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INTERNATIONAL DEVELOPMENT ASSOCIATION

**Debt Sustainability in Low-Income Countries—Proposal for an Operational
Framework and Policy Implications**

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Abbreviations and Acronyms

ARD	Agriculture and Rural Development
BADEA	Arab Bank for Economic Development in Africa
CBM	Credit-Buydown Mechanism
CEMLA	Center for Latin American Monetary Studies
CFF	Compensatory Financing Facility
CIRR	Commercial Interest Reference Rate
CPA	Country Program Assessments
CPIA	Country Policy and Institutional Assessment
DAC	Development Assistance Committee
DMFAS	Debt Management and Financial Analysis System
DRI	Debt Relief International
EIB	European Investment Bank
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GNI	Gross National Investment
HIPC	Highly Indebted Poor Country
ICRG	International Country Risk Guide
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFF	International Finance Facility
IMF	International Monetary Fund
JBIC	Japan Bank for International Cooperation
LICUS	Low Income Countries Under Stress
MDB	Multilateral Development Bank
MDGs	Millennium Development Goals
MEFMI	Macroeconomic and Financial Management Institute of Eastern and Southern Africa
NPV	Net Present Value
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
OPEC	Organization of Petroleum Exporting Countries
PPG	Public and Publicly Guaranteed (debt)
PRGF	Poverty Reduction and Growth Facility
PRSP	Poverty Reduction Strategy Paper
RER	Real Exchange Rate
SOE	State Owned Enterprise
UNCTAD	United Nations Conference on Trade and Development
UNITAR	United Nations Institute for Training and Research
WAIFEM	West African Institute for Financial and Economic Management

EXECUTIVE SUMMARY

1. **This paper develops an operational framework for debt sustainability assessments in low-income countries and draws policy implications for donors, creditors, and borrowers.** Low-income countries face significant challenges in meeting their development objectives, especially the Millennium Development Goals (MDGs), while at the same time ensuring that their external debt remains sustainable. The aim of the proposed framework is to guide borrowing decisions of low-income countries in a way that matches their need for funds with their current and prospective ability to service debt, tailored to their specific circumstances. Given the central role of official creditors and donors in providing new development resources to these countries, the framework simultaneously provides guidance for their lending and grant-allocation decisions to ensure that resources to low-income countries are provided on terms that are consistent with their long-term debt sustainability and progress towards achieving the MDGs.
2. **While the concept of debt sustainability in low-income countries is somewhat different than in middle-income countries, excessive debt in low-income countries is a serious problem.** Given low-income countries' reliance on official flows, debt sustainability depends largely on the willingness of official creditors and donors to provide positive net transfers through new financing. Nevertheless, high debt levels can be problematic as they may require debt restructuring and forgiveness which is disruptive and costly and the burden of a debt overhang may undermine urgent progress on policy reform. High debt levels also force lenders to allocate scarce concessional resources in a manner that keeps high debtors afloat, often at the expense of other deserving countries.
3. **The proposed debt sustainability framework is based on two broad pillars: (i) indicative country-specific external debt-burden thresholds that depend on the quality of the country's policies and institutions; and (ii) an analysis and careful interpretation of actual and projected debt-burden indicators under a baseline scenario and in the face of plausible shocks.** The proposed debt thresholds are based on empirical analyses undertaken both at the Bank and the IMF which demonstrate that there is significant dispersion in the debt ratios that countries can sustain; countries with weaker institutions and policies are likely to experience debt distress at significantly lower debt ratios. Projections of debt burden indicators are essential for a forward-looking analysis, and need to incorporate, among other things, judgments on the evolution of domestic public debt and private external debt over the projection period as well as the impact of normal volatility on a country's repayment capacity. These two pillars, in combination with other relevant country-specific considerations, can help in the design of an appropriate external borrowing strategy under which the amount and terms of new financing would facilitate progress toward achieving the MDGs and generate a sustainable debt and debt-service outlook.
4. **The proposed framework has important policy implications for donors, creditors, and borrowers.** There are two broad areas where policy changes in donor and creditor assistance would be needed. First, creditors would need to review current lending

policies to ensure that they appropriately reflect countries' risk of debt distress. This would almost certainly require an increase in the concessionality of financing to low-income countries, including an increase in the volume of grants. Second, since an appropriate mix of concessional loans and grants would provide only limited capacity to absorb large, unforeseen, exogenous shocks, creditors may also wish to consider new or modified concessional lending instruments to deal with such eventualities.

5. **While donors and creditors can help low-income countries achieve debt sustainability, the primary responsibility lies with low-income countries themselves.** As they strive to reach the MDGs, these countries will need to preserve debt sustainability by keeping new borrowing in step with the capacity to repay, adopting better policies and institutions that help accelerate growth, managing debt prudently, and increasing resilience to exogenous shocks.

6. **The debt sustainability framework proposed in this paper will have no bearing on the implementation of the HIPC Initiative.** The HIPC Initiative deals with the existing debt overhang in HIPCs and is built upon binding thresholds to achieve debt reduction, which ensures equal treatment of countries under this Initiative. The proposed debt sustainability framework, in contrast, serves the different purpose of informing judgments on appropriate future borrowing policies in low-income countries.

7. **Subject to both Boards' approval of the suggested approach, the next step will consist of developing detailed guidelines for Bank and Fund operations, consistent with the framework.** These will be prepared separately, but in a coordinated way, tailored to each institution's policies, practices, and lending instruments. Once such operational guidelines are in place, Bank and Fund staff will periodically review the experience with their implementation, introduce improvements as necessary, and more generally, continue to conduct research on the issues, in close consultation with partners and stakeholders.

I. INTRODUCTION

8. **Low-income countries face significant challenges in meeting their development objectives, including the Millennium Development Goals (MDGs), without sowing the seeds for debt-servicing problems in the future.** In the past, despite access to low-cost financing, many low-income countries accumulated high levels of debt that imposed a heavy burden on their economies and ultimately required costly debt relief to be resolved. With many “graduated” HIPCs experiencing rising debt burdens again, and debt ratios in some other low-income countries also reaching elevated levels, there is a clear need for guidance on how much debt these countries can afford to accumulate.¹ Such guidance is particularly urgent in light of the sizeable spending requirements associated with achieving the MDGs. Attempts to meet these requirements through large additional borrowing, even if provided on concessional terms, could create serious debt-servicing problems in the future and undermine the very objectives they are meant to achieve.

9. **This paper develops an operational framework for debt-sustainability assessments in low-income countries outside the HIPC Initiative and draws policy implications for donors, creditors, and borrowers.**^{2 3} Many of the key issues were highlighted in a Fund staff paper of May 2003, and discussed by Fund Executive Directors during an informal Board seminar.⁴ In the Bank, Executive Directors had an opportunity to discuss these issues in the context of two technical briefings in July and December 2003.⁵

¹ In post-completion point (“graduated”) HIPCs, the calculated NPV of debt-to-exports ratios have risen due to a combination of weaker than expected export earnings (often reflecting depressed commodity prices), new borrowing, lower discount rates, and changes in exchange rates. See IMF and World Bank, *Heavily Indebted Poor Countries—Status of Implementation* (SM/02/264, 9/23/02, and DC2002-0020, 9/21/2002).

² For the purpose of this paper, low-income countries are defined as all countries that are eligible for IDA and PRGF loans, respectively.

³ For the Fund’s operational purposes, the debt-sustainability framework for low-income countries would complement the framework already adopted for countries with significant market access, see IMF, *Assessing Sustainability* (SM/02/166, 5/28/02) and IMF, *Sustainability Assessments—Review of Application and Methodological Refinements* (SM/03/206, 6/11/03).

⁴ See IMF, *Debt Sustainability in Low-Income Countries—Towards a Forward-Looking Strategy* (SM/03/185, 5/28/03).

⁵ See IDA, *Debt Sustainability in the Context of Achieving the Millennium Development Goals* (IDA/SecM2003-0453), July 22, 2003 and IDA, *The HIPC Initiative: Origins, Eligibility Criteria, Current Status and Future Challenges* (OM2003-0061), November 21, 2003.

This report builds on the discussions at the respective Boards, and incorporates feedback from extensive consultations with various stakeholders.⁶ The aim of the proposed framework is to guide borrowing decisions of low-income countries in a way that matches their needs for funds with their current and prospective ability to service debt, tailored to their specific circumstances. Given the central role of official creditors and donors in providing fresh funds to these countries, the framework simultaneously provides guidance for their lending and grant-allocation decisions to ensure that resources to low-income countries are provided on terms that are consistent with their long-term debt sustainability.

10. **Subject to both Boards' approval of the suggested approach, the next step will consist of developing detailed guidelines for Bank and Fund operations, consistent with the framework.** These will be prepared separately, though in a coordinated way, tailored to each institution's policies, practices, and lending instruments. Once such operational guidelines are in place, Bank and Fund staff will periodically review the experience with their implementation, introduce improvements, refinements, and alterations, as necessary, and, more generally, continue to conduct research on the issues, in close consultation with partners and stakeholders.

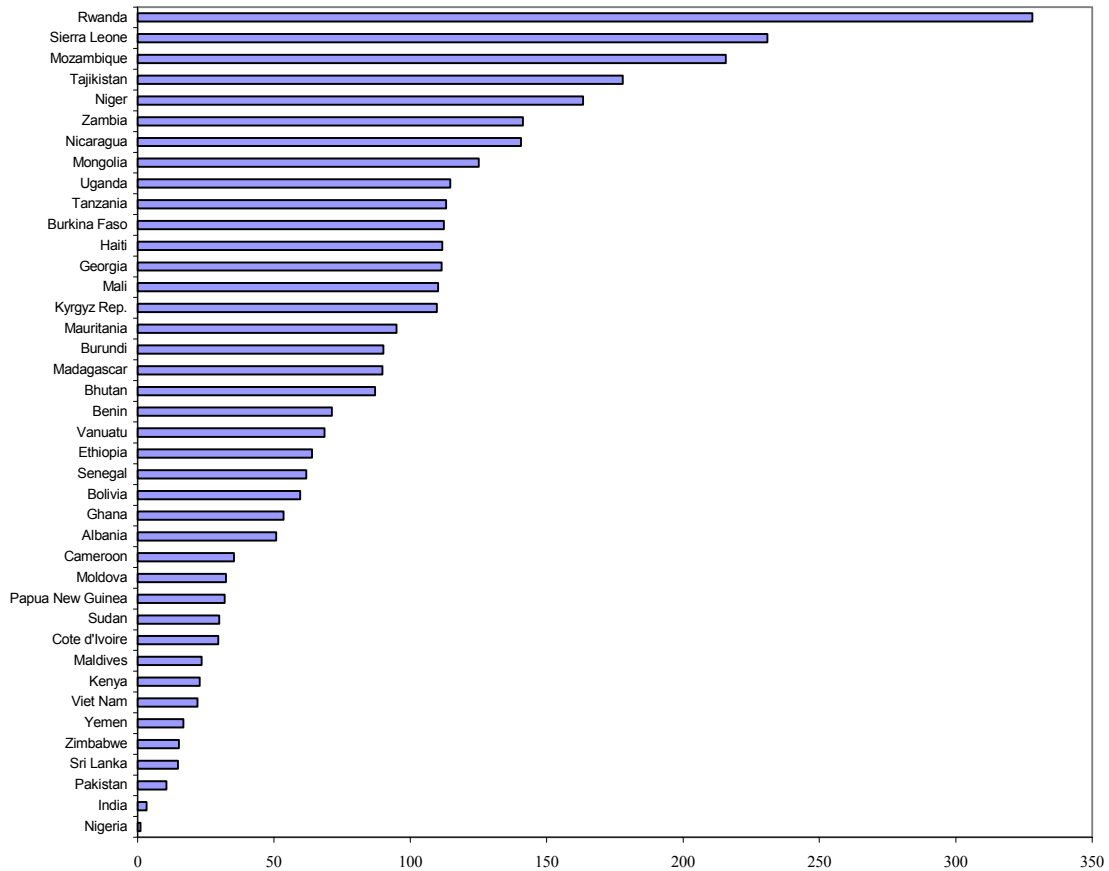
11. **The rest of this paper is structured as follows:** Section II discusses the concept and importance of debt sustainability in the specific context of low-income countries. Section III develops the proposed operational framework for debt-sustainability assessments, consisting of indicative country-specific thresholds and long-term projections and stress testing of debt-burden indicators. Section IV examines implications of the framework for creditors and donors, focusing on the need to provide financing on appropriately concessional terms and to design instruments that mitigate the impact of exogenous shocks. Section V probes the main implications for borrowers, acknowledging that they bear the ultimate responsibility for ensuring that their debts remain sustainable. Section VI presents the main conclusions, and Section VII summarizes the key issues for discussion.

II. WHY IS DEBT SUSTAINABILITY IMPORTANT?

12. **The concept of debt sustainability in low-income countries is different from that in middle-income countries that rely primarily on private financing.** While low-income countries are a diverse group—ranging from poor countries with weak policy records and histories of war and civil strife to relatively advanced economies that have some access to private capital inflows and are on the verge of becoming emerging markets—most countries in this group rely predominantly on official financing (Figure 1). As a result, the

⁶ The staffs of the two institutions consulted widely with government officials, bilateral donor agencies, representatives of multilateral development banks, academics, and non-government organizations. On all these occasions, helpful comments were received that have helped shape the proposed framework contained in this paper.

Figure 1. Official Development Assistance to Selected Low-Income Countries, Average 1995-2000 1/
(In percent of total government revenue, excluding grants)



Source: World Bank World Development Indicators, Global Development Finance, IMF Government Finance Statistics, 2003, and IMF staff estimates.

1/ ODA flows include loans and grants net of principal repayments.

sustainability of their debt—i.e., the condition that this debt can be serviced without resort to exceptional financing or a major future correction in the balance of income and expenditure—is largely de-linked from the sentiments of the market, as embodied in spreads on market interest rates. Indeed, to the extent that donors and creditors base the allocation of new aid flows on the implied *net* transfers to recipient countries—effectively providing more gross transfers to those countries with higher debt-service payments—debt sustainability is a particularly blurred concept in these countries.⁷ Debt can be serviced for long periods, or

⁷ Empirical analysis shows that this describes the past behavior of creditors and donors fairly accurately. See for example, Birdsall et al. (2002) and Powell (2003).

suddenly become unsustainable, depending on the willingness of official creditors' and donors to provide positive net transfers through concessional loans and grants.

13. **Even though the risks are different, excessive debt in low-income countries is a serious problem, and debt sustainability remains an essential condition for economic stability.** The high cost of unsustainable debt for economic growth and development is borne out by the experience of many heavily indebted poor countries, and has been a focus of debate in the literature in the context of the debt-overhang theory.⁸ In a nutshell, it can be argued that, if a country is expected to service and repay its debt from its own future resources, high debt creates adverse incentives associated with (present and anticipated) distortionary taxes. But if debt service that is considered excessive relative to the available resources is expected to be covered by increased aid flows or debt relief, this may undermine a government's incentives to maintain sound macroeconomic policies and increase its own repayment capacity.⁹ An additional consideration is the cost of a debt restructuring itself, which can be highly disruptive to economic activity and undermines the development of a credit culture by eroding the sanctity of credit contracts. Moreover, as countries with heavy debt-service obligations require larger gross official inflows to finance a given primary deficit, they are more vulnerable to a discontinuation, or interruption, of official flows—or to a general shift in aid policies as a result of changing priorities of creditors and donors. This issue may become more pressing in the future, because the predominance of multilateral debt, both in existing stocks and new borrowing, reduces these countries' ability to have temporary liquidity problems alleviated through Paris Club reschedulings. With very limited alternative financing options, these countries face higher risks not only of becoming unable to meet their debt-service obligations, but also of seeing their social and developmental progress halted, or even reversed, in the event that official aid recedes. This creates uncertainties about the future that tend to discourage governments and private investors from engaging in longer-term commitments. Finally, a rising share of revenues devoted to debt-service payments—even if financed by new aid flows—weakens a government's ability to implement its own policies, particularly as aid flows are often earmarked. The result can be a severe loss of ownership that undermines public support for policy reforms and brings governments under pressure to renege on their debt-service obligations.

⁸ The literature on the debt overhang, which was originally developed in the context of middle-income countries' excessive indebtedness to private creditors but has been increasingly applied also to low-income countries, is vast. A few prominent examples are Cohen and Sachs (1986); Krugman (1988); Sachs (1989); Cline (1995); Agénor and Montiel (1996); and Servén (1997). For a summary of the literature, see Patillo et al. (2002), as well as Loko et al. (2003).

⁹ These adverse incentive effects are part of the motivation for donors and creditors to link aid flows increasingly to indicators of policy performance.

14. **The above problems are exacerbated by certain characteristics of many low-income countries that adversely affect their ability to cope with high debt.** These include: (i) risks of misuse and mismanagement of resources, due to weak public institutions, poor governance, and generally low implementation capacity; (ii) returns on investment that frequently accrue only over the long term, and whose benefits (such as, from improved security and health care) may be diffuse and cannot be easily captured by governments in the form of higher taxes to repay debts; and (iii) narrow and highly volatile production and export bases that make these countries particularly vulnerable to exogenous shocks that can significantly worsen their debt dynamics. The more prevalent these factors are in a given country, the larger the risk that debt-service obligations, even on concessional terms, reach levels that undermine a government's ability to devote sufficient resources to areas of social and economic priority. This argues for a tailored approach to assessing debt sustainability in low-income countries that incorporates the extent to which countries are subject to such political, institutional, and structural risks.

15. **The corresponding risk to creditors from unsustainable debt burdens in low-income countries is that they may be forced into new lending or debt relief for the purpose of maintaining positive net transfers.** Such a policy implies that new loans today trigger the need for additional financing or debt forgiveness in the future, as the debt service may otherwise place an intolerable adjustment burden on the borrower. Since most official lending to low-income countries is concessional, a policy under which countries with high debt service systematically receive more new loans (or debt relief) is neither a fair nor transparent way of allocating scarce official resources. Within a given aid resource envelope, such an allocation mechanism, that effectively earmarks these resources to keep high debtors afloat, necessarily comes at the expense of other deserving countries, undermining efforts to direct funds in support of good policies.

16. **These risks highlight the importance of using the HIPC Initiative to break the cycle.** But the Initiative needs to be implemented successfully, and, in particular, countries that have not yet benefited from HIPC assistance need to adopt and maintain sound policies (Box 1). Beyond that, it is crucial that the ongoing implementation of the HIPC Initiative be accompanied by a new regime under which official lenders and donors allocate concessional resources on the basis of countries' policies and in support of the MDGs rather than on the basis of existing debt-service obligations arising from past borrowing decisions. The HIPC Initiative facilitates this regime change by limiting its support to those countries that are pursuing sound policies. But it can only be effective in the long run if lenders prove more successful than in the past in tailoring the provision of new loans to countries' future capacity to repay.

Box 1: Implementing the HIPC Initiative

The HIPC Initiative was designed as a debt-reduction mechanism to end repeated debt reschedulings and defensive lending and thus provide a solid foundation to qualifying countries for achieving debt sustainability and accessing new resources for development finance. It constitutes a strong commitment of the international community to reduce substantially the external debt burden of heavily indebted poor countries that pursue prudent economic policies and implement agreed social and structural reforms, thus contributing to a process supporting growth and poverty reduction. Twenty-seven HIPCs, more than two-thirds of the 38 countries that potentially qualify for assistance under the Initiative, have reached the decision point, where the international community commits itself to providing sufficient assistance at the time of the completion point for these countries to achieve debt sustainability. The completion point is reached when the Executive Boards of the IMF and the World Bank decide that the country has met the agreed conditions for assistance under the Initiative. Debt relief committed to the 27 decision point countries accounts, in present value terms, for about 85 percent of the total expected relief for the 34 HIPCs for which data are available. Ten HIPCs have reached the completion point, most recently Nicaragua, in January 2004.

The Initiative has had a substantial impact in reducing debt stocks and debt service and reallocating the savings on debt-service payments to poverty-reducing expenditures. As a result of HIPC relief, debt stocks for the 27 HIPCs that have reached the decision point are projected to decline by about two-thirds in NPV terms; the debt-service-to-exports ratio declined from an average of 15.7 percent in 1998 and 1999 to 9.9 percent in 2002; annual debt service is projected to be about 30 percent lower during 2001-05 than in 1998 and 1999, freeing about US\$1.0 billion in annual debt-service savings; and poverty-reducing expenditures increased from about US\$6.1 billion in 1999 to US\$8.4 billion in 2002 and are projected to increase to US\$11.9 billion in 2005. Revised figures on debt relief and net aid flows also suggest that debt relief provided has been additional to other forms of external financing.

Eleven potentially eligible HIPCs face a substantial remaining challenge in reaching the decision point. Most of these countries are affected by conflict and several have protracted arrears. It is hoped that some of these countries could establish a policy performance record by the end of 2004 when the sunset clause of the Initiative takes effect. There may also be other countries, whose debt ratio has recently increased, that could be considered eligible for debt relief under the HIPC Initiative.

The process of reaching the completion point has generally taken longer than earlier envisaged. Delays have been experienced because of difficulties in maintaining satisfactory performance records in macroeconomic programs primarily due to fiscal policy slippages, as well as longer than previously anticipated time to prepare PRSPs. Currently, 10 of the 17 countries in the interim period (between decision and completion point) have satisfactory performance records in their macroeconomic programs.

Debt ratios in a few cases have deteriorated after completion point as a result of declines in commodity prices, under-delivery of debt relief by some creditors, higher-than-expected new borrowing, and a decline in discount rates. These were all factors in the case of Uganda, for example. In Mali, the debt ratio has been adversely affected by declines in world gold prices, while in Bolivia substantial new borrowing due to widening fiscal deficits and substantial financing for a large energy project have been important factors.

Overall creditor participation has been strong and is improving, but is not yet unanimous. All Paris Club bilateral creditors and multilateral creditors representing more than 99 percent of debt relief required from this group have agreed to participate in the HIPC Initiative. Among non-Paris Club creditors, countries representing more than 80 percent of the required NPV contributions have made some debt-relief commitments, but 24 members have not yet indicated their agreement to participate. Participation by commercial creditors has been limited. Their share of the outstanding debt stock has been substantially reduced through the Debt Reduction Facility for IDA-only countries. For the 27 Decision Point countries, commercial debt account for only 2.4 percent of HIPC assistance, in present value terms. Nevertheless, a recent survey indicated that of 28 HIPCs, nine were facing litigation on credits held by commercial creditors, and settlement of such claims could involve substantial costs for debtors.

17. **Notwithstanding the strong arguments for keeping low-income countries' debt levels manageable, designing an optimal borrowing (and lending) strategy is far from straightforward.** While an overly conservative approach to new borrowing may unnecessarily constrain net inflows—hampering the efforts of low-income countries to attain their development goals—too permissive a framework risks sowing the seeds of future debt-servicing problems. Given that repayment obligations cover a time horizon of several decades, the uncertainties are large.

18. **These considerations suggest two key principles upon which a prudent financing strategy for low-income countries should be predicated:**

i. New lending should be geared to a country's capacity to carry debt—which in turn, depends on its ability to use these resources effectively for development and growth, and on its vulnerability to shocks.

ii. To the extent that additional resources, beyond a country's capacity to carry debt, may be productively employed to generate growth and achieve the MDGs—these resources should be provided in the form of grants rather than loans.

These principles assign a central role to country-specific debt sustainability assessments in determining the appropriate mix of loans and grants. The following section proposes an operational framework for undertaking such assessments and discusses some of the trade-offs and considerations involved.

III. AN OPERATIONAL FRAMEWORK FOR DEBT SUSTAINABILITY ASSESSMENTS

19. **A key consideration in designing an operational framework is the appropriate balance between rules and discretion.** A more standardized, rules-based approach generally implies greater transparency and promises to be more effective in disciplining future financing decisions. On the other hand, the heterogeneity of low-income countries argues for a more flexible approach that takes account of country-specific circumstances. Indeed, even a fairly standardized framework requires judgment at various stages of the analysis: projecting a country's debt burden and its debt-servicing ability; choosing the appropriate indicators to assess debt sustainability; and deciding what constitutes a debt level that signals distress by imposing an excessive burden on a country's existing or future resources. The following proposal seeks to balance these two dimensions, by establishing indicative thresholds for a range of debt-burden indicators that explicitly incorporate country-specific factors found to be most relevant for debt sustainability. These thresholds pertain to public and publicly guaranteed external debt which typically dominates low-income countries' total external and public sector debt, and is the portion most important to the official international community. However, the proposed framework recommends incorporating public domestic debt as well as private external debt, wherever relevant, into the analysis—although no thresholds are proposed for them. The approach does not eliminate the need for judgment in specific cases, but is intended to guide and discipline future financing decisions, since experience suggests

that approaches based on judgment alone may be insufficient to prevent an excessive rise in debt.

A. General Considerations

20. **Analyses of debt sustainability are inherently forward-looking and probabilistic.** Whether a country—and specifically its government—will be able to service its debt depends on its existing debt burden as well as the prospective path of its deficits, the financing mix between loans and grants, and the evolution of its repayment capacity—namely (the foreign currency value of) GDP, exports, and government revenues. Projections of the debt dynamics provide a link between debt sustainability and macro-economic policies. At the same time, such projections are only as good as their underlying assumptions, and these assumptions have a particularly slender basis for the long time horizon implied by the average maturity of concessional loans. The scope for error is large—both on the upside and the downside—with past experience suggesting a systematic tendency toward excessive optimism.¹⁰ Indeed, while the specifics differed across countries, a common theme behind the historical rise in low-income countries’ debt ratios was that borrowing decisions were predicated on growth projections that never materialized. This experience points to the need for well-disciplined projections, including by laying bare the assumptions on which they are predicated and by subjecting them to rigorous stress tests that explicitly incorporate the impact of exogenous shocks.¹¹

21. **Debt sustainability can be assessed on the basis of indicators of the debt stock or debt service relative to various measures of repayment capacity (typically GDP, exports, or government revenues).**¹² Each of these indicators has its merits and its limitations, suggesting that they should be used in combination.¹³

¹⁰ An analysis of projections made by Fund staff over the period 1990-2001 suggests a bias toward over-optimism of about 1 percentage point a year in forecasts of low-income country real GDP growth. The bias in projecting GDP growth in U.S. dollar terms, however, was considerably larger, at almost 5 percentage points a year.

¹¹ This is the approach in the Fund’s framework for middle-income countries, where a baseline scenario depicts the likely evolution of the debt ratio, while standardized stress tests, calibrated on countries’ historical performance, provide a probability-weighted indication of alternative debt outcomes.

¹² Conceptually, debt sustainability assessments should be based on a government’s net worth, in present value terms, which is the difference between its debt and the present value of its future primary surpluses. However, given that such an assessment must rely on very long-term projections (theoretically covering an infinite horizon) they are less useful for practical purposes. Moreover such assessments do not identify potential liquidity problems.

(continued)

- *Debt service* is the most obvious measure of the immediate burden that debt imposes on a country by crowding out other important uses of scarce resources by the borrower. Debt-service ratios provide the best indication of this claim on resources and the associated risk of payment difficulties and distress. In the same vein, low and stable debt-service ratios are the clearest indication that debt is likely to be sustainable. However, in light of the back-loaded repayment profiles typical of concessional debt, current debt-service ratios may understate the burden inherent in the existing debt stock. In principle, this problem can be avoided by examining the projections of debt-service ratios, but these projections are subject to very large uncertainties associated with making forecasts over periods as long as 40 years.
- *Debt stocks* provide a useful shorthand measure of the future debt service burden inherent in *existing* debt. This burden is best measured by the *present value of debt*, which—in contrast to its face value—captures the concessionality of outstanding obligations. Reliance on existing NPV-based indicators avoids the need for projections, but is not without problem, as such indicators compare future debt-service obligations with existing repayment capacity without taking account of countries' ability to grow. This is particularly relevant when maturity periods are long. Similarly, while the NPV-based indicators may signal debt-servicing difficulties some time in the future, they do not provide information on when these problems may become pressing. Moreover, NPVs are sensitive to the level of the discount rate and can be difficult to interpret when discount rates change with market conditions (see Box 2). The appropriate discount rate should ideally capture the long-term return on risk-free assets, suggesting an approach that filters out temporary fluctuations. For this reason, it is proposed that the discount rate for future NPV calculations outside the HIPC Initiative be set initially at 5 percent—the (rounded) current level of the U.S. dollar CIRR—and be adjusted by a full 100 basis points whenever market rates (measured by the 6-month average of the U.S. dollar CIRR) deviate from it by at least this amount for a consecutive period of six months. This proposal strikes a balance between the desire to keep the discount rate stable without de-linking it entirely from market conditions.
- Finally, the choice of the most relevant *denominator* depends on the constraints that are most binding in an individual country, with GDP capturing overall resource constraints, exports those on foreign exchange, and revenues those on the government's ability to generate fiscal resources. In general, it is useful to monitor external debt in relation to GDP and export earnings and public debt in relation to GDP and fiscal revenues. Similarly, external and public debt service are usefully expressed relative to exports and revenues, respectively.

The practical convention is therefore, to assess debt sustainability on the basis of the above mentioned indicators.

¹³ See IMF (2003a), for a more extensive discussion of the pros and cons of individual indicators.

Box 2. Methodology for NPV Calculations Under the Proposed Framework

The NPV of debt, which is derived by discounting the outstanding debt-service stream by an appropriate interest rate, provides a comparable measure of countries' effective debt-service burden. The idea is that the same nominal amount of debt in two countries, can imply a very different effective burden, depending on the interest rate charged and the repayment structure. By discounting the two debt-service streams by the *same* interest rate, the NPV captures this difference. It is therefore superior to the nominal debt stock in measuring the effective debt burden of countries on a comparable basis.

The key difficulty in deriving NPVs is the choice of the discount rate. An obvious choice is to use a risk-free, forward-looking "world market interest rate" as a common discount factor. The NPV can then be interpreted as the "commercial equivalent" of the debt stock, corresponding to the amount a country would have to put aside in reserves (i.e., invest risk-free) today, to cover its future debt-service obligations. Applying this notion in practice has led to the use of currency-specific commercial interest reference rates (CIRRs), which correspond to secondary market yields on government bonds in advanced economies with maturities of at least 5 years. CIRRs can, in theory, be interpreted as forward-looking, risk-free world market rates, and, at the same time, allow a market-based comparison of the "sacrifices" by different creditors (captured in the difference between the face value and the NPV of a loan).

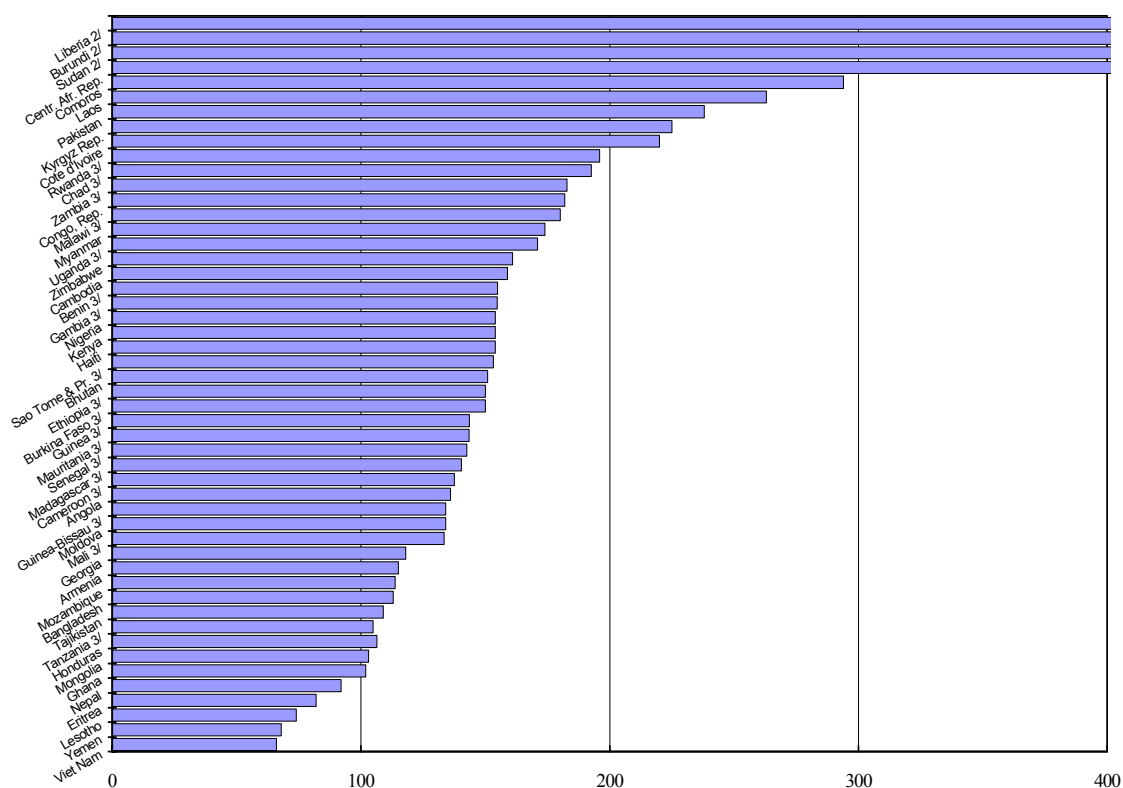
Using CIRRs as discount rates, however, is not without problems.

- **First, it is not obvious how to interpret changes in NPVs due to movements in world interest rates.** Since the actual (nominal) debt-service payments on fixed-rate concessional debt do not change in response to movements in advanced economies' interest rates, one interpretation is that these changes simply reflect valuation adjustments without altering the borrowing countries' economic circumstances. An alternative interpretation is that to the extent that world interest rates embody information on expected future world inflation (consistent with the Fisher equation), lower (higher) interest rates would signal weaker (stronger) export earnings of borrowing countries in the future. In this wider interpretation of the NPV (that also embodies repayment-capacity considerations but is difficult to prove empirically) lower world interest rates are indicative of higher debt service-to-exports ratios, and thus, a higher risk of debt-servicing difficulties, in the future.
- **Second, in either interpretation, NPVs should only respond to lasting structural changes in world interest rates.** However, CIRRs fluctuate in response to temporary shifts in world-market conditions, and thus provide very noisy signals about long-term developments. While it is impossible to distinguish clearly cyclical from structural changes, a mechanism for filtering out some of the noise seems appropriate to guide long-term borrowing decisions.
- **Finally, the use of currency-specific CIRRs implicitly extends the exchange-rate assumptions embodied in interest differentials throughout the lifetime of a loan.** Since the underlying maturity of the bonds that determine the CIRRs is much shorter than the maturity of most concessional loans, discounting with CIRRs for different currencies exaggerates the exchange-rate movements justified by interest differentials. Using current U.S. dollar and yen CIRRs, for example, implicitly assumes an annual yen appreciation of nearly 3 percent vis-à-vis the dollar, which would translate into a cumulative appreciation of 200 percent over 40 years, to a rate of about 35 yen per dollar. On the other hand, using a common discount rate across currencies would ignore any exchange-rate information embodied in interest-rate differentials and potentially understate the cost of loans in low-interest currencies.

In balancing the above considerations toward a pragmatic operational solution, the following methodology is suggested for NPV calculations outside the HIPC-Initiative context: Debt-service data would be collected in the same currency as other balance of payments items (typically the U.S. dollar). In converting debt-service payments into a common currency, the authorities are advised to incorporate the information embedded in market-interest differentials over the relevant period (e.g. ten years). NPVs would then be derived on the basis of a common discount factor. The discount rate is proposed to be set initially at the (rounded) current level of the U.S. dollar CIRR of 5 percent, but will be adjusted by 100 basis points, whenever the U.S. dollar CIRR (6-month average) deviates from it by at least this amount for a consecutive period of 6 months. This proposal strikes a balance between the desire to insulate NPV calculations from temporary noise, without de-linking it entirely from long-term market trends.

For these reasons, it is best to base debt sustainability analyses on a variety of indicators, acknowledging that each is important in signaling current or prospective constraints that a country may face in meeting its debt-service obligations. At the same time, some structure to assessing these indicators is desirable in an operational context. Accordingly, it is proposed that the framework will, in the first instance, focus on the debt stock in present value terms, as a summary indicator of the future obligations a country has already taken on, while the time path of debt-service indicators would be tracked to assess the likelihood and timing of liquidity problems. For illustration, Figure 2 shows the estimates of NPV debt stocks, relative to exports, for a selected group of low-income countries.

Figure 2. NPV of Debt-to-Exports Ratios in Selected Low-Income Countries, 2001 1/
(In percent)



Source: World Bank, Global Development Finance 2003; and official HIPC documents.

1/ NPV estimates incorporate the delivery of committed debt relief for those countries that had reached the decision point under the HIPC Initiative by end 2001 (see footnote 3). Exports reflect average exports of goods and services for 1999-2001.

2/ Liberia, Burundi and Sudan's NPV of debt-to-exports ratios were 1100, 1700, and 680 percent respectively; they have been truncated for scaling purposes.

3/ Denotes all HIPCs that reached the decision points by end-2001.

22. Perhaps the most difficult judgment lies in choosing the appropriate threshold for assessing whether a country's current or projected debt burden is sustainable.

Clearly, this judgment needs to be informed by the experience of countries encountering debt-servicing problems at alternative levels of debt and with varying frequency. A growing body of empirical literature has examined episodes of "debt distress" in low-income

countries (defined in terms of debt-servicing difficulties—arrears or Paris Club reschedulings—or the impact of debt burdens on growth), tracing these episodes to debt or debt-service indicators associated with a high probability of debt distress or adverse growth implications, sometimes contingent on other macroeconomic and institutional factors.¹⁴ The specific results must of course be interpreted carefully, as the occurrence of debt distress, as measured, depends not only on an indebted country’s difficulties in servicing debt but also on the response of creditors and donors—e.g., on whether to reschedule debt service or provide “new” financing. More generally, as the wider literature on early-warning systems has shown, there are inherent limits to the ability of such models to discriminate between cases in which countries will or will not run into difficulties. Countries experience debt-servicing problems for a variety of reasons specific to their circumstances, and only some of these can be captured in cross-country regressions. These caveats do not deny an important role for empirical thresholds in judging the sustainability of a country’s debt dynamics, but warrant caution in using them too rigidly as binding constraints on new borrowing.

23. **In light of these considerations, the proposed methodology for assessing debt sustainability consists of two building blocks:** (i) the choice of appropriate threshold ranges for debt-burden indicators based on empirical findings and an explicit consideration of country-specific circumstances; and (ii) projection and interpretation of the debt-burden indicators under the policy baseline and under probable “stress scenarios” which incorporate a country’s vulnerability to exogenous shocks. Both steps will require a significant element of judgment to create a balanced financing strategy for an individual country.

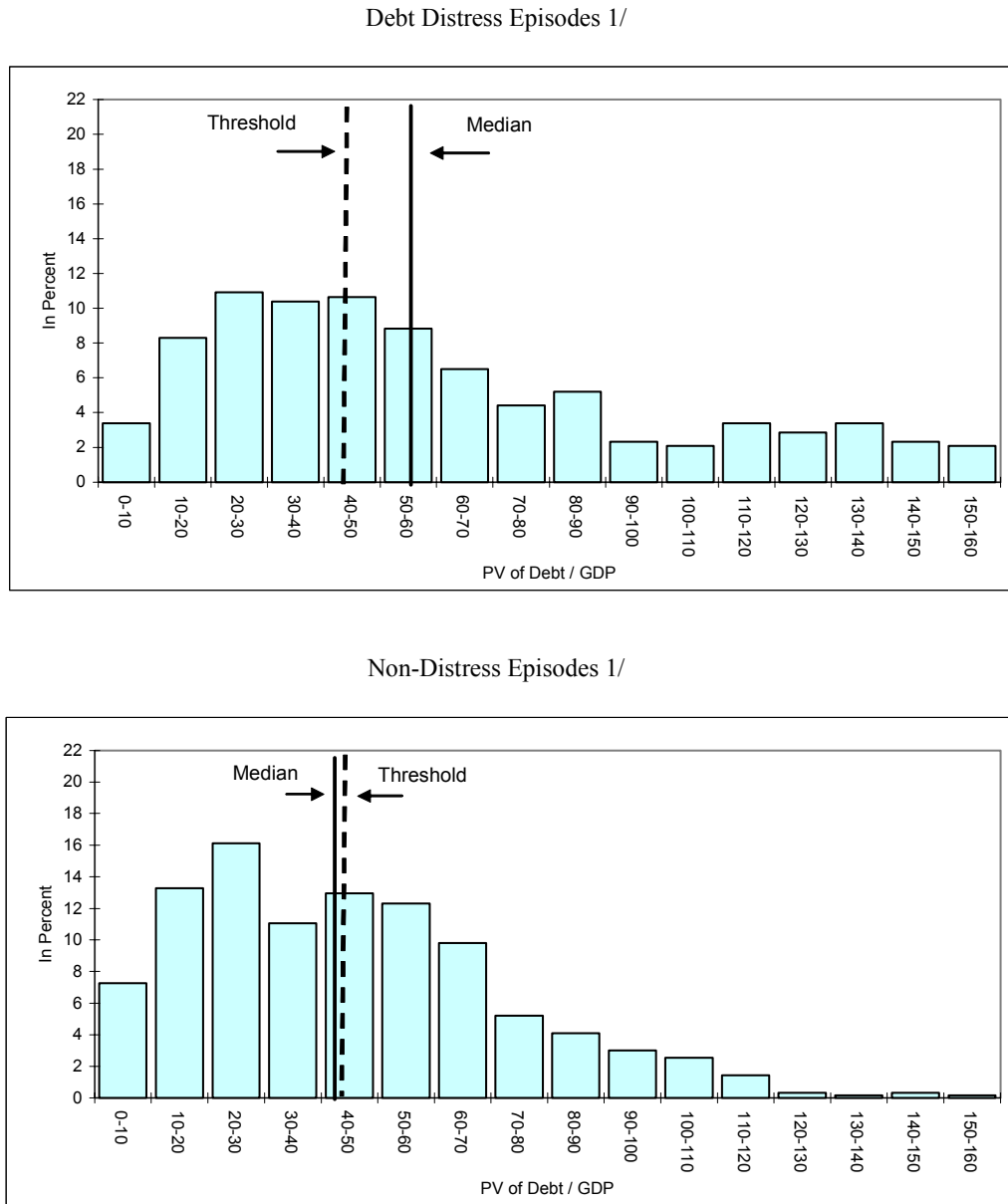
B. Empirical Thresholds

24. **As a first step, it is useful to explore the debt ratios at which low-income countries have run into—or managed to avoid—debt-servicing difficulties in the past.**¹⁵ The upper panel of Figure 3 illustrates the frequency distribution for the NPV of debt-to-GDP ratios that were associated with debt-servicing difficulties, defined by significant arrears accumulation on official debt (equivalent to at least 5 percent of the total debt stock), while the lower panel shows the corresponding distribution for “non-distress” events (at least

¹⁴ See, for example, Kraay and Nehru (2004) who find strong evidence for the importance of institutions and policies, as well as shocks, in determining the debt levels at which countries experience distress. Reinhart et al. (2003) explore the concept of “debt intolerance” in emerging market economies, which, they find, is related to these countries’ repayment history, indebtedness level, and history of macroeconomic stability. Manasse, Roubini and Schimmelpfenning (2003) identify a range of solvency and liquidity factors that help predict debt crises—again applied to emerging markets.

¹⁵ The frequency of debt distress and the associated debt-burden ratios depend on what definitions are used to signal debt distress, and on the sample included in the analysis. See Appendix I for a more in-depth discussion of this analysis.

Figure 3. Frequency Distribution of the Present Value of Debt to GDP for Distress and Non-Distress Events



Source: Staff estimates.

1/ For the definition of distress and non-distress events, see Appendix I. The threshold is defined as the median PV of debt-to-GDP ratio in the year prior to distress.

three consecutive years without significant arrears). A comparison of the two distributions, and of the median levels for the respective debt ratios, shows that “distress” episodes tended to be associated with a noticeably higher debt ratio. To derive debt sustainability thresholds from this analysis, it is useful to focus on the median debt ratio in the year prior to running into debt-servicing difficulties, which can be interpreted as a cutoff for distinguishing distress from non-distress events. This ratio, which is marked by the dotted line, is 43 percent of GDP, and is very similar to the thresholds derived under different methodologies in the empirical literature.¹⁶ Accordingly, it appears to be a reasonable threshold at which an “average” country may be expected to run into problems. While useful as a first cut, such average threshold is nevertheless rather crude, since it disregards other factors that may have an impact on a country’s debt-servicing ability, and thus does not discriminate well between distress and non-distress events. Indeed, the proportion of incidents in which countries either avoided debt-servicing problems at ratios above the threshold or, conversely, experienced difficulties at lower ratios—i.e., the magnitude of “type I” and “type II” errors—is large at about 36 percent each. The threshold analysis therefore needs to be refined by taking account of country-specific circumstances.

25. **Among the factors that influence the debt levels countries can sustain, the quality of policies and institutions turns out to be a key determinant.** Countries operating in a weaker institutional and policy environment are likely to experience debt distress at significantly lower debt ratios, as such countries tend to be more prone to misuse and mismanagement of funds and less capable of using their resources productively. This result, which is one of the key findings of Kraay and Nehru (2004), is corroborated by the Fund staff’s empirical analysis in Appendix I, showing a very similar, and indeed large, impact of policies on the likelihood of distress. With the quality of policies measured by the Bank’s Country Policy and Institutional Assessment (CPIA) index,¹⁷ both studies come to the conclusion that countries operating in a weak policy environment (25th percentile of the CPIA) have the same risk of distress as countries with strong policies (75th percentile) at debt ratios that are lower by about 30 percent of GDP, 200 percent of exports, and 100 percent of revenues (including grants).

26. **As with any “early-warning” system, a crucial decision is which probability of debt distress one is willing to tolerate.** A higher probability allows for more debt, though

¹⁶ See, for example, Cohen (1997) and Patillo et al. (2002), whose findings are discussed in Appendix I.

¹⁷ The CPIA index groups 20 indicators into 4 broad categories: economic management, structural policies, policies for social inclusion and equity, and public sector management and institutions. Countries are rated on their current status in each of these performance criteria, with scores from 1 (lowest) to 6 (highest). The index is updated annually. The country-specific ratings (in quintiles) for both the aggregate indicators and its main components are available at <http://siteresources.worldbank.org/IDA/Resources/Quintiles2002CPIA.pdf>.

obviously at the greater risk of subsequent distress. One possibility, adopted by Kraay and Nehru, is to benchmark the probability on the average, or unconditional, likelihood of debt distress (which is 25 percent in their sample).¹⁸ They therefore derive debt thresholds, contingent on the quality of a country's policies and institutions, such that the probability of

Table 1. Empirical Debt Sustainability Ranges (in percent) 1/		
	Bank staff analysis 2/	Fund staff analysis 3/
NPV of debt-to-GDP	21-49	26-58
NPV of debt-to-exports	79-300	83-276
NPV of debt-to-revenue	142-235	138-264
Sources: Kraay and Nehru (2004); and Fund staff estimates (see Appendix I). 1/ Ranges correspond to CPIA policy ratings at the 25 and 75 percentile, respectively. 2/ Corresponds to a 25 percent distress probability. 3/ Corresponds to a 20 percent distress probability, consistent with an NPV of debt-to-GDP threshold for "average policies" of 43 percent (in line with the median in the year prior to distress).		

debt distress at that debt level is 25 percent.¹⁹ An alternative approach is to benchmark on the average (or unconditional) debt threshold at which countries have first run into debt-servicing difficulties. This is the approach followed by Fund staff in the analysis presented in Appendix I. By using the average threshold of 43 percent of GDP derived above, the probability of debt distress for a country with an average quality of policies and institutions turns out to be 20 percent.²⁰ Table 1 spells out the implied debt threshold ranges

¹⁸ See Kraay and Nehru (2004).

¹⁹ An unconditional distress probability of 25 percent means that there is a 75 percent chance that a given country in a given year will not experience any of the three indicators of distress used in the study for the next five years. Conversely, there is a 25 percent chance that at least one of the three incidents of distress will be observed in the next year, and will continue to be observed for at least three years.

²⁰ Four important explanations for the difference in the unconditional probabilities of debt distress are that the Fund staff study (i) focuses on low-income countries only, while Kraay and Nehru use a wider sample of developing countries; (ii) accommodates the smaller sample size by applying a less rigorous methodology to discriminate distress from non-distress events; (iii) applies a more restrictive definition of debt distress; and (iii) uses an NPV series
(continued)

corresponding to the 25th and 75th percentiles of the CPIA index. While the results are very similar, it bears emphasizing that the implicit choice of distress probabilities remains a policy decision. The above ranges are guided by historical experience of debt distress, but higher or lower thresholds—and correspondingly higher or lower risk of debt distress—may be regarded appropriate in a forward-looking framework that attempts to balance the risk of debt distress with the need for new financing.

27. **Irrespective of what probability of debt distress is considered tolerable, the empirical evidence suggests that debt thresholds should be established in light of the quality of a country’s policies and institutions.** Table 2 presents a translation of this notion into an operational matrix, by defining indicative policy-dependent debt limits, based on the (rounded) results of Bank and Fund staff’s empirical analyses. As stressed above, while the

	Table 2. Indicative Policy-Dependent Debt and Debt-Service Thresholds (in percent)		
	Assessment of Institutional Strength and Quality of Policies		
	Poor	Medium	Strong
NPV of debt-to-GDP	30	45	60
NPV of debt-to-exports	100	200	300
NPV of debt-to-revenue	150	200	250
Debt service-to-exports	15	25	35
Debt service-to-revenue	20	30	40

Source: Staff calculations.

differences in debt thresholds between poor and strong policy performers are independent of the chosen probability, the absolute levels of these limits are a function of the probability for distress one is willing to tolerate. If the approach of centering the debt thresholds around the unconditional benchmark of about 45 percent of GDP is acceptable, these limits provide a useful basis to guide future borrowing (and lending) decisions—perhaps with a conservative bias, given that the underlying NPV data in the empirical analyses are derived on the basis of historical discount rates (either fixed average rates or variable CIRRs) that are higher than

that is derived on the basis of a fixed discount rate of 7½ percent, while the NPVs in the Kraay and Nehru study are derived using (variable) CIRRs.

current rates.²¹ Finally, Table 2 also presents indicative thresholds for debt-service ratios based on the findings of Kraay and Nehru, and derived on the same basis as the debt-stock thresholds.²² This would suggest that countries with strong policies and institutions may be able to sustain debt service of up to 35 percent of exports and 40 percent of revenues, while poor performers should limit these ratios to about half the size.

28. **The suggested approach implies that debt sustainability assessments incorporate an explicit evaluation of a country's institutions and policies.** While a number of historical indicators are available to help inform this assessment, it inevitably requires judgment. Besides the Bank's comprehensive CPIA index, which is published in quintiles and encompasses both objective macroeconomic criteria as well as subjective assessments by its staff, other historical indicators are available to complement the assessment. These include a governance index compiled by Bank staff along six dimensions,²³ other indices of transparency (such as Transparency International's country ratings) and of political risk and bureaucratic quality (such as the International Country Risk Guide), assessments of compliance with standards and codes undertaken in the context of FSAPs, and measures of the track record of policies under Bank- and Fund-supported programs. In addition, Fund staff has begun to explore ways in which to assess the quality of policies more systematically across member countries in the context of the forthcoming Global Monitoring Report. Beyond these historical indicators, the *prospective* quality of policies—which is the relevant concept—may also be influenced by new developments, such as emergence from conflict, changes in government, or recent reforms that are expected to have a significant bearing on future policy performance. Caution will need to be exercised, however, to prevent policy optimism from feeding into excessive levels of new borrowing before evidence of improvements becomes apparent.

29. **Besides the quality of policies and institutions, a country's susceptibility to shocks has been found to have a significant bearing on the debt levels it can sustain.**

²¹ Whether this introduces, indeed, a conservative bias to the framework depends on the interpretation of NPVs in response to discount-rate movements, as discussed in Box 2. Such a bias is less obvious if a lower discount rate is suggestive of a weaker prospective repayment capacity and consequently higher risk of debt distress for a given nominal debt-service profile.

²² In the Fund staff analysis, the implicit debt-service thresholds are not very meaningful, because they are contaminated by the effect of arrears (consistent debt-service series are only available on a payment basis). Kraay and Nehru circumvent this problem by applying a more rigorous methodology to distinguish distress from non-distress events. Since this methodology effectively reduces the number of useable observations, however, it is not an option for the Fund staff analysis, which is based on a smaller sample of countries.

²³ See <http://www.worldbank.org/wbi/governance/govdata2002/>.

Adverse movements in key macroeconomic variables can undermine a country's debt-servicing capacity and move debt ratios onto an explosive path. The variables that determine the vulnerability of a country's debt outlook include the volatility of its export earnings, output growth, and exchange rate path, as well as fluctuations in non-debt financing, including both grants and foreign direct investment. In a forward-looking framework, these factors are best captured through stress tests, calibrated to a country's historical volatility. It is proposed that the stress test results be interpreted in a manner such that a country's debt outlook should be robust (i.e., remain below its respective thresholds) not only in the baseline but also in the face of probable shocks.²⁴ While the specifics of this proposal—including the time horizon to which it applies—are elaborated in the following section, it should be stressed that this interpretation introduces a conservative bias to the framework; baseline ratios would have to be below the respective thresholds by a margin that corresponds to the impact of country-specific shocks. This conservative bias serves to counteract the empirical bias toward over-optimism in baseline projections of debt ratios.

30. **Finally, while other factors undoubtedly play a role in affecting an individual country's ability to carry debt, there are limits on the extent to which they can be captured systematically in the framework without making it too complex.** Such factors may include complementary indicators of a country's absorptive capacity and of a government's ability to devote its resources to servicing debt. In many instances, a useful proxy for this ability may be a country's per capita income level under the plausible assumption that poorer countries have more limited absorptive capacity and smaller cushions against shocks, while facing generally tighter constraints in diverting resources from low-priority areas toward debt service.²⁵ In addition, concerns about the denominators (GDP, exports, and fiscal revenues)—such as, measurement or coverage issues—may warrant caution in interpreting the debt-burden indicators. While the framework needs to have the flexibility to take account of such considerations, it is important that this does not undermine its overall purpose, which is to strike an appropriate balance between countries' short-term financing and longer-term sustainability concerns. It is therefore proposed that such factors that are considered important for an individual country's debt-servicing ability—and that are not captured already in the assessment of policies and macroeconomic volatility—be taken into account in the interpretation of the results of the debt sustainability analysis, discussed in the next section.

²⁴ This provision would not be sufficient to deal with large, unforeseen shocks, which would require additional measures (see Section IV B).

²⁵ This argument is similar to the “tapering-in” proposal for aid flows, which suggests that new financing should grow in step with countries' administrative and absorptive capacity (see Collier and Dollar (2002), and Bulir and Lane (2002) for a discussion). The notion that poorer countries tend to run into debt-servicing problems at lower debt levels is indeed supported by the staffs empirical analysis which incorporates per capita income as a statistically significant control variable in its probit regressions.

31. **To summarize, cross-country empirical studies provide useful insights for assessing the sustainability of countries' current and projected indebtedness.** An important empirical finding is that there is significant *dispersion* in the debt ratios that countries can sustain, and that the quality of a country's macroeconomic policies and institutions has a crucial bearing on the levels associated with distress. The proposed framework builds on this finding, by making the quality of policies and institutions an explicit factor in setting indicative country-specific thresholds. Importantly, this approach implies that the established thresholds are inherently dynamic, as countries that advance and improve their policies and institutions will be able to sustain higher levels of debt. In contrast to the policy dimension, a country's susceptibility to shocks—while also of major importance for debt sustainability—will not be captured in the country-specific threshold but rather through stress-tests, by defining a prudent borrowing path that keeps debt ratios at sustainable levels also in the event of plausible shocks. Finally, a careful case-by-case judgment will be required to incorporate other considerations that are deemed to have a significant bearing on the debt and debt-service ratios countries can sustain.

C. Analysis of Current and Projected Debt Indicators

32. **Once indicative thresholds have been established, the second step consists of assessing and interpreting a country's current and prospective debt-burden indicators under the baseline and in the event of probable shocks.** The purpose of this second step is to examine the implications of current policies and possible shocks which may take debt to risky levels in the future. The proposed analysis consists of two elements: (i) projections and stress testing of the five relevant debt-burden indicators in a standardized format; and (ii) analysis and interpretation of the main debt-sustainability concerns.

Long-Term Projections and Stress Testing

Projections and stress-test results would be presented in standardized templates for public and external debt dynamics that lay bare the assumptions on which they are predicated. The proposed approach is an adaptation of the debt sustainability framework that has been applied in the Fund to countries with significant access to financial markets, including industrial and emerging market economies.²⁶ The suggested low-income country templates for external and public sector debt—to be used for debt-sustainability analyses outside the context of the HIPC Initiative which is governed by its own specific rules—are discussed in more detail in Appendix II, on the basis of two hypothetical country cases, and their interpretation is summarized in Box 3. The templates derive the path of the five main indicators—both under the policy baseline and under stress—and make explicit the key

²⁶ See IMF (2002) and IMF (2003b). For those low-income countries that rely strongly on private financing and hold only a small share of debt on concessional terms, it may be more appropriate to conduct the analysis on the basis of the framework for “market-access countries”.

Box 3: Debt Sustainability Analysis—Illustration of the Proposed Approach

This box summarizes the key features of the proposed approach for external and public debt-sustainability assessments which is illustrated, in more detail, in Appendix II, on the basis of two hypothetical country cases. In general, the sustainability of both external and public sector debt should be assessed separately, unless domestic debt of the public sector (external debt of the private sector) is negligible, in which case a single analysis of external (public) debt would be deemed sufficient. Moreover, in those low-income countries that have access to private international capital markets and hold relatively small amounts of concessional debt, the Fund's existing template for countries with "significant market access" may be a more suitable analytical tool to assess debt sustainability.

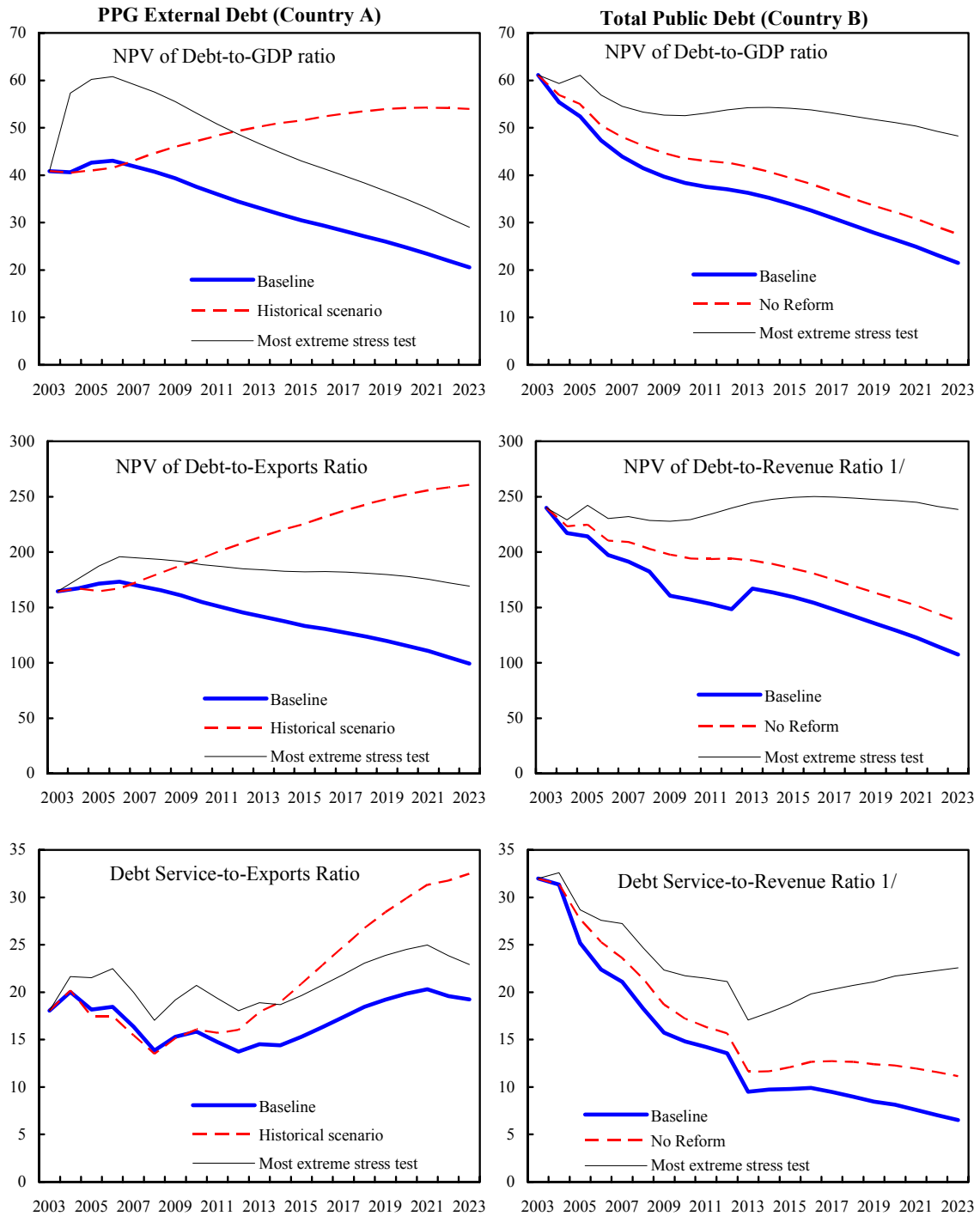
The results of the external debt sustainability analysis are summarized in the left-hand panels of Figure 4 for the hypothetical country A. Based on an assessment of Country A's policies and institutions, debt-burden thresholds of **40 percent of GDP** and **180 percent of exports** are deemed appropriate upper benchmarks for the NPV of its public and publicly guaranteed (PPG) debt, with a corresponding PPG debt-service threshold of about **20 percent of exports**. A comparison of the projected debt-burden ratios with these thresholds suggests that Country A's debt situation, while projected to improve in the long run, is tight over the medium term, with little room for borrowing beyond what is projected in the baseline.

Stress tests confirm this preliminary conclusion. The analyzed stress tests include a "historical scenario" where key variables are assumed to be at their historical averages, an "adverse financing scenario", simulated as a consistently higher interest rate on new borrowing, and so-called "bound tests" that model the implication of temporary adverse deviations in key parameters from the baseline projections—with the size of the deviations informed by Country A's historical experience, measured by averages and volatility. The interpretation of the bound tests is linked to projections 10 years ahead, at which point they correspond roughly to an average probability of 25 percent. Country A's historical scenario produces a considerable deterioration in the debt-burden indicators over time. The reason for the deviation from the baseline is the gap between current account deficits and FDI inflows, which is projected to shrink over time. Thus, a convincing case for the favorable outlook for FDI flows and the current account would have to be made, in this specific case, to justify the baseline projections. Moreover, four of the six bound tests result in NPV of debt-to-GDP ratios that exceed the indicative threshold by 4-7 percentage points after 10 years. The analysis therefore suggests that country A should try to seek higher concessionality in its new financing or keep its borrowing levels below those envisaged under the baseline to create more room for maneuver in the event of adverse shocks. A revision of borrowing plans would seem warranted, in particular, if FDI inflows over the coming years fall short of expectations.

The analysis of public debt sustainability in Country B is summarized in the right-hand panels of Figure 4. Country B's government has considerable domestic obligations of 20 percent of GDP, which are included in the NPV simulations at their face value. However, due to HIPC assistance, the external component of Country B's public sector debt is below its assumed indicative thresholds of **45 percent of GDP** and **200 percent of revenues, including grants**, in present value terms. Both overall and external public debt are projected to improve considerably over time, on account of strong GDP growth (relative to Country B's history) and front-loaded fiscal adjustment. Total debt service, which absorbs more than 30 percent of revenues in the near term, is projected to fall rapidly, as expensive domestic debt is being reduced.

The stress tests, which are applied to total public debt, suggest that Country B's debt dynamics are particularly vulnerable to a weaker growth outlook. While the "historical scenario", as well as a "no-reform scenario" (akin to an unchanged primary balance) would imply a favorable debt outlook—though less optimistic than under the baseline—slower long-term growth would keep debt ratios high. Vulnerability to weaker growth is also confirmed by the "bound tests". Reflecting country B's poor and volatile historical growth record, the standard two-period shock to growth would be sufficient to keep the NPV of overall public debt high after ten years, at about 55 percent of GDP and 245 percent of revenues. With projected domestic debt of less than 7 percent of GDP and 30 percent of revenues, the implied ratios for PPG external debt would be slightly above their respective thresholds. Although total debt service would remain below 20 percent of revenues, Country B's borrowing strategy would have to be revisited, if the optimistic growth assumptions fail to materialize in the coming years. More generally, an adjustment strategy focused more strongly on raising revenues rather than relying on spending cuts, would appear more viable to protect priority expenditure in the event of adverse macroeconomic developments.

Figure 4. Simulations of Debt-Burden Indicators Under Alternative Scenarios, 2003-2023
(In percent)



Source: Staff simulations.

1/ Revenues are defined inclusive of grants.

underlying assumptions and how they compare with a country's own history. The fiscal template derives the NPV of public external and domestic debt (the latter approximated by its face value) in percent of GDP and revenues, together with the public debt service-to-revenue ratio. The external template determines the NPV of public and private external debt (the latter, again, approximated by its face value), as a share of GDP and exports, as well as the external debt service-to-exports ratio. Both templates also provide explicit projections of the NPV of public and publicly guaranteed external debt, relative to the relevant denominators, to allow a comparison with the indicative thresholds. In light of the generally long maturity and grace periods, the projection horizon covers 20 years, which still implies that a sizeable part of the back-loaded debt-service obligations on new loans contracted on IDA, or other highly concessional, terms, will not be captured in the debt-service projections—though they are captured in the NPV of debt.

33. The design of stress tests is adapted from the template applied in the Fund for countries with significant market access, to reflect the circumstances of low-income countries and the specific features of the proposed framework. The role of the stress-testing exercise is twofold:

- As in the case of “market-access countries,” the stress tests help discipline macroeconomic projections, including by comparing the underlying assumptions to the country's historical record. This is captured in the “historical scenario” that derives the debt indicators under the assumption that the key variables are at their historical 10-year averages. To the extent that debt dynamics in the program baseline scenario appear significantly more benign than would be implied by the country's previous record, careful justification for the more optimistic outlook would be required. In addition, the analysis also includes scenarios that depict the debt indicators in the event of less favorable terms on new financing (external debt template) or in the absence of fiscal-policy reform (public debt template).
- A second function of the stress tests—captured in the “bound tests”—is to examine the implications of shocks for the projected debt and debt-service path, based on a country's historical volatility. The link to a country's historical volatility implies that the deterioration in the debt-burden indicators relative to the baseline will be greater in those countries that have been more susceptible to shocks. Under the presumption that a country's projected borrowing path should be robust to “likely” shocks, the results of the stress-testing exercise would feed directly into the overall design of an appropriate financing strategy. In other words, even if the debt indicators under the *baseline* are below the thresholds deemed prudent for the country, the financing strategy should be reconsidered if they exceed the thresholds under the *shock scenarios*, specified at an appropriate point in time.²⁷ To avoid an unduly

²⁷ The time dimension is important, as the shocks are modeled to occur at the beginning of the projection period, implying more extreme (and less probable) deviations from the baseline in earlier years.

conservative approach to new borrowing, the stress tests are designed to mimic relatively plausible shocks—corresponding to an average 25 percent probability over a 10-year horizon.²⁸ The trade-off is that this ex ante approach to volatility cannot deal with large exogenous shocks with a probability below 25 percent. Thus, low-income countries would still require contingency instruments to mitigate the impact of such shocks ex post (see Section IV. B).

Analysis of the Main Debt Sustainability Concerns

34. **The first step of the analysis consists of a comparison of the projected debt-burden indicators with the indicative country-specific thresholds established before.** The general presumption would be that the debt-burden indicators should remain below the thresholds in both the baseline and the stress scenarios. But even if this is the case, rapid changes in debt-burden indicators from low levels should be monitored closely, as they may signal an unsustainable policy path. When debt-burden indicators are above the thresholds, a careful interpretation is required to draw balanced conclusions about the sustainability of the debt outlook. Here, four principal situations can be distinguished: (i) most indicators are above the relevant empirical benchmarks; (ii) only one of the debt ratios is above its benchmark; (iii) the results of the public and external debt sustainability analyses differ significantly; and (iv) debt-stock and debt-flow ratios paint a different picture.

35. **In cases in which most indicators are above the relevant empirical benchmarks (either under the stress tests or already in the baseline), a country's debt situation would be considered a matter of concern.** The appropriate policy response will depend on the specific country circumstances but would generally involve some combination of policy adjustment to reduce the overall level of borrowing, and—where possible—a higher share of grant financing or increased concessionality on planned borrowing.²⁹ In practice, for countries with Fund- and Bank-supported programs such an outcome would generally trigger an iterative process, at the end of which the agreed policies and the amount and terms of new financing would result in debt dynamics that are deemed sustainable. For countries that already start off with debt ratios in excess of the indicative thresholds—perhaps as a result of a severe shock or weak policies in the past—debt ratios would be expected gradually to approach their indicative threshold levels, as some new borrowing may be required to avoid an unduly harsh policy adjustment should sufficient grants not be forthcoming.

²⁸ Appendix III describes the calibration of the stress tests. The deviations from the baseline for shorter horizons are more extreme, corresponding to a considerably lower probability (e.g., less than 4 percent in the first year), which must be taken into account when the stress test results are interpreted.

²⁹ Obviously, for countries that are eligible but have not yet received assistance under the HIPC Initiative, the latter would be the first course of action to reduce debt ratios to sustainable levels, once policies are on track.

36. **A careful interpretation is required when only one of the debt ratios exceeds its respective benchmark.** In this case, debt sustainability concerns may arise mainly from weaknesses in the specific variables used to measure debt-servicing capacity. Here, judgment will be needed to determine whether there is in fact a debt problem or some other kind of issue—for instance, statistical biases in measuring GDP, or particular weaknesses in revenue collection. A diagnosis of the latter may call for a different policy response—respectively, measures to improve the quality of data, or to strengthen revenue administration and widen the tax base—although in many cases these measures would need to be accompanied by cautious borrowing policies until they bear fruit. A careful interpretation of the results would also need to take account of other factors that influence a country’s effective repayment capacity, such as high workers’ remittances or significant re-exports (with a large import component) which would tend to ease or tighten a country’s foreign-exchange constraint, respectively. Interpreting weaknesses in any of the denominators and identifying the appropriate response is a difficult but crucial part of the analysis.

37. **Careful judgment is also needed in cases in which the assessment of public and external debt differ significantly.** A large deviation between public and external debt ratios reflects either high public domestic or high private external debt.³⁰ The latter is unlikely to be an issue in most low-income countries and is also potentially less troublesome—unless the private sector is over-borrowing, which raises issues of contingent liabilities. The assessment of whether private sector debt is excessive and poses a significant risk for public debt sustainability must be made in the context of country-specific analysis, and dealing with such a problem would require a tailored policy response that addresses its specific origins.³¹ Thus, while the external debt-sustainability template projects the total external debt ratio (including private obligations) as one important indicator, its central focus (including for the stress tests) is on public and publicly-guaranteed external debt—consistent with the empirical threshold analysis.

38. **High domestic debt of the public sector, on the other hand, has become a serious issue in a number of low-income countries and needs to be factored into the analysis.** While there are no empirical thresholds available to assess the appropriateness of total public debt in low-income countries, the inclusion of domestic obligations in the public debt-sustainability analysis is, nonetheless important. Domestic debt service—just like its

³⁰ The appropriate coverage of the public sector is not always straightforward. For a discussion of the main considerations to guide this decision, see IMF (2003a).

³¹ Excessive external borrowing by the private sector may be related to explicit or implicit government guarantees, including on the level of the exchange rate, and may be alleviated by improved prudential regulations on the banking sector. Ultimately, large external borrowing may require a correction of the current account via a sharp depreciation of the exchange rate which would directly affect the domestic-currency value of the government’s foreign debt, in addition to its contingent liabilities.

external counterpart—presents a drain on public resources that raises the risk of debt distress. Issuance of domestic debt instruments occurs for different reasons, making domestic debt measures more difficult to interpret (Box 4). For example, in a small number of strongly-performing countries, domestic debt has been accumulated in response to large external aid inflows.³² In these countries, a key issue is the appropriate use and phasing of aid flows to ensure that they do not lead to excessive appreciation pressures on the domestic currency. In many instances, issuance of domestic debt reflects the explicit objective of promoting the development of domestic financial markets, which also serves governments' long-term goal of eventually issuing debt at reasonable cost in domestic currency. Whatever the reasons, the benefits of domestic debt must be carefully weighed against the potentially heavy burden it imposes on the budget, as for most low-income countries, it is currently a costlier form of financing compared with highly concessional external funds—even after exchange-rate risks are taken into account.³³ This implies, however, that the appropriate policy response would be to combine prudent external borrowing policies, informed by the indicative thresholds, with a strategy that contains domestic debt at “reasonable” levels. What level of domestic debt is reasonable, is a difficult question that does not lend itself easily to empirical analysis, as it depends on a variety of country-specific factors, including its purpose, cost, and coverage.³⁴ In short, while there are no empirical thresholds available to assess the appropriate level of domestic debt, it needs to be monitored and carefully interpreted. This is the reason why domestic debt is included in the proposed public sector debt-sustainability analysis, recognizing that its implications for an appropriate forward-looking financing strategy must be judged on a case-by-case basis.

39. Finally, the analysis needs to distinguish between stock and flow problems, which tend to have different implications for an appropriate financing strategy. A high debt-service ratio in the near term combined with a relatively low debt stock is indicative of liquidity needs that could be alleviated by additional (appropriately concessional) financing or conventional Paris Club flow reschedulings (if a significant amount of debt service is due

³² In these countries, sizeable amounts of domestic debt have been issued to sterilize the expansionary monetary impact of foreign-exchange interventions, which were aimed at limiting the appreciation of the domestic currency in response to large aid inflows. For a theoretical analysis and discussion of three case studies (Uganda, Tanzania, and Mozambique) see Buffie et al. (2003).

³³ Very few low-income country governments (India's is an example) have been able to pay low interest rates on domestic debt. In this case, the above considerations must be modified.

³⁴ One important factor is, for example, whether pension liabilities are included in the debt statistics or not.

Box 4: Domestic Debt in Low-Income Countries

For a long time, in the context of debt sustainability analyses, it was commonly assumed that different degrees of coverage of public debt were applicable to middle-income and low-income countries. Focusing on the external public debt burden was considered adequate for the latter, since their domestic debt levels were low. Domestic financial markets were relatively less developed and were not a significant source of financing.

In reality, however, the perception that domestic debt does not play an important role in low-income countries may have been partly the result of weak data availability. Indeed, although external debt remains the dominant source of public financing, for some low-income countries domestic debt is far from negligible. At end-2000—the latest date for which consistent information is available—6 out of 20 low-income countries with available data had a ratio of domestic debt to GDP greater than 25 percent (see table). Moreover, the table may understate the overall domestic debt burden of the respective governments. Not only is data often unavailable, in most cases the available data covers central government debt only, and excludes debt contracted by local governments and public enterprises¹.

Domestic Debt in Selected Low-Income Countries

2000	Domestic Debt as % of GDP	Interest Payments on Domestic Debt as % of GDP	Interest Payments on Domestic Debt as % of Revenues
Benin	5.8	0.1	0.6
Burkina Faso	18.0	0.2	1.6
Burundi	13.3	1.4	7.0
Cameroon a/	18.7	0.4	2.1
Cote d'Ivoire	20.4	0.4	2.3
Ethiopia a/	42.2	1.4	7.6
Gambia, The	31.4	3.5	18.8
Ghana	28.9	5.3	30.1
Guayana b/	36.9	2.1	11.8
India a/	67.5	n/a	n/a
Kenya a/	22.2	2.9	12.4
Liberia c/	57.0	1.0	7.8
Nicaragua	42.2	1.0	4.0
Niger	18.5	0.2	1.8
Nigeria	21.0	2.4	5.4
Pakistan a/	46.4	6.3	54.7
Rwanda	11.7	0.3	1.8
Senegal	6.7	0.2	1.0
Togo	24.2	n/a	n/a
Uganda	4.9	0.3	2.9
Yemen d/	11.1	1.9	4.8
Zambia	19.3	1.4	7.2
Average	25.8	1.6	9.3

Source: IMF Statistical Appendices; Central Banks and staff estimates.

Note: Data covers central government debt only, except for India, where the coverage is for the public sector, including the central government, state governments, and major public enterprises.

a/ 1999/00; b/ June 2000; c/ September 2002; d/ 1999.

Domestic financing often fulfils a buffer role, which may result in sudden increases in domestic debt stocks:

- i. Domestic debt may surge because the government has to sterilize significant foreign inflows.
- ii. The government may also issue domestic debt to mop up liquidity that has been created by supporting public sector banks in financial difficulties or to recapitalize insolvent private banks, as recently done in Nicaragua.
- iii. Domestic debt may also rise as governments intentionally attempt to foster the development of the country's domestic financial market.

Domestic debt complicates the assessment of debt sustainability:

- i. Domestic debt tends to be issued at shorter maturities and is therefore more vulnerable to roll-over risks.
- ii. In the domestic market, unlike in the market for external debt, the government may be able to influence the cost of borrowing through its implementation of interest and monetary policies.
- iii. Unlike external debt, domestic debt is usually issued at market interest rates and is therefore much more vulnerable to changes in the macroeconomic environment, and generally more costly in low-income countries.

¹ For example, in Ghana the central government's domestic debt stood at about 27 percent of GDP in 2001, but the ratio including local governments' and SOEs' was twice as high. (IMF, Ghana: Selected Issues, May 2003).

to bilateral creditors). A high debt-stock with low current debt-service ratios is indicative of debt-servicing difficulties in the future. While long grace and maturity periods provide room for a gradual response to the debt-stock problem—acknowledging the opportunities for countries to grow out of excessive indebtedness before its implications, in terms of debt service, are felt—many of these countries’ own history is a sobering reminder of the significant downside risks. Thus, a high debt stock generally calls for primary reliance on grant financing and only limited new borrowing on highly concessional terms—which is also more feasible as the low debt service contains overall gross financing needs. A combined debt-service and stock problem calls for more urgent measures, as the country will need financing to ease its liquidity constraints, without further undermining debt sustainability. In this situation, policies to alleviate the debt problem, including a prioritized and well-specified expenditure program and the mobilization of grant resources will need to be a major focus of any program.

40. **In sum, debt sustainability analyses for low-income countries should consist of two elements:** (i) indicative country-specific debt-burden thresholds that depend on the quality of individual country’s policies and institutional environment; and (ii) an analysis and careful interpretation of actual and projected debt-burden indicators under the baseline and in the face of plausible shocks. These two pillars, in combination with other relevant country-specific considerations, provide an informed basis for the design of an appropriate country-specific borrowing strategy under which policies and the amount and terms of new financing would generate a debt and debt-service outlook that is deemed consistent with a country’s prospective repayment capacity and supportive of its eventual graduation from official aid flows. In a number of cases, the application of this framework will likely generate the need for a significant increase in grant financing over the coming years to enable these countries to achieve their development objectives on a durable basis—i.e., without creating debt-service problems in the future. The policy implications for the global community are discussed next.

IV. POLICY IMPLICATIONS FOR THE GLOBAL COMMUNITY

41. **The framework for debt sustainability has important implications for the level and terms of external financial assistance to low-income countries.** First, creditors would need to review current lending policies to ensure that they appropriately reflect countries’ risk of debt distress. The tailoring of new lending decisions to the risk of debt distress would almost certainly require an increase in the concessionality of financing to low-income countries, and consequently, a higher volume of grants, to avoid a reduction in net transfers. Moreover, the explicit recognition of macroeconomic volatility in determining a country’s borrowing capacity, combined with a reasonable degree of domestic adjustment should economic conditions weaken, would guard countries against normal volatility, but would not provide adequate protection against large unforeseen shocks. Therefore, creditors may wish to consider new contingent lending instruments and modify existing instruments to mitigate the adverse effects of exogenous shocks.

A. Incorporating Debt Sustainability Considerations Into External Financing Policies

42. **To reduce the likelihood of future debt crises in low-income countries, it is important that creditors and donors provide new financing at levels and on terms that limit a country's risk of debt distress.** The appropriate amount of new loans, in present value terms, would need to be assessed on the basis of the debt-sustainability framework presented in Section III, and derived in the context of the country's macroeconomic framework. This would allow new borrowing (lending) volumes and terms to be consistent with long-term economic prospects and the risk of debt distress, but may, in some cases, require additional grants to prevent disruption to development programs. The provision of additional grants should consider a country's needs and its ability to use resources effectively and should reward countries following sound policies.

43. **Under this framework, countries with sound policies would receive a mix of loans and grants that would be consistent with their policy performance and their risk of debt distress.** Provided a country's policies are considered appropriate, the legacy of a high debt burden or vulnerability to shocks would not be a justification for denying it resources. Instead, the overall allocation of grant resources (including those embedded in the concessionality of new loans) would need to be based on policies and other relevant criteria. Thus, a country would neither be "rewarded" nor "punished" for a high debt level, in terms of the effective grant resources it receives—which is an important provision to avoid moral hazard. A country with low risk of debt distress, however, should be in a position to obtain more of its resources in the form of loans, implying higher nominal transfers for a given grant-equivalent. Box 5 examines two country examples to show what such a framework, if adopted in the past, would have implied for debt levels and the volume of grants required.

Implications for New Lending

44. **Given a country's macroeconomic projections, the framework described in Section III would yield the present value of new borrowing that would be consistent with debt sustainability.** Within the overall borrowing envelope, expressed in present value terms, a country would have greater scope to borrow, the higher the grant element of its new financing; at the same time, it would maintain flexibility to borrow at different terms from different creditors.

45. **There could be instances where creditors' willingness to lend to a country exceeds the level of borrowing compatible with debt sustainability.** With creditors continuing to base lending decisions on their priorities, objectives, and risk-bearing capacity, there may be situations in which they can make a convincing argument for lending levels that exceed those suggested by the standardized framework—for example a high-return project, or the likelihood that certain reforms could result in a distinct improvement in growth. In these (presumably) exceptional circumstances, the country authorities, supported by their creditors, would need to make a clear case for exceeding the indicative debt thresholds, and progress would need to be monitored carefully to ensure that higher levels of

Box 5. Adopting An Ex-Ante Framework for New Lending

This box illustrates the possible impact of an ex-ante framework that links the concessionality of new financing to debt-burden indicators, using historical simulations for Tanzania and Madagascar, HIPC countries which are past completion point and decision point respectively. Both countries have received substantial debt relief under the HIPC Initiative (due to the Initiative, Tanzania's debt burden was reduced by about \$1.9 billion at completion point and Madagascar's by about \$1 billion at decision point, in 2001 NPV terms). The historical evolution of Tanzania and Madagascar's nominal debt-to-exports ratios from 1980 to 2001 are simulated under the stylized assumption that whenever debt reaches certain threshold ratios, the following year's disbursements are in the form of grants rather than loans (see figure). The assumed threshold triggers are an NPV of debt-to-exports of 200 percent; an NPV of debt-to-GDP of 45 percent; and an NPV of debt-to-fiscal revenue of 200 percent (corresponding to indicative triggers for a "medium-performer" in Table 2). For Tanzania, these triggers would have necessitated switching from loans to grants from 1981 to 1994, as well as in 1996. Consequently, Tanzania's NPV of debt-to-exports ratio in 2001 would have been 116 percent under the simulations compared with an actual ratio of about 330 percent. The annual value of grants that would have been required to prevent a fall in net flows (i.e. the value of loan disbursements withheld) if this ex-ante framework had been in place would have amounted to about \$175 million in nominal terms. Similarly, a simulation for Madagascar over the same period reveals that about 70 percent of all disbursements would have had to be made in the form of grants, implying average grant flows of about \$135 million per year between 1980 and 2001. Madagascar's simulated debt-to-exports ratio at end-2001 would have been equivalent to 50 percent, compared with an actual ratio of more than 200 percent.



lending are achieving the envisaged results. Creditors would also be expected to increase the concessionality of these additional loans to the extent possible (Table 3).

46. **Similarly, there will likely be cases in which disbursements from the pipeline of concessional loans that are deemed consistent with a country's prospective repayment capacity fall short of its needs for implementing its development agenda.** In these circumstances, the first course of action would be to mobilize additional grant resources from donors, in the context of consultative group meetings. Should adequate grant resources not be available, creditors could examine all means possible to further increase the concessionality in their lending terms so that resource flows could rise without raising the risk of debt distress. While there may be scope in individual development institutions for increasing their loan concessionality, the Fund, as a monetary institution, would not be expected to follow suit. Indeed, given that the concessionality of PRGF loans is comparatively low, the provision of new loans from the Fund would presumably be limited in these cases—though the framework is sufficiently flexible to accommodate some lending. Even after exploring these options, some countries may still be left with a gap between financing needs and appropriately concessional aid resources. In these circumstances, the Government would need to adapt its borrowing strategy to prioritize the use of scarce resources in close collaboration with creditors and donors, while simultaneously improving the conditions for strengthening its borrowing capacity, particularly through improved policies and institutional reforms. In most instances, the terms of the assistance available would play an important role in determining the financing priorities; but it is conceivable that other considerations (for example, whether the use of funds is earmarked for specific purposes, or if it requires domestic co-financing) could also apply.

47. **Ultimately, the extent to which countries will face dilemmas between financing needs and long-term debt sustainability depends to a large extent on the international community's willingness to provide additional grants.** Unless donors and creditors can significantly increase their pool of resources, a higher share of grant funding to some countries would have to come at the expense of reduced nominal transfers available to all. This would result in fierce competition for these resources. Increased competition may have the positive side effect of encouraging better policy performance, to the extent that strong performers are able to attract more resources (both grants and loans), thereby improving their chances of meeting the MDGs. But the reduction in aggregate new financing that would be required for a shift from loans to grants within a given aid envelope, would simultaneously lower the chances to advance for other countries with below-average policies. Thus, to reward strong performers without closing the door on others to catch up, the international community will need to combine an improved aid-allocation mechanism guided by policy performance with an overall increase in available resources.

Table 3. Concessionalities of Loans by Selected Creditors 1/

Creditor	Grace Period	Maturity	Interest Rate	Fees	Service Charges	Commitment Charge ^{4/}	Repayments per year	Repayment Profile	Currency	Grant Element	
										Current IMF Method ^{2/}	CIRR 2003 ^{3/}
IDA40	10	40	0.75%	0%	0%	0.5%	2	IDA40 ^{6/}	SDR and USD	82.0%	63.2%
IDA35	10	35	0.75%	0%	0%	0.5%	2	IDA35 ^{7/}	SDR and USD	77.8%	58.1%
IaDB ^{5/}	10	40	1% & 2% ^{8/}	0%	0%	0.0%	2	EQUIP	Multiple	76.3%	57.0%
IMF	5.5	10	0.5%	0%	0%	0.0%	2	EQUIP	SDR	27.1%	23.0%
African Dev Fund	10	50	0.0%	0%	0.75%	0.5%	2	Specific ^{12/}	Multiple	84.4%	67.5%
Nordic Development Fund	10	40	0.0%	0%	0.75%	0.5%	2	EQUIP	SDR	72.0%	49.6%
IFADI	10	50	1.0%	0%	0%	0.0%	2	EQUIP	SDR	72.6%	50.0%
OPEC	5	20	0.5%	0%	0%	0.0%	2	EQUIP	USD	56.6%	35.8%
JBIC	10	40	0.75%	0%	0%	0.0%	2	<i>EQUIP</i>	Yen	49.4%	33.9%
EU	10	40	0.75% ^{9/}	0%	0%	0.0%	2	Specific	EUR	73.0%	54.6%
BADEA	10	30	1.0% ^{10/}	0%	0%	0.0%	2	EQUIP	USD	67.5%	42.9%
EIB	10	50	1.0% ^{10/}	0%	0%	0.0%	2	Specific	EUR	73.6%	55.2%
Asian Development Fund	8	32	1% & 1.5%	0%	0%	0.0%	2	EQUIP	USD	71.9%	51.8%
Islamic Dev. Bank	10	30	0.0%	0%	0% ^{11/}	0.0%	2	EQUIP	SDR	74.5%	54.0%

Source: Staff estimates, based on publicly available information for each Institution.

- For some creditors, lending terms vary depending on the borrower country and/or the project financed. For simplicity, those conditions which represented the "softest" loan terms were used to calculate the grant element.
- Refers to concessionalities calculations for debt ceilings in Fund-supported programs, which use 6-month (10-year) averages of CIRRs as discount rates, plus a spread subject to the maturity period, for loans with maturity of less than (at least) 15 years
- This method of calculating concessionalities uses the 6-month average currency-specific CIRR, and is consistent with the HIPC framework.
- Levied on undisbursed amounts. For the purpose of this exercise, it was assumed that the loan is disbursed in one observation.
- IaDB lends in multiple currencies, in this case the discount rate used was the USD CIRR.
- 20 percent of the loan is repaid during the first 10 years after grace period. The rest is paid afterwards.
- Principal repayable at 2.5 percent per annum during the first 10 years after the grace period and 5 percent per annum afterwards.
- 1 percent during the grace period, 2 percent afterwards.
- Current rate ranges from 0.75 percent up to 4 percent.
- Current rate ranges from 1 percent up to 4 percent.
- Current rate ranges from 0 percent up to 2.5 percent.
- 10 percent of the loan is repaid in the 10 years following the grace period and the remaining 90% over 30 years.

Prospects for Increasing Aid Flows

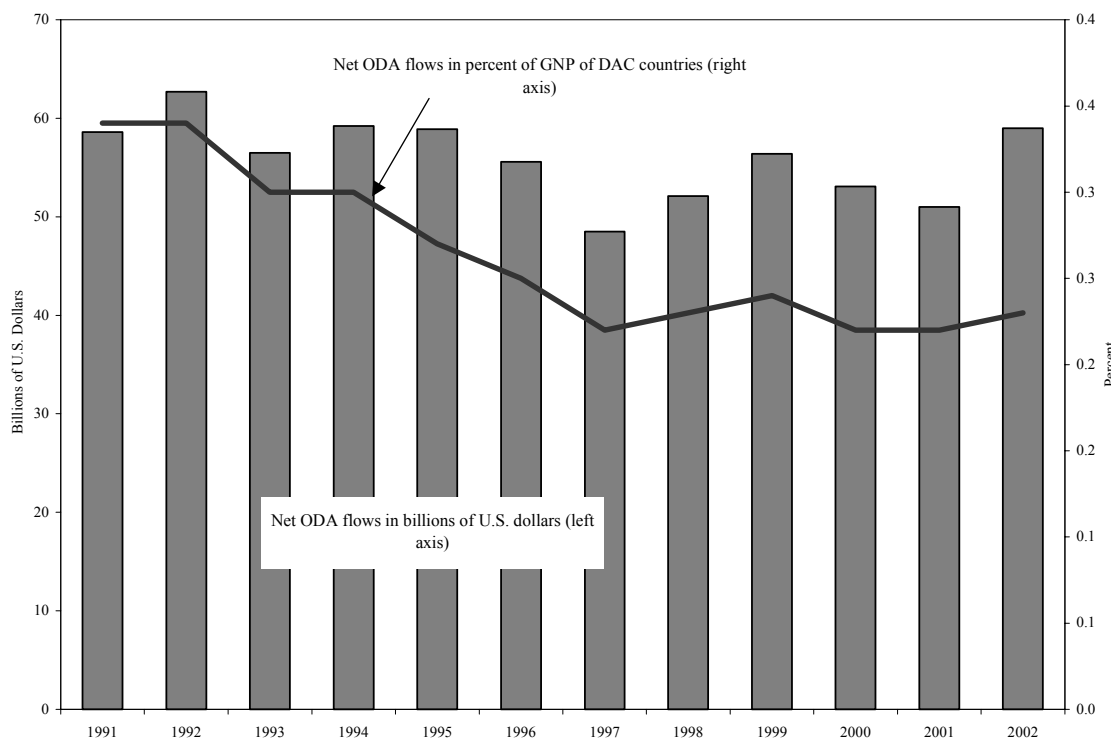
48. **Since achievement of the MDGs depends not only on adequate financing but, most importantly, on strong policies in the countries concerned, any estimate of the additional grant requirements is contingent on assumptions about the policy performance in individual countries.** Using a country-based approach, a recent paper prepared by Bank staff for the Development Committee found that with continued policy and institutional reforms, developing countries could productively use additional flows of about \$30 billion annually. This estimate is conservative for several reasons: (i) it does not reflect the costs of meeting all the MDGs in all countries (which would require a more optimistic policy scenario but also more financing); (ii) it reflects gaps in data and analysis at the country level, such that certain financing requirements, particularly with regard to infrastructure and capacity enhancement, are not included; and (iii) it does not consider the costs of meeting global and regional public goods, including measures to combat HIV/AIDS or achievement of broad environmental sustainability.³⁵ Importantly, the study finds that the implications for the volume and phasing of additional aid varies across countries, depending on their specific circumstances, such as prospects for improving policies and the volume of current aid flows. Nevertheless, it concludes that early commitment of additional aid is crucial to help promote reforms and build up countries' capacity to use larger amounts of aid productively over time.

49. **Aid flows would therefore have to increase significantly in comparison to their historical trend.** Official Development Assistance (ODA) provided to developing (and low-income) countries has remained about the same in nominal US dollar terms since 1991 (Figure 5)—and thus, has actually fallen as a share of developed countries' GDP, from 0.34 percent on average in 1990 to 0.23 percent in 2002. At the International Conference on Financing for Development, in Monterrey, Mexico in March, 2002, donors committed to a substantial increase in ODA to meet the MDGs. If these promises are fulfilled, ODA would rise by 31 percent in real terms (or US\$ 16 billion) by 2006,³⁶ but this is well short of the estimated amounts required to finance the MDGs. Some donor pledges have been translated into programs, such as the US's Millennium Challenge Account, which envisages providing

³⁵ World Bank and IMF, *Supporting Sound Policies with Adequate and Appropriate Financing*, Development Committee Report No. DC2003-0016, September 13, 2003. The study focuses mainly on a sample of 18 well-performing low-income countries. Extrapolating from these countries and taking account of absorptive capacities in low-income countries under stress (LICUS) and the effect of aid in middle-income countries, it estimates an incremental amount of \$30 billion annually as a conservative estimate of additional aid requirements.

³⁶ See World Bank and IMF (2003).

Figure 5. Trends in ODA Flows, 1991-2002 1/



Source: OECD DAC

US\$ 5 billion in new grants annually, the Global Fund for AIDS, TB and Malaria, the US's Emergency Plan for Aids Relief, and the UK's proposal for global bonds (the International Finance Facility).

50. **Thus, the required increase in the availability of resources to low-income countries calls for increased aid allocation and broad participation among donors.** Currently, approximately 75 percent of grants are provided directly by bilateral donors in the context of their bilateral aid programs. Among multilateral creditors, IDA, special IDA-administered facilities, the European Union, UN agencies, and some other multilateral organizations have facilities that provide grant financing. In addition, a small but growing share of grants is provided by NGOs, foundations, and other private sources (at end- 2001, private grants to ODA recipients totaled \$7.3 billion, equivalent to 14 percent of ODA that year). Donors could increase the volumes of these flows either directly or by channeling additional grants through multilateral institutions.

51. **Concessionalty of new financing could also be increased by innovative financing instruments.** An innovative financing instrument that is already available to donors for this purpose is the credit-buydown mechanism (CBM). Under a CBM, instead of receiving principal and interest payments from a borrower, the creditor receives the present value of these flows from a donor, effectively turning the loan into a grant for the borrowing

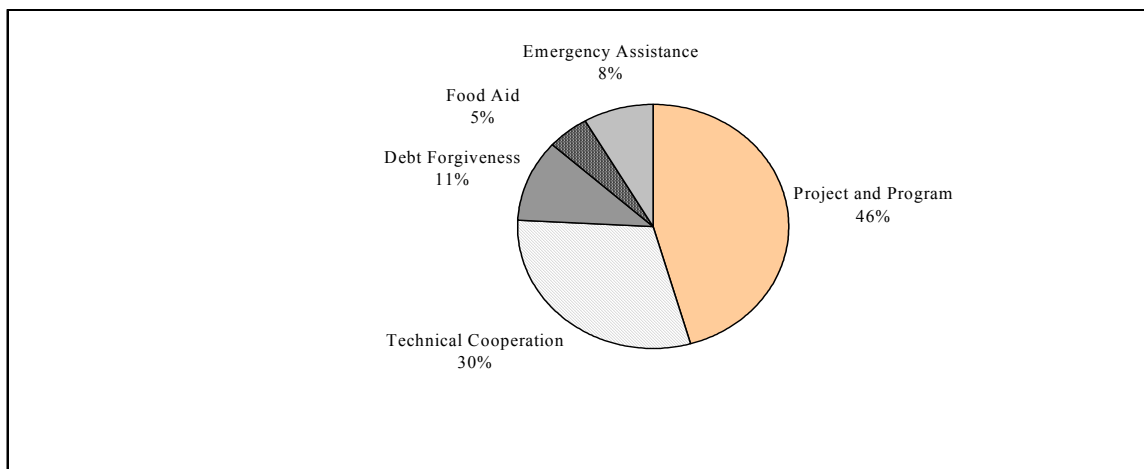
country. The CBM uses donor resources to increase the grant element of, and reduce payments on, already contracted multilateral debt. It is conceivable that this and other instruments would be used on a wider scale in the future.

52. **Besides increasing the level of aid flows, there is also room to strengthen its effectiveness and improve the delivery and allocation process.** Development assistance needs to be better aligned with the recipient country's priorities and processes, as set out in its development and poverty reduction strategy. One aspect of improved alignment is for those providing aid to coordinate their support better and to harmonize their policies and procedures around the recipient country's own systems while ensuring that this does not come at the expense of fiduciary standards. The approach agreed at the Rome Harmonization Forum is promising and needs to be linked at the country level to the PRSP approach.³⁷ A greater proportion of aid should also be provided in forms that can help meet the incremental costs of financing the MDGs. For example, 30 percent of grants continue to be provided as technical co-operation (Figure 6). But where budgetary and financial management systems are adequate—and technical assistance can play an important role in helping countries achieve this—aid should be provided in the most productive ways to finance the higher recurrent costs associated with meeting the MDGs, namely through budget support or well-targeted sectoral programs. Finally, aid flows need to be predictable, timely, and counter-cyclical. The delivery of aid to low-income countries can be greatly improved by: (i) ensuring that year-to-year fluctuations in allocations are minimized and that aid budgets are protected from short-term pressures;³⁸ and (ii) providing quick-disbursing funds to mitigate the economic and social impact of external shocks.

³⁷ In February, 2003, heads of multilateral and bilateral development institutions and other financial institutions and partner countries deliberated on the international effort to harmonize the operational policies, procedures, and practices of such institutions with those of partner country systems to improve the effectiveness of development assistance and thereby contribute to meeting the MDGs. See "Rome Declaration on Harmonization", February 25, 2003, <http://www1.worldbank.org/harmonization/romehlf/Documents/RomeDeclaration.pdf>. The OECD DAC set up a Working Party on Aid Effectiveness and Donor Practices in May 2003. Through its Task Teams and Joint Ventures, which include the MDBs and the IMF, this Working Party will identify specific ways of improving the delivery of aid, including implementation of the Rome Declaration on harmonization and alignment, enhancing the predictability of aid, and addressing issues related to budget support.

³⁸ Empirical analysis demonstrates that aid flows can be, on average, two to three times as volatile as the recipient country's output, as well as highly pro-cyclical, especially in sub-Saharan Africa. See Pallage and Robe (2001).

Figure 6. Composition of Grant Funding (end-2001)
(In percent)



Source: OECD DAC.

B. Designing Instruments That Mitigate the Impact of Exogenous Shocks

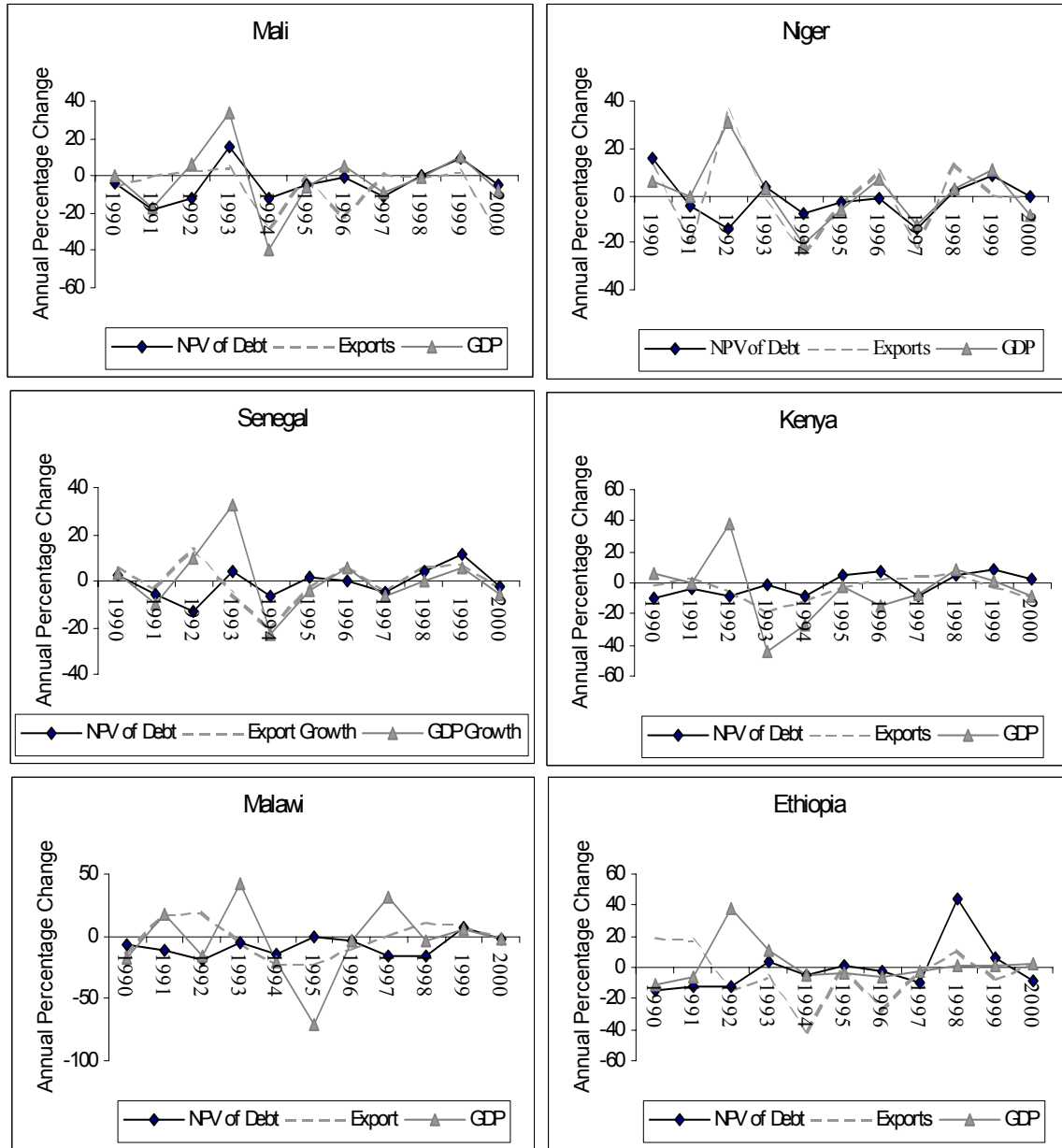
53. **Debt distress in low-income countries is often caused by exogenous shocks that cause liquidity problems and require exceptional financing.** As illustrated in Figure 7, changes in debt-burden indicators have largely reflected swings in export earnings and GDP, often caused by exogenous shocks.³⁹ Adverse shocks can be defined as unanticipated events beyond the control of authorities that can have a significant negative impact on an economy. They can arise for many reasons, including natural disasters (such as droughts), changes in relative prices (for example, commodity price shocks), political instability or civil strife (even in neighboring countries), and sudden changes in capital flows (such as the withdrawal of donor support). Commodity price shocks have often been persistent,⁴⁰ and evidence shows that they tend to be more severe in low-income countries than in other developing countries (Figure 8), and more frequent.⁴¹ For example, between 1992-2001, the average size of a

³⁹ See Easterly (1993).

⁴⁰ See Cashin et al. (2000). The paper finds that for the majority of the 44 commodity price indices included in the sample it took more than five years, on average, for a shock to dissipate to half its original magnitude. For ten of the commodities studied, including cocoa, coffee (robusta), gold, and tobacco, price shocks were permanent, defined as never dissipating to half their original magnitude.

⁴¹ IMF, *Fund Assistance for Countries Facing Exogenous Shocks* (SM/03/288, 8/11/03). The report also documents that low-income countries have a higher incidence of natural disasters
(continued)

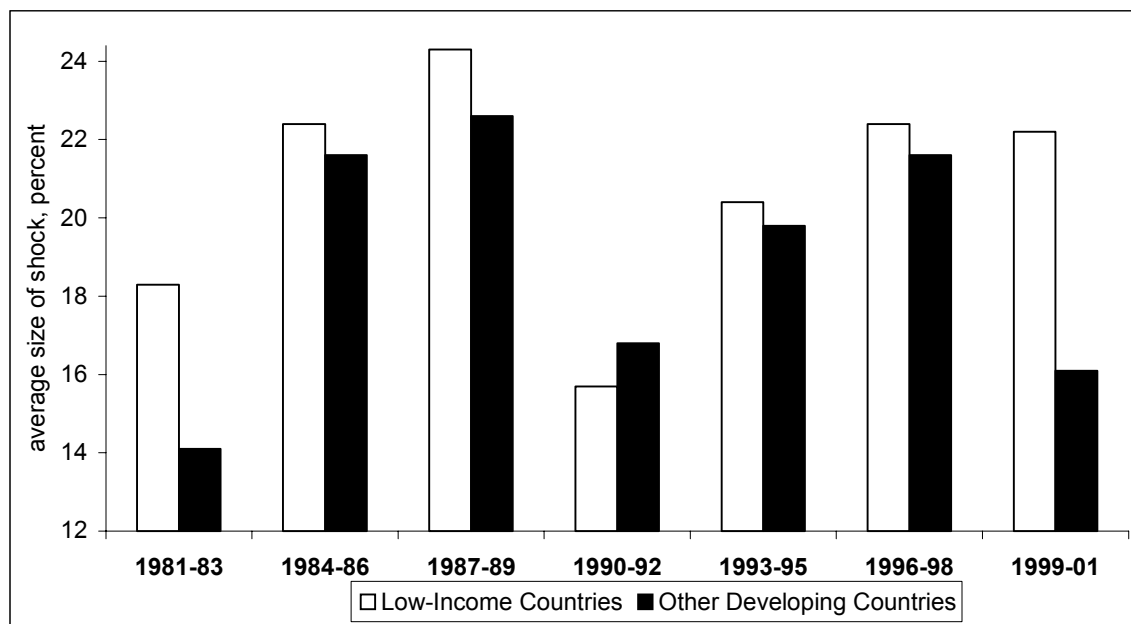
Figure 7. NPV of Debt, Exports and Output Volatility
Annual percent change, 1980-2001



compared with other developing countries and tend to suffer larger damages (which averaged 5.8 percent of GNP between 1997-2001) when shocks occur.

negative commodity price shock (measured by the decline in real prices from the previous year's level) was 22 percent for low-income countries and 16 percent for other developing countries. Low-income countries experienced commodity price shocks every 3.3 years on average, while other developing countries experienced them, on average, every 4.4 years.⁴²

Figure 8. Developing Countries' Vulnerability to Exogenous Shocks 1/ 2/
(Average size of negative shocks in real prices of export commodities)



Source: IMF (2003c)

1/ A shock is defined as at least 10 percent decline in the real price of the commodity from its previous year.

2/ Data covers 52 developing countries, of which 30 are low-income. Oil exporting countries are excluded.

54. **While shocks may be caused by a variety of factors, their impact is usually a contraction in broad macroeconomic variables, such as GDP growth and exports, and a substantial loss in welfare.** Income losses from shocks tend to be higher in low-income countries than in other developing countries. For a sample of low-income countries, the direct income loss from negative export price shocks averaged 6.8 percent in the year of the shock, and over a four-year period, the income loss amounted to 14 percent of initial output, with associated consumption volatility leading to substantial welfare losses.⁴³ In many low-income countries, estimated welfare gains from eliminating volatility exceed those of an

⁴² IMF (2003c). A shock is defined as an at least 10 percent decline in real prices from the previous year's level.

⁴³ Collier and Dehn (2001).

additional point of growth forever.⁴⁴ Low-income countries also experience high and persistent volatility in the real exchange rate caused, in large part, by their vulnerability to terms of trade shocks. Since contractions in GDP resulting from shocks are often accompanied by a significant depreciation in the currency, the overall burden of servicing foreign-currency debt can be particularly onerous in the period following a shock.⁴⁵

55. **The impact of exogenous shocks on the debt dynamics can be addressed both *ex ante* and *ex post*.** An *ex ante* approach would be to incorporate volatility into the baseline projections and conduct stress tests to model the consequences of possible shocks, and then translate these into prudent lending and borrowing decisions. This is the basic approach embedded in the proposed framework in Section III. It is akin to an “*ex ante* adjustment” that would allow countries to face “likely” shocks without experiencing debt distress. An *ex post* approach would be to apply insurance mechanisms that can provide effective relief once a shock is experienced. This relief could be in the form of additional financing or reduced debt service. In practice, a combination of both *ex ante* and *ex post* approaches could be considered to deal with the consequences of large shocks, for example by complementing the proposed framework with mechanisms that provide insurance-like *ex post* relief for shocks that substantially increase the risk of debt distress. Such a combined approach would offer the most effective protection against the possibility that large shocks undermine a country’s chances of meeting the MDGs in the event that grant resources may not be forthcoming.

56. **The appropriate *ex post* response to exogenous shocks is typically a combination of some additional appropriately concessional financing (or reduced debt service) with adjustment in expenditures in relation to income.** In principle, it is optimal to finance temporary shocks but adjust to permanent ones; however, this prescription is difficult to interpret and apply. First, it is often impossible to determine at the outset whether a shock will be permanent or temporary. Second, research indicates that even in the case of permanent shocks, foreign assistance can be very effective in dealing with its consequences, as long as it is available quickly, and is provided in a way that includes incentives for policy adjustments and measures to reduce vulnerability to future shocks.⁴⁶ Therefore, even if shocks are permanent, adjustment is less painful if it is stretched out over time and combined with upfront additional financing. Additional financing for exogenous shocks should be provided on terms that reflect a country’s risk of debt distress, with highly debt-distressed countries receiving financing in the form of grants; the importance of appropriate financing terms is underscored by cases in which new loans provided in response to shocks have

⁴⁴ Pallage and Robe (2003).

⁴⁵ Hausmann and Rigobon (2003).

⁴⁶ IMF (2003c).

created debt-servicing problems for countries where debt levels were high to begin with and where the effects of the shocks lasted for a long time.⁴⁷

57. **Experience with existing schemes to help countries cope with shocks is mixed and work on designing new instruments is at a preliminary stage (Box 6).** Stabilization schemes such as the EU's Stabex and the IMF's Compensatory Financing Facility (CFF) tried to smooth earnings in response to terms of trade shocks, but were limited in their success partly because commodity price shocks were so persistent. More recently, research on new instruments has focused on reducing the burden of debt service in the aftermath of shocks, for example, by linking debt service obligations to variables associated with volatility in export earnings or GDP growth, such as commodity prices and the real exchange rate. Work on designing new instruments for low-income countries is going on both at the World Bank and the IMF, and the Boards will be informed about progress periodically. What makes these instruments particularly difficult to design is that they need to deliver significant relief to countries experiencing a shock, but at the same time, like all insurance schemes, they need to remain financially viable over the long term.

V. POLICY IMPLICATIONS FOR LOW-INCOME COUNTRIES

58. **While donors and creditors can play an important role in helping low-income countries achieve debt sustainability, the primary responsibility lies with low-income countries themselves.** Decisions related to new borrowing are typically made in an environment of great uncertainty. Countries face difficult choices: should they continue borrowing to meet development objectives, even if debt levels rise beyond certain thresholds, or should they be more prudent, potentially foregoing opportunities for growth-enhancing investments? Clearly, countries need to be mindful of the risks of accumulating debt against the mere prospect of an acceleration of growth in the future. As such, borrowing should be in step with, and supportive of, progress in strengthening the capacity to repay through better policies and institutions to accelerate growth; prudent debt management to keep debt to reasonably low levels and ensure new borrowing in the right amounts and on appropriate terms; and measures to increase resilience to exogenous shocks. While these issues are essential elements of the core development strategy in most low-income countries, they are only discussed briefly below, given this paper's primary focus on the development of a debt sustainability framework.

A. Improving Policies and Institutions

59. **The importance of policies and institutions for higher and more sustained growth lies at the core of the development agenda in low-income countries.**⁴⁸ Good

⁴⁷ See Brooks et al. (1998). An analysis of debt dynamics in Uganda shows that an 11 percent decline in export earnings in 1999/2000 added 20 percentage points to Uganda's NPV of debt-to-exports ratio that year; see IMF (2003a).

Box 6: Ex-Post Mechanisms for Mitigating Exogenous Shocks

In the past, mechanisms for mitigating exogenous shocks comprised mainly of stabilization schemes such as the EU's Stabex and the IMF's Compensatory Financing Facility (CFF). These failed to provide effective counter-cyclical assistance to countries affected by shocks, partly due to disbursement delays that resulted from a high degree of complexity in terms of coverage, eligibility, and evaluation methods.¹ Past experience with these schemes, and empirical work analyzing their effectiveness suggest that on balance, schemes to smooth export earnings in the face of terms of trade shocks have not been very successful or have proven financially unviable.

The impact of exogenous shocks may also be mitigated ex-post by developing mechanisms that reduce the burden of debt-service obligations in the aftermath of shocks. This would reduce the need for reliance on ad-hoc mechanisms, such as the Paris Club's willingness, demonstrated in several past cases, to defer debt-service payments of countries affected by severe shocks (e. g., Hurricane Mitch in Honduras and Nicaragua). This can be done by indexing debt service to GDP growth or to variables associated with volatility in export earnings, such as commodity prices or the real exchange rate. Preliminary research on linking debt-service obligations in low-income countries to commodity prices through swap arrangements showed that these arrangements would provide limited relief in debt service-obligations—equivalent to less than 5 percent of total payments, in the event of adverse shocks.²

Linking a country's debt-service obligations either to GDP growth or to local currency units, indexed to inflation, appears, in preliminary analysis, to be more promising—though not without potential implementation problems.³ Both arrangement would mitigate the effects of adverse shocks that manifest themselves in lower GDP growth or real exchange-rate depreciations, respectively. The latter is important because most of low-income countries' debt is contracted in foreign currency. As a result, real depreciations in response to exogenous shocks—akin to falling GDP growth—make debt service more burdensome, just at a time when it is more difficult to pay, with the opposite effect in case of positive shocks. Denominating debt service in inflation-indexed local currency units, or linking it to GDP growth, would avoid these effects in both directions.⁴ Indeed, inflation-linked bonds have proved beneficial to emerging markets, especially in Latin America. Some MDBs, such as the World Bank and the EIB have facilities to lend in local currency, but in the case of the World Bank, the facility is limited to IBRD borrowers.

Finally, donors and creditors could earmark funds or frontload resources and/or backload debt service in order to provide prompt counter-cyclical assistance to deal with large, unanticipated, exogenous shocks. The EU, for example, has funds (the EU's "B" envelope under the Cotonou Agreement) which are earmarked to address shocks.⁵ The IMF also has the flexibility to support countries through (augmented) PRGF arrangements in response to exogenous shocks, but PRGF loans have relatively short maturities (10 years), implying a comparatively low grant element. Similarly, IDA has the flexibility to provide supplemental credits for countries facing exogenous shocks where there is an ongoing adjustment operation in place. To the extent that grant allocations are available and unused in a given year, this supplemental financing could also take the form of a grant in IDA13.⁶ IDA13 also provides a grant facility to help countries manage natural disasters.

¹The EU responded to the unsatisfactory operation of Stabex and Sysmin by launching the FLEX scheme (July 2002), which is based on overall export earnings as opposed to the commodity-by commodity operation of the previous schemes.

² See Gilbert and Tabova (2003). The World Bank (IBRD) can provide commodity swaps to middle-income countries, but no countries have requested it so far.

³ See Borensztein and Mauro, forthcoming, and Hausman and Rigobon (2003), respectively.

⁴ Hausman and Rigobon (2003) suggest that IDA, due to its well-diversified lending portfolio, is well positioned to offer insurance against the negative effects of exogenous shocks by linking repayments on IDA credits to inflation-indexed local currency units.

⁵ The Cotonou Agreement—General Overview, European Commission, June 2000.

⁶ A supplemental grant of this type was approved in for Mali in early December 2003 to help fund the additional gap that emerged due to the persistence of the civil strife in Cote d'Ivoire.

⁴⁸ See, for example World Bank (1998).

policies and institutions are critical, at the microeconomic level, to reduce corruption and strengthen property rights, the rule of law, and the quality of civil service, all of which have been shown to positively impact long-term growth—including by improving the climate for entrepreneurship and foreign investment.⁴⁹ Policies that support macroeconomic stability are also key. Sound fiscal policies can enhance domestic resource mobilization, reducing the need for external financial assistance, while trade policy reforms that lower trade barriers in low-income countries and expand their access to industrial country markets are essential to facilitate export growth.

60. **Apart from supporting growth, good policies are also likely to attract higher aid flows and eventually move countries along a virtuous circle of creditworthiness and growth to an eventual graduation from donor dependence.** To the extent that creditors and donors precondition new financing on the quality of policies, increased concessional lending flows will be highly dependent on improved policy performance. While few low-income countries can be considered creditworthy in the true sense of the term (that is, they have access to private international capital), success stories such as Thailand, Korea and Botswana⁵⁰ demonstrate that with the right mix of policies, institutions and financial assistance, countries can attract private capital in significant amounts and become emerging markets within the foreseeable future.

B. Strengthening Debt Management

61. **Many low-income countries still have a long way to go in strengthening their capacity to pro-actively manage the maturity structure and currency composition of their debt.** Debt management in low-income countries tends to involve a choice between long-term concessional external borrowing in foreign currency and short-term domestic borrowing at market rates which often reflect significant inflation and liquidity risk premia within shallow markets.⁵¹ Sometimes governments may be tempted to reduce interest costs by borrowing domestically in foreign currency—though at the expense of incurring exchange-rate risk. Stronger and deeper domestic debt markets would help low-income

⁴⁹ Knack and Keefer (1995), Mauro (1995).

⁵⁰ All these countries were considered low-income and relatively uncreditworthy in the mid-1960s. Since then, however fast growth and good progress on policy reforms have helped these countries move to middle-income status.

⁵¹ The PRGF arrangements for many HIPCs and post-HIPCs contain performance criteria on not contracting new non-concessional external debt. Borrowing in the domestic market allows governments to issue domestic-currency denominated debt which has the advantage of eliminating exchange-rate risks altogether. However, because domestic debt markets tend to be underdeveloped, governments often have to resort to short-term or indexed debt or borrow from domestic banks at high cost.

countries issue a larger share of their debt in longer-term, fixed-rate, domestic-currency-denominated securities, thus reducing the overall risks in the debt portfolio. But many low-income countries often do not have the luxury of such a choice. The high premia they pay on domestic financing makes it advantageous to rely almost exclusively on official development assistance from abroad.

62. **Notwithstanding these constraints on actively managing risks, low-income countries can take various steps to improve their debt management.** Most importantly, governments need to be in a position to track debt-service obligations effectively to avoid costly penalties, and to make well-informed and transparent decisions about the amounts and terms of new public borrowing, consistent with the broader macroeconomic framework. This requires: (i) improving the monitoring of public and publicly-guaranteed debt on a broad definition (i.e., including debt of public enterprises, and local authorities, as well as claims on the private sector that are guaranteed by public entities) to obtain a better assessment of contingent liabilities; (ii) co-ordinating debt management closely with fiscal and monetary policies; (iii) providing debt-management agencies with a clear legal mandate and an effective disclosure policy; and (iv) recruiting staff to public debt-management offices that have good financial market, public policy, and technical skills, including for undertaking debt-sustainability analyses, so that they can provide the necessary support to policymakers.⁵²

63. **A number of institutions currently provide assistance to low-income countries in building capacity for debt management.** The Commonwealth Secretariat and UNCTAD-DMFAS are involved in the provision of a computer-based data management system for data recording and analysis. UNITAR offers training programs on debt and financial management with a focus on legal aspects. DRI, a non-profit organization, runs a program for capacity building in HIPCs. The World Bank has provided assistance mainly through its support for regional organizations.⁵³ Additionally, the World Bank has provided assistance related to risk analysis, strategy formulation and domestic debt-market development at the country level.⁵⁴ The Fund and Bank have collaborated on a pilot project

⁵² See IMF and World Bank, “Guidelines for Public Debt Management”, March 21, 2001.

⁵³ Important regional organizations that provide technical assistance on issues of debt management to low-income countries are the Macroeconomic & Financial Management Institute of Eastern and Southern Africa (MEFMI), Pole Dette (Regional Debt Management Training Center of Central and Western Africa), the West African Institute for Financial and Economic Management (WAIFEM), and the Center For Latin American Monetary Studies (CEMLA).

⁵⁴ The Banking and Debt Management Group of the Treasury of the World Bank has been one of the key suppliers of technical support in the area of debt management. Recently, hands-on training courses on risk modeling for government debt portfolios have been offered. Additionally, case studies on debt management, cash management and domestic

(continued)

involving a series of Country Program Assessments (CPAs). The main objective is to design, in co-operation with government officials, a program of reforms and capacity building to improve a country's capacity to manage sovereign debt. The program also provides assistance on the development and maintenance of domestic debt markets. Among low-income countries, Indonesia, Kenya and Nicaragua are participating in the program so far.

C. Increasing Resilience to Exogenous Shocks

64. **Low-income countries can also take measures to increase their resilience to exogenous shocks.** First, an adequate level of foreign reserves provides an obvious cushion against shocks. In addition, countries may take preventive measures that are targeted at more specific shocks. In the past, some countries, for example, have attempted to stabilize commodity prices through domestic microeconomic risk-management schemes. Like their international counterparts, however, these have only been marginally effective. More recently, a number of countries have had some success with using market-based instruments to hedge themselves against falls in export prices and revenues. In the long term, export diversification is the most effective mechanism to increase resilience to exogenous shocks. While diversification presents a number of challenges, there are some success stories which show that it is feasible over a longer horizon. Finally, the reduction of budget rigidities, combined with a well-designed tax system and social safety net, can help governments cope with the implications of external shocks.

65. **A number of domestic mechanisms intended to stabilize export earnings, such as marketing boards, buffer funds, and variable taxation were used widely in the past, but have proved costly and ineffective, mostly because of the failure of governments to segregate the stabilization functions of these schemes from the provision of implicit subsidies.**⁵⁵ These micro-level risk-management schemes were set up to mitigate the impact of price declines on the incomes of those hardest hit by the shock.⁵⁶ Contrary to expectations, however, domestic stabilization schemes often created large contingent liabilities for the government. Although stabilization was their official aim, once established, these schemes were quickly depleted as they invested their surpluses poorly and diverted stabilization funds to other purposes. The persistence of commodity price shocks meant that price stabilization

debt-market development have been carried out for Tanzania and Malawi, which laid out preliminary action plans for reform programs.

⁵⁵ Gilbert (1993) and Knudsen and Nash (1990).

⁵⁶ In theory, they could contribute to macro-level stabilization in two ways. First, they could accord protection at the macro level by minimizing the diversion of scarce government resources to deal with the adverse impacts of exogenous shocks. Second, sectoral stability could lead to macro stability if the sector (coffee, cocoa, cotton) was a large contributor to fiscal revenues, and was an important driver of export and overall economic activity.

schemes needed to accumulate large balances during peaks to support an uncertain low price period, which often proved unfeasible. These schemes are gradually being eliminated, though they continue to be prominent in Ghana, Mali and Burkina Faso, among others.

66. **Some countries also had partial success using markets to reduce exposure to volatile export prices and revenues.** The most widely used instruments are forward, futures, and swap contracts (Box 7). The ability of derivatives to provide effective macro-level protection against commodity price shocks is limited, however. First, it is difficult to scale-up the use of derivatives to cover a significant share of total export earnings, mainly because of lack of financial resources and the limited depth of these markets. Second, the majority of exporters in low-income countries have limited access to these derivative markets, with insufficient expertise in using them, and inadequate funds to cover costs of buying derivative instruments (though for exchange-traded commodity futures, the upfront cost is fairly small). Thirdly, derivative markets for agricultural commodities are mainly short-term (while adverse price shocks are often long-term), and extending them beyond one year becomes very expensive, although strategies exist for a rolling hedge that offers partial protection against adverse price movements.⁵⁷

Box 7. Official Uses of Commodity Derivative Markets

Derivatives have been used extensively by commodity market boards (most notably the Ghanaian cocoa marketing board, Cocobod) and stabilization funds (such as the Ivorian Caisstab, which has recently been abolished) which have typically contracted forward a proportion of the crop up to 18 months ahead through the broker-merchant market, enabling these institutions to set a producer price in advance of a new crop year. This form of contracting has declined with the general abolition of the boards and stabilization schemes. In metals, state-owned mining companies have locked in prices by establishing short futures positions on recognized exchanges or on an “over-the-counter” basis. Examples include Zambia (copper), Chile (copper), and Mexico (silver).¹ The gold market has seen a significant proportion of investment financed by gold loans in which companies have bought gold spot and sold forward to raise funds at an advantageous rate while simultaneously hedging revenues. There is an active swaps market in oil and major metals. The World Bank is currently providing technical assistance, capacity building and training for producer organizations and local financial institutions on commodity price risk management instruments. So far, assistance has been provided to Honduras, Nicaragua, Tanzania and Uganda.²

¹ IMF (2003c).

² World Bank (2003). Agriculture and Rural Development Department, “Dealing with Commodity Shocks: Experience and Options”. Paper prepared for the G-8 nations.

67. **Overall, export diversification is likely to be the most effective protection against commodity-price shocks, though country experiences suggest that this is not an**

⁵⁷ See Cohen and Portes (2003).

easy objective for governments to achieve. Encouraging export diversification in a way that is consistent with comparative advantage requires not only a coherent strategy but also a conducive environment for private entrepreneurs to embark on new activities and take risks. Such an environment is typically characterized by government policies devoted to macroeconomic stabilization including a realistic exchange rate, structural reforms, and growth, and supported by trade liberalization with increased market access, flexible labor markets, high quality of human capital and physical and financial infrastructure, and an investment climate that is attractive to foreign direct investment.⁵⁸ While a number of success stories, such as China, Chile, Costa Rica, Korea, Malaysia, and Thailand illustrate the potential for diversification, for most low-income countries the development of a well-diversified export base is likely to remain a long-term goal.

VI. CONCLUSIONS

68. **Debt sustainability is an essential condition for economic stability and growth in low-income countries.** Irrespective of whether debt-service obligations are expected to be financed by a country's own resources or by additional aid inflows or debt relief, excessive debt levels create adverse incentives for private investors or governments to engage in activities that spur long-term growth. In addition, while market rollover risks are limited in most low-income countries, those that are heavily indebted are particularly vulnerable to interruptions in aid flows in response to changing priorities of official creditors and donors. These problems are aggravated by various political, institutional, and structural risk factors, that tend to reduce returns on investment in low-income countries and, more generally, constrain their governments' ability to service debt. The corresponding risk to official creditors is that they may be forced to maintain positive net transfers to a country or to provide debt relief to ease the constraints that excessive debt service would otherwise impose on the use of countries' scarce resources. This would curtail the limited resources available to support sound policies in other deserving countries and generally undermine the efficient and transparent allocation of official aid flows.

69. **The proposed operational debt-sustainability framework for low-income countries aims at preventing excessive debt accumulation, by linking a country's borrowing potential to its current and prospective ability to service debt.** In recognition of the diversity across low-income countries, the framework incorporates empirical evidence on the factors that influence countries' debt-servicing capacity and risk of debt distress, by establishing dynamic, policy-dependent thresholds for a range of relevant debt-burden indicators. These thresholds are proposed to be used to inform judgments on debt sustainability, by providing indicative benchmarks for projected debt-burden indicators—namely, the present value of public and publicly guaranteed debt and debt service in relation to alternative measures of a country's repayment capacity—both under the baseline and in

⁵⁸ Amin Gutiérrez de Piñeres and Ferrantino (1995). The World Bank (2003). Zambia: The Challenge of Competitiveness and Diversification. Report No 25388-ZA.

the event of likely shocks. Based on a careful interpretation of the results and consideration of other relevant factors that influence an individual country's ability to carry debt, the proposed approach provides an informed basis for designing a sustainable country-specific borrowing (and lending) strategy.

70. **The proposed framework has important operational implications for creditors, donors, and low-income borrowers.** Creditors and donors would need to provide new financing at levels and on terms that limit low-income countries' risk of debt distress. This would imply an increase in the overall level of grants to low-income countries. Creditors and donors would also need to explore ways of helping countries deal with the impact of adverse exogenous shocks, which have proven to be a major contributor to deteriorating debt dynamics in low-income countries. The proposed framework protects the debt dynamics against "likely" shocks, by subjecting the long-term debt projections to stress tests which influence the judgment on appropriate levels of new borrowing. This precautionary ex-ante approach, however, will need to be complemented by ex-post mechanisms that provide additional financing or effective debt-service relief in the aftermath of more severe shocks. Finally, low-income countries also need to take important steps to bolster their own resilience to debt distress, such as improving policies and institutions, enhancing debt-management capacity, and implementing domestic policies that reduce their vulnerability to exogenous shocks.

71. **Next Steps.** Subject to Directors' approval of the proposed approach, the staffs of the two institutions will separately prepare detailed operational guidelines for Bank and Fund operations, consistent with the framework.

VII. ISSUES FOR DISCUSSION

72. Directors have stressed the need for an operational framework to assess debt sustainability in low-income countries. Do they agree that the operational framework proposed in this paper can provide an informed basis for determining sustainable borrowing and lending policies in these countries? More specifically:

- Does the framework strike the right balance between rules and discretion, by establishing policy-dependent indicative benchmarks for debt indicators, subjecting long-term debt projections to extensive stress testing, and allowing room for judgment in the interpretation of the results in light of other country-specific considerations?
- Is the choice of the specific thresholds ranges, based on historical experience of debt distress, appropriate, or would Directors prefer a more or less conservative approach to guide new lending decisions?
- Does the proposed framework assign appropriate roles to the various debt-burden indicators, by focusing, in the first instance, on the debt stock in present value terms, as a summary indicator of future obligations already taken on, while tracking debt-service indicators to assess the likelihood and timing of potential liquidity problems?

➤ Is the choice and magnitude of stress tests, and their suggested interpretation as presenting “likely” shocks, appropriate for the purpose of the framework?

73. Directors may wish to express their views on the implications for lenders and donors, in particular, with regard to the need to tailor the terms of new financing to countries’ risk of debt distress. Do they agree with the conclusion that overall grant resources to low-income countries need to be increased and, if so, do they see scope for a sizeable increase? What options do Directors see, if grants are not sufficient to ensure that a country can obtain the financing required to meet the MDGs while maintaining debt sustainability?

74. Directors may wish to comment on the problem of shocks and the possible approaches for dealing with their impact. Do they see scope for applying ex-post mechanisms for dealing with shocks on a wider basis and would they support further research in this direction?

75. Directors may wish to comment on how low-income countries could increase their resilience to debt distress. In this regard, do they view the proposed framework as providing appropriate incentives for countries to strengthen their policies?

EMPIRICAL ANALYSIS

1. Central to operationalizing the debt-sustainability framework is determining at what point debt becomes unsustainable, i.e., at what point debt indicators reach “danger levels”. The HIPC Initiative, in order to determine debt relief for HIPC countries, uses a present value (PV) of debt-to-exports ratio of 150 percent as a sustainability threshold. However, this ratio is considered to be conservative—implying that the “danger level” is higher—and makes no allowance for country-specific differences. Since the HIPC Initiative encompasses a diverse group of creditors to agree on the required amount of debt relief, the choice of a single debt-sustainability threshold as opposed to country-specific thresholds has the advantage of simplifying the implementation of the Initiative. The primary purpose of the low-income debt-sustainability framework, however, is not the facilitation of debt relief but informing new borrowing and lending decisions. Given that countries are likely to differ in their ability to sustain a given debt level, debt-sustainability thresholds that serve as the basis for lending or borrowing decisions would need to take those country-specific differences into account. It needs to be emphasized, though, that this is not an exact science and assessing prudent debt levels will necessarily involve a large degree of judgment.

2. The World Bank (Kraay and Nehru, 2004) empirically examined the determinants of “debt distress”, which was defined as periods in which countries resorted to exceptional financing in any of three forms: (i) significant arrears on external debt, (ii) Paris Club rescheduling, and (iii) non-concessional balance-of-payments support from the IMF. Using probit regressions, the analysis found that three factors explained a substantial fraction of the cross-country and time-series variation in the incidence of debt distress: the debt burden, the quality of policies and institutions, and shocks. They showed that these results were robust to a variety of alternative specifications, and that the core specifications had substantial out-of-sample predictive power.

3. Drawing partly on work by Gottschalk and Loko (2003), Fund staff have replicated the analysis in Kraay and Nehru with three modifications: (i) the dataset was limited to low-income countries; (ii) debt distress was defined purely by the occurrence of significant arrears to official creditors; and (iii) a different dataset was used for NPV of debt calculations.⁵⁹ This appendix presents the results of this analysis, which broadly corroborate the World Bank’s findings. The appendix also surveys some of the existing empirical literature on debt-sustainability thresholds and factors influencing them.

A. A First Look At The Data

4. The most simple approach towards assessing debt-sustainability thresholds is considering the average debt level in countries that have been experiencing a debt-distress

⁵⁹ Details of this approach are discussed below.

episode. This approach does not take country-specific factors into account, but provides a first glimpse at unconditioned average debt-sustainability thresholds.

5. The Fund staff analysis defines debt-distress episodes as situations marked by significant arrears accumulation (in excess of five percent of total debt) on obligations to official creditors.⁶⁰ This is a broad definition of debt distress, in the sense that it encompasses episodes of severe distress, where countries accumulate arrears continuously over a long period of time, and less severe episodes, where countries accumulate arrears in some but not all years. Focusing on arrears to official (as opposed to all) creditors, on the other hand, is meant to narrow the definition to relatively acute episodes of debt distress, assuming that countries would otherwise not take the risk of jeopardizing their primary, and most likely future, source of finance. Non-distress episodes are defined as at least three consecutive years in which the stock of arrears to official creditors is smaller than five percent of the total debt stock. All other episodes are defined as debt-distress episodes.

6. The first row in Figure 1 plots the distribution of the PV of debt-to-GDP ratio for both debt-distress and non-distress episodes. Visual inspection suggests that the distribution for the distress episodes is skewed towards the right, which means debt ratios tend to be higher for countries experiencing debt distress. This is also borne out by the summary statistics presented in the upper panel of Table 1, which show that the median of the PV of debt-to-GDP ratio for the debt-distress episodes is indeed noticeably higher than the corresponding median for the non-distress episodes. A similar relationship is found for the other debt-stock variables.⁶¹ Although the observation that debt-distress episodes are accompanied by high debt ratios does not prove that high debt is a cause for debt distress, it does show that the data is consistent with such a hypothesis.

7. For calculating debt-sustainability thresholds, the Fund staff analysis focuses on the debt situation that prevailed on average in the year prior to the beginning of a debt-distress episode. If countries accumulate debt over time until the debt burden becomes unsustainable, the year prior to debt distress could be interpreted as representing the “tipping point” where any further increase in debt will lead to distress. This approach yields a threshold value for the PV of debt-to-GDP ratio of around 43 percent, 192 percent for the PV of debt-to-exports ratio, and 288 percent for the PV of debt-to-revenue ratio.

⁶⁰ The threshold of five percent is intended to prevent ‘de minimis’ arrears from signaling debt distress and is consistent with the debt-distress definition chosen by Kraay and Nehru.

⁶¹ For the debt-service ratios this relationship is not visible, since these ratios are based on debt service *paid*, and not debt service *due*. Reliable data is available only for the former. Debt service paid does not include the accumulation of arrears, and therefore captures only part of the debt-service burden a country would face if it were to service its external obligations in full.

8. To assess how well these threshold values discriminate between debt-distress and non-distress observations, the 43 percent threshold value for the PV of debt-to-GDP ratio is indicated as a dotted line in Figure 1. From the first panel it is apparent that approximately 36 percent of non-distress events occurred at debt ratios higher than the threshold, and approximately 36 percent of the debt-distress episodes are characterized by debt ratios below the threshold. This illustrates that using a threshold value that does not take country-specific differences into account can lead to substantial type I and type II errors by wrongly classifying non-distress episodes as debt-distress episodes and vice versa.

9. In exploring the factors that determine a country's ability to sustain a given level of debt, Fund staff's empirical findings corroborate the result of the Bank staff analysis (Kraay and Nehru) on the strong role of policies; countries with strong policies can sustain a higher debt burden than those with weak policies. To provide a visual illustration of this result, the two lower panels in Figure 1 split the sample into observations corresponding to strong and weak policies, and show for these two groups the relative distribution of the PV of debt-to-GDP ratio for debt-distress and non-distress episodes.⁶² Comparing the distribution for non-distress episodes, the median for the strong policy observations turns out to be substantially higher than that of weak policy observations. A similar result is found for the debt-distress episodes. This supports the hypothesis that countries with strong policies can sustain higher debt levels than countries with weak policies without experiencing debt distress. By focusing again on the debt situation in the year prior to debt distress it is possible to derive debt-sustainability thresholds that differentiate between strong and weak policy, which is a first step towards country specific thresholds (Table 1). However, this approach is still relatively crude in that it distinguishes only between strong and weak policies and it also does not control for the role of shocks, which are another important cause of debt-distress episodes. This suggests to turn to more sophisticated econometric techniques to overcome these limitations.

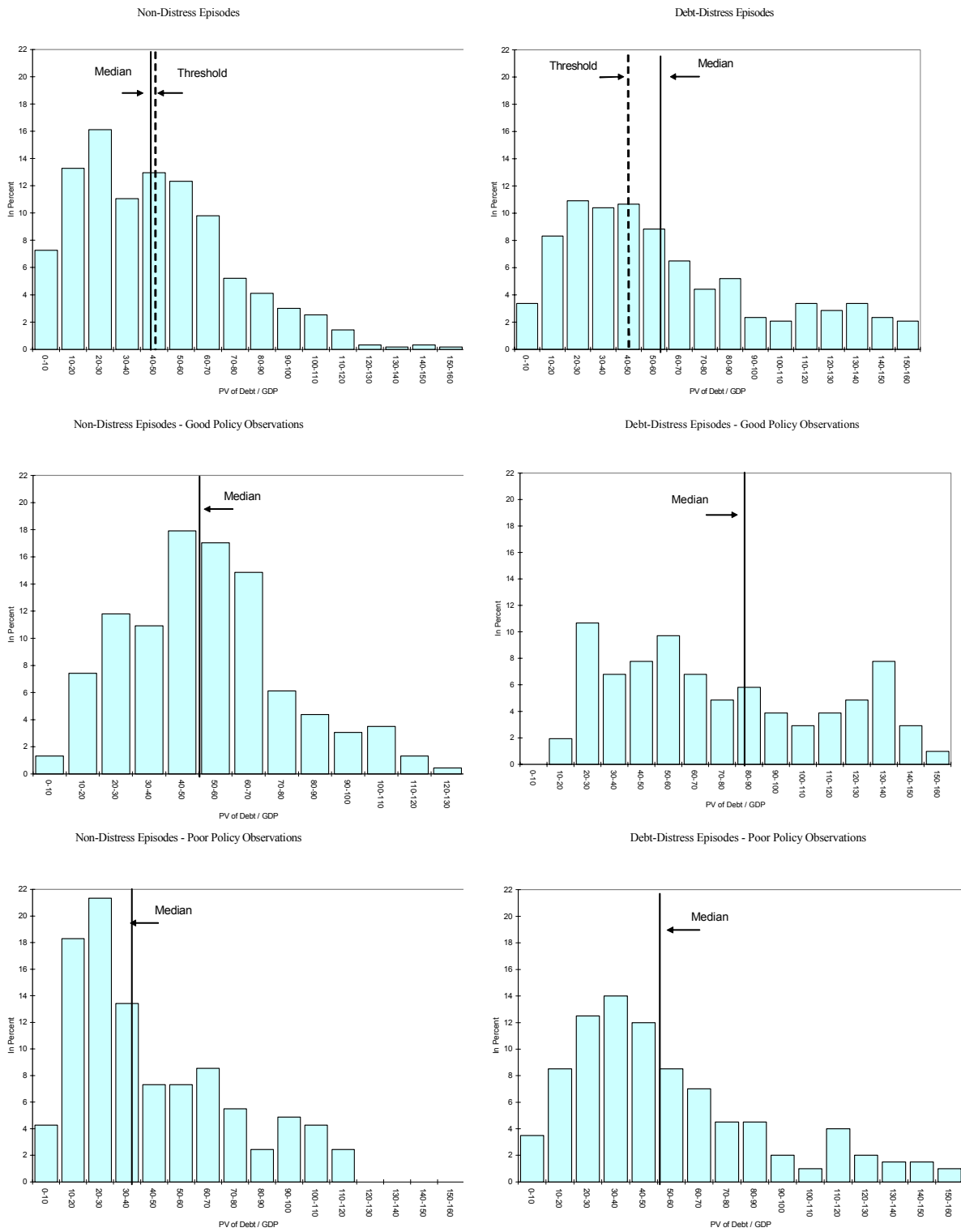
B. Empirical Results on the Link Between Debt Distress, Debt, and Policy

10. The aforementioned study by Kraay and Nehru uses a probit regression model to investigate the effect of debt and policy on the probability of debt distress using developing country data. Debt-distress episodes are defined as periods where countries have either a large arrears stock relative to the total debt stock⁶³, receive debt relief in the form of Paris Club rescheduling, or receive exceptional from the IMF. The study focuses on severe debt-distress episodes by eliminating all seemingly temporary distress episodes that are less than

⁶² Following Kraay and Nehru, the quality of policy is measured on the basis of the World Bank's CPIA index. Strong policy is defined as observations in the lower two quintiles, and weak policy corresponds to observations in the upper two quintiles.

⁶³ Arrears—which refer to arrears to all creditors (official and private) on long-term debt outstanding—are defined as large if they exceed 5 percent of total debt outstanding.

Figure 1. Relative Frequency Distribution of the PV of Debt-to-GDP Ratio



Source: Fund staff estimates.

Table 1. Median Debt Ratios During Debt Distress and Non-Distress Episodes 1/
(In percent)

	All Observations		
	Non-distress	Debt distress	Prior to Debt distress
PV of debt/GDP	41	58	43
PV of debt/exports	190	268	192
PV of debt/revenue	225	340	288
Debt service paid/exports	15	14	15
Debt service paid/revenue	18	15	13
	Good Policy Observations		
	Non-distress	Debt distress	Prior to Debt distress
PV of debt/GDP	50	81	60
PV of debt/exports	212	325	249
PV of debt/revenue	242	374	389
Debt service paid/exports	19	20	21
Debt service paid/revenue	24	17	20
	Poor Policy Observations		
	Non-distress	Debt distress	Prior to Debt distress
PV of debt/GDP	35	50	47
PV of debt/exports	195	239	213
PV of debt/revenue	250	333	305
Debt service paid/exports	14	10	15
Debt service paid/revenue	18	14	18

Source: Fund staff estimates.

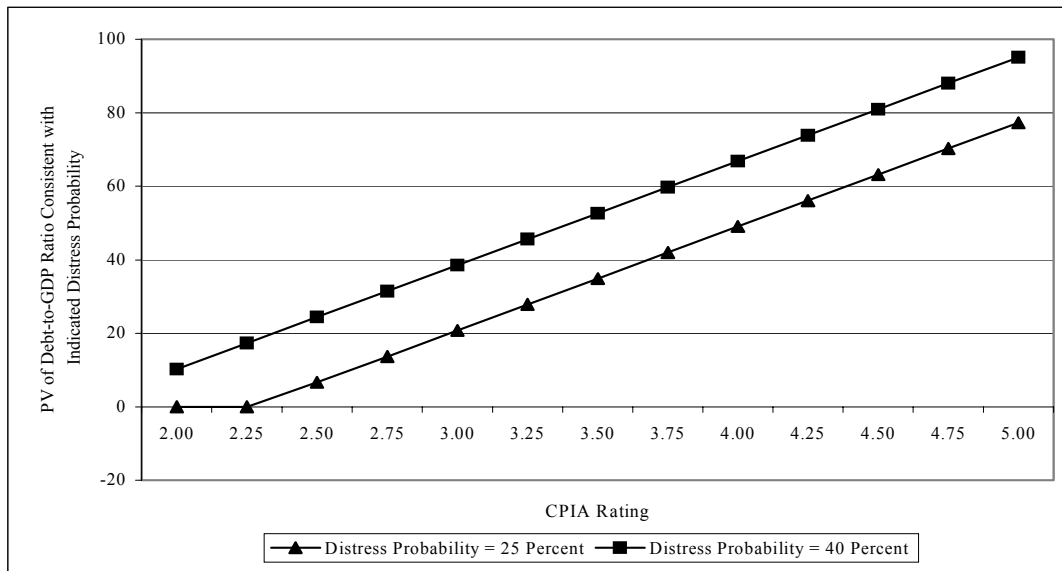
1/ Since the CPIA index is not available for all years and all countries, the sample for "All Observations" is larger than a combined sample of "Good Policy Observations" and "Poor Policy Observations". As a result, the median debt ratios for "All Observations" is not always between the corresponding ratios for good and poor policy observations, respectively.

three years long. Non-distress episodes are defined as non-overlapping periods of five consecutive years in which none of the three debt-distress indicators are observed. Explanatory variables are measured in the first year of non-distress and the year prior to the beginning of debt-distress episodes respectively, a methodology that controls for endogeneity in the effects of distress on debt ratios and the other right-hand side variables. A probit model

is then used to estimate the probability of debt-distress episodes as a function of debt variables, the CPIA index as an indicator for the quality of policy, and real GDP growth as a measure of shocks that countries experience. Using this specification, the authors find that debt levels, policy variables, and GDP growth are highly significant in determining the probability of debt distress.

11. An important implication of Kraay and Nehru’s results is that there is a strong tradeoff between debt indicators and policy variables. This is illustrated in Figure 2, which plots the NPV of debt-to-GDP ratio that is consistent with a fixed probability of debt distress

Figure 2. Sustainable Debt Level as a Function of Policies and Debt Distress Probabilities



Source: Kraay and Nehru (2004).

and a given quality of policy. Figure 2 shows, for example, that given a debt-distress probability of 25 percent, countries with a CPIA index of 4 (in a range of 1-6, with 1 marking the worst and 6 the best performance) can sustain a PV of debt-to-GDP ratio of 50 percent, whereas for countries with a CPIA index of 3, the corresponding debt ratio is at 20 percent.⁶⁴ For a given probability of debt distress, these results can be interpreted as providing a range for debt-sustainability thresholds, where the individual position of a country within the range depends on the quality of its policies.⁶⁵

⁶⁴ These results have been computed under the assumption that real GDP growth is at its average, which is equivalent to a no-shock assumption.

⁶⁵ The corresponding ranges for the other debt variables are reported in Table 1 of the main text for a 25 percent probability of distress.

12. The reliability of these threshold ranges depends critically on the ability of the model to effectively discriminate between debt-distress and non-distress episodes. An evaluation of the out-of-sample predictive power of the model shows that most specifications correctly predict 70 percent or more of the distress episodes. The authors find some variation in the prediction success regarding non-distress episodes; for the best specification they report a misclassification rate of 13 percent. In contrast, the misclassification rate of non-distress episodes jumps to over 50 percent if only the debt but not the policy variable is used. This mirrors the results from Figure 1, which also pointed to a large misclassification problem if debt thresholds do not take the policy dimension into account.

13. An important question is whether Kraay and Nehru's results can be reproduced for other policy variables. Manasse, Roubini and Schimmelpfennig (2003) use a similar methodological approach as Kraay and Nehru for the purpose of developing an early warning model of sovereign debt crises for emerging market economies. They find that macroeconomic variables reflecting solvency and liquidity factors can predict a debt crisis episode one year in advance. More specifically, they report that low GDP growth, current account imbalances, tight liquidity and monetary conditions in the G7 area, low trade openness, exchange rate overvaluation and volatility, monetary mismanagement (in the form of high inflation), policy uncertainty (in the form of high volatility of inflation), and political uncertainty matter for predicting debt crises.⁶⁶ It is possible that a number of these variables could also be important for explaining debt-distress episodes in low-income countries.

14. To explore this hypothesis for low-income countries, probit regressions similar to Kraay and Nehru's basic specification are estimated using other policy variables in place of the CPIA indicator. Following Kraay and Nehru, the estimated probit model explains the probability of debt distress as a function of debt, policy, and shocks. The latter are approximated with the growth rate of real GDP. However, since in contrast to Kraay and Nehru's results the GDP growth rate variable was often insignificant if used in isolation, the set of control variables was expanded to include the natural logarithm of GDP per capita (Atlas method) and a dummy variable for African countries. The GDP per capita variable serves as a measure of a country's capacity to cope with external shocks, based on the assumption that poorer countries may lack a well diversified economy or institutional capacity to weather such shocks. The dummy variable for African countries is intended to capture the high vulnerability of many African countries to commodity price shocks because of their dependence on commodity exports. Table 2 shows that all control variables are jointly significant at the 5 percent level. The definition of debt distress and non-distress episodes is the same that has been used for Figure 1 and Table 1. All variables have been lagged by one period to control for endogeneity.

15. This consideration of alternative policy variables allows a multidimensional analysis of the effect of policy on debt distress and hence acts as a robustness check of the result that

⁶⁶ Interestingly, they do not find a role for fiscal policy variables.

policy matters. Following Manasse et al., the policy variables considered are current account imbalances, trade openness, two alternative measures of exchange rate overvaluation, exchange rate volatility, inflation, and volatility of inflation. The current account variable serves as a measure of external financing requirements and is defined as the ratio of the current account balance to international reserves. Trade openness is defined as the sum of exports and imports over GDP. Exchange rate overvaluation is measured using an overvaluation index based on Dollar (1992) and alternately as the deviation of the real effective exchange rate from the preceding three-year average. Inflation is measured as the annual change in the consumer price index and inflation volatility as the deviation of the inflation rate from the preceding three-year average. Following Kraay and Nehru, real GDP growth is interpreted as a measure of shocks and not as a policy variable. A measure of monetary tightness in G7 countries, which is found by Manasse et al. to be an important determinant of debt distress in emerging markets, is omitted here since low-income countries typically do not borrow on commercial terms. In addition, the International Country Risk Guide (ICRG) indices on political risk and the quality of bureaucracy are used as measures of political risk and of institutional quality.

Table 2. Determinants of Distress 1/

	CPIA			Openness			Real Exchange Rate Deviation			Overvaluation		
	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue
Debt ratio	0.015**	0.002**	0.003**	0.016**	0.003**	0.003**	0.009**	0.002**	0.003**	0.016**	0.003**	0.004**
Policy	-0.519**	-0.415**	-0.404**	-0.006**	0.001	0.001	0.006*	0.006	0.008**	0.000	0.001	0.002*
P-Value of Test of Controls	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.290	0.000	0.000	0.000
Implied Thresholds 2/ 3/												
Bad Policy	26	83	138	28			27			161		234
Average Policy	43	186	205	37			34			189		261
Good Policy	58	276	264	45			38			202		296

	Exchange Rate Volatility			Inflation			ICRG Bureaucracy Index			ICRG Political Risk Index		
	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue	Debt-to-GDP	Debt-to-exports	Debt-to-revenue
Debt ratio	0.014**	0.002**	0.003**	0.015**	0.003**	0.003**	0.012**	0.002**	0.002**	0.012**	0.002**	0.002**
Policy	0.411**	0.429**	0.322**	0.001**	0.001**	0.002**	-0.312**	-0.233**	-0.272**	-0.016*	0.001	-0.007
P-Value of Test of Controls	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Implied Thresholds 2/ 3/												
Bad Policy	15	44	127	36	137	206	3	...	...	16		
Average Policy	23	103	156	39	154	241	7	...	17	26		
Good Policy	33	174	191	40	160	252	29	48	131	34		

Source: Fund staff estimates.

1/ * and ** denotes significance at the 5% and 1% level respectively.

2/ Debt ratios are in present value terms using constant discount rates.

3/ Missing value indicates that the relevant policy variable is found to be insignificant. "..." denotes negative thresholds.

16. Table 2 reports the results from this analysis and the implied policy-dependent debt-sustainability thresholds where the respective policy variables are significant, at least at the

five percent level. The implied debt thresholds have been calculated for the mean of the debt-ratios and control variables, and the 25th, 50th and 75th quartiles of the CPIA which correspond to strong, average and weak policies respectively. The 20 percent probability of distress used in these calculations was chosen such that the PV of debt-to-GDP for average policy countries corresponds to the threshold of 43 percent found in the unconditioned sample depicted in Figure 1. The first set of columns in Table 2 shows the results for the CPIA index as the policy variable. A comparison with Kraay and Nehru's results reported in Table 1 of the main text indicates that both empirical models agree on the relative effect of policies on debt thresholds. Both models find a threshold range between strong and weak policies of approximately 30 percentage points for the PV of debt-to-GDP ratio, 200 percentage points for the PV of debt-to-export ratio, and 100 percentage points for the PV of debt-to-revenue ratio. However, the absolute levels of the implied thresholds are higher for the model estimated here when the same probability of distress is assumed. The unconditional probability of distress used in Kraay and Nehru's analysis is 25 percent which, when applied to the specification here, generates absolute threshold levels that are higher by approximately 10, 85, and 55 percentage points for the debt-to-GDP, debt-to-exports, and debt-to-revenue ratios respectively.⁶⁷

17. The divergence in threshold levels for identical distress probabilities may partly reflect sample differences, differences in the definition of variables, or differences in methodology between Kraay and Nehru's analysis and the approach here: (i) whereas Kraay and Nehru use a sample of developing countries, the analysis here uses low-income countries only (see Table 3 for the list of countries included); (ii) the PV values used here (from Easterly's dataset) are based on a fixed discount rates of 7.5 percent, whereas the PV values in Kraay and Nehru's study are based on variable currency-specific commercial interest reference rates (CIRRs) as discount rates; and (iii) there are differences in defining debt-distress episodes as already noted. Nevertheless, even though these differences probably account for a significant part of the divergence in threshold levels, it is also clear that the absolute threshold levels depend strongly on the somewhat arbitrary choice of the probability of distress. The Kraay and Nehru paper and the analysis above suggest two useful approaches to determine the suitable choice of probability; alternative methodologies applied in other studies are discussed in the next section.

18. For policy variables other than the CPIA index, Table 2 shows that many of those considered here are highly significant and have the expected sign. That is, these results confirm that countries with strong policies can sustain higher debt ratios than those with weak policies, and this conclusion holds for many dimensions of policy. The absolute level and the range of the implied thresholds are typically considerably smaller than those found for the CPIA index. This may be the result of a significant omitted variable bias, since Table

⁶⁷ For example, the PV debt-to-GDP thresholds increase from 26, 43, and 58 percent to 37, 54, and 69 percent for weak, average and strong policies respectively when the probability of distress is increased from 20 to 25 percent in our analysis.

Table 3. List of Countries Covered in Empirical Analysis

Angola	Haiti	People's Democratic Republic of Lao
Armenia	India	Republic of Congo
Azerbaijan	Indonesia	Republic of Yemen
Bangladesh	Kenya	Rwanda
Benin	Kyrgyz Republic	Senegal
Bhutan	Lesotho	Sierra Leone
Burkina Faso	Liberia	Solomon Islands
Burundi	Madagascar	Sudan
Cambodia	Malawi	São Tomé & Príncipe
Cameroon	Mali	Tajikistan
Central African Republic	Mauritania	Tanzania
Chad	Moldova	The Gambia
Comoros	Mongolia	Togo
Côte d'Ivoire	Mozambique	Uganda
Democratic Republic of Congo	Myanmar	Ukraine
Ethiopia	Nepal	Uzbekistan
Georgia	Nicaragua	Vietnam
Ghana	Niger	Zambia
Guinea	Nigeria	Zimbabwe
Guinea-Bissau	Pakistan	

practically all regressions in Table 2 cover only one dimension of policy and omit other dimensions that also matter for debt distress.⁶⁸ Estimates using the CPIA index as policy variable are probably less affected by this problem, since the CPIA is itself a fairly comprehensive policy indicator. This suggests that threshold estimates using a broad based index like the CPIA are likely to be more reliable, even though the result that policy matters holds more generally.

C. The Relationship Between Debt and Growth

19. An important consideration in the above calculations of debt thresholds is determining the appropriate value for the risk of crisis. The approach followed above was to apply the risk of distress associated with historical experience, measured by the average debt

⁶⁸ In the case of inflation, the estimated coefficients are highly significant but quantitatively so small that inflation practically has no effect on the probability of debt distress. In addition to the omitted variable bias, the inflation variable may suffer to a particular large degree from an endogeneity bias in the sense that debt distress often leads to large increases in inflation, which would bias the regression results downwards.

ratio prior to distress events in the unconditioned sample of observations (i.e. the 43 percent PV debt-to-GDP threshold). Kraay and Nehru use a probability of distress of 25 percent which is equal to the historical unconditional average of debt distress in their sample. Alternatively, the 'target' probability of debt distress could be chosen by taking into account the negative effects of debt crises on the country's macroeconomic performance at different probabilities of distress. Such an approach is followed by Cohen (1997). He calculates the growth impact of a debt crisis at various probabilities to identify the probability of debt distress that has the largest negative effect on growth. With this probability, and the result from a probit regression that explains debt distress as a function of debt levels, he computes the implied debt thresholds. He finds that a 60 percent probability of distress has the maximum effect on growth, and finds threshold values of 50 percent for the PV of debt-to-GDP ratio, 200 percent for the PV of debt-to-exports ratio, and 290 percent for the PV of debt-to-tax ratio, which correspond closely to the unconditional threshold estimates presented above.

20. Pattillo, Poirson, and Ricci (2002) pursue an alternative approach that searches for non-linearities in the relationship between debt and growth. In particular, they argue on theoretical grounds that at low debt ratios the impact on growth is positive, whereas at high debt ratios the impact is negative, and examine this hypothesis for a group of developing countries between 1968-1998. Estimating quadratic and spline specifications using a large panel dataset, they find debt to have a nonlinear impact on growth even when investment is controlled for. In particular, the average impact of debt on per capita growth becomes negative for PV of debt levels above 160-170 percent of export and 35-40 percent of GDP.⁶⁹ If policy aims at ensuring a positive average impact of debt on growth, these results could also be interpreted as threshold values.

⁶⁹ The marginal effect of external debt on growth in this study is found to become negative at NPV of debt-to-GDP ratios of 9-14 percent. Using a sample for low-income countries only, a recent study by Clements et al. (2003) finds that in this group, negative marginal effects on growth begin to occur at levels of public and publicly guaranteed external debt of 20-25 percent of GDP.

ILLUSTRATION OF PROPOSED DEBT-SUSTAINABILITY FRAMEWORK

1. **This Appendix illustrates the proposed framework for debt-sustainability analyses in low-income countries.** The output generated by the two templates for the assessment of external and public debt sustainability is presented on the basis of two hypothetical country cases. In general, both parts of the analysis would be conducted for each low-income country—consistent with the approach adopted in the Fund for emerging markets and industrialized countries—unless domestic debt of the public sector (external debt of the private sector) is negligible. In this case, a single analysis of external (public) debt would generally be sufficient. Moreover, for those low-income countries that have access to private international capital markets and hold relatively small amounts of concessional debt, the Fund’s “emerging-market template” may be a more suitable analytical tool for debt-sustainability assessments.

A. External Debt Sustainability Analysis

2. **The first step of the analysis consists of determining appropriate indicative thresholds for the relevant debt-burden indicators, namely the NPV of public and publicly guaranteed (PPG) external debt, in percent of GDP and export, and the debt service-to-exports ratio.** It is assumed that the quality of policies and institutions in the hypothetical country (Country A) is close to average, though slightly on the weak side, suggesting indicative debt-burden thresholds that are somewhat below the ratios established in Table 2 of the main text for medium policies. Thus, indicative ratios of **40 percent of GDP** and **180 percent of exports** would appear to be appropriate upper benchmarks for the NPV of PPG external debt in this country, with a corresponding PPG debt-service threshold of about **20 percent of exports**.

3. **In a second step, the external template is applied to project the debt dynamics under the baseline (Table 1).** Starting from the evolution of total (nominal) external debt, as a share of GDP, and the breakdown of the factors that determine the debt dynamics (namely, the non-interest current account, non-debt creating capital inflows (FDI), and the endogenous debt dynamics), Table 1 derives the NPV of external debt and its public and publicly guaranteed component—with the NPV of private sector debt approximated by its face value. In Country A, private sector debt is low at less than 5 percent of GDP and projected to rise only gradually to about 15 percent of GDP by the end of the 20-year projection period. The NPV of PPG external debt, however, at 41 percent of GDP, is slightly above the indicative threshold—though some 15 percentage points below the export-based threshold. Thus, GDP would, at present, constitute the more binding denominator constraint, while the export-based ratio is high enough to suggest that elevated debt ratios are not driven by denominator (i.e., measurement) problems. Over the medium term, both ratios are projected to rise slightly to a maximum of 43 percent of GDP and 173 percent of exports, respectively, but to return to their initial levels by 2008. With broadly stable PPG debt-service ratios of somewhat less than 20 percent of exports, the situation would, on balance, appear manageable but tight with little room for additional borrowing beyond the baseline projections. Some comfort would

Table I. Country A: External Debt Sustainability Framework, Baseline Scenario, 2000-2023 1/
(In percent of GDP, unless otherwise indicated)

	Actual			Historical Average 6/	Standard Deviation 6/	Estimate					Projections		
	2000	2001	2002			2003	2004	2005	2006	2007	2008	2003-08 Average	2013
External debt (nominal) 1/	59.5	62.5	63.5			64.5	65.7	69.3	70.3	67.9	65.6		54.3
o/w public and publicly guaranteed (PPG)	55.6	58.2	59.1			60.0	61.2	64.7	65.7	62.9	60.1		45.8
Change in external debt	-0.8	3.0	1.0			1.0	1.2	3.6	1.0	-2.3	-2.4		-1.9
Identified net debt-creating flows	-1.3	2.6	1.0			2.2	3.0	2.6	2.0	-1.1	-1.0		-0.7
Non-interest current account deficit	6.2	6.4	6.5	8.2	2.4	11.3	12.2	12.4	12.2	8.8	8.6		7.3
Deficit in balance of goods and services	17.5	15.9	14.7			15.8	16.8	17.0	16.8	16.7	16.4		14.7
Exports	26.6	26.0	24.8			24.9	24.3	24.9	24.9	24.8	24.6		23.4
Imports	44.1	41.8	39.5			40.7	41.0	41.8	41.6	41.5	41.0		38.1
Net current transfers (negative = inflow)	-3.9	-5.0	-3.9	-5.6	1.6	-4.6	-4.6	-4.6	-4.6	-4.6	-4.6		-4.6
Other current account flows (negative = net inflow)	-7.4	-4.5	-4.3			0.1	0.1	0.1	0.1	-3.3	-3.2		-2.7
Net FDI (negative = inflow)	-5.0	-2.5	-3.9	-3.7	2.2	-6.9	-7.4	-7.9	-8.6	-8.0	-7.9		-6.7
Endogenous debt dynamics 2/	-2.5	-1.3	-1.7			-2.2	-1.8	-1.9	-1.7	-1.8	-1.8		-1.2
Contribution from nominal interest rate	1.8	1.5	1.5			1.6	1.7	1.5	1.6	1.5	1.4		1.4
Contribution from real GDP growth	-2.3	-2.1	-3.0			-3.8	-3.5	-3.5	-3.3	-3.3	-3.2		-2.6
Contribution from price and exchange rate changes	-2.0	-0.7	-0.2			...	...	...	...	...	...		...
Residual (3-4) 3/	0.5	0.4	0.1			-1.2	-1.8	1.0	-1.0	-1.2	-1.3		-1.2
o/w exceptional financing	-2.2	-1.3	-0.9			0.0	0.0	0.0	0.0	0.0	0.0		0.0
NPV of external debt 4/	...	...	45.8			45.4	45.1	47.3	47.7	46.9	46.2		41.7
In percent of exports	...	...	184.9			182.5	185.9	190.1	191.8	189.5	187.8		178.0
NPV of PPG external debt	...	...	41.3			40.9	40.6	42.7	43.1	41.9	40.7		33.1
In percent of exports	...	...	166.8			164.4	167.3	171.5	173.3	169.2	165.5		141.3
Debt service-to-exports ratio (in percent)	15.2	22.6	25.5			22.5	24.6	22.9	23.2	21.1	19.0		23.0
PPG debt service-to-exports ratio (in percent)	11.2	18.6	21.1			18.1	20.0	18.2	18.5	16.4	13.9		14.5
Total gross financing need (billions of U.S. dollars)	0.2	0.3	0.3			0.4	0.4	0.4	0.4	0.3	0.3		0.5
Non-interest current account deficit that stabilizes debt ratio	7.0	3.4	5.5			10.3	11.0	8.9	11.2	11.1	11.0		9.2
Key macroeconomic assumptions													
Real GDP growth (in percent)	4.1	3.8	5.1	5.9	15.6	6.5	6.0	5.5	5.0	5.0	5.0	5.5	5.0
GDP deflator in US dollar terms (change in percent)	3.4	1.2	0.3	2.3	14.9	2.0	2.9	-1.5	1.5	1.8	2.0	1.4	2.2
Effective interest rate (percent) 5/	3.2	2.7	2.6	2.8	0.2	2.8	2.9	2.4	2.4	2.2	2.2	2.5	2.6
Growth of exports of G&S (US dollar terms, in percent)	9.7	2.5	0.5	8.4	9.9	9.1	6.4	6.6	6.5	6.5	6.5	6.9	6.0
Growth of imports of G&S (US dollar terms, in percent)	6.6	-0.4	-0.6	9.1	22.5	12.0	10.0	6.0	6.0	6.5	6.0	7.8	5.6
Grant element of new public sector borrowing (in percent)	...	...	...	...	...	44.5	40.9	36.8	37.7	26.8	29.1	36.0	27.3
<i>Memorandum item:</i>													
Nominal GDP (billions of US dollars)	3.0	3.2	3.4			3.7	4.0	4.1	4.4	4.7	5.1		7.2

Source: Staff simulations.

1/ Includes both public and private sector external debt.

2/ Derived as $[r - g - \rho(1+g)] / (1+g+\rho+g\rho)$ times previous period debt ratio, with r = nominal interest rate; g = real GDP growth rate, and ρ = growth rate of GDP deflator in U.S. dollar terms.

3/ Includes exceptional financing (i.e., changes in arrears and debt relief); changes in gross foreign assets; and valuation adjustments. For projections also includes contribution from price and exchange rate changes.

4/ Assumes that NPV of private sector debt is equivalent to its face value.

5/ Current-year interest payments divided by previous period debt stock.

6/ Historical averages and standard deviations are generally derived over the past 10 years, subject to data availability.

arise from a per capita income level that is assumed to be at the upper end of the low-income country spectrum. Over the long term PPG debt ratios are projected to improve, on account of falling current account deficits and sizeable FDI inflows, while the endogenous debt dynamics would deteriorate somewhat. The debt-service ratio would continue to hover around 20 percent, as financing is increasingly obtained from commercial sources.

4. **The third step of the analysis consists of an interpretation of the stress-test results.** The stress tests are conducted for the NPV of PPG external debt and distinguish between “alternative scenarios,” which are designed as permanent modifications of key baseline assumptions, and “bound tests,” representing temporary deviations—though some with permanent level effects. The alternative scenarios include a “historical scenario” in which the main parameters that determine the debt dynamics (namely, real GDP growth; inflation, measured by changes in the GDP deflator, in U.S. dollar terms; the non-interest current account in percent of GDP; and non-debt creating flows in percent of GDP) are assumed to remain at their historical averages, generally derived over a ten-year period. This scenario is intended to provide a “reality check” for the baseline projections against the country’s own history. The second alternative scenario is a “financing scenario” in which new borrowing is assumed to be on less favorable terms (a 2 percentage point higher interest rate) throughout the projection period. The bound tests, include isolated two-period one-standard deviation shocks to the key variables (including export growth in addition to the above-mentioned parameters), a combined shock of half the size, and a one-time 30 percent depreciation.⁷⁰ The size of the shocks has been chosen to present, on average, a 25 percent probability of occurring over a 10-year period, as derived in Appendix III and discussed in the main text. The implications for the key debt-burden indicators, presented in Table 2—and illustrated in Figure 1 for the baseline, the historical scenario, and the most extreme bound test—suggest the following interpretations:

- The simulation of the long-term debt dynamics under historical trends (scenario A1) produces a considerable deterioration over time in both debt and debt-service indicators, despite historically more favorable growth and inflation developments. The reason for the negative deviation from the baseline is the gap between current account deficits and FDI inflows, which is projected to shrink over time under the baseline. A justification of the baseline projections, in this specific case, would therefore need to focus on convincing arguments in support of the relatively favorable outlook for FDI and current account developments. Over the medium term, the stability of the debt outlook is also contingent on obtaining the assumed concessional financing, as two percentage points higher interest

⁷⁰ To be precise, the shocked variables under the bound tests (except for the depreciation scenario) are assumed to be equivalent to their historical averages plus/minus two (one) standard deviations over the following two years, before returning to their levels under the baseline (see footnotes to Table 2).

Table 2. Country A: Sensitivity Analyses for Key Indicators of Public and Publicly Guaranteed External Debt, 2003-23
(In percent)

	Estimate		Projections					
	2003	2004	2005	2006	2007	2008	2013	2023
NPV of Debt-to-GDP Ratio								
Baseline	41	41	43	43	42	41	33	21
A. Alternative Scenarios								
A1. Key variables at their historical averages in 2004-23 1/	41	41	41	42	43	45	50	54
A2. New public sector loans on less favorable terms in 2004-23 2/	41	43	47	49	48	48	43	35
B. Bound Tests								
B1. Real GDP growth at historical average minus one standard deviation in 2004-05	41	48	58	59	57	56	45	28
B2. Export value growth at historical average minus one standard deviation in 2004-05 3/	41	42	47	48	46	45	36	21
B3. US dollar GDP deflator at historical average minus one standard deviation in 2004-05	41	48	57	57	56	54	44	27
B4. Net non-debt creating flows at historical average minus one standard deviation in 2004-05 4/	41	46	54	54	53	52	40	22
B5. Combination of B1-B4 using one-half standard deviation shocks	41	49	60	60	59	57	46	27
B6. One-time 30 percent nominal depreciation relative to the baseline in 2004 5/	41	57	60	61	59	58	47	29
NPV of Debt-to-Exports Ratio								
Baseline	164	167	172	173	169	165	141	99
A. Alternative Scenarios								
A1. Key variables at their historical averages in 2004-23 1/	164	167	165	167	174	181	215	261
A2. New public sector loans on less favorable terms in 2004-23 2/	164	176	187	196	195	193	184	169
B. Bound Tests								
B1. Real GDP growth at historical average minus one standard deviation in 2004-05	164	167	172	173	169	165	141	99
B2. Export value growth at historical average minus one standard deviation in 2004-05 3/	164	187	221	223	218	214	179	118
B3. US dollar GDP deflator at historical average minus one standard deviation in 2004-05	164	167	172	173	169	165	141	99
B4. Net non-debt creating flows at historical average minus one standard deviation in 2004-05 4/	164	190	217	218	214	210	170	104
B5. Combination of B1-B4 using one-half standard deviation shocks	164	176	194	196	192	188	158	107
B6. One-time 30 percent nominal depreciation relative to the baseline in 2004 5/	164	167	172	173	169	165	141	99
Debt Service-to-Exports Ratio								
Baseline	18	20	18	18	16	14	15	19
A. Alternative Scenarios								
A1. Key variables at their historical averages in 2004-23 1/	18	20	17	17	15	13	18	33
A2. New public sector loans on less favorable terms in 2004-23 2/	18	20	18	19	18	15	15	26
B. Bound Tests								
B1. Real GDP growth at historical average minus one standard deviation in 2004-05	18	20	18	18	16	14	15	19
B2. Export value growth at historical average minus one standard deviation in 2004-05 3/	18	22	22	22	20	17	19	23
B3. US dollar GDP deflator at historical average minus one standard deviation in 2004-05	18	20	18	18	16	14	15	19
B4. Net non-debt creating flows at historical average minus one standard deviation in 2004-05 4/	18	20	19	20	18	16	19	20
B5. Combination of B1-B4 using one-half standard deviation shocks	18	21	19	20	18	15	17	21
B6. One-time 30 percent nominal depreciation relative to the baseline in 2004 5/	18	20	18	18	16	14	15	19
<i>Memorandum item:</i>								
Grant element assumed on residual financing (i.e., financing required above baseline) 6/	16	16	16	16	16	16	16	16

Source: Staff projections and simulations.

1/ Variables include real GDP growth, growth of GDP deflator (in U.S. dollar terms), non-interest current account in percent of GDP, and non-debt creating flows.

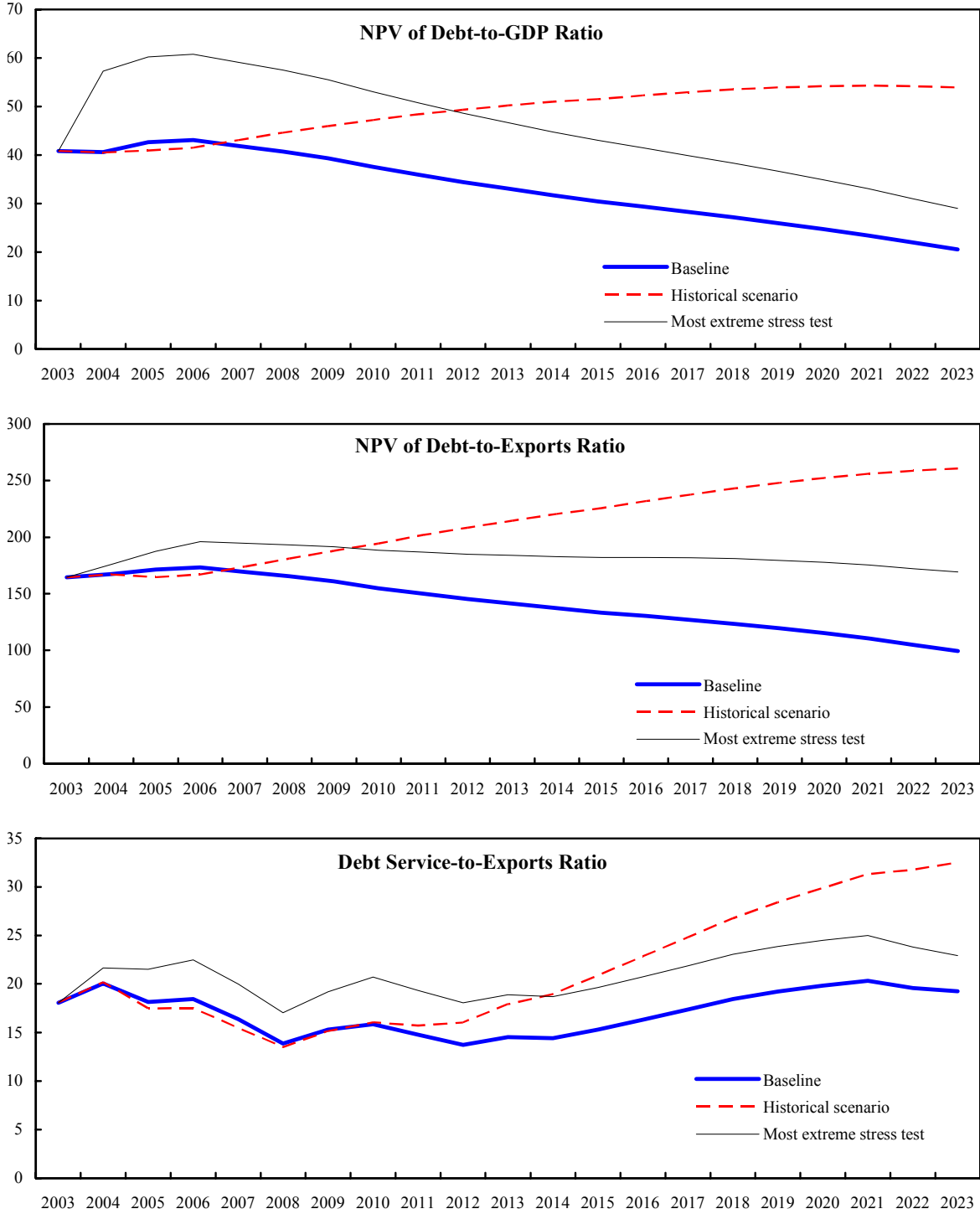
2/ Assumes that the interest rate on new borrowing is by 2 percentage points higher than in the baseline, while grace and maturity periods are the same as in the baseline.

3/ Exports values are assumed to remain permanently at the lower level, but the current account as a share of GDP is assumed to return to its baseline level after the shock (implicitly assuming an offsetting adjustment in import levels).

4/ Includes official and private transfers and FDI.

5/ Depreciation is defined as percentage decline in dollar/local currency rate, such that it never exceeds 100 percent.

Figure 1. Country A: Indicators of Public and Publicly Guaranteed External Debt Under Alternative Scenarios, 2003-2023 (In percent)



Source: Staff simulations.

rates would raise the debt ratio to some 48 percent of GDP (scenario A2)—considerably higher than the indicative threshold.

- The worst scenario among the bound tests is a one-time 30 percent exchange-rate depreciation, which results in an NPV of debt-to-GDP ratio of 47 percent after 10 years—7 percentage points above the indicative threshold and some 14 percentage points above the baseline projection. Similar effects—with NPV of debt-to-GDP ratios of around 45 percent after 10 years—arise from the GDP growth shock, the deflator shock, and the combined shock. The NPV of debt-to-exports ratio and the debt service ratio, on the other hand, would remain below their indicative threshold levels.
- In conclusion, while the short-term borrowing profile for 2004 appears appropriate, over the medium term, country A would be advised to seek higher concessionality in its new financing or keep its borrowing levels below those envisaged under the baseline to create more room for maneuver in the event of adverse shocks. A revision of borrowing plans would appear particularly warranted, if FDI inflows fell short of expectations.

B. Public Sector Debt Sustainability Analysis

5. **The structure of the public debt-sustainability template mirrors that for external debt.** The debt dynamics, however, are now driven by the primary fiscal balance, as opposed to the non-interest current account, and by “above-the-line” items specific to the fiscal accounts, while exchange-rate movements only affect the foreign-currency denominated part of the debt stock. The NPV of public debt is derived by including domestic liabilities at their face value, and the external component, both relative to GDP and revenues (including grants) is identified separately, to provide a basis for comparisons with the indicative threshold ratios.

6. **The baseline projections are presented in Table 3.** The hypothetical low-income country (Country B) is assumed to have received debt relief under the HIPC Initiative in 2003, which reduced the NPV of public sector external debt by more than one-third to about 42 percent of GDP and 164 percent of revenues. Under the assumption that the quality of Country B’s policies and institutions is about average, and that no other factors (such as, per capita income) suggest particular weakness or strength, both ratios would be below the indicative thresholds of **45 percent of GDP** and **200 percent of revenues**.⁷¹ However, Country B’s government has sizeable domestic obligations, equivalent to about 20 percent of GDP, which add considerably to the government’s debt-service burden, indicated by near-

⁷¹ Care needs to be taken in interpreting the debt-burden ratios relative to the indicative thresholds, as the coverage of the public sector in the template, following country-specific conventions, may differ from the concept of PPG external debt (for example, by not including private sector debt that is publicly guaranteed).

Table 3. Country B: Public Sector Debt Sustainability Framework, Baseline Scenario, 2000-2023
(In percent of GDP, unless otherwise indicated)

	Actual			Historical Average 5/	Standard Deviation 5/	Estimate					Projections		
	2000	2001	2002			2003	2004	2005	2006	2007	2008	2003-08 Average	2013
Public sector debt 1/	222.2	171.1	171.9			125.3	113.6	105.6	97.9	92.2	87.4		72.6
o/w foreign-currency denominated	217.1	150.2	152.9			105.9	97.8	91.8	85.5	80.8	77.1		66.2
Change in public sector debt	39.3	-51.1	0.9			-46.6	-11.7	-8.1	-7.7	-5.8	-4.7		-2.4
Identified debt-creating flows	35.7	-52.6	2.4			-45.6	-10.4	-7.2	-5.7	-5.8	-5.3		-3.8
Primary deficit	2.8	4.7	1.6	-1.1	3.9	0.5	-1.5	-1.0	-0.4	-0.9	-0.5	-0.7	0.4
Revenue and grants	25.1	24.8	26.3			25.5	25.5	24.5	24.0	23.0	22.8		21.7
of which: grants	5.7	5.7	8.3			7.1	7.4	6.3	5.9	4.8	4.7		3.6
Primary (noninterest) expenditure	27.9	29.5	27.8			25.9	24.0	23.5	23.6	22.0	22.3		22.1
Endogenous debt dynamics	40.7	-69.8	0.9			-12.9	-9.0	-6.2	-5.2	-4.9	-4.7		-4.2
Contribution from interest rate/growth differential	-7.5	-13.4	-5.8			-7.6	-4.8	-5.3	-5.3	-4.6	-4.4		-3.9
of which: contribution from average real interest rate	-1.1	-3.0	-0.8			-0.2	0.6	0.1	-0.2	-0.4	-0.4		-0.6
of which: contribution from real GDP growth	-6.3	-10.4	-5.0			-7.4	-5.4	-5.4	-5.0	-4.2	-4.0		-3.2
Contribution from real exchange rate depreciation	48.2	-56.4	6.7			-5.4	-4.1	-0.8	0.1	-0.3	-0.3		-0.3
Other identified debt-creating flows	-7.9	12.5	0.0			-33.1	0.0	0.0	0.0	0.0	0.0		0.0
Privatization receipts (negative)	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0
Recognition of implicit or contingent liabilities	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0
Debt relief (HIPC and other)	-7.9	0.0	0.0			-33.1	0.0	0.0	0.0	0.0	0.0		0.0
Bank recapitalization	0.0	12.5	0.0			0.0	0.0	0.0	0.0	0.0	0.0		0.0
Residual, including asset changes	3.6	1.4	-1.6			-1.0	-1.3	-0.9	-2.0	0.1	0.5		1.4
NPV of public sector debt	140.2	115.0	123.1			61.1	55.4	52.4	47.3	43.9	41.5		36.3
o/w external	135.1	94.1	104.0			41.7	39.5	38.7	34.9	32.6	31.2		29.8
Gross financing need 2/	7.0	8.0	6.4			8.6	6.5	5.2	4.9	3.9	3.6		2.5
NPV of public sector debt-to-revenue ratio (in percent) 3/	558.8	463.2	468.2			240.0	217.1	214.4	197.3	191.4	182.3		167.0
o/w external	538.5	378.9	395.8			163.6	155.0	158.2	145.5	142.1	137.0		137.1
Debt service-to-revenue ratio (in percent) 3/ 4/	12.1	10.1	15.5			32.0	31.4	25.2	22.4	21.1	18.3		9.5
Primary deficit that stabilizes the debt-to-GDP ratio	-36.5	55.8	0.7			47.1	10.2	7.1	7.2	4.8	4.2		2.8
Key macroeconomic and fiscal assumptions													
Real GDP growth (in percent)	3.6	4.9	3.0	0.6	5.6	4.5	4.5	5.0	5.0	4.5	4.5	4.7	4.5
Average nominal interest rate on forex debt (in percent)	1.0	0.6	0.6	0.7	0.3	1.1	1.1	1.0	0.9	0.9	0.8	1.0	0.5
Average real interest rate on domestic currency debt (in percent)	16.3	12.8	0.1	9.8	8.5	1.6	3.3	4.6	5.5	5.4	5.1	4.3	5.0
Real exchange rate depreciation (in percent, + indicates depreciation)	24.0	-24.1	4.6	-2.3	24.2	-3.6	-3.9	-0.9	0.1	-0.4	-0.4	-1.5	-0.5
Inflation rate (GDP deflator, in percent)	30.0	24.3	19.7	43.7	44.2	19.9	13.7	7.9	5.2	5.0	5.0	9.5	5.0
Growth of real primary spending (deflated by GDP deflator, in percent)	9.2	10.9	-2.9	3.9	17.0	-2.7	-3.2	2.6	5.4	-2.2	5.5	0.9	5.3
Grant element of new external borrowing (in percent)	62.3	62.3	62.3	88.7	18.2	62.3	62.3	62.3	62.3	62.3	62.3	62.3	62.3

Sources: Country authorities; and Fund staff estimates and projections.

1/ [Indicate coverage of public sector, e.g., general government or nonfinancial public sector. Also whether net or gross debt is used.]

2/ Gross financing need is defined as the primary deficit, plus debt service, plus the stock of short-term debt at the end of the previous period.

3/ Revenues including grants.

4/ Debt service is defined as the sum of interest and amortization on medium and long-term debt of the public sector.

5/ Historical averages and standard deviations are generally derived over the past 10 years, subject to data availability.

term debt service-to-revenue ratios of more than 30 percent—which is also the indicative threshold for medium policies (though not strictly comparable as the latter is derived on the basis of external PPG debt, only).

7. **The baseline projections anticipated a considerable improvement in the debt-burden indicators over the longer-term.** During the next ten years, total public sector debt is projected to fall to 36 percent, in present value terms, and to 22 percent by 2023, with domestic debt dropping gradually to negligible levels. The projected reduction in debt stocks is accompanied by a rapid improvement in the debt-service ratio to 20 percent over the medium term and less than 10 percent in the long run. These projections assume relatively high GDP growth and tight fiscal policy. Real GDP growth is projected at around 4½ percent, on average, over 2003-2023; this optimistic forecast contrasts with the recent historical experience (½ percent per annum), but may be plausible under a scenario in which good policies are implemented. A gradual fiscal adjustment, mostly driven by cuts in primary expenditure, transforms the 2002 primary deficit of 1½ percent of GDP into a modest surplus during the simulation period. With real primary spending growing at only 1 percent a year during the adjustment period (2003-08) and about 4 percent (the historical average growth rate) thereafter, there is little room for poverty-reducing spending, unless this is created by a reallocation of the budget for these programs.

8. **The stress test results are presented in Table 4 and Figure 2.** In recognition of the importance of domestic debt, and to avoid duplication from the external debt sustainability analysis, the public-debt template conducts stress tests for total public sector debt and debt service—which cannot be directly compared with the indicative thresholds, and needs to be interpreted with care. In addition to the historical scenario (applied to real GDP growth and the primary balance), the second alternative scenario simulates the debt-burden indicators under unchanged primary balances, akin to a “no-reform” scenario, and the third scenario assumes permanently lower GDP growth, with the deviation from the baseline linked to historical volatility. While the first two scenarios would simply curb the decline in the debt ratio, without alter the trend, the weaker growth scenario would keep the debt-burden indicators high throughout, with the NPV of debt-to-revenue ratio rising to 300 percent by the end of the projection period, and the debt-service ratio moving back up to about 30 percent.

9. **The bound tests are similar to the ones simulated in the external-debt template.** In addition, they include a one-off 10 percent of GDP increase in other debt-creating flows, due for example to the unexpected realization of contingent liabilities. The stress tests suggest that Country B’s debt outlook is particularly vulnerable to a GDP growth shock, which would keep the NPV of debt-to-GDP ratio above 50 percent after ten years. Under the assumption that the residual borrowing needs are met from external sources—such that domestic debt would fall as in the baseline—the external component of public debt would amount to 48 percent of GDP and 215 percent of revenues, in present value terms—both exceeding their indicative threshold values. However, debt-service (on total public debt) would remain considerably below the current level of 30 percent of revenues.

Table 4. Country B: Sensitivity Analyses for Key Indicators of Public Sector Debt , 2003-2023

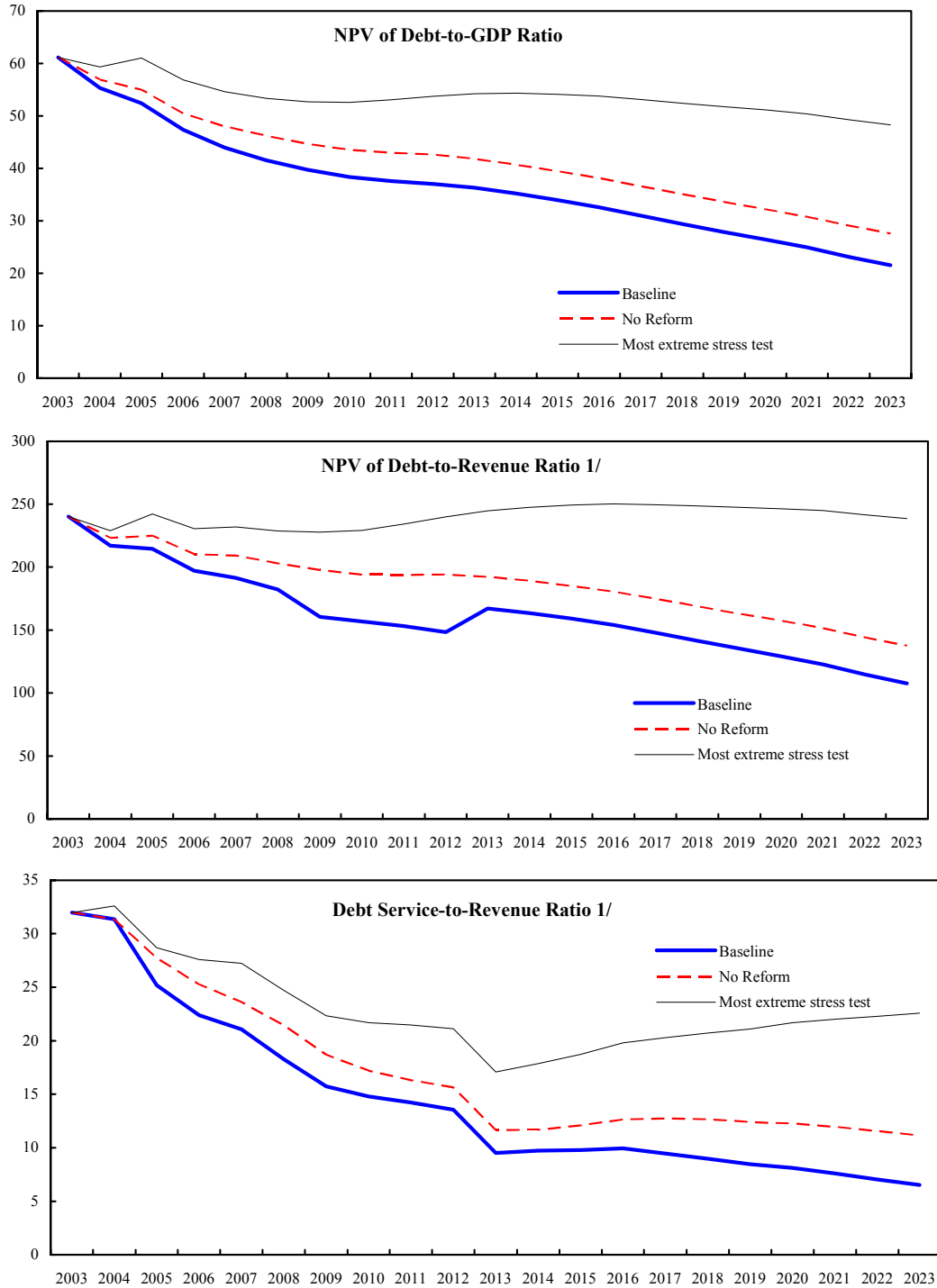
	Estimate		Projections					
	2003	2004	2005	2006	2007	2008	2013	2023
NPV of Debt-to-GDP Ratio								
Baseline	61	55	52	47	44	42	36	22
A. Alternative scenarios								
A1. Real GDP growth and primary balance are at historical averages	61	58	57	53	51	50	48	30
A2. Primary balance is unchanged from 2003	61	57	55	50	48	46	42	28
A3. Permanently lower GDP growth 1/	61	56	54	50	48	47	50	61
B. Bound tests								
B1. Real GDP growth is at historical average minus one standard deviations in 2004-2005	61	59	61	57	55	53	54	48
B2. Primary balance is at historical average minus one standard deviations in 2004-2005	61	58	58	53	49	47	41	25
B3. Combination of 2-3 using one half standard deviation shocks	61	58	58	53	49	46	39	22
B4. One time 30 percent real depreciation in 2004	61	81	77	70	65	61	50	29
B5. 10 percent of GDP increase in other debt-creating flows in 2004	61	63	60	54	51	48	42	26
NPV of Debt-to-Revenue Ratio 2/								
Baseline	240	217	214	197	191	182	167	107
A. Alternative scenarios								
A1. Real GDP growth and primary balance are at historical averages	240	224	229	216	216	211	206	130
A2. Primary balance is unchanged from 2003	240	223	225	210	209	203	192	138
A3. Permanently lower GDP growth 1/	240	220	220	207	206	202	226	298
B. Bound tests								
B1. Real GDP growth is at historical average minus one standard deviations in 2004-2005	240	229	242	230	232	229	245	238
B2. Primary balance is at historical average minus one standard deviations in 2004-2005	240	229	238	220	215	205	189	123
B3. Combination of 2-3 using one half standard deviation shocks	240	228	236	216	210	200	180	111
B4. One time 30 percent real depreciation in 2004	240	318	316	294	284	269	228	145
B5. 10 percent of GDP increase in other debt-creating flows in 2004	240	248	244	226	221	211	195	127
Debt Service-to-Revenue Ratio 2/								
Baseline	32	31	25	22	21	18	10	7
A. Alternative scenarios								
A1. Real GDP growth and primary balance are at historical averages	32	32	27	25	23	21	10	4
A2. Primary balance is unchanged from 2003	32	31	28	25	24	21	12	11
A3. Permanently lower GDP growth 1/	32	32	26	24	23	21	16	28
B. Bound tests								
B1. Real GDP growth is at historical average minus one standard deviations in 2004-2005	32	33	29	28	27	25	17	23
B2. Primary balance is at historical average minus one standard deviations in 2004-2005	32	31	30	29	24	20	11	9
B3. Combination of 2-3 using one half standard deviation shocks	32	32	29	27	23	20	10	7
B4. One time 30 percent real depreciation in 2004	32	33	28	25	24	21	11	9
B5. 10 percent of GDP increase in other debt-creating flows in 2004	32	31	38	27	24	20	11	10

Sources: Country authorities; and Fund staff estimates and projections.

1/ Assumes that real GDP growth is at baseline minus one standard deviation divided by the square root of 20 (i.e., the length of the projection period).

2/ Revenues are defined inclusive of grants.

Figure 2. Country B: Indicators of Total Public Debt Under Alternative Scenarios, 2003-2023
(In percent)



Source: Staff simulations.
1/ Revenues are defined inclusive of grants.

10. **In conclusion, while the debt-burden indicators are projected to improve considerably under the baseline, the positive outlook is contingent on fairly optimistic assumptions about growth and policy adjustments.** Based on its historical record, Country B is highly vulnerable to output shocks that could endanger debt sustainability. Furthermore, the success of the adjustment is predicated on cuts in spending (relative to GDP), which will pose a challenge, as the government simultaneously attempts to reallocate the budget toward poverty-reducing activities. In this context, an adjustment strategy that relies on raising the revenue effort might be politically more viable. The borrowing strategy under the baseline would need to be revised if the optimistic assumptions on growth, in particular, fail to materialize during the coming years. In these circumstances, higher grants would greatly help alleviate the pressure to cut spending.

STOCHASTIC SIMULATION OF EXTERNAL DEBT RATIO

1. As noted in the text, a key element of the proposed framework is adequate stress testing of the debt dynamics in the baseline scenario. Calibrating the stress tests, however, is not straightforward. The stress tests should be sufficiently demanding to capture the main risks facing the country's debt sustainability, yet not so extreme that they model events whose likelihood is so small that they are irrelevant. A reasonable choice might be to calibrate the stress tests so that the implied outcome for the long-term debt ratio (say, at a 10-year horizon) has a roughly 25 percent likelihood of occurring.⁷² This appendix explains how stochastic simulations can be used to calibrate the stress tests accordingly.

2. The first step consists of deriving the probability distribution of the debt ratio at various horizons using stochastic simulations. To account for potential correlations among the forcing variables of external debt dynamics—namely, real GDP growth (g), interest rate (i), rate of change in the U.S. dollar value of the GDP deflator (ρ), non-interest current account balance (cb) and net FDI flows in percent of GDP (ndf)—an autoregressive data-generating process is assumed for these variables. Specifically, denoting the vector of forcing variables by $z = (g, i, \rho, cb, ndf)'$, the data-generating process is modeled as:

$$(1) \quad z_t = \beta_0 + \sum_{k=1}^K \beta_k z_{t-k} + \varepsilon_t$$

where $\varepsilon \sim N(0, \Sigma)$ represents a vector of serially uncorrelated normal errors. This filtering equation allows serial correlation among the forcing variables through $\{\beta_k\}_{k=0}^K$ and Σ .

Once the filtering equation (1) is estimated by using historical data, an N -year random sample of forcing variables, $\{\tilde{z}_t\}_{t=1}^N$, can be generated by feeding into the estimated filter the ε shocks, $\{\tilde{\varepsilon}_t\}_{t=1}^N$, that are drawn from $N(0, \Sigma)$.⁷³ Finally, the corresponding N -year random sample of the NPV of debt-to-GDP ratio, denoted by $\{npvd_t\}_{t=1}^N$, can be obtained by substituting $\{\tilde{z}_t\}_{t=1}^N$ into the debt dynamics equation given by:

⁷² Focusing on the 10-year horizon strikes a compromise between the growing uncertainties of long-term projections and the desire to capture adequately the debt-service obligations and associated financing needs arising from new borrowing in light of often long grace periods.

⁷³ In the simulation, a random sample of ε is constructed by pre-multiplying the *i.i.d.* shocks drawn from the standard normal distribution by the Choleski factor W of Σ , where W is a lower-triangular matrix that satisfies $\Sigma = WW'$.

$$(2) \text{ npvd}_t = \frac{(1+r_t)(1-\mu_t)}{(1+g_t)(1+\rho_t)} \text{ npvd}_{t-1} + (1-ge_t)(\text{ndf}_t - cb_t)$$

where $1-\mu_t = (1-ge_t)/(1-ge_{t-1})$ and ge_t represents the grant element defined as the difference between the debt stock and the NPV of debt, expressed in percent of the debt stock.⁷⁴ By simulating (2) repeatedly, a “fan chart” of possible outcomes of the debt ratio (with their associated probabilities) can be generated.

3. The next step is to compare the debt ratios implied by the stress tests in the sustainability framework to this empirically derived probability distribution. Specifically, let npvd^s denote the debt ratio implied by the respective stress test, and

$p^s = \text{prob}(\text{npvd} \geq \text{npvd}^s)$ the likelihood (known as the p-value) that the actual debt ratio will exceed this level. Then, as noted above, a reasonable choice would be to calibrate npvd^s to yield a *p-value* of about 25 percent at a 10-year horizon. If the p-value is much lower, then the stress test may be considered too extreme in the sense that it models an event whose likelihood is relatively low. A significantly higher p-value would suggest that the stress test is too benign since there is high probability that the actual debt ratio will exceed the level implied by the stress test.

4. To calibrate the stress tests in the sustainability framework, stochastic simulations were performed for a “representative” low-income country. Representative time series data for forcing variables were generated for the period from 1985 to 1999 by taking averages across 20 PRGF-eligible countries.⁷⁵ Given the relatively short time span of the dataset in annual frequency, a parsimonious specification was estimated for (A.1) by restricting the order of lags for z to 1 (i.e., $K=1$), and suppressing off-diagonal elements of β_k to zero.⁷⁶ Based on the estimated filtering equation, the NPV of debt-to-GDP ratios were simulated 10,000 times over the 20-year period, assuming a constant grant element of 30 percent and an

⁷⁴ See IMF (SM/03/185), Appendix I, for how this formula is derived.

⁷⁵ The following countries were included in the sample: Burundi, Djibouti, Dominica, Gambia, Ghana, Grenada, Guinea-Bissau, Kenya, Madagascar, Maldives, Mali, Mozambique, Nigeria, São Tomé & Príncipe, Senegal, Solomon Islands, Sri Lanka, St. Vincent and Grenadines, Togo, and Vanuatu.

⁷⁶ This specification is equivalent to assuming for each forcing variable a univariate first-order autoregressive process. Under this formulation, potential serial correlation across forcing variables would be captured through the moment matrix Σ , which was constructed by using the estimated residuals over the last 10-year period of the sample for consistent comparison with the standard template tests.

initial value of the NPV of debt-to-GDP ratio of 40 percent.⁷⁷ Accordingly, the standard template tests were conducted over the same time span, applying isolated two-period, one-standard deviation shocks to the key parameters, and a two-period one-half standard deviation combined shock, with standard deviations derived as averages across countries over the last 10-year period of the sample.⁷⁸ Under the baseline (the most likely outcome, assuming a continuation of historical trends) the debt ratio rises from 40 percent of GDP to 70 percent of GDP over a 20-year period.

Table 1. Summary Results of Stochastic Simulation

Year	Severity of shock in its impact on NPV of debt-to-GDP ratio						
	Most extreme	Second	Third	Fourth	Fifth	Sixth	Least extreme
A. NPV of debt-to-GDP ratio from standard template analysis (in percent) 1/							
1	53.0	48.9	45.9	45.2	44.7	43.0	42.6
5	62.8	58.3	56.8	53.7	52.5	49.2	48.5
10	66.8	62.6	61.2	58.4	57.2	54.2	53.5
15	70.5	66.6	65.3	62.7	61.6	58.8	58.2
20	73.9	70.3	69.1	66.7	65.7	63.1	62.6
B. Associated shock 1/							
1	exr	comb	xg	ρ	fdi	ntr	g
5	comb	xg	exr	ρ	fdi	ntr	g
10	comb	xg	exr	ρ	fdi	ntr	g
15	comb	xg	exr	ρ	fdi	ntr	g
20	comb	xg	exr	ρ	fdi	ntr	g
C. P-value (in percent)							
1	3.7	11.4	21.9	25.4	27.7	38.2	41.1
5	15.7	22.3	24.8	31.2	33.9	41.9	43.7
10	26.4	31.9	34.1	38.3	40.5	45.5	46.9
15	31.5	36.0	37.8	41.4	42.9	47.0	47.6
20	36.3	39.8	41.1	43.6	44.7	48.0	48.6

Source: Staff simulations.

1/ The isolated shocks are modeled as two-year, one-standard deviation shocks to g = real GDP growth, ρ = dollar GDP deflator, xg = export growth, and non-debt creating financing (including fdi and ntr = net transfers) as a share of GDP. The combined shock (comb) is applied as a two-year, one-half of a standard deviation shock to these variables. The exchange rate shock (exr) corresponds to a 30 percent depreciation of the local currency.

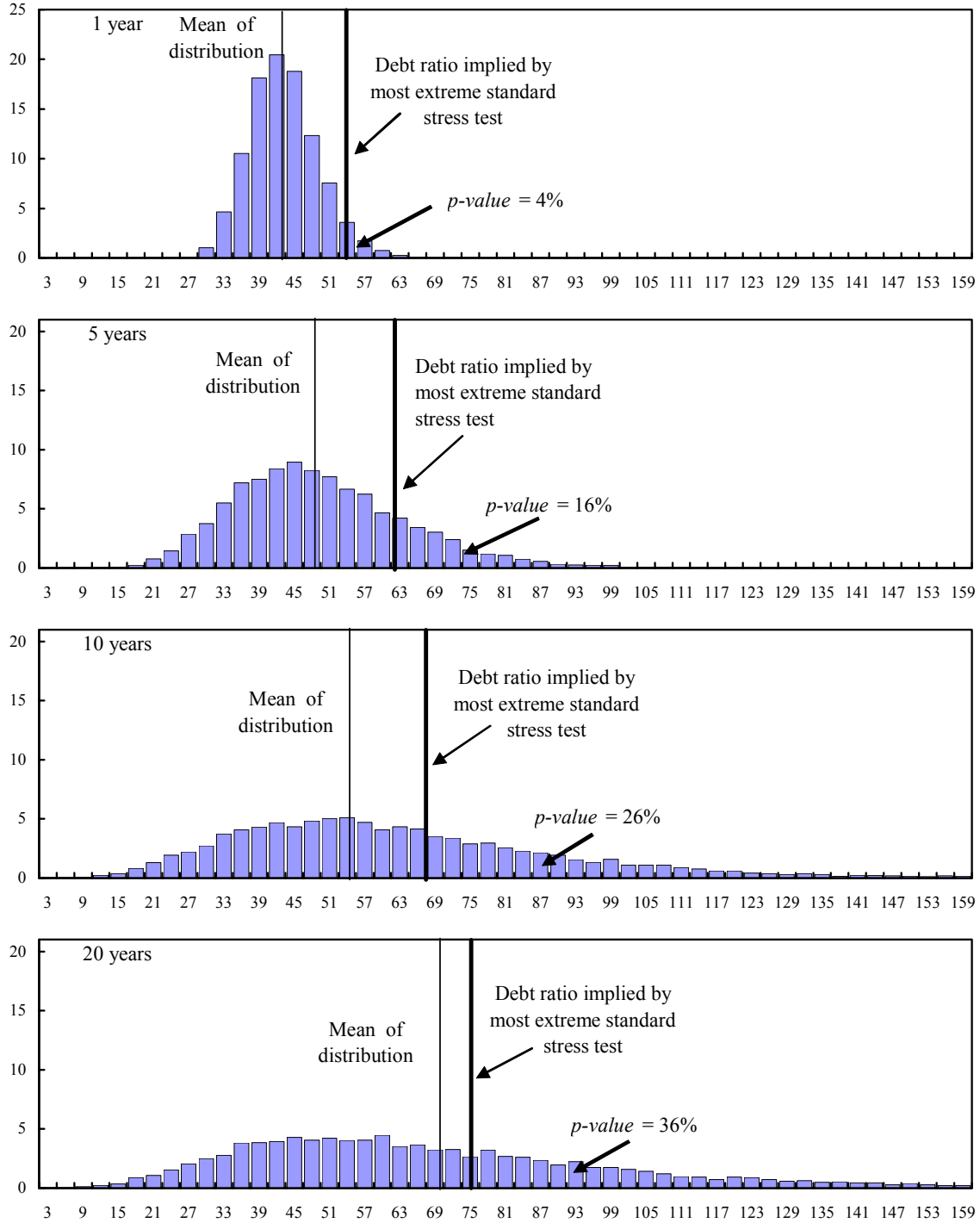
⁷⁷ The assumed grant element of 30 percent was chosen based on the 2001 average across PRGF-eligible countries. The initial value of the NPV of debt at 40 percent of GDP was assumed to be consistent with the targeted ratio (150 percent) of the NPV of debt-to-exports under the HIPC Initiative, and the average GDP share of exports among PRGF-eligible countries (i.e., about 25 percent).

⁷⁸ In addition, one stress test assumes a one-time 30 percent depreciation of the local currency vis-à-vis the U.S. dollar. All shocks are applied to the beginning of the projection period.

5. Table 1 summarizes the results of the stochastic simulations for a representative low-income country by reporting debt ratios from the standard template (in a descending order) after applying the above shocks and the corresponding p -values. The results of the standard template analysis indicates that under the most extreme sensitivity test—which, at all horizons, is associated with a combined shock to the forcing variables—the NPV of debt ratio would reach 67 percent over the 10-year horizon (instead of 54 percent of GDP in the baseline). It also indicates that the ordering of shocks in terms of their impact on the debt ratio tends to remain stable over the five to twenty-year horizon. The p -value associated with the most extreme shock is 26 percent at the 10-year horizon (16 and 36 percent over 5 and 20 years, respectively)—suggesting that the stress tests are calibrated appropriately.

6. Table 1 also indicates that the p -value (i.e., the likelihood that the debt ratio exceeds the level corresponding to the respective stress test) tends to increase over the projection horizon. Moreover, the p -values are typically higher than those reported for emerging market countries (see IMF (2003b)). The former observation can be explained by the tendency of the true probability density function of debt ratio to become more fat-tailed as the projection horizon lengthens, which is indeed the case for the simulated probability distribution as shown in Figure 1. The latter seems to be related to the fact that forcing variables of debt dynamics are generally more volatile in low income countries than emerging market countries. Although not reported here, the simulated probability distribution of the debt ratio tends to be more fat-tailed at all horizons when the volatility of forcing variables increases.

Figure 1. Simulated Probability Density Function of Debt Ratio and P-Value Implied by Standard Stress Test at Selected Horizons



Source: Staff estimates.

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