

On The Sustainability of External Debt: Is Debt Relief Enough?

Gianni Vaggi*

University of Pavia

Annalisa Prizzon[‡]

University of Pavia and OECD

This version: January 2009

Abstract

Notwithstanding debt relief measures and the overall financial improvements that they bring about, many low-income countries, LICs, still face daunting tasks: economic growth, human development and regular debt service. Our analytical device extends Pasinetti (1998) analysis to the case of external debt. This simple graphical tool that we call the ‘geometry of debt sustainability’ — GDS — allows a new evaluation of the notion of foreign debt sustainability. GDS brings to the fore the role of NICA — the non-interest current account — in the long-run sustainability of foreign debt. Considerations on debt stabilization are integrated with the notion of affordability of debt service in LICs, which we proxy recurring to the ‘human factor’ approach (Vaggi, 1993). Moreover GDS shows why both debt cancellation and additional aid are necessary to give indebted low-income economies a chance to improve both human development and long-run economic viability.

JEL classification numbers: E60, F30, H60, O11

Keywords: debt relief, external debt sustainability, development finance

*Corresponding author: Department of Political Economy and Quantitative Methods, University of Pavia, via S. Felice, 7, 27100 Pavia, Italy. gianni.vaggi@unipv.it. [‡] OECD, Development Centre, 2, Rue André Pascal, F-75775 Paris Cedex 16, France. annalisa.prizzon@oecd.org. The authors are grateful for constructive comments from Amit Bhaduri and Amitava Dutt. The authors alone are responsible for any remaining errors. The views expressed herein are solely those of the authors and do not necessarily represent the views of the OECD.

1 Introduction

Since the end of the 1980s, heavily indebted low-income countries have been benefiting from debt relief measures that go from debt service rescheduling to partial or total debt stock forgiveness. A large number of schemes have been proposed and some of them have been tried. Among them the most famous ones are the Heavily Indebted Poor Countries Initiative, HIPC¹, of 1996 enhanced in 1999 and the Multilateral Debt relief Initiative, MDRI², of 2005. Many low-income countries have benefited from different degrees of debt cancellation. Notwithstanding these obvious bonuses and the overall financial improvements that they bring about, many countries still face daunting tasks: they have a foreign debt to service every year, plus they are supposed to improve their Human Development Index, HDI, and to achieve the Millennium Development Goals, MDGs. Moreover it is not yet clear whether the debt story of the 1980s and 1990s is finally over or whether some countries are at risk of falling again into a debt trap³. To sum up: is the remaining foreign debt sustainable or not?

We show that some further clarifications to the notion of foreign debt sustainability are both appropriate and necessary, in particular if low-income indebted countries must achieve two major targets:

¹In the case of HIPC sustainability is defined as some figures described as thresholds: the Net Present Value, NPV, of debt-to-export ratio and NPV of debt-to-government revenues ratio, the latter is the so called ‘fiscal window’ for very open economies (see IMF and World Bank (1999) and IMF and World Bank (2001)). Any value below those thresholds is regarded as being sustainable. We concentrate on the debt-to-GDP ratio or debt ratio.

²It represents the first multilateral initiative that aims to total write-off of liabilities of the three most relevant Multilateral Development Banks in terms of volume of HIPC loans: World Bank, IMF and African Development Bank. IADB joined the initiative in January 2007. MDRI may be considered the second enhancement of HIPC since it is not completely separated from it: HIPC eligibility criteria are prerequisites for benefiting from MDRI but the achievement of the completion point is a necessary but not sufficient condition for MDRI eligibility.

³Based on 2006 data, among completion point countries, for example Mauritania presents a NPV of debt-to-GDP ratio of 188 per cent and both Burkina Faso and Sao Tomé and Príncipe above 90 per cent (World Bank, 2008a). Moreover, according to the Debt Sustainability Framework classification of the IMF and World Bank, only nine Heavily Indebted Poor Countries (HIPC) are rated as enjoying a low risk of debt distress (?).

- ability to service foreign debt;
- improvements in human development conditions.

We use a model which elaborates on Pasinetti (1998), where he discusses the conditions under which domestic debt ratio stabilizes⁴ in the context of European Monetary Union countries. Pasinetti (1998) shows that there is an implicit relationship between the debt ratio — i.e. Debt-to-GDP ratio — and either the total and the primary surplus (deficit) of a country. Thus he sets a boundary relation which defines the sustainability area of public finance: inside this area, which includes the boundary itself, the debt ratio is not increasing⁵. Our analytical device extends Pasinetti (1998) analysis to the case of external debt.

This simple graphical tool that we call the ‘geometry of debt sustainability’ — GDS — allows a new evaluation of the notion of foreign debt sustainability. Usually it is defined either in terms of thresholds, as in the HIPC initiative, or in terms of a non increasing debt ratio. GDS is based on the notion of Non-Interest Current Account, NICA, which is the equivalent of primary surplus in the case of domestic public debt. There is a precise relationship between the NICA-to-GDP and the Debt-to-GDP ratios, which describes all the combinations of NICA and debt stock that guarantee a non-increasing debt ratio. GDS brings to the fore the role of NICA in the long-run sustainability of foreign debt and this links up with the so-called transversality condition, according to which in the long run a debt must go to zero, i.e. it must be entirely repaid⁶. GDS allows a very simple evaluation of the efficacy of different measures of debt relief and it offers a new perspective and analytical explanation on some possible policy actions; sections 3- to 5 illustrate some relevant cases.

⁴Henceforth, we use the term of *stabilization* to indicate a debt ratio that remains constant or decreases.

⁵See Pasinetti (1998). He also shows that the Maastricht’s figures for the debt ratio and the deficit-to-GDP ratio targets represent only one of many possible combinations along the boundary relation.

⁶See for instance Cohen (1985). The condition is algebraically expressed by $\lim_{t \rightarrow +\infty} \frac{D_t}{(1+i)^t} = 0$, where D_t is the debt stock at time t and i is the nominal interest rate.

We concentrate on low-income countries, LICs, because they are the ones facing the most challenging issues in the most difficult conditions. Usually LICs lack domestic savings and need foreign financing. True the average interest rate is very low due to loan concessionality and it is lower than the GDP growth rate. However most LICs run NICA deficits and last but not least they still present low levels of human development which should be overcome also by freeing resources from the debt burden. However the GDS framework can be easily adapted to the macroeconomic features of emerging economies, both in Asia and in Latin America, as section 5 and Appendix B briefly show.

Section 2 describes the basic analytical framework and the building of the ‘geometry of debt sustainability’. GDS shows how the initial conditions should change to guarantee sustainability and in particular the effects of debt forgiveness on debt stabilization are discussed in section 3. The same section evaluates the role of aid in the GDS framework and provides a new rationale for a policy of synchronized debt cancellation and additional aid, we call it a ‘shock therapy’. Section 4 integrates the financial considerations on debt stabilization with the notion of affordability of debt service, which we proxy recurring to the ‘human factor’ approach (Vaggi, 1993). A debt stock is affordable if it allows both debt service and a minimum improvement in the standard of living. Section 5 applies GDS to the case GDP-indexed bonds, bonds indexed to the economic performance of the country, which is more relevant for middle income economies and emerging markets. Appendix B provides numerical examples of GDP growth requirements for debt stabilization in HIPC, Latin America and Asian countries.

2 The analytical framework

Fiscal sustainability analysis usually focuses on primary surplus⁷. Nevertheless in open economy the overall surplus, i.e. the current account, CA, is preferred to NICA. This is so because CA measures changes in net external

⁷See for instance Agénor and Montiel (1996), Chalk and Hemming (2000), Burnside (2005).

position towards the rest of the world: a CA deficit indicates an increase in net foreign liabilities. The Non-Interest Current Account may be a more difficult concept to single out : it may be proxied by the Trade Balance which however does not account for inflows such as grants and workers' remittances. However we prefer NICA because it does not depend on debt itself, it does not include interest payments and it provides a better indicator of the long-run external sustainability. As a matter of fact NICA is the source out of which foreign debt can be repaid in the long run, as it is clear in debt solvency analysis.

We consider a net debtor country where i is the nominal and constant interest rate and D the debt stock, thus iD are interest payments. All magnitudes are in nominal terms and are expressed in domestic currency as if the exchange rate was fixed and equal to one⁸. We suppose that the capital account KA includes only debt related flows, so it measures the change in net foreign liabilities, i.e. $KA \equiv \Delta D$, and $NICA \equiv -\Delta D + iD$. Scaling by GDP, Y , multiplying by $\frac{D}{Y}$ and defining θ as the debt stock growth rate we have

$$nica \equiv (i - \theta)d \tag{1}$$

where $\frac{NICA}{Y} = nica$ and $\frac{D}{Y} = d$.

A non-increasing debt ratio requires the GDP growth rate g to be equal to or higher than the debt stock growth rate θ . This condition is met if

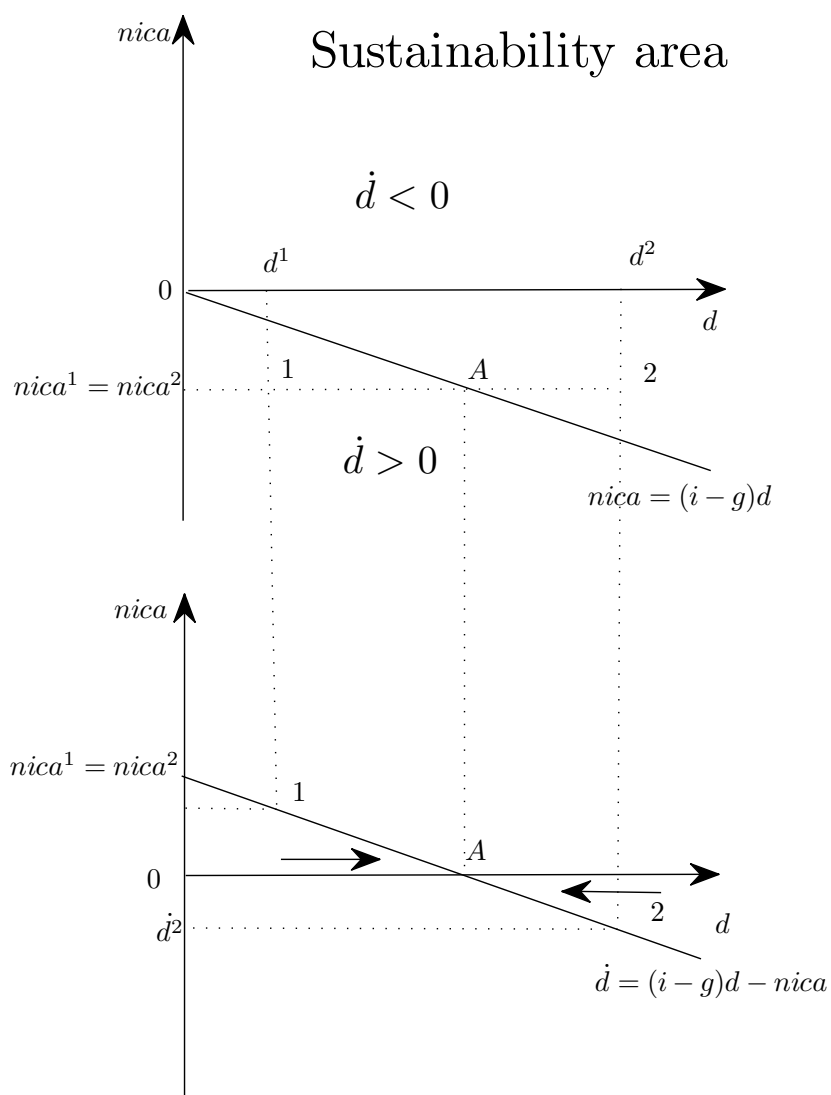
$$nica \geq (i - g)d \tag{2}$$

Relationship (2) can be described in a diagram whose vertical axis represents the NICA ratio, $nica$, and the horizontal axis is the debt-to-GDP ratio, d , see the upper part of Figure 1. Here we assume a country with a $nica$ deficit and with $i < g$: these conditions are typical of most LICs and HIPC. Depending on the country's actual values of $nica$ and d , we have three different cases.

First, the country is on the boundary relation, i.e. all the combinations

⁸With a few analytical complications GDS allows to take into consideration the case of flexible exchange rates.

Figure 1: The Framework of the Geometry of Debt Sustainability



of $nica$ and d for which the debt ratio is constant.

Second, the country finds itself above the boundary relation, the debt ratio is decreasing because $nica > (i - g)d$. We define sustainability area the area above the boundary relation, including the boundary relation itself.

Third, the country locates below the boundary relation, the debt ratio is increasing because $nica < (i - g)d$. The growth rate is not high enough relatively to the interest rate to cover the high negative $nica$.

We enrich our diagram with the debt ratio state equation, which describes the variation through time of the debt-to-GDP ratio: as it is well known this is given by

$$\dot{d} = (i - g)d - nica \quad (3)$$

which is depicted in the lower part of Figure 1.

The boundary relation and the state equation can be represented in the same diagram: we denominate this comprehensive framework ‘Geometry of Debt Sustainability’, GDS⁹.

Figure 1 needs a few comments.

First, clearly equation (2) and (3) lead to similar results in terms of the stabilization of the debt ratio. It must be emphasized that in equation (3) the NICA ratio is a parameter, which is the value of NICA ratio. This value is seen on the vertical axis of the bottom part of Figure 1. Of course the country can only be located only along the state equation on a point which depends on the actual debt ratio. If a country is located on point A where the state equation crosses the horizontal axis, then in the upper part of the diagram it will lie on the corresponding point A' of the boundary relation.

Second, debt stability is often associated with equation (3) but GDS tells us something more. As we have seen in the upper part of the graph, the debtor country can place itself above, below or along the boundary relation.

In the upper part of Figure 1, a $nica$ deficit moves the country upwards

⁹Harck (2000) has a similar diagram for the case of public debt, but there is no analysis of foreign debt sustainability, as it is also the case in Pasinetti (1998).

and it allows to approach the sustainability area. Given the values of *nica* deficit, i and g , an increase in the debt ratio shifts the country to the right thus coming nearer to the sustainability area¹⁰. This sort of paradox derives directly from the accounting perspective on which GDS is built and can be explained if we remember that debt ratio stabilization is a long-run process with an inbuilt dynamics.

Consider the following example. Two countries, 1 and 2, differ *only* in the values of their initial debt ratio, such that $d^1 < d^2$ and they have the same stable equilibrium (point *A* in the lower part of Figure 1).

Country 2 presents a decreasing debt ratio. The increase in the numerator, the debt stock, is only due to interest payments' rollover and is lower than the increase in the denominator, the GDP, thus the debt ratio decreases and this effect is larger the higher the debt ratio.

In the case of country 1 the debt ratio increases but this movement takes place at a progressively lower speed until it reaches the stable value at point *A*. Country 1 starts from a lower debt ratio than country 2, but given the *nica* deficit, i and g , can 'accommodate' a larger debt stock than the initial one.

Notice that with unchanged *nica*, i and g , country 1 will not enter into the sustainability area, the process of debt accumulation will stop at point *A* where Country 2 progressively reduces its foreign liabilities *vis-à-vis* its GDP. For similar reasons, it will not enter into the area below the boundary relation.

When $i > g$, both the boundary and the state equation slope upwards. If the debt stock is high, an even larger *nica* surplus might be required to cover interest payments and enter into the sustainability area, which is the case of most of the middle-income countries.

It must be emphasized that these results derive from the fact we have adopted

¹⁰We could have a non-linear boundary relation in the case of the 'debt overhang' where there is an inverse relationship between the growth rate and the debt ratio and when the interest rate increases as the debt stock grows. This implies that the higher the debt ratio the smaller is the sustainability area.

an accounting framework, which is of course quite binding. Moreover the stabilization of the debt ratio is a very long-run phenomenon: point A corresponds to a steady state which is attained after repeated rounds of interest payments and GDP growth with unchanged i , g and above all unchanged $nica$. GDS highlights the inner dynamics of foreign debt¹¹; once you have a given debt ratio and a given $nica$ deficit there is an inbuilt tendency for the ratio to move towards its stable value, at point A in the diagram. Indeed, the experience of many countries with very high debt ratios shows that indebtedness is typically a long-run phenomenon, which it is not easy to get rid of once you have fallen into it.

The geometry of debt sustainability shows the analytical relations between the two major aspects of the financial side of debt sustainability. On one side, the debt ratio can be stabilized, in the sense of bringing it on a non-increasing path also in a country with a $nica$ deficit. On the other hand, only a $nica$ surplus can guarantee that the debt will ever be repaid. To achieve a stable debt to GDP ratio can be economically painful, but can be achieved in a relatively short run, on the contrary in a low-income economy with undiversified exports moving from a $nica$ deficit to a $nica$ surplus requires much more time and it implies a process of structural change. Debt is a typical phenomenon for which the short and long run are also closely interlinked, GDS shows the relationships between the two time dimensions, but it emphasizes the essential role of $nica$ in this overall process.

Till now we have taken as given important macroeconomic magnitudes, of course g , i and $nica$ do change over time, moreover changes in the debt ratio may affect both growth rates and interest rates, thus modifying both the boundary relation and the state equation. In the next section we examine some possible modifications in the values of these magnitudes, in particular in relation debt cancellation. GDS shows the impact of different scenarios of debt relief and the way to enhance their efficacy.

¹¹Similar considerations hold for the domestic public debt stabilization process.

3 The rational for debt forgiveness and aid additivity

3.1 Debt cancellation

Debt forgiveness consists in an agreed reduction of the debtor country liabilities which can be either partial or total, the latter case can be called ‘fresh start’ (see Sachs (2002)). The rationale behind debt forgiveness derives both from the ‘debt overhang’ effect and from the possible crowding out effect of debt service on poverty reduction expenditures.

By itself debt forgiveness does not directly affect either i , g or $nica$, the only immediate effect would be that of moving the country from right to left in the upper part of Figure 1¹². In the case of a country characterized by a $nica$ deficit and by $i < g$, debt forgiveness might take it away from the sustainability area. This is not so absurd as it looks like, on the contrary it tells us a very simple truth. By reducing the debt ratio debt cancellation re-creates more space for debt accumulation in a way which is consistent.

Let us take a low-income country which benefits from debt relief because the actual debt ratio d_1 is higher both than the HIPC threshold, d^t , and the stable debt ratio (point A) in the bottom part of Figure 2. There are four possible cases.

First, after debt forgiveness the country fails to improve both g and $nica$; the country has a chance to re-start her past debt history, that is to say it can accumulate foreign liabilities which is not a very satisfactory outcome.

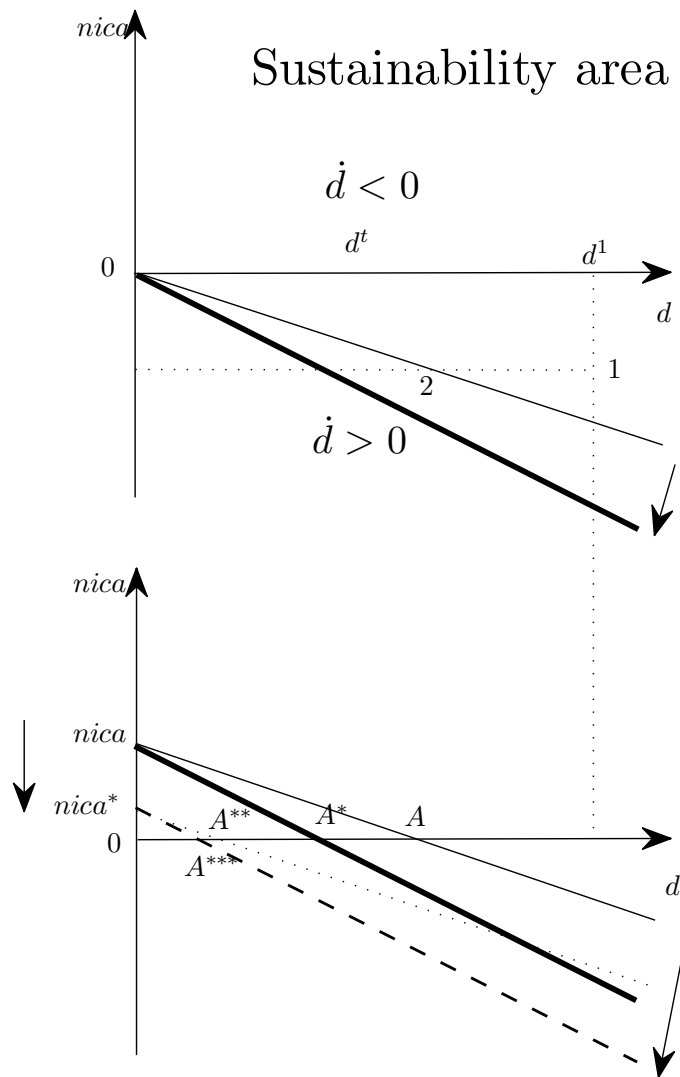
Second, the country succeeds in increasing g . Both the boundary relation and the state equation rotate downwards and the stable debt ratio lowers from A to A^* (see the bold lines in Figure 2).

Third, $nica$ improves: the state equation shifts downwards (the dotted line in Figure 2) thus reducing the stable debt ratio from A to A^{**} .

Fourth, in the most fortunate case the increase in g is accompanied by

¹²If we used the Current Account, ca , instead of $nica$, the debt stock reduction would have a positive impact on ca and in the diagram the country would move to the left but also up because of the improvement in ca due to lower interest payments. This would bring the country closer to the sustainability area.

Figure 2: Debt Forgiveness, the Growth Rate and NICA



a *nica* improvement. A greater growth rate of output produces a downward shift of both the boundary relation and the state equation. Moreover the state equation shifts downwards as *nica* improves. The stable steady state ratio goes from A to A^{***} .

The ‘geometry of debt sustainability’ shows the limits of debt cancellation. Even in the case of total cancellation, a ‘fresh start’, a country that fails to improve both g and *nica* would accumulate new debt stocks¹³. However debt forgiveness can bring about a very important relief in the short run, mainly by reducing the debt service to be disbursed in countries which are constrained by a systematic lack of foreign currency and need to increase the resources aimed at human development and at the achievement of the MDGs.

A high growth rate is quite important for the long-run sustainability of foreign financing. From this point of view the improved growth performance in many low-income HIPC, particularly in Sub-Saharan Africa, during the first decade of the twenty-first century is a most welcome novelty. However in a LIC the state of the external accounts and of *nica* in particular are much more decisive than growth to assess the long-run financial sustainability of foreign borrowing. Without an improvement in *nica* — indeed a moderately positive *nica* — an indebted low-income economy would always be at risk of serious re-payment problems and possible financial and currency crisis.

However *nica* improvements require profound structural changes in the export-import composition and indeed in the production structure of a LIC¹⁴. This process of structural change takes time, it is a long-run objective and requires investments into new sectors of the economy¹⁵. From this point of view debt cancellation it is a way to allow the debtor country more time and

¹³See more on debt forgiveness in Appendix A.

¹⁴See the UNCTAD Least Developed Countries reports of 2004 and 2006. The importance of appropriate changes in the import export propensities for the sustainability of external debt is also highlighted in Bhaduri (1987).

¹⁵*nica* is influenced by changes in the terms of trade, particularly if the value of exports depends on the prices of few products; these movements can easily bring the country inside/outside the sustainability area. Of course this situation does not reduce financial vulnerability, but let her prone to external shocks.

more financial resources to go through the process of structural change which must boost its external accounts.

We can imagine a process in which thanks to cancellation the debt ratio d decreases and the country moves from point 2 to point 1 in Figure 2, to the left of the boundary relation. Now the country is outside the sustainability area, but thanks to debt cancellation it has a lower foreign exchange constraint. The country attracts foreign direct investments and can also start new borrowing. Suppose more investments improve the *nica*, now the country moves up from point 1 and may end up into the sustainability area. After debt cancellation and because of the new borrowing the debt ratio increases, thus the country moves to the right of point 1, but this movement would end up into a stable debt ratio A^{**} , lower than the initial one, on the new state equation, corresponding to the improved *nica*¹⁶.

To sum up: poor and indebted countries need some breathing time and a policy space, debt cancellation may provide both.

3.2 More aid

The GDS diagram allows also some interesting considerations about aid flows and in particular it brings to the fore a point which is often overlooked; other things being equal increasing aid and debt cancellation have very different effects on the debt stabilization. The impact of larger aid flows is similar to *nica* improvements¹⁷, the state equation shifts downwards, while debt cancellation moves d to the left. Of course any other type of net additional financial flows entering *nica*, such as workers' remittances, would produce similar results. More Foreign Direct Investments and more Portfolio Inflows have an impact similar to that of debt cancellation because they appear in the capital account side of the balance of payments¹⁸.

¹⁶If *nica* improves and g increases the new stable debt ratio could be A^{***} .

¹⁷Precisely we intend a larger aid-to-GDP ratio. Therefore aid flows must grow more than GDP.

¹⁸Aid flows and debt relief disbursement differ also in terms of the degree of conditionality attached. Moreover, we are aware of the different macroeconomic impact of each component of the balance of payments that cannot be discussed in our accounting framework.

Let us examine the effect of additional aid in our GDS framework. We can consider two cases.

First, aid flows are just enough to reduce the *nica* to a value, call it $nica_{target}$, which stabilizes the debt-to-GDP ratio at its existing level, d^1 in Figure 3, this is the ‘weak hypothesis’. For a given *nica* the amount of additional aid is precisely what is needed to prevent further increases in the debt ratio and to bring the country inside the sustainability area. In figure 3, originally the low-income country is at point 1.

Due to increased aid, the state equation moves downwards, see the dotted line, but there is still a *nica* deficit. The value of the stable debt ratio decreases from A to A^* and coincides with d^1 . In the upper part of the graph, the boundary relation is not affected. The country moves from 1 to 1*. Of course in this case the additional aid is used for the debt service, which might not be the best utilization of aid in a low-income country.

Second, aid flows cover the entire *nica* deficit, call it the ‘strong hypothesis’. The post-aid *nica* will become zero. In the bottom part of the diagram the state equation shifts downwards, see the bold line, and the stable debt ratio position coincides with the origin. In the upper part of the graph the boundary relation is unchanged, however, the position of the country vertically shifts from 1 to d^1 . Now the country is on a decreasing debt ratio path, i.e. $\dot{d}^1 < 0$, and in the long run this implies that d goes to zero.

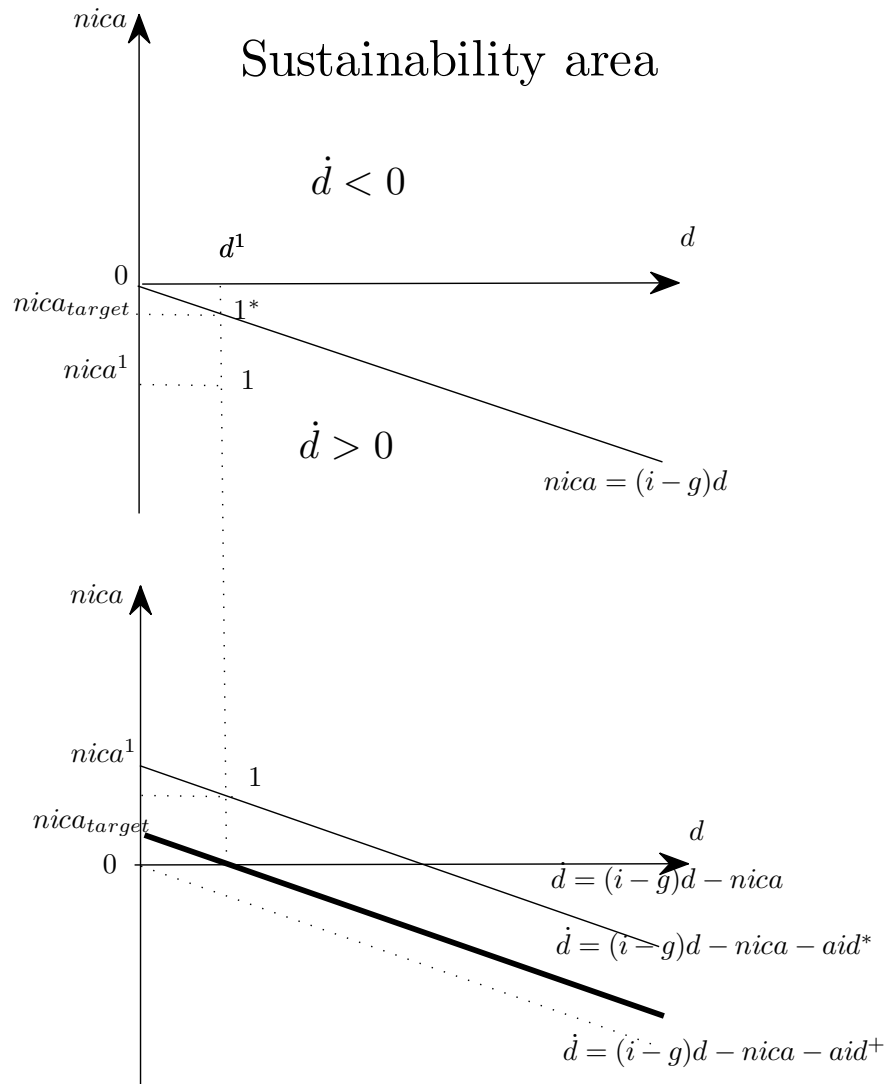
Of course, all the positive outcomes deriving from the additional aid depend on the aid-to-GDP ratio being kept at the new higher level in the future. If aid is reduced and the country has not improved either g , *nica* or both the debt stock will accumulate again.

The simple diagram that we call GDS shows that an appropriate mixture of debt cancellation and increased aid can bring the country either closer or inside the sustainability area. This has important policy implications for

Figure 3: Effects of Aid Flows

$$aid^* = nica_{target}$$

$$aid^+ = nica_{deficit}$$



indebted LICs. As we have already said in the short run they have to face a double task: they must fulfil their debt service obligations but at the same time they have to spend more and in a better way on human development; the use of aid to service the debt can be regarded as a failure. For the indebted LICs one could think of a kind of ‘shock therapy’ according to which debt relief and increased aid are simultaneously applied, this would help the country to partially overcome the short-run trade-off between servicing the debt and improving human development expenditures. This combined strategy could create conditions very similar to a ‘fresh start’.

Debt cancellation re-creates room for new borrowing thus possibly reducing the debt overhang effect¹⁹ while increased aid covers part of the *nica* deficit. Of course this is a kind of ‘buying time’ situation in view of the improvement of *nica*. In this case the country has a ‘breathing time’ with a real chance for a new start. This would give the country more time and more policy space to undertake the process of structural change aimed at improving *nica*. Since the debt crisis of 1980s there has been a large number of plans for the poorest and indebted countries, but none of them has been effective, in the sense of leading to sustainable foreign borrowing. Even now these countries are not in the economic and financial conditions in which they could realistically pursue three fundamental objectives: economic growth, human development and regular debt service.

4 The ‘human factor’ approach and debt affordability

There is a widespread dissatisfaction with the many different notions of foreign debt sustainability which rely on financial and macroeconomic parameters²⁰.

Foreign debt as an important and unwelcome human dimension, partic-

¹⁹On the other hand, Arslanalp and Henry (2004) do not support the existence of a debt overhang effect in low-income countries and therefore the opportunity for debt relief in enhancing growth, attributing the economic stagnation to lack of basic infrastructures.

²⁰On the different notions of foreign debt sustainability see for instance Cline (1994).

ularly when it constrains the resources that a low-income country needs for human development and for poverty reducing expenditures. Many LICs have very low interest rates thus $g > i$ and if the *nica* deficit is not too large the foreign debt service might look sustainable. An explosive debt ratio may well be accompanied by a worsening in the standard of living. An affordable²¹ foreign debt stock of a low-income economy should allow the achievement of two major targets that we have indicated in the Introduction. A debt is deemed to be ‘affordable’ if:

- it is compatible with a non-increasing debt-to-GDP ratio;
- it allows for an improvement in the standard of living.

Here we proxy the notion of affordability with the ‘human factor’ approach (Vaggi, 1993). In very poor countries economic growth has to be used to improve human development and to achieve the MDGs; therefore only part of GDP growth can be used to service foreign debt and to stabilize the debt ratio. The usual condition $g > i$ may not be a good indicator of debt affordability. Taking into account the ‘human factor’, the GDS equations change as follows

$$\theta \leq g - h \quad \text{a non-increasing debt ratio condition} \quad (4)$$

$$nica = (i + h - g)d \quad \text{boundary relation} \quad (5)$$

$$\dot{d} = (i + h - g)d - nica \quad \text{state equation} \quad (6)$$

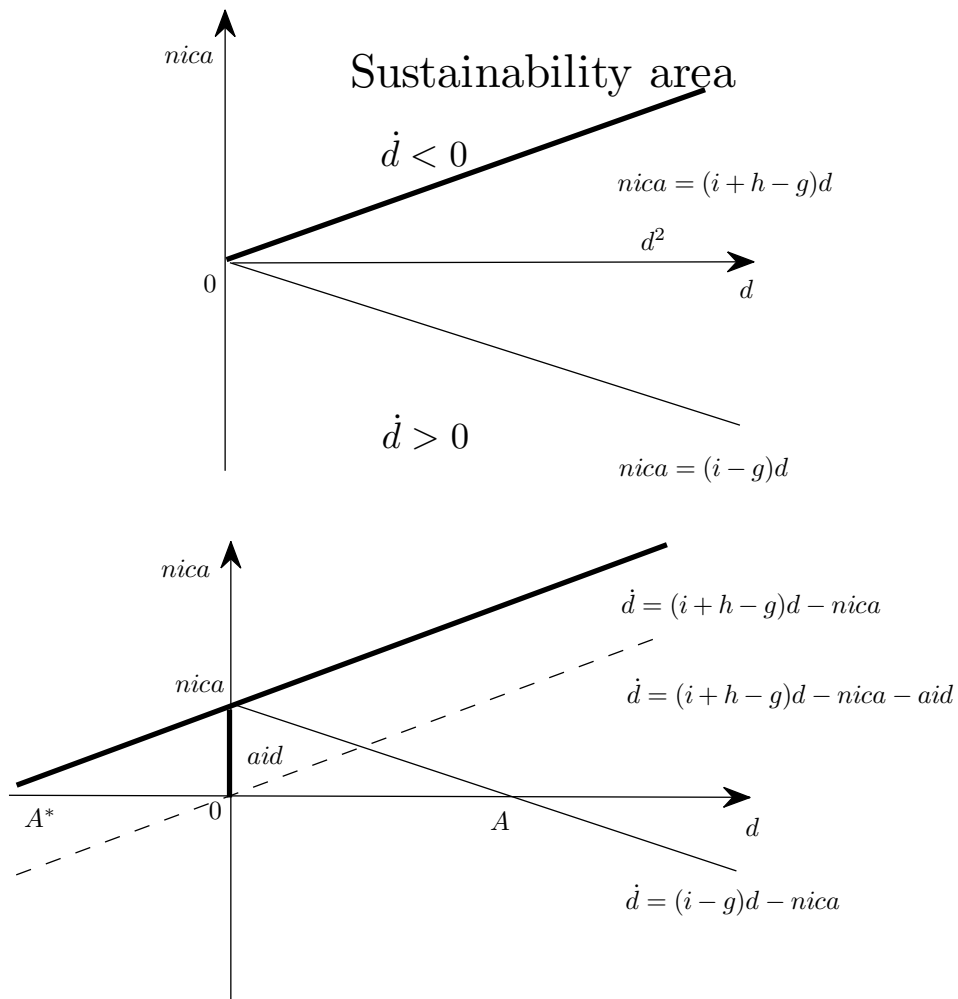
$$d_h = \frac{nica}{i+h-g} \quad \text{debt ratio equilibrium} \quad (7)$$

where $h = p + k$ is the ‘human factor’: p is the population growth rate and k is the percentage target increase in GDP per capita. k measures the improvement in the standard of living which is considered to be necessary to attain the MDGs or just a higher level of human development²². d_h is the stable debt ratio consistent with a k increase in GDP per capita. In Figure 4 the baseline scenario is the same as in Figure 1, country 2 has a *nica* deficit,

²¹On the notion of affordability see for instance Northover et al. (1998), Birdsall and Williamson (2002), Sheshamani (2003) and Bhattacharya (2003).

²²On the possible values of k see Vaggi (1993) and Appendix B of this paper.

Figure 4: 'Human Factor'



$g < i$, and the actual debt-to-GDP ratio, d^2 , is higher than its stable ratio, A : the debt ratio decreases, the country is located inside the sustainability area and the situation looks manageable.

Nevertheless, the ‘human factor’ perspective can drastically modify the above condition. Suppose $g < i + h$, such that the growth rate is not high enough to cover population growth and to guarantee an increase in income per capita which satisfies the required target k . The thicker lines describe the new situation: both the boundary relation and the state equation are now positively sloped²³ and above all the sustainability area is much reduced²⁴. A condition which looked sustainable and in which the debt ratio was stabilized now appears to be much more dramatic. This is obvious because the ‘human factor’ h imposes a requisite on g : for the purpose of financial stabilization the growth rate is lower than the actual growth rate. The trade-off between expenditures in favor of human development and financial stabilization becomes much more stringent: debt stabilization cannot be attained unless human development targets are neglected. Notice that the introduction of the human factor reinforces our arguments in favor of a ‘shock therapy’ for low-income economies²⁵. Under such conditions debt forgiveness plus increased aid would be the only option which might mitigate the constraint, at least in the short run. Debt cancellation moves the country to the right on the horizontal axis, total cancellation leads the country to the origin; additional aid brings down the state equation in the bottom part of Figure 4, where we have assumed that aid is equal to the entire *nica* deficit. Therefore the state equation now crosses the origin, which is where the country now finds itself.

To sum up; the ‘human factor’ offers a more articulated perspective on sus-

²³In a purely accounting perspective, the equilibrium shift from debtor to creditor, from A to A^* .

²⁴Compared to the baseline scenario of Figure 1, if $g > h + i$, the downward sloped boundary relation and the state equation rotate upwards thus reducing the sustainability area and increasing the value of the stable debt ratio. The situation is not as dramatic as the one described in Figure 4, but debt stabilization and human development are on a more stringent trade-off.

²⁵Even a *nica* surplus might not be enough to achieve both aims.

tainability and sets the challenges facing an indebted low-income country in a more realistic perspective. Debt stabilization can be attained by a simultaneous increase in aid flows and total debt cancellation. Suppose that the donors' community adopts the 'strong hypothesis' for aid: the state equation shifts downwards and crosses the origin, see the dashed line. Nevertheless, given the debt stock d_2 , the debt ratio is still on an exploding path.

5 New financial tools

In recent years there has been an increasing interest for new tools in development finance (Jha, 2004). Particularly, it includes a revival in indexed bonds instruments for low and middle-income countries financing²⁶ where the interest rate is linked to the economic performance of the debtor country. This economic performance may be measured by the GDP growth rate, by other relevant magnitudes such as net exports, or by the price of some primary commodities, if they represent an important share of country's exports. These financial instruments are designed to limit vulnerability to either cyclical or sudden shocks and thus reducing the likelihood of defaults and debt crises (Griffith-Jones and Sharma, 2006). In particular Borensztein and Mauro (2004) suggest that GDP-indexed bonds contribute to debt ratio stabilization.

The GDS framework can be easily adapted to describe this case, which can be of interest for some middle-income economies and for emerging markets, where foreign liabilities quite often take the form of bonds. For these type of economies we continue to assume that in the baseline scenario they have a *nica* deficit, but contrary to LICs, interest rates are greater than GDP growth rates. The situation is described in Figure 5 where the boundary relation is positively sloped²⁷. Notice that unless the country is already

²⁶See for instance Borensztein and Mauro (2004), Tabova (2005), Gilbert and Tabova (2005), Cohen et al. (2006), Griffith-Jones and Sharma (2006).

²⁷GDS could also describe many other cases; for instance those in which debt is partly foreign and partly domestic owned and those in which the exchange rate modifies. Moreover, the low interest rate such that $i < g$ is concessional and not determined by market forces.

inside the sustainability area the debt ratio will ‘explode’.

In the case of GDP-indexed bonds, the interest rate i^b is determined by the following indexation rule:

$$i^b = bg \quad (8)$$

where b is a scalar such that $0 < b < 1$ and $i^b < g$ by definition.

The boundary relation and the state equation become as follows²⁸:

$$nica = (b - 1)gd \quad (9)$$

$$\dot{d} = (b - 1)gd - nica. \quad (10)$$

Both relations become now negatively sloped, see thicker lines. The debt ratio d may either increase or decrease depending on whether the country locates itself on the right or on the left of the stable equilibrium A^{ib} , but in any case the debt ratio will no longer explode.

GDP-indexed bonds represent a concessional finance instrument and they can contribute to the stabilization of the debt ratio. In low performance countries they can reduce the adverse impact of the rolling over of interest arrears on debt ratio²⁹; at the same time best performance debtors can face higher obligations.

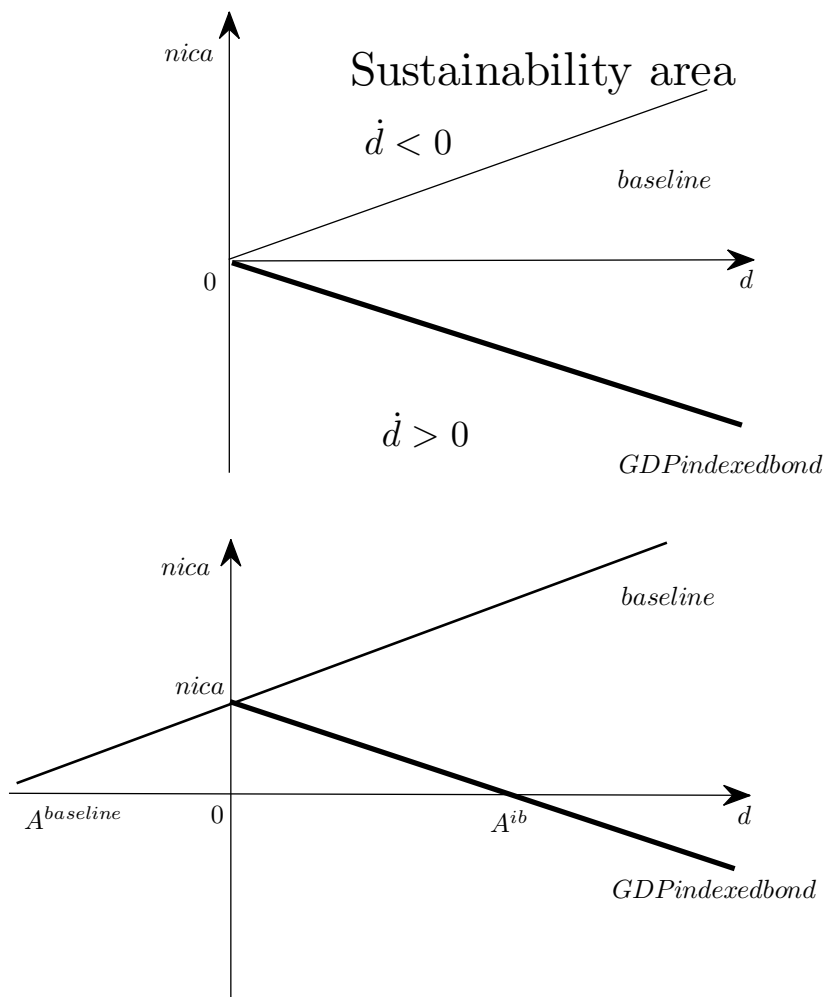
6 Conclusions

We want to emphasize that the Geometry of Debt Sustainability, GDS, is a very simple but also very versatile tool to analyze the problem of foreign debt sustainability. GDS can easily be adapted to different types of countries with different macroeconomic performances. In this paper we have shown that GDS highlights some stylized elements which should never be forgotten when dealing with the debt of low-income countries. Let us summarize the major points.

²⁸In Figure 5 A^{ib} corresponds to debt ratio equilibrium for the GDP-indexed bonds scenario.

²⁹One can imagine a lower limit for i^b to avoid that it becomes negative in cases of an economic recession.

Figure 5: GDP-indexed Bonds



First, quite often debt sustainability is equated with the condition $g > i$, as a matter of fact when this condition holds and depending on the initial value of the debt ratio d even a *nica* deficit is compatible with the stabilization of the debt ratio. However GDS brings to the fore the role of *nica* in the process of debt sustainability: *nica* is the only source out of which foreign debt can be repaid in the long run. In order for debt forgiveness to be efficient and for a country to move to a stronger position in her external finance *nica* needs improve permanently and even to become positive³⁰.

Second, *nica* improvement implies major changes in the production and export structure of a developing country, but these changes need investments and take time. A poor country with low domestic savings has to borrow, unless it can rely on aid only, but the terms of this borrowing have to be compatible with the long-run process of structural change. The process of lending and borrowing which has taken place since the late 1970s was based on the wrong footing: the terms of borrowing were not adequate to the tasks the countries had to face. This is clear from the fact that the debt crisis has now lasted more than one generation, notwithstanding the many reschedulings which have taken place since the mid 1980s and for the LICs the very favorable interest rates. The fallacies of the many plans and initiatives is also highlighted by the fact that most of the new debt of middle and low-income economies was due the rolling over of unpaid interests, a clear sign of unrealistic lending and borrowing conditions. With GDS we can see how to set the borrowing process on more realistic grounds. In particular GDS explains why a ‘shock therapy’ which combines debt cancellation and increased aid can be a necessary policy to give a real chance to indebted low-income countries to strengthen their international financial position in a permanent way.

Third, we have seen that in the case of LICs the condition $g > i$ is inadequate to properly describe the notion of sustainability, this condition offers a partial and incomplete view of debt sustainability because it concentrates only on the financial side of the problem. The notion of affordability takes

³⁰Of course this is equivalent to the condition according to which a permanent improvement in domestic public debt requires a primary surplus.

into account the human development challenges facing a developing country and integrates them into sustainability analysis. Therefore the traditional view of sustainability is transformed and it offers a completely different viewpoint on what an affordable foreign debt is. By adapting GDS to the ‘human factor’ approach to affordability we have seen that the sustainability area is greatly reduced. Therefore a situation which could be regarded as sustainable in financial terms may be absolutely unaffordable for a low-income country. The notion of affordability and the GDS set the challenges facing an indebted low-income country inside a more realistic approach.

To sum up: debt is mainly about the long run, as it is *nica* improvement, but the above points clearly show that in the case of LICs the short and the long run must both be taken into consideration. Certainly the poor countries must make the most efficient use of aid and of debt forgiveness, but three points must be kept in mind, also because they have important policy implications. First, these countries have to tackle many different challenges at the same time and debt sustainability is only one of them. They also have to make efforts in: MDGs, human development, export diversification, fiscal stability and so on. Too many targets without clear priorities and an idea about the possible trade-offs between them can lead to confusion and disaster.

Second, the size of aid and the size and terms of foreign borrowing must be appropriate to the difficulty of the tasks and challenges facing low-income countries. Debt forgiveness is no substitute for less aid and cannot justify a reduction of Official Development Assistance.

Third, GDS and the emphasis on *nica* improvement suggest another interesting consideration. Aid and debt policies are an important part of the story of debt affordability. The improvement of *nica* is a difficult long-term objective which surely requires appropriate domestic policies in the indebted LICs, but it must also be supported by appropriate international trade agreements which favor the export diversification process in these economies. Forgiving the debt of LICs but preventing them from adopting measures to start up new sectors and to protect the very few activities they have outside the primary and the public sectors it is incoherent and counterproductive. It

amounts to setting a goal on one table while disrupting it on another one. High-income countries could and should have more coherent aid, debt and trade policies. Without these considerations in mind the game will not be credible and will not work.

Appendix A

Let us take the case of a country with a *nica* surplus and $i > g$ and $\dot{d} > 0$: the *nica* surplus is not sufficient to cover interest payments and the country locates on the right of its stable debt ratio (see Figure1). In Figure A1³¹ we see the evolution over time of the debt-to-GDP ratio, in the baseline scenario, the one without any debt forgiveness, the country would experience an exploding debt-to-GDP ratio.

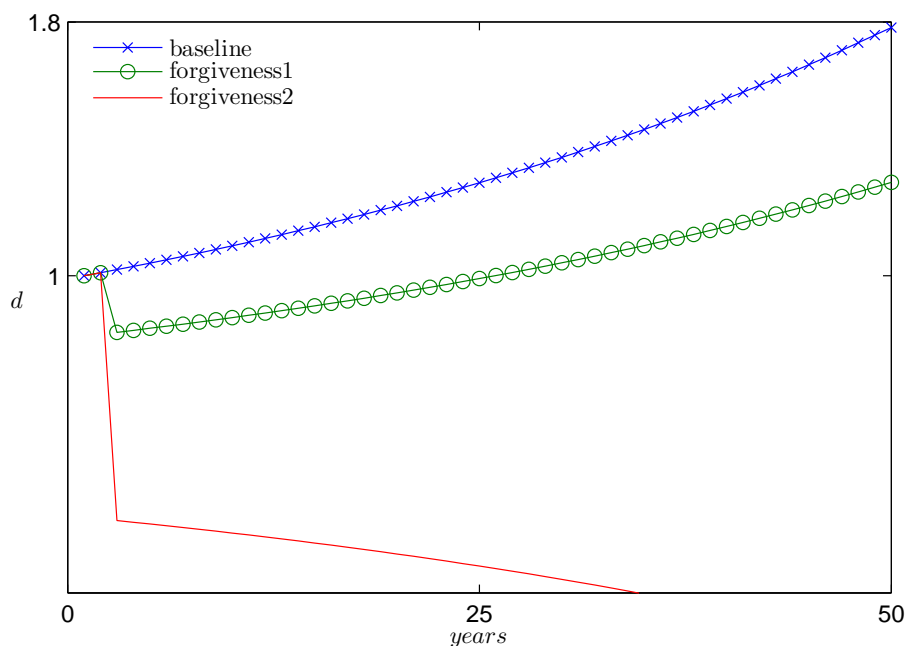
If the country benefits from debt forgiveness two outcomes are possible.

First, after debt forgiveness, the country is still to the right of its stable debt ratio. Debt stock accumulates again and the debt ratio increases even if at a lower pace than in the baseline scenario (forgiveness 1).

Second, forgiveness is sufficient to move the country on the left-hand side of the stable debt ratio. Interest payments are now lower than *nica* surplus and debt liabilities shrink determining a decreasing debt ratio path (forgiveness 2).

³¹The horizontal axis in Figure A1 is expressed in years since simulations are based on an annual interest rate.

Figure A1: Examples of Debt Forgiveness: Outcomes on d



Appendix B

By using the state equation it is possible to estimate the GDP growth rate g^* that would be required to stabilize the actual debt ratio. We carry on this exercise for three groups of countries: HIPCs³², Latin American³³ and East Asian³⁴ countries and we use data for 2000 – 2006, which has been a much more positive period than the two previous decades, particularly for HIPCs and Latin America. All data are in nominal values. The figures in the first two columns of Table B1 — $nica$ and i — are first derived by taking their average values for each country over the seven years and second by calculating

³²The group is composed of 40 HIPCs; Afghanistan is excluded because of missing data.

³³Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela.

³⁴Cambodia, China, Indonesia, Lao, Malaysia, Mongolia, Myanmar, Papua New Guinea, Philippines, Vietnam and Thailand.

the simple average for each geographical group, without taking into account the size of population. In the third column we indicate the external debt ratio d based only on 2006 data: in this way this variable wholly considers consequences of the most recent debt relief measures. For each group these figures give the baseline conditions of a ‘representative country’. Columns four and five report two different estimates for the ‘human factor’, specifically for the k factor; data on population growth are from World Bank (2008b)³⁵. First, in the fourth column h_1 , we define *a priori* targets for the increase in income per capita: 5 per cent for HIPCs and 2 per cent for both Latin American and East Asian countries. The lower level of human development defined by the HDI motivates a more ambitious target for HIPCs. Second, in the fifth column we report the ‘human factor’ h_2 based on the assessment of annual additional per capita dollars required to achieve health and education related MDGs by 2015³⁶. It turns out that each HIPC would require additional 51 US\$ per capita per year, while Latin America and East Asia 21 US\$ and 8 US\$ respectively³⁷. The very high h_2 factor for HIPCs depends on the fact that per capita income is much lower in HIPCs — 359 US\$ — than in Latin America — 4,043 US\$ — and East Asia — 1,386 US\$ World Bank (2007).

The sixth column indicates the GDP growth rates that would be required to stabilize the debt ratio year after year in the baseline scenario. First, thanks to a high *nica* surplus and a low interest rate in Asia even a modest 0.90 growth rate would allow debt ratio stabilization. Second, Latin American countries have an external debt ratio and a *nica* deficit which are considerably lower than those of HIPCs, however because of the higher interest rate they would require a greater growth rate to stabilize the debt ratio. Third, HIPCs must grow at a remarkable annual 13.19 per cent growth that has to be sustained in the long run, during the entire maturity of foreign debt: no

³⁵Population growth is 2.44, 1.40 and 1.50 per cent for HIPCs, Latin American and East Asian countries, respectively. We apply the same methodology adopted for *nica* and *i*.

³⁶Health per capita estimates are from CMH (2001) and increase in per capita education expenditure from Burns et al. (2003).

³⁷These figures underestimate the resources required to achieve the MDGs by 2015 since they are concerned only with health and education related targets.

HIPC and no LIC has such an impressive past economic record.

(per cent)

	$nica$	i	d	h_1	h_2	g^*	$g_{h_1}^*$	$g_{h_2}^*$
HIPC	-8.32	1.32	70.11	7.43	16.77	13.19	20.62	29.95
Latin American	-1.91	5.92	39.82	3.40	1.92	10.73	14.12	12.65
East Asia	1.06	3.01	50.26	3.50	2.08	0.90	4.40	2.98

Authors' calculation based on World Bank (2008a) and World Bank (2008b)

However the situation becomes much more complicated if we consider not only the financial sustainability of debt but also its affordability and we take into account the 'human factor'. In the seventh column we find the value of the growth rate, $g_{h_1}^*$, necessary *both* to stabilize the debt ratio *and* to satisfy the 'human factor' h_1 . The growth requirement would increase by around 3 per cent for both Latin American and East Asian countries. Given the recent growth records only some Asian Countries are in a position to fulfill both these targets. In the case of HIPCs the attainment of both debt ratio stabilization and human development targets would require an outstanding and sustained growth rate of 20.63 per cent. In the eighth column we report the growth requirement $g_{h_2}^*$ based on the more demanding h_2 human factor. Now HIPCs would require an even more outstanding and sustained growth rate of 29.96 per cent!

References

- Agénor, P. and Montiel, P. (1996). *Development Macroeconomics*. Princeton University Press.
- Arslanalp, S. and Henry, P. (2004). Helping the Poor to Help Themselves: Debt Relief or Aid. NBER Working Paper 10230.

- Bhaduri, A. (1987). Dependent and Self-Reliant Growth with Foreign Borrowing. *Cambridge Journal of Economics*, 11(3):269–73.
- Bhattacharya, A. (2003). From Debt Relief to Achieving the MDGs. Annual World Bank Conference on Development Economics, Oslo.
- Birdsall, N. and Williamson, J. (2002). *Delivering on Debt Relief: From IMF Gold to a New Aid Architecture*. Center for Global Development, Washington D.C.
- Borensztein, E. and Mauro, P. (2004). The Case for GDP-Indexed Bonds. *Economic Policy*, 19(38):165–216.
- Burns, B., Mingat, A., and Rakotomala, R. (2003). *Achieving Universal Primary Education by 2015 - A Chance for Every Child*. World Bank, Washington D.C.
- Burnside, C. (2005). *Fiscal Sustainability in Theory and Practice: A Handbook*. The World Bank, Washington DC.
- Chalk, N. and Hemming, R. (2000). Assessing Fiscal Sustainability in Theory and Practice. IMF Working Paper 81, International Monetary Fund, Washington D.C.
- Cline, W. (1994). *International Debt Reexamined*. Longman Ltd., London.
- CMH (2001). Macroeconomics and Health: Investing in Health for Economic Development. Technical report, WHO, Geneva.
- Cohen, D. (1985). How to Evaluate the Solvency of an Indebted Nation. *Economic Policy*, 1(1):139–67.
- Cohen, D., Fally, T., and Villemot, S. (2006). In Favour of a Fund to Stabilize Commodity Exporters' Income. CEPR Discussion Paper Series 5550.
- Gilbert, C. and Tabova, A. (2005). Can We Link Concessional Debt Service to Commodity Prices? Dipartimento di Economia Università di Trento.
- Griffith-Jones, S. and Sharma, K. (2006). GDP-Indexed Bonds: Making It Happen. Working Paper 21, UNDESA, New York.
- Harck, S. (2000). On the Sustainability Area as a Simplifying Didactic Device. *Cambridge Journal of Economics*, 24(4):505–8.
- IMF and World Bank (1999). Modifications to the Heavily Indebted Poor Countries (HIPC) Initiative. Washington D.C.

- IMF and World Bank (2001). The Challenge of Maintaining Long-term External Debt Sustainability. Washington D.C.
- Jha, R. (2004). Innovative Sources of Development Finance: Global Cooperation in the Twenty-first Century. *World Economy*, 27:193–214.
- Northover, H., Joyner, K., and Woodward, D. (1998). A Human Development Approach to Debt Relief for the World's Poor. U.K. CAFOD.
- Pasinetti, L. (1998). The Myth (or Folly) of the 3 percent Deficit/GDP Maastricht Parameter. *Cambridge Journal of Economics*, 1(22):103–16.
- Sachs, J. (2002). Resolving the Debt Crises of Low-income Countries. *Brookings Paper on Economic Activity*, (1):257–86.
- Sheshamani, V. (2003). Towards a Human Development Approach to Debt Sustainability: Some Observations. Annual World Bank Conference on Development Economics, Oslo.
- Tabova, A. (2005). On the Feasibility and Desiderability of GDP-Indexed Concessional Lending. Dipartimento di Economia Università di Trento.
- Vaggi, G. (1993). Sustainable Debt and the Human Factor. In Vaggi, G., editor, *From the Debt Crisis to Sustainable Development - Changing Perspectives on North-South Relations*, pages 117–51. The Macmillan Press LTD, Basingstoke.
- World Bank (2007). World Development Indicators. [CD-ROM], Washington D.C.
- World Bank (2008a). Global Development Finance. [CD-ROM], Washington D.C.
- World Bank (2008b). World Development Indicators. [CD-ROM], Washington D.C.