

# External Debt Sustainability: Theory and Empirical Evidence

*Marco Arnone, Luca Bandiera, and Andrea F. Presbitero<sup>1</sup>*

**Abstract:** This paper is a review of the different approaches on external debt sustainability. The Heavily Indebted Poor Country (HIPC) Initiative was launched to assure a permanent exit from debt dependence. However, the IMF-World Bank program is not without faults, in particular for what concerns debt sustainability analysis. The aim of this work is to present the IMF-World Bank approach to debt sustainability, together with the other approaches in the literature. We show that a new and broader framework is emerging to address the main shortcomings of the standard analysis, namely, the effects that large external debts and deficits have on growth and the macroeconomic environment.

Keywords: HIPC Initiative, Debt Sustainability, Debt Relief, External Debt.

JEL Classification Numbers: F34, H63, O11, O19

Author's E-mail Address: [marco.arnone@yahoo.com](mailto:marco.arnone@yahoo.com) [lbandiera@worldbank.org](mailto:lbandiera@worldbank.org) and [presbitero@dea.unian.it](mailto:presbitero@dea.unian.it)

---

<sup>1</sup> Marco Arnone is at the Catholic University of Milan (Italy), Andrea Presbitero at the Università Politecnica delle Marche (Ancona - Italy); Luca Bandiera is a consultant at The World Bank. This paper was started when Marco Arnone was an Economist in the IMF's Monetary and Financial Systems Department, and this version was finalized when A. Presbitero was a Summer Intern at The World Bank. The authors wish to thank Maurizio Baussola, Stefano Bosi, Luigi Campiglio, Marco Mazzoli, Vickram Nehru, Diego Scalise, Martin Sommer, Francesco Timpano, and Marco Vivarelli for helpful comments. Opinions expressed reflect only those of the authors. Remaining errors are ours alone.

## Contents :

1. Introduction and Summary	3
2. Debt Relief: An Overview on Different Perspectives	5
3. Different Approaches to External Debt Sustainability	7
A. Financial Sustainability	8
B. Economic Sustainability	13
C. A Comprehensive Approach To Debt Sustainability	14
4. The Effects of a Large External Debt on Economic Growth	15
A. The Debt Overhang Effect	17
B. The Liquidity Constraint	20
C. The Effect of the Uncertainty About Future Resource Flows and Debt Repayments	21
5. The Effects of External Debt on Growth: Empirical Evidence	22
6. The Effects of Fiscal Deficits on The Economy	26
7. Empirical Models on Debt Sustainability	29
8. Conclusions	32
References	33
Annex A	39
Annex B: Models of Debt Relief	41
Boxes	
Box 1: The IMF – World Bank Approach to Sustainability	10
Box 2: The Net Present Value	11
Box 3: Inflation and Seignorage	28
Figures	
1. The Debt-Laffer Curve	18
2. Dooley’s Model of Debt Relief	18
3. Debt Relief and Output Growth	20
4. Contribution of Debt to Output Growth	23

## 1. Introduction and Summary

In the last twenty years several developing countries have accumulated large external debt which hamper economic growth and are a constraint to poverty alleviation. A high debt burden negatively affects economic growth through the effects of the debt overhang hypothesis and liquidity constraints. These factors theoretically explain how a large external debt and debt service could squeeze investment and dent economic growth. The existing empirical evidence seems to support this view: the disincentive effects, due to debt overhang, and the crowding out of public investment negatively affect the rate of growth of output.

The High Indebted Poor Countries (HIPC) Initiative – launched by the IMF and the World Bank – deals with long-term external debt sustainability and poverty reduction, so as to prevent debtor countries to re-accumulate high level of external debt, insure a permanent exit from debt dependence and provide budgetary support to implement the poverty reduction strategies designed by the HIPCs themselves.

This paper reviews the different approaches to external debt sustainability. The theoretical literature on debt sustainability, with a particular attention to the IMF-World Bank approach, and the effects that a large external debt and fiscal deficit have on economic growth in low-income countries (LIC) are presented, in order to contribute to develop a comprehensive and more appropriate approach to assess the sustainability of external debt in the HIPCs.

Regarding debt relief, the literature presents two different perspectives, unified by the common idea that the current approach is not able to foster economic growth, which is the core element for poverty alleviation and debt sustainability. One part of the literature (the “poverty trap” approach) argues for a much broader and deeper debt reduction, that should be linked to an assessment of the specific requirements needed by debtors to meet their essential needs<sup>2</sup>. The other view (the “selective” approach) claims that more selectivity and conditionality is needed in order to avoid wastes and loans to corrupted governments<sup>3</sup>. Selectivity should be instrumental to stimulate governments to improve their economic policies, while conditionality is a necessary condition to urge recipients to adopt structural reforms.

While a different and wider perspective on debt relief should consider both approaches, we would favour the “selective” approach. In addition, the latter should be embedded in sound macroeconomic policies, trade and financial openness, and knowledge-intensive investment in LICs. The empirical evidence supports the idea that these factors are keys to sustained economic growth, which is definitely fostered when complemented with good governance<sup>4</sup>. While we regard as somewhat unwarranted the “poverty trap” approach, we suggest that the “selective” view should be embedded in a strong

---

<sup>2</sup> See, among others, Sachs [2005b].

<sup>3</sup> See, among others, Easterly [2001a, 2001b].

<sup>4</sup> However, while good governance is conducive to growth (IMF’s World Economic Outlook, april 2003 and sept. 2005) in itself it is neither necessary nor sufficient for growth: Arnone, Bellavite, Graziadei, [2005] point out that, in the ten last years, ten South-East & Pacific Asian economies enjoyed sustained economic growth with diminishing quality of governance.

macroeconomic framework with a particular emphasis on *fundamentals* like trade and financial openness, competition policies, and investments in technology and human capital (the “extended selective approach”).

A comprehensive framework for debt sustainability requires a fully-fledged government budget constraint, which includes not only the external position, but also domestic debt and exchange rates. The theory of sovereign debt is generally concerned with the government budget constraint and the evolution of internal and external debt along with other relevant macroeconomic variables. A high level of internal indebtedness soaks up resources and diverts money from development and growth programs and it should be considered together with external debt. Arnone and Presbitero [2005] and Christensen [2004] highlight that, even if the ratio of domestic debt to GDP in African countries is generally small, with respect to foreign indebtedness, domestic debt seems to have a significant adverse effect on the budget because of interest payments.

The “debt sustainability analysis” (DSA) accounting approach<sup>5</sup> used in current policy analysis presents several shortcomings. Financial sustainability is quite limited a notion for a concept that is, instead, multi-faceted and requires a wider perspective. The most important shortcomings of the standard DSA are the endogeneity of the relevant variables, the exclusion of domestic debt and of the essential needs requirements.

The macroeconomic impact that many variables have on economic activity requires the implementation of a more comprehensive framework in order to assess long-run debt sustainability. Some recent models develop a sophisticated analysis, which includes some of the main criticisms received by the HIPC DSA. These models are a substantial improvement over the analytics of the HIPC Initiative and they could be considered as a starting point for a more comprehensive approach, based on the fully-fledged government budget constraint, which should include the domestic debt, the exchange rate and the current account balance. Nevertheless, they present some limitations, mainly due to the exclusion of the current account, of domestic debt, or to the lack of feedback between fiscal and current account balances.

The remainder of the paper is as follows: Section 2 presents the main approaches to debt relief. Section 3 illustrates different concepts of debt sustainability and the different ways in which it is assessed, together with their limitations. Sections 4 and 5 present the theoretical effects of a large external debt on economic growth, and the related empirical evidence. Section 6 briefly looks at the effects of fiscal deficits on the macroeconomic system, with particular attention to inflation, interest rates and current account, and the related empirical evidence. Section 7 presents models of debt sustainability that attempt to overcome some of the criticisms that the simple IMF-WB debt sustainability analysis has received. Mathematical details of these models are presented in the Annexes.

---

<sup>5</sup> The Accounting approach is defined in section 3.A

## 2. Debt Relief: An Overview on Different Perspectives

Debt relief is nowadays one of the most important and critical issues of political economy, because it affects the life of more than one billion of poor people across the world. The great efforts done by many NGOs and by Jubilee 2000 campaign have raised a lot of attention on debt relief and have brought great pressure on the rich countries governments. This large mobilization resulted in a deeper commitment in debt reduction and has pushed forward the debt issue in the political agenda.<sup>6</sup>

Despite past experiences, many countries keep on having large external debt and debt service obligations which hamper economic growth and are a constraint to poverty alleviation. The High Indebted Poor Countries Initiative (HIPC) deals with the solvency issue of LICs and includes for the first time also the multilateral institutions<sup>7</sup>. The two main objectives of the Initiative, as stated by the World Bank and the IMF, are the long-term debt sustainability and poverty reduction. The focus of this work is primary on the sustainability analysis, which is crucial, because it should avoid the debtors to re-accumulate high level of debt and it should assure a permanent exit from the debt dependence.

Notwithstanding an increased commitment of donors that originated the Enhanced HIPC (E-HIPC), the initiative has received many criticisms both from NGOs activists and from academic literature. Birdsall, Williamson and Deese [2002] provide a very exhaustive review of the HIPC Initiative and of its criticisms. The most important distinction is between who argues for a much broader and deeper debt reduction, as the only solution to reduce poverty and who claims that more conditionality and selectivity is needed in order to avoid wastes and loans to corrupted governments. Both the line of criticisms are well-founded and have in common the underlying idea that debt relief until now was not able to foster a strong path of economic growth, which is the core element for poverty alleviation and debt sustainability.

A complete debt cancellation without increased foreign aid is calculated [Sachs, 2002] to be not enough to meet only the basic health expenditures, while other resources are required for other basic needs and social infrastructures. Many activists and NGOs call for a complete debt write-off: Pettifor, Thomas and Telatin [2001] are very critics about HIPC Initiative, which, in their opinion, has not reached the long-term debt sustainability and “has failed the poorest countries”. The last Oxfam [2005] report calls for a 100% cancellation of bilateral and multilateral debt, for an increase in aid volume (at least until the 0.7% of GNP target pledged by OECD countries) by donor countries and for a limited use of conditionality. Jeffrey Sachs is among the ones who call for a deeper commitment and, even admitting that poor targeting is a source of the scarce results reached by foreign aid, he claims also that the current level of aid is not enough to start a growth process. He advocates for a real change in the creditors-donors point of view: debt reduction should be directly linked to an assessment of debtor specific

---

<sup>6</sup> On July 8, 2005, the G8 Heads of state have announced a proposal to augment debt relief to completion point HIPCs, leading to 100 percent cancellation of debt owned by them to IDA, the IMF and the African Development Fund.

<sup>7</sup> A quick overview on the targets and the design of the HIPC Initiative is provided in Annex C.

requirements for meeting their essential needs [Sachs, 2002, 2005a, 2005b]. A debt reduction limited to a general threshold is doomed to obtain poor results in terms of poverty reduction and economic growth. Birdsall and Deese [2004] propose to deepen debt relief, which should be based on the burden of debt payments on social needs expenditures, and to enlarge the group of eligible countries, other than to insure the HIPC countries against external shocks.

Another part of the literature claims for conditionality and selectivity in aid allocation and states that debt reduction is often given to corrupted governments which do not have any incentive to start to implement better economic policies. This line of reasoning is close to the Burnside and Dollar [2000] findings about aid effectiveness and good macroeconomic policies. There are plenty of examples of loans and grants given to countries with bad institutions and governance, which resulted in miserable effects on economic growth. Thomas [2001] expresses doubt on debt relief effectiveness because of the lack of resources and capabilities for accounting, budgeting and monitoring public resources in HIPC countries. She argues that the money freed by debt relief is likely to “go missing” because of bad governance, instead of being spent in poverty reduction plans. As a consequence, strict conditionality is a necessary condition in order to force recipients to adopt structural reforms and improve governance: the focus should be moved from faster debt relief to good planning. In order to reach long-term results, the recipient countries need time to develop social spending plans before getting interim relief. The donors, on the other side, should become more responsible for and should monitor the resource allocation, so that poor countries have incentives to improve macroeconomic policies.

Debt relief given to irresponsible governments is not only ineffective, but it is also a lost opportunity to help better governed countries eradicate poverty. William Easterly [2001a, 2001b, 2002] links the previous arguments with the potential exclusion of other equally poor countries, which were able to manage well their external balance (i.e. India, Bangladesh). Easterly clearly refuses the statement that debt relief allows for more spending on health and education and endorses conditionality claiming that “debt relief will only help reduce debt burdens if government policies make a true shift away from redistributive politics and toward a focus on economic development” [Easterly, 2001a: 22].

Economic growth in developing countries is fostered primarily by sound macroeconomic policies and competition policies, and secondarily with good governance, according to Arnone *et al.* [2005]. Evidence from the ten largest Asian economies show that, despite worsening governance, but with strong trade openness, international capital inflows and technology transfers, growth has been spurred enormously. This is consistent with economic theory and the usual IMF approach of sound macroeconomic management, followed by good governance. Combining the selectivity view with a particular emphasis on the endorsement of macroeconomic management and sound public policies, we call for an “extended selective approach”.

From the discussion emerges that a deeper commitment by the donors, associated with a particular attention to macroeconomic and competition policies, and a sensible allocation process is desirable. It seems unambiguous that the current amount of

resources freed up by debt relief is not enough to reach the MDGs. On the contrary, corruption, poor macroeconomic management and bad governance must be taken into account in the aid allocation process, and poor countries that were able to manage their fiscal balance should not be penalized.

### 3. Different Approaches to External Debt Sustainability

The external debt sustainability issue is widely debated in the theoretical and empirical literature and there are different perspectives to debt sustainability, depending on the economic targets and on the consideration of lender and borrower behaviour. The HIPC Initiative is based mainly on the Debt Sustainability Analysis (DSA), which concerns the behaviour of the borrower country and its willingness and ability to meet its debt obligations. However, the notion of debt sustainability is quite complex and it should generally consider both the behaviour of the borrower and of the lender. Debt sustainability is achieved by the interaction of the debtor country economy and of the investment choices made by creditors in the financial markets. The literature presents different approaches to debt sustainability: a first distinction is made between the lender-based and borrower-based approaches, while a broader classification distinguishes between a simple debt capacity analysis (financial sustainability) and a more complex view that involves the assessment of some basic development targets (economic sustainability). The approach used by the HIPC Initiative is just one of the possible ways to address the problem and we will see that it could be criticized under many aspects.

It is possible to make a distinction between different perspectives used in the literature to address the external debt sustainability problem:

- Optimising models: where the marginal benefit equals the marginal cost of borrowing. This approach was the first one developed by the theory (for a survey, see Eaton [1993]).
- Non-optimising models: *growth-cum-debt model and “debt dynamics” approach*. In the growth-cum-debt model, the external borrowing is used in order to fill the gap between domestic savings and investments, as in the two-gap model [Chenery and Strout, 1966]. The condition to be solvent requires that the rate of growth of the economy must be greater than the rate of interest (the cost of borrowing). One important shortcomings is the lack of attention to the foreign currency issues. The “*debt dynamics*” approach looks at the external solvency and at the export rate of growth, which is now the parameter that must exceed the interest rate. These models remain unsatisfactory, because the growth paths are assumed to be time invariant and imports are not considered.
- Fiscal space models: due to reduced public expenditures because of debt service. Moreover, the lack of infrastructure and public spending has an adverse effect on private investments, which are dismissed, and the result is a slower growth. Another way in which the cash flow effect damages the economy is through import compression, which reduces government investments and, in turn, the rate of growth of the economy.

- Disincentive effects: a large stock of debt undermines economic performance through the *debt overhang* effect, which is related to the tax disincentive and to macroeconomic stability. In the first case, which reflect the basic idea of the debt overhang theory, a large stock of debt discourages the investments because taxes on future income are expected to be used to serve the debt payments. In the second case, the disincentives are related to the possible creation of macroeconomic instability, due to: (1) exchange rate depreciation, (2) increases in fiscal deficit, (3) monetary expansion and inflation and (4) uncertainty due to exceptional financing.

Large part of the theoretical and the empirical analysis has focused on the capacity of a debtor country to servicing its debt, ignoring the effect that debt and deficit has on the other economic variables and the development requirements. In the following sections, we present the theoretical background of the two approaches – accounting and present value constraint – of financial sustainability. The limitations of this point of view and the reasons in favour of a development perspective – based on the adverse effects of a large external debt on the economy – call for a more comprehensive approach to external debt sustainability.

#### A. Financial Sustainability

Following the so-called accounting approach (or, borrower based approach), a fiscal deficit is considered sustainable if it generates a constant debt-to-GDP ratio [Cuddington, 1996]. The level of primary surplus (or deficit) which stabilizes the debt-to-GDP ratio –  $b$  – is given by:

$$(1) \quad SURP_t = \frac{r_t - g_t}{1 + g_t} b$$

where  $r$  is the real interest rate and  $g$  is the rate of growth of GDP. From the equation (1) is clear that, as long as the economy grows at a rate higher than the interest rate, it is possible to run a sustainable primary deficit. What really matters is the capacity of the government to raise revenues that could balance the expansion of the stock of debt. Since in LICs the grant elements is a substantial fraction of GDP ( $f$ ), Cline [2003] argues that the previous condition should be less stringent, and he defines the primary balance as:

$$(2) \quad pb = (r-g)b - f.$$

In this way, he estimates<sup>8</sup> that HIPC countries do not have to run any primary surplus, but they can incur a primary deficit equal to 7.2 percent of gdp, without boosting the debt-to-gdp ratio above the current level of 106%.

Loser [2004] underlines that the debt-to-GDP ratio depends on the behaviour of debt, of real GDP and of the real exchange rate, but what is really important for sustainability is

---

<sup>8</sup> Assuming a reasonable growth rate of 3%, grants equal to 4.5% of gdp and the real interest rate equal to 0.5%.



the behaviour of the underlying variables, as the net transfers, interest payments, exchange rates, and their impact on growth. Moreover, it is crucial to consider the possible substitution effect between external and domestic debt and the likely constraints on the availability of new financing. The foreign borrowing, indeed, depends not only on the financial gap and on the interest payments, but also on the balance between domestic and foreign borrowing. Generally, there is not perfect substitution between domestic and foreign borrowing, and this affects the domestic interest rate and, as a consequence, the growth performance.

The World Bank and the IMF view is strictly connected to the debt capacity perspective and the debt sustainability analysis is based on the accounting approach and it derives thresholds of solvency. The World Bank and the IMF are concerned about the external debt and the borrower behaviour and they look at the country's willingness and ability to meet the future and current external debt service obligations, without incurring into arrears or rescheduling. (See Box 1)

The DSA used in the HIPC Initiative follows this approach and it is based on the determination of thresholds of solvency. These indicators of debt sustainability are the ratios of Net Present Value (NPV) of debt to exports and to fiscal revenues. (See Box 2) The DSA used in the HIPC Initiative is based on stock indicators only, while flow indicators are merely descriptive. These ratios, initially based on historical values have been subsequently adjusted downwards, to grant higher debt relief to a larger number of countries.

The choice of the thresholds and the accounting framework have been subject to many criticisms (among the others, Gunter [2003], Hjertholm [2001, 2004], Belloc and Vertova [2002], Cohen [2000]). The HIPC Initiative is meant to be a permanent exit from future debt rescheduling thanks to the achievement of debt sustainability in the long run. However, the simple accounting framework does not necessarily ensure that once a certain NPV of debt to export is achieved, it will be maintained in the long run. Moreover, the framework assumes that HIPCs will continue borrowing at very high concessional terms in the medium term and no attention is paid to domestic debt dynamics. More generally, the accounting approach could overcome those problems, but it is weakened by two important shortcomings: (1) the real interest rate and the rate of growth of GDP are generally considered exogenous, while they are affected by the government spending, and (2) the assumption about the growth rate of liabilities, which ignore the role of lenders.

The Present Value Constraint (PVC) approach (or, lender based approach) defines a government solvent whether the flow of the expected value of future resources is at least equal to the face value of the stock of debt. It is the classical approach used to evaluate the domestic debt sustainability and it is translated in the following condition:

$$(3) \quad B_0 = \sum_{t=1}^{\infty} \frac{SURP_t}{(1+r)_t}$$

Where B is the initial stock of debt, r is the real interest rate and SURP are the future surpluses, given by the difference between revenues and public expenditures. This criterion is different from the accounting one, which imposes an upper bound to the debt-to-GDP ratio. Under the usual assumption of the real interest rate greater than the

rate of growth of GDP, the PVC requires only that the real grow rate of debt is less than the real interest rate. If the rate of growth of debt is between the real interest rate and the rate of growth of GDP, the PVC is satisfied, but the debt-to-GDP ratio can grow over time. The focus is on what level of deficit is financeable and, as a consequence, this analysis does not require the full repayment of the entire debt.

Cohen [2000] suggests a market value approach which should take into account also the risk of non-payment. In that way, the market value of the stock of debt is smaller than its face value and its present value and the donors should consider the distinction between nominal and actual debt cancellation. What is generally considered new aid should be, in this perspective, a reported loss.

### **Box 1: The IMF – World Bank Approach to Sustainability**

Under the Original HIPC Initiative, launched in 1996, “a country can be considered to achieve external debt sustainability if it is expected to meet its current and future external debt-service obligations in full, without recourse to debt relief, rescheduling of debts, or the accumulation of arrears, and without unduly compromising growth” [IMF, 1997: 17]. The eligibility will be based on the debt sustainability analysis (DSA) defined on a case-by-case basis, which moves from the basic accounting approach, since debt sustainability is defined as “a position of a country when the NPV of debt (public and publicly guaranteed) to exports ratio and the debt-service (on public and publicly guaranteed loans) to export ratio are below certain country-specific target levels within ranges of 200-250 percent and 20-25 percent respectively” [IMF, 1997: 28]. For countries with open economies (export-to-GDP ratio greater than 40) and substantial tax revenue (at least greater than 20% of GDP), having a NPV of debt-to-tax revenue greater than 280 is an alternative condition for eligibility.

The thresholds are determined on the basis of the past experience of a number of countries. The key indicators ignore the domestic debt and use the net present value of debt in order to consider the degree of concessionality of the debt stock.

With the Enhanced HIPC Initiative the eligibility standards are reduced, but the approach to debt sustainability does not change. The ratio of the NPV of debt-to-exports is 150, while the additional fiscal indicator is lowered to 250 and it applies to countries with a revenues-to-GDP above 15% and exports-to-GDP ratio above 30%. Lowering the ratio aims to provide a deeper and broader debt relief, while the choice of a uniform target removes the country-by-country assessment and ignores the relevance of debt service [Andrews et al., 1999].

The criticisms received by many NGOs and academics – and by internal evaluation departments<sup>9</sup> – urge the World Bank and the IMF [IMF, 2001a and 2002a] towards a more comprehensive definition of external debt sustainability. The development of a fiscal and external repayment capacity and the expected flows of grants and lending are included as key aspects for sustainability, together with the existing stock of public

<sup>9</sup> A report by the World Bank Operations Evaluation Department [Eaton, 2002: 10] states “that there is *no* current debt level that “ensures debt sustainability” with any certainty. It all depends on the future behaviour of the country and its creditors”.

debt. In order to “assess long-term debt sustainability, the focus of attention must shift from this single debt indicator [the NPV of external public debt] to a more complex and comprehensive view of the development process in which policies, institutions, exogenous factors and debt management play an integral role over time” [IMF, 2001a: 3].

In February 2004, the World Bank and the IMF proposed a new debt sustainability framework [IMF, 2004a], accepting some of the previous criticisms. The new framework is “a “forward looking” approach that aims to guide borrowing and lending decisions for low-income countries on terms that allow borrowing countries to devote resources toward achieving the MDGs, while also staying within their means to repay loans. By accounting each country’s specific circumstances, the framework tries to help borrowing countries balance their need for funds with their current and prospective ability to repay their debts. Linking a country’s borrowing potential to its current and prospective ability to service debt should help countries avoid accumulating excessive debts”<sup>10</sup>.

It is recognized the willingness of donors and creditors to provide new financing. This new approach is based on three pillars: (1) the determination of country-specific debt thresholds, depending on policies and institutional quality (following the results obtained by Kraay and Nehru [2004]), (2) the evaluation of the impact on debt of external shock , and (3) the formulation of an appropriate borrowing and lending strategy that contains the risk of debt distress.

In September 2004 a new IMF and World Bank paper [IMF, 2004c, 2005a] works out this new operational framework: given the empirical evidence that links the policy variables with the probability of debt distress, the debt sustainability assessment should adopt policy-dependent debt and debt-service thresholds. These ratios will be revised periodically, according to new institutional data. Domestic debt is now considered: it is admitted that it should be included in the analysis, because of its relevance in many low-income countries. The practical assessment implies (1) the analysis of debt dynamics over the baseline scenario, related to the thresholds, (2) the simulation of some export shocks, (3) the interpretation of these results, and (4) the assessment of the appropriate level of borrowing associated with the probability of debt distress.

## **Box 2: The Net Present Value**

The NPV of debt is the sum of all the future debt service obligations – interest and principal – on existing debt, discounted at the market interest rate. Its use is justified because it takes into account the degree of concessional lending. In fact, when the interest rate on a loan is below the market rate, the NPV of debt is lower than its face value.

The IMF and the World Bank recognize that the NPV is not free from shortcomings, because (1) it compares future debt-service obligations with current repayment capacity without considering the country’s growth capacity; (2) it does not take into account the

<sup>10</sup> Source: [www.worldbank.org/debt](http://www.worldbank.org/debt) [last accessed November 2005]

risk of not repayment; and (3) it is sensitive to the choice of the discount rate (for further details on the choice of the Currency-specific Interest Reference Rates (CIRR) as discount rates, see [IMF, 2004a]).

Martin [2004] challenges the idea that NPV is the more accurate measure of debt burden, because it does not capture the debt overhang effect. Private investors are deterred by large stock of debt, but they generally look at the face value of debt. Moreover, he claims that debt is actually discounted much more heavily than it should, with the consequence that countries lose part of debt relief. Discount rate should be based on the interest rate which countries could earn by investing the loan disbursements internationally. This would currently be around 2.5 percent, after a dramatic fall in 2001-2003, while CIRR rates are above 4 percent. Cohen [2000] argues that, in order to avoid that risk, the probability that debt will be honoured should be considered. So, the appropriate measure of debt is its market value, that considers the risk of non-repayment. Cline [2003] and an UNCTAD report [2004] confirm the concerns about the use of CIRRs and the high sensibility of the NPV of debt to the choice of the discount rate. In particular, the six-month average of the CIRRs gives rise to high volatility in the estimation of assistance and cost of the initiative and, also, to an unfair assistance level, due to the fact that some countries receive the assessment of the debt burden in different periods with different levels of interest rates. The new debt sustainability framework for LICs adopted by the World Bank and the IMF [IMF, 2004a] addresses the criticism about the volatility of NPVs by introducing a single rate to discount the future debt service in dollar terms.

### **Limitations of the financial sustainability approach**

The most important limits of both these traditional approaches – the accounting and the PVC – are the exogeneity of the main policy variables and great reliance on the projections. In reality, the capacity repayment is function of the rate of growth of GDP, of exports, of fiscal revenues and of the interest rates, which are, to some extent, influenced by the level of indebtedness. Gunning and Mash [1998] stress the centrality of forecasts, GDP growth, and real interest rate for sustainability analysis. Moreover, they underline also that what matter are not only economic fundamentals, but also expectations which generates uncertainty and make predictions less reliable. Loser [2004] specifies many limitations to the DSA, in particular underlying the problems of endogeneity<sup>11</sup>, the volatility in the key variables and the need to consider explicitly an adequate level of indebtedness, function of the specific institutional and economic characteristic of a country. The limitations of this sort of analysis are recognized also by the World Bank Operations Evaluation Department, which stresses that the debt projections are likely to be biased by the assumptions and the methodology used in forecasting [Eaton, 2002], which does not consider the effects of high external debt and of the required macroeconomic adjustments on growth.

---

<sup>11</sup> This issue is raised, among other, also by Belloc and Vertova [2002], who calls for a more general framework. Goldstein [2003] suggests considering the negative feedback that high interest rates and a tight fiscal policy have on the rate of economic growth.

The use of the ratio of NPV of debt to exports is widely considered inadequate as a sustainability criteria (see Martin [2002]). Hanmer and Shelton [2001: 5] argue that “an increase in exports does not necessarily translate into an increase in government revenue” because exports are highly volatile. Even considering the ratio of affordable debt service to revenue as the unique solvency criterion – as suggested, among other, by Gunter [2003], Martin [2002], Eurodad [2001] and Oxfam [2001] – is subject to criticisms<sup>12</sup>. As a results, “sustainability needs to be determined by a borrowing level that is consistent with a sustainable external balance and a sustainable government budget” [Hanmer and Shelton, 2001: 5].

The HIPC framework ignores the current account balance and the foreign exchange constraint. Goldstein [2003] stresses the importance of the exchange rate behaviour for the emerging economies, since public debt is generally denominated in foreign currency. A sharp depreciation or a slowdown in the world trade could reduce the capability of a country to generate enough foreign exchange revenues to service its debt obligations. The new debt sustainability framework for LICs recognises the importance of exogenous shocks on the capacity of repaying external debt. However, shocks are evaluated only in a partial equilibrium, which does not consider secondary effects.

Another important aspect that is generally ignored by the solvency criteria is the feasibility of the adjustments required in order to reach sustainability. Roubini [2001] underlines that the resource gap and the primary gap models provide only a normative rule using the practical criterion of the thresholds. However, in order to stabilize the debt ratio to a certain threshold, a country could have to run a trade (or primary) surplus that, given the expectation on interest rates and economic growth, is practically unfeasible. Goldstein [2003] agrees with the fact that standard analysis ignores that some targets are literally impossible to deliver, given the volatility and the reliance on market sentiment of interest rates, exchange rates and inflation.

## **B. Economic sustainability**

The development perspective criticizes the simple framework in which debt sustainability is generally assessed and it proposes two different channels in order to improve the analysis: the consideration of the endogeneity of the main variables and the enlargement of the targets for debt forgiveness. First, following the underlined shortcomings of the traditional approaches, the development perspective investigates the links and the relationships between fiscal deficits, interest rates, economic growth, inflation and balance of payments in order to solve the endogeneity of these variables. And second, this approach takes into account the amount of resources needed by debtor countries to reach specific targets of growth and poverty reduction (as the Millennium Development Goals).

One of the most important supporters of this view is Jeffrey Sachs, who advocates for a consideration of the financial requirements needed for the basic social and health expenditures. His point of view is widely reflected in a variety of NGOs documents which stress the dramatic role played by economic growth and poverty reduction. The

---

<sup>12</sup> See on this point Birdsall and Deese [2002], who agree with the spirit of this proposal, but point out that such a scheme is an incentive for recipient governments to loose their tax collection effort.

WB-IMF analysis, on the contrary, does not explicitly calculate the amount of resources that will be redirected to spur economic growth and to reduce poverty after debt relief.<sup>13</sup> Resources freed up by debt relief are assumed to be spent on health, education, nutrition and infrastructures, according to the government plans. In that way, there is not a real expenditures target and it is not assured that there will be economic growth and, as a consequence, sustainability. Some authors (among others, Martin [2002]), in fact, move the focus from the debt ratios to the debt service payments, which are a more direct indicator of the resources soaked up by external obligations. Eurodad [2001] calls for a poverty approach to debt sustainability, which gives a lot of emphasis to the resources needed to satisfy the essential human needs, to domestic debt (prioritized with respect to the external debt to favour internal macroeconomic stability) and to other non-essential expenditures.

### **C. A Comprehensive Approach to Debt Sustainability**

A comprehensive framework requires a fully-fledged government budget constraint, which includes not only the external position, but also domestic debt and exchange rates. The theory of debt is, indeed, generally concerned with the government budget constraint and the evolution of debt (internal and external) indicators along with the other relevant macroeconomic variables. A more appropriate approach should be based on the government budget constraint, that links fiscal deficit, public debt, output growth, inflation and the balance of payments. In fact, a high level of internal indebtedness soaks up resources and diverges money from development and growth programs and it should be considered together with external debt<sup>14</sup>. Goldstein [2003] points out that even private sector liabilities should be considered, because they could become government debt (i.e. in case of a banking crisis, as happened in the Asian financial crisis). Arnone and Presbitero [2005] and Christensen [2004] highlights that, even if the ratio of domestic debt to GDP in African Countries is generally small, with respect to foreign indebtedness, domestic debt seems to have a significant adverse effect on the budget, because of large interest payments, and it is also crowds out private lending.

A complete DSA should consider not only the financial sustainability, but also the economic one: a country should dispose of enough resources to serve its debt obligations and also to improve its economic performance. From the previous discussion it should be clear that the simple accounting approach presents many shortcomings and that a debt sustainability analysis requires a broader framework. The great emphasis given to economic growth as a necessary condition to achieve sustainability is embedded in the IMF and WB works [IMF, 2002a: 22-23], which clearly state that “While the existing stock of debt (and associated debt service) sets the point of departure for determining long-term debt sustainability, the growth of income,

---

<sup>13</sup> In the HIPC framework, the use of HIPC savings is monitored only during the interim period, that is before debt relief becomes irrevocable.

<sup>14</sup> About the relevance of domestic debt see, among others, Martin [2002, 2004], Reinhardt, Rogoff and Sevastano [2004], who argue for the inclusion of domestic debt and private sector debt. Furthermore, even if the stock of domestic debt is small, the high cost of this debt is likely to become a constraint for public investment. In order to raise money on domestic markets, governments have to offer high interest rates, which make the cost of debt a relevant variable, even compared with a large external debt (on which the interest rate is very low).

exports, and fiscal revenue – which, to a large extent, reflect a country’s economic policies – are the underlying determinants of the evolution of a country’s capacity to service external debt over longer term”.

The new IMF-WB debt sustainability framework is based on three main pillars: (1) a country specific analysis, (2) a borrowing policy based on the risk of debt distress, and (3) a more careful projection method, which should give relevance to external shocks. The IMF and WB staff has elaborated a proposal for evaluating long term sustainability [IMF, 2004a, 2004c, 2005a] which moves from the previous context, but includes some of the received suggestions. Large part of the literature underlines the necessity to consider the specificity of a single country’s economic and institutional environment. Even if a general procedure that ends with some general threshold has the advantage of being simple and transparent, empirical works and theoretical considerations show that different countries are able to bear different level of indebtedness. Sun [2004] stresses the relevance of four elements which affect fundamentally the HIPC’s capability of achieving long term sustainability: (1) the quality of policies and institutions, (2) an adequate debt management, (3) diversified export base, and (4) fiscal revenues mobilization.

The relevance of institutions is generally confirmed by the literature, which stresses the importance that institutional quality has for a country’s capability of managing debt and fostering growth. Kraay and Nehru [2004], show that institutional quality, exogenous shocks and the debt burden are the three main structural factors that affect the probability of debt distress across countries. Asiedu [2003] presents a model that shows how a minimum level of institutional quality is required in order to reap the benefits of debt relief.

#### 4. The Effects of a Large External Debt on Economic Growth

The most important determinant of debt sustainability, as well as for poverty reduction, is economic growth. Whichever is the definition of sustainability, an increase in the rate of growth of GDP makes affordable a higher level of debt. On the contrary, whether the economy is sluggish, it is difficult to find resources to pay the current debt service obligations and the debtor country need to borrow money to cover its current expenditures. The more important link is, however, the other way round. Traditional neoclassical models and some endogenous growth models imply a positive relationship between debt and growth. However, the key assumption of perfect capital mobility is unrealistic and, when dropped, lower debts are associated with higher growth. The debt overhang hypothesis considers the investment channel and the disincentive effects on government policies that lead to poor macro policies. Also inflation tax, reduced public investments and uncertainty (option of waiting and misallocation of investments) are likely to occur with a large debt stock. Additionally, large debt stocks lead to capital flights, high tax rates and continuous over-borrowing, with a negative effect on growth.

Claessens et al. [1996] provide an accurate definition of the linkages between debt and economic performance<sup>15</sup>:

#### **Disincentive effects**

- Debt overhang theory: when the debt burden is too high (the debt exceeds the future repayment ability), the expected debt service is a positive function of the aggregate output. This squeezes investment, because the returns are “taxed away” by the foreign creditors.
- The stock of debt has another negative effect on economic performance, due to the level of uncertainty of the fraction of debt service that will be repaid with the country’s own resources as outcome of debt rescheduling negotiations.

#### **Cash flow effects**

- Moreover, debt reduction could facilitate the access to the international financial markets and the repatriation of flight capital (increasing private investment and the efficiency of the investment selection).
- The “liquidity constraint”<sup>16</sup>: a reduction in current debt service increases the current level of investments, for any given level of future indebtedness. It is different from debt overhang, which is focused on the stock of debt. If there is no debt overhang, the same increase in investment can be reached with a new loan or with a reduction in current debt service.

#### **Moral hazard effect**

- With debt relief, debtors might believe that creditors have eased their position and that they will be more willing to forgive any future debt, when the likelihood to obtain a repayment will become low. Conditionality could reduce moral hazard (debt reduction to countries with a record of sound macro policies). In this sense, refinancing and rescheduling (“short-leash” approach, which, however, is criticized because it does not allow for a complete ownership of the reform by the indebted country) has an advantage on granting debt reduction. For conditionality to be effective it is crucial that the threat is credible (i.e. policies off track mean no more funding).

The economic literature has generally investigated and tested empirically three main channels through which the debt affects the economic growth: (1) the debt overhang effect, (2) the uncertainty effect, and (3) the liquidity constraint effect (see, i.e. the articles in Addison, Hansen and Tarp [2004], Bhattacharya and Clements [2004],

---

<sup>15</sup> Pattillo et al. [2002] provide an exhaustive review of the most important contribution in this particular topic. However, it is worth noting that high debts have different effects, not only related to macroeconomic performance, but also to political and institutional aspects. High debts could undermine the effectiveness of structural reforms aimed to enhance growth and poverty reduction. The permanent fiscal crisis and the heavy administrative burden – due to the number of rescheduling and different creditors (at least 31, in HIPC) and to the large number of currencies (at least 26) in which debt is denominated – can undermine the development of sound institutions, capable of making strategic choices [Moss and Chiang, 2003].

<sup>16</sup> The adverse effect of external debt service on economic performance and investment is widely called “crowding out” effect, especially in the empirical literature (see, among others, Clements *et al.* [2003] and Pattillo *et al.* [2002]), since repayments soak up resources and reduce public investment.



Hanmer and Shelton [2001] and Elbadawi et al. [1997] who include also the lack of access to international financial markets).

### **A. The Debt Overhang Effect**

The debt overhang is defined as a situation in which the creditors do not expect to be fully repaid because of the presence of a large stock of debt. The literature about the debt overhang theory starts generally from two papers by Krugman<sup>17</sup> [1988] and Sachs [1989], who analyze what happens to a country which is unable to service its debt payments in full, without new borrowing. Krugman [1988: 255] asserts that “*A country has a debt overhang problem when the expected present value of potential future resource transfers is less than its debt*”.

The presence of this stock of debt changes the incentives of both creditor and debtor and debt relief could benefit both of them. The former could have an incentive to keep on lending in order to avoid a loss, with the hope that the recipient will improve its economic conditions and will repay all its claims in the near future. The latter has a disincentive to invest because he perceives that all the gains will be used to pay the lender and, in some way, they will be taxed away. What is important for debt relief is that a debt reduction could be in the interest of both debtors and creditors, because the lenders could increase the likelihood that the remaining obligations will be serviced in full and the debtors could reduce the distortions given by the presence of the debt burden on investment choices. The debt-Laffer curve (it represents the expected repayments as a function of the face value of the debt, see Figure 1)<sup>18</sup> shows the possibility of this double benefit. When the debtor country is on the right side (the “wrong” side) of the curve, a debt reduction increases the likelihood of the repayment. So, as long as the stock of debt is higher than the critical value  $D^*$ , both the creditors and the debtor will be well off after debt relief.

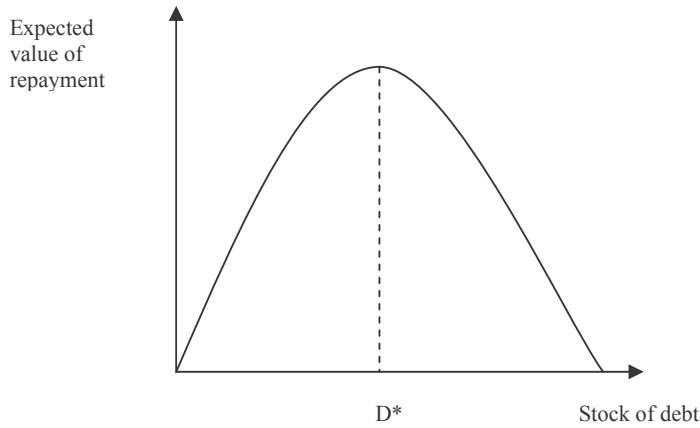
The implicit tax, that weights on the debtor, has a distortionary effect on investment choices and reduces economic growth. This distortion could be avoided or limited by debt reduction. The discouragement in investing is not only limited to physical capital, but also to human capital and to the adoption of new technologies and of economic reforms (trade liberalization, fiscal reforms...). The extent and the criteria according to which foreign aid flows are determined could increase or decrease the adverse effects.

---

<sup>17</sup> See Annex A for a brief description of the Krugman’s model

<sup>18</sup> The literature indicates with the debt Laffer curve the same phenomenon, even if the graphical representation could be different. Here the probability of repayment is plotted against the debt stock. Cline [1995: 163] traces the curve in the space expected value – face value of debt. The rationale is the same, but in that way it is possible to show that the secondary market value of the debt could be seen as an indicator of inefficiency, as underlined also by Cohen [1989]. The ray from the origin tells the market price of the debt and it is generally less than unity. Debt overhang starts when the curve diverges from the 45° line and, when the curve has a negative slope, any additional debt imposes a disincentive so large that the expected repayments decrease.

Figure 1: *The Debt-Laffer Curve*



Dooley [1989] clarifies how debt relief can benefit both creditors and debtors, thanks to an increase in investments and, as a consequence, in debt repayments<sup>19</sup>. Using a very simple two-period model with intertemporal consumption, Dooley defines the consumption in the second period ( $C_2$ ) as a function of the investment in the first period ( $I_1$ ), which are given by the difference between the initial endowment and consumption:

$$C_2 = f(I_1), \quad \text{where } I_1 = E_1 - C_1$$

Figure 2: *Dooley's Model of Debt Relief*

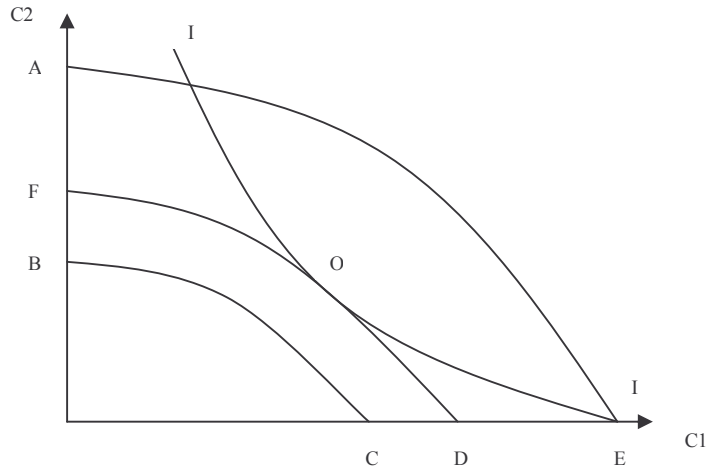


Figure 2 shows the transformation curve  $AE$  in the simple case with no debt. With the usual indifference curves, the optimum will be given by the tangency condition. In the presence of an inherited stock of debt  $D$  (the line  $AB$ ), the new curve will be shifted to

<sup>19</sup> Dooley analyses also the problems of the leveraged buy-out of existing debt and of coordination between creditors. Here, I keep the problem as simple as possible because the aim is to show when debt relief could benefit both the parts.

the left. Until when the outcome of the investment undertaken in the first period is less than  $D$ , consumption in the second period will remain zero, because all the new resources are used to repay the creditors. The new transformation curve  $BE$  is made by the line  $BC$  and the portion  $CE$  of the horizontal axis, equal to the stock of debt  $D$ . From the diagram is now easy to see that, depending on the position of the indifference curve, debt relief could make both the parts better off. Given the indifference curve  $II$ , the optimal choice (when there is a debt stock) is the point  $E$ . That situation is unsatisfactory because debtors do not invest and creditors will not receive any repayment. A debt reduction (equal to  $FB$ ) gives the new optimum  $O$ , in which the debtor has an incentive to invest and the creditor is better off because he is repaid. The situation is analogous to what happens in the previous diagram when the debt reduction increases the expected value of debt repayments.

The theoretical background of the debt overhang hypothesis can be used for a broader interpretation of the negative effects of debt on growth, which include the disincentive that a high stock of debt has on other type of investments (i.e. human capital) and on the government's willingness to adopt structural reforms and fiscal adjustments ("extended" debt overhang). Notwithstanding its original formulation concerns the adverse effects that high debts have on economic growth through a disincentive in investments in physical capital, the scope of having a large external debt is very large and it could harm the economy in different ways, reducing the pace of economic growth.

Sachs [2002] supports an extensive interpretation of debt overhang effect in a model that shows how an excessive debt burden could embed the low income countries in a poverty trap. Using the basic assumption of non-linearities in saving, investment and production (based on the fact that, when income is under a minimum level of subsistence, the saving rate is zero) the effect of debt relief on economic growth can be described by Figure 3.

According to the model, real growth is a function of the stock of physical capital  $k$  and the accumulation of  $k$  over time depends on the saving rate, the rate of depreciation and on population growth<sup>20</sup>. The saving rate is assumed to fall dramatically when capital stock reaches a very low level, so that the capital growth rate turns out to be negative when  $k$  is less than  $k^*$ . So, the economy shrinks when  $k < k^*$  and there is a poverty trap because, even if the saving rate is positive, it is so low that output and capital stock decline to the point when saving rate is zero and the rate of decline is equal to  $(\delta + n)$ . On the other hand, whether  $k > k^*$  the economy grows at an increasing rate because saving is greater than the amount of resources needed to replace capital per worker  $(n + \delta)k$ .

This poverty trap model seems to be consistent with the real situation of many poor countries, where saving rates are very low, and with the debt overhang hypothesis, since a large stock of debt lowers investment and reduces the capital stock. A poverty trap could also be triggered by a demographic pressure or by the fact that the marginal productivity of  $k$  could be negative when  $k$  is very low, contrary to the usual assumptions (Inada condition), because capital stock might become productive only above a certain threshold. Furthermore, the poverty trap derives from the fact that, in

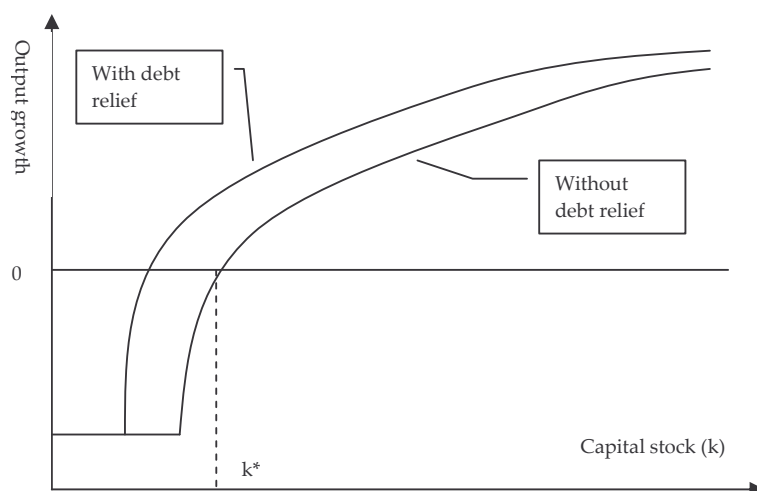
---

<sup>20</sup>  $dk/dt = s - (n + \delta)k$ .

absence of public investment in human capital and basic infrastructure<sup>21</sup>, also private investment are unlikely to be made.

HIPCs are likely to be in a situation with a declining output, because a high debt burden decreases the investment rate through the debt overhang effect. Debt relief shifts the curve in Figure 3 upward and an economy that was shrinking could start to grow. This conclusion supports the idea of a fresh start for the HIPCs and a more comprehensive idea of debt sustainability, which should consider explicitly also the investment requirements in health, education and infrastructures.

Figure 3: *Debt Relief and Output Growth* [Sachs, 2002: 7].



## B. The Liquidity Constraint

The negative effect of debt on growth works not only through the impact of the stock of debt, but also via the flows of service payments, which are likely to crowd out public investment (Cohen [1993]). The rationale behind the negative impact of debt payment on investment is that, if the debt obligations are expected to be met, the service payments could affect investment decisions, depending on the efficiency of the rescheduling strategy; on the other hand, if a debtor country is not expected to repay its debt, as a result of a known rescheduling rule, then investments should not be crowded out. Cohen [1993] presents a model in which, for a country whose nominal debt is so large that creditors cannot commit their rescheduling strategy to follow a given rule, the crowding out effect is proportional to the amount of resources that the creditors are able to “tax away” and not to the stock of debt. The service of debt is shown to be proportional to the cost of debt repudiation and it crowds out investments for a factor that is equal to the intertemporal elasticity of substitution.

<sup>21</sup> This is due to the fact that public investments are determined by budgetary outlays and tax revenues are very low for a country with very low level of income. Moreover, a large share of foreign financing is often used to finance current expenditure.

Since the HIPCs receive net positive resource transfers, the disincentive effect of a large debt burden might be mitigated and the debt service payments are the main determinant of economic growth. Hansen [2004] stresses the difference between the current experience of the HIPCs and the debt crisis in the 1980s, which was the starting point for the debt overhang hypothesis. The HIPCs, contrary to the indebted countries in the 1980s, receive generally net positive resource transfers which are likely to reduce the disincentives to invest. Therefore, a decreasing level of debt service payments is the crucial determinant for investment and growth. Hansen calls for more additionality because his results show that both investment and growth are significantly explained by debt service and effective aid<sup>22</sup>.

### **C. The Effect of the Uncertainty about Future Resource Flows and Debt Repayments**

It is generally believed that a large debt burden increases the uncertainty about how much of the outstanding debt will be actually repaid. The third channel through which a large external debt could affect the economic performance concerns the uncertainty about future aid and resources inflows and about debt service payments, together with their effects on macroeconomic stability.

Risk of default, rescheduling and arrears are likely to increase the volatility of future inflows and additional lending, while the access to capital markets depends on the perceived sustainability [Gunning and Mash, 1998]. This generates an uncertain environment, in which also the government policies and reforms depend on conditional lending and on rescheduling. The outcome is a situation in which domestic and foreign investors are likely to exercise the “waiting” option, even if the economy’s fundamentals are improving [Serven, 1996]. Moreover, investment decisions under uncertainty are not forward-looking and the short term, low risk investments will be preferred to the long-run, high risk and structural ones. This misallocation of resources reduces the efficiency and productivity of capital, leading to a slowdown of economic growth.

Debt reduction reduces the uncertainty and increases the confidence in the debtor country’s government and in its policies, fostering economic growth. This argument is similar to the debt overhang hypothesis, but here the focus is not on the disincentives arising from the likelihood that the gains will be taxed away by foreign creditors, but on the general uncertainty that dominates the economy and biases the investment choices, in terms of misallocation and withdrawals. Claessens et al. [1996] argue that one of the conclusions that could be drawn from the experience of the Brady Plan is the crucial importance of reduced uncertainty. The removal of continual ongoing rescheduling was the main channel through which the debt reduction affected growth. Debt reduction has the effect of increasing capital inflows by strengthening the confidence in the government reforms and in the new policies. This happens because investors look at debt reduction “as an “endorsement” by the international financial community that the

---

<sup>22</sup> The main argument of Hansen’s analysis is the importance of additionality, contrary to selectivity and conditionality invoked by many authors (see, i.e. Birdsall and Williamson [2002]). His results show that whether aid and debt payments are reduced one for one, there is no effect on economic growth and investment could fall.

country is successfully pursuing sound macroeconomic policies and structural reforms” [Claessens et al. 1996: 34].

Close to this issue there is the relationship between debt and capital flight, which leads to lower economic growth. In a model developed by Calvo (in Pattillo et al. [2002]), the return on capital is lowered by the distortionary tax burden on capital required to service the debt. Low returns reduce investments and, as a consequence, economic growth. Facing lower future returns, investors prefer to send their capital abroad, rather than investing resources in the country.

## 5. The Effects of External Debt on Growth: Empirical Evidence

The empirical evidence generally confirms the debt overhang hypothesis, even if the link between debt and growth is not perfectly defined, because the relative incidence of the debt variables and the magnitude of the effects differ across different studies. Some authors (i.e. Pattillo *et al.* [2002, 2004]) show how the stock of debt is the reason for a slow growth, while others (i.e. Chowdhury, [2004]) find that both the debt burden and the debt service obligations squeeze investment and the economic performance. Moreover, some early studies reject the hypothesis that the debt-to-GDP ratio depresses investment, while they find evidence in support of the relevance of debt service payments<sup>23</sup>. Eventually, Cline [1995] underlies that debt relief makes sense only whether a country is on the wrong side of the debt Laffer curve, but this is not always the case: he reports the results on some studies done in the 1980s which found the few countries were effectively on the right side of the diagram.

Clements *et al.* [2003] investigate the relationships between external debt, investments and growth in 55 low-income countries, finding some empirical evidence in favour of the debt overhang: estimating a simple growth model and using panel data, they find that, over a certain threshold, more debt lead to negative rates of growth. Those thresholds are lower than the ones used in the HIPC program (external debt is roughly 30-37 percent of GDP, or 115-120 percent of exports). Furthermore, they show that public investments are what really matters for economic growth: a one percent increase in public investment results in a 0.2% increase in GDP, but this positive linkage becomes less effective as long as public investments increase, because they lead to higher deficit and to higher levels of debt, which negatively affect economic growth.

Pattillo *et al.* [2002] find a very similar non linear relationship between debt and growth, using a panel data set for 93 developing countries. As before, initial debt fosters growth but, above a certain level (A), the marginal effect becomes negative and, over another threshold (B), the contribution of debt to growth turns out to be negative (see figure 4). The results obtained by Pattillo *et al.* confirm the debt overhang hypothesis, but the estimates of the thresholds are different from the ones obtained by Clements *et al.* [2003]. In Pattillo *et al.*, the impact of external debt on growth becomes negative (point B) when the ratio of the NPV of debt to exports is larger than 160-170, while in

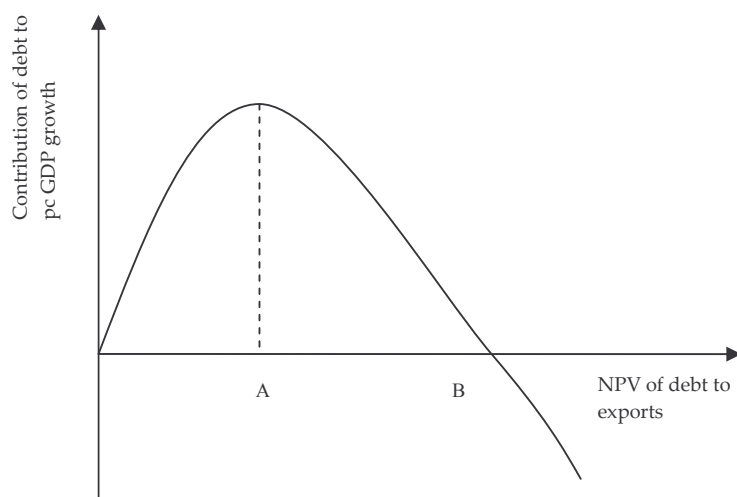
---

<sup>23</sup> These studies should be taken with caution because they do not address some relevant issues, such as the degree of concessionality of the loans and the real interest rate, whose inclusion in the regression could bias the coefficients on the debt variables [Claessens et al., 1996].

Clements the ratio of debt to exports is 115-120. The marginal impact in general turns into negative when the ratio is roughly half of those levels<sup>24</sup>.

Elbadawi *et al.* [1997] find evidence for 99 developing countries of the debt overhang hypothesis: their data are consistent with an inverse-U shaped curve that has its maximum where the ratio of the current stock of debt to GDP is 0.97. Even if the results can change using different specifications<sup>25</sup>, the general conclusion supporting the adverse effect of debt on growth is confirmed: current deficit stimulates growth, but there is a limit above which past debt accumulation hinders output growth. Moreover, this analysis provides some support to a broader interpretation of the debt overhang hypothesis: it seems that a large debt affects the real exchange rate, fiscal deficit and inflation, which, in turn, impact negatively on private investments; the effect on these policy variables deters reform programs and reduces the government's capability of absorbing and adjusting shocks.

Figure 4: *Contribution of Debt to Output Growth.*



The implications for debt relief of this non-linear relationship depend crucially on the estimates of A and B. The more the threshold of 150 used in the HIPC initiative is close to A, the higher will be the contribution of the new debt burden on output growth. Debt forgiveness has the aim of moving from the right to the left of the “wrong” side of this curve and its impact depends on the shape of that curve. Pattillo *et al.* [2002] show that the HIPC initiative could contribute to a one percentage point increase in output growth and it could also make the average contribution of debt to growth positive. The estimates obtained by Clements *et al.* [2003], seem to suggest a similar or slightly higher incidence of the initiative, depending on the different estimation procedures.

<sup>24</sup> The main reasons of the difference in the thresholds are probably due to the different samples used (Pattillo *et al.* [2002] consider also middle-income countries) and to the use of face value of NPV of debt.

<sup>25</sup> Moreover, as underlined by Pattillo *et al.* [2004], the results could be flawed by the endogeneity of the debt variables and by some country specific effects, that are not addressed in the dynamic panel model.

These results, however, have to be taken with caution, because there are other variables, as government balance, public investment, debt service, that may alter the conclusions. The positive impact of debt relief found by Pattillo *et al.* might be flawed by the fact that the sample includes middle-income countries and the computation of the impact is done for the average country. Their conclusion do not change significantly whether investments are taken into account or not, while Clements *et al.* [2003] explicitly claim that the likely positive effect of debt forgiveness on investments could further increase the effectiveness of the initiative.

Pattillo *et al.* [2004] find evidence of a narrow interpretation of the debt overhang effect, which works mainly through physical investment. They use a panel data set for 61 developing countries and confirm, using different econometric techniques<sup>26</sup>, their previous findings about the debt overhang hypothesis. They also show that the non-linear relationship between debt and growth works through main channels: physical capital and total factor productivity. Quantitatively, for the average high-indebted country, doubling the debt will reduce the growth of output, physical capital and total factor productivity by 1%. The effect of debt on growth occurs mainly through TFP and less via physical capital accumulation<sup>27</sup>, while the relevance of human capital is generally negligible. This last result is similar to what obtained by Clemens *et al.* [2004] and in contrast to Pattillo *et al.* [2002], who indeed find evidence of a broader debt overhang hypothesis, which include also the adverse impact of debt on human capital.

In two recent papers, Cordella *et al.* [2005] and Imbs and Ranciere [2005] find evidence of non-linearities in the debt growth relation. The former argues that over a certain threshold, the debt effect on growth is nil, creating a “debt irrelevance” zone, while the latter use a non parametric technique to support the bell shaped curve, arguing that better institutions reduce the magnitude of the debt overhang. Moreover, Cordella *et al.* [2005] find that debt overhang is a valid hypothesis only for non-HIPC countries, since the HIPCs are in the debt irrelevance side of the Debt-Laffer curve, which starts with a NPV of debt above 50%-60% of GDP<sup>28</sup>. They argue that the HIPC Initiative is shifting Completion Point countries from the debt irrelevance zone to the downward sloping part of the curve, so that additional debt relief is doomed to spur economic growth.

Presbitero [2005] shows that a huge debt burden has a negative effect on GDP growth, arguing that the basic relationship is negative. Using a dynamic panel model, the analysis on developing countries finds a negative and linear link between debt and growth (and the lack of an inverse U-shaped curve), which could be explained by the sample of countries. In fact, dealing with developing and indebted countries (in which debt is likely to impair economic growth) means that quite all the sample is on the right

---

<sup>26</sup> Their results are robust across different specifications of the basic model and the endogeneity issue is addressed also using the new method of Identification through Heteroskedasticity, developed by Rigobon [2003].

<sup>27</sup> This result confirms analytically previous conclusions (Pattillo *et al.* [2002]) which suggested that the main channel through which large debt hampers growth is the efficiency and quality of the investment rather than the level of investments.

<sup>28</sup> Splitting the sample between low and severely indebted countries, the authors find that debt overhang is still valid in low indebted countries, but not in the second sample. In sum, Cordella *et al.* [2005] argue that is the level of indebtedness and not differences in policies or institutions which drives the evidence on debt overhang.



side of the inverse U-shaped curve, while the left side of the curve should be occupied by industrialized and low indebted countries, in which more debt leads to more growth<sup>29</sup>.

Contrary to those results, the empirical evidence found by Cohen [1993], for 81 developing countries in the period 1965-87, is consistent with a rejection of the debt overhang hypothesis and supports the crowding out effect. Cohen finds not significant the correlation between the debt-to-export ratio and the investment variable, while the debt service is significantly negatively correlated with investment. So, a large stock of debt seems not to be a good predictor of the low investment ratio experienced in the 1980s. The slowdown of investment is indeed due to the flows of net transfers: the point estimate of the crowding out effect is 0.35, which means that for every 3 percentage point of GDP transferred abroad in debt service payments, investment declines by 1 percentage point. Similar results are obtained also by Presbitero [2005], who finds evidence of a liquidity constraint on total investment, especially in Low Income countries.

More recent works find mixed evidence about the “liquidity constraint” effect, which is generally additional to the “debt overhang” effect or negligible. Hansen [2004] corroborates the effectiveness of the liquidity constraint, because debt service, when included together with an aid variable, has a negative impact on investment (the point estimate – 0.33 – of the crowding out effect is very close to the value found by Cohen [1993]) and on growth.

The negative effect of debt service on growth is confirmed also by the analysis done by Chowdhury [2004], who shows that there is a negative causal impact that runs from debt to economic growth. The results address the problems of causality and heterogeneity of the data, but not the effect on investment. As a consequence, there is no evidence of a debt-Laffer curve, even if four different measures of debt stock and debt service payment affect negatively and linearly the GDP growth. Debt service payments are shown to have a detrimental impact on per capita income growth and on private investments because they reduce import capacity and available credit, creating a disincentive for investors [Elbadawi *et al.*, 1997].

Despite some evidence in favour of the crowding out effect, some empirical works do not find a significant impact of debt service on growth: Pattillo *et al.* [2002, 2004] include a debt service indicator in the growth regression, but find it not significant<sup>30</sup> and argue for the relevance of the adverse effect of the stock of debt. Clements *et al.* [2003] show that debt service has no direct effect on growth, but they find support for the “crowding out” effect of debt service on public investment. However, the magnitude of this effect is quite weak and this suggests that debt relief should not be expected to provide a sharp increase in public investment. A reduction in debt service from 8.7% of GDP to 3% will increase public investment by 0.7-0.8% and, given the growth regression estimates (1% more in investment means 0.2% increase in economic

---

<sup>29</sup> According to Pattillo *et al.* [2002] and Clements *et al.* [2003], the marginal effect becomes negative when the debt ratios are close to 60 or 80, and, in our sample, the 5<sup>th</sup> percentile of debt-to-exports ratio is 84, so that 95% of observations should be in the negative side of the inverse U-shaped curve.

<sup>30</sup> This result, contrary to the expectations (as admitted by the authors themselves), could be due to the fact that the data do not measure the actual payments, but rather the scheduled ones.

growth), this will be translated in a per capita GDP growth increase of 0.1-0.2%. On the other hand, whether at least half of debt relief resources are directed to public investment, the same reduction in debt service can increase economic growth of 0.5% per annum. This indirect effect, combined with the direct one, makes debt relief more effective [Clements *et al.*, 2003]. Eventually, the econometric analysis of this work will find that the liquidity constraint is twice larger in the Low Income countries than in the overall sample of developing countries. Furthermore, controlling for aid, we find out that a reduction in debt service seems to be more effective in raising investments, than an increase of the same amount in foreign assistance.

In sum, the evidence of a direct link between debt and growth remains unclear, since econometric results lack of robustness<sup>31</sup> [Moss and Chiang, 2003]. In particular, these empirical works should focus on more accurate investigations of the real effects of indebtedness on economic performance in the HIPCs (or for LICs). Furthermore, in order to draw a more realistic estimate of the impact of debt dynamics on economic performance, there should be a careful econometric analysis of the debt effects on investment (and not only on economic growth), of the direction of causality between debt and growth, and also of the relevance of a policy or institutional variable, which is often neglected in this sort of studies, and that could be a common determinant of both low growth and high debt.

All the previous works evaluate the relationship between external debt and growth, so that it is possible to estimate the contribution of a debt reduction to economic growth as an exercise of comparative statistic. A very recent paper by Chauvin and Kraay [2005] is the only empirical attempt to evaluate explicitly the impact of debt relief on a set of different macroeconomic variables, as growth, public spending, investment and institutional quality. The authors construct a dataset on debt relief from 1989 to 2003 for 62 Low Income countries: using the difference-in-difference technique, Chauvin and Kraay do not find any positive effect of debt relief on their dependent variables. Even acknowledging that the estimates might be flawed by statistical problems, their conclusions are quite pessimistic on the likelihood of debt relief to bring the expected benefits in terms of social spending and economic growth.

## 6. The Effects of Debt on Fiscal Deficits and on the Economy<sup>32</sup>

The ways in which fiscal deficit affects the economy depend on how it is financed and on the composition of government spending. The sources are money creation, domestic and external borrowing. The creation of new money is likely to produce inflation. Domestic borrowing could originate a credit squeeze and the crowding out of private

---

<sup>31</sup> The basic results obtained by Pattillo *et al.* [2002, Tables 3-6], i.e., on the inverse U-shaped curve are not generally confirmed across different specifications (the quadratic specification is significant at 5% level of confidence, in 2 out of 16 specifications, both using the LSDV estimator, which is biased and inconsistent), and they seem not to be really robust.

<sup>32</sup> This part is based mainly on the exhaustive paper written by Easterly and Schmidt-Hebbel [1991]. A more rigorous treatment of the main model used by the literature is in Agenor and Montiel [1996, chapter 4.3].

consumption and investment. The recourse to foreign borrowing, instead, generates pressure on the current account deficit, inducing a real exchange rate appreciation.

Financing of the public deficits with debt, rather than with tax revenues, avoids negative effects on consumption and can boost both public and private investment. Assuming that the Ricardian equivalence does not hold, fiscal policies could lower consumption as a response to a tax increase, even if the rise is expected in the future. The evidence from 10 developing countries highlights the negative effect that taxes have on private consumption, due to the reduction in the disposable income [Easterly and Schmidt-Hebbel, 1991]. The effect of an increase in tax on private investment is less clear, because of the high dependence on the structure of the economy: in general, privatization, investment in infrastructures and the reform of the financial sector are three key elements that could increase the complementarity between public and private sector, fostering private investment.

The composition of government spending is important because public expenditure can be substitute or complement to private consumption and investment. Public investments in infrastructure, i.e., are likely to boost private investment, while other kinds of investments are substitute to the private ones, which are crowded out.

On the other hand, fiscal deficits are affected by inflation, real interest rates, real exchange rates and output as a result of the debt burden graving on the economy:

- The inflation rate is likely to increase the fiscal deficit. This is due to the rise in the nominal interest rates, which impinges on the interest payments, and also for the so-called Olivera-Tanzi effect<sup>33</sup>. However, this negative effect on fiscal balance could be mitigated by the reduction in real public expenditure, if public wages are not indexed.
- An increase in the real interest rates raises the interest payments and worsens the fiscal deficit. Financial liberalization increases the sensitivity of deficit to the interest rates and the general rise in the interest rates due to financial liberalization expands the cost of debt.
- The consequences of movements in the real exchange rate are in both directions. A real depreciation enlarges the deficit because it boosts public expenditure (higher foreign interest payments and cost of traded goods), but it could also reduce the fiscal deficit, because it raises public revenues, through direct and indirect taxation (especially in countries with state-owned firms producing tradables).
- Economic growth might not be a solution for fiscal deficit. Easterly and Schmidt-Hebbel [1991] argue that this idea is flawed because, generally, a higher growth implies not only higher revenues, but also higher expenditures. Moreover, an economy characterised by public deficit, high inflation and interest rates has little chance to reach a strong economic growth.

---

<sup>33</sup> The Olivera-Tanzi effect concerns the temporal lags in the tax collection and it is particularly relevant in the developing countries. See, i.e. Agenor and Montiel [1996: 116-121]

An empirical investigation on ten developing countries [Easterly and Schmidt-Hebbel, 1991] has found that a low and stable deficit is generally associated with economic growth. In particular, high level of deficit are linked with high interest rates (unless financial repression), high inflation (and seignorage, even if the correlation is low) and a reduction in domestic investment (supporting the crowding out hypothesis) and in total and private consumption, which suggests that public and private consumption are substitute.

Contrary to these empirical regularities, inflation seems to be weakly correlated to fiscal balances<sup>34</sup>, and the reason could be the non-linear relationship (Laffer curve, see box 3) that links seignorage revenue and inflation. This relationship is very important and it has raised a lot of interest also for the relevance of seignorage revenues in developing countries. However, the case studies show an unfavourable trade-off between inflation and seignorage revenues. Furthermore, even in developing countries, the magnitude of seignorage is quite limited, an average of roughly 2% of GDP. Its relevance is due to the fact that it fluctuates widely from year to year and, in period of crisis and high inflation, it could become a very important source of funding for the government.

Silva [1986] argues that the crowding out effect is lower, the more elastic is the demand for money and public debt. The increase in public deficit financed by borrowing will increase more than proportionally the demand and this will raise prices and interest rates reducing private investment. With an elastic demand for money, the requested raise in rate of interest to restore equilibrium is small and the crowding out of investment turns out to be limited.

Large fiscal deficit could have both an adverse inflationary effect and an output effect, due to the crowding out of private investment. However, these negative consequences can be mitigated if deficit reflects a raise in public investment and if public and private investments are complementary [Agenor and Montiel, 1996, and Agenor, 2004].

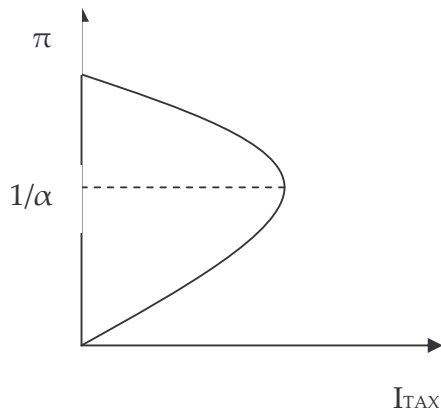
### Box 3: Inflation and Seignorage

Since inflation and seignorage revenues are linked by a non-linear relationship that originates a Laffer curve, policy makers can estimate the optimal inflation tax, fixing the inflation rate equal to a parameter ( $1/\alpha$ ) that could be easily estimated. The Laffer curve seems, indeed, to be confirmed by the empirical evidence (see, i.e. Easterly and Schmidt-Hebbel [1991: 42]).

Seignorage is defined as the sum of the change in the real stock of money ( $m$ ) and of the inflation tax:

$$(1) \quad S = \frac{\Delta M_t}{P_t} = \dot{m}_t + \pi_t m_t = \dot{m}_t + I_{TAX}$$

<sup>34</sup> Agenor and Montiel [1996] claim that in the short run there is an absence of any correlation between inflation and deficit, while in the long run there is only a weak positive correlation. Among the various arguments proposed to explain this finding, there is the tight money paradox, based on the results of Sargent and Wallace [1981].



In steady state  $m$  does not change and  $S = I_{TAX}$ . Moreover, inflation is constant at  $\pi^*$ . Given the usual Cagan money demand function (2) and set  $m_0 = 1$ :

$$(2) \quad m_t = m_0 e^{-\alpha\pi^*} \quad \text{with } \alpha > 0$$

$$(3) \quad I_{TAX} = \pi^* e^{-\alpha\pi^*}$$

The (3) depicts the Laffer curve represented in the diagram, which reach its maximum when  $\pi^* = 1/\alpha$

The fiscal approach to the balance of payments is supported by the evidence, which shows that fiscal and external balances move together. Fiscal adjustments, reduction in the current account deficit and depreciation are closely associated, confirming the analysis of Rodriguez [1990] who underlies that, if the Ricardian equivalence does not hold, a tax reduction, financed by increased internal or external borrowing, boosts private spending and, as a consequence, reduces the trade surplus and generates a real exchange rate appreciation. The empirical evidence seems to support the idea that the current account and fiscal balance move in the same direction, since large fiscal deficit are generally associated with large external imbalances [Agenor and Montiel, 1996].

## 7. Empirical Models on Debt Sustainability

The economic literature presents only few models that analyse debt relief and sustainability under a broader framework than the accounting approach. The HIPC initiative aims to reach long run debt sustainability mainly through fixing specific thresholds, that are believed to bring the debt burden at manageable levels. However, according to some authors, debt relief seems to have failed to reach a level of sustainability sufficient to enhance and foster economic growth and poverty reduction. One of the reasons pointed out is related to the choice of the sustainability indicators, which do not derive from an analytical model and, therefore, they are not connected with any explicit target of economic growth. The empirical literature, however, presents few contributions in this field: some works takes the debt sustainability as a target and derives all the macroeconomic adjustments required, while other papers are more concerned about a growth target.

All these work<sup>35</sup> have the advantage of developing a more complete macroeconomic model that takes into account the interrelationships between the more important variables, but they present some drawbacks due to the necessity of taking the model simple and manageable (which implies that some aspect are ignored).

<sup>35</sup> The details of these models are presented in Annex B.

One of the first models of external debt sustainability is developed by Elbadawi, Ndulu and Ndung'u [1997], who fix a growth target and derive the equilibrium solution for the debt ratios. With a targeted output growth of 5%, the results for 99 developing countries show that the ratio of external debt to exports consistent with the model is 330, while the debt service to exports (revenues) turns out to be 8.8 (10), private investment are 15% of GDP and the country has to run a deficit equal to 6% of GDP.

The model is questionable on a number of different assumptions (i.e. the fixed level of revenues and public spending, public investment), for the choice of using the current value and not the net present value of the debt stock and for the lack of inclusion of relevant variables. In particular, even if it has the advantage of including both the foreign and domestic debt, it ignores the current account and the balance of payments. Furthermore, the high level of aggregation does not allow to disentangle different channels of capital inflows (such as aid and remittances) and commercial and concessional loans. Eventually, one of the main drawbacks of the model is that it is a simple exercise of comparative statics: it ignores any dynamics in the transition period from the year in which debt forgiveness is granted and the equilibrium point.

More recent works have developed a more complete framework, focusing on debt sustainability and not on a particular target of income growth. Edwards [2002, 2003] looks at the experience of Nicaragua and in two different analyses he investigates the relationships between debt relief and fiscal sustainability and debt relief and current account. Edwards [2003] defines macroeconomic sustainability following two key features: (1) fiscal sustainability and (2) current account sustainability. He develops two different dynamic models of sustainability: the first one has a primary balance consistent with a stable debt-to-GDP ratio as a target, while the second a current account consistent with solvency.

The main advantages of these studies are the consideration of domestic debt, the distinction between concessional and commercial debt, the inclusion of remittances, aid and grants, as well as seignorage revenue, which are key elements for developing countries. In both cases, he finds out that sustainability requires strong adjustments (reduced expenditures, higher taxes, devaluation), which are politically difficult to implement and which can diverge resources from the poverty reduction and growth enhancing programs.

The main drawback of these works is a lack of integration between the two analysis: in particular, the adjustments demanded for the sustainability of the current account are likely to undermine the fiscal stability. The sensitivity of the results with respect to the rate of growth of GDP underlines the necessity for a closer look at the consequence that the adjustments have on economic growth.

Fedelino and Kudina [2003] find that the HIPC Initiative does not assure fiscal sustainability, unless fiscal policies change. They start from the Edwards' approach to fiscal sustainability and modify the budget constraint in order to include: (1) the exchange rate, and (2) the distinction between domestic and foreign debt. Their model implies that donor should provide more grants and aid flows to fund the required and

expected increased poverty reduction expenditures, since a tighter fiscal policy in the HIPCs is not viable. The authors conclude that “Unless HIPCs improve their primary fiscal positions or grant financing is sustained at current, or possibly higher, levels, debt sustainability in HIPCs may prove elusive in the long term” [p. 26].

This model has the advantage of including the domestic debt into the analysis, but it has the same limitations that affect Edwards’ models. In particular, it takes the crucial economic variables as exogenous and, then, it derives the effect of a change in those variables. However, as the authors themselves admit, interest rates, inflation, exchange rates and economic growth should be endogenous, because they are clearly affected by debt relief and by lenders’ behaviour.

Burnside and Fanizza [2001, 2004] look at the effects that debt relief has on government budget constraint and on output growth. They analyze the HIPC initiative with a different perspective: the sustainability of debt and external sector are not addressed, but this model has the advantage of looking at the effect of debt reduction on the economy, without assuming a growth rate target. Government spending, investment, tax revenues and output change in response to debt forgiveness, to the level of conditionality and to the spending decisions. The inclusion in the model of a money demand function allows for the simulation of two different scenarios, depending on the monetary policy. If central bank wants a stable inflation (active policy), the outcome is a small reduction in the long run level of debt and inflation, while a loose monetary policy results in a substantial debt reduction, at a cost of a higher inflation in the short run.

These results confirm the unpleasant monetarist arithmetic highlighted by Sargent and Wallace [1981]: lower current inflation implies a higher inflation in the long run, or, in this case, lower inflation in the future requires a higher rate of current inflation. However, that conclusion could be mitigated by fiscal reforms: if government increases spending in poverty reduction programs and cuts other expenditures, there are sizeable gains in terms of permanent reduction of debt and inflation, both with passive and active monetary policy. The relevance of the growth effect denotes the importance of the effectiveness of poverty reduction programmes in raising growth for fiscal sustainability.

Even if sustainability is not explicitly considered, this model allows for a broad macroeconomic evaluation of debt reduction. The evolution of debt stock and of the government budget constraint consents to assess the likelihood of a future debt distress. The main limitations of this model concern: (1) the disconnection between the monetary and the real part of the model, since inflation, completely determined in the money market, is not allowed to impact on output, and (2) the exclusion of domestic debt, of the current account and of real exchange rates. A comprehensive framework that addresses these issues requires a fully-fledged government budget constraint, including both the external and the domestic position, and exchange rates, in order to achieve a more realistic impact of debt relief on the HIPCs’ economy.

## 8. Conclusions

This paper reviews the literature on debt sustainability and proposes the economic blocks that should frame a more comprehensive debt sustainability analysis. A number of authors have emphasized the need for a more comprehensive framework to analyse the effects of the debt burden on the LICs economies. The dominant financial framework represent a rigorous tool to project the evolution of public debt, but it does not internalise the feedback effects of debt on the functioning of the economy nor does it consider the development need of the LICs.

A comprehensive debt sustainability framework should include the 5 following blocks:

1. Country specific debt thresholds, which define the need and magnitude of debt relief (or grant financing), such that the reduction in debt burden has a positive effect on economic growth, according to the findings of the debt overhang theory.
2. Debt service thresholds, which ease the temporary liquidity constrain of servicing public debt, in order not to crowd out public or private investment.
3. The evaluation of the risk of default, rescheduling and arrears, which are likely to increase the volatility of future inflows and the uncertainty about future policies.
4. The analysis of the public deficit financing and of the characteristics of the domestic financial markets, which have feedback effects on future public deficits, monetary policy and inflation.
5. The analysis of the external financing gap, in connection with the financing of public deficits and the external borrowing of the private sector, which have an impact of the real exchange rate.

The theoretical and empirical literature on debt sustainability presents all the previous blocks, but it fails to connect the different sections of the analysis. As a possible direction of future research, the model developed by Burnside and Fanizza [2004] could be extended to determine the magnitude of debt relief, the effect of debt relief on economic growth, and the effects of the modality of financing of public deficits and of the external financing gap on the domestic interest rate and on the real exchange rate.



## References

- Addison, Tony, Henrik Hansen, and Finn Tarp, 2004, (ed. by) *Debt Relief for Poor Countries*. (New York: Palgrave MacMillan).
- Agenor, Pierre-Richard, 2004, *The Economics of Adjustment and Growth*. (Harvard University Press, Cambridge).
- , and Peter J. Montiel, 1996, *Development Macroeconomics*, (Princeton: Princeton University Press).
- Andrews, David, Anthony R. Boote, Syed S. Rizavi, and Sukhwinder Singh, 1999, "Debt Relief for Low-Income Countries The Enhanced HIPC Initiative", *IMF Pamphlet Series* No. 55.
- Arnone, Marco, 2004, "Le iniziative di Riduzione del Debito Estero per i Paesi Poveri: Una Valutazione Critica", *Vita e Pensiero*, December 2004, Catholic University of Milan.
- Arnone, Marco, and Andrea F. Presbitero, 2004, "Sostenibilità e Riduzione del Debito Estero per i Paesi Poveri", *Working Paper*, n. 27, Catholic University of Piacenza, February 2005.
- Arnone, Marco, Carlo Bellavite Pellegrini, and Francesco Graziadei, 2005, *Il Venture Capital per lo Sviluppo – Una Analisi delle Economie Emergenti*, Milano: Vita e Pensiero.
- Asiedu, Elizabeth, 2003, "Debt relief and institutional reform: a focus on Heavily Indebted Poor Countries", *The Quarterly Review of Economics and Finance* Vo. 43, pp. 614-626.
- Belloc, Marianna, and Pietro Vertova, 2002, "On foreign debt sustainability of developing countries: towards a long run approach for development", (unpublished; University of Siena).
- Bhattacharya, Rina, and Benedict Clements, 2004, "Calculating the Benefits of Debt Relief", *Finance & Development*, December 2004, pp. 48-50.
- Birdsall, Nancy, and Brian Deese, 2002, "Beyond HIPC: Secure Sustainable Debt Relief for Poor Countries", *Center for Global Development Working Paper*, No. 44.
- , John Williamson, and Brian Deese, 2002, *Delivering on Debt Relief From IMF Gold to a New Aid Architecture*. (Washington D.C: Center for Global Development, Institute for International Economics).

- Burnside, Craig, and Domenico Fanizza, 2001, "Hiccups for HIPC's?", *Mimeo*.
- 2004, "Hiccups for HIPC's?", *NBER Working Paper* No. 10903.
- , and David Dollar, 2000, "Aid, Policies, and Growth", *American Economic Review*, Vol. 90, No. 4, pp. 847-868.
- Chauvin, Nicolas D. and Aart Kraay, 2005, "What Has 100 Billion Dollars Worth of Debt Relief Done for Low-Income Countries?", *World Bank Working Paper*, September 2005.
- Chenery and Strout, 1966, "Foreign Assistance and Economic Development", *American Economic Review*, Vol. 56, pp. 679-733.
- Chowdhury, Abdur R., 2004, "External Debt, Growth and the HIPC Initiative: Is the Country Choice Too Narrow?", chapter 8 in *Debt Relief for Poor Countries*, ed. by Addison, Hansen and Tarp.
- Christensen, Jakob, 2004, "Domestic Debt Markets in Sub-Saharan Africa", *IMF Working Paper*, No. 04/46.
- Claessens, Stijn, Enrica Detragiache, Ravi Kanbur, and Peter Wickham, 1996, "Analytical Aspects of the Debt Problems of Heavily Indebted Poor Countries", *World Bank Policy Research Working Paper* No. 1618.
- Clements, Benedict, Rina Bhattacharya, and Toan Q. Nguyen, 2003, "External Debt, Public Investment, and Growth in Low-Income Countries", *IMF Working Paper* No. 03/249.
- Cline, William, 1995, *International Debt Reexamined*, (Washington D.C: Institute for International Economics).
- 2003, "HIPC Debt Sustainability and Post-relief Lending Policy", (unpublished; Center for Global Development and Institute for International Economics).
- Cohen, Daniel, 1989, "How to Cope with Debt Overhang: Cut Flows rather than Stocks", Chapter 13 in *Dealing with Debt Crisis*, ed. by Husain and Diwan.
- 1993, "Low Investment and Large LCD Debt in the 1980's", *The American Economic Review*, Vol. 83, No. 3.
- 2000. "The HIPC Initiative: True and False Promises", *OECD Development Centre Working Paper*, No. 166.
- Cordella, Tito, Luca A. Ricci, and Marta Ruiz-Arranz, 2005, "Deconstructing HIPC's Debt Overhang", *mimeo*, International Monetary Fund, April 2005.

- Cuddington, John T., 1997, "Analysing the Sustainability of Fiscal Deficits in Developing Countries", *Working Paper* No. 97-01, Georgetown University, Economic Department.
- Dooley Michael, 1989, "Debt Relief and Leveraged Buy-Outs", *International Economic Review*, Vol. 30, No. 1.
- Eaton, Jonathan, 1993, "Sovereign Debt: A Primer", *World Bank Economic Review*, Vol. 7, No. 2, pp. 137-72.
- 2002, *The HIPC Initiative: The Goals, Additionality, Eligibility, and Debt Sustainability*, (Washington D.C: The World Bank Operations Evaluation Department).
- Easterly, William, 2001a, "Think Again: Debt Relief", *Foreign Policy*, Vol. 127, pp. 20-26.
- 2001b, *The Elusive Quest for Growth: Economists Adventures and Misadventure in the Tropics*, (Cambridge, Mass: The MIT Press).
- 2002, "How Did Heavily Indebted Poor Countries Become Heavily Indebted? Reviewing Two Decades of Debt Relief", *World Development*, Vol. 30, No. 10, pp. 1677-1696.
- , and Klaus Schmidt-Hebbel, 1991, "The Macroeconomics of Public Sector Deficits", *World Bank Country Economic Department Working Paper*, No. 775.
- Edwards S. 2002. Debt Relief and Fiscal Sustainability. *NBER Working Paper* 8939, May 2002.
- 2002. Debt Relief and the Current Account: An Analysis of the HIPC Initiative. *The World Economy* 26(4): 513-531.
- Elbadawi, Ibrahim A., Benno J. Ndulu, and Njuguna Ndung'u, 1999, "Debt Overhang and Economic Growth in Sub-Saharan Africa", chapter 5 in *External Finance for Low-Income Countries*, ed. by Iqbal, Zubair, and Ravi Kanbur (Washington D.C: IMF Institute).
- Eurodad, 2001, *Putting Poverty Reduction First*. (Brussels).
- Fedelino, Annalisa, and Alina Kudina, 2003, "Fiscal Sustainability in African HIPC Countries: A Policy Dilemma?", *IMF Working Paper*, No. 03/187.
- Goldstein, Morris, 2003, "Debt Sustainability, Brazil, and the IMF", *Institute for International Economics Working Paper*, No. 03-1.
- Gunning, Jan W., and Richard Mash, 1998, "Fiscal Implications of Debt and Debt Relief: Issues Paper". *Mimeo*.

- Gunter, Bernhard G., 2003, "Achieving Long-Term Debt Sustainability in All Heavily Indebted Poor Countries (HIPCs)", Discussion Paper prepared for the G-24 XVI Technical Meeting, February 2003.
- Hanmer, Lucia, and Ruth Shelton, 2001, "Sustainable Debt: What has HIPC Delivered?", Paper for the WIDER Conference on Debt Relief, Helsinki, August 2001.
- Hansen, Henrik, 2004, "The Impact of External Aid and External Debt on Growth and Investment". chapter 7 in *Debt Relief for Poor Countries*, ed. by Addison, Hansen and Tarp.
- Hjertholm, Peter, 2001, "Debt Relief and the Rule of Thumb: Analytical History of HIPC Debt Sustainability Targets", Paper for the WIDER Conference on Debt Relief, Helsinki, August 2001.
- 2004, "HIPC Debt Sustainability Thresholds: Revisiting the Case for a Uniform Formula for Debt Relief", *Journal of Restructuring Finance*, Vol. 1, No. 1, pp. 13-33.
- Husain, I, Diwan I. 1989. (edit. by). *Dealing with Debt Crisis*. The World Bank. Washington DC. September 1989.
- Imbs, Jean, and Romain Ranciere, 2005, "The Overhang Hangover", *World Bank Policy Research Working Paper*, No. 3673, August 2005.
- International Monetary Fund, 1997, "Debt Relief for Low-Income Countries and the HIPC Initiative", prepared by the Policy Development and Review Department, WP/97/24.
- 2001, "The Challenge of Maintaining Long-Term External Debt Sustainability", prepared by the Staffs of the World Bank and the International Monetary Fund, April 20, 2001.
- 2002, "The Enhanced HIPC Initiative and the Achievement of Long-Term External Debt Sustainability", prepared by the Staffs of the World Bank and the International Monetary Fund, April 15, 2002.
- 2003, *World Economic Outlook*, April 2003.
- 2004a, "Debt Sustainability in Low-Income Countries - Proposal for an Operational Framework and Policy Implications", prepared by the Staffs of the World Bank and the International Monetary Fund, February 3, 2004.
- 2004b, "Debt Sustainability in Low-Income Countries: Further Considerations on an Operational Framework and Policy Implications", prepared by the Staffs of the World Bank and the International Monetary Fund, September 10, 2004.

- 2005a, “Operational Framework for Debt Sustainability Assessments in Low-Income Countries – Further Considerations”, prepared by the Staffs of the World Bank and the International Monetary Fund, March 28, 2005.
- , 2005b, *World Economic Outlook*, September 2005.
- Kraay, Aart, and Vikram Nehru, 2004, “When Is External Debt Sustainable?” *World Bank Policy Research Working Paper*, No. 3200.
- Krugman, Paul, 1988, “Financing vs. Forgiving a Debt Overhang”, *Journal of Development Economics*, No. 29, pp. 253-268.
- Loser, Claudio M., 2004, “External Debt Sustainability: Guidelines for Low- and Middle-income Countries”, *G.24 Discussion Paper Series*, No. 26. (UNCTAD).
- Martin, Matthew, 2002, “Debt Relief and Poverty Reduction: Do We Need a HIPC III?”, Paper presented to North-South Institute, (Debt Relief International).
- 2004, “Assessing the HIPC Initiative: The Key HIPC Debates”, chapter 2 in *Debt Relief Myths and Reality*, ed. by Teunissen, Jan J., and Age Akkerman, (The Hague: FONDAD).
- Moss, Todd J., and Hanley S. Chiang, 2003, The Other Costs of High Debt in Poor Countries: Growth, Policy Dynamics, and Institutions”, *Issue Paper on Debt Sustainability*, Center for Global Development, Washington DC, August 2003.
- Oxfam, 2001, *Debt Relief: Still Failing The Poor*,
- 2005, *Paying the Price – Why rich countries must invest now in a war on poverty*, (Oxford: Oxfam).
- Pattillo, Catherine, Helene Poirson, and Luca Ricci, 2002, “External Debt and Growth?” *IMF Working Paper*, No. 02/69.
- 2004, “What Are the Channels Through Which External Debt Affects Growth?”, *IMF Working Paper*, No. 04/15.
- Pettifor, Ann, Bronwen Thomas, and Michela Telatin, 2001, “HIPC – flogging a dead process”, *Jubilee Report*. Available via the Internet at [www.jubileepius.org](http://www.jubileepius.org)
- Presbitero, Andrea F., 2005a, “The Debt-Growth Nexus: a Dynamic Panel Data Estimation”, *Department of Economics Working Paper*, No. 243, Università Politecnica delle Marche, Ottobre 2005.
- Reinhart, Carmen M., Kenneth S. Rogoff, and Miguel A. Savastano, 2003, “Debt Intolerance”, *NBER Working Paper*, No. 9908, August 2003.

- Rigobon, Roberto, 2003, "Identification Through Heteroskedasticity", *The Review of Economics and Statistics*, Vol. 85, No. 4, pp. 777-792.
- Rodriguez, Carlos A., 1990, "The External Effects of Public Sector Deficits", *Cema Working Papers* 70, (Universidad del CEMA).
- Roubini, Nouriel, 2001, "Debt Sustainability: How to Assess Whether a Country is Insolvent", (unpublished; Stern School of Business).
- Sachs, Jeffrey D., 1989, "The Debt Overhang of Developing Countries". In *Debt, Stabilization and Development*, by Calvo, Guillermo A., Ronald Findlay, Pentti Kouri, and Jorge Braga de Macedo, (Oxford: Basil Blackwell).
- 2002, "Resolving the Debt Crisis of Low-Income Countries", *Brookings Papers on Economic Activity*, Vol. 1, pp. 257-286.
- 2005a, "An Accountable Approach to Aid", *Financial Times*, January 24, 2005.
- 2005b, *The End of Poverty*, Penguin Press, March 2005
- Sargent, Thomas J, and Neil Wallace, 1981, "Some Unpleasant Monetarist Arithmetic", *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 5.
- Silva, A. C., 1986, "Macroeconomic Impact of Debt Financed Fiscal Deficits: Non-Sceptical Considerations", Chapter 7 in *Public Finance and Public Debt*, ed. by B. P. Herber (Detroit: Wayne State University Press).
- Sun, Yan, 2004, "External Debt Sustainability in HIPC Completion Point Countries", *IMF Working Paper*, No. 04/160.
- Thomas, Melissa A., 2001, "Getting Debt Relief Right", *Foreign Affairs*, Vol. 80, No. 5.
- UNCTAD, 2004, *Debt Sustainability: Oasis or Mirage?* (Geneva: United Nations).

## Annex A

### Krugman's model of debt overhang [1988]

It is a two period model, with an outstanding debt  $D$ , all due in the first period. If the country has not enough resource to repay the debt, it can borrow at the opportunity cost  $i$ . The new borrowing must be repaid in the second period (otherwise there is forgiveness). Lenders are risk neutral. The maximum payments in the two periods are  $x_1$  and  $x_2$ . The focus of the model is on the first period and in the debtor capacity of attracting new funds.

#### **No uncertainty**

If  $x_1 < D$ , the country will borrow the amount  $D - x_1$ . The lenders will agree only if  $(1 + i)(D - x_1) < x_2$ , which means that there is no liquidity problems if the present value of the available resources is larger than the stock of debt:

$$(1) \quad x_1 + \frac{x_2}{(1+i)} > D$$

If this is not the case, the best solution for the creditors is an immediate write-off of the debt at a level equal to the actual resource transfer.

#### **Uncertainty**

Now  $x_2$  is a random variable that can assume two values:

$$x_2 \equiv \begin{cases} x_G & \text{with probability } (p) \\ x_B & \text{with probability } (1-p) \end{cases} \quad \text{with } x_G > x_B$$

The borrowing need is  $L = D - x_1$  and the interest rate offered is such that  $L(1 + r) = x_G$  (it is the highest interest rate possible and the creditors will receive all the available resources in either the state of the world). The condition necessary for lending is similar to (1), with the present value of resource transfer greater than the inherited debt:

$$(2) \quad x_1 + \frac{[px_G + (1-p)x_B]}{(1+i)} > D$$

If debt is larger, the country is unable to service its debt. The creditors are willing to prevent the liquidity crisis and accept a certain loss (given by the difference between the first term of (2) and the amount of resources  $Z$  that creditors can take from the country in period 1). On the contrary, they could lend enough money to prevent default in the first period, hoping that they will receive the full payment in the second period. A simple strategy is a new lending  $L = D - x_1$  at the usual rate  $r$ , so that creditors will receive all the potential resources in period 1. (it is true that the expected repayment:  $[px_G + (1-p)x_B]/(1+i) < L$ , but it is more than what creditors could obtain without new lending). So, creditors have an incentive to lend, even at an expected loss, to defend

their existing claims. But they have also the incentive to apply the highest possible interest rate  $r$  ( $r$  will be higher than  $i$  if  $x_G > L(1 + i)$ ): as long as there is a state of the world in which the present value of resource transfer is greater than the debt, creditors will charge  $r > i$ ).

Concessional lending, however, is generally observed and it has an economic sense because it is an incentive to economic adjustment. Using a model in which  $x_2$  could assume two values (low and high) depending on the adjustment effort, it is possible to show that it could be in the interest of the creditors to charge an interest rate sufficiently low ( $r < i$ ) to incentive the debtor to make the higher adjustment effort.

This results have strong implications: (1) concessional lending should be generally associated with conditionality, because creditors want the debtor to make the highest effort, and (2) there is a lack of credibility in the creditors' threat of stopping lending, because the model shows that defensive lending to prevent a liquidity crisis remains in their interest.



## Annex B: Models of Debt Relief

### The Elbadawi, Ndulu and Ndung'u model of external debt sustainability

Elbadawi, Ndulu and Ndung'u [1997] develop a simple model of debt sustainability, which is based on two basic equations for the rate of growth and for private investment, estimated for 99 countries in the period 1960-94. The model considers only the public sector gap, ignoring the balance of payments and takes the government expenditures and revenues, the interest rates and the exchange rates as given. The normative solution of the model implies an assumption of output growth of 5% and, thus, the consistent levels of fiscal deficit, debt and debt services can be derived.

#### **Equations and identities**

The basic growth model (equation 1) is consistent with debt overhang and financial constraint hypothesis, while other significant determinants are public sector deficit to GDP (DEF), external shocks (measured as terms of trade variability, TT) and public investment to GDP (PbI). The growth-debt relationship can be represented by a debt-Laffer curve with a maximum at an external debt-to-GDP (ExDY) ratio of 0.97.

The private investment model (equation 2) consider both the demand side and the credit constraint, because large debt stocks, debt service payments and fiscal deficit reduce the demand for private investment to GDP (PrI) and squeeze the credit supply. The estimated equation find the usual inverse-U shaped effect of external debt, a negative effect of deficit, terms of trade, debt service to exports (ExDSX), and a positive effect of the rate of output growth. The impact of real exchange rate, inflation and public investment is considered as well.

The fiscal deficit (equation 3) is given by the basic identity that sums the primary deficit (R – G) plus the interest payments on foreign and domestic debt (DDY).

$$(1) g_Y = 5.38ExDY - 2.97ExDY^2 - 0.31DEF + 2.54PbI - 0.05ExDSX - 0.03TT$$

$$(2) PrI = 0.0041g_Y + 0.96ExDY - 0.03ExDY^2 - 0.002DEF - 0.02TT - 0.15ExDSX$$

$$(3) DEF = (R - G) + rDDY + r^*(ExDY * -NFA^*)e$$

#### **Assumptions**

PbI =  $\beta$ \*ExDR = 0.10 (Public investment to GDP as a function of external debt service to revenues)

r = -1.8934 (domestic real interest rate)

r\* = 0.48 (foreign real interest rate)

DDY = 0.11 (domestic debt to GDP)

R = 0.103 (revenues to GDP)

G = 0.213 (Government spending to GDP)

e = 0.89 (real exchange rate)

#### **Closure and results**

Once the exogenous growth target is fixed (at 5%), the model is solved for public sector liabilities stocks and flows. The growth rate of 5% is consistent with a ration ratio of

external debt to exports stable at 330%, while the ratio of debt service to exports (revenues) stabilises at 8.8% (10%), private investment are 15% of GDP and the country has to run a deficit equal to 6% of GDP. These numbers support the HIPC initiative, whose target of external debt is lower than the one derived by the model and so should boost economic growth.

### **The Edwards' models of debt relief**

#### **Fiscal sustainability**

Public debt (D) is determined by the sum of commercial domestic public debt (DD) and concessional foreign debt (DC). The change in the debt stock is given by the budget constraint (1):

$$(1) \quad \dot{B}_t = (r_t^C DC_{t-1} + r_t^D DD_{t-1}) + PB_t - \dot{B}_t$$

where the change in monetary base (B) is the seignorage revenue and r are the nominal interest rates. The rate of growth of DC and DD are respectively  $\theta$  and  $\beta$ . In order to constraint the debt-to-GDP ratios to be bounded in the long-run,  $\theta$  and  $\beta$  are less or equal to  $(g + \pi)$ , which are the real rate of GDP growth and the rate of inflation. These conditions assure a convergence path of the primary balance to GDP ratio (PBY), whose dynamic is expressed by (2):

$$(2) \quad PBY_t = \left[ (\theta - r_t^C) \left( \frac{DC}{D} \right)_0 e^{(\theta - g - \pi)(t-1)} + (\beta - r_t^D) \left( \frac{DD}{D} \right)_0 e^{(\beta - g - \pi)(t-1)} \right] \left[ \frac{1}{1 + g + \pi} \right] - (g + \pi) \left( \frac{B}{Y} \right)_0$$

where the subscript 0 signals the ratio of the face value of debt and of base money to GDP immediately after the debt reduction. The sustainable path of the PB depends on the rate of growth of commercial and concessional debt, on the nominal interest rates, on inflation and on the rate of growth of GDP. Different scenarios could be the results of different assumptions on  $\theta$  and  $\beta$ . The steady state values of sustainable primary deficit show that ignoring the domestic debt results in an underestimation of the fiscal effort required to achieve the fiscal sustainability.

The calibration of the model for the experience of debt reduction in Nicaragua shows that the resulting PB depends on the alternative assumptions on the rate of growth of GDP. Under the more realistic scenario ( $\theta = g/2 + \pi$  and  $\beta = g + \pi$ ) the steady state of DD to GDP is equal to the time 0 value and the steady state of DC to GDP ratio is zero. The speed of declining is quite slow and after ten years the concessional debt is still 133% of GDP (starting from 167% and with  $g = 5\%$ ). The higher  $g$ , the lower will be the surplus required to maintain sustainability. However, under reasonable assumptions, the fiscal adjustment is severe and the evolution of grants and donations (G) has a strong effect on the extent of the adjustment. Since  $PB = PE + G + t$ , a reduction in G (realistic after the debt relief) implies an increase in taxes or a reduction in the primary expenditures (PE) to maintain sustainability. This point highlights problems of political feasibility for the required fiscal adjustments.

### **Current account sustainability**

The model starts from the current account balance (CA) and, given assumptions on the growth rates of the capital flows, derives the sustainable path of current account to GDP ratio, consistent with solvency.

$$(1) \quad CA_t = IP_t + TB_t - REM_t = KF_t - \dot{R}_t = \dot{DC}_t + \dot{DE}_t + \dot{P}_t + FDI_t + G_t - \dot{R}_t$$

The current account, measured in foreign exchange, is given by the trade balance (TB), plus the net payment of interests (IP), minus the net flow of remittances (REM), or, alternatively, by the net capital inflows (KF) minus the change in international reserves (R). The KF can be decomposed in net changes in concessional (DC) and commercial external (DE) debt, in private portfolio investment (P), in net foreign direct investment, and in grants and donations (G).

The rate of growth of subsidized loans is equal to  $\beta g + \pi$ , with  $0 < \beta < 1$ , while DE, R and P could deviate from the steady state growth rate (equal to  $g + \pi$ ), when the ratios to exports in t-1 differs from the long run values. The same adjustment process work for the FDI, which converges to a long run desired ratio relative to exports. Grants and donations are assumed exogenous and their future path is generally declining after debt relief.

The sustainable path of current account to GDP ratio, under the realistic assumption about  $\beta$  (less than one, so that the DC/Y ratio converges to zero) and given a stable degree of openness ( $\chi = X/Y$ ), depends on the initial values of the capital flows, on their long run desired ratios to exports and on the speed of adjustments to steady state values. The steady state value of CA/Y (given by (2)) depends on the steady state ratios of portfolio flows, external debt, foreign investment, aid and donations and monetary base B.

$$(2) \quad (CA/Y)^* = \left[ (DE/X)^* + (P/X)^* \right] \frac{\chi(g + \pi)}{1 + g + \pi} + \chi \left( (FDI/X)^* + (G/X)^* \right) - (g + \pi) \chi (B/X)^*$$

The results obtained by the calibration of the model, with data about debt relief in Nicaragua and under the assumption of a declining trend of grants and donations, show that the time path of current account deficit follows a significant declining trend, which implies a very sharp adjustment. Data about the trade balance confirm the strong required adjustments, in terms of depreciation of the real exchange rate, in order to achieve the sustainable deficit.

The main conclusion of the model is that the large depreciation required after the HIPC initiative to achieve external debt sustainability threatens the fiscal sustainability, through the increase in the domestic debt-to-GDP ratio, and entails a great fiscal adjustment.

### **The Fedelino and Kudina model of debt sustainability**

Fedelino and Kudina [2003] start from the Edwards' approach to fiscal sustainability and modify the budget constraint in order to include: (1) the exchange rate, since a

currency depreciation worsens the debt dynamics; and (2) the distinction between domestic and foreign debt, since domestic debt could be a source of distress and a relevant source of financing for LICs (that have a limited access to international capital markets).

The authors assume that foreign creditors provide concessional financing, while domestic credit is at commercial terms, making their model very similar to Edwards [2002], apart from the inclusion of the exchange rate. The dynamics of the budget constraint depends on the assumption about the lenders' behaviour: domestic debt is assumed to remain a constant share of GDP, while the evolution of foreign lending is analysed under two scenarios (conservative and optimistic).

Under the conservative scenario, only two countries out of the 12 African countries of the sample can afford to run a small primary deficit in the first ten years, while in the optimistic case all countries can sustain a primary deficit. Since these two possibilities are quite unrealistic, the authors look at a mean scenario, when half of the countries fail the sustainability test and they require strong fiscal adjustments.

It is worth noting that a tighter fiscal policy could start a vicious cycle, because it could harm economic growth and, as a consequence, higher fiscal surplus will be eventually required to sustain the given level of indebtedness.

Changes in the basic assumptions are reflected in the levels of sustainable deficit: the main point is that the impact of exogenous shocks is higher in the optimistic scenario than in the conservative one. A large donors' commitment allows for expansionary policies, but it also increases the risk of debt distress.

Since the results show that many HIPC are expected to incur into debt sustainability problems after graduation from the HIPC initiative, policy makers face three alternatives:

1. Reducing current expenditures. It is an unfeasible solution because current expenditures are already close to subsistence levels in LICs. However, a more efficient resource allocation and a sounder public expenditure management can foster economic growth.
2. Increasing fiscal revenues. A higher tax rate dampens growth performance, but a reform of fiscal system could have a positive impact on budget constraint, even if it takes time to obtain significant results.
3. Increasing grants, even after HIPC Initiative. However, debtor countries should improve their macroeconomic environment, in order to attract private capital flows and FDI.

There is a trade-off between targets of macroeconomic stability and debt sustainability and pro-growth and anti-poverty policies. Moreover, external financing could not only undermine debt sustainability, but also hinder economic growth, because of Dutch-disease effect.

In conclusion, this model has the advantage of including the domestic debt into the analysis, but it has the same limitations that affect Edwards' models. In particular, it assumes the crucial economic variables as exogenous and it derives the effect of a change in those variables on debt dynamics. However, as the authors themselves admit, the interest rates, inflation, exchange rates and economic growth should be endogenous, because they are clearly affected by debt relief and by lenders' behaviour. The latter, eventually, could be modelled more analytically, instead of looking at the two extreme scenarios.

### The Burnside and Fanizza model of debt relief

Given the budget constraint (1), an HIPC government, given its stock of debt ( $D_0$ ) and the level of spending ( $G$ ) and aid ( $A$ ), faces a situation in which solvency requires a significant future increase in either seignorage ( $M/P$ ) or tax ( $T$ ) revenues, as clear from equation (2).

$$(1) \quad \dot{B}_t = rD_t + G_t - T_t - A_t - \frac{M_t}{P_t}$$

$$(2) \quad D_0 + \int_0^{\infty} (G_t - A_t) e^{-rt} dt = \int_0^{\infty} \left( T_t + \frac{M_t}{P_t} \right) e^{-rt} dt \gg 0$$

The debt relief granted at decision point reduces the stock of debt to the new value  $D_0' = (1 - \theta)D_0$ . This could be thought also as an increase equal to  $\theta D_0$  in the aid flows, that, thanks to conditionality, are transferred to an equivalent raise in public spending. Whether any indirect effect of debt reduction is not considered, it is easy to show that the budget constraint is not relaxed and the future path of taxes and monetary base do not change. This conclusion is, however, flawed by too simple assumptions that can be relaxed.

A Cagan money demand function is included in order to evaluate the inflationary impact of debt relief, and government spending can affect the output. The output effect is due to the fact that the additional resources freed up by debt reduction are spent in poverty reduction programs ( $\hat{G}$ ). A fraction  $\alpha$  of  $\hat{G}$  raises investments and, as a consequence, the level of output:

$$(3) \quad \dot{K}_t = \alpha \hat{G}_t - \delta K_t$$

$$(4) \quad Y_t = Y + \rho K_t$$

where  $\delta$  is the capital depreciation rate and  $\rho$  a non-negative constant. Since tax revenues are a fraction of output ( $T_t = \omega Y_t$ ), the indirect effects of debt relief relax the government budget constraint.

The initial steady state is given by (5) and implies that, if the stock of debt is constant and given  $A$  and  $G$ , the higher the initial stock of debt  $D_0$ , the higher the rate of inflation  $\pi$  ( $m$  is  $M/P$ ) or the tax rate:

$$(5) \quad \dot{B}_t = rD_t + G - \omega Y - A - \pi m$$

The HIPC Initiative lasts for the period  $(0, T)$  in which aid are increased by a fraction  $\psi > 0$  ( $A_t = A(1 + \psi)$ ) and also the government expenditures increase by the amount  $A\psi = \hat{G}$ , thanks to conditionality. After debt relief ( $t > T$ ), aid and public expenditures come

back to their previous values of A and G. Given the present value of debt relief  $(A\psi(1 - e^{-rT}))(1/r)$ , the fraction of government debt service that is forgiven is:

$$(6) \quad \theta = a\psi \frac{1 - e^{-rT}}{rD_0}$$

Given the assumptions made, it is possible to derive the paths for K and Y for  $0 < t < T$  and for  $t > T$ : the results show that the increase in tax revenue is proportional to the magnitude of debt relief:

$$(7) \quad \int_0^{\infty} \omega(Y_t - Y)e^{-rt} dt = \frac{\omega\rho\alpha}{\delta + r} \theta D_0$$

In order to close the model, the authors consider two different types of monetary policy. Since they show that the equilibrium inflation rate follows a path like:

$$(8) \quad \pi_t = \begin{cases} \gamma + (\bar{\gamma} - \gamma)e^{(t-T)/n} & 0 \leq t \leq T \\ \bar{\gamma} & t \geq T \end{cases}$$

the **active monetary policy** tries to keep inflation stable across the two sub-periods. The central bank chooses  $\gamma$ , while the path of seignorage revenue  $M_t^s/P_t$ , given the budget constraint, is completely determined by  $\gamma$ . In the other case, **passive monetary policy**, government spending increases the liquidity of the system and it represents new seignorage revenue.

The calibration of the model implies assumptions on  $r$ , on the money demand function, on the initial level of debt (equal to 70% of Y), on the steady state value of G (equal to 20% of Y) and A ( $A = 0.03Y$ ) and on  $\omega$ , fixed at 0.15. These initial conditions are consistent with a primary deficit and a weak fiscal position (high inflation and seignorage). Under reasonable assumptions, the country receives an amount of debt relief equal to 2.7% of GDP for a ten-year period. Since the government budget constraint can be written as:

$$(9) \quad \int_0^{\infty} (M_t^s/P_t - \pi m)e^{-rt} dt = - \int_0^{\infty} \omega(Y_t - Y)e^{-rt} dt$$

and given the (7), it could be shown that the budget constraint is indirectly relaxed by debt relief:

$$(10) \quad \int_0^{\infty} (M_t^s/P_t - \pi m)e^{-rt} dt = - \frac{\omega\rho\alpha}{\delta + r} \theta D_0$$

The relaxation of the budget constraint is equal to 17.5% of GDP, roughly one fourth of the initial stock of debt, and implies that seignorage can be reduced for an amount equal to the increased tax receipts.

In case of active monetary policy, the growth effect allows for a reduction of inflation after debt relief from 25% to 21%, and a permanent reduction of the debt-to GDP ratio to 0.55. With a passive monetary policy, the growth effect weakens both the short-run increase in inflation due to excess liquidity and also the long-run value of inflation (14%), while the long run level of debt is equal to 26% of  $Y$ <sup>36</sup>. So, with a loose monetary policy, the gains in terms of a further reduction of debt and inflation are limited by the costs of the higher inflation during the debt relief period.

---

<sup>36</sup> Without growth effect all the additional liquidity stays in the system and the higher seignorage leads to a rapid decline in debt, whose long-run value is half of the initial value  $D_0$ .