

IMF Publication

Debt Sustainability in Low-Income
Countries - Toward a Forward-Looking
Strategy

INTERNATIONAL MONETARY FUND

INTERNATIONAL MONETARY FUND

Debt Sustainability in Low-Income Countries—Towards a Forward-Looking Strategy

Prepared by the Staff of the Policy Development and Review Department

Approved by Timothy Geithner

May 23, 2003

Contents	Page
Executive Summary	3
I. Introduction	5
II. Lessons from the Low-Income Country Debt Crisis	6
III. Defining the Problem: Beneficial Financing Versus Burdensome Debt	11
A. The Financing Gap Model and Its Caveats	12
B. Why Are Low-Income Countries Different?	14
IV. A Framework for Debt Sustainability and Borrowing Policies in Low-Income Countries	18
A. Criteria for Assessing Debt Sustainability	18
Flow vs. Stock Variables	19
NPV vs. Nominal Debt Stocks	19
Public vs. External Debt	21
Denominator	22
Vulnerability and Stress Testing	23
B. Translating Debt Sustainability Into Borrowing Policies	27
V. Conclusions and Next Steps	31
VI. Summary of Issues	32
Text Boxes	
1. Alternative Proposals for Defining Debt Sustainability	17
2. NPV of Debt: Interpretation and Measurement	21
3. Examining Debt Indicators: The Case of Bolivia	23
4. Debt Dynamics in Low-Income Countries	25
5. Enclave Projects	31

Figures

1.	HIPC Debt Burden Ratios and Per Capita Income, 1979–2001	8
2.	Projected and Actual External Debt Ratios in the Kyrgyz Republic, Ghana, and Pakistan, 1995–2000	10
3.	Cameroon: Debt Sustainability Simulations, 2002–10	28

Tables

1.	Income and Debt Indicators for PRGF-Eligible Countries.....	7
----	---	-------------------

Appendix

1.	Debt Dynamics in Low-Income Countries	33
----	---	--------------------

References.....	37
-----------------	--------------------

Executive Summary

This paper provides a framework for discussion of the key issues that need to be taken into account in designing a forward-looking debt and borrowing strategy for low-income countries. Such a strategy has to support the development objectives of these countries, embodied in the Millennium Development Goals (MDGs), while maintaining debt sustainability to prevent costly debt crises in the future. The paper addresses these issues in the context of the existing international policy environment, including with regard to aid flows, and, in particular, does not re-examine the appropriateness of debt relief under the HIPC Initiative. Moreover, although the paper takes positions on several issues that are relevant to Fund surveillance and program design, it does not aim to bring closure on these issues at this stage. Instead, it is intended as an input into a series of workshops, some of which are being jointly sponsored by the Fund and the World Bank. The emerging consensus will be reflected in a joint Bank-Fund paper elaborating specific policy proposals in the fall of 2003.

The severe economic and social consequences of the low-income country debt crisis highlight the importance of drawing the right lessons. While both debtors and creditors have learnt from past mistakes, many factors remain that make these countries susceptible to debt-servicing difficulties, including their high vulnerability to shocks; policy deficiencies and weak institutions; limited administrative and debt-management capacity; and risks of political crisis and war, as well as the severe threat posed by the HIV/AIDS epidemic. More generally, further work is needed to deepen understanding of the sources of growth in individual countries. In light of these considerations, a cautious approach to new borrowing may be warranted, together with a recognition of a greater role for grants to support the MDGs without leading to an unsustainable accumulation of debt.

In assessing debt sustainability—the requirement that indebtedness be kept in line with a country’s capacity to repay—several considerations are particularly relevant to low-income countries. These countries are generally characterized by reliance on official flows and by various structural weaknesses and vulnerabilities that adversely affect their growth potential. High debt itself can be an obstacle to growth, as argued in the debt overhang literature. While good policies, combined with support from the international community, can greatly reduce the implicit tension between financing needs and debt sustainability, the above characteristics imply several constraints on these countries’ ability to generate the resources to service their debts. The level at which debt becomes unsustainable, however, would need to be determined in light of country-specific factors.

Based on these considerations, the paper discusses a number of issues that would need to be resolved in formulating advice on borrowing policies for low-income countries. Instead of proposing a one-dimensional measure of debt sustainability, it proposes that such assessments should be informed by a menu of indicators, including the NPV of debt and debt service, relative to exports, revenues, and GDP, and their evolution over time under realistic macroeconomic assumptions. Judgment will be required in interpreting the outcome of such an analysis relative to empirical thresholds as well as in identifying an individual country’s key constraints, both in normal times and under stress. Based on such an analysis, consistent borrowing policies and alternative modes of finance (such as grants) could then be linked to an appropriate NPV of public

debt—the operational target—determined in light of external considerations, debt-service projections, and other country-specific factors. The paper argues that flexibility would be needed in determining the relevant coverage of debt and the mix of new external financial flows and adjustment in response to shocks.

I. INTRODUCTION

1. **An appropriate forward-looking debt and borrowing strategy for low-income countries has the objective of helping those countries to fulfill their development financing needs in a way that avoids a repetition of the debt crisis from which many of them are only now emerging.** Low-income countries are likely to require substantial external financing in the period ahead, particularly if they are to meet the Millennium Development Goals (MDGs) adopted by the international community. But the experience of the past 25 years—when debts of a large number of countries reached excessive levels that set back their efforts to achieve solid growth and alleviate poverty for years—serves as a sobering reminder of what can go wrong. As debt problems emerged, it was many years before the international community took decisive action, culminating in the adoption of the Heavily Indebted Poor Country (HIPC) Initiative, in the fall of 1996. The HIPC Initiative, enhanced and expanded in 1999, charted a course toward restoring debt sustainability by providing resources for substantial debt relief.¹ However, the Initiative, which is neither designed nor intended to be a permanent mechanism, will not benefit all low-income countries and can only support but not guarantee sustainability going forward. This underscores the importance of pursuing policies in the future that are consistent with debt sustainability, particularly once the HIPC Initiative has run its course.

2. **Many of the issues relevant for debt sustainability in low-income countries are the same as in other countries, but some additional factors also play a role.** A framework for assessing sustainability in low-income countries can build on the approach the Fund has adopted for countries with significant access to international financial markets.² This framework is designed to provide a basis for better informed and more disciplined assessments of sustainability. It lays bare the macroeconomic assumptions underlying medium-term projections of the debt dynamics and subjects these assumptions to stress tests. While the key features of this framework are also relevant to low-income countries, these countries share a number of characteristics that warrant some important modifications in the analysis of debt sustainability:³ notably, their dependence on (unreliable) aid flows; the importance of

¹ The HIPC Initiative reduces a qualifying country's net present value (NPV) of external public debt to 150 percent of exports or 250 percent of government revenues.

² See International Monetary Fund (2002).

³ The definition of low-income countries is typically based on per capita income (the current threshold used by the World Bank, for example, is \$875 in 2001 per capita gross national income). This generally determines also eligibility for concessional loans from multilateral institutions and official bilateral creditors. In the assessment of debt sustainability, other factors shared by many low-income countries, aside from their income level, are important. For this reason, this paper leaves open the precise definition of low-income countries, to allow for the inclusion (exclusion) of countries that share many (few) of the features typical for this group.

concessional and official debt; the nature of the shocks to which they are subject; and constraints on their ability to generate the resources necessary to repay their debts.

3. **At the same time, the diversity of low-income countries needs to be taken into account explicitly in assessing debt sustainability (Table 1).** Some countries are affected by conflict (e.g., Central African Republic, Myanmar), others are in the process of transition to market economies (e.g., Kyrgyz Republic, Mongolia), and still others are on the threshold of becoming emerging markets (e.g., India, Vietnam). In addition, the debt and debt-service burden of these countries differs, reflecting their policies and growth records in the past as well as whether they have benefited from HIPC assistance.

4. **This paper lays out the issues that would need to be addressed within a forward-looking debt strategy for low-income countries, providing input into a series of workshops on this topic scheduled over the coming months.**⁴ The intention of the paper is not to propose modifications to the HIPC Initiative framework or to existing debt-relief commitments. Instead, and without downplaying the critical role of international support, the analysis focuses on the criteria for assessing debt sustainability and designing appropriate borrowing policies in low-income countries within the *existing* international policy environment. Section II sets the stage with a review of the lessons that can be drawn from the mistakes of the past. Section III lays out the issues, concentrating on the tension between external financing needs and debt sustainability, with a focus on the special characteristics of low-income countries. Both sections provide background for the analysis in Section IV which sets out the main elements that need to be considered in a forward-looking debt strategy. Section V presents the main conclusions and Section VI summarizes key issues. While the paper takes positions on a number of issues relevant for Fund-surveillance and the design of Fund-supported programs, its aim is not to make specific policy recommendations at this stage, but rather to focus the dialogue over the coming months on the key questions at hand. The outcome of this dialogue, together with possible policy proposals, will be communicated to the Executive Boards of the Fund and the Bank in the fall.

II. LESSONS FROM THE LOW-INCOME COUNTRY DEBT CRISIS

5. **The low-income country debt crisis highlight the importance of drawing the right lessons.** The increase in many low-income countries' debts, beginning in the 1970s and peaking in the early 1990s, was accompanied by disappointing performance in their struggle against poverty (Figure 1). For HIPCs alone, nominal debt stocks rose from moderate levels in the early 1980s to some 800 percent of exports and 160 percent of gross national income in the mid-1990s, in many cases constituting a debt overhang that may have contributed to these countries' poor growth performance. In a global environment in which many economies

⁴ Workshops are scheduled to take place in Paris and Berlin (May) and Washington (September), the latter being organized by the Fund and the Bank.

Table 1. Income and Debt Indicators for PRGF-Eligible Countries

Country	External debt-to-GNI ratio 1/	External debt service-to-exports ratio 2/	External debt service-to-revenue ratio 3/	Per-capita gross national income 4/	Country	External debt-to-GNI ratio 1/	External debt service-to-exports ratio 2/	External debt service-to-revenue ratio 3/	Per-capita gross national income 4/
	(In percent)			(In U.S. dollars)		(In percent)			(In U.S. dollars)
Sao Tomé and Príncipe	726.1	31.7	19.0	280	Cambodia	74.3	2.0	8.4	270
Guinea-Bissau	463.5	8.6	8.6	160	Rwanda	71.6	24.7	10.3	220
Nicaragua	332.6	23.0	40.4	n.a.	Bolivia	71.5	39.1	36.3	940
Mauritania	275.1	25.9	39.7	350	Lesotho	63.2	12.1	17.5	550
Guyana	220.5	n.a.	41.1	840	St. Vincent and the Grenadines	61.6	7.9	15.3	2,690
Congo, Republic of	219.0	1.6	5.0	700	Kenya	61.6	17.3	18.5	340
Angola	213.6	15.1	25.2	500	Burkina Faso	61.3	17.3	11.0	210
Sierra Leone	206.6	48.0	34.6	140	Cape Verde	59.9	7.5	10.9	1,310
Zambia	205.3	18.7	22.8	320	Sri Lanka	55.4	9.6	25.8	830
Mozambique	198.1	11.4	9.6	210	Uganda	55.4	23.7	15.8	280
Malawi	163.6	11.7	12.9	170	Grenada	55	4.6	9.8	3,720
Burundi	163.3	37.2	13.5	100	Solomon Islands	54.5	6.7	6.9	580
Sudan	161.4	3.2	4.8	330	Pakistan	53.8	26.8	37.6	420
Lao, P.D.R.	149.6	8.1	15.2	310	Georgia	53.7	9.5	47.4	570
Kyrgyz Republic	149.5	29.3	83.6	280	Nepal	49.6	6.5	14.9	240
Côte d'Ivoire	140.9	22.4	57.0	630	Armenia	46.5	7.6	11.7	560
Ghana	132.2	19.3	47.6	290	Djibouti	46.2	5.5	7.9	890
Mali	130.8	12.1	19.9	210	Dominica	45.1	n.a.	10.8	3,060
Tajikistan	125.0	10.9	67.8	160	Eritrea	44.8	1.1	1.0	190
Madagascar	123.6	7.7	15.6	260	Vietnam	40.8	7.5	20.3	410
Togo	120.1	6.1	17.6	270	Bhutan	39.9	4.2	3.9	640
Guinea	115.6	15.3	32.3	400	Maldives	39.3	4.3	9.5	2,040
Comoros	114.6	5.0	9.3	380	Tonga	37.6	11.6	9.5	1,530
Gambia, The	113.4	7.0	21.0	330	St. Lucia	35.4	9.6	21.1	3,970
Cameroon	111.6	20.5	33.8	570	Bangladesh	33.3	9.1	18.6	370
Honduras	94.7	19.3	51.1	890	Uzbekistan	32.3	25.1	n.a.	550
Nigeria	92.9	4.3	7.2	290	Vanuatu	30.7	1.4	4.3	1,050
Central African Republic	91.6	9.0	10.7	270	Haiti	28.8	8.0	12.5	480
Moldova	90.9	16.7	n.a.	390	Azerbaijan	24.1	8.0	n.a.	650
Mongolia	90.0	4.7	n.a.	400	India	21.1	12.5	21.6	460
Niger	89.0	9.2	12.4	170	Albania	20.3	2.0	3.1	1,230
Ethiopia	86.6	13.9	10.1	100	Afghanistan	n.a.	n.a.	n.a.	n.a.
Samoa	83.5	10.8	10.2	1,520	Congo, Dem. Republic of	n.a.	n.a.	11.3	n.a.
Tanzania	82.9	16.2	14.3	280	Kiribati	n.a.	n.a.	n.a.	830
Chad	79.9	9.3	13.8	200	Liberia	n.a.	n.a.	0.1	n.a.
Senegal	78.7	14.4	25.9	480	Myanmar	n.a.	4.7	16.8	n.a.
Papua New Guinea	78.5	12.9	28.4	580	Somalia	n.a.	n.a.	n.a.	n.a.
Yemen, Republic of	76.0	3.8	5.9	460	Timor Leste	n.a.	n.a.	n.a.	n.a.
Benin	74.4	12.6	18.4	360					

Sources: Global Development Finance (The World Bank); World Economic Outlook (IMF); and Fund staff estimates.

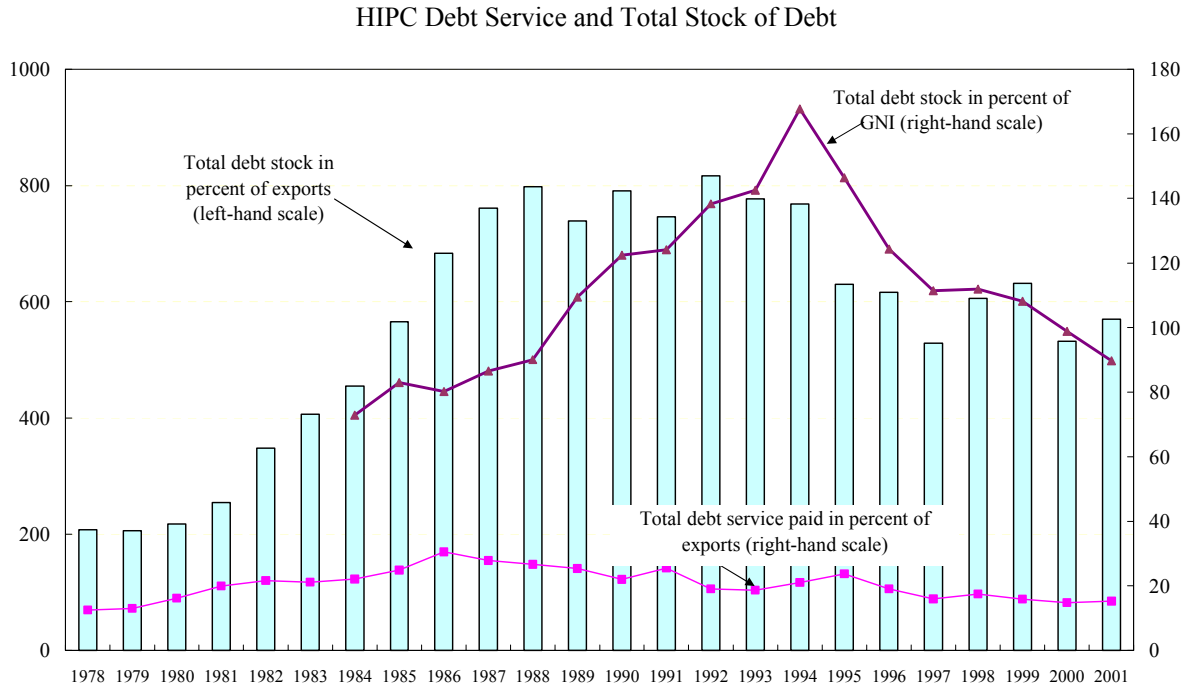
1/ Nominal stock of debt to gross national income in 2000, based on figures from GDF.

2/ Total debt service paid to exports of goods and services in 2000. Based on figures from GDF.

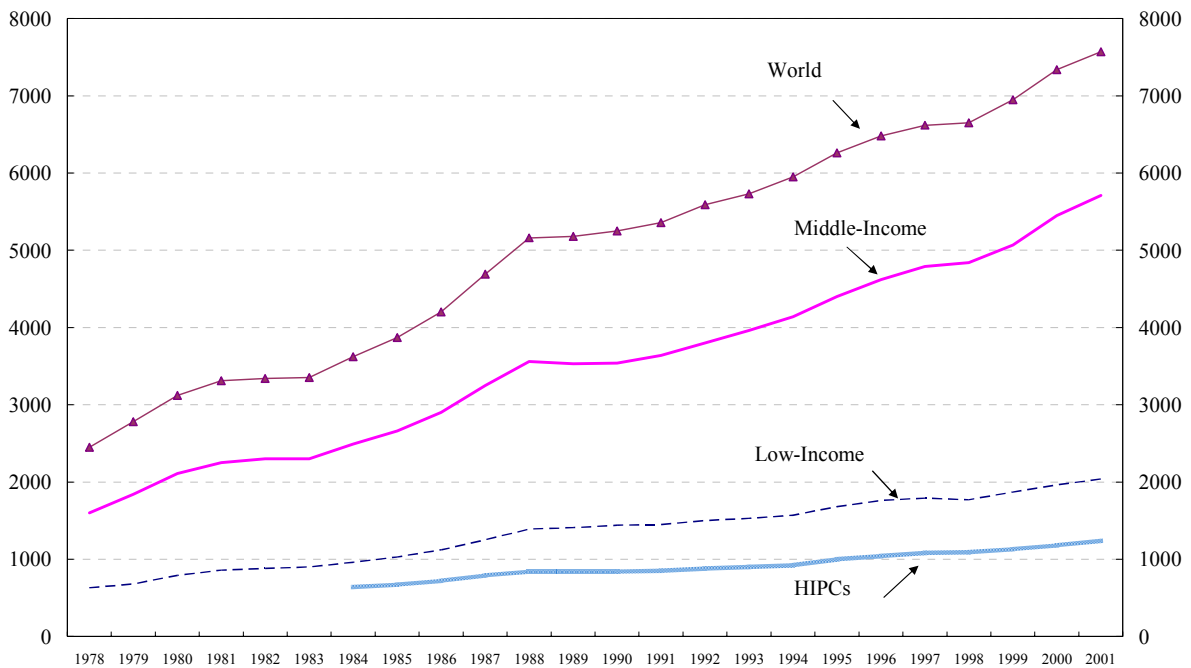
3/ Total debt service in U.S. dollars from GDF in 2000. Central government revenue including grants from the WEO in 2000. A better revenue measure would be central government revenue excluding grants. However, this measure is not available on a consistent basis from GDF or WEO.

4/ 2001 gross national income.

Figure 1: HIPC Debt Burden Ratios and Per Capita Income, 1979-2001
(In percent)



Per Capita Income, in the World, Middle-, and Low-Income Countries, and HIPCs 2/



Sources: World Bank, Global Development Finance, 2003; World Bank Debtor Reporting System; and staff estimates.

1/ Average of individual ratios for 42 HIPCs for which data is available.

2/ Gross National Income, World Bank Purchasing Power Parity (PPP) methodology, in current international dollars.

prospered from growing trade and financial integration, some of the world's poorest countries were left further behind—seemingly unable to put large amounts of net external financing to good use. Although the debt problem was only one of several factors contributing to slower growth, this experience is a reminder of the challenges that lie ahead in translating new borrowing into growth-enhancing projects and policies.

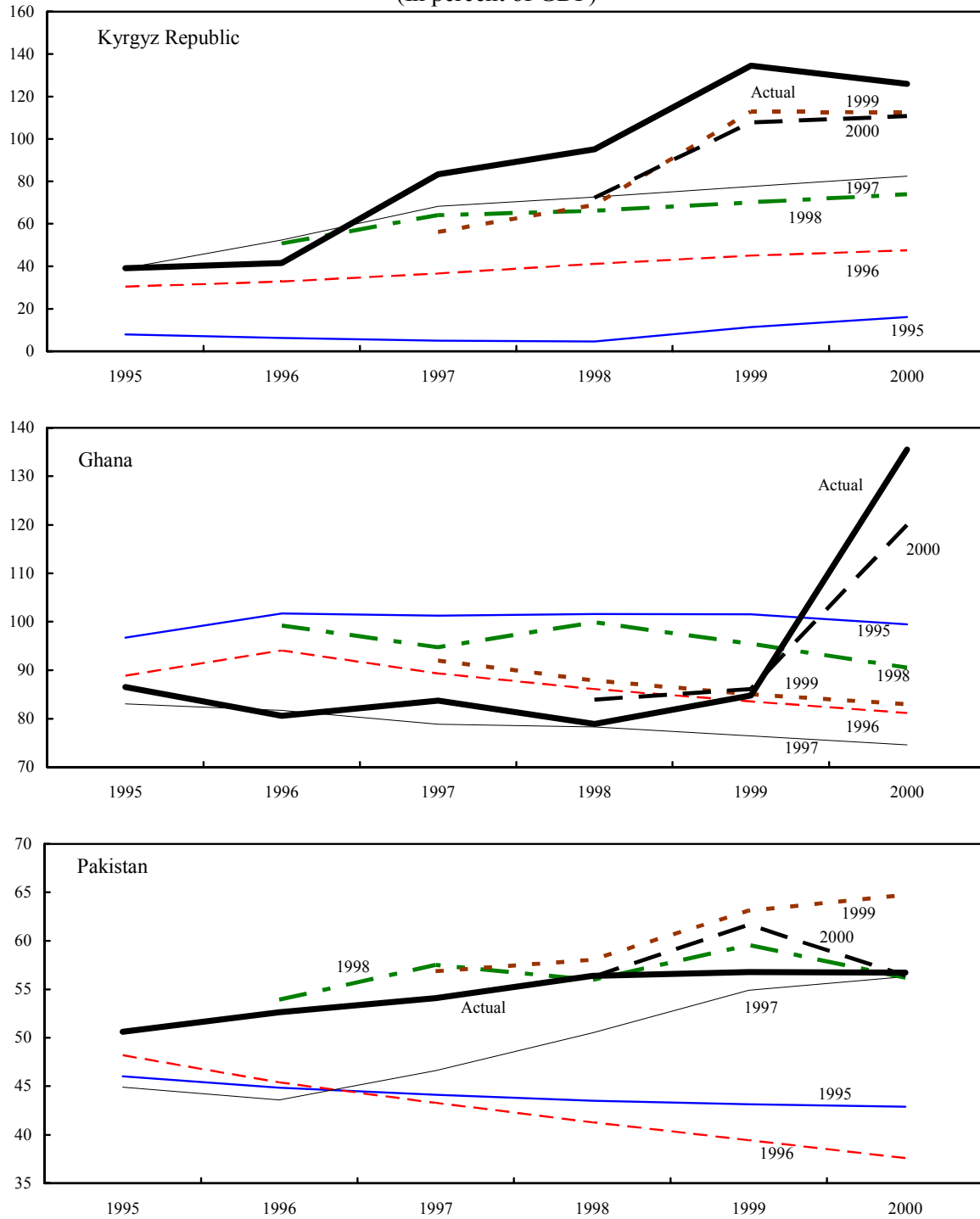
6. **In contrast to recent emerging market debt crises, the crisis in low-income countries developed in slow motion.** Payment difficulties—the first manifestation of problems—were initially addressed through new net lending and flow reschedulings, first on commercial and subsequently on increasingly concessional terms. Net flows to these countries (i.e., grants and loans minus debt service paid) were positive, averaging 13 percent of GDP per country over 1984–96, but much of the new flows were in the form of new debt, and grants were not used to relieve the overall debt burden.⁵ This strategy distracted attention of both debtors and donors from more fundamental economic issues and, by pushing debt-service payments into the future, added to these countries' solvency problems. The acknowledgement that the debt *stocks* of these countries were effectively unsustainable, and that indebtedness itself could be among the factors impeding investment and growth, started to take hold only in the early 1990s, when the Paris Club began to consider stock-of-debt operations, and culminated in 1996 in the HIPC Initiative, with its comprehensive treatment of all outstanding obligations.⁶

7. **The reasons behind the unsustainable rise in low-income countries' debt ratios offer important lessons for preventing debt crises in the future.** While the specifics differed across countries, a common theme is that the financing provided to these countries did not generate the economic growth envisaged or, in other words, that borrowing decisions were predicated on growth projections that never materialized. Indeed, overly optimistic projections were not limited to crisis countries, as illustrated in Figure 2. Some of the specific factors explaining the dissonance between debt and growth were at play simultaneously in most of the crisis countries, including: (i) vulnerability to exogenous shocks, such as adverse terms of trade or weather; (ii) waste of resources due to policy deficiencies, poor governance, and weak institutions in typically public-sector dominated economies; (iii) inadequate debt management reflected in unrestrained borrowing at unfavorable terms; (iv) nonconcessional lending and refinancing policies of creditors, primarily in the early years, motivated, in part, by the desire

⁵ For the group as a whole, the ratio of aggregate net transfers to aggregate GDP (i.e., the GDP-weighted average) was 7 percent, reflecting proportionately smaller flows to the larger economies in the group.

⁶ The Paris Club provided its first concessional stock-of-debt operation in 1995 to Uganda. For a brief history of debt relief to low-income countries, see Daseking and Powell (1999).

Figure 2. Projected and Actual External Debt Ratios in the Kyrgyz Republic, Ghana, and Pakistan, 1995-2000
(In percent of GDP)



Sources: World Economic Outlook; and Fund staff estimates.

to promote their own exports;⁷ and (v) political factors, such as civil war and social strife often with devastating economic consequences.⁸

8. **Both debtors and creditors have learnt from past mistakes and adopted policies that lower the risk of future debt crises.** Many low-income countries have strengthened macroeconomic policies and debt management and have embraced ambitious structural and institutional reform agendas to bolster their long-term growth potential. These policy reforms have directly tackled two of the past weaknesses identified above and should, over time, also widen export bases and lower vulnerability to exogenous shocks. In addition, awareness of past mistakes has, in many cases, caused lenders and donors to replace nonconcessional financing with concessional loans and grants. Moreover, many low-income countries, and graduating HIPC, in particular, are now benefiting from favorable debt-service profiles as a result of the long grace periods and low interest rates on restructured debt and new financing.

9. **Nevertheless, many weaknesses remain that warrant a cautious approach to new borrowing.** First, over optimistic growth projections risk being repeated, unless there is a deeper understanding of what drives growth and how to foster it in a particular country. While further study is needed, it is clear that many structural reforms will take time to bear fruit, and that most low-income countries will continue to suffer from weak institutions, volatile export and production bases, and limited administrative and debt-management capacity for some time to come. In addition, risks of political crisis and war remain significant in many of these countries, while the HIV/AIDS epidemic has posed a new—and in a number of countries, catastrophic—threat to long-term economic prospects. For these reasons, the most general lesson from the low-income country debt crisis—that new borrowing even on concessional terms be pursued with caution, based on prudent economic projections and recognition of country-specific circumstances and risks—remains valid today.

III. DEFINING THE PROBLEM: BENEFICIAL FINANCING VERSUS BURDENSOME DEBT

10. **The low-income country debt crisis is a reminder that external borrowing can be detrimental if it fails to generate a commensurate increase in a country's capacity to repay.** A variety of factors influence the relationship between borrowing and capacity to repay, which forms the basis for determining debt sustainability. Theoretically, the two concepts of repayment capacity and debt can be combined in the notion of net worth, defined for the government as the present value of future primary budget surpluses minus the present value of public debt-service obligations.⁹ However, the underlying inter-temporal budget constraint—

⁷ For a discussion of the historical role and objectives of export credit agencies, see Stephens (1999).

⁸ For a discussion of these factors and the specific experience of ten low-income countries, see Brooks and others (1998).

⁹ See Chalk and Hemming (2000), for a discussion of different concepts of sustainability. For countries, net worth would be equivalent to the present value of non-interest current account surpluses minus the present value of external debt-service obligations, with the future current

(continued)

that deficits ultimately have to be offset by surpluses—is less useful for practical purposes, particularly in low-income countries where this condition is unlikely to be binding (i.e., where deficits are expected to persist) for some time to come. For this reason, and because future surpluses are inherently uncertain, debt sustainability is commonly assessed by determining the evolution of debt relative to a measure of repayment capacity, and is defined as a situation in which a country has the capacity to meet its present and future debt-service obligations without requiring a major correction in its balance of income and expenditure.¹⁰ This section explores the factors that influence the relationship between debt and repayment capacity, focusing on the specific characteristics of low-income countries—though acknowledging the heterogeneity among them. Understanding these factors is necessary if borrowing policies in these countries are to be formulated prudently and if history is not to repeat itself.

A. The Financing Gap Model and Its Caveats

11. **Developing countries typically rely on foreign capital to finance a chronic shortfall of domestic savings over investment, that is, a gap in their external current account.** This by itself is not problematic, as long as the foreign savings are channeled (either directly or indirectly) into productive investment that allows the country to grow and generate future export earnings (and thus foreign exchange) with which to repay foreign creditors. In theory, based on the notion of diminishing marginal returns to capital, developing countries should be able to generate higher returns on investment than more advanced economies, creating the incentives for capital inflows and enabling them to catch up.¹¹ This logic applies, in principle, also to certain categories of government spending classified as consumption, such as primary education and health, that are expected to have positive effects on a country's growth potential. These considerations suggest that, even if external financing leads to a buildup in debt, that debt should be manageable as the higher growth generates the resources to service it.

12. **International experience on the link between financing and growth in low-income countries is, however, more pessimistic than suggested by this logic of capital scarcity.**¹² Doubts on this link are also cast by the literature on the effectiveness of aid, which suggests that more aid brings higher growth only in the presence of good policies—encompassing both good institutions and stable macroeconomic conditions.¹³ In the context of borrowed resources,

account surpluses (i.e., the excess of savings over investment) generated by the profits from the (external debt-financed) investment.

¹⁰ See International Monetary Fund (2002).

¹¹ Indeed, in perfect world capital markets, a simple two-country neoclassical model would suggest that all investment take place in the low-capital country, reflecting its higher rates of return. See Lucas (1990).

¹² See Easterly (1999).

¹³ Tsikata (1998) and Burnside and Dollar (2000). However, other studies have cast doubt on the robustness of this conclusion; see e.g., Lensink and White, (2000).

failure to generate growth is even more problematic, as the resulting debt burden may in itself be a factor undermining growth.

13. **This latter concept is known as a debt overhang and was an important part of the rationale for the HIPC Initiative.**¹⁴ The principle is that, while foreign financing should have a positive impact on investment and growth, the associated debt service tends to work in the opposite direction, with the latter effect becoming stronger as debt grows.¹⁵ The increasingly adverse effect of debt service on investment and growth has been explained by the anticipation of higher and progressively more distortionary taxes needed to repay the debt, which dampen investors' (after-tax) returns. At a sufficiently high level of debt, the adverse effect dominates, implying that the initially positive relationship between borrowing and investment is reversed.¹⁶ The resulting debt-servicing difficulties, in turn, create expectations that some of the debt will have to be forgiven, thereby discouraging private foreign investors from providing new financing, while reducing borrowing governments' incentives to pursue sound policies that strengthen their capacity to repay. At the same time, official lenders, unwilling to recognize losses and fearing the emergence of arrears, may perpetuate the problem by engaging in defensive lending—that is, providing new loans only to ensure repayment without sufficient regard to the policy framework.¹⁷

14. **Identifying the threshold at which the debt stock begins to have a negative impact on growth is, in practice, very difficult.** This is not just because the impact of the debt overhang needs to be disentangled from other factors, but also because the threshold itself depends on a variety of economic and political factors that differ across countries and over time.¹⁸ This notion is important also in understanding the HIPC thresholds of 150 percent of

¹⁴ The literature on this topic, which was originally focused on middle-income countries but has increasingly been applied also to low-income countries, is vast. For a few prominent examples, see Cohen and Sachs (1986); Krugman (1988); Sachs (1989); Cline (1995); Agénor and Montiel (1996); and Servén (1997). For a brief summary of the literature see Pattillo and others (2002) or Loko and others (2003).

¹⁵ This argument is often made with reference to a debt “Laffer” curve: in countries being on the “wrong side” of the curve, the debt overhang has such a large negative effect on their capacity to repay that debt forgiveness would actually benefit the creditors.

¹⁶ Indeed, the expectation that debt service will be growing faster than the country's capacity to pay, further discourages domestic investment, as it implies that foreign creditors would receive an increasing share of returns.

¹⁷ See, for example, Birdsall and others (2002) and Easterly (2001).

¹⁸ While empirical evidence of a debt overhang is mixed, a recent study by Pattillo and others (2002) finds a non-linear relationship between debt and growth in a sample of 93 developing countries that is indicative of a debt overhang. Their analysis suggests, on average, a negative impact of external debt on per capita growth for NPV of debt levels above 160–170 percent of exports and 35–40 percent of GDP.

exports and 250 percent of revenues, which should not be interpreted as unequivocally separating sustainable from unsustainable debt ratios. The application of uniform levels under the HIPC Initiative was decided on the basis of practical considerations that demanded equitable, transparent, and simple rules for the provision of debt relief to qualifying countries. Based on the empirical analysis at the time, the specific levels were agreed under the presumption that they would provide a safety margin to qualifying countries—with the parallel stretching out of debt-service payments under the Initiative adding to the robustness of this result.¹⁹

B. Why Are Low-Income Countries Different?

15. **While many of the theoretical considerations discussed above apply to developing countries in general, low-income countries have some particular characteristics that have important implications for their debt sustainability:**

- *Many low-income countries receive very little private capital in the form of FDI, and hardly any commercial loans, but instead depend on official grants and concessional loans to finance their investment needs.* As a result, these countries are largely insulated from the volatility of private capital flows that triggered debt-rollover problems in emerging markets. In addition, the concessionality of financing makes it more likely that the returns on new investments exceed their (subsidized) costs—and hence, that the debt dynamics will be sustainable. On the other hand, aid dependence complicates debt-sustainability assessments because the flows are not under a government’s control and are intrinsically uncertain. Moreover, the way aid is allocated can create disincentives to implement debt-reducing policies to the extent that aid flows are reduced in response to improvements in debt indicators.²⁰
- As a related issue, it is recognized that achieving the MDGs would require a substantial increase in financing flows to low-income countries from their recent levels.
- *At the same time, investment and debt dynamics in low-income countries—more so than in other countries—are subject to a number of pitfalls.* First, investment returns depend on how funds are used. With weak public institutions, poor governance, and generally low implementation capacity, resources in low-income countries are often misused or mismanaged. But even if resources are invested in projects that are expected to generate positive payoffs, returns are typically highly uncertain, often diminished by structural rigidities and weak policies, or wiped out by natural disaster and conflict. Also, payoffs often accrue only over the long term, and the benefits of some (such as improved security and health care) may be diffuse. In contrast, debt service (at least interest) starts falling due

¹⁹ The safety margin was introduced with the enhancement of the HIPC Initiative, when the threshold for the NPV of debt-to-exports ratio was lowered to 150 percent from an original range of 200–250 percent.

²⁰ See Claessens and others (1997). Of course, the opposite incentives could be created by allocating additional aid to countries that reduce their debt burden.

immediately, potentially crowding out other spending, as governments (typically the main debtors) may have limited ability to increase revenues. Finally, with narrow and highly volatile production and export bases, low-income countries are particularly vulnerable to exogenous shocks that may significantly alter their debt dynamics. These factors qualify the theoretical notion of high investment returns in low-income countries and can contribute to a general lack of confidence and fear of debt repudiation by potential investors. Together, they reveal why private capital flows to these countries are not abundant—as neoclassical theory would suggest—but rather scarce.²¹

16. Given these typical characteristics of low-income countries, five fundamental (and often overlapping) types of constraints affect their ability to generate the resources necessary to service their debts:²²

- *Foreign-exchange constraints*, reflecting the limited degree to which domestic factors of production can be transformed into the foreign exchange required for debt service and financing of imports.
- *Fiscal constraints*, reflecting the government’s limited ability and capacity to tax in order to meet debt service on top of other expenditure priorities.
- *Limited fungibility* of resources, due, for example, to earmarking of revenues for sub-national governments and agencies or to restrictions on the use of foreign aid for debt service (e.g., cases where foreign aid is explicitly tied to particular projects or uses, thus reducing the government’s ability to shift resources toward debt service).
- *Rollover constraints*, reflecting the difficulty of smoothly refinancing debt-service humps.
- *Political or moral considerations*, associated with the resources allocated to debt service in relation to social or poverty-related expenditure.

17. Low-income countries differ in the extent to which they are subject to such constraints and risk factors, and thus in the debt levels they can sustain and in the indicators that are most useful in signaling potential problems. Some low-income countries are more advanced than others in terms of access to private capital, institutional and administrative capacity, and resilience to economic shocks. As a result, they share few of the above characteristics, but instead face risks similar to emerging markets. But even among the less-advanced low-income countries, there are important differences in the specific constraints and the type and magnitude of typical shocks they face.

²¹ Indeed, the observation that capital inflows are lower than suggested by a simple neoclassical model is not confined to low-income countries—even though the factors that account for this are likely to differ for more advanced economies. For a discussion of this issue applied to transition economies, see Lipschitz, Lane, and Mourmouras (2002).

²² See Gelb and Ye (2001).

18. **Forming a judgment on the relative importance of various constraints in individual countries is key for assessing their debt sustainability, but is necessarily subjective and sometimes controversial.** The different constraints are very difficult to quantify in practice, and the extent to which they are binding has been an issue of substantial debate. Moral considerations, in particular, are at the heart of a number of recent proposals that focus on debt service-to-revenue ratios and on “affordable debt service” derived as a residual after allowing for spending necessary to meet the MDGs (see Box 1). Quite different from the approach followed in this paper, these proposals are motivated by the search for an ethical solution to the debt problems of low-income countries, assuming implicitly a willingness by the donor community to provide potentially vast amounts of additional aid and debt relief.²³ Absent such willingness, however—which is the assumption underlying this paper—the proposed tight debt-service ceilings would imply, in many cases, very restrictive limits on new borrowing, potentially jeopardizing the achievement of the MDGs. Moreover, repeated debt relief can have serious adverse incentive effects on both private investors and debtor governments.

19. **The various constraints and risks to debt sustainability impose limitations on the speed at which countries can grow out of poverty, with the least developed countries facing the toughest constraints.** Since these countries’ economic and social needs are high, governments may be tempted to borrow large sums upfront in order to generate the benefits as quickly as possible. Such a scenario may be beneficial to countries if the efficiency of investments is high or if investments remove bottlenecks to growth, thereby generating sufficient returns with which to repay the additional debt. In these circumstances, a cautious borrowing policy could prove suboptimal, as countries would forego opportunities to move onto a higher growth path. The counterargument to this strategy is that countries would risk becoming trapped in a debt overhang, being burdened by rising debt-service obligations already in the medium term before they can reap the benefits of their investments—especially in the social areas. This risk is elevated by the possibility that large external financing may substitute for, rather than support, domestic savings. Indeed, as institutions strengthen, administrative and absorptive capacity widens, and countries become better able to put the financing to good use. This argues for the pace of new borrowing to grow in step with countries’ administrative and absorptive capacity, to ensure durable progress in development.²⁴

²³ Calls for additional debt relief are sometimes supported by the notion of so-called “odious debts,” e.g., debts that were contracted by illegitimate governments and should arguably be forgiven. The term dates back to the days of the Spanish-American War, where the United States argued that Cuba’s debt was odious, as it (i) was incurred without the consent of the people; and (ii) did not benefit the people. In the recent debate, examples for debts that have been argued to be odious include those incurred under the apartheid regime in South Africa, under Mobutu in former Zaïre (now Democratic Republic of Congo), and under Marcos in the Philippines (see Kremer and Jayachandran (2002)).

²⁴ This argument is very similar to the “tapering-in” proposal for aid flows, as discussed in Bulir and Lane (2002).

Box 1. Alternative Proposals for Defining Debt Sustainability

The experience from the low-income country debt crisis and, more recently, the objective of achieving the MDGs, have prompted various stakeholders to suggest modifications to traditional definitions of debt sustainability, emphasizing the opportunity costs of servicing debt. These notions of debt sustainability shift the focus away from debt stocks to debt service. With the intention of minimizing the crowding out of priority spending, the proposals typically establish tight limits on debt service relative to GDP or revenues (see, for example, U.S. Congress (2002) and Birdsall and Williamson (2002)). Although such limits could in principle be achieved by strictly curtailing new lending to low-income countries (perhaps after some initial debt relief), the intention is generally to motivate an increase in net aid flows. A prominent extension of this approach is to link debt sustainability explicitly to the resources needed to achieve the MDGs: “affordable debt service” would be calculated as a residual from the revenue base after taking account of the necessary spending to meet the MDGs and to service domestic debt (see Eurodad (2002) and Jubilee Research (2002)). Similar proposals include suggestions that the affordable debt service be determined by an independent review panel with representatives appointed by both creditor and debtor countries (see Sachs (2002)). Given that many low-income countries have debt-service obligations that exceed such limits, the demand for (immediate) debt relief is typically an integral part of these proposals.

While these proposals may sound intuitively appealing, they raise a number of practical as well as fundamental concerns:

- First, given that the achievement of development objectives depends not only on external financing but also on domestic policies, the need for debt relief and grants would require a country-by-country judgment of what constitutes an adequate policy effort. This would be extremely difficult, in practice, and would potentially lead to vast differences in the definition of debt sustainability across countries, raising obvious issues of fairness. This is particularly the case as the provision of aid under these proposal would presumably fall with progress in meeting development goals and improving repayment capacity (namely revenues), thereby “penalizing” strong performers and creating disincentives to reform.
- Second, the proposals are based on the notion that external debt service is, by its nature, problematic and inconsistent with a country’s development needs. In contrast, it can be argued that limiting debt service to marginal amounts obstructs the evolution of a credit culture in which borrowers understand the need to repay and creditors have the trust that obligations will be honored. A track record of servicing debt is crucial for gradually reducing the reliance on official flows and attracting private capital, including FDI, that is ultimately needed to sustain strong economic activity and development.
- Third, making such a framework operational would require that donor countries be prepared to allocate a potentially unlimited amount of debt relief and grants to eligible countries. Indeed, the proposals are designed to put the onus on the international community to provide low-income countries with substantial net transfers while simultaneously limiting their debt-service burden. However, without firm commitments of donors to deliver the required aid flows, the envisaged limits on debt service would become counter-productive, as they would imply very tight financing constraints, making it all the more difficult for low-income countries to meet the MDGs.

20. **Low-income countries can greatly reduce the tension between large financing needs and debt sustainability through appropriate economic policies and with support from abroad.** Sound macroeconomic policies together with structural and institutional reforms that improve economic flexibility, governance, and administrative capacity, can go a long way in boosting the efficiency of investment and generally strengthening a country’s repayment capacity. In addition, there is often room to bolster domestic savings through more efficient revenue mobilization, better expenditure prioritization, and improved incentives for private savings. Such efforts—directly and through a track record of meeting debt-service

obligations—would also help attract FDI, thereby reducing the need for debt-creating inflows, while providing additional benefits in terms of expertise and technology transfer. Moreover, official aid flows are increasingly directed to those countries that pursue strong policies in the context of the PRSP-process. While appropriate economic policies and reforms can greatly increase the net benefits from new financing, the international community plays an important role in supporting low-income countries through responsible lending; provision of grants; and close coordination among donors to maximize aid effectiveness and establish an allocation mechanism that encourages strong policies while providing effective risk-sharing against exogenous shocks.²⁵ Arguably the most effective and lasting support the international community can provide is a reduction in existing trade barriers and an increase in markets access for low-income countries' products. In sum, the challenge for low-income countries—to meet ambitious development objectives without compromising debt sustainability—calls for strong domestic policies, a prudent borrowing strategy, and support from abroad.

IV. A FRAMEWORK FOR DEBT SUSTAINABILITY AND BORROWING POLICIES IN LOW-INCOME COUNTRIES

21. **To design appropriate borrowing policies, low-income countries will need a forward-looking framework for assessing the sustainability of their debts over time.** For balance of payments or budget-support loans, which are not linked to individual projects, borrowing decisions would need to rely on purely macroeconomic considerations. But even in decisions about individual projects that are deemed beneficial from a microeconomic perspective—based on rates of return or other project assessment tools—there is still a need to keep track of the implications for overall debt sustainability. The criteria that can be used for such an overall assessment are discussed next.

A. Criteria for Assessing Debt Sustainability

22. **The HIPC Initiative represents the most comprehensive debt relief framework for low-income countries to date.** In this framework, debt relief is based on debt stock indicators—the ratio of the net present value (NPV) of debt to exports or, for very open economies, the ratio of the NPV of debt to government revenue—with debt-service indicators playing only an informative role. The decision to focus on the stock, while consistent with the debt-overhang theory, largely reflected the need for a uniform, simple, and workable formula, in the interest of transparency and perceived fairness. However, there is no reason to expect that a formula that is suitable for these purposes would also be the appropriate guide to individual countries' decisions on new borrowing going forward.

23. **In designing a debt sustainability framework from a forward-looking perspective, a suitable set of indicators and stress tests can create a basis for better-informed and more consistent judgments.** The following discussion explores the choice of the relevant

²⁵ In this context, a compelling moral case can be made that funds provided for humanitarian purposes and unlikely to enhance long-term growth should be in the form of grants rather than loans.

indicator(s), the appropriate debt concept, and the design of stress tests that are best suited to informing debt sustainability assessments in view of country-specific constraints and risks.

Flow vs. Stock Variables

24. **Both debt-stock and debt-service indicators provide important information on countries' debt burdens, implying that both should be drawn on when assessing debt sustainability.** Debt-stock indicators are generally used to assess potential solvency concerns, providing information about future debt-servicing commitments and prospective payment difficulties if a country's capacity to repay does not expand. Debt-service indicators, which are typically expressed relative to fiscal revenues and exports, measure the extent to which debt service crowds out alternative uses of resources—namely other public expenditure and imports. The crowding-out effect is particularly relevant for countries with limited ability to raise revenues or obtain market financing, but must be interpreted in the context of actual and prospective net external inflows, including grants. Finally, in those low-income countries that have access to private capital and/or borrow on non-concessional terms and at variable interest rates, debt-service indicators are useful to signal rollover risk.²⁶ Since low-income countries' debt is typically due over a long horizon, debt-service indicators are arguably a more suitable measure to capture these countries' effective constraints. On the other hand, it is precisely the long maturity and grace periods that can keep debt-service indicators misleadingly low over the medium term. This can, in principle, be addressed by extending projection periods in low-income countries to some 30–40 years (in line with typical maturity periods), which, however, involves other shortcomings related to widening uncertainties about denominators and prospective new borrowing. For this reason, debt-stock indicators that capture the (certain) future obligations on existing debt are an essential measure of debt sustainability also in low-income countries with long maturity profiles.

NPV vs. Nominal Debt Stocks

25. **Debt-stock indicators based on the NPV of debt are more meaningful than those based on its face value for the purpose of measuring and comparing the stream of future debt-service payments.** The NPV of debt, which is derived by discounting the stream of future debt-service payments by an appropriate market interest rate, provides an aggregate measure of the effective debt-service burden implied by a given debt stock. Loans contracted at this market rate have an NPV that is identical to their face value, and grants (with 100 percent concessionality) have an NPV of zero, while the NPV of all other concessional financing (with an interest rate that is below the discount rate) falls somewhere in between.²⁷ In principle, this

²⁶ For most low-income countries rollover risk is less of a concern, as much of their debt is owed to multilateral creditors which do not tend to withhold financing in times of uncertainty or crisis and which provide such financing on fixed (concessional) rates.

²⁷ It should be noted that the NPV of a concessional loan changes over time (even with fixed terms and a constant discount rate), reflecting both amortization payments and the loan's remaining maturity. For example, the NPV rises throughout the grace period even though the face value of the loan remains constant.

discount rate should be the world interest rate, and the NPV can then be interpreted as the “commercial equivalent” of a given nominal debt stock that is comparable across countries (see Box 2).

26. **Deriving the NPV in practice, however, involves a number of issues mainly related to the choice of the discount rate.** The practice under the HIPC Initiative and for debt ceilings in Fund-supported PRGF arrangements is to use as discount rates the historical averages of currency-specific commercial interest reference rates (CIRRs), which correspond to secondary market yields on sovereign bonds in industrial countries.²⁸ While this practice comes close to using some measure of the world interest rate, it has two undesirable implications: (i) NPVs fluctuate with market conditions in advanced economies, even when the terms faced by the borrowing country are unaffected; and (ii) loans contracted in “low-interest currencies” (e.g., the Japanese yen) translate into higher NPVs (through lower discount rates). This second implication would seem justified from a borrowing country’s perspective only if the *historical* interest differentials were a good guide for future exchange rate movements over the lifetime of the respective loans—which is unlikely to be the case. An arguably more pragmatic approach outside the HIPC-Initiative context, that would avoid these problems, would be to use a fixed discount rate—such as the 10 percent flat rate previously used for the World Bank’s *Global Development Finance* statistics.²⁹ Obviously, a shift to a different discount method, irrespective of the rate chosen, would not alter countries’ underlying debt sustainability, but may temporarily complicate interpretations of existing debt ratios—including in relation to the HIPC thresholds. This calls for caution in interpreting NPV ratios—arguing for a focus on the path rather than the level. It does not, however, qualify the conclusion that the NPV of debt is the preferred stock measure for low-income countries with concessional debt.

²⁸ CIRRs are determined monthly by the OECD, typically on the basis of the secondary market yield on government bonds with a residual maturity of five years. For PRGF-related debt ceilings, 10-year historical averages of discount rates are used for loans with maturities longer than 16 years. Under the HIPC Initiative and for PRGF-related debt ceilings for loans with less than 15-year maturities, 6-month historical averages are used. Currency-specific CIRRs are used to try to capture market expectations about exchange rate movements without the need for explicit assumptions on the exchange rate path. See www.oecd.org for more details on CIRRs.

²⁹ In this case, prospective cross-currency movements (suggested, for example, by interest-parity conditions) could be modeled explicitly for an applicable period, rather than using historical interest differentials implicitly for the entire maturity period. In the HIPC Initiative, this pragmatic approach would have created problems, as it would have added an element of subjectivity that is inconsistent with the HIPC principles.

Box 2. NPV of Debt: Interpretation and Measurement

A country's external debt is generally deemed sustainable if the present value of its existing debt-service obligations does not exceed the present value of the returns generated by the use of foreign capital.¹ As the timing of the two payment streams is not identical, the present value calculation, by discounting the two payment streams at an appropriate discount rate, makes them comparable. However, a central question relates to the choice of the discount rate that should be used for this purpose.

In theory, the discount rate should be the rate that captures the value (opportunity costs) of having returns on a debt-financed project accrue before (after) debt-service payments are made. Thus, it is the “time value” that determines the discount rate, whereas the actual interest rate paid and the rate of return on the debt-financed project are both captured in the streams to be discounted. To determine the “time value”, assume that returns start to emerge before debt service falls due (or that the initial returns are higher than the debt-service payments). In this case, the (extra) returns can be invested risk-free at the world interest rate. Correspondingly, assume that debt-service payments fall due before investment returns are generated. In this case, the timing mismatch can be bridged by temporarily reducing official reserves, implying an opportunity cost that is equivalent, again, to the world interest rate. This logic implies that for debt sustainability assessments, the world interest rate should be used to discount the two corresponding payment streams, that in themselves are determined by country-specific interest rates and rates of return.

In practice, and for reasons discussed, debt sustainability assessments generally relate the present value of debt-service obligations in the numerator to a current measure of repayment capacity in the denominator. Thus, the question of the discount rate is reduced to the numerator, i.e., the NPV of debt, which, if derived on the basis of the world interest rate, provides a comparable measure across countries that can be interpreted as a “commercial equivalent” of the respective debt stock—in the sense that it represents the amount that, if invested at the world interest rate, would be exactly sufficient to cover a country's existing debt-service obligations. For countries that borrow on market terms, the NPV is typically approximated by its face value, implicitly applying a discount rate that is equal to the actual interest rate paid in each period. While this practice avoids the need of obtaining debt-service information over the lifespan of outstanding debt, it distorts comparisons of effective debt-service burdens, particularly in low-income countries facing interest rates well below world market rates.

¹ For a government, the capacity to repay would be determined by the present value of future primary surpluses, which, in turn, depend on its ability to tax future incomes.

Public vs. External Debt

27. **Whether to focus debt sustainability analyses on external debt, public debt, or a combination of both depends also on country circumstances.** For middle-income countries, there is a clear delineation between external debt (encompassing private and public sector debt) and public debt (comprised of public sector external and domestic debt). This delineation is less important in many low-income countries because both private sector external debt and domestic public debt are often small. In these countries, the concept of public and publicly guaranteed external debt, used for the HIPC Initiative, is generally the relevant one. However, several low-income countries—especially those with mineral or natural resource sectors—do

have large private sector external debts, not all of which are government guaranteed, and some governments have sizeable domestic debt liabilities in either foreign or domestic currency (e.g., Ghana and Sri Lanka). Other low-income countries, such as those in the CFA franc zone, are actively promoting the use of intra-regional (domestic-currency denominated) government securities to finance their fiscal deficits. Thus, in order for the analysis of debt sustainability to be robust, it would be appropriate to assess both external and public debt sustainability for countries where the two concepts differ. In this context, it is important to recognize that the definition of the public sector varies across countries, with some focused on the central government and others on a more comprehensive concept, including local governments and/or public enterprises.³⁰ Interpretation of debt indicators would have to be made with care depending on the precise definition used. In addition, contingent liabilities, arising for example from balance-sheet exposures of (often publicly-owned) banks, would need to be factored into the public debt analysis where relevant. This would be consistent with the framework adopted in the Fund for middle-income countries.³¹

Denominator

28. **Debt sustainability assessments are based on debt or debt service in relation to appropriate measures of a country's repayment capacity—typically GDP, exports of goods and services, and government revenue.** Indicators in relation to GDP are most useful when debt repayment capacity is best captured by the size of the entire economy, as is typically the case for middle-income countries. This is the primary concept used in the Fund's framework for assessing sustainability in middle-income countries, where arguably there is greater scope than in low-income countries to meet debt-servicing obligations through fiscal and/or external adjustment.³² However, as indicated in the earlier discussion in Section III, other considerations (including foreign exchange, fiscal, fungibility, rollover, and political constraints) are often of critical importance in low-income countries, implying that alternative denominators may be equally or more important in informing an assessment of debt sustainability. For example, if a given country is judged to be primarily foreign-exchange constrained, exports would seem to be the most appropriate denominator for the NPV of debt and debt-service ratios—adjusted in some cases to include remittances or to exclude the import component of re-exports. On the other hand, fiscal, fungibility, and political or moral considerations, suggest the use of ratios expressed in terms of government revenue (and perhaps also certain categories of expenditure). For most low-income countries, multiple constraints are likely to be relevant, suggesting that debt sustainability assessments should be informed by multiple indicators (as illustrated in Box 3 for the case of Bolivia).

³⁰ Under the HIPC Initiative framework, debt of public enterprises—defined as at least 50 percent owned by the government—is included in the definition of public debt, regardless of whether the debt is formally publicly guaranteed.

³¹ See International Monetary Fund (2002).

³² Of course, even in middle-income countries, there are limits to the country's ability to channel GDP into debt service—as exemplified by the relatively low debt-to-GDP ratios and high debt-to-export ratios in the run-up to Argentina's 2001 debt crisis.

Box 3. Examining Debt Indicators: The Case of Bolivia

To illustrate the use of the multiple-constraint framework, the case of Bolivia is examined. While this assessment is not meant to be final or exhaustive, it provides a first glance at how the framework could be applied to a specific country.

Debt stock indicator

Bolivia benefited from debt relief under the original and enhanced HIPC Initiatives, culminating in its reaching the completion point in June 2001. Although Bolivia has some access to nonconcessional financing (primarily from the Andean Development Corporation) and is expected to graduate from World Bank and IDB concessional loans in the years ahead, most of its outstanding debt and new financing is on concessional terms. This would argue for focusing on the NPV of debt as the relevant stock indicator.

Coverage of debt

Bolivia has significant domestic debt, totaling 19 percent of GDP at end-2002. Given this, in addition to non-trivial amounts of private sector external debt, Bolivia's external and public debt should be analyzed separately. In addition, any contingent liabilities of the government should be monitored as well.

External sector constraints

Bolivia's exports-to-GDP ratio was about 20 percent in 2002—well below the average of 28 percent for all developing countries. Based on this, a case could be made that Bolivia is foreign-exchange constrained. This would argue for the use of exports rather than GDP in the denominator when calculating the debt-stock ratio. Similarly, in cases of market stress (Bolivia had problems selling government paper in times of political turmoil), the difficulties in generating foreign exchange may be a key constraint to debt servicing, particularly since most of its domestic debt is also in foreign currency. Therefore, the debt service-to-exports ratio should also be examined. Bolivia's ratio of its NPV of external debt to exports stood at a comparatively moderate rate of 114 percent at end-2002. However, its external debt service is projected to be relatively high in 2003, at 18 percent of exports.

Public sector constraints

Bolivia's combined public sector revenue-to-GDP ratio was 22 percent in 2002. This ratio is comparable to those in emerging markets, particularly in Latin-America and Asia, suggesting that Bolivia may suffer less from administrative constraints than some other low-income countries. Similarly, not much of Bolivia's public sector financing is based on tied aid, allowing for fungibility of resources. Bolivia's NPV of public and publicly guaranteed (PPG) debt (including domestic liabilities) stood at 182 percent of revenues in 2002—considerably lower than the HIPC threshold of 250 percent (which is defined on the basis of external PPG debt only). However, its public sector debt service absorbed nearly 40 percent of revenues and was equivalent to almost 70 percent of social expenditure in 2002.

Preliminary conclusions

A key source of vulnerability for Bolivia's debt sustainability comes from its comparatively high external and public sector debt service relative to exports and revenues, respectively, while debt-stock ratios appear more moderate. This could point to debt service ratios being the binding constraints when deciding about new borrowing—suggesting particular caution about the terms of new borrowing. The associated risks are emphasized by Bolivia's vulnerability to exogenous shocks and the sensitivity of sustainable public debt dynamics to slippages in the ambitious program of fiscal adjustment.

Vulnerability and Stress Testing

29. **In forecasting the debt dynamics, it is necessary to rely on macroeconomic projections that, in low-income countries, are typically highly imprecise and warrant an explicit analysis of possible risks.** Projection uncertainties are an inherent feature of the development process but also reflect major exogenous shocks to which these countries are

subject. Often potential shocks—including policy slippages—are analyzed in explicit alternative scenarios that take account of the interaction between macroeconomic variables. While such scenarios are an important part of good analysis, because of their complexity, they typically focus only on a small subset of possible shocks. For this reason, stress tests, applied to a wide set of relevant variables, are crucial to informing the overall debt sustainability assessment. A good basis for determining what shocks are likely to affect debt sustainability in low-income countries is given by the two equations in Box 4. The analysis shows, both in general terms and with an application to Uganda, that the evolution of the NPV of debt-to-exports ratio depends on the rate of growth of exports; the external financing gap—determined by the trade and services balance, grants, FDI inflows, and changes in reserves—the (concessional) rate of interest; the grant element of the debt (which is affected by the discount rate); and the exports-to-GDP ratio.³³ Similarly, the dynamics of the NPV of debt-to-revenue ratio depend on the rate of growth of revenue; the primary fiscal balance; grants; the interest rate; the grant element; and the exchange rate. Thus, a natural set of stress tests could be derived from these groups of variables.³⁴ Of course, additional stress tests, related to country-specific contingent liabilities or other important variables, should be undertaken on a case-by-case basis.³⁵

30. Conducting stress tests on the basis of changes in the relevant variables requires, as a second step, a decision about the magnitude of shocks to be examined. To the extent that a country has not undergone major structural changes in its recent past, historical volatilities would be an obvious choice (as in the framework for middle-income countries), but flexibility may be called for to deal with changed structures and new threats, such as the

³³ In addition to these variables, movements in cross-currency exchange rates can also affect countries' debt dynamics to the extent that the debt stock consists of loans of various currencies.

³⁴ As discussed earlier, for more advanced low-income countries with access to private financing and little constraints on obtaining foreign exchange, GDP could be a more relevant denominator than exports or revenue. If the debt ratio were expressed in relation to GDP, the endogenous debt-dynamics would be driven by the difference between the interest rate and GDP growth (rather than export or revenue growth), and the multiplier would only capture the grant element without scaling it by the exports-to-GDP or revenue-to-GDP ratio.

³⁵ A note that provides further guidance on the technical aspects of debt sustainability assessments and appropriate stress testing in low-income countries is currently being prepared jointly by Fund staff in FAD and PDR.

Box 4. Debt Dynamics in Low-Income Countries

A closer look at the debt dynamics in low-income countries provides a useful illustration of how their specific characteristics affect debt sustainability. After discussing the evolution of relevant low-income country debt ratios, in general terms, the underlying equations are used to illustrate the factors behind the fairly recent and sizeable deterioration in Uganda's NPV of debt-to-exports ratio.

I. Evolution of Debt Ratios in Low-Income Countries

The debt dynamics, as measured by changes in the NPV of debt relative to exports and revenues—the two ratios used under the HIPC Initiative—evolve according to the following relationships (derived in Appendix I):

$$(1) \quad \frac{NPV_t}{X_t} - \frac{NPV_{t-1}}{X_{t-1}} = \frac{i_t - \xi_t - \mu_t(1+i_t)}{(1+\xi_t)} \frac{NPV_{t-1}}{X_{t-1}} + \frac{(1-GE)}{x_t} (td_t - tr_t - fdi_t + \Delta r_t)$$

change in debt ratio
endogenous debt dynamics
multiplier external financing gap

$$(2) \quad \frac{NPV_t}{R_t} - \frac{NPV_{t-1}}{R_{t-1}} = \frac{(i_t - \rho_t + \alpha_{t-1} \cdot \dot{e}_t(1+i^f_t))}{(1+\rho_t)} \frac{NPV_{t-1}}{R_{t-1}} + \frac{(1-GE_t)}{r_t} (pd_t - g_t)$$

change in debt ratio
endogenous debt dynamics
multiplier fiscal financing gap

Notwithstanding the same notation, the first equation defines the NPV of *external* debt, expressed in foreign-currency (typically U.S. dollar) terms, which is driven by current account dynamics, while the second describes the NPV of *public* debt, in domestic-currency terms, which is linked to the fiscal balance. Abstracting from the different currency denominations, the two NPVs are identical only if the private sector has no external and the government no domestic debt. While this may be a plausible approximation for some low-income countries, it is clearly not applicable to all. Both equations identify the three main factors that determine the debt dynamics:

- The (external or fiscal) *financing gap* is the factor that captures the tension between debt sustainability and the need for financing most directly. The fiscal gap is equivalent to the primary deficit (*pd*) after grants (*g*), while the external gap is defined as the combined deficit in the trade and services account (*td*) that is not financed by grants and other current transfers (*tr*), equity inflows (*fdi*), or a reduction in official reserves and other foreign assets (*Δr*), with small letters expressing ratios in percent of GDP. When a country or government boosts its investment to achieve higher growth, the financing gap rises, as reflected in a larger trade and/or fiscal deficit, unless there is an offsetting fall in domestic (public or private) consumption. In the absence of higher grants or other non-debt financing, the debt ratios increase.
- The *multiplier* determines the extent to which a given financing gap, expressed in percent of GDP, raises the relevant debt ratio. First, the impact of the gap on the NPV of debt is reduced by the concessionality of financing. This is captured by multiplying the gap by $(1-GE)$, which is the ratio of the NPV to the nominal debt stock, with GE defined as the grant element. In addition, since the financing gap is expressed relative to GDP, it has to be converted into the relevant denominator for the debt ratio, by dividing it by the exports-to-GDP ratio (*x*) or the revenue-to-GDP ratio (*r*). Reflecting weak tax administration and small export bases, the multiplier in many low-income countries is considerably larger than 1, even if the debt is contracted on highly concessional terms.

Box 4. Debt Dynamics in Low-Income Countries (concluded)

- Even in the absence of a financing gap, the debt ratio also responds to *endogenous effects*, which are often the dominant factor in times of stress. The endogenous dynamics result primarily from the difference between the (concessional) interest rate i and the growth of the relevant denominator, i.e., export earnings (ξ) or revenues (ρ). In addition, the endogenous dynamics react to changes in the grant element between periods $t-1$ and t , captured by $\mu = 1 - (1-GE_t)/(1-GE_{t-1})$ in equation (1). The term μ is zero if the grant element of the overall debt stock remains unchanged between the two periods, and it is positive (negative), if the grant element increases (falls). In equation (2), μ is for simplicity assumed to be zero—which is not a very restrictive assumption, as movements in the grant element are typically small from one period to the next, but would not be appropriate in an operational context, when debt dynamics are examined over a long period. The larger the initial debt ratio, the stronger the endogenous effect—which is beneficial in “normal” times, when export and revenue growth exceed the concessional interest rate, but works in the opposite direction when the growth rates are very low or negative. Finally, the endogenous dynamics of the public debt ratio are also affected by exchange rate movements, captured in the second term of the numerator, with α denoting the share of foreign-currency in the total NPV of public debt, and $\dot{\epsilon}$ the rate of depreciation of the local currency. Thus, a large depreciation, which raises the domestic-currency value of foreign-currency debt, can lead to a sharp rise in the debt ratio, even if revenue growth exceeds the interest rate, and the primary balance after grants is in surplus

II. An Application to Uganda

In 2000, shortly after having been declared eligible for substantial support under the Enhanced HIPC Initiative, Uganda experienced a sharp and unexpected rise in its NPV of debt-to-exports ratio. As a result, the country’s debt burden now exceeds the HIPC threshold of 150 percent by some 50 percentage points. While this does not necessarily call into question Uganda’s debt sustainability, particularly in light of its still relatively low debt-service ratios, it does demonstrate the fragility of the country’s debt dynamics. Indeed, large fluctuations in the NPV of debt-to-exports ratios can be expected in low-income countries, especially if their export bases are small and volatile, as is the case in Uganda.

On the basis of the external debt equation (1), it is easy to show how Uganda’s NPV of debt-to-exports ratio could rise by some 50 percentage points in just a few years, in spite of highly concessional borrowing. First, notwithstanding a grant element on total debt of some 65 percent, Uganda’s “multiplier” is about 3, reflecting its very low exports-to-GDP ratio of about 12 percent. As a result, each 1 percent of GDP financing gap translates into a 3 percentage point increase in the NPV of debt-to-exports ratio. Thus, although Uganda has been receiving annual transfers and FDI of nearly 12 percent of GDP, its residual financing gap of about 3½ percent of GDP contributes some 10 percentage points a year to its NPV of debt-to-exports ratio. In addition, when export earnings fell by more than 11 percent in 1999/00 (which is just one-third of the standard deviation over the past 10 years), the endogenous debt dynamics added another 20 percentage points to Uganda’s NPV of debt-to-exports ratio in that year.

While these developments clearly illustrate the volatility of Uganda’s NPV of debt-to-exports ratio, they do not necessarily suggest a worsening going forward. Indeed, with an effective average interest rate of less than 1 percent, Uganda’s debt ratio will trend downward from its currently high level (even with annual contributions of about 10 percentage points from the financing gap), as long as average export growth does not fall much below 7 percent (compared with a 10-year historical average of nearly 17 percent). Of course the debt-stabilizing condition becomes more difficult to attain, once the debt ratio has fallen: for example, a stabilization of the NPV of debt-to-exports ratio at 100 percent, requires export growth of nearly 13 percent a year, with the other variables unchanged. These considerations only underscore the difficulties in designing appropriate forward-looking borrowing policies in low-income countries.

HIV/AIDS epidemic. The results of a set of standardized stress tests on the NPV of debt-to-exports ratio and the debt service-to-exports ratio are illustrated in Figure 3 for the case of Cameroon.³⁶ The stress tests highlight that the envisaged improvement in Cameroon's debt indicators under the baseline requires a more favorable combination of export growth and grants than achieved in the past. They further point to the country's high vulnerability to export shocks. Indeed, a one-standard deviation shock to export growth for two consecutive years (with permanent level effects) would be sufficient to put Cameroon's debt dynamics on a clearly unsustainable path in the absence of higher grants or offsetting (and often painful) import adjustments. These simulations, besides highlighting the potential fragility of low-income countries' debt dynamics, raise the question of how to interpret and use the stress test results to guide a country's borrowing decisions.

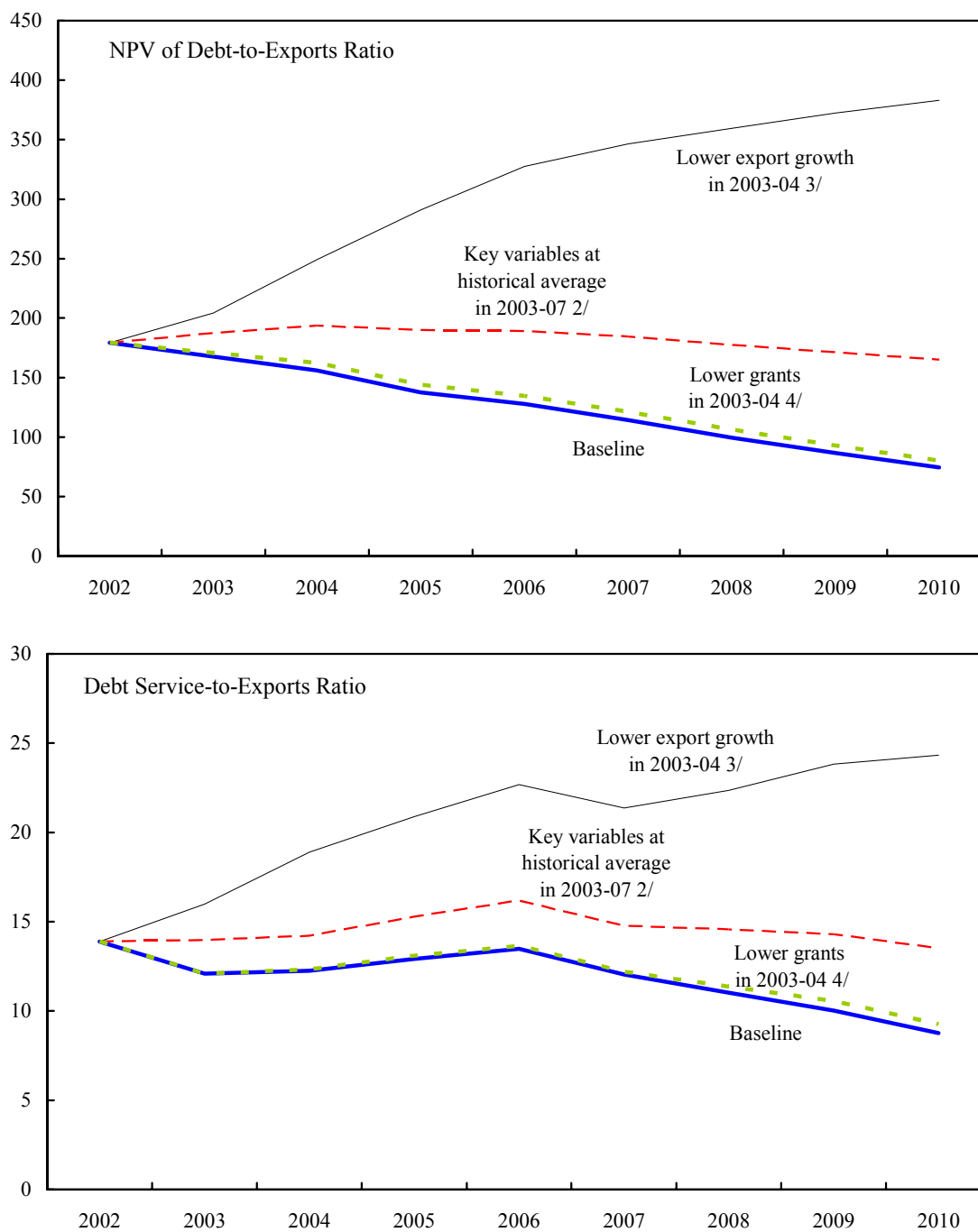
B. Translating Debt Sustainability Into Borrowing Policies

31. **The analysis in the previous sections forms the basis for advising low-income countries on the level of borrowing that is consistent with debt sustainability.** This advice has to take account of the fact that both the amount and the concessionality of new borrowing are relevant in assessing its macroeconomic implications: even highly concessional financing can lead to debt problems if undertaken on a large enough scale. The NPV of debt—which provides a single measure of the country's stream of future debt servicing requirements—should be at the center of the analysis in an environment where much of low-income countries' new borrowing is on concessional terms. The intention would be to keep the NPV of debt below a level deemed excessive in relation to servicing capacity (GDP, exports, or revenues). This approach to assessing overall debt levels would imply flexibility in countries' borrowing decisions—leaving them to choose a mix of concessional and non-concessional financing without dulling their incentives to attract financing on the most concessional terms. Of course, even if the central focus were on a combined NPV measure, in some cases nonconcessional borrowing should be eschewed altogether.

32. **When linking borrowing policies to debt indicators, probably the most difficult and controversial decision relates to the threshold level that defines the “danger zone” at which borrowing should be curtailed.** The key question, from the point of view of the international community, is whether to identify a threshold that would be used in assessing sustainability in all (or a particular category of) low-income countries, or whether to leave this to be determined on a case-by-case basis depending on country-specific factors. One difficulty in formulating such a danger level, either for an individual country or a group of countries, is that in low-income countries that borrow almost exclusively from official sources, market signals are scarce, making it particularly difficult to detect growing solvency concerns.

³⁶ The simulations do not include a stress test for lower GDP growth, because this (isolated) shock has no impact on the NPV of debt and debt service ratios relative to exports, unless assumptions are made about the link between GDP and other variables. A growth shock would obviously have an impact on the debt-to-GDP ratio.

Figure 3. Cameroon: Debt Sustainability Simulations, 2002-10 1/
(In percent)



Source: IMF staff calculations.

1/ All residual borrowing in the stress test scenarios is assumed to be at an interest rate of 2 percent, with 25 years maturity and 5 years grace period, implying a grant element of about 30 percent, in line with the concessionality of the existing debt stock.

2/ Export value growth and official transfers, in percent of GDP, are at average levels of past ten years.

3/ Assumes export growth at historical ten-year average minus one standard deviation.

4/ Assumes net official transfers, in percent of GDP, at historical ten-year average minus two standard deviations.

Empirical thresholds (such as the earlier reported 160–170 percent for the NPV of debt-to-exports ratio and 35–40 percent for the NPV of debt-to-GDP ratio)³⁷ have limited value in specific cases, as they are derived on the basis of a certain sample and time period, are sensitive to the underlying discount rate assumptions, and do not capture the heterogeneity across countries. At best, such empirical thresholds can be used as first reference points that would need to be adjusted on the basis of country-specific characteristics, including debt-service ratios and volatility to shocks informed by stress tests. This requires considerable judgment, in practice, which is made more difficult by many countries' highly volatile past. How to translate stress test results into borrowing decisions is particularly tricky when some of the simulated shocks put an otherwise falling debt ratio on a clearly unsustainable path. Indeed, borrowing decisions may be better informed by less volatile measures, which could be achieved, for example, by designing stress tests—particularly for highly volatile exports—on the basis of rolling averages.³⁸

33. Another important question that is especially relevant in light of low-income countries' vulnerability to shocks is how the actual occurrence of such shocks should affect borrowing decisions. The dilemma in such a situation is that a shock may simultaneously worsen the financing gap and the endogenous debt dynamics, as, for example, a weakening in the terms of trade would be likely to do. In principle, the appropriate response to a shock depends on its persistence. If the shock were temporary, such that its impact would be fully reversed in the future, then the appropriate response would be to finance the balance of payments gap, whereas if the shock were permanent in nature, the country will need to adjust to bring policies in line with the new economic reality. In practice, however, it is very difficult to determine at the outset whether a shock is temporary or permanent. Thus, from a pragmatic standpoint, the response to shocks would need to be, in part, determined by a country's existing debt situation. If debt ratios were relatively low to begin with, additional borrowing might seem reasonable to smooth the adjustment to the shock over time and mitigate the need for import suppression, even if the shock is perceived to be permanent. On the other hand, if debt ratios were already high prior to the shock, the country may have little choice but to reduce borrowing, to the extent that new grant resources are not made available to offset the adverse endogenous debt dynamics. Usually countries are somewhere in the middle between the two extremes, arguing for flexibility on a case-by-case basis. These considerations highlight, once again, the importance of reducing debt ratios in good times to create room for maneuver when external conditions deteriorate. They also stress the significance of grant financing in providing vulnerable countries with cushions in times of shocks to ease their difficult choice between curtailing imports and growth, and risking a sharp rise in debt ratios to potentially unsustainable levels.

34. Finally, flexibility may also be called for to distinguish between borrowing by different entities and for different purposes. As discussed earlier, the coverage of debt

³⁷ As indicated earlier, these levels find empirical support in a recent study by Pattillo and others (2002).

³⁸ In principle, this is similar to the usage under the HIPC Initiative of three-year averages of exports when determining the amount of debt relief.

relevant for assessing sustainability should be determined by a country's particular circumstances and constraints. As the government cannot control private sector borrowing, public sector debt is in practice the operational target for borrowing policies, but the appropriate coverage of public sector debt is a difficult issue. Some countries, for example, have profitable public enterprises which borrow (nonconcessionally) from private foreign sources (typically, though not always, with an explicit government guarantee). Determining whether borrowing by such enterprises should be included in the coverage of public sector debt would depend on many considerations, including the profitability of the public enterprises; their price and employment policies; their existing indebtedness and ability to generate foreign exchange with which to service their debts; and the likelihood that the associated contingent liabilities would become realized budgetary liabilities of the central government. It may also be reasonable to exclude certain projects (such as enclave projects) on a case-by-case basis from borrowing ceilings altogether, though caution is clearly warranted (Box 5). On the other hand, even private sector loans—undertaken with implicit or explicit government guarantees—can become public liabilities. In general, if loans of various public entities are excluded from borrowing ceilings, it will be important to monitor the debt situation of such entities as well as other contingent liabilities associated with weak private enterprise or financial sector balance sheets.

35. **In sum, when translating country-specific debt sustainability analyses into borrowing policies, there are important tradeoffs between the clarity that comes from establishing a uniform debt-sustainability threshold versus the benefits of tailoring sustainability assessments to the factors that are relevant in individual countries.** The approach suggested here argues for focusing borrowing policies, to the extent possible, on the most relevant constraints for a particular country, guided by an appropriate set of indicators and stress tests. This is essentially the same approach being followed in the IMF's sustainability assessments in middle-income and upper-income countries: the framework for these assessments is intended to provide a basis for better-informed and disciplined judgments about sustainability in individual countries, rather than providing a rule for determining whether a particular country's debt is deemed sustainable. In most low-income countries, the key indicators will include the NPV of debt (public and external) and debt service relative to revenues and exports, respectively. Informed by a debt sustainability analysis, based on realistic macroeconomic assumptions, the maximum amount of new borrowing would be linked to an overall NPV limit. The NPV limit would be determined in light of the projected path of debt service ratios and other important country-specific factors, with public sector debt as the operational target, but subject to external considerations. Case-by-case judgment will be needed to decide about the possible exclusion of certain categories of debt (such as enclave projects) from borrowing limits, the interpretation of stress-test results, and the appropriate response to actual shocks.

Box 5. Enclave Projects

In addition to borrowing to finance poverty spending and other (generally non-commercial) investment, some governments, at times, borrow to finance government equity in commercial activities with private (foreign) partners and identified export markets. Oil exploration, pipelines, and hydroelectric dams are examples of such projects. These projects (known as enclave projects) are expected to become self-financing once brought on stream, as the associated export earnings are likely to be more than sufficient to service any debts incurred during the construction phase. A natural question when discussing debt sustainability in low-income countries is, therefore, the degree to which enclave projects should be included or excluded from government borrowing limits.

Most PRGF arrangements currently assume no contracting or guaranteeing of nonconcessional external debt. Thus, in order to respect performance criteria under the PRGF, governments are precluded from borrowing on commercial terms, even in cases where the government is an equity partner with a foreign investor—either directly or through a state-owned enterprise—and needs to borrow to finance its share of the project. Concessional lending is generally not available (or appropriate) given that it would serve to cross-subsidize a private foreign investor.

In light of their prospective commercial viability, one could reasonably argue that enclave projects should be excluded from borrowing limits. However, such a judgment would have to be made with great care. In particular, justification of the exclusion would need to be made based on sound evidence of future export potential (perhaps through export contracts) and project viability, preferably based on assessments by key donors or IFIs. An examination of the risks that such a contingent liability could become a true budgetary liability (i.e., in the sense that it is not covered by sufficient export earnings) would need to be a key element of such assessments. Moreover, if enclave projects are excluded from borrowing limits in certain cases, the associated borrowing would still need to be closely tracked, and debt indicators (both including and excluding debt associated with the enclave project) should be continuously evaluated.

V. CONCLUSIONS AND NEXT STEPS

36. **The paper has laid out a roadmap of the choices involved in creating a framework for debt sustainability assessments and prudent borrowing policies in low-income countries.** Based on a brief discussion of these countries' defining characteristics and past difficulties in resolving the inherent tension between large financing needs and debt sustainability, the paper has examined various elements that a forward-looking approach would need to address. In particular, constraints faced by many low-income countries with regard to fiscal policy, access to foreign exchange, or political and administrative capacity, are critical to an assessment of aid debt sustainability and vulnerability to shocks that must underlie a consistent borrowing strategy.

37. **Key issues to be resolved in this context include the appropriate choice of debt indicators and their calculation, the type of stress tests to be conducted, the consideration of limiting concessional (in addition to non-concessional) borrowing, and the relevant coverage of debt.** In confronting these issues, it is essential to strike the right balance between policy guidelines applicable to all low-income countries and country-specific modifications. Depending on country-specific considerations, alternative debt indicators and stress tests can be identified to draw conclusions about a country's debt sustainability. Following an informal Board seminar based on this paper and feedback from a series of workshops scheduled through

the summer, it is envisaged that a joint Bank-Fund paper containing specific policy proposals for an operational framework on debt sustainability assessments and borrowing policies in low-income countries be presented to both Boards in the fall of 2003.

VI. SUMMARY OF ISSUES

- Directors may wish to comment on the way the issues are framed in the paper.
- Directors may wish to comment on the proposed approach to exploring and resolving these issues in the period ahead. In particular, do they support the proposed consultative process?
- Directors may wish to comment on the envisaged plan that a joint Bank-Fund paper framing specific proposals be prepared for discussion by the Boards in the fall.

DEBT DYNAMICS IN LOW-INCOME COUNTRIES

This appendix derives the equations for the NPV of debt-to-exports and the NPV of debt-to-revenue ratios, discussed in Box 4 of the main text.

NPV of External Debt-to-Exports Ratio

The starting point for the external debt equation is the evolution of the nominal debt stock, given by the following relationship:

$$(3) \quad D_t = (1 + i_t)D_{t-1} + TD_t - Tr_t - FDI_t + \Delta R_t,$$

with D_t defined as the nominal debt stock at the end of period t ; i_t as the average effective interest rate in period t (derived as interest payments in period t divided by the debt stock in the previous period); TD_t as the combined deficit in the trade and services account; Tr_t as the sum of official grants and other current transfers; FDI_t as net non-debt creating (i.e., equity) capital inflows; and ΔR_t as the change in official reserves and other foreign assets (with a positive figure denoting an increase in foreign assets). All variables are expressed in U.S. dollars terms. The above equation is derived directly from the balance of payments identity, which implies that *net* debt-creating capital inflows are positive—i.e., that a country's *net* external debt increases ($D_t - D_{t-1} - \Delta R_t > 0$)—if its current account deficit ($TD_t + i_t D_{t-1} - Tr_t$) exceeds the level of net equity inflows (FDI_t).

The above equation can be transformed into an equation for the NPV of debt by making use of the concept of the grant element GE_t , which is defined as the difference between the debt stock and the NPV of debt, expressed in percent of the debt stock:

$$(4) \quad GE_t = \frac{(D_t - NPV_t)}{D_t} \Leftrightarrow D_t = \frac{NPV_t}{(1 - GE_t)}.$$

Inserting equation (2) into equation (1) leads to the following expression:

$$(5) \quad \frac{NPV_t}{(1 - GE_t)} = (1 + i_t) \frac{NPV_{t-1}}{(1 - GE_{t-1})} + TD_t - Tr_t - FDI_t + \Delta R_t.$$

Multiplying equation (3) by $\frac{(1 - GE_t)}{X_t}$, where X_t denotes the dollar value of exports in period t , leads to the following equation for the NPV of debt-to-exports ratio in period t :

$$(6) \quad \frac{NPV_t}{X_t} = \frac{(1+i_t)}{(1+\xi_t)} \frac{NPV_{t-1}}{X_{t-1}} \frac{(1-GE_t)}{(1-GE_{t-1})} + \frac{(1-GE_t)}{X_t} (TD_t - Tr_t - FDI_t + \Delta R_t).$$

Finally, subtracting $\frac{NPV_{t-1}}{X_{t-1}}$ from both sides of the equation, and defining the ratio

$\frac{(1-GE_t)}{(1-GE_{t-1})}$ as $1-\mu_t$, results in the following definition of the change in the NPV of debt-to-exports ratio between periods $t-1$ and t :

$$(7) \quad \frac{NPV_t}{X_t} - \frac{NPV_{t-1}}{X_{t-1}} = \frac{i_t - \xi_t - \mu_t(1+i_t)}{(1+\xi_t)} \frac{NPV_{t-1}}{X_{t-1}} + \frac{(1-GE_t)}{x_t} (td_t - tr_t - fdi_t + \Delta r_t),$$

with the lower-case symbols in the final term on the right-hand side denoting ratios in percent of GDP. The term μ_t captures the change in the grant element between periods $t-1$ and t . It is zero when the grant element remains constant and positive (negative) when the grant element increases (falls). The above formula is useful from an analytical perspective, as it identifies the direction in which individual variables affect the debt dynamics, while providing an intuitive expression that is closely aligned with the more familiar equation for the nominal debt-to-GDP ratio.³⁹ However, given its complex dynamics, the grant element—which depends on the discount rate as well as the terms (interest rate and repayment profile) and the amount of new borrowing relative to existing debt—is typically derived implicitly. For this reason, the above equation is less useful from an operational standpoint.

NPV of Public Debt-to-Revenue Ratio

The analysis of the NPV of public sector debt is similar to that of external debt, with two main differences: (i) public sector debt is driven by the dynamics of the fiscal rather than the external current account balance; and (ii) while external debt in low-income countries is generally denominated exclusively in foreign currency, public sector debt (external and domestic) is often issued in both foreign and domestic currencies, implying the need for an

³⁹ If the NPV dynamics were assessed relative to GDP, equation (6) would become:

$$\frac{NPV_t}{GDP_t} - \frac{NPV_{t-1}}{GDP_{t-1}} = \frac{i_t - g_t - \mu_t(1+i_t)}{(1+g_t)} \frac{NPV_{t-1}}{GDP_{t-1}} + (1-GE_t)(td_t - tr_t - fdi_t + \Delta r_t),$$

with g_t denoting the growth of dollar-denominated GDP. Thus, the only difference between the more familiar equation for the nominal debt stock would be the inclusion of the grant element—both in the endogenous debt dynamics and in the “multiplier” to the financing gap.

explicit consideration of exchange rate movements. Starting again from the nominal debt dynamics, but separating between domestic- and foreign-currency debt (D^d and D^f , respectively), the evolution of the two components can be described by the following equations:

$$(8) \quad D^d_t = (1 + i^d_t)D^d_{t-1} + (1 - \beta)(PD_t - G_t), \text{ and}$$

$$(9) \quad D^f_t = (1 + \dot{e}_t)(1 + i^f_t)D^f_{t-1} + \beta(PD_t - G_t).$$

All variables are expressed in local currency terms, with i^d_t and i^f_t defined as the average effective interest rates on domestic- and foreign-currency debt, respectively; β as the share of foreign-currency financing of the primary budget deficit PD_t after grants G_t ; and \dot{e}_t as the change in the exchange rate (local relative to foreign currency), with an increase denoting a depreciation of the local currency.

Applying the same algebra as in the external debt equation, the NPV of debt-to-revenue ratios for the two components of public debt can be derived as follows:

$$(10) \quad \frac{NPV^d_t}{R_t} - \frac{NPV^d_{t-1}}{R_{t-1}} = \frac{i^d_t - \rho_t - \mu^d_t(1 + i^d_t)}{(1 + \rho_t)} \frac{NPV^d_{t-1}}{R_{t-1}} + \frac{(1 - GE^d_t)}{r_t} (1 - \beta)(pd_t - g_t), \text{ and}$$

$$(11) \quad \frac{NPV^f_t}{R_t} - \frac{NPV^f_{t-1}}{R_{t-1}} = \frac{i^f_t - \rho_t + \dot{e}_t(1 - \mu^f_t)(1 + i^f_t) - \mu^f_t(1 + i^f_t)}{(1 + \rho_t)} \frac{NPV^f_{t-1}}{R_{t-1}} + \frac{(1 - GE^f_t)}{r_t} \beta(pd_t - g_t),$$

with R_t defined as government revenues in period t ; ρ_t as their growth rate; and lower-case letters as ratios relative to GDP.

Adding equations (10) and (11), while defining α_{t-1} as the share of foreign-currency in the total NPV of debt in period $t-1$, and i_t and GE_t as the weighted averages of the two interest rates and grant elements, respectively (with the former weighted on the basis of the NPV shares in period $t-1$ and the latter on the basis of the deficit-financing shares in period t), and assuming, for simplicity, $\mu^d_t = \mu^f_t = \mu_t$,⁴⁰ leads to the following expression:

⁴⁰ This assumption has no qualitative impact on the results.

$$(12) \quad \frac{NPV_t}{R_t} - \frac{NPV_{t-1}}{R_{t-1}} = \frac{(i_t - \rho_t + \alpha_{t-1} \cdot \dot{e}_t (1 - \mu_t) (1 + i^f_t) - \mu_t (1 + i_t))}{(1 + \rho_t)} \frac{NPV_{t-1}}{R_{t-1}} + \frac{(1 - GE_t)}{r_t} (pd_t - g_t).$$

With $\mu_t = 0$, follows equation (2) in Box 4.

References

- Agénor, Pierre-Richard, and Peter J. Montiel, 1996, *Development Macroeconomics*, (Princeton: Princeton University Press).
- Birdsall, Nancy, Stijn Claessens, and Ishac Diwan, 2002, “Will HIPC matter? The Debt Game and Donor Behaviour in Africa,” *Centre for Economic Policy Research Discussion Paper Series*, No. 3297, pp. 1–35, (U.K.).
- Birdsall, Nancy, and John Williamson, 2002, “Delivering on Debt Relief: From IMF Gold to a New Development Architecture,” Institute of International Economics (Washington).
- Brooks, Ray, Mariano Cortes, Francesca Fornasari, Benoit Ketchekmen, and Ydahlia Metzgen, 1998, “External Debt Histories of Ten Low-Income Developing Countries—Lessons from Their Experience,” IMF Working Paper 98/72 (Washington: International Monetary Fund).
- Bulir, Ales, and Timothy Lane, 2002, “Aid and Fiscal Management,” IMF Working Paper 02/112 (Washington: International Monetary Fund).
- Burnside, Craig, and David Dollar, 2000, “Aid, Policies, and Growth,” *American Economic Review* v90, n4 (September), pp. 847–68.
- Chalk Nigel, and Richard Hemming, 2000, “Assessing Fiscal Sustainability in Theory and Practice,” IMF Working Paper 00/81 (Washington: International Monetary Fund).
- Claessens, Sitjn, Enrica Detragiache, Ravi Kanbur, and Peter Wickham, 1997, “HIPCs Debt Review of the Issues,” *Journal of African Economies*, Vol. 6, No. 2, pp. 231–54.
- Cline, William, 1995, *International Debt Reexamined*, Institute of International Economics (Washington).
- Cohen, Daniel, and Jeffrey Sachs, 1986, “Growth and External Debt under Risk of Debt Repudiation,” *European Economic Review*, Vol. 30, pp. 529–550.
- Daseking, Christina, and Robert Powell, 1999, “From Toronto Terms to the HIPC Initiative—A Brief History of Debt Relief for Low-Income Countries,” IMF Working Paper 99/142 (Washington: International Monetary Fund).
- Easterly, William, 1999, “The Ghost of Financing Gap: Testing the Growth Model Used in the International Financial Institutions,” *Journal of Development Economics* v60, n2 (December), pp. 423–38.

_____, 2001, “Growth Implosions, Debt Explosions, and My Aunt Marilyn: Do Growth Slowdowns Cause Public Debt Crises?,” *World Bank Policy Research Working Paper Series*, No. 2531.

Eurodad, 2002, “Putting Sustainable Development First,” available via internet: <http://www.eurodad.org/>.

Gelb, Alan, and Xiao Ye, 2001, “Debt Sustainability for Africa’s non-Oil HIPC: A Note,” The World Bank (Washington).

International Monetary Fund, 2002, “Assessing Sustainability,” prepared by the Policy Development and Review Department, SM/02/166 and available via internet: <http://www.imf.org/external/np/pdr/sus/2002/eng/052802.htm>.

Jubilee Research, 2002, “The Unbreakable Link - Debt Relief and the Millennium Development Goals,” available via internet: <http://www.jubilee2000uk.org/>.

Kremer, Michael, and Seema Jayachandran, 2002, “Odious Debt,” *Brookings Policy Brief*, No. 103, Brookings Institution (Washington).

Krugman, Paul, 1988, “Financing vs. Forgiving a Debt Overhang,” *Journal of Development Economics*, Vol. 29, pp. 253–68.

Lensink, Robert, and Howard White, 2000, “Assessing Aid: A Manifesto for Aid in the 21st Century?,” *Oxford Development Studies* v28, n1 (February), pp. 5–17.

Lipschitz, Leslie J., Timothy Lane, and Alexandros Mourmouras, 2002, “Capital Flows to Transition Economies: Master or Servant,” IMF Working Paper 02/11 (Washington: International Monetary Fund).

Loko, Boileau, Montfort Mlachila, Raj Nallari, and Kadima Kalonji, 2003, “The Impact of External Indebtedness on Poverty in Low-Income Countries,” IMF Working Paper 03/61 (Washington: International Monetary Fund).

Lucas, Robert, 1990, “Why Doesn’t Capital Flow from Rich to Poor Countries?,” *American Economic Review, Papers and Proceedings*, No. 80, pp. 92–96.

Pattillo, Catherine A., H. Poirson, and L. Ricci, 2002, “External Debt and Growth,” IMF Working Paper 02/69 (Washington: International Monetary Fund).

Sachs, Jeffrey, 1989, “The Debt Overhang of Developing Countries,” in *Debt Stabilization and Development: Essays in Memory of Carlos Diaz Alejandro*, ed. by Guillermo Calvo and others, (Oxford: Basil Blackwell).

_____, 2002, “Resolving the Debt Crisis of Low-Income Countries,” *Brookings Papers on Economic Activity* v0, n1, Brookings Institution, pp. 257–86.

Servén, Luis, 1997, “Nonlinear Effects of Inflation on Economic Growth,” *Staff Papers*, International Monetary Fund, Vol. 43, No. 1, pp. 199–215.

Stephens, Malcolm, 1999, *The Changing Role of Export Credit Agencies* (Washington: International Monetary Fund).

Tsikata, Tsidi, 1998, “Aid Effectiveness—A Survey of the Recent Empirical Literature,” IMF Papers on Policy Analysis and Assessment 98/1 (Washington: International Monetary Fund).

U.S. Congress, 2002, House of Representatives and Senate Bills, HR4524 and S.2210.