

Prizzon, Annalisa; Vaggi, Gianni

Working Paper

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

Quaderni di Dipartimento, No. 094

Provided in Cooperation with:

University of Pavia, Department of Economics and Quantitative Methods (EPMQ)

Suggested Citation: Prizzon, Annalisa; Vaggi, Gianni (2009) : On The Sustainability of External Debt: Is Debt Relief Enough?, Quaderni di Dipartimento, No. 094, Università degli Studi di Pavia, Dipartimento di Economia Politica e Metodi Quantitativi (EPMQ), Pavia

This Version is available at:

<http://hdl.handle.net/10419/95288>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

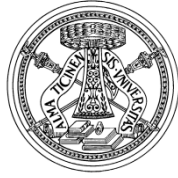
Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



Quaderni di Dipartimento

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

Annalisa Prizzon
(Università di Pavia e OECD)

Gianni Vaggi
(Università di Pavia)

94 (04-09)

Dipartimento di economia politica
e metodi quantitativi
Università degli studi di Pavia
Via San Felice, 5
I-27100 Pavia

Aprile 2009

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

Gianni Vaggi*
University of Pavia

Annalisa Prizzon
University of Pavia and OECD

This version: April 2009

Abstract

Elaborating on Pasinetti (1998), the ‘Geometry of Debt Sustainability’ — GDS — represents a simple analytical tool for the analysis of the long-run sustainability of foreign debt. GDS provides a simple analysis of three aspects of debt sustainability. It points up how the ‘structural’ aspect — NICA, the non-interest current account — is closely interlinked with the purely ‘financial’ aspect. The paper focuses on low-income countries, LICs, which face several daunting tasks at once: economic growth, human development and regular debt service. Therefore GDS is also used to analyse the ‘human development’ aspect of debt sustainability. By considering the three aspects together it emerges that there might be a very stringent trade-off between regular debt service and human development expenditures. All the more so because most LICs suffer from structural NICA deficits and GDS highlights the fact its improvement is a necessary condition to achieve long-run debt sustainability. However, export diversification and the building of stronger trading capacities take time. 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, H60, O11

Keywords: debt relief, external debt sustainability, development finance

1 Introduction

Since the end of the 1980s, heavily indebted low-income countries have been benefiting from debt relief measures that go from the rescheduling of interest payments to partial or total debt stock forgiveness. Among them the most famous ones are the Heavily Indebted Poor Countries Initiative, HIPC, of 1996 enhanced in 1999 and the Multilateral Debt Relief Initiative, MDRI¹, of 2005. Notwithstanding these bonuses and the overall

*Corresponding author: Department of Political Economy and Quantitative Methods, University of Pavia, via S. Felice, 7, 27100 Pavia, Italy. gianni.vaggi@unipv.it. The authors are grateful for constructive comments by Amit Bhaduri and Amitava Dutt and by participants to the seminar at the University of Pavia. 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.

¹On HIPC Initiative and MDRI see IMF and IDA (1999) and IDA (2005) respectively.

financial improvements that they bring about, many of these 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 if the debt story of the 1980s and 1990s is finally over or whether some countries are still at risk of falling again into a debt trap. To sum up: is the remaining foreign debt sustainable or not?

Pasinetti (1998) discusses the conditions for the stabilisation² of the debt ratio considering the implicit relationship between the debt ratio — i.e. Debt-to-GDP ratio — and either the total or the primary surplus (deficit). Pasinetti (1998) shows that the Maastricht criteria are only one of the infinite number of possible combinations of these magnitudes which allow the stabilisation of the debt ratio.

We use Pasinetti (1998) to build a simple graphical tool that we call the ‘Geometry of Debt Sustainability’ — GDS — which provides a new perspective for evaluating the sustainability of external debt. There is a precise relations between the NICA-to-GDP ratio — the Non-Interest Current Account, NICA, is the equivalent to primary surplus in the case of domestic public debt — and the Debt-to-GDP ratio that guarantees that the debt ratio does not increase. GDS combines together the *financial aspect* of sustainability, captured by the difference between the growth rate and the interest rate, with the *structural aspect*, how to achieve a large enough NICA surplus. GDS shows the ways in which the structural and the financial aspects are interlinked, but allows to examine in the analysis on foreign debt sustainability. However while sustainability analyses tend to focus on the financial element, GDS points up the role of structural improvements in NICA for the long-run sustainability of foreign debt³. Moreover the GDS framework can incorporate the *human development aspect* of foreign debt sustainability.

We concentrate on low-income countries, LICs; most of them lack domestic savings and need foreign financing. The average interest rate is very low due to loan concessionality and it is generally 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. The GDS framework can be easily adapted to the macroeconomic features of emerging economies, both in Asia and in Latin America, as section 6 and the Appendix briefly show.

Section 2 describes the basic analytical framework and the building of the ‘Geometry of Debt Sustainability’. The effects of debt forgiveness on debt stabilisation are

²Henceforth, we use the term of *stabilisation* to indicate a debt ratio that remains constant or decreases.

³Long-run sustainability can be 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 (see Cohen (1985)). 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 repaid.

discussed in Section 3. Section 4 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 ‘positive shock therapy’. Section 5 integrates the financial considerations on debt stabilisation with the notion of affordability of debt service. It is proxied by the ‘human factor’ approach (Vaggi, 1993) where a debt stock is considered affordable if it allows both regular debt service and a minimum improvement in the standard of living. Section 6 applies the GDS framework to the case of GDP-indexed bonds, or in general to bonds indexed to the economic performance of the country. Finally, the Appendix provides numerical examples of GDP growth requirements for debt stabilisation in HIPCs, Latin America and Asian countries.

2 The analytical framework

Fiscal sustainability analysis usually focuses on primary surplus⁴. 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 position towards the rest of the world: a CA deficit indicates an increase in net foreign liabilities. 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. Indeed, a positive NICA is the source out of which foreign debt can be repaid in the long run.

We consider a net external debtor country. Each variable is expressed at current prices and in domestic currency, as if the exchange rate were fixed and equal to one⁵. The capital account, KA, includes only debt related flows, so it measures the change in net foreign liabilities. The equilibrium of the balance of payments corresponds to

$$-NICA + iD - \dot{D} = 0 \quad (1)$$

where i is the nominal interest rate and D the debt stock, thus iD indicates interest payments. Scaling by GDP, Y , multiplying the last term on the right-hand side of (1) by $\frac{D}{Y}$ and defining θ as the growth rate of the debt stock we obtain

$$-\frac{NICA}{Y} + i\frac{D}{Y} - \frac{\dot{D}}{Y}\frac{D}{Y} = 0 \quad (2)$$

which can be expressed as

$$nica = (i - \theta)d \quad (3)$$

⁴See for instance Agénor and Montiel (1996), Chalk and Hemming (2000), Burnside (2005).

⁵GDS can easily take into account flexible exchange rates and the case of partly foreign and partly domestic-owned debt.

where $\frac{NICA}{Y} = nica$ and $\frac{D}{Y} = d$. The growth rate of the debt stock is equal to

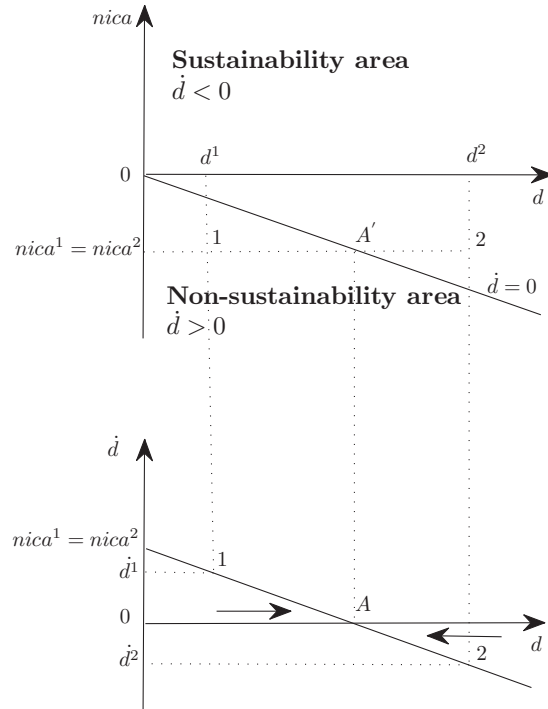
$$\theta = i - \frac{nica}{d} \quad (4)$$

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

$$nica \geq (i - g)d \quad (5)$$

Relationship (5) can be described in a diagram whose vertical axis represents the NICA-to-GDP 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 economies.

Figure 1: The Framework of the ‘Geometry of Debt Sustainability’



Depending on the country’s actual values of $nica$ and d we have three different cases.

First, the debt ratio is stable, with $\theta = g$, the country is on the boundary relation, which indicates all the combinations of $nica$ and d such that $\dot{d} = 0$.

Second, the country finds itself above the boundary relation, the debt ratio is decreasing because $nica > (i - g)d$ with $\theta < g$. We denominate *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 as $nica < (i - g)d$: stability condition is violated.

We can express the variation of the debt ratio through time — the state equation — as follows

$$\dot{d} = \frac{\dot{D}}{D} - \frac{\dot{Y}}{Y} = \theta - g \quad (6)$$

From inserting (4) into (6) we obtain

$$\dot{d} = -nica + (i - g)d \quad (7)$$

which is depicted in the lower part of Figure 1.

Hence, given the initial condition d , the particular solution of equation (7) can be written as follows

$$d_t = \frac{nica}{i - g} + \left[d - \frac{nica}{i - g} \right] e^{(i-g)t}. \quad (8)$$

If $\dot{d} = 0$, d corresponds to its equilibrium value d^* , i.e. $\frac{nica}{i-g}$ which corresponds to point A in the lower part of Figure 1; the deviation from the equilibrium value ($d_t - d^*$) is expressed by $\left[d - \frac{nica}{i-g} \right] e^{(i-g)t}$.

The boundary relation and the state equation can be represented in the same diagram: we denominate this comprehensive framework ‘Geometry of Debt Sustainability’, GDS⁶.

Clearly equation (3) and (7) lead to similar results in terms of the stabilisation of the debt ratio. In equation (7) $nica$ is the NICA-to-GDP ratio of the country. This value — in this case negative — is seen on the vertical axis of the bottom part of Figure 1. Of course the country can be located only along the state equation on a point which depends on the actual debt ratio. If a country is 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.

When $i > g$, both the boundary relation and the state equation slope upwards. If the debt stock is quite high, an even larger $nica$ surplus might be required to cover interest payments and enter into the sustainability area.

If $i < g$, given the same d , a $nica$ deficit lower than the actual one would allow to approach the stability condition $\theta \leq g$, as it is expected. However, given the values of $nica$ deficit, i and g , the probability of the country of being located inside the sustainability area increases with the debt ratio⁷. This sort of paradox derives directly from

⁶Harck (2000) has a similar diagram for the case of public debt.

⁷We could have a non-linear boundary relation both in the case of the ‘debt overhang’ effect — 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

the accounting perspective on which GDS is built, and can be explained if we remember that debt ratio stabilisation is a long-run process with an inbuilt dynamics.

On this point, consider the following example. Two countries, 1 and 2, differ only in the values of their initial debt stock, such that $d^1 < d^2$, but they have the same stable equilibrium d^* (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' roll-over 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 ⁸. Country 1 starts from a lower debt ratio than country 2, but given the *nica* deficit, i and g , it 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' . Country 2 progressively reduces its foreign liabilities *vis-à-vis* its GDP and it will not enter into the area below the boundary relation.

It must be emphasized that these results derive from the fact we have adopted an accounting framework, which is of course quite binding. Moreover the stabilisation 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 debt; 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 foreign 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 the one hand, 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 depending on $(g - i)$; 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 scales, but it emphasizes the essential role

the sustainability area.

⁸The speed of adjustment can be calculated, see for example Bhaduri (1975).

of $nica$ in this overall process.

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. GDS shows the impact of different scenarios of debt relief and the way to enhance their efficacy.

3 Debt forgiveness

The rationale behind debt forgiveness derives both from the ‘debt overhang’ effect and from the possible crowding-out of debt service on poverty reduction expenditures.

By itself debt forgiveness does not directly affect either i , g or $nica$, the only immediate consequence would be that of moving the country from right to left in the upper part of Figure 1⁹. In the case of a country characterized by $nica$ 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, according to the GDS scheme, with the given values of $nica$, i and g .

Let us take a low-income country which benefits from debt relief. 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.

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

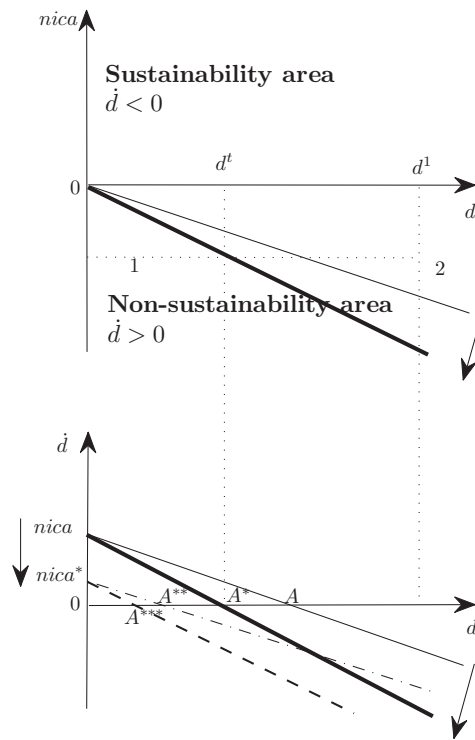
Third, $nica$ improves: the state equation shifts downwards (the dashed-dotted line in Figure 2) thus reducing the value of the stable debt ratio from A to A^{**} .

Fourth, in the most fortunate case the increase in g is accompanied by a $nica$ improvement, see the dashed line. The stable steady state 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’ (Sachs, 2002), a country that fails to improve both g and $nica$ would simply again accumulate new debt stocks. A high growth rate is quite important for the long-run sustainability of foreign financing. In a LIC, $nica$ is at least as decisive as GDP growth to assess the long-run financial sustainability of foreign borrowing.

⁹If we used the current account-to-GDP ratio, ca , instead of $nica$, in the diagram the debt stock reduction would move the country to the left but also up because ca improves due to lower interest payments. This would bring the country closer to the sustainability area.

Figure 2: Debt Forgiveness, the Growth Rate and NICA



However *nica* improvements require profound structural changes in the export-import composition and indeed in the production structure of a LIC¹⁰. This process of structural change takes time, it is a long-run objective and requires investments into new sectors of the economy. From this point of view debt cancellation is a way to allow the debtor country more time and more financial resources to go through the process of structural change which must boost its external accounts.

Let us portray case four above in Figure 2. Thanks to cancellation the debt ratio d decreases and the country moves from point 2 to point 1 to the left of the boundary relation. Now the country is outside the sustainability area but it has a lower foreign exchange constraint. The country may attract new borrowing. Thanks to a smaller ‘debt overhang’ effect¹¹ and to the judicious use of the new finances the growth rate increases and the relevant boundary relation is now the bold one. 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. If *nica* too improves the country moves up from point 1 and may end up into the sustainability area and on the new state equation, corresponding to the improved *nica*. Now the stable debt ratio is A^{***} .

4 Additional aid

The GDS diagram brings to the fore a point which is often overlooked: other things being equal, increased aid flows and debt cancellation have very different effects on the debt stabilisation. The impact of aid flows is similar to *nica* improvements¹², the state equation shift downwards, while debt cancellation moves d to the left. More Foreign Direct Investments and more Portfolio Equity Inflows have an impact similar to that of debt cancellation because they appear in the capital account side of the balance of payments¹³.

We examine the effect of additional aid in the 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, the low-income country is at point 1. Due to increased

¹⁰See UNCTAD (2004) and UNCTAD (2006). The importance of appropriate changes in the import and export propensities for the sustainability of external debt is also highlighted in Bhaduri (1987).

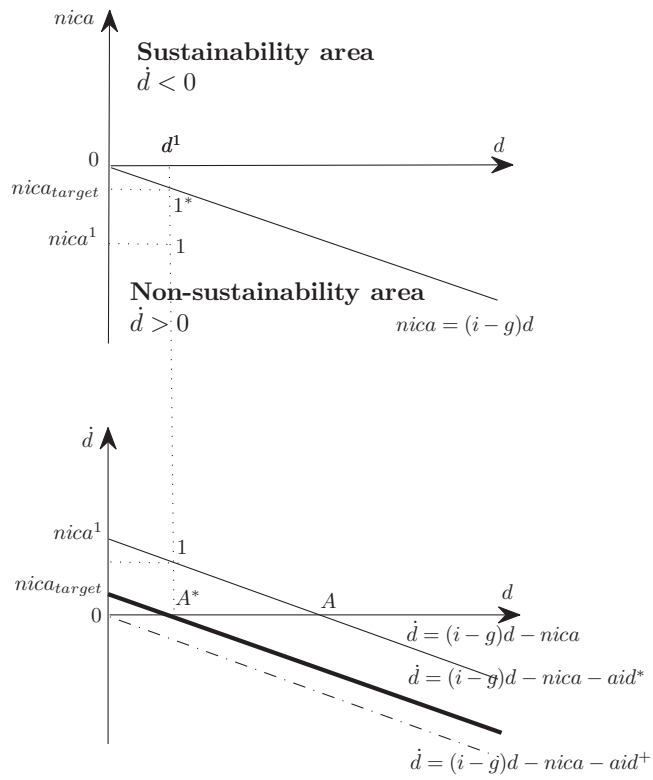
¹¹On the other hand, Arslanalp and Henry (2005) do not support the existence of a debt overhang effect in low-income countries attributing the economic stagnation to lack of basic infrastructures.

¹²We intend a larger aid-to-GDP ratio, where aid flows must grow more than GDP. In the GDS scheme increased remittances have an impact similar to that of larger aid.

¹³We are aware of the different macroeconomic impact of each component of the balance of payments that cannot be discussed in our accounting framework.

Figure 3: Effects of Aid Flows

$$\begin{aligned} aid^* &= nica_{target} \\ aid^+ &= nica_{deficit} \end{aligned}$$



aid, the state equation moves downwards, see the bold 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 . 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 its best utilization 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 dashed-dotted line, and the stable debt ratio 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 future¹⁴.

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 indebted LICs. One could think of a kind of ‘positive 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.

5 The ‘human factor’ approach and debt affordability

Foreign debt has an important and unwelcome human dimension, particularly when it constrains the resources that a LIC needs for human development and for poverty reduction expenditures. Many LICs have very low interest rates thus $g > i$; if the *nica* deficit is not too large the foreign debt service might look sustainable. However, the fact that $\theta \leq g$ and the debt ratio is not on an explosive path may well be accompanied by a worsening in the standard of living. In our view the notion of ‘affordability’ of foreign debt is better suited to describe the actual conditions of an indebted low-income economy¹⁵. A debt is deemed to be ‘affordable’ if:

- it is compatible with the stabilisation of the debt-to-GDP ratio,
- it allows for an improvement in the standard of living.

In general this means that part of the GDP, or of the value of exports, has to be set aside for poverty reduction expenditures, prior to debt service.

¹⁴If aid is reduced and the country has not improved either g , *nica* or both the debt stock will accumulate again.

¹⁵On the notion of affordability see Northover et al. (1998), Birdsall and Williamson (2002), Sheshamani (2003) and Bhattacharya (2003).

We proxy the notion of affordability with the ‘human factor’ approach (Vaggi, 1993). In very poor countries 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’ approach to affordability the GDS equations change as follows

$$\theta \leq g - h \quad \textit{stability condition} \quad (9)$$

$$nica = (i + h - g)d \quad \textit{boundary relation} \quad (10)$$

$$\dot{d} = (i + h - g)d - nica \quad \textit{state equation} \quad (11)$$

$$d_h = \frac{nica}{i+h-g} \quad \textit{debt ratio equilibrium} \quad (12)$$

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 in order to attain the MDGs or a higher level of human development¹⁶. d_h is the stable debt ratio consistent with k .

In Figure 4, where the baseline scenario is the same as in Figure 1, the country has a *nica* deficit, $g > i$ and the actual debt-to-GDP ratio, d^2 , is higher than its stable ratio, A : the debt ratio decreases and the situation looks manageable.

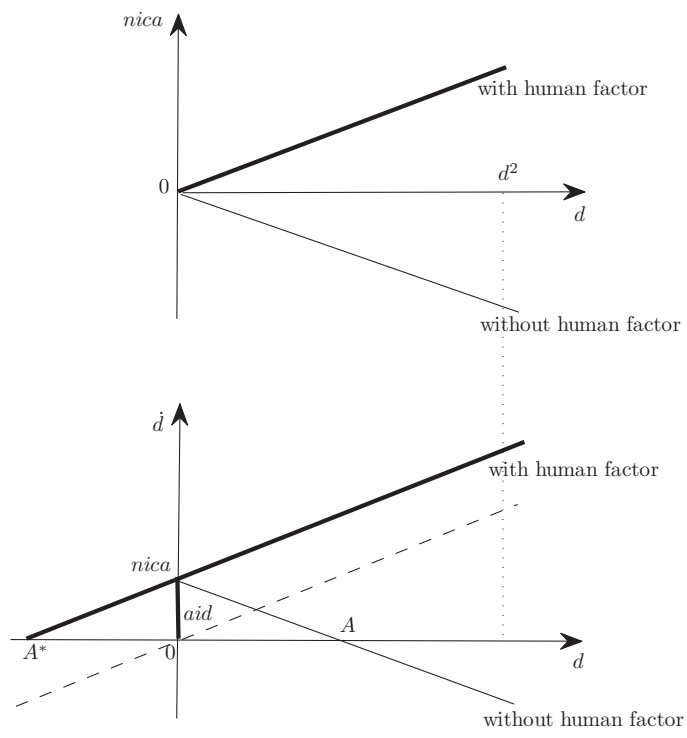
Nevertheless the ‘human factor’ perspective can drastically modify the above condition. Suppose $g < i + h$ such that the growth rate is not high enough to pay interests on foreign debt and to guarantee an increase in income per capita which satisfies the required target k . The bold lines describe the new situation: both the boundary relation and the state equation are positively sloped and above all the sustainability area is much reduced¹⁷. A condition which looked sustainable and in which the debt ratio was stabilized now appears to be much more dramatic. The ‘human factor’ h requires part of economic growth to be allocated to human development expenditures and therefore the growth rate available for the purpose of financial stabilisation is lower than the actual one. The trade-off between expenditures in favour of human development and financial stabilisation becomes more stringent: debt stabilisation cannot be attained unless human development targets are neglected.

Under such conditions debt forgiveness plus increased aid would be the only option which might mitigate the constraint, at least in the short run.

¹⁶On the possible values of k see Vaggi (1993) and the Appendix of this paper.

¹⁷In a purely accounting perspective, the equilibrium shift from debtor to creditor, from A to A^* . Compared to the baseline scenario of Figure 1 if $g > h + i$ then the growth rate is higher than the ‘human factor’ and the stability relation and the state equation still slope downwards, but they rotate upwards thus reducing the sustainability area and increasing the value of the stable debt ratio.

Figure 4: 'Human Factor'



6 New financial tools

In recent years there has been a revival of interest in indexed instruments for low and middle-income countries financing¹⁸; the idea being that the interest rate on foreign debt 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 item in the country's exports. These financial instruments are designed to limit vulnerability of the country to either cyclical or sudden shocks (Griffith-Jones and Sharma, 2006). In particular Borensztein and Mauro (2004) suggest that GDP-indexed bonds contribute to debt ratio stabilisation.

The GDS can be adapted to 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. We 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. Notice that unless the country is already inside the sustainability area the debt ratio will 'explode'. Given *nica*, *i* and *g* there is no stable value of *d*.

The interest rate i^b is determined by the following indexation rule¹⁹:

$$i^b = bg \tag{13}$$

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

The boundary relation and the state equation become as follows:

$$nica = (b - 1)gd \tag{14}$$

$$\dot{d} = (b - 1)gd - nica. \tag{15}$$

Both relations become now negatively sloped, see the bold 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.

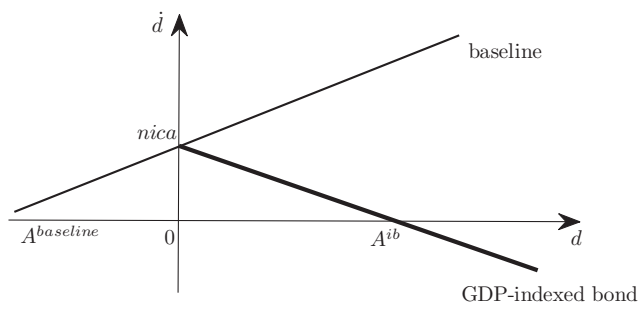
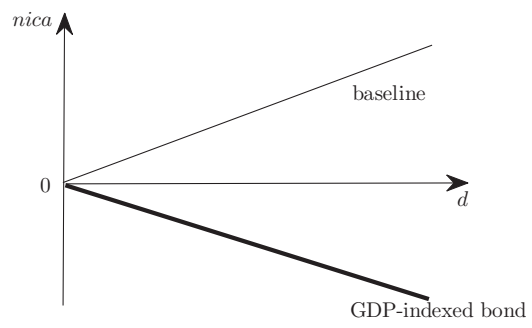
7 Conclusions

The 'Geometry of Debt Sustainability', GDS, is a very simple but also very versatile tool to analyse the problem of foreign debt sustainability. GDS can easily be adapted to different types of countries with different macroeconomic performances and it highlights some very important aspects of debt sustainability in LICs. Let us summarize the major points.

¹⁸See for instance Borensztein and Mauro (2004), Tabova (2005), Gilbert and Tabova (2005), Cohen et al. (2006), Griffith-Jones and Sharma (2006).

¹⁹One 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, 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. However GDS brings to the fore the role of *nica* and the structural aspects in the process of debt sustainability. In order for debt forgiveness to be efficient and for a country to move to a stronger position in her external finance, *nica* needs to improve permanently and even to become positive.

Second, *nica* improvements imply major changes in the production and export structure of a developing country, but these changes need investments, which may derive from foreign borrowing and above all structural change and export diversification take time. 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 favourable interest rates. The fallacies of the many plans and initiatives are 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. GDS shows how to set the borrowing process on more realistic grounds. In particular GDS explains why a ‘positive 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 position in a permanent way.

Third, quite often sustainability is equated with the condition $g > i$, but in the case of low-income countries this could be highly misleading. The notion of affordability takes into account the human development challenges facing a developing country and integrates them into the sustainability analysis. By adapting GDS to the ‘human factor’ approach to affordability we have seen that a situation which could be regarded as sustainable in financial terms may be absolutely unaffordable for a LIC. The ‘human factor’ approach requires that part of the GDP growth rate is allocated to human development expenditures and therefore the growth rate available for the purpose of financial stabilisation is lower than the actual one. The notion of affordability and the GDS framework 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 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.

First, these countries have to tackle many different challenges at the same time and debt sustainability is only one of them. 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, the improvement of *nica* is a difficult long-term objective which surely requires appropriate domestic policies by LICs. However this export diversification process must also be supported by appropriate international trade relations, a kind of external enabling environment. Forgiving the debt but fostering trade arrangements which damage LICs' net exports is incoherent and counter-productive; without permanent *nica* improvements debt becomes a permanent condemnation. High-income economies must open their markets to the products of LICs, but above all LICs must not be prevented from adopting industrial policies which favour new industries and protect the very few activities they have in the manufacturing sector.

GDS shows that 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

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: HIPCs²⁰, Latin American²¹ and East Asian²² 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.

Table 1: Growth and Debt Stabilization

	<i>nica</i>	<i>i</i>	<i>d</i>	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 America	-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)

The figures in the first two columns of Table 1 — *nica* and *i* — are first derived by taking their average values for each country over the seven years and second by

²⁰The group is composed of 40 HIPCs; Afghanistan is excluded because of missing data.

²¹Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela.

²²Cambodia, China, Indonesia, Lao PDR, Malaysia, Mongolia, Myanmar, Papua New Guinea, Philippines, Vietnam and Thailand.

calculating the simple average value 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 order to take into account the consequences of debt relief measures. 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)²³. 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, as defined by the HDI, motivates a more ambitious target for HIPCs. In the fifth column we report the ‘human factor’ h_2 based on the assessment of the annual additional per capita dollars required to achieve health and education related MDGs by 2015 for each group²⁴. It turns out that each HIPC citizen would require additional 51 USD per year, while in Latin America and in East Asia the figures would be 21 USD and 8 USD respectively²⁵. The very high h_2 factor for HIPCs depends on the fact that per capita income is much lower in HIPCs — 359 USD — than in Latin America — 4,043 USD — and East Asia: 1,386 USD.

The sixth column indicates the GDP growth rates that would be required to stabilize the debt ratio year after year in the baseline scenario. Thanks to a high *nica* surplus and a low interest rate in Asia even a modest 0.90 growth rate would allow the stabilisation of debt ratio. 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 high growth rate to stabilize the debt ratio. HIPCs must grow at a remarkable annual 13.19 per cent, and growth has to be sustained during the entire maturity of foreign debt: no HIPC and no LIC has such an impressive past economic record. Notice that these figures are based on external debt data that already include debt relief measures.

However the situation becomes much more complicated if we consider not only the financial sustainability of debt but also its affordability. 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 fulfil both these targets. In the case of HIPCs the attainment of both debt ratio stabilisation and human development targets would require a sustained growth rate of 20.62 per cent. In the eighth column we report the growth requirement $g_{h_2}^*$ where the human factor is assessed considering the increase

²³Population growth is 2.43, 1.33, and 0.85 per cent for HIPCs, Latin American and East Asian countries, respectively, and it is calculated with the same methodology adopted for *nica* and *i*.

²⁴Estimates for health per capita are from Commission for Macroeconomics and Health (2001) and education per capita expenditure from Burns et al. (2003).

²⁵These figures underestimate the resources required to achieve the MDGs by 2015 since they are concerned only with health and education related targets.

in income per capita necessary to achieve health and education related MDGs targets. Based on these data, HIPCs would require an even more outstanding growth rate of 29.96 per cent.

References

- Agénor, P. and Montiel, P. (1996). *Development Macroeconomics*. Princeton University Press.
- Arslanalp, S. and Henry, P. (2005). Is Debt Relief Efficient. *The Journal of Finance*, 60(2):1017–51.
- Bhaduri, A. (1975). On the Analogy between the Quantity- and the Price-Trade. *Oxford Economic Papers, New Series*, 27(3):455–61.
- 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.
- 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.
- Commission for Macroeconomics and Health (2001). *Macroeconomics and Health: Investing in Health for Economic Development*. Geneva. World Health Organization.
- Gilbert, C. and Tabova, A. (2005). Can We Link Concessional Debt Service to Commodity Prices? Technical Report No. 8, 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.
- Harc, S. (2000). On the Sustainability Area as a Simplifying Didactic Device. *Cambridge Journal of Economics*, 24(4):505–8.

- IDA (2005). The Multilateral Debt Relief Initiative: Implementation Modalities for IDA. Washington D.C.
- IMF and IDA (1999). Modifications to the Heavily Indebted Poor Countries (HIPC) Initiative. Washington D.C. International Monetary Fund and World Bank.
- 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. Technical Report No. 9, Dipartimento di Economia Università di Trento.
- UNCTAD (2004). Least Developed Countries Report – Linking International Trade with Poverty Reduction. Geneva. United Nations Conference on Trade and Development.
- UNCTAD (2006). Least Developed Countries Report – Developing Productive Capacity. Geneva. United Nations Conference on Trade and Development.
- 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 MacMillian Press LTD, Basingstoke.
- World Bank (2008a). Global Development Finance. [CD-ROM], Washington D.C.
- World Bank (2008b). World Development Indicators. [CD-ROM], Washington D.C.