compared with 28.8 percent of GDP in countries where public spending was below the average for the region as a whole. As noted in chapter 2, public spending on social security and welfare services was particularly oversized in countries with large governments—15.3 percent of GDP compared to 7.3 percent in countries with smaller governments. Core government functions (general public services, defense, public order, and safety) were also larger, representing 7.9 percent of GDP in the for-

mer countries against 5.8 percent in the latter. Because higher levels of spending are associated with larger fiscal deficits (see figure 3.5) and levels of public debt, interest payments in countries with large governments were twice as high as in countries with small governments—2.9 percent of GDP in the former compared to 1.4 percent in the latter.

- Limited administrative capacity could be another reason a threshold may exist in the way public spending affects growth. Administrative capacity improves only slowly, reflecting gradual improvements in public sector management and civil servant skills, yet expenditure programs may grow relatively swiftly, resulting in administrative bottlenecks, poor program design, and low expenditure effectiveness.
- Financing of big governments requires high levels of taxation that are likely to distort incentives for saving, investment, and work effort beyond some threshold level. The general rule of thumb is that deadweight losses from taxes increase in proportion to the square of taxation.

This study finds a nonlinear relationship between public expenditure and growth in ECA countries, using general government spending as the independent variable. The results reported in annex 3A (table 3A.2, regressions 1–3) provide evidence that public spending negatively affects growth at expenditure levels of 35 percent of GDP or higher.¹⁰ Beyond this threshold, an increase in general government expenditures of 1 percentage point of GDP reduces growth by an estimated 0.3–0.4 percent per year. At levels below about 35 percent, public sector size has no robust measurable effect on growth.¹¹ Such an inflection point is to be seen as an approximate rather than an exact measure, the more so that the impact of the size of government on growth is likely to depend on public sector governance as further discussed below (see also box 3.3).

In countries where public sector governance is weak, misallocations of public expenditures and weak administrative capacity are likely to be exacerbated, making the nonlinear impact of large government programs more pronounced. In addition, taxes are likely to be more distortionary when governance is poor, with high compliance costs and bribery of tax officials adding to the impact of high and distorting tax rates. In contrast, the threshold effects of big governments on growth may be mitigated by strong public institutions.

The hypothesis that the quality of governance influences the impact of big governments on growth (see box 3.3) has been tested by using two indicators of the quality of governance. Findings are robust to the

BOX 3.3**Why Good Governance Could Mitigate the Negative Impact of Big Governments: Some Simple Analytics**

It is reasonable to expect that the marginal benefits of public spending will diminish as the size of expenditure programs gets bigger, assuming a given set of public sector institutions and social preferences. Similarly, as the tax burden gets higher the marginal cost of taxation can be expected to increase, because high taxes usually distort incentives to invest and participate in the labor force. Although political factors may certainly complicate outcomes, from an economic perspective public expenditures should increase until their marginal benefits match the marginal cost of taxes needed for their financing (see figure below, point A).

Better public sector governance would affect both determinants of government size. The marginal benefit of a given level of public expenditures would increase, because better program design and resource management would improve outcomes, for example, in health care or education. At the same time, the marginal cost of a given level of taxes would decrease, because better tax administration and tax design could help raise revenues in less distorting ways. With better than average governance (as in high-income OECD countries), the optimal size of government—as measured by the size of public expenditures and taxes—could thus increase compared to the typical country (see figure below, point A*). A bigger size of government would not necessarily exert a negative impact on efficiency and growth.

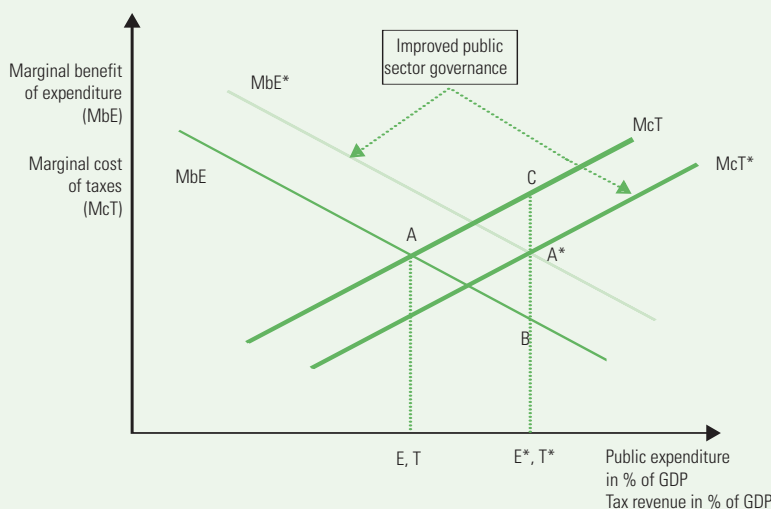
(continued)

use of alternative indicators of governance: (a) the World Bank's Country Policy and Institutional Assessment (CPIA) ratings for public sector management and institutions, 1992–2004; and (b) an indicator of government effectiveness compiled by the World Bank.¹²

The analysis confirms that strong governance mitigates the negative impact of public sector size on growth. The ECA country sample was split into two broad country groups, one with relatively poor quality of public sector management (or weak government effectiveness) and another with relatively good quality of public sector management (or high government effectiveness). The results in annex 3A, table 3A.2, indicate that public sector size—above the indicative threshold of 35 percent of GDP—exerts a strong negative impact on growth in countries with weak government effectiveness. However, public sector size does not have a significant negative impact in countries with good government effectiveness. Results using the CPIA indicator (annex 3A, table 3A.3) consistently indicate a strong negative impact of “big government” in countries with relatively weak

BOX 3.3. CONTINUED

Suppose, however, that public expenditures and taxes were to rise in the typical country (with average quality of governance) up to the levels indicated by E^* and T^* . This would create a gap between a higher marginal cost of taxes (point C) and a lower marginal benefit of expenditures (point B). Misalignment of marginal cost and benefits would create an efficiency loss (or dead-weight loss), measured by the familiar “Harberger triangle” ABC. The larger the efficiency loss, the more negative the impact of government size on growth. By contrast, efficiency losses would not be felt unless the size of government exceeded the optimal size. The association of large public expenditure with lower growth in countries with weak governance—but only beyond a certain threshold of expenditure—is corroborated by the empirical findings in this study.



Source: Authors.

public management and institutions but do not reveal a consistent pattern for countries where public management is strong. The differential impact of the size of government in the two groups of countries is depicted in figures 3.6a and 3.6b.

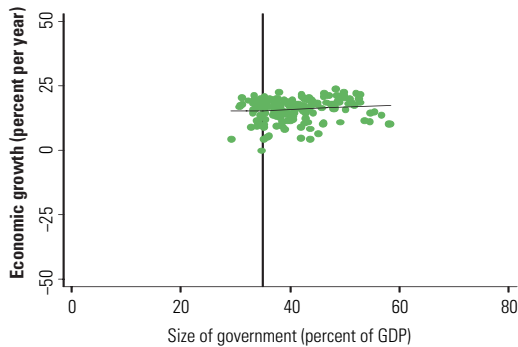
The Composition of Expenditures and Structure of Taxes

For this study, the growth effects of “distorting” and “nondistorting” taxes and of “productive” and “unproductive” expenditures were analyzed, while accounting for the government’s budget constraint. There is, indeed, empirical evidence that productive expenditures are conducive to growth, particularly when financed with nondistorting taxes (box 3.4). Departing only slightly from previous stud-

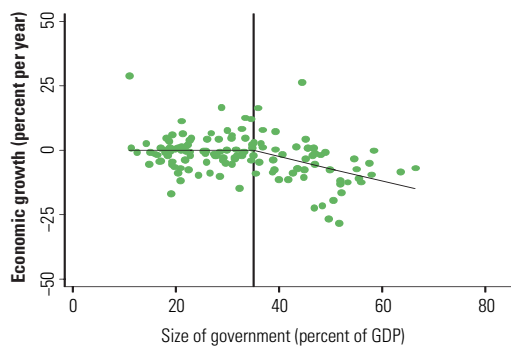
FIGURE 3.6

Economic Growth and the Size of Government by Relative Government Effectiveness in ECA Countries, 1992–2004

a. More-effective governments



b. Less-effective governments



Source: World Bank staff calculations.

Note: The values on the y-axis represent economic growth after controlling for the effects of all independent variables other than the size of government (in percent of GDP). Based on regressions (4) and (7), table 3A.2, annex 3A.

ies (Kneller, Bleaney, and Gemmell 1999, for instance) public spending on education, health care, housing, and economic affairs is classified as productive, while unproductive expenditures include social security and welfare, recreation, culture and religion, economic services, and general public services. Such a classification should not be taken as a value judgment, because social transfers are usually part of a “social compact” to provide valued safety nets. However, if the design of these programs makes them fiscally unsustainable, or requires financing through high labor taxes that impede employment, their unwanted consequences for growth may offset their intended redistributive impacts. Distorting taxes include personal and corporate taxes, payroll taxes, social security contributions, and property taxes. Taxes on domestic goods and services are considered nondistorting. The analysis covers 20 ECA countries during the period 1995–2004, a relatively short estimation period because of limitations in the available data on general government expenditures by function.

The empirical results (annex 3B) once again confirm that a larger fiscal surplus promotes growth (table 3B.2, regressions 5–8). Moreover, a larger fiscal surplus (or a smaller deficit) appears to have a stronger impact on growth when achieved through a cut in unproductive expenditures, with the impact being slightly lower in the case

BOX 3.4**Public Expenditure Composition, Tax Structure, and Economic Growth: Empirical Analysis to Date**

Since the blossoming of empirical growth literature in the late 1980s, several studies have examined the impact of key expenditure components on growth. Aschauer (1989) found that spending on core infrastructure (streets, highways, airports, mass transit, and so forth) had a positive impact on private sector productivity. Several other studies have found positive growth effects of public investment (Nourzad and Vrieze 1995; Sanchez-Robles 1998; Kamps 2004), with some evidence supporting the law of diminishing returns (De la Fuente 1997). Furthermore, several studies have presented evidence that public investment can be productive if it creates infrastructure that serves as input to private investment (Devarajan, Swaroop, and Zou 1996).

The literature strongly supports the growth-enhancing effect of expenditure on human capital if it is well-targeted (Guellec and van Pottelsberghe 1999; Diamond 1999; De la Fuente and Doménech 2000; Heitger 2001). Some studies, however, emphasize that public spending (in particular, on research and development) must complement rather than crowd out private spending (David, Hall, and Toole 2000). Consumption and social security spending have generally been found to have either no effect or a negative effect on growth (Aschauer 1989; Barro 1990, 1991; Grier and Tullock 1989), although some (Cashin 1995) found a positive growth impact from welfare spending. For other categories of public spending, the evidence is even less conclusive.

Regarding tax structure, using a panel of 23 OECD countries, Widmalm (2001) found that different taxes have different growth effects and that tax progressivity is bad for growth. The harmful effects of a progressive income tax structure were also noted by Padovano and Galli (2001, 2002), and Lee and Gordon (2005). The latter found that the marginal corporate tax rate is negatively correlated with economic growth in a cross-section of 70 countries during 1970–97, while other tax variables, including the average tax rate on labor income, are not significantly associated with economic growth. Kneller, Bleaney, and Gemmell (1999) found that an increase in productive expenditures enhances growth when financed by nondistorting taxation, provided the overall size of government remains relatively limited, while an increase in distorting taxes significantly reduces growth.

Source: Authors.

of financing through an increase in nondistorting taxes. Although differences are small, the impact is further reduced when the increase in the surplus is financed by an increase in distorting taxes or a cut in productive expenditures.

Large unproductive expenditures lead to lower growth, especially when financed with debt or higher taxes. The negative impact of

unproductive expenditures on growth is robust across all empirical specifications (annex 3B, table 3B.2, regressions 4–5 and 7–8). This harmful effect is even larger when an increase in unproductive spending is debt-financed (that is, accompanied by an increase in the fiscal deficit) or financed by an increase in distorting taxes. Financing through nondistorting taxes appears to be almost equally harmful. Although estimated differences are again small, the least negative impact is seen when taxes (whether actual or future, if more debt is issued) are held constant, with higher unproductive spending thus financed through cuts in productive expenditure.¹³

Evidence regarding the impact of productive expenditures and the structure of taxes is mixed. The results indicate that productive expenditures always have a positive (though not always significant) impact on growth, in contrast to the harmful incidence of unproductive expenditures. It is, however, counterintuitive that the impact of larger productive spending is not significant when matched by lower unproductive spending (annex 3B, table 3B.2, regression 6). This may reflect the threshold effects of overall spending and the quality of governance discussed earlier. Distorting taxes exert a negative, but generally not significant, incidence on growth unless they finance an increase in unproductive spending, in which case their impact is significantly negative (table 3B.2, regression 6). Finally, the growth impact of nondistorting taxes does not appear to be significant.

The negative impact of unproductive expenditures on growth is particularly strong where governance is weak. This has been tested again by splitting the ECA country group into two subgroups according to the quality of governance, using the same indicators discussed in the previous section—the CPIA average rating on “public sector management and institutions” and the “government effectiveness” indicator. The empirical findings are detailed in annex 3B (table 3B.4) and summarized in table 3.4. Results indicate that unproductive expenditures are indeed harmful for growth when public sector management or government effectiveness (or both) is weak, but their impact is mitigated when government effectiveness is strong. Moreover, productive expenditures promote growth (when tax-financed) in countries where governance is good, but have no significant impact where governance is poor. In countries where government effectiveness is weak, identifying and cutting unproductive spending would make a strong contribution to growth and poverty reduction in the short run. This should indeed be as a short-term policy priority, because building capacity for better governance and institutions requires time and brings a development benefit only over the longer run.

TABLE 3.4

Summary of Empirical Findings on Growth Impact of Public Expenditure Composition and Tax Structure

	Good governance	Poor governance
"Unproductive" expenditures	No measurable impact	Negative impact
"Productive" expenditures	Positive impact	No measurable impact
"Distorting" taxes	Negative impact	No measurable impact
"Nondistorting" taxes	Positive impact	No measurable impact

Source: Based on annex 3B, tables 3B.1 and 3B.4

The structure of taxes appears to matter for growth only where governance is strong. When governance is relatively effective, the impact of big government is mitigated but the structure of financing matters. Distorting taxes have a significantly negative impact on growth, while nondistorting taxes seem to have a positive incidence—presumably because the effective use of revenues raised by these taxes outweighs their costs. In contrast, when governance is weak, what seems to matter is the overall size of government and the resulting total tax burden, rather than the structure of taxes. It is more likely that all types of taxes have high compliance costs that outweigh any benefits from less-distorting tax design.

Creating Fiscal Space

Fiscal space is the government's ability to increase expenditure or reduce taxes without impairing the sustainability of its financial position (see Heller 2005). This requires that the primary fiscal surplus be consistent with a stable public debt ratio over the long run (annex 3C). On the expenditure side, fiscal space can be created by (a) reallocating expenditures from low-value programs toward programs with a higher effect on growth or (b) improving the efficiency of public expenditures to get better value from particular programs. On the financing side, fiscal space can be created by (a) broadening the tax base, (b) increasing tax rates, or (c) mobilizing grant aid. Moreover, fiscal space can be created by accelerating the reduction of public debt—or using one-off revenues (such as privatization revenues) to pay back public debt—to reduce the primary fiscal surplus required for debt solvency. The analysis below focuses on the expenditure side of the budget.

Expenditure Allocations and Fiscal Space

The differences between the actual primary balance over 2002–05 in ECA countries and the primary fiscal balance required to stabilize the public debt ratio in the long run can be considered an approximate indicator of fiscal space. A positive difference indicates that fiscal space is potentially available for increased spending or for lower taxes, while a negative difference signals that fiscal space would need to be created before any decision to increase expenditures or reduce taxes. Illustrative estimations of the primary fiscal surplus needed to stabilize the debt ratio in the long run have been carried out for ECA countries based on the methodology outlined in annex 3C. At least three caveats apply: (a) more conservative assumptions regarding future financing conditions would imply much lower estimates of fiscal space; (b) mitigating surrounding risks (such as debt rollover risks due to short debt maturities or interest rate and exchange risks) would call in many countries for reducing the public debt ratio, thus further limiting fiscal space; (c) the threshold of public debt consistent with a low risk of insolvency depends on the quality of public debt and budget management institutions, which is uneven across countries. Weak institutions would call for a higher primary fiscal surplus (which would thus be equivalent to lower fiscal space) to achieve a reduction in public debt in proportion to GDP.

Despite ambitious fiscal consolidation, fiscal space appears to be still limited in many ECA countries. Four groups of countries can be identified:

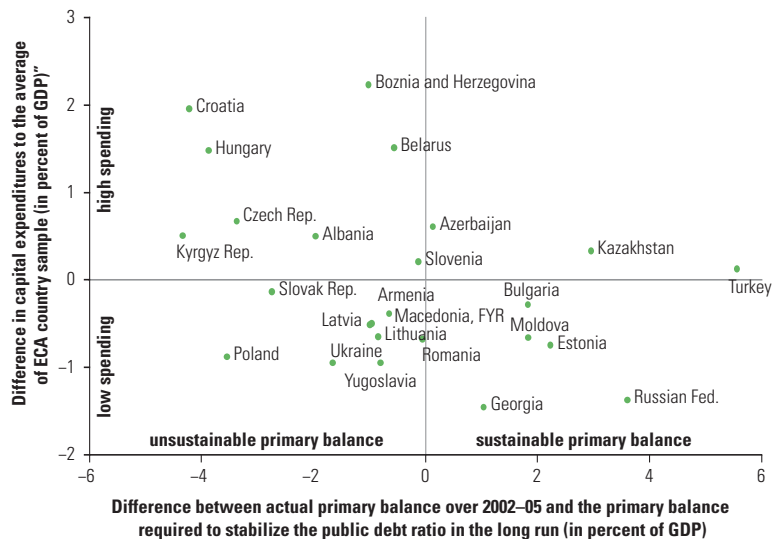
- Countries where fiscal space seems to be available but public spending in growth-promoting sectors is below the group average
- Countries where fiscal space seems to be available but public spending in those growth-promoting sectors is above average for the whole group
- Countries where additional fiscal space needs to be created to ensure long-run solvency and public spending in growth-promoting areas is below the group average
- Countries where additional fiscal space needs to be created to ensure long-run solvency and public spending in these growth-promoting areas is relatively oversized

Estimates of fiscal space and the size of growth-promoting expenditures on public investment and social sectors are shown in figure 3.7

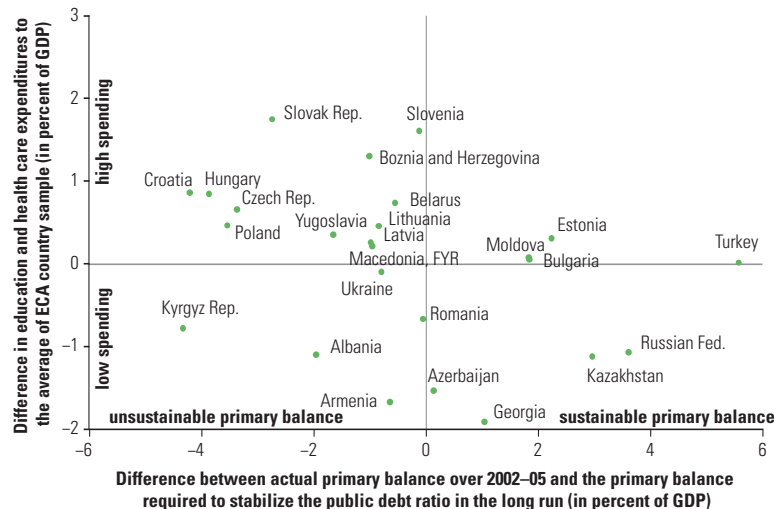
Policy priorities vary in each country group. Expenditure increases could be considered in countries where fiscal space is available and

FIGURE 3.7
Potentially Growth-Promoting Expenditure and Fiscal Space in ECA Countries

a. Capital expenditure



b. Expenditure on education and health care



Sources: IMF, Eurostat, and ECA fiscal database.

Note: Averages for 2002–04. Differences in expenditures in proportion to GDP are normalized to the sample average.

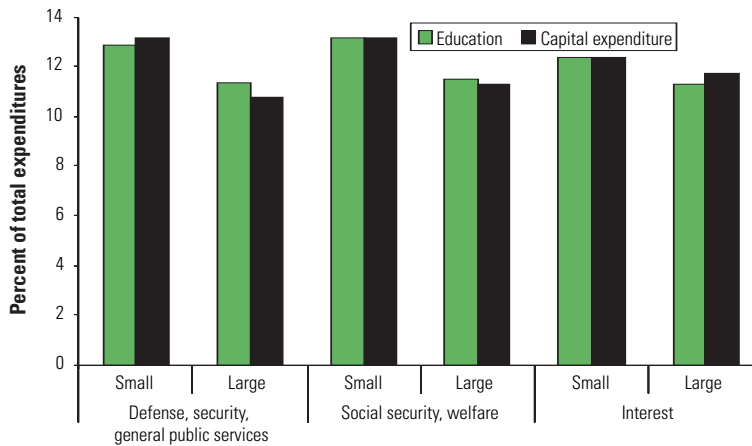
expenditures in a specific category seem to be relatively low (the lower right quadrant in figure 3.7)—subject to the caveats mentioned above and to careful selection of projects. In countries where fiscal space is available but expenditures appear to be high (the upper right quadrant), it would seem more appropriate to try to improve efficiency than to increase spending. In countries where public spending is below average but fiscal space is lacking (the lower left quadrant), the emphasis should be on expenditure reallocations, because they represent the only viable means of increasing potentially growth-promoting spending without impairing solvency. Finally, in countries where fiscal space needs to be created but public expenditures are oversized relative to comparators (the upper left quadrant), mostly EU-8 and Southeastern Europe¹⁴ countries, measures are needed to improve expenditure efficiency and reduce spending because expenditure increases would compromise debt sustainability.

Oversized core government functions and social security and welfare services are associated with relatively low levels of potentially growth-promoting expenditures. As documented earlier, large fiscal imbalances are the main reason for lack of fiscal space and are associated with high levels of public spending in proportion to GDP (figure 3.5). In turn, large public expenditures often reflect oversized core government functions and sizeable payments for social security and welfare. Expenditures for education and infrastructure—typically considered growth-promoting because they enhance the efficiency of production factors—appear to be on average lower in countries with large expenditures for core government functions, social security, and welfare (figure 3.8). In these countries, expenditures for education and capital spending are lower by about 1.5–2.5 percentage points of total general government expenditures—the equivalent of 0.7–1.1 percentage points of GDP for each expenditure category. Similarly, higher interest payments on public debt seem to crowd out spending on education and capital spending.

Thus, when fiscal space is lacking, a key goal should be to reduce potentially unproductive spending. As noted above, large unproductive expenditures come at the expense of potentially productive spending, especially in education and infrastructure. Changing the composition of expenditures for a given total amount of spending would thus improve prospects for long-term growth. In addition, as indicated by empirical evidence reviewed earlier, an improvement in the fiscal balance seems to be more beneficial for growth when financed by a curtailment in unproductive spending. Creating needed fiscal space for debt sustainability by reducing unproductive expenditures thus has a mutually reinforcing impact on growth.

FIGURE 3.8

“Productive” versus “Unproductive” Expenditure Allocations in ECA Countries, Average, 2002–04



Source: ECA fiscal database.

Efficiency of Expenditures and Fiscal Space

Better expenditure efficiency also increases available fiscal space. Improved efficiency delivers better results out of a given amount of resources—or, equivalently, makes it possible to save on resources necessary to achieve policy goals. Indeed, ensuring expenditure efficiency in a sector should be a precondition for committing additional scarce public resources in that sector. Education, health care, and some infrastructure services are also provided in part through private financing. Efficiency in public service delivery is also important to complement private spending in these sectors.

Expenditure efficiency depends on both sector-specific and cross-cutting factors. Fundamentally, efficiency depends on sector-specific institutional arrangements, addressed in Part 2 of this study. For example, efficiency in health care depends on incentives for responsible use of pharmaceuticals and medical services, operational autonomy and accountability of hospitals, and incentives for cost containment created by provider payment systems. Expenditure efficiency may also depend on the composition of expenditures—for example, the amount of resources spent on preventive care or the share of expenditures on educational equipment such as computers and scientific instruments. However, as indicated by the empirical

findings discussed above, expenditure efficiency may also depend on broader factors that affect the quality of public sector governance—such as the incentives (or disincentives) for results-oriented performance in the civil service, the control of corruption, and the quality of public procurement systems.

Benchmarking of efficiency can help to determine whether the focus of policy should be on expenditure reallocations among sectors or efficiency-enhancing reforms within particular sectors. This study attempts to benchmark the efficiency of spending on health care and education in ECA countries and six high-growth comparator countries for which data are available: Chile, Ireland, the Republic of Korea, Spain, Thailand, and Vietnam. The calculations cover the period 1995–2004. Sector-specific outcome and input indicators are summarized in table 3.5, and overall performance has been calculated as the average value of the outcome indicators for each sector.¹⁵

Sector outcomes depend both on the quantity of inputs used, as measured by expenditure per student in education and expenditure per capita in health care, and on the efficiency of such spending. All else equal, higher levels of spending would be expected to improve outcomes through, for example, more advanced equipment or better training of personnel (or both). Indeed, a positive relationship exists between performance in a sector (as measured by the combined outcome indicator) and the level of public spending (figures 3.9 and 3.10).¹⁶ But expenditure efficiency also matters, as measured by the difference between actual performance and the average level predicted by the level of public spending in the sector.

Four groups of countries can be identified with regard to relative expenditure efficiency:

- Low-spending countries with above-average performance based on their level of expenditure (that is, those above the regression line)

TABLE 3.5

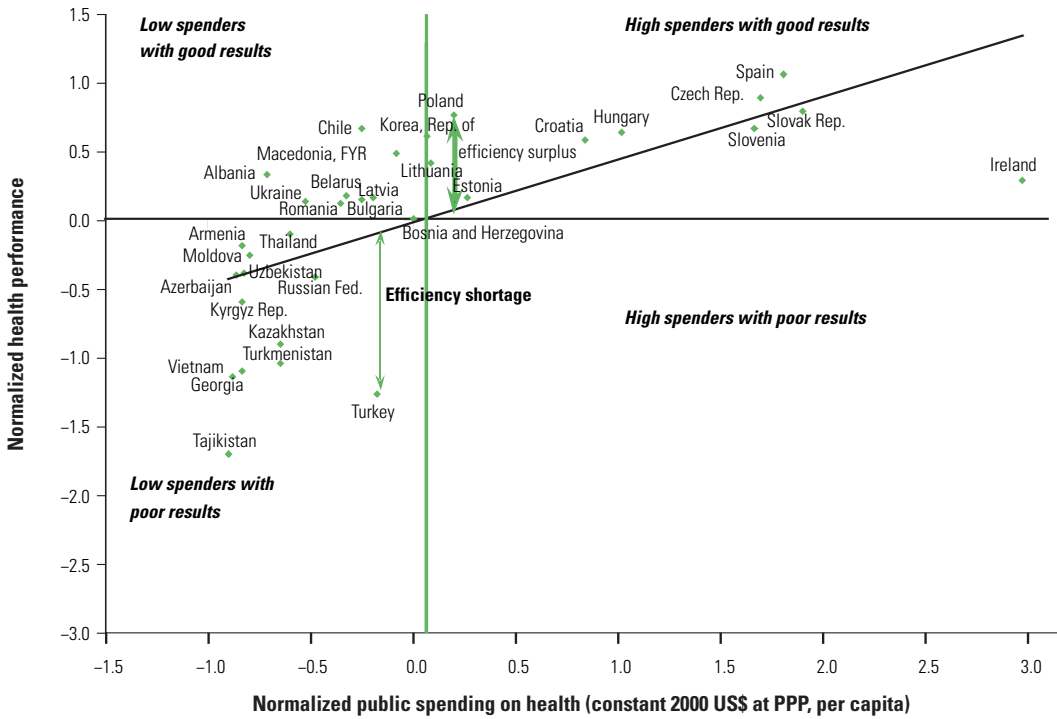
Performance and Input Indicators for Expenditures in Health Care and Education

Outcomes	Health care	Education
	<ul style="list-style-type: none"> • Life expectancy at birth (years) • Infant survival rate (per 1,000 births) • Maternal survival rate (per 100,000 births) • Immunization, average measles and DPT (% of children ages 12–23 months) 	<ul style="list-style-type: none"> • Imputed learning scores calculated by Crouch and Fasih (2004) • Youth employment rate (% of total labor force ages 15–24 years) • School life expectancy (years), total • School enrollment, tertiary (% gross) • Literacy rate, youth female (% of females ages 15–24)
Inputs	<ul style="list-style-type: none"> • Health expenditure, public (US\$ per capita, PPP, constant prices from 2000) 	<ul style="list-style-type: none"> • Public spending on education (US\$ per capita, PPP, constant prices from 2000), adjusted by share of school-age population

Source: World Bank staff.

Note: DPT = Diphtheria, pertussis, tetanus vaccine. PPP = Purchasing power parity.

FIGURE 3.9
Health Care Performance Compared with Public Spending Per Capita, Average, 1995–2004

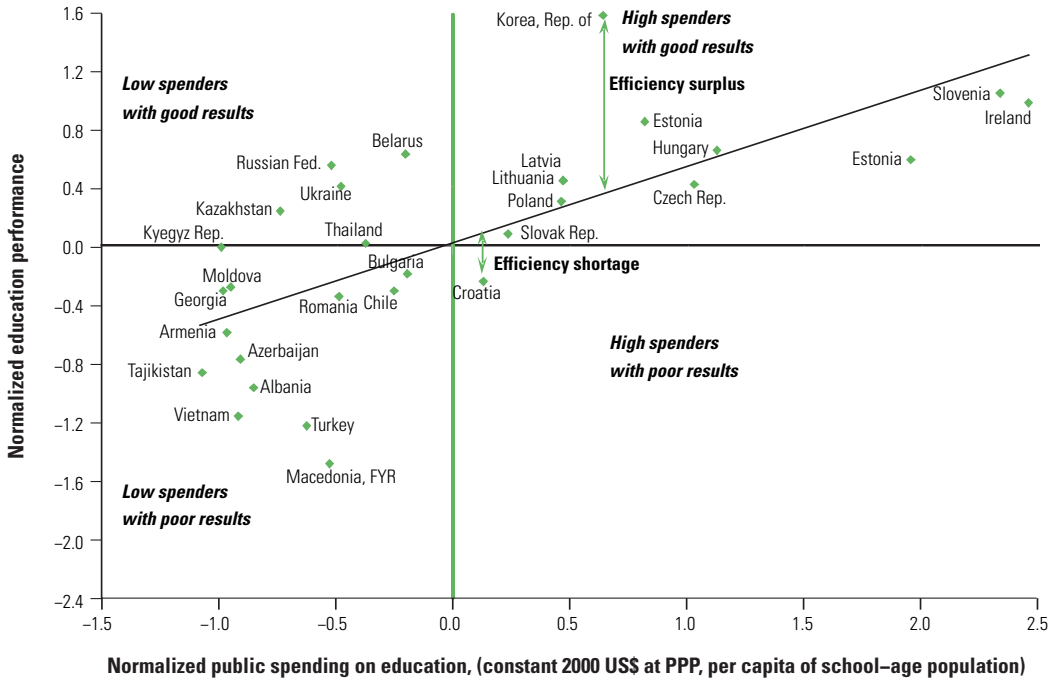


Source: World Bank staff.

- High-spending countries with above-average performance based on their level of expenditure (mostly higher-income countries)
- Low-spending countries with performance below the predicted average (below the regression line)
- High-spending countries with performance below the predicted average

The calculations support the finding that better public sector governance contributes to improved expenditure efficiency in health care and education. The quality of public sector governance was measured by the CPIA indicator of the quality of public sector management—one key indicator used in the econometric estimations in the previous section.¹⁷ Efficiency gaps (as measured by the difference between actual and predicted performance) in both health and education are positively correlated with the quality of governance in ECA countries (figure 3.11).

FIGURE 3.10
Education Performance Compared with Public Spending Per Capita of School-Age Population, Average, 1995–2004

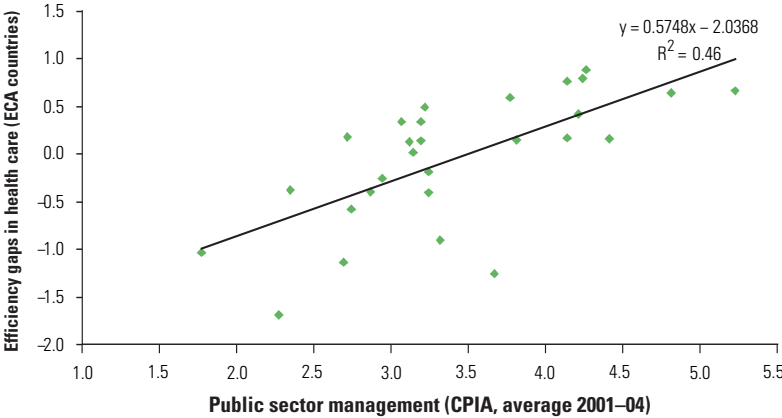


Source: World Bank staff.

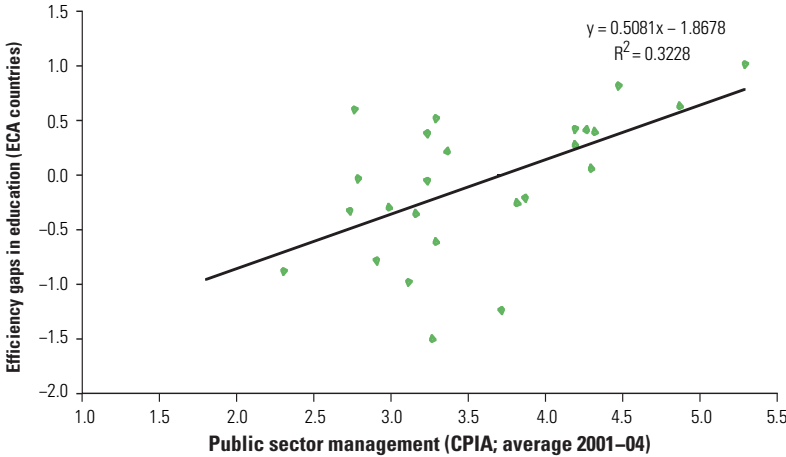
Policy priorities depend on a country’s relative efficiency position. In low-spending countries that achieve relatively poor results in a specific sector, improving efficiency should be a precondition to increased spending in that sector. Improving efficiency is even more critical in high-spending countries where results are relatively poor, because higher spending is even less of an option. In contrast, low-spending countries with relatively good performance in a sector may be able to improve outcomes still further through expenditure reallocations that increase the amount of resources spent in that sector, as long as the additional resources are also spent productively. In all countries, broadly based improvements in public sector governance can reinforce the positive impacts of sector expenditure reforms.

FIGURE 3.11
Efficiency Gaps in Health Care and Education and the Quality of Governance

a. Health care



b. Education



Source: World Bank staff.

Note: The sample includes only ECA countries using the efficiency gaps portrayed in figures 3.9 and 3.10.

Conclusions

What types of adjustments have been successful? A majority of fiscal adjustments in ECA have been successful—that is, they have been sustained over a sufficient period to restore fiscal balances to levels consistent with solvency and reduction in the public debt ratio. Most successful deficit reductions were driven by expenditure cuts across a

vast array of economic categories. In the aftermath of fiscal consolidations, growth has been higher when the fiscal effort has been successful than when adjustments have failed.

Does the fiscal deficit matter for growth? A sound fiscal position appears to be a key prerequisite for higher growth in ECA. Lower fiscal imbalances are associated with greater macroeconomic stability, less business uncertainty, and a stronger investment climate.

Does the size of government matter for growth? The size of government affects economic growth in a nonlinear manner, with the impact also depending on the quality of governance. At expenditure levels of roughly 35 percent of GDP or higher, public spending negatively affects growth, while at levels below that threshold government size has no robust measurable effect on growth. The quality of governance mitigates the negative impact of public sector size on growth—public sector size strongly impairs growth in countries with weak government effectiveness, but there is no significant evidence of a negative impact when government is effective.

Does growth depend on the composition of expenditures and the structure of taxes? Large “unproductive” spending leads to lower growth when government effectiveness is weak, but its impact is insignificant when governance is relatively strong. Productive spending promotes growth in countries where governance is good, but has no significant impact where governance is poor. When governance is effective, the structure of financing also matters for growth. Distorting taxes have a significantly negative impact on growth but nondistorting taxes seem to have a positive affect, presumably because the effective use of revenues outweighs their costs. In contrast, what seems to matter when governance is weak is the overall size of government, which determines the total tax burden, rather than the structure of taxes.

Are productive expenditures constrained by unproductive spending? Lack of fiscal space for productive spending is often associated with large government size, which in turn reflects oversized core government functions (general public services, defense, and security), transfer payments for social security and welfare services, and interest payments on public debt. Potentially growth-promoting expenditures, especially for education and public investment, are thus crowded out.

What trade-offs exist between levels of spending and expenditure efficiency? Improving expenditure efficiency can provide benefits at very low cost. The efficiency of public spending varies considerably across ECA countries, as discussed further in chapters 4–7. Before considering increases in spending, countries with serious efficiency gaps should focus on institutional reforms to strengthen the impact of public spending.

Annex 3A Determinants of Growth in Transition Economies, 1992–2004; Econometric Evidence

Baseline Empirical Model

The regression model draws on Fischer and Sahay (2000). The baseline specification is of the following general form:

$$Gr_{i,t} = \beta_0 + \beta_1 WD_{i,t} + \beta_2 INF_{i,t} + \beta_3 FIS_{i,t} + \beta_6 IRP_{i,t}$$

where $Gr_{i,t}$ is the real GDP per capita growth rate; $WD_{i,t}$ is a war dummy or an index of armed conflict; $INF_{i,t}$ is the natural log of inflation; $FIS_{i,t}$ is the fiscal balance in percent of GDP, with positive values denoting fiscal surpluses; and $IRP_{i,t}$ is the overall index of reform progress, which is the unweighted sum of the European Bank for Reconstruction and Development indexes of small-scale privatization and price liberalization, with higher values indicating greater progress in structural reform; and i and t are country and year indexes, respectively. Ordinary least squares (OLS) is used to estimate equation (1). To test the robustness of the baseline results and account for cross-country heterogeneity, we also utilize other econometric methods, such as fixed effects and random effects estimators. Estimation results are provided in tables 3A.1, 3A.2, and 3A.3.

TABLE 3A.1
Determinants of Economic Growth, 1992–2004

Variable	OLS (1)	Fixed effects (2)	Random effects (3)
War dummy	-5.70* (1.90)	-5.86*** (3.15)	-5.83*** (3.30)
Ln(inflation) (IMF)	-2.09*** (7.32)	-1.73*** (4.92)	-1.91*** (6.44)
Fiscal balance (% of GDP)	0.61*** (5.78)	0.74*** (8.37)	0.70*** (8.56)
Overall index of reform	-0.10 (0.91)	0.01 (0.05)	-0.07 (0.58)
Constant	13.76*** (3.76)	10.55** (2.11)	12.96*** (3.53)
Observations	295	295	295
R-squared	0.53	0.57	
Number of countries		25	25

Source: World Bank staff calculations.

Note: OLS = Ordinary least squares. *Significant at 10 percent level. ** Significant at 5 percent level. *** Significant at 1 percent level. Robust t-statistics in parentheses.

TABLE 3A.2

Economic Growth and the Size of Government By Government Effectiveness, 1992–2004
WB Governance Indicator for Government Effectiveness

Variables	All Countries			Relatively more effective government			Relatively less effective government		
	OLS (1)	Fixed effects (2)	Random effects (3)	OLS (4)	Fixed effects (5)	Random effects (6)	OLS (7)	Fixed effects (8)	Random effects (9)
War dummy	-5.45* (1.86)	-5.92*** (3.18)	-5.67*** (3.27)	-3.16 (1.55)	-1.69 (0.89)	-2.66* (1.66)	-5.74 (1.25)	-4.7 (1.48)	-5.34* (1.81)
Ln(inflation) (IMF)	-1.91*** (5.95)	-1.83*** (5.32)	-1.85*** (6.30)	-0.88*** (3.37)	-1.06*** (3.89)	-1.00*** (4.18)	-2.97*** (4.80)	-2.38*** (3.43)	-2.72*** (4.48)
Fiscal balance (% of GDP)	0.51*** (4.75)	0.38*** (3.24)	0.49*** (5.22)	0.71*** (7.20)	0.73*** (6.31)	0.70*** (7.01)	0.47*** (3.38)	0.32 (1.64)	0.44*** (2.83)
Overall index of reform	-0.01 (0.08)	-0.11 (0.68)	-0.05 (0.40)	0.34*** (3.94)	0.36*** (2.90)	0.34*** (3.49)	-0.59* (1.66)	-0.52 (1.41)	-0.62** (1.99)
Expenditure (percent of GDP) (<35%)	-0.14 (1.26)	-0.25 (1.65)	-0.17* (1.67)	-0.08 (0.15)	-0.11 (0.27)	-0.12 (0.29)	0.00 (0.00)	-0.2 (0.85)	-0.08 (0.45)
Expenditure (percent of GDP) (≥35%)	-0.13* (1.68)	-0.41*** (3.85)	-0.26*** (2.87)	0.13** (2.16)	0.19* (1.74)	0.14* (1.84)	-0.48*** (2.87)	-0.67*** (3.60)	-0.55*** (3.36)
Dummy (expenditure) ≥35%	-0.52 (0.43)	0.12 (0.09)	0.09 (0.08)	-1.18 (0.88)	-0.62 (0.60)	-0.81 (0.82)	0.08 (0.03)	-0.93 (0.30)	-0.45 (0.15)
Constant	16.10*** (3.42)	22.29*** (3.34)	18.14*** (4.41)	0.8 (0.04)	0.96 (0.07)	2.13 (0.16)	28.71*** (2.66)	31.18*** (2.71)	31.43*** (3.41)
Observations	295	295	295	160	160	160	135	135	135
R-squared	0.56	0.6		0.61	0.61		0.6	0.63	
Number of countries		25	25		13	13		12	12

Source: World Bank staff calculations.

Note: * Significant at 10 percent level. ** Significant at 5 percent level. *** Significant at 1 percent level.

TABLE 3A.3

Economic Growth and the Size of Government by Government Effectiveness
CPIA Indicator for Public Sector Management

Variables	All Countries			Relatively more effective government			Relatively less effective government		
	OLS (1)	Fixed effects (2)	Random effects (3)	OLS (4)	Fixed effects (5)	Random effects (6)	OLS (7)	Fixed effects (8)	Random effects (9)
War dummy	-5.45* (1.86)	-5.92*** (3.18)	-5.67*** (3.27)	4.00 (1.06)	4.79* (1.93)	4.22* (1.89)	-11.55*** (4.15)	-9.74*** (3.81)	-10.85*** (4.49)
Ln(inflation) (IMF)	-1.91*** (5.95)	-1.83*** (5.32)	-1.85*** (6.30)	-1.16*** (3.54)	-0.80* (1.93)	-1.11*** (3.01)	-2.51*** (5.42)	-2.01*** (3.79)	-2.36*** (5.26)
Fiscal balance (% of GDP)	0.51*** (4.75)	0.38*** (3.24)	0.49*** (5.22)	0.42** (2.41)	0.72*** (4.68)	0.50*** (3.67)	0.44*** (3.90)	0.15 (0.94)	0.37*** (2.91)
Overall index of reform	-0.01 (0.08)	-0.11 (0.68)	-0.05 (0.40)	0.18 (1.22)	0.41** (2.18)	0.17 (1.14)	-0.38 (1.56)	-0.2 (0.75)	-0.33 (1.47)
Expenditure (percent of GDP < 35%)	-0.14 (1.26)	-0.25 (1.65)	-0.17* (1.67)	-0.51*** (2.80)	-0.02 (0.09)	-0.47*** (3.84)	0.13 (1.17)	-0.24 (1.22)	-0.01 (0.08)
Expenditure (percent of GDP { 3 5%)	-0.13* (1.68)	-0.41*** (3.85)	-0.26*** (2.87)	0.03 (0.39)	0.38** (2.27)	0.13 (1.04)	-0.30** (2.21)	-0.57*** (3.89)	-0.38*** (3.07)
Dummy (expenditure { 35%)	-0.52 (0.43)	0.12 (0.09)	0.09 (0.08)	1.92 (1.07)	1.15 (0.75)	1.65 (1.15)	-2.49 (1.50)	-2.23 (1.15)	-2.09 (1.12)
Constant	16.10*** (3.42)	22.29*** (3.34)	18.14*** (4.41)	17.90** (2.13)	-5.55 (0.61)	16.83*** (3.54)	19.00*** (3.19)	24.41*** (2.64)	21.58*** (3.05)
Observations	295	295	295	152	152	152	143	143	143
R-squared	0.56	0.6		0.39	0.4		0.68	0.72	
Number of countries		25	25		13	13		12	12

Source: World Bank staff calculations.

Note: CPIA = Country Policy and Institutional Assessment. * Significant at 10 percent level. ** Significant at 5 percent level. *** Significant at 1 percent level.

Annex 3B Composition of Public Expenditures, Structure of Taxes, and Growth in ECA Countries, 1995–2004: Econometric Evidence

Empirical Model and Data

Taxes are classified as distorting and nondistorting and expenditures are classified as productive and unproductive as shown in table 3B.1.

The empirical model draws on the specification used in Barro and Sala-i-Martin (1992) and Barro (1997) and is similar to the specification proposed by Bleaney, Gemmell, and Kneller (2001) and Kneller, Bleaney, and Gemmell (1999). The following growth equation is estimated:

$$g_{it} = \alpha + \sum_{i=1}^k \beta_i I_{it} + \sum_{i=1}^m \gamma_i M_{it} + \sum_{i=1}^n \theta_i Z_{it} + \varepsilon_{it}$$

where g_{it} is per capita real GDP growth in country i at time t , and I_{it} is a vector of variables often included in growth regressions surveyed by Levine and Renelt (1992): the initial level of income and the investment ratio. M_{it} is a vector of fiscal variables that includes revenues (*rev*), expenditures (*exp*), and budget surplus (*surplus*), that is, $M = [rev, exp, surplus]$. Furthermore, the model accounts for the government's budget constraint, thus

TABLE 3B.1

Classification of Taxes and Expenditures

Classification for estimation purposes	Functional classifications
Distorting taxes	Taxation on income and profit (personal income tax, corporate income tax) Social security contributions Taxation on payroll and manpower Taxation on property
Nondistorting taxes	Taxation on domestic goods and services
Other revenues	Taxation on international trade Nontax revenues Other tax revenues
Productive expenditures	Educational expenditure Health expenditure Housing expenditure Economic affairs (includes transport)
Unproductive expenditures	Social security and welfare expenditure Expenditure on recreation, culture, and religion Expenditure on economic services General public services expenditure
Other expenditures	Other expenditure (unclassified) Defense expenditure Public order and safety

Source: World Bank staff.

$$\sum_{i=1}^m \gamma_i M_{it} = 0$$

Given that the sum of revenues, expenditures, and the budget balance equals zero, one element must be omitted in the estimation to exclude perfect collinearity. The variable omitted is assumed to be an implicit financing element. Finally, Z_{it} is a vector of variables identified by past studies as potentially important explanatory variables of growth (for example, proxies for country openness to international trade, institutional variables, or inflation). A transition dummy (for negative GDP growth periods caused by transition) is also included. The panel regression is estimated with the Prais-Winsten method. Estimation results are in table 3B.2.

TABLE 3B.2

Public Expenditure Composition, Taxation Structure, and GDP Growth, 1995–2004
Dependent variable: Growth of GDP per Capita Estimation Technique: Linear Regression,
Heteroskedastic Panels Corrected Standard Errors

Omitted fiscal variable	Surplus (1)	Spending (2)	Revenue (3)	Surplus (4)	Non-distortional taxation (5)	Non-productive spending (6)	distortional taxation (7)	Productive spending (8)
Explanatory variable								
- eq (1)								
Initial level of income	0	-0.000***	-0.001***	0	0	0	-0.000**	0
	-1.59	-3.03	-5.67	-0.8	-0.62	-0.61	-2.31	-0.28
Investment ratio	0.059*	0.038	0.032	0.054**	0.034	0.036	0.031	0.039*
	-1.84	-1.47	-1.13	-2.05	-1.24	-1.41	-1.14	-1.76
Population growth	-0.1	-0.021	0.037	-0.083	-0.031	-0.031	-0.01	-0.039
	-1	-0.23	-0.28	-0.87	-0.36	-0.33	-0.11	-0.5
Recession dummy	-11.606***	-9.244***	-8.684***	-10.864***	-8.980***	-8.960***	-8.962***	-9.101***
	-11.57	-6.39	-6.25	-7.1	-4.69	-6.21	-4.78	-4.84
Revenue	-0.136**	-0.101***						
	-2.35	-4.49						
Expenditure	0.052		0					
	-0.71		-0.01					
Fiscal surplus		0.463***	0.435***		0.437***	0.484***	0.407***	0.406***
		-5.85	-6.5		-5.14	-6.22	-5.26	-4.97
Distorting taxes				-0.016	-0.101*	-0.180***		-0.105*
				-0.37	-1.95	-3.11		-1.8
Productive expenditure				0.047	0.150**	0.031	0.144**	
				-0.85	-2.28	-0.51	-2.22	
Non-distorting taxes				0.055		-0.054	-0.026	0.059
				-1.17		-1.02	-0.58	-1.2
Unproductive expenditure				-0.339***	-0.284***		-0.310***	-0.229***
				-8.22	-7.43		-8.89	-7.37
Observations	181	171	171	181	171	171	171	171
Number of cty_id	21	20	20	21	20	20	20	20

Source: World Bank staff calculations.

Note: * Significant at 10 percent level. ** Significant at 5 percent level. *** Significant at 1 percent level.

Robustness tests have been conducted through extreme bound analyses (EBA) as proposed by Levine and Renelt (1992), following the methodology elaborated by Leamer (1985). Generally, the findings in table 3B.2 are robust to the inclusion of additional variables that have been linked to growth in the literature (openness, progress in privatization, and inflation). However, among the fiscal variables only the budget surplus and unproductive spending have a robust impact on growth in *all* specifications, as required by the stringent EBA criterion. Increase in government unproductive spending financed by increase in distorting taxes or deficit seems to have a most harmful growth effect. Moreover, the expenditure-financed reduction in the government deficit has a larger effect than the tax-financed reduction. EBA results are summarized in table 3B.3.

Results based on country groups, depending on the quality of governance, are shown in table 3B.4.

The findings should be interpreted with caution, given a number of problems that are commonly encountered in this type of cross-section regression. The most important of these may be a potentially severe simultaneity problem, arising from business cycle effects and Wagner's law (the tendency for government expenditure to be higher at higher levels of per capita GDP). There may also be concerns about

TABLE 3B.3

Robustness Test for the ECA Country Sample with Three Conditioning Variables

Financed by:	Distortionary	Nondistortionary	Productive spending	Unproductive spending	Surplus
Coefficient					
Distortionary					
EBA lower bound	n.a.	-0.13	-0.19	-0.26	-0.07
EBA higher bound	n.a.	-0.07	-0.10	-0.18	-0.01
Robust		No	No	Yes*	No
Productive spending					
EBA lower bound	0.18	0.09	n.a.	-0.09	-0.08
EBA higher bound	0.57	0.19	n.a.	0.04	0.06
Robust	No	No		No	No
Unproductive spending					
EBA lower bound	-0.35	-0.31	-0.27	n.a.	-0.37
EBA higher bound	-0.31	-0.23	-0.22	n.a.	-0.31
Robust	Yes	Yes*	Yes		Yes
Surplus					
EBA lower bound	0.40	0.43	0.41	0.48	n.a.
EBA higher bound	0.48	0.51	0.52	0.57	n.a.
Robust	Yes	Yes	Yes	Yes	

Source: World Bank staff calculations.

Notes: Results significant at the 5% level, three conditioning variables

* At the 10% level, three conditioning variables, model specification as in Table A2.5.

TABLE 3B.4

Expenditure Composition, Tax Structure, and Growth in ECA, 1995–2004
Estimations by Government Effectiveness (WB Governance Indicator
for Government Effectiveness)

Variables	High government effectiveness					Less government effectiveness				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Initial level of income	0.000*	0	0	-0.000*	0	-0.001*	-0.001***	-0.000**	-0.001***	-0.001***
	-1.73	-1.07	-0.42	-1.75	-0.3	-1.84	-2.75	-1.97	-2.68	-2.89
Investment ratio	0.025	0.077	0.122	-0.079	0.186***	0.082**	0.077***	0.063**	0.075**	0.077***
	-0.32	-0.92	-1.55	-0.65	-2.71	-2.49	-2.72	-2.38	-2.43	-2.85
Population growth	-0.275	-0.205	-0.088	-0.207	-0.129	-0.043	-0.025	-0.024	-0.046	-0.031
	-0.79	-0.72	-0.35	-0.54	-0.45	-0.57	-0.3	-0.24	-0.75	-0.4
Recession dummy	0	0	0	0	0	3.034	4.304	6.168**	4.388	4.202
	(.)	(.)	(.)	(.)	(.)	-0.6	-1.09	-2.46	-1.05	-0.99
Productive expenditure	0.106*	0.167***	0.113	0.229**		-0.169	0.023	-0.200***	-0.037	
	-1.79	-2.83	-1.32	-2.57		-1.29	-0.24	-3.12	-0.29	
Unproductive expenditure	-0.14	0.065		-0.192*	0.085	-0.346***	-0.318***		-0.356***	-0.369***
	-1.23	-0.8		-1.8	-0.85	-2.79	-3.78		-3.73	-3.93
Distorting taxes	-0.431***	-0.464***	-0.566***		-0.608***	0.161	0.105	0.037		0.053
	-3.86	-4.45	-4.94		-4.91	-1.33	-1.27	-0.28		-0.46
Nondistorting taxes	0.165***		0.181***	-0.077	0.214***	0.156		-0.032	0.172	0.13
	-3.25		-3.06	-1.21	-4.63	-0.8	-0.24	-1.17	-0.87	
Fiscal surplus		0.743***	0.752***	0.610***	0.765***		0.283**	0.264***	0.295***	0.292**
		-6.22	-7.12	-3.82	-6.81		-2.48	-2.59	-2.7	-2.51
Observations	92	82	82	82	82	89	89	89	89	89
Number of cty_id	10	9	9	9	9	11	11	11	11	11

Source: World Bank staff calculations.

Note: CPIA = Country Policy and Institutional Assessment. * Significant at 10 percent level. ** Significant at 5 percent level. *** Significant at 1 percent level.

data quality and measurement errors. While the possible simultaneity effect is an argument in favor of panel regressions with shorter time spans (as used in this exercise), it at the same time limits the room for including potentially important lags of the explanatory variables. Additional regressions (not reported here but available upon request) tried to tackle the potential endogeneity problem in three ways. First, regressions were run with (moving) five-year averages of the data, which eliminates some of the short-run cyclical simultaneity between growth and fiscal performance. Second, the empirical model was respecified so that fiscal factors affect growth with a lag. Finally, a dynamic panel model was estimated using the Arellano and Bond (1991) Generalized Method of Moments (GMM) technique, which uses lags of the endogenous variables as instruments. The alternative specification does not change the point estimates radically,

although there is a marked reduction in the statistical significance and precision of the estimates given the small and unbalanced nature of the panel.

Annex 3C Calculating a Sustainable Primary Fiscal Balance in ECA Countries—A Note on Methodology

A sustainable primary fiscal balance can be defined as the primary balance that stabilizes public debt in proportion to GDP. This can be computed starting from the general government budget constraint:

$$\Delta\left(\frac{D}{Y}\right) = \frac{D_t}{Y_t} - \frac{D_{t-1}}{Y_{t-1}} = \frac{D_t}{Y_t} - \frac{D_{t-1}\left(1 + \frac{\Delta Y}{Y_{t-1}}\right)}{Y_{t-1}\left(1 + \frac{\Delta Y}{Y_{t-1}}\right)} = \frac{D_t - D_{t-1} - D_{t-1}\frac{\Delta Y}{Y_{t-1}}}{Y_t} = \frac{\Delta D - D_{t-1}g}{Y_t}$$

where b is primary balance, i is nominal interest rate on public debt, D is public debt, and t denotes time.

Expressing a change in public debt to GDP ratio as a function of GDP growth rate and imposing a constant public debt ratio condition:

$$\frac{\Delta D - D_{t-1}g}{Y_t} = \frac{-b_t + iD_{t-1} - D_{t-1}g}{Y_t} = \frac{-b_t + (i - g)D_{t-1}}{Y_t} = \frac{-b_t}{Y_t} + \frac{(i - g)D_{t-1}}{Y_{t-1}(1 + g)} = 0 \Leftrightarrow \frac{b}{Y} = \left(\frac{i - g}{1 + g}\right)\frac{D}{Y}$$

where Y is nominal GDP and g is its growth rate.

This condition implies that as long as the interest rate exceeds economic growth, governments have to run a primary surplus to rein in public debt growth relative to output. A primary deficit can be sustained only if the interest rate is permanently lower than the rate of economic growth, which is unlikely for several reasons.

First, economic agents have to be remunerated for deferring consumption; if “spenders” could consume more than “savers” both in the current period and in the future, no one would want to save. In such a situation, the resulting shortage of savings would result in an increase in the interest rate sufficient to create adequate incentives for deferring consumption over time. Second, excessive borrowing and investment at low interest rates would eventually lower the growth rate, given the decreasing marginal productivity of capital and possible efficiency bottlenecks in the use of inputs.

Theoretically, a government with high credibility could run a primary deficit permanently and not go bankrupt, if such a government

could borrow at a lower interest rate than output growth. This would require economic agents to be excessively risk averse (with a strong preference for low but stable returns on government debt) and returns on public debt to be much less uncertain than economic growth. However, even in these circumstances, taking excessive advantage of the opportunity to run a primary deficit and roll over public debt might push a government into a situation where a growth slowdown would force higher taxes on a generation already hit by slower growth (Ball, Elmendorf, and Mankiw 1995).

Estimations of the fiscal primary surplus needed to stabilize the debt ratio in the long run are based on the assumption that the difference between real interest rates and economic growth in ECA countries in the long run will be similar to the average observed in the member countries of the euro area over the last two decades. Obviously this is a favorable assumption, given that country risk in ECA is in general higher, as reflected in risk premiums on interest rates for foreign currency-denominated sovereign bonds. Moreover, in some countries, poorly managed contingent liabilities of the public sector may periodically add to public debt.

Notes

1. Extensive evidence indicates that high taxes on labor use negatively affect labor market outcomes in OECD countries. Evidence is more limited in ECA countries, but tends to confirm findings from OECD countries (see World Bank 2005b, and chapter 9 in this report).
2. Thus, according to the criterion used here, whether an adjustment is successful will not depend on its eventual impact on the long-term growth potential of the economy but only on its contribution to fiscal solvency. It is conceivable that, although successful fiscal consolidations may ensure fiscal solvency in the short term, they may impede long-term growth if the brunt of adjustment falls onto public investment programs or calls for education and health expenditure compression. The impact of the composition of public expenditures on growth is examined as a separate question later in this chapter.
3. This definition implies that the improvement in the primary balance is sustained once the adjustment episode has ended because the primary balance does not drop below the level that qualified it as an adjustment (see Purfield 2003). An alternative, much more demanding, definition of successful adjustment, more suitable to the study of fiscal adjustments in developed countries, has been proposed by Alesina and Perotti (1997).
4. The low number of unsuccessful adjustments in ECA and their heterogeneity with respect to composition make it difficult to estimate a logit model of sufficient quality to explain in a more quantitative way what factors made adjustments successful or unsuccessful. Moreover, the

calculation of the contribution of changes in revenue should be adjusted for changes in hydrocarbon revenue to correct for swings in energy prices. Unfortunately, disentangling oil and non-oil revenues is not always possible using Government Finance Statistics international fiscal data.

5. The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia.
6. The Heritage Foundation's index of fiscal burden takes into account the top marginal income tax rate, top marginal corporate tax rate, and a change in government expenditure as a percentage of GDP.
7. A parsimonious empirical model has been used (Fischer and Sahay 2000) where growth is modeled as a function of stabilization, structural reform, and exogenous shocks related to conflict. Specification details and estimation results are provided in annex 3A. The sample consists of an annual panel for 24 ECA countries over the period 1992–2004. Macroeconomic stabilization is measured by the annual inflation rate and the fiscal balance as a percentage of GDP. An indicator is also used to account for disruptions caused by armed conflict. Structural reform is measured by the overall index of reform progress elaborated by the European Bank for Reconstruction and Development. This measure follows Sachs (1996).
8. It should be noted that the findings are robust to changes in the specification of the empirical model. They hold true in a more standard specification using the Barro and Sala-i-Martin empirical growth regressions, as further analyzed below and in annex 3B.
9. However, the economies in these high-deficit countries did not generally experience a cyclical slowdown in the early 2000s (except for Poland), which would be expected if automatic fiscal stabilizers were functioning.
10. The method proposed by Hansen (1999, 2000) for testing the existence of threshold effects in the relationship between growth and total expenditure provides similar results.
11. The baseline results on the nonlinear relationship between size of government and growth, and how governance affects this relationship, are robust to the use of data from 1995–2004. The use of this shorter, more recent period effectively excludes the early transition period characterized by very large governments and a deep economic recession in the region. These additional results are available in Pushak, Tiongson, and Varoudakis (2007). The findings are also valid regardless of whether the regression model also controls for the impact of the fiscal balance. Results excluding the fiscal balance are not reported in annex 3A.
12. This indicator measures "the competence of the bureaucracy and the quality of public service delivery." See Kaufmann, Kraay, and Mastruzzi (2006).
13. By reallocating spending, the negative impact of higher unproductive spending in such a case is not exacerbated by a larger overall size of government, which—according to the results presented in the previous section—is detrimental to long-run growth, especially when governance is weak. It should be noted that the negative growth impacts of unproduc-

tive spending and larger fiscal deficits are robust after accounting for specification bias due to the possible omission of other pertinent determinants of growth from the empirical model. This has been confirmed through “Extreme Bound Analysis” (EBA), the results of which are reported in annex 3B, table 3B.3. By contrast, the impact of distorting and nondistorting taxes, as well as of productive expenditures, was not confirmed to be robust in EBA.

14. Albania, Bosnia and Herzegovina, Croatia, Bulgaria, the former Yugoslav Republic of Macedonia, Romania, and Serbia and Montenegro.
15. Values of the outcome and input indicators have been normalized by subtracting the sample average from the individual country values and dividing by the standard deviation for the entire sample.
16. This relationship does not portray an efficiency frontier (an international best practice) in a sector but an average level of efficiency across ECA countries and the six comparators after controlling for expenditures. Measures of expenditure efficiency based on an international efficiency frontier can be found in Herrera and Pang (2005). It could also be claimed that a relationship incorporating diminishing returns to government spending may represent a better specification than a linear relationship because many of the performance indicators considered are bounded.
17. The average value of the indicator over 2001–04 was used to ensure consistency in its definition.