IMF Working Paper

Growth, Governance, and Fiscal Policy Transmission Channels in Low-Income Countries

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INTERNATIONAL MONETARY FUND

WP/03/237

IMF Working Paper

Fiscal Affairs Department

**Growth, Governance, and Fiscal Policy Transmission
Channels in Low-Income Countries[1]**

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Authorized for distribution by Sanjeev Gupta

December 2003

Abstract

Private investment is the principal transmission channel through which fiscal policy affects growth in high-income countries. In low-income countries, governance and also other considerations suggest that the primary channel is factor productivity. Empirical results reported in this paper confirm this expectation: in low-income countries, factor productivity is some four times more effective than investment as a channel for increasing growth through fiscal policy. Although the private investment response to fiscal contraction may be minor, high-deficit, low-income countries can nonetheless benefit from a reduction in unsustainable fiscal deficits because of governance-related factor productivity responses that increase growth.

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I. INTRODUCTION

"Expansionary fiscal contractions" occur when sustained reductions in government budget deficits increase GDP or growth of real income. Evidence of expansionary fiscal contractions for high-income countries, following reductions in public spending rather than increases in government revenues, is reported by Giavazzi and Pagano (1990), Bertola and Drazen (1993), Alesina and Perotti (1995), and Alesina (1997); Drazen (2001) reviews the evidence regarding high-income countries. Evidence indicating the presence of expansionary fiscal contractions in low-income countries is reported by Gupta, Clements, Baldacci, and Mulas-Granados (2002 and 2003).

Increased private investment appears to be the principal explanation for expansionary fiscal contractions in high-income countries. Sustained reductions in government budget deficits increase private investment through reduced real interest rates and enhanced price and external stability.

There is no corresponding evidence available indicating why expansionary fiscal contractions occur in low-income countries. The objective of the study reported in this paper is to investigate the reasons for expansionary fiscal contractions in low-income countries. This requires identifying the transmission channels through which fiscal policy affects growth in these countries.

In low-income countries, as in high-income countries, investment is a channel prospectively linking fiscal policy and growth. An alternative channel is factor productivity. We shall investigate the relative effectiveness of investment and factor productivity as fiscal-policy transmission channels in low-income countries.

Considerations that we shall set out suggest that, in low-income countries, factor productivity and not investment is predicted to be the primary channel linking fiscal policy to growth. This prediction is based prominently on governance characteristics of public sector spending and administration in low-income countries. Governance in these countries is often poor (see, for example, the studies reported in Abed and Gupta, 2002). The poor governance is predicted to diminish the effectiveness of the investment channel while increasing the effectiveness of the factor-productivity channel in the link between fiscal policy and growth.

The paper is organized as follows. Section II describes the transmission channels linking fiscal policy and growth in high- and low-income countries and sets out the basis for the prediction regarding the effectiveness of the investment and factor-productivity channels. Section III describes the specification for estimation. Section IV describes the data. Section V reports the empirical results. Section VI summarizes the conclusions: the principal policy conclusion is that, although increased investment is not a channel through which low-income countries might expect substantial benefit from fiscal adjustment, high-deficit low-income countries can expect to benefit from expansionary fiscal contractions through factor productivity, which can be expected to increase for governance-related reasons.

II. TRANSMISSION CHANNELS

A. High-Income Countries

In the standard Keynesian macroeconomic model, fiscal policy fosters private sector investment by sustaining or increasing domestic demand. The positive effect on growth of fiscal expansions can be (partially or entirely) offset by adverse effects of deficit financing on investment through higher interest rates, inflationary pressures, and external sector instability. The decline in private investment following fiscal expansions—often referred to as a "crowding out" effect because public spending displaces private investment—can also occur because increases in interest rates affect perceptions of fiscal sustainability. The intertemporal budget constraint requires that the present value of obligations to repay government borrowing and to pay interest on government debt does not exceed the present value of future budgetary primary surpluses; excessive deficits and the associated increased public debt reduce market confidence in a government's ability to satisfy this constraint. Conversely, deficit reductions or fiscal contractions can increase investment, and thereby increase growth. This in general requires that deficit reductions occur through lower current government expenditure rather than through tax increases or reduced public investment (see Von Hagen, Hallett, and Strauch, 2002).

Reduced government deficits may also increase investment through more stable exchange rates that restore investor confidence and moderate or eliminate capital flight (Hjelm, 2002).[2] Reduced deficits can also preempt financial crises by signaling changed policies and thereby positively affecting expectations of future budgetary viability (Bertola and Drazen, 1993).

A supply-side link between fiscal policy and investment has been suggested through wage levels (Alesina, Ardagna, Perotti, and Schiantarelli, 1999). Investment is a function of the shadow value of capital, which depends on the present discounted marginal product of capital, and falls as wage rates increase (because the capital/labor ratio is an increasing function of wage in a competitive market). Higher current or expected taxes on labor result in higher post-tax equilibrium wages, lower expected profits, and lower investment.

Reduced deficits can also increase private consumption and investment through a wealth effect, as emphasized by Giavazzi and Pagano (1990). Lower deficits imply reduced future taxes to service government debt. The reduced future taxes increase the present value of perceived private permanent income or wealth, and increase growth through increases in private spending on investment and consumption.[3]

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[2] Hjelm (2002) finds that real exchange rate depreciations preceding fiscal contractions increase growth. Nominal depreciations reduce domestic supply prices and increase domestic demand. However, these beneficial effects can be reversed through higher prices unless fiscal policy reduces budget deficits. Hjelm concludes that fiscal contractions preceded by exchange rate depreciations have been expansionary in industrial countries.

[3] The perceived reduction in future taxes also increases the present value of utility through reduced deadweight losses associated with lower taxation. If public spending and private spending were perfect substitutes, changes in bond-financed public spending would be subject to the Ricardian equivalence (that is, subject to limitations

(continued…)

Private investment can also increase because of a perception that deficit reductions signal political stability through agreement within the government on reduced spending. That is, the deficit reduction is a signal that discord within the government has come to an end, and that a period of political stability is to follow (Drazen, 2001).[4]

B. Low-Income Countries

The above fiscal-policy transmission channels are not expected to be similarly effective in low-income countries. Wealth effects require the presence of adequately developed financial markets to facilitate increased private expenditures in response to perceived higher permanent income. Financial markets may not be sufficiently developed to facilitate such responses in poorer countries, where wealth is also often not principally held in the form of financial assets. When intertemporal exchange through financial markets cannot take place, current private spending cannot increase growth in response to perceived future increases in private-sector income.

In low-income countries, the investment channel for increased growth is impeded by low interest-rate insensitivity of private investment. Interest rates do not respond to lower deficits if there is financial repression.[5] Independently of financial repression, insufficiently developed domestic credit and government bond markets may, in any event, not allow a role for interest rates in affecting private investment. Government policies of directed credits to designated enterprises (that may be owned by the state) may replace or override the role of financial and capital markets.

Restricted economic freedom also makes private investment unattractive in low-income countries (see de Haan and Sturm, 2000; Bengoa and Sanchez-Robles, 2003).[6] Private investment is discouraged when rights of ownership are compromised by inadequate

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and qualifications, the private sector would internalize and offset the intertemporal changes associated with the change in government policy).

[4] In high-income countries the relation between fiscal policy and growth can also be a basis for political motives to influence election outcomes (see Economides, Philippopoulos, and Price, 2003). In low-income countries the motive of electoral influence is often absent because elections at which an opposition can be expected to replace the incumbent government do not take place.

[5] In financially repressed economies a government sets a lower than competitive-market interest rate for domestic savers. The government legislates a state monopoly on receiving deposits at the low interest rate and thereby benefits from the low interest that it has set for itself as sole borrower. The benefit to the government from financial repression is directly expressed as the difference between the domestic interest rate and a higher interest rate available in international capital markets. On financial repression as a source of government revenue, see Hillman (2003, Chapter 7).

[6] The absence or limited presence of democratic institutions in many low-income countries adversely affects economic freedom and thereby private investment incentives. See de Haan and Sturm (2003).

protection of private property rights, when international remittances of profits are not allowed, and when exchange controls inhibit purchase of imported inputs.

While fiscal contractions reduce a government's reliance on inflationary financing in the presence of financing gaps, private investment in low-income countries tends to be insensitive to price stability. With domestic bond markets absent or rudimentary and access to foreign capital markets restricted or unavailable, domestic financing of deficits takes place principally through inflationary financing. In these circumstances, reduced deficits can improve incentives for private investment through enhanced price stability. Yet, because investment in low-income countries is often principally undertaken by the public sector, investment is insensitive to price stability. Since public investment is financed largely through concessionary loans provided by international agencies and bilateral donors, investment is generally quite insensitive to the market incentives that affect private investment decisions.[7]

The above considerations taken together suggest the prediction that, although private investment is the primary channel for expansionary fiscal contractions in high-income economies, a similar role should not be expected for private investment in low-income countries.

C. Factor Productivity and Public Sector Governance

An aggregate production function can be represented in the form:

$$Y = AV_i^{\alpha_i}, \tag{1}$$

where Y is aggregate output, V_i indicates factor inputs, α_i indicates the elasticity of output for input i, and A is an index of total factor productivity. Growth of real output is given by the combined components of increased factor productivity through changes in A and increased availability of factors of production through increases in a factor-input quantity V_i, with the linkage emphasized by endogenous growth theory that investment, in particular in human capital, increases factor productivity and so staves off decreasing returns.[8] Beyond increased investment (and the productivity consequences of increased investment), higher growth can occur if changes take place that directly increase factor productivity.

The aggregate production function (1) does not distinguish factors of production by sectoral location of employment or production. With competitive markets, intersectorally mobile factors, and only private profit-maximizing production, the value of the marginal product of a factor of production is the same in all uses, so that location of employment or use of a

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[7] Donors can, however, be influenced by social and political instability. See Chauvet (2002).

[8] See for example Barro and Sala-i-Martin (1995).

particular factor does not matter for factor productivity. However, the public sector is not necessarily subject to competitive conditions.[9]

Because of the absence of competitive conditions, public-sector wages can include a rent component. Incomes may then be higher in the public sector, whereas labor productivity can be higher in the private sector.[10] If resources are more productive in the private sector than in the public sector, average factor productivity will increase whenever reduced public expenditure shifts resources from the public sector to the private sector. In that case, the index of factor productivity A declines with the share of labor or resources employed in the public sector.

Factor productivity expressed in the index A also reflects externalities imposed on the private sector by the state sector. Effectively implemented government spending on needed infrastructure increases private sector productivity by providing complementary public inputs (for example, through spending on roads and bridges that facilitate trade in rural areas). The public sector can, however, also impose negative externalities on factor productivity in the private sector. One source of such negative externality is the deadweight loss from taxes that finance public spending, and the associated adverse factor-supply effects of taxation.[11] Poor governance has additionally been observed, particularly in low-income countries, as a source of negative externality imposed by the public sector; poor governance has been reported to reduce the effectiveness and productivity of public spending (see for example Mauro 1998; Gupta, de Mello, and Sharan, 2001; and other papers in Abed and Gupta, 2002).

Unproductive public spending can take various forms, including spending on wages and salaries of unproductive employees or ghost workers.[12] Public spending is also unproductive

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[9] See, for example, Hillman (2003, Chapter 3).

[10] The rent available in the public sector as a component of remuneration is, by definition, a payment beyond that available in the alternative of employment in the private sector (or through the alternative of unemployment). The rent in public-sector employment is a tax-financed transfer from the private sector or is financed through other internal means or through externally available funds. With incomes (including the rent component) in employment in the state sector exceeding incomes in the private sector (and exceeding income if unemployed), there is excess demand for employment in the public sector. Persons seeking the higher incomes available from employment in the public sector are blocked by entry barriers, which also preserve the public sector rents. That is, employment is described by an insider-outsider theory of rent preservation. See Lindbeck and Snower (1989).

[11] The magnitude of this effect is more than usually difficult to assess in low-income countries, where capital and labor supply are often influenced by considerations beyond marginal factor prices.

[12] Evidence on ghost workers (who are fictitious, duplicate or otherwise erroneous entries in the public employment rolls) is provided in reports of public sector reform in low-income countries. An example of public spending on ghost workers is provided in a report (The Jakarta Post, September 17, 2003) of payments by the Indonesian government of more than Rp 111.7 billion per month (US$13 million) in salaries to absentee public employees. The payments were revealed following implementation of a government-initiated program to update the data on civil servants, as part of a policy of reform of the government bureaucracy. Public sector censuses undertaken by other governments have likewise identified ghost workers. On ghost workers and civil service reform in low-income countries, see http://www1.worldbank.org/publicsector/civilservice/common.htm.

when government expenditures do not reach designated spending objectives. This happens, for example, when government officials are corrupt and seek bribes for preferentially selecting beneficiaries of government programs, for authorizing private investment projects, for allowing participation of government enterprises in joint ventures with private investors, or for allowing access to inputs provided through state enterprises.[13]

Rent seeking also decreases factor productivity. When personal benefits from government employment or public spending take the form of rents, lower government deficits may decrease the values of the contestable rents. Incentives to use time, effort, and initiative in seeking to become a state-sector employee or to benefit from government programs are then reduced.[14] When resources for rent-seeking activities are redirected to productive activities, factor productivity increases, thereby increasing growth.

The seeking of rents through government employment or through personal benefit from public spending may not be equally contestable by all members of the population. Rather, educational achievements may be required to be able to compete for employment in government positions or to be able to attempt to influence designation of the beneficiaries of public spending. Rent-seeking incentives then reduce growth by diverting higher human capital away from productive activities.[15]

The above governance-related considerations are the basis for a prediction that it is increased factor productivity but not private investment that is the principal transmission channel for expansionary fiscal contractions in low-income countries.

D. The Composition of Public Spending and Factor Productivity

For any level of budget deficit, the composition of public spending is expected to affect factor productivity. If public sector employees engage in bribe-seeking and rent-seeking activities, a change in the composition of public spending away from wages to more productive uses is predicted to increase factor productivity and thereby increase growth.

However, reductions in some categories of public spending on wages such as in education and health sectors can, of course, hamper growth. Also, in poor-governance economies, lower levels of wages for public-sector employees may increase corruption. Lower public-sector wages may increase incentives to find sources of supplemental illegal income (see Van

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[13] On the relation between economic freedom and corruption in rich and poor countries, see Graeff and Mehlkop (2003), who identify restrictions on economic freedom with opportunities for corruption.

[14] In general, the value of the resources unproductively used in seeking rents declines when the value of a contested rent declines. On the different influences that can affect social costs when rent-seeking incentives are present, see for example Hillman (2003, Chapter 6).

[15] On the diversion of productive abilities to rent seeking, see Gelb, Hillman, and Ursprung (1998), Acemoglu and Verdier (1998) and Dabla-Norris and Wade (2002).

Rijckeghem and Weder, 2001), thereby increasing corruption and reducing factor productivity and growth. A reduction in the share of government spending on wages therefore need not always be beneficial for growth.

Increased public spending on some types of capital projects is not necessarily beneficial for growth. In poor-governance economies, corruption has been reported to reduce the effectiveness of capital spending. Through corruption, biases are imparted toward spending on types of capital equipment and infrastructure that are amenable to solicitation of bribes and to private appropriation of government budgetary allocations (Mauro, 1998; Gupta, de Mello, and Sharan, 2001).

Because of governance-related effects, increases in unproductive categories of public spending can therefore hamper growth.[16] We shall accordingly investigate the role of the composition of public spending in affecting growth.

E. Governance and Investment

We have proposed that, because of governance-related considerations, increased factor productivity is anticipated to be the principal transmission channel for expansionary fiscal adjustments in low-income countries. Governance-related considerations also affect the role of investment as a fiscal-policy transmission channel in low-income countries. Since when governance is poor or inadequate, corruption creates adverse incentives for private investment.

F. The Fundamental Role of Governance

Governance therefore has a fundamental role in affecting both prospective fiscal-policy transmission channels. Poor governance underlies the hypothesized prominence of factor productivity in expansionary fiscal contractions in low-income countries. At the same time poor governance lowers the effectiveness of investment as a transmission channel linking fiscal policy to growth.

III. THE SPECIFICATION FOR ESTIMATION

To investigate whether expansionary fiscal contractions are present, and to assess the roles of investment and factor productivity as fiscal-policy transmission channels, we estimate a recursive system consisting of:

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[16] When the public sector imposes net negative externalities on the private sector, the overall adverse effect of higher public spending more than offsets the positive contributions to growth of other categories of public expenditure. Also, in this case, the size of government spending (and not only the amount of deficit spending) is a determinant of growth. However, at the margin, reductions in deficit-financed public spending are reductions in overall public spending. Hence our estimates will apply equally for the consequences of a reduction in the deficit and reduction in public spending.

(i)   a growth equation;
(ii)   a gross investment equation;
(iii)   an equation linking fiscal policy to inflation; and
(iv)   an equation linking fiscal policy to exchange rate movements.

This specification allows direct and indirect channels for the effects of fiscal policy on growth to be distinguished in a system that remains sufficiently tractable to be estimated using standard econometric methods.

The direction of causality in this system runs from fiscal policy to exchange rate movements that in turn affect inflation. These variables are expected to have an impact on gross investment, which is a component of growth.

The model corresponds to system of equations with restrictions on the feedbacks among the endogenous variables. We also estimate an unrestricted system of equations allowing feedbacks between endogenous variables. The feedbacks were not statistically significant, confirming the empirical validity of the recursive model.[17]

With **y** a vector of endogenous variables and **x** a vector of exogenous variables, the recursive system is expressed as:

$$\mathbf{y} = \mathbf{B}\mathbf{y} + \mathbf{\Gamma}\mathbf{x} + \xi \tag{2}$$
,

where **B** is an upper triangular matrix containing for each pair of endogenous variables i and j with elements $\beta_{ij} \neq 0$ and $\beta_{ji} = 0$, **Γ** is a matrix of direct effects of the exogenous variables on the endogenous variables, and ξ is a vector of the equations' error terms. With the error covariance matrix of the system diagonal (i.e., so that the disturbance terms are not correlated across equations), Eq. (2) can be estimated using standard least square techniques with parameter estimates that are unbiased and efficient. If the error covariance matrix is not diagonal, the above system can be estimated simultaneously allowing for feedbacks among the error terms of the different equations.

A feature of this system is that total effects on **y** of each exogenous and endogenous variable can be estimated using the reduced form $\mathbf{y} = \mathbf{\Pi}\mathbf{x} + \varsigma$. The total effect of **x** on **y** is given by $\mathbf{\Pi} = (\mathbf{I} - \mathbf{B})^{-1}\mathbf{\Gamma}$ and the total effect of **y** on **y** is given by $\mathbf{\Theta} = (\mathbf{I} - \mathbf{B})^{-1} - \mathbf{I}$.[18]

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[17] See Duncan (1975) on the advantage of using a recursive system.

[18] The indirect effects can be calculated by subtracting the direct effects matrices **B** and **Γ** from the respective total effects of **y** and **x**.

A. The Growth Equation

The form of the growth equation is:

$$g_{it} = \beta_{11} \log(y_{i0}) + \beta_{12} I_{it} + \beta_{13} n_{it} + \boldsymbol{\beta}_{14} \mathbf{X}_{it}$$
$$+ \beta_{15} def_{it} + \sum_{1}^{q} \alpha_{1j} e_{jit} + \sum_{1}^{p} \varphi_{1k} r_{kit} + \beta_{16} dhi_{it} + \beta_{17} trans_i + \eta_{1i} + \upsilon_{it}, \tag{3}$$

where $g_{it} = \log(y_{it}) - \log(y_{it-1})$ is growth of per capita income, with $y_{it} = \dfrac{Y_{it}}{P_{it}}$ and where P_{it} is the total population size. Growth is here specified as a function of standard covariates used in the endogenous growth literature:[19]

- The logarithm of initial per capita income $\log(y_{i0})$, which accounts for convergence, that is, the potential for growth depends on the level of per capita income that has been attained. The coefficient, which represents the rate of convergence, is negative if there is (conditional) convergence and is positive if poor countries are caught in a poverty trap.

- Gross investment as a share of GDP (I_{it}): gross investment here includes private and public investment. The coefficient is expected to be positive.

- The population growth rate (n_{it}) is part of the definition of per capita income growth, but also affects growth through domestic market size and domestic demand. The coefficient could be positive or negative.

The vector $\mathbf{X}$ consists of:

- The initial primary and secondary school enrollment rates (pe_{i0} and se_{i0}): human capital is a main component of endogenous growth, although in the countries that we consider human capital was not overall well developed during the sample period. We use the data on school enrollment to proxy for the stock of human capital, although the proxy is of course imperfect and reflects more the development of human capital rather than human capital in place.[20]

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[19] See for example Kneller, Bleaney, and Gemmell (1999).

[20] School enrollment is subject to gender biases and also governance considerations through the provision of quality publicly financed schooling and abilities of parents to organize schooling based on self-financed user prices when provision by the state is ineffective or missing (see for example Hillman and Jenkner, 2003, for an

(continued…)

- The terms of trade index (tot_{it}) appears in the growth equation to account for possible exogenous shocks in international commodity prices that may have an impact on growth.

- Time-invariant specific attributes of the country, such as institutions characterizing governance, are reflected in η_i.

Fiscal policy variables that affect growth are:

- The overall fiscal deficit as a ratio to GDP (def_{it}): expansionary fiscal contraction is indicated if the coefficient is negative.

- The share of the j-th expenditure category in total public spending (e_{jit}) to test for the effects through the composition of public spending.[21]

- The share of the k-th revenue item in total budget revenue (r_{kit}), which allows us to consider how revenue sources affect growth.[22]

Also included in the growth equation are:

- The interaction of fiscal balance with a low-deficit dummy ($defpost_{it}$), to control for the effect of deficit reduction (or expansion) on growth in countries that have already achieved a modicum of fiscal stability.[23] We define low-deficit countries as countries that had an average fiscal deficit below 2.5 percent of GDP during the sample period.

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overview of these issues). Also, education or available human capital is not an input for growth if there are other impediments to productive employment of qualified people, as expressed in low or absent social mobility.

[21] It would be useful to be able to disaggregate capital spending into foreign and domestically financed components. Foreign-financed capital spending can be expected to be more productive than spending on domestically financed projects because of the monitoring of the former projects by the international community. However, data availability has constrained us to use aggregate capital expenditure. The disaggregation is not expected to have significant effects in this sample because: (1) the major share of capital spending is foreign-financed; (2) part of domestically financed capital spending is tied to foreign financing through counterpart funds.

[22] See Kneller, Bleaney, and Gemmell (1999) for inclusion of budget composition in augmented growth models. Expenditure categories consist of wages and salaries, transfers and subsidies, interest on domestic and external debt, purchase of goods and services and other current expenditure, and capital outlays. Revenue categories include tax revenues and nontax revenues and grants. Other current expenditure and nontax and grants revenue are not included to avoid multicollinearity.

[23] $defpost_{it}$ is the interaction between deficit and a dummy for low-deficit countries. These are also called post stabilization countries and fiscal policy is expected to have different effects in these countries. See Adam and Bevan (2000 and 2001); Gupta, Clements, Baldacci, and Mulas-Granados (2003).

- Following Khan and Senhadji (2001), a dummy is included for countries with annual inflation exceeding 20 percent (dhi_t) to test for a (nonlinear) negative effect on growth of high inflation.[24]

- A dummy for transition economies ($trans_i$): we expect the transition countries to have different average growth rates as a result of the collapse of GDP at the onset of the transition to market economies.

B. The Investment Equation

The investment equation is for gross investment (as defined in the growth equation, combining public and private investment). Investment appears in the growth equation and is endogenous to fiscal policy and other influences, including governance through corruption. To identify the *indirect effect* of fiscal policy on growth through investment, we estimate:[25]

$$
\begin{aligned}
I_{it} = \beta_{21} \log(y_{i0}) &+ \beta_{22} n_{it} + \boldsymbol{\beta}_{23} \mathbf{X}_{it} + \beta_{24} def_{it} + \beta_{25} defpost_{it} \\
&+ \beta_{26} i_{it} + \beta_{27} dhi_{it} + \beta_{28} trans_i + \beta_{29} ext_{it} + \eta_{2i} + v_{it},
\end{aligned}
\tag{4}
$$

where all variables are defined as in the growth equation. The initial value of per capita income reflects the link between income levels and profit expectations, which are determinants of private investment.

We have noted that corruption can be anticipated to discourage private investment and reduce the effectiveness of public investment.[26] To capture a nonlinear effect of government size on the level of investment, we include the change in the ratio of government spending to GDP interacted with a corruption index (ext_{it}). This variable is zero for countries that have an index of corruption below a given threshold, and takes the value of the change in government size, measured by the share of government outlays to GDP, for the other observations.

The fiscal policy variables included in the equation are the overall fiscal deficit as a ratio to GDP and its interaction with the low-deficit dummy. We also control for transition economies in the sample using a dummy variable ($trans_i$) that takes the value of unity for

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[24] The empirical study by Khan and Senhadji (2001) suggests 20 percent inflation rate as a threshold for developing countries, beyond which inflation exerts a negative effect on growth.

[25] See also Fischer (1993) and de la Fuente (1997).

[26] See Del Monte and Papagni (2001) and Gupta, Davoodi, and Tiongson (2001). Rajkumar and Swaroop (2002) similarly consider the efficacy of public spending on health care in developing countries and find that corruption reduces the effectiveness of public health expenditure on child mortality and other health status indicators in a sample of developed and developing countries.

these countries. Since we expect inflation to be a major determinant of investment,[27] we include both the level of annual inflation (i_{it}) and the dummy for countries with inflation higher than 20 percent per year (dhi_t) to expresses nonlinearities in the effects of inflation on investment.

C. Inflation

Fiscal policy is a determinant of inflation, which appears in the growth and investment equations.[28] We regress the logarithm of one plus the inflation rate on the fiscal deficit and its interaction with the low-deficit dummy.[29] Other exogenous variables included are initial per capita income ($\log(y_{i0})$), as well as the terms of trade (tot_{it}), the currency depreciation rate ($excd_{it}$), the degree of openness ($open_{it}$)[30], the employment rate (emp_{it}), and two dummies for transition and low-deficit countries, all of which are included in vector $\mathbf{Z_{it}}$:

$$\log(1 + i_{it}) = \beta_{31} \log(y_{i0}) + \beta_{32} def_{it} + \beta_{33}\ defpost_{it} + \boldsymbol{\beta}_{34} \mathbf{Z_{it}} + \eta_{3i} + \xi_{it} . \quad (5)$$

D. The External Sector

Apart from effects on inflation, high budget deficits may have adverse effects on growth through unsustainable balance of payment positions. Fiscal policies that contribute to perceptions that fiscal or external policy is unsustainable may trigger capital flight and reduced foreign direct investment, thereby slowing output growth. Large fiscal deficits may also lead governments to use financial repression, including restrictions on international capital flows.

It is difficult to estimate a proper exchange rate equation in a cross-country study with a static specification. Nonetheless, we include the exchange rate equation to capture the direct effect of fiscal policy on the external position (Fischer, 1993). This is done by regressing the fiscal deficit and its interaction with the low-deficit dummy on the annual change in the nominal exchange rate $excd_{it}$. Additional variables included in the equation are represented by vector $\mathbf{Z_{it}}$, which consists of the terms of trade index, the low-deficit and transition economies dummies, the trade openness indicator, and the employment ratio. Vector $\mathbf{W_{it}}$ consists of the ratio of external debt to GDP, the interaction between change in government

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[27] See for example Fischer (1993).

[28] See for example Catao and Terrones (2003).

[29] See also Fischer, Sahay, and Végh (2002).

[30] For a review of the contribution of trade openness on growth in empirical and theoretical studies, see Berg and Krueger (2003).

size and corruption, and the composition of government spending and revenue in percent of GDP. The external sector equation is:

$$excd_{it} = \beta_{41} def_{it} + \beta_{42} \ defpost_{it} + \boldsymbol{\beta_{43}} \mathbf{Z}_{it} + \boldsymbol{\beta_{44}} \mathbf{W}_{it} + \eta_{4i} + \vartheta_{it} .$$ (6)

E. Endogeneity of Fiscal Policy

In this recursive system of equations, endogeneity of fiscal policy implies that decisions about the level of the deficit and the composition of the budget precede decisions or realizations concerning other variables. To account for fiscal policy not being exogenous and to rule out reverse causality, we use a GMM estimator that also allows residuals to be heteroskedastic. The fiscal balance is instrumented using the lagged fiscal deficit and a variable representing the degree of democracy.[31]

IV. THE COUNTRY SAMPLE

Our data set covers 39 low-income countries that had IMF-supported programs for the period 1999-2001. The sample of countries, which includes transition economies, is determined by data availability for all variables used in the analysis, and the objective of having a broad range of low-income countries across regions and institutional characteristics. While our sample excludes low-income countries that did not have IMF-supported programs during the 1990s, the sample covers the majority of low-income countries for which requisite data for this study are available. The list of countries in the empirical estimation is provided in Appendix I, along with descriptions of variables and data sources.

All countries included in the sample have obtained concessional loans from the Fund since 1987 under the Enhanced Structural Adjustment Facility (ESAF) or since 1999 under the Poverty Reduction and Growth Facility (PRGF) that replaced the ESAF. Countries remain in the sample even if the Fund-supported program was interrupted because performance targets under the program were missed.[32]

Both ESAF-supported programs and PRGF-supported programs envisaged concessional budget assistance from the World Bank and other multilateral and bilateral donors.[33] In many

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[31] Democracy is a good instrument for fiscal deficit since it captures the link between fiscal policy and governance, which is significant in low-income countries.

[32] Typically performance targets envisaged under the programs include ceilings on the overall fiscal deficit and the change in net domestic assets of the banking sector and a floor on reserves. Occasionally more specific targets specifying revenue performance or expenditure floors in specific sectors are also included.

[33] Budget assistance in the form of project loans (for specific projects, usually capital and development projects) and programs loans (based on specific policy-related conditionality) is classified as external financing in the fiscal accounts. However, direct assistance in the form of grants is classified above the line as a revenue source, thereby contributing to the reduction in the fiscal deficit.

cases, in the absence of a Fund program, external aid from other multilateral and bilateral donors would also be frozen, although this is not a rule. The programs are intended to ensure macroeconomic stability through implementation of sound economic policies and structural reforms that would enhance limited technical capacities in low-income countries.

There are differences between ESAFs and PRGFs. For example, for ESAF-supported programs over the 1986–95 period, the deficit was targeted, on average, to decrease by about one percentage point of GDP relative to the preprogram year (see Abed and others, 1998), while the more recent PRGF-supported programs, on average, targeted relatively small increases in budget deficits to allow for higher poverty-reduction public spending. A basic tenet of the PRGF is that a stable macroeconomic position is critical for promoting growth and reducing poverty. The elimination of budget imbalances was not the sole aim of these Fund-supported programs, which also sought, inter alia, to improve the composition of public expenditure and revenues.

Table 1. Descriptive Statistics

Variables	Mean	Median	Standard Deviation	Kurtosis	Skewness	Observations
Capital expenditure (percent of GDP)	9.02	7.4	7.25	11.89	3.01	457
Corruption dummy	0.07	0	0.25	9.82	3.43	468
Corruption index	2.70	3	1.06	0.77	-0.65	300
Democracy index	2.97	3	1.32	-0.10	-0.43	300
Domestic financing (percent of GDP)	1.65	0.7	4.78	9.29	1.96	407
Exchange rate appreciation	-15.31	-8.01	23.20	3.99	-1.41	468
External financing (percent of GDP)	4.57	3.58	5.98	8.94	2.30	407
Fiscal deficit (percent of GDP)	6.20	4.61	7.65	10.19	-2.68	468
Inflation	130.11	9.7	893.87	206.97	13.26	468
Initial gross primary enrollment	77.42	84.1	26.38	-1.00	-0.42	456
Initial gross secondary enrollment	32.45	23.5	29.64	0.13	1.22	456
Initial per capita GDP (national currency)	145,809.02	76,125.80	308,191.23	21.63	4.48	468
Interest payment (percent of GDP)	3.37	2.4	3.22	20.53	3.18	430
Investment (percent of GDP)	18.98	17.1	9.55	5.22	1.90	429
Labor ratio	45.88	47	5.68	1.51	-0.97	442
Low deficit dummy	0.25	0	0.43	-0.66	1.16	468
Openness index	0.77	0.64	0.69	104.87	8.53	443
Population growth	2.35	2.56	2.59	72.61	-2.57	468
Tax revenue (percent of GDP)	15.05	13.6	7.37	1.28	1.13	459
Terms of trade	102.26	100	35.04	161.68	9.94	468
Total external debt (US$B)	2.98	1.72	2.92	1.47	1.37	468
Transfer and subsidies (percent of GDP)	3.28	2.2	3.55	13.36	3.24	370
Transition economies dummy	0.21	0	0.40	0.15	1.47	468
Wages and salaries (percent of GDP)	6.64	5.6	3.73	7.58	2.48	410

Source: See Appendix I.

Table 1 reports descriptive statistics for the variables used in the study. Fiscal deficits were reduced on average by more than 1.5 percent of GDP during the sample period 1990–2001. The average fiscal deficit in the sample was 6.2 percent of GDP. Financing for the deficits came mostly from external concessional sources (4.6 percent of GDP). Real per capita GDP growth was not significantly different from zero during the period (the point estimate was minus 0.3 percent per year).[34] Between 1990 and 2001, the fiscal deficit fell from 7.6 percent of GDP to 5.4 percent of GDP, both as a result of the increase in the revenue to GDP ratio and a fall in the ratio of total government spending to GDP.

V. ECONOMETRIC RESULTS

Results for the estimations are set out in Tables 2–5. Each table contains a column with the baseline GMM estimation for each equation using both the overall fiscal balance and its financing components as regressors. We also present a set of alternative results based on different estimators to check the robustness of the baseline results. These estimators include the fixed effects estimator (LSDV), a feasible generalized least square estimator (FGLS), and a robust regression estimator (Hamilton, 1991) that eliminates the influence of outliers on the results. We also estimate Eqs. (3)–(6) by relaxing the assumption that the error term is not correlated across equations, thereby allowing feedbacks among the equations. We use an error component two-stage least-square estimator (EC2SLS) and fixed-effect instrumental-variable estimator (Baltagi, 1995).

A. Baseline Analysis

The Growth Equation

Table 2 shows the results of the estimation of the growth equation.[35] A fiscal surplus is positively related to growth, but not for countries with low deficits, for which increased deficits are found to have no significant effect on growth. That is, expansionary fiscal contractions arise only for initially high-deficit countries. For these countries, a reduction in the fiscal deficit by one percentage point of GDP raises the per capita GDP growth rate by around 0.2 percentage points. If a country has a low deficit, the positive effect on growth of deficit reductions is offset by the negative effect of the interaction between the fiscal deficit and the low-deficit dummy.[36]

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[34] In the subsample of non-transition economies the deficit ratio was lower than for the whole sample, at 5.5 percent of GDP, while per capita GDP grew on average by 0.4 percent per year.

[35] Note that sample size differs depending on the availability of explanatory variables in each equation.

[36] The Wald test of the joint significance of the two coefficients rejects the hypothesis that fiscal consolidations increase growth in low-deficit countries.

Table 2. Growth Regression: Dependent Variable-Average Per Capita Real GDP Growth Rate 1/

	Baseline GMM	GMM	LSDV	FGLS	Robust Reg.	EC2SLS	2SLS
	1	2	3	4	5	6	7
Fiscal deficit (in percent of GDP)	-0.188		-0.202	-0.201	-0.142	-0.227	-0.183
	(1.70)*		(5.49)***	(5.21)***	(7.17)***	(2.71)***	(1.80)*
Fiscal deficit in low-deficit countries (in percent of GDP)	0.219	0.134	0.301	0.352	0.144	0.397	0.215
	(1.83)*	(0.71)*	(2.40)**	(2.52)**	(2.16)**	(2.30)**	(1.19)
Initial per capita GDP level	0.0000014	0.000001	0.0000016	0.00000035	0.0000014	-0.0000048	0.0000023
	(3.93)***	(1.66)*	(3.84)***	(0.18)	(6.24)***	(1.80)	(0.00)
Population growth rate	-0.248	-0.187	-0.064	-0.145	-0.01	-0.238	-0.251
	(2.06)**	(1.16)	(0.95)	(1.94)*	(0.29)	(1.95)*	(1.90)*
Terms of trade	-0.028	-0.025	-0.022	-0.011	-0.002	-0.026	-0.028
	(6.66)***	(6.05)***	(4.29)***	(1.99)**	(0.45)	(5.65)***	(6.15)***
Investment (in percent of GDP)	0.087	0.066	-0.013	0.015	0.016	0.101	0.088
	(1.73)*	(1.17)	(0.32)	(0.59)	(0.74)	(2.52)**	(1.92)*
Initial gross primary enrollment rate	0.075	0.071	0.018	0.014	0.064	0.003	
	(1.88)*	(1.86)*	(0.64)	(1.34)	(4.20)***	(0.22)	
Initial gross secondary enrollment rate	-0.068	-0.089	0.053	0.046	0.064	0.027	
	(1.99)**	(1.42)	(2.03)**	(2.87)***	(4.61)***	(1.17)	
Wages and salaries (in percent of total exp.)	-0.102	-0.044	-0.066	-0.091	-0.053	-0.035	-0.102
	(2.20)**	(0.94)	(1.69)*	(3.24)***	(2.54)**	(0.96)	(2.10)**
Transfers and subsidies (in percent of total exp.)	-0.022	0.005	-0.205	-0.163	0.061	-0.053	-0.021
	(0.44)	(0.08)	(5.40)***	(4.86)***	(3.03)***	(1.00)	(0.37)
Interest payment (in percent of total exp.)	-0.032	-0.059	0.032	-0.02	0.047	-0.057	-0.03
	(0.62)	(0.95)	(0.83)	(0.65)	(2.17)**	(1.50)	(0.61)
Capital spending (in percent of total exp.)	0.081	0.075	0.061	0.021	0.012	0.051	0.082
	(1.99)**	(1.65)*	(1.92)*	(0.91)	(0.68)	(1.75)	(2.14)**
Tax revenue (in percent of total exp.)	0.042	0.041	0.027	-0.046	0.027	-0.012	0.043
	(1.73)*	(0.92)	(1.01)	(2.98)***	(1.86)	(0.61)	(1.38)
Transition economies dummy	9.122	10.282	8.716	-1.74	8.484	5.285	
	(4.44)***	(3.55)***	(4.17)***	(1.38)	(7.60)***	(2.81)***	
High inflation dummy	-1.205	-0.737	-2.082	-2.194	-0.892	-0.911	-1.23
	(2.11)**	(1.20)	(4.05)***	(4.31)***	(3.26)***	(1.68)*	(2.16)**
Domestic financing (in percent of GDP)		-0.373					
		(2.49)**					
External financing (in percent of GDP)		-0.062					
		(0.17)					
Constant			0.876	8.238	-9.909	4.269	3.557
			-0.24	(3.43)***	(4.99)***	-1.35	0
Observations	193	172	332	332	331	193	193
R-squared	0.63 /2	0.59 /2	0.56		0.79		
Hansen J	0.074	1.598					

Source: Authors' calculations.
1/ Robust z statistics in parentheses.
2/ Uncentered R-2;
* significant at 10 percent;
** significant at 5 percent;
*** significant at 1 percent.

Initial per capita GDP is positively related to growth. There is therefore absence of (conditional) convergence. Population growth is negatively related to growth of per capita income; domestic market expansion due to population growth does not lead to higher growth. The terms of trade have little direct effect on growth. An improvement in the terms of trade does not significantly increase per capita income growth, although an improvement in the terms of trade will increase national income. The initial gross primary school enrollment rate, a proxy for human capital, shows a positive effect on per capita growth but secondary school enrollment is not associated with higher per capita growth.

Gross investment is a determinant of growth: the growth rate of per capita GDP increases by almost one percent when the gross investment-to-GDP ratio increases by 10 percent.

The composition of government spending also affects growth. An increase by one percent in the ratio of total spending on wages to total expenditure reduces growth by 0.1 percent, *ceteris paribus*. A one percent increase in capital spending in total government outlays increases per capita GDP growth by less than 0.1 percent.

Decomposition into domestically and externally financed components of the deficit shows that the composition of deficit financing affects growth. Reduced deficits financed from domestic sources increase growth: a reduction in domestic deficit financing by one percent increases per capita GDP growth by 0.4 percent. That is, expansionary fiscal contraction is associated with reductions in domestic deficit financing. Changes in external deficit financing, however, do not have a significant effect on growth.

The composition of government revenue affects growth. Achieving fiscal consolidations by increasing the share of tax revenues to total revenue including grants is beneficial for growth. Also, grants and non-tax revenue tend to be negatively correlated with tax revenue collection.[37]

The direct effect of inflation on growth is nonlinear: high-inflation countries grow less than low-inflation countries. Countries with inflation above 20 percent have lower per capita growth rate by more than one percentage point.

The Investment Equation

The results for the growth equation show that investment affects growth. However, when investigating transmission channels, we ask whether fiscal contractions increase investment. The answer to this question is provided by the estimation of the investment equation. The results for the investment equation are reported in Table 3, which shows that, overall, fiscal contractions *do not* affect investment. Neither the overall fiscal deficit variable nor its interaction with a dummy for low-deficit countries is significantly different from zero.

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[37] See Gupta, Clements, Pivovarsky, and Tiongson (2003).

Table 3. Investment Equation Regression: Dependent Variable-Average Investment
(In percent of GDP) 1/

	Baseline GMM	GMM	LSDV	FGLS	Robust Reg.	EC2SLS	2SLS
	1	2	3	4	5	6	7
Fiscal deficit (in percent of GDP)	0.068		0.035	0.013	-0.056	0.084	0.070
	(0.64)		(0.80)	(0.18)	(2.24)**	(0.88)	(0.70)
Fiscal deficit in low-deficit countries (in percent of GDP)	0.025	0.342	-0.143	-0.496	-0.049	0.02	0.025
	(0.17)	(1.44)	(1.00)	(2.08)**	(0.60)	(0.11)	(0.14)
Initial per capita GDP level	0.0000059	2.0E-06	-4.1E-06	1.6 E-06	6.2E-06	5.0E-06	1.4E-06
	(4.38)***	(0.77)	(-3.19)***	(0.98)	(8.37)***	(1.26)	(0.00)
Population growth rate	-0.111	0.138	0.055	-0.077	0.039	-0.154	-0.121
	(0.95)	(0.55)	(0.65)	(0.55)	(0.81)	(0.96)	(0.74)
Terms of trade	-0.0002	0.011	-0.001	0.005	-0.002	0.0004	0.0003
	(0.03)	(1.83)*	(0.23)	(0.49)	(0.49)	(0.06)	(0.05)
Initial gross primary enrollment rate	0.191	0.316	0.418	0.09	0.483	-0.014	
	(9.04)***	(6.22)***	(17.53)***	(5.06)***	(35.08)***	(0.26)	
Initial gross secondary enrollment rate	0.15	-0.045	-0.21	0.038	-0.304	0.089	
	(4.61)***	(0.51)	(7.69)***	(1.48)	(19.23)***	(1.15)	
Change in the product of total exp.* corruption	-0.149	0.182	-0.128	-0.148	0.01	-0.153	-0.147
	(2.21)**	(0.65)	(1.91)*	(1.26)	(0.24)	(2.18)**	(2.07)**
Inflation rate	-0.001	-0.0002	-0.00004	-0.0008	-0.0007	-0.001	-0.001
	(2.17)**	(0.33)	(0.09)	(0.11)	(0.25)	(1.60)	(1.48)
High-inflation dummy	-2.38	-2.007	-1.917	-2.648	-1.888	-2.332	-2.362
	(3.19)***	(2.00)**	(3.38)***	(3.08)***	(5.76)***	(3.68)***	(3.68)***
Transition economies dummy	-14.911	-7.835	-16.409	-9.098	-14.229	-11.015	
	(8.59)***	(3.31)***	(8.87)***	(5.03)***	(13.30)***	(2.06)**	
Domestic financing (in percent of GDP)		-0.619					
		(2.06)**					
External financing (in percent of GDP)		0.247					
		(0.36)					
Constant			8.274	12.41	8.197	18.772	19.169
			(4.43)***	(7.36)***	(7.59)***	(5.37)***	(0.00)
Observations	272	241	413	413	413	272	272
R-squared	0.97 /2	0.96 /2	0.77		0.93		
Hansen J	0.098	3.006					

Source: Authors' calculations.
1/ Robust z statistics in parentheses.
2/ Uncentered R-2.
* significant at 10 percent.
** significant at 5 percent.
*** significant at 1 percent.

However, when the deficit financing components are examined separately, reduced domestic deficit financing increases investment: a reduction in domestic deficit financing ratio by one percent increases the investment ratio by half a percentage point.[38] Both initial primary and secondary school enrollment ratios appear statistically significantly correlated to the investment ratio, whereas the terms of trade have no effects on investment.

Inflation reduces investment. The effect is nonlinear. A 10 percent increase in the rate of inflation reduces the investment ratio by 0.01 percent. The nonlinear effect of inflation on investment is larger: if annual inflation rate exceeds 20 percent, the investment ratio is lower by 2.5 percent than in countries with low inflation.

Weak governance affects investment through corruption. In countries with high levels of corruption, an increase of 10 percent in the growth of the product of government spending and the index of corruption reduces the investment ratio by 1.5 percent of GDP. This confirms previously reported observations that provision of government-supplied goods and services in poor-governance countries is associated with wasteful spending that reduces investment.

The Inflation Equation

By reducing reliance on inflationary financing, fiscal contractions can reduce inflation, which can increase growth directly and indirectly through increased investment. The results of the estimate of the inflation equation are reported in Table 4. Large fiscal deficits are associated with higher inflation. An increase in the fiscal deficit by one percent of GDP in high-deficit countries increases inflation by 0.1 percent. However, when budget deficits are low, increasing the fiscal deficit has no significant effect on inflation. The degree of trade openness, currency depreciation,[39] and a transition economy dummy reduce inflation.[40]

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[38] It appears that fiscal consolidations that reduce domestic deficit financing may stimulate private investment through a change in the composition of credit in the economy.

[39] The correlation between low inflation and currency depreciations is high in the sample (the correlation coefficient is 0.67). This can be attributed to the absence of a dynamic specification in the model. The results in both the exchange rate and inflation equations need to be qualified in this respect. At the same time, an overvalued exchange rate reduces exports, which can undermine fiscal stability and lead to inflationary financing of the budget if external deficit financing is limited. On the other hand, depreciation enhances fiscal stability through increased exports, and inflation declines when the need for inflationary financing is reduced. Another reason why exchange rate depreciation is associated with lower inflation is that, if the currency depreciates for external reasons, the authorities have incentives to bring inflation under control in order to gain in real terms from the depreciation. Otherwise the nominal depreciation would be offset by inflation and the real exchange rate could continue to appreciate. Aside from these considerations, we use data on the official exchange rate, which may deviate from an unofficial exchange rate that may be pertinent for a substantial part of foreign transactions.

[40] The net effect of being a transition economy becomes negative once we include the fiscal balance. It seems that in these countries, which had a higher average deficit (8 percent as opposed to the average 6 percent), it is the fiscal deficit that caused the high inflation. Once this effect is taken out, the consequence of being a

Table 4. Inflation Equation Regression: Dependent Variable Rate of Annual Inflation 1/

	Baseline GMM	GMM	LSDV	FGLS	Robust Reg.	EC2SLS	2SLS
	1	2	3	4	5	6	7
Fiscal deficit (in percent of GDP)	0.106 (3.46)***		0.025 (6.41)***	0.023 (6.36)***	0.004 (4.15)***	0.048 (6.38)***	0.096 (6.23)***
Fiscal deficit in low-deficit countries (in percent of GDP)	-0.114 (3.38)***	-0.096 (3.36)***	-0.029 (2.44)**	-0.027 (2.36)**	-0.006 (2.03)**	-0.052 (3.25)***	-0.103 (4.26)***
Initial per capita GDP level	4.0E-07 (2.55)**	4.2E-07 (1.54)	-6.7E-08 (0.79)	8.3E-09 (0.13)	-2.7E-08 (1.37)	4.5E-09 (0.07)	-1.9E-06 0.00
Terms of trade	-0.001 (1.31)	-0.001 (1.02)	-0.0002 (0.32)	-0.001 (1.94)*	0.001 (9.49)***	-0.001 (2.42)**	-0.001 (1.07)
Low-deficit dummy	0.534 (3.29)***	0.387 (2.79)***	0.087 (1.63)	0.085 (1.86)*	0.008 (0.65)	0.261 (4.02)***	0.484 (4.54)***
Transition economies dummy	-0.989 (2.25)**	-0.163 (0.21)	-0.05 (0.30)	0.112 (1.97)**	0.087 (2.21)**	0.116 (1.58)	
Exchange rate fluctuation	-0.011 (3.45)***	-0.008 (3.54)***	-0.013 (14.23)***	-0.014 (16.76)***	-0.004 (19.05)***	-0.013 (11.49)***	-0.011 (7.09)***
Openness index	-0.385 (2.26)**	-0.289 (1.49)	-0.004 (0.12)	0.015 (0.60)	-0.004 (0.61)	-0.043 (1.03)	-0.341 (3.61)***
Labor ratio	-0.008 (0.36)	0.002 (0.04)	-0.004 (0.28)	-0.002 (0.61)	0.005 (1.54)	-0.004 (1.06)	-0.012 (0.54)
Domestic financing (in percent of GDP)		0.107 (2.06)**					
External financing (in percent of GDP)		0.088 (1.29)					
Constant	0.686 (0.59)	-0.669 (0.27)	0.051 (0.07)	0.048 (0.31)	-0.339 (2.08)**	0.042 (0.24)	0.672 0.00
Observations	275	241	417	417	417	275	275
R-squared	0.50 /2	0.55 /2	0.59		0.76		
Hansen J	0.12	2.13					

Source: Authors' calculations.
1/ Robust z statistics in parentheses:
2/ Uncentered R-2;
* significant at 10 percent;
** significant at 5 percent;
*** significant at 1 percent.

transition economy is not negative for inflation. Perhaps this is because core inflation (defined as inflation not caused by fiscal policy) was lower than in other countries with more market rigidities.

Table 5. Exchange Rate Equation Regression: Dependent Variable-Exchange Rate Appreciation 1/

	Baseline GMM	GMM	LSDV	FGLS	Robust Reg.	EC2SLS	2SLS
	1	2	3	4	5	6	7
Fiscal deficit (in percent of GDP)	-2.350		-0.361	-0.254	-0.528	-0.932	-3.968
	(1.82)*		(1.38)	(1.07)	(2.92)***	(1.59)	(2.61)***
Fiscal deficit in low-deficit countries (in percent of GDP)	1.871	2.743	0.078	0.019	0.323	0.470	3.250
	(1.63)	(1.50)	(0.12)	(0.03)	(0.71)	(0.48)	(1.90)*
Terms of trade	-0.065	-0.036	-0.095	-0.074	-0.094	-0.075	-0.068
	(2.28)**	(0.91)	(3.39)***	(2.89)***	(4.86)***	(2.66)***	(1.88)*
Low-deficit dummy	-3.828	-8.41	-1.185	2.082	-5.409	1.353	-8.788
	(0.66)	(0.99)	(0.33)	(0.75)	(2.15)**	(0.31)	(1.05)
Transition economies dummy	-26.848	76.209	-39.922	3.43	-24.632	27.199	
	(0.84)	(3.01)***	(2.37)**	(0.89)	(2.11)**	(3.47)***	
Opennes index	-25.985	-5.75	-24.099	-2.457	-15.874	-2.167	-15.909
	(1.93)	(0.30)	(2.92)***	(0.83)	(2.78)***	(0.59)	(1.22)
Labor ratio	4.338	2.391	2.013	0.652	0.351	0.288	3.505
	(3.52)***	(1.09)	(2.54)**	(2.99)***	(0.64)	(0.94)	(2.25)**
Debt to GDP	0.052	-0.049	-0.041	-0.226	-0.404	-0.101	0.042
	(0.52)	(0.29)	(0.31)	(1.81)	(4.42)***	(0.79)	(0.27)
Change in the product of total exp. (in percent of GDP) * corruption control index	0.708	1.681	0.103	-0.012	0.089	0.207	1.295
	(1.86)*	(2.00)**	(0.62)	(0.08)	(0.77)	(1.03)	(2.71)***
Wages and salaries (in percent of GDP)	0.878	0.934	0.464	0.607	0.495	0.968	1.081
	(2.24)**	(1.91)	(2.01)**	(3.84)***	(3.10)***	(4.54)***	(2.83)***
Transfers and subsidies (in percent of GDP)	-0.998	-1.587	-0.726	-0.239	-0.182	-0.887	-1.51
	(2.41)**	(1.86)	(2.65)***	(1.45)	(0.96)	(2.89)***	(3.10)***
Capital spending (in percent of GDP)	0.691	0.358	0.382	0.384	0.411	0.687	0.741
	(2.18)**	(0.76)	(2.24)**	(3.28)***	(3.50)***	(4.40)***	(2.59)***
Interest payment (in percent of GDP)	0.147	-0.136	-0.21	0.008	-0.222	0.317	-0.104
	(0.47)	(0.38)	(0.87)	(0.05)	(1.34)	(1.74)	(0.26)
Grants (in percent of GDP)	-0.248	-0.242	-0.252	-0.151	-0.12	-0.153	-0.316
	(2.56)**	(2.54)**	(4.08)***	(3.52)***	(2.80)***	(2.39)**	(2.76)***
Domestic financing (in percent of GDP)		-5.027					
		(2.07)**					
External financing (in percent of GDP)		-1.747					
		(0.52)					
Constant	-158.023	-139.121	-29.269	-51.756	21.614	-51.892	-158.026
	(2.22)**	(1.17)	(0.78)	(3.35)***	(0.83)	(2.57)**	(2.09)**
Observations	199	178	317	317	317	199	199
R-squared	0.65 /2	0.43 /2	0.42		0.59		
Hansen J	2.46	1.06					

Source: Authors' calculations.
1/ Robust z statistics in parentheses.
2/ Uncentered R-2.
* significant at 10%;
** significant at 5%;
*** significant at 1%.

The Exchange Rate Equation

Results for the exchange rate equation are presented in Table 5. Fiscal deficits are associated with nominal exchange rate depreciation in both high- and low-deficit countries. A one percent increase in the deficit ratio leads to an exchange rate

depreciation of 2.5 percent, irrespective of whether the country has a high deficit. Expenditure composition also affects the exchange rate. While higher wages and capital expenditures lead to exchange rate appreciation, spending on transfers is associated with currency depreciation. We also find that receiving a large share of overall revenue in the form of grants is associated with a negative effect on exchange rate stability. Increasing government size in a high-corruption country is also detrimental for exchange rate stability and leads to a more depreciated currency. These results should however be taken with caution, as variables possibly omitted from the equation could be important. However, these variables should not affect the significance and the sign of the fiscal deficit variable, which is robust to alternative specifications of this equation.

Transition Economies

We have controlled for the different initial conditions and experiences in the transition economies in our sample. Growth was higher over the sample period (1990–2001) in transition economies but investment was lower. Other things being equal, the direct effect of being a transition economy increased growth sufficiently to more than offset the lower growth attributable to lower investment and inflation. Being a transition economy was therefore on average beneficial for growth, while the effect of fiscal policy on growth was not statistically different between transition and non-transition economies.[41]

B. Robustness Analysis

Alternative Estimation Methods

We assessed the robustness of the empirical results using alternative estimators. These include the standard fixed effect estimator based on dummy variable least squares, a feasible GLS estimator that takes into account the possibility that the residual distribution departs from normality, a robust last absolute distance estimator (LAD) estimator, the error component two-stage least square estimator, and a fixed effect instrumental variable estimator.[42] The latter two methods allow the correlation of the error terms across equations to be nonzero, so there can be feedbacks between growth and the other macroeconomic variables. Results from the alternative estimation methods confirm the previous findings and are presented in Tables 2–5.

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[41] We tested the significance of the introduction into the growth equation of the interaction between fiscal policy and the transition economies dummy and the associated coefficient was found to be not significant.

[42] Robust regression is used to correct for large outliers and observations with large leverage values in the regression. The robust regression method adopted in this paper uses iteratively re-weighted least squares to obtain robust estimation of both the regression coefficients and the standard errors by assigning lower weights to observations with higher influences.

The results of the robustness analysis confirm the finding of the baseline specification. We continue to find that fiscal consolidations are beneficial for growth in high deficit countries. The main channel through which fiscal policy affects growth remains increased total factor productivity, including effects through a more productive composition of government spending. Good governance affects the total investment-to-GDP ratio. Government size becomes negatively related to investment when corruption is widespread. Inflation has an independent negative effect on growth and private investment, besides the indirect effect through fiscal deficits.

Alternative Definition of High-Deficit Countries

We also carried out an alternative robustness analysis by using a different definition for the low-deficit dummy and its interaction with the fiscal deficit. In the baseline regression the definition of this variable is based on the overall deficit (countries with an average fiscal deficit below 2.5 percent of GDP are classified as low-deficit countries). The advantage of using the overall deficit rather than a decomposition of its domestic and externally financed components is that this is a better proxy for public debt sustainability. Large fiscal deficits, no matter how they are financed, can become unsustainable when reflected in high levels of the net present value of public debt relative to GDP.[43] The sustainability of public debt is expected to be a major influence underlying the effects of fiscal policy on growth, with countries benefiting most from fiscal contractions when their debt positions are not sustainable (see also Giavazzi and Pagano, 1990).

However, besides the fiscal deficit size, the composition of fiscal deficit financing sources is also relevant for fiscal sustainability—as the results above have shown. Deficits mostly financed from domestic sources tend to be inflationary and to increase real interest rates, while concessionary external financing of the deficit has more limited negative macroeconomic consequences, except regarding exchange rate appreciation. Thus, high levels of domestic financing of the deficit as a share of GDP are more inhibiting for growth than the overall fiscal deficit.

We accordingly re-estimated the recursive system (3)–(6) using a dummy that reflects low levels of *domestic* financing of the fiscal deficit as a share of GDP. As in the baseline regression, this variable is interacted with the fiscal deficit to gauge the nonlinear effect of fiscal policy on growth. Results from the revised estimates largely confirm the findings of the baseline model.[44] The main difference from the findings of the baseline regressions is that the effect of domestic financing of the deficit on gross investment becomes less significant. The results suggest that fiscal contractions increase growth in countries with large domestic

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[43] In principle, one should use the net present value of public debt as a share of GDP to identify countries with initial fiscal vulnerabilities. However, this information is not available for many of our sample countries.

[44] These results are not presented in the paper but are available upon request from the authors.

deficit financing, confirming the nonlinear relationship between fiscal policy and growth as reported in Gupta, Clements, Baldacci, and Mulas-Granados (2002 and 2003).

C. Analysis of Total Effects

The above results for the different equations estimated can be combined using the properties of a recursive system (path analysis). The total effects can be reported for each variable, with the total contribution of each variable to the change in the dependent variable decomposed into direct effects and indirect effects that are mediated by other variables. Following the path of each effect allows identification of the channels through which fiscal policy affects growth.

Table 6. Total Effects Decomposition: Exogenous Variables 1/

	Fiscal Deficit	Fiscal Deficit in Low-Deficit Countries	Initial Per Capita Real GDP	Population Growth	Terms of Trade	Primary Enrollment	Secondary Enrollment	Wages and Salaries	Transfer and Subsidies	Interest payment	Capital Expenditure	Tax Reveue	Transition Dummy	Excessive Inflation	Exchange Rate appreciation	Low-Deficit Dummy	Openness Index	Labor Ratio	Debt to GDP
Total effects																			
Per capita GDP growth	-0.19	0.22	0.00	-0.25	-0.03	0.09	-0.05	-0.10	0.00	0.00	0.08	0.04	7.80	-1.41	-0.01	0.00	0.00	0.00	0.00
Investment 2/	-0.10	0.07	0.01	0.00	-0.20	190.00	150.00	0.01	0.01	0.00	0.01	0.00	-14899.56	-2380.00	-147.99	-0.50	0.02	0.03	0.00
Inflation	0.14	-0.10	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00	-0.62	0.00	-0.01	0.70	-0.03	-0.05	0.00
Exchange rate appreciation	-2.30	0.00	0.00	0.00	-0.06	0.00	0.00	0.87	0.99	0.00	0.69	0.24	0.00	0.00	0.71	0.00	-25.90	4.30	0.00
Direct effects																			
Per capita GDP growth	-0.19	0.22	0.00	-0.25	-0.03	0.08	-0.07	-0.10	0.00	0.00	0.08	0.04	9.10	-1.20	0.00	0.00	0.00	0.00	0.00
Investment 2/	0.00	0.00	0.01	0.00	-0.20	190.00	150.00	0.00	0.00	0.00	0.00	0.00	-14900.00	-2380.00	-148.00	0.00	0.00	0.00	0.00
Inflation	0.12	-0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.62	0.00	0.00	0.70	-0.32	0.00	0.00
Exchange rate appreciation	-2.30	0.00	0.00	0.00	-0.06	0.00	0.00	0.87	0.99	0.00	0.69	0.24	0.00	0.00	0.71	0.00	-25.90	4.30	0.00
Indirect effects																			
Per capita GDP growth	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	-1.30	-0.21	-0.01	0.00	0.00	0.00	0.00
Investment 2/	-0.10	0.07	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.44	0.00	0.01	-0.50	0.02	0.03	0.00
Inflation	0.03	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.28	-0.05	0.00
Exchange rate appreciation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Authors' calculations.
1/ Matrix coefficients are from baseline regressions.
2/ Coefficients are multiplied by a factor of 1000.

Table 6 presents the total effects of the exogenous variables on the four endogenous variables growth, investment, inflation, and exchange rate movements. Overall, deficit reductions increase growth in countries with high initial deficits and do not significantly affect growth in other countries. That is, expansionary fiscal contractions occur when deficits are initially large.

The total effect of fiscal deficits on growth (the sum of the direct and indirect effects) is larger than the direct effect of fiscal deficit on growth, although the additional indirect effect

is small. The largest indirect effects on growth are related to high inflation and transition countries. Primary and secondary enrollment both have a direct positive effect on investment, which, through the growth equation, increases per capita GDP growth (that is, there is an indirect positive effect of education to growth).

Table 7 presents direct and indirect effects of endogenous variables on the other dependent variables in the system. We see that indirect effects are small in size. The indirect effects of inflation on growth and investment and of exchange rate movements on inflation are negative: the total effect of inflation and exchange rate movements on the level of investment and total factor productivity growth is slightly higher than the direct negative effect.[45]

Table 7. Total Effects Decomposition: Endogenous Variables 1/

	Per Capita GDP Growth	Investment	Inflation	Exchange Rate Appreciation
Total effects				
Per capita GDP growth	0.000	87.000	-0.062	0.001
Investment	0.000	0.000	-0.709	0.008
Inflation	0.000	0.000	0.000	-11.000
Exchange rate appreciation	0.000	0.000	0.000	0.000
Direct effects				
Per capita GDP growth	0.000	87.000	0.000	0.000
Investment	0.000	0.000	-0.709	0.000
Inflation	0.000	0.000	0.000	-11.000
Exchange rate appreciation	0.000	0.000	0.000	0.000
Indirect effects				
Per capita GDP growth	0.000	0.000	-0.062	0.001
Investment	0.000	0.000	0.000	0.008
Inflation	0.000	0.000	0.000	0.000
Exchange rate appreciation	0.000	0.000	0.000	0.000

Source: Authors' calculations.

1/ Matrix coefficients are from baseline regressions. All coefficients are multiplied by a factor of 1000.

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[45] This result is consistent with previous findings for industrial countries that point to the importance for growth and fiscal sustainability of combined fiscal tightening and real exchange rate depreciations (Lambertini and Tavares, 2001; Hjelm, 2002).

Finally, we have noted that the investment transmission channel is present, with a reduction in the ratio of domestic deficit financing to GDP of one percent increasing the corresponding investment ratio by half a percentage point. The total effect of fiscal policy on growth through the investment channel, measured by the product of the coefficient of the fiscal deficit in the investment equation and the coefficient of investment in the growth equation as $(0.61*0.09) = 0.05$, compares, however, with the effect of fiscal policy on growth through the direct factor productivity channel, as measured by the coefficient of the fiscal deficit in the growth equation, of 0.19. That is, the factor productivity channel is some four times more effective than the investment channel.

VI. CONCLUSIONS AND POLICY IMPLICATIONS

The empirical results that we have reported reveal the presence of expansionary fiscal contractions in high-deficit, low-income countries. Using different procedures, we have thereby confirmed the conclusions regarding fiscal policy and growth in low-income countries of Gupta, Clements, Baldacci, and Mulas-Granados (2002 and 2003).

Our objective has been to identify the transmission channels between fiscal policy and growth that underlie the expansionary fiscal contractions observed in low-income countries. We have proposed that, contrary to the case of high-income countries where investment is the primary channel linking fiscal policy to growth, in low-income countries factor productivity is expected to be the principal fiscal-policy transmission channel for increased growth. The expectations of a diminished role for investment and a primary role for factor productivity have been based on poor governance attributes that have been characteristic of low-income countries. Poor governance is expected to discourage private investment, although other considerations as well suggest that in low-income countries investment is expected to be a relatively ineffective channel linking fiscal policy to growth. For reasons that we have set out, a consequence expected from poor governance is also that when public expenditure, in particular on wages, declines, factor productivity will increase.

We find, as predicted, that although investment affects growth, investment is not the primary channel for expansionary fiscal contraction in low-income countries. Factor productivity is the primary fiscal-policy transmission channel, expressed directly in a positive effect on growth when deficits are initially high. Increased factor productivity is also in particular related to reductions in the wage component of public spending.

The results support a governance-related explanation as the reason for expansionary fiscal contractions in low-income countries. The outcome that increased factor productivity and not investment is the primary transmission channel in high-deficit, low-income countries is consistent with the evidence on poor governance in these countries with respect to public spending and public administration.

The expansionary fiscal contractions occur when the domestically financed component of the deficit is reduced. This implies that high levels of fiscal deficits financed from domestic

sources are counterproductive for growth. Reductions in deficits financed through external concessionary budgetary support have no significant direct effect on growth.[46]

Since expansionary fiscal contractions in high-income countries occur principally through increased private investment, and because investment in low-income countries is not a primary transmission channel from fiscal policy to growth, governments in low-income countries might believe that benefits from increased growth achieved through fiscal contractions are not available. However, while the channel for growth through increased investment may be absent or minor in low-income countries, the results reported in this study show that governance attributes introduce a scope for expansionary fiscal contractions through the channel of increased factor productivity. Consequently, sound fiscal policies can promote growth in low-income countries that have high budget deficits.

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[46] There may be an indirect positive effect on growth through an increased share of capital spending in total government expenditure. The finding that concessionary budget support did not appear to significantly affect growth in the 1990s raises issues that are not our major concern here. For an overview of these issues, see Easterly (2001). International-agency surveillance procedures have been a response to the ineffectiveness of external assistance in increasing growth (see, for example, Hillman, 2002).

Figure 1. Fiscal Balance, Growth, Investment, Inflation, and Exchange Rate Appreciation, 1990–2001
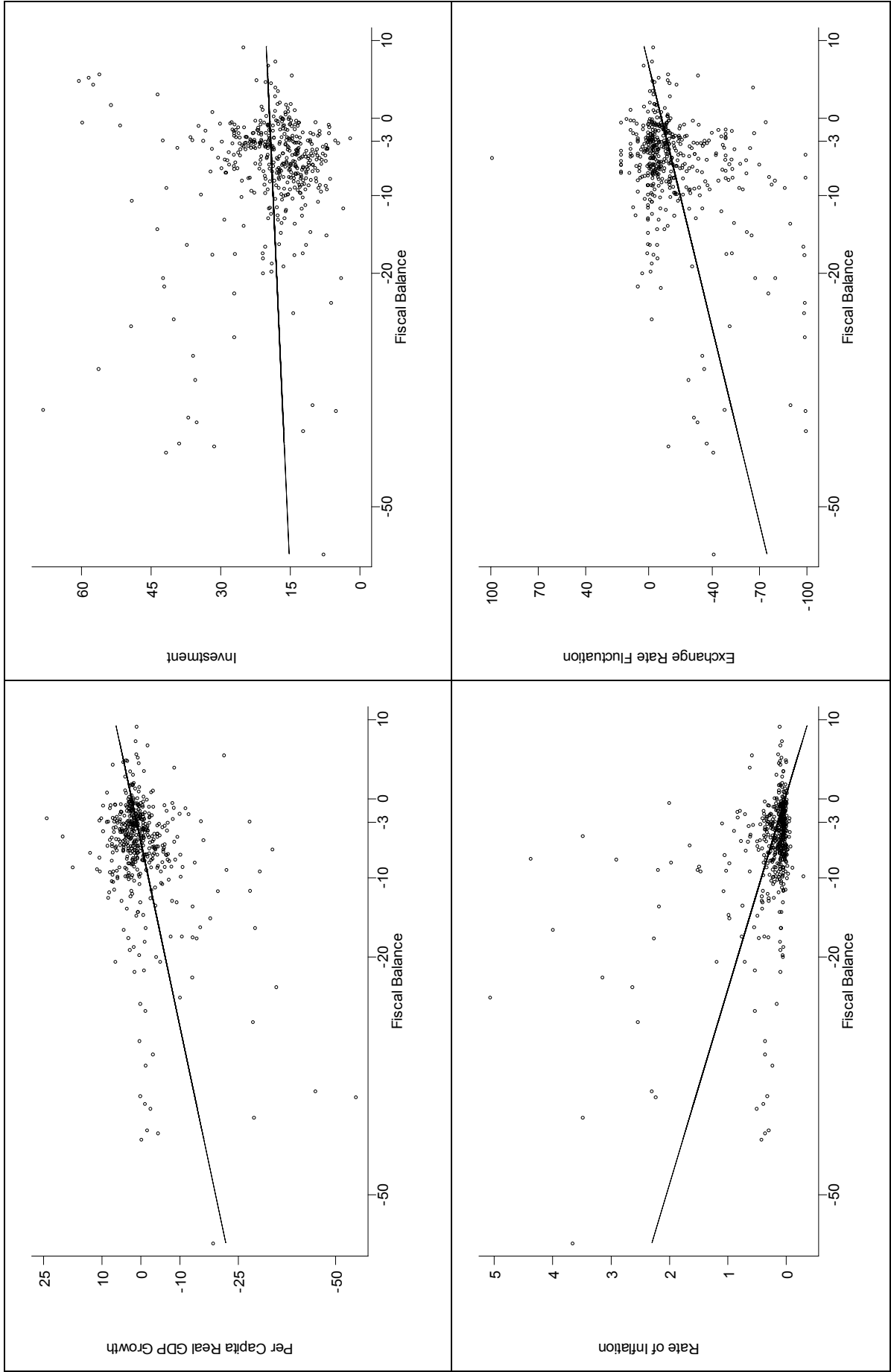
Source: Authors' calculations.

DATA SOURCES, DESCRIPTION OF VARIABLES, AND COUNTRY SAMPLE

Variable	Description	Source 1/
Terms of trade	Terms of trade index. Annual.	WEO
Growth rate	Growth rate of real per capita GDP (PPP). To avoid cyclically related fluctuations, the growth rate of per capita GDP is the average growth rate over the three-year period.	WEO
Initial per capita GDP	Real GDP per capita in 1900.	WEO
Exchange rate fluctuations	Percentage changes in nominal exchange rates. Annual.	WEO
Openness	Sum of exports and imports in percent of GDP.	
Labor ratio	Labor force in percent of total population. Annual data.	WDI
Inflation	Annual percentage changes in CPI.	WEO
Fiscal deficit	Fiscal deficit in percent of GDP (negative if in surplus). Note that grants are classified as part of government's revenue. Thus, receipt of grant reduces the overall fiscal deficit. Annual data.	SR
Low-deficit countries	Countries with an average fiscal deficit below 2.5 percent of GDP during the sample period.	...
Total revenue	General government's total revenue including grants	
Initial primary school enrollment	Gross primary school enrollment rate in 1990.	WDI
Initial secondary school enrollment	Gross secondary school enrollment rate in 1990.	WDI
Population	Total population.	WDI
Investment	Gross investment (public and private) in percent of GDP	WEO
Composition of expenditure	Wages and salaries, transfers and subsidies, interest payments, and capital spending. Expressed in percent of total expenditure in the growth equation, and in percent of GDP in the exchange rate equation.	SR
Tax revenue	Tax revenue in percent of GDP	SR
Transition economy dummy	1 for transition economies; 0 for non-transition economies.	...
High inflation dummy	1 for countries with the average annual inflation rate over 20 percent, otherwise 0.	...
Domestic financing	Domestic financing include domestic bank and non-bank financing. Expressed in percent of GDP.	SR
External financing	External financing includes concessional loans from multilateral and bilateral donors, and non-concessional loans and bond issuance. Expressed in percent of GDP.	SR
Corruption	We use an indicator based on the International Country Risk index of corruption. This is defined in terms of excessive patronage, nepotism, job reservation, secret party funding, and suspiciously close ties between politics and business. Countries with highest levels of corruption have a score of zero while countries with no corruption have a score of six. We choose a threshold of two for constructing the corruption dummy variable. This threshold is consistent with additional existing information on high corruption countries in our sample. Robustness analyses is carried out using alterative thresholds with no significant change.	ICR
Debt to GDP	Stock of external debt in percent of GDP.	WEO
Democracy	This variable is based on scores of how governments are responsible to people. The highest score (6 points) is for countries that have alternating parties in democratic government and the lowest score is for autocratic regimes. In between, governance ranges from dominated democracy to a one-party state.	ICR

1/ Data are taken from IMF staff reports (SR), IMF World Economic Outlook (WEO) database, World Bank World Development Indicator (WDI) database, and the International Country Risk (ICR) index by PRS Group Inc.

List of Countries in the Sample

Albania, Armenia, Benin, Bolivia, Burkina Faso, Cambodia, Cameroon, the Central African Republic, Chad, Djibouti, 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.

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