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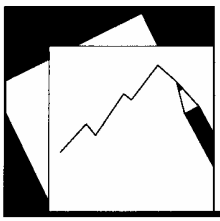

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Debt Overhang or Debt Irrelevance? Revisiting the Debt-Growth Link

Tito Cordella, Luca Antonio Ricci, and Marta Ruiz-Arranz

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Debt Overhang or Debt Irrelevance? Revisiting the Debt-Growth Link

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Abstract

Do Highly Indebted Poor Countries (HIPCs) suffer from a debt overhang? Is debt relief going to improve their growth rates? To answer these important questions, we look at how the debt-growth relationship varies with indebtedness levels and other country characteristics in a panel of developing countries. Our findings suggest that there is a negative marginal relationship between debt and growth at intermediate levels of debt, but not at very low debt levels, below the "debt overhang" threshold, or at very high levels, above the "debt irrelevance" threshold. Countries with good policies and institutions face overhang when debt rises above 15-30 percent of GDP, but the marginal effect of debt on growth becomes irrelevant above 70-80 percent. In countries with bad policies and institutions, overhang and irrelevance thresholds seem to be lower, but we cannot rule out the possibility that debt does not matter at all.

JEL Classification Numbers: F34; O40, C23

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I. INTRODUCTION

A large share of highly indebted poor countries' (HIPCs') stock of external debt has been cancelled through the HIPC debt relief initiative.[2] The donor community has been intensively debating whether HIPCs still suffer from a debt overhang and, if so, whether further debt relief is necessary. To shed some light on such an important and controversial issue, in this paper we investigate the effect of indebtedness on growth, resource flows, and investment patterns in a panel of about 80 developing countries, including more than 30 HIPCs. We initially differentiate the effect of debt on growth for HIPCs and non-HIPCs. As this distinction—although relevant from a policy point of view—may not be meaningful from an analytical point of view, most of the analysis then focuses on how the debt-growth relationship differs with some of the country characteristics that have historically distinguished HIPCs from non-HIPCS, such as the extent of indebtedness and the quality of policies and institutions. This helps us identify some important nonlinearities in the debt-growth relationship that cannot be ignored when deciding the likely effects of forgiving additional amounts of external debt, as in recent proposals for extensive debt cancellation.

The main economic justification for granting a country debt relief is the presence of a debt overhang that hampers its investment and growth opportunities. The concept of debt overhang, and the idea that debt write-offs might increase efficiency, gained the limelight in the 1980s when, in a few influential papers motivated by the emerging market debt crisis, Sachs (1988) and Krugman (1988) applied Myers' (1977) insights to sovereign lending. More generally, this research suggest that a heavy debt burden may act as an implicit tax on the resources generated by a country, and therefore reduce the size of domestic and foreign investments as well as their quality, and create negative incentives for policy reforms.[3] The success of the Brady plan for the resolution of the 1980s debt crisis validated the debt overhang theory. It is thus not surprising that, when faced with the 1990s HIPCs' debt crisis, the international community decided to follow a similar path. There are, however, at least three reasons why the effects of debt relief might be different in HIPCs.

First, there is evidence that generous official assistance helped HIPCs service their external debt, so that they never experienced the crowding out of resources that preceded the emerging market debt crisis of the 1980s.[4] A simple inspection of Figure 1 suggests that net official transfers to HIPCs have grown together with the debt stock from the 1970s to the mid-1990s, and that donors/creditors have continued to transfer to HIPCs resources in excess of those needed to service the growing debt. This sharply contrasts with the Brady countries'experience (see Figure 2) where, at the onset of the debt crisis in the mid-1980s, net transfers turned negative and debt servicing crowded out resources that would otherwise have been available for growth-enhancing

[2] Through July 2005, debt reduction packages had been approved for 28 of the 38 eligible countries, 23 of which in sub-Saharan Africa. These packages have provided $38.2 billion in debt relief over time, in present value terms.

[3] See Corden (1989).

[4] Birdsall, Classens, and Diwan (2002), and Marchesi and Missale (2004) provide evidence that in HIPCs official assistance rose with indebtedness levels. We come back to this important issue later on.

investment. Incidentally, the trend of HIPCs' net official transfers is also very different from that in other low-income countries, where these transfers are smaller in size and have been declining consistently since the mid-1980s (see Figure 3).

Second, one could argue that HIPCs' excessive debt levels are purely fictitious—and are not defaulted only because they are continuously evergreened. One should thus not overestimate their negative incentive effects. This argument suggests the possibility that HIPCs' debt does not induce much overhang because it is not expected to be repaid. The argument is based on the fact that HIPCs rely mainly on official lending and that default costs on official bilateral debt are less onerous, as the international community will continue to provide fresh assistance even in the case of default. In this situation, the forgiveness (as opposed to the evergreening) of unrealistic debt obligations is unlikely to have significant effects on incentives and policies.[5]

Finally, HIPCs' access to international capital markets has always been very limited. This is reflected in their large share of official debt, as opposed to the Brady countries' predominant share of commercial debt (see Figure 4a-b). To the extent that the main obstacles for the lack of private investments in the past—such as poor policies, institutions, and infrastructure—have not been removed, there is no guarantee that, even after a complete debt write-off, private capital would flow to these countries in a way it never did before. This is the argument that Arslanap and Henry (2003) use to support their view that debt relief works for relatively developed highly indebted emerging economies but not for HIPCs that lack much of that critical infrastructure that forms the basis for profitable economic activity.[6]

Notice that the positive net transfers and the fictitious debt levels arguments do not rule out the possibility that a complete (or at least a very large) cancellation of HIPCs' debt may allow these countries to move out of the official lending/forgiving trap and to access the private capital market. Furthermore, debt relief could lower the uncertainty surrounding net transfers, and thereby promote investment and growth. This, of course, would not be the case if, because of poor policies and infrastructure, official lending will remain the only source of HIPCs' financing for the foreseeable future, independently of their stock of debt. Summarizing, while all the three arguments discussed above suggest that "small" amounts of debt relief should not matter, only the third rules out the potential positive effects of "large" debt cancellations, suggesting that HIPCs would not be able to take advantage of their increased creditworthiness, for instance, by gaining access to the international capital market. Since all these arguments have possible merit, a way to see which one is likely to prevail is through an empirical assessment of how indebtedness affected growth in HIPCs and non-HIPCs, and more generally in countries with different levels of debt.

Our analysis sheds new light on the debt-growth relationship and draws some implications for highly indebted countries. On the basis of a large sample of about 80 developing countries, we start by investigating how such a relationship differs between HIPCs and non-HIPCs, as such

[5] Our econometric analysis does not allow differentiating this channel from the previous one of pure net transfers.

[6] Of course, the removal of distortions could make official assistance more effective, and foster growth even in countries that do not have capital market access.

distinction has been the focus of the policy debate on debt relief. [7] We find quite robust evidence that the debt overhang argument holds for non-HIPCs. Conversely, we find no significant relationship between debt and growth for HIPCs. However, this is not enough to answer the question of whether the HIPCs' growth performance would benefit from debt relief should their indebtedness levels be lowered below the (high) levels they experienced over most of the sample period. To gain some insight on this important question, it is necessary to assess whether the debt and growth relationship depends on those country characteristics such as indebtedness levels and the quality of policies and institutions that are the real underlying analytical determinants that distinguished HIPCs from non-HIPcs over most of our sample.

When we allow the effect of debt on growth to vary across different indebtedness levels, we find a highly nonlinear relationship, negative at intermediate levels of debt but not at low or high levels. This result holds even after controlling for investment.[8] We denote the first threshold, i.e., the indebtedness level above which the marginal effect of debt on growth becomes negative, as the debt overhang threshold. We define the second threshold, i.e., the indebtedness level above which the marginal effect of debt on growth becomes zero, as the debt irrelevance threshold. When we allow the nonlinear relationship between debt and growth to vary according to countries' characteristics, we find that these characteristics indeed matter. In particular, in countries with good policies and institutions the debt overhang threshold is between 15 and 30 percent of GDP, and the debt irrelevance threshold around 70-80 percent of GDP. Countries with bad policies and institutions seem to exhibit lower thresholds, which suggests that they can borrow less before facing debt overhang, and that further debt accumulation stops to matter earlier than in the group of countries with good policies. However, in countries with bad policies and institutions, the overall debt-growth relationship is not robust, and we cannot rule out the possibility that it is flat over the entire debt domain, lacking an overhang section. Our analysis therefore, suggests that, in highly indebted countries debt relief would be growth-enhancing only if it is sufficiently large and if these countries present good economic and policy conditions. Our results do not offer clear evidence that countries with poor policies and institutions would benefit from debt relief at all.

In order to further understand why the effect of debt might be different in HIPCs and non-HIPCs, we look at the determinants of transfers and investment. Our empirical strategy draws upon Marchesi and Missale (2004).[9] Again, we allow for the determinants of transfers to vary between

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[7] Chowdhury (2001) also explores separate samples of HIPCs and non-HIPCs, and finds a linear significant negative effect of debt on growth for the two groups of countries; such an effect increases with openness.

[8] The fact that the negative significant relationship between debt and growth holds even after controlling for investment (a result common in the literature previously discussed) suggests that the channels through which debt affects growth do not encompass only the quantity of investment but also its quality and volatility as well as policymakers' incentives.

[9] Marchesi and Missale (2004) investigate the pattern of net transfers distinguishing between HIPCs and non-HIPCs. They find that while in non-HIPCs a higher stock of debt tends to reduce the amount of transfers, the opposite happens in HIPCs. Furthermore, once they distinguish between the different types of creditors, they find that in the case of HIPCs multilateral creditors appear more generous than bilateral creditors. Earlier, Birdsall, Claessens, and Diwan (2002) studied the determinants of net transfers for a panel of 37 poor countries (mostly HIPCs), and

(continued…)

HIPCs and non-HIPCs, and we confirm their result that the relationship between transfers and debt levels is negative only for non-HIPCs. This may at least partly explain why, in HIPCs, very high levels of debt may not matter for economic growth. Finally, to better understand the channels through which debt overhang may work, we look at the determinants of investment.[10] In our analysis, after controlling for aid flows, we find that the negative relationship between debt and investment only holds for non-HIPCs. In HIPCs, consistent with the results on growth, investment does not depend on the stock of debt.

The remainder of the paper is organized as follows: the next section reviews the existing empirical literature. Section III presents the data and the empirical methodology. Section IV looks at the debt-growth relationship, distinguishing between HIPCs and non-HIPCs and between countries with different levels of debt and different country characteristics. Section V discusses the determinants of resource transfers and investment. Finally, Section VI discusses the policy implications of our analysis and concludes.

II. LITERATURE REVIEW

The empirical literature on debt overhang and the likely effects of debt relief is far from conclusive.[11] In one of the first empirical studies devoted to low income countries, Claessens (1990) finds that only very few indebted countries are on the wrong side of the debt Laffer curve. This implies that, collectively, creditors are unlikely to profit from an across-the-board debt forgiveness.[12] In the same negative vein, Borenzstein (1990), using numerical simulations for a representative debtor country, finds that debt relief does not have any important quantitative effect on growth. Warner (1992) also casts doubt on the debt overhang hypothesis by showing that equations without debt-related information can forecast the investment declines of many

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found that bilateral donors provide low-income countries the resources necessary to repay their obligation vis-à-vis multilateral organization.

[10] In the existing literature, only a few papers have focused on the channels through which indebtedness influences growth. Pattillo, Poirson, and Ricci (2003b) find that debt overhang operates mainly via total factor productivity, but also via investment. Clements, Bhattacharya, and Nguyen (2003) decompose private and public investment and find that the negative effects of indebtedness are stronger for the latter. While the first paper looks at developing countries in general, the second focuses on low-income countries.

[11] Most of the empirical literature loosely defines debt overhang as a negative marginal effect of debt on growth. In this paper we call this concept "marginal debt overhang." We also introduce a concept of "average debt overhang," defined as a situation in which a country could enjoy higher growth if indebtedness levels were decreased by a sufficient amount. This concept becomes relevant if the marginal effect of debt on growth is negative (hence there is marginal debt overhang) at intermediate levels of debt, but is flat (hence there is no marginal debt overhang) at high levels of debt: at both intermediate and high levels of debt there would be average debt overhang. The remainder of the paper refers to debt overhang as marginal debt overhang, unless otherwise specified.

[12] Husain (1995), in a theoretical model of external debt and taxes, argues that the disincentive effects associated with debt overhang need to be implausibly large in order to place a country on the negative side of the debt Laffer curve.

indebted countries during the 1980s. In line with these results, Depetris Chauvin and Kraay (2005) find no evidence that debt relief has raised growth.

Other authors provide mixed evidence. Cohen (1993) estimates investment equations for a sample of 81 developing countries for the period 1965–87 and shows that debt levels do not have much explanatory power. However, he finds that high debt has a negative impact on growth for Latin American countries and concludes that—consistent with a crowding out story of debt servicing costs—what does matter is the actual flow of net transfers. Cohen (1997) does not use debt stocks as regressors, but finds that the risk of a debt rescheduling (or debt crisis) significantly lowers growth in Latin America, and this effect is particularly strong when debt exceeds 50 percent of GDP. On the other hand, it argues that for African countries in the 1980s and 1990s high debt is not a major cause of the poor economic performance. Hansen (2001) also presents mixed evidence about the effect of debt on growth for a sample of 54 developing countries.

Finally, stronger evidence in support of debt overhang is initially found in Kaminsky and Pereira (1996) for Latin American countries, in Deshpande (1997) for a group of 13 countries, and in Elbadawi, Ndulu, and Ndung'u (1997) for a large sample of 99 developing countries. The latter paper estimates cross-country growth and investment regressions using nominal debt in a quadratic specification using annual observations, and infers a threshold level of debt around 100 percent of GDP, beyond which the marginal impact of debt on per capita growth turns negative.[13] Pattillo, Poirson, and Ricci (2002) study the debt-growth relationship in a sample of about 100 developing countries using various nonlinear specifications, using various methodologies to control for endogeneity, and employing debt both in net present value and in nominal terms. They identify a much lower overhang threshold, of about 20 percent of GDP (similar results are found by Clements, Bhatacharya, and Nguyen, 2003). Building on this work, Pattillo, Poirson, and Ricci (2003a) impose a spline function with a break at the identified threshold and allow the function to have different slopes for countries with different policies or aid (however, they do not allow for the threshold to change with country characteristics). They find that for highly indebted countries the negative impact of high debt on growth is, on average, significantly stronger in a bad policy or low aid environment, reflecting a more negative effect on TFP growth.[14] More recently, Imbs and Ranciere (2005) find some evidence of debt overhang occurring when NPV of debt to GDP reaches 30-35 percent. Building upon the IMF (2003) work on public debt, Abiad and Ostry (2005) find that in developing countries high public debt levels do not elicit an increase in primary surpluses. This finding suggests the existence of an irrelevance threshold for public debt—a level beyond which fiscal policy no longer seeks to satisfy the government's intertemporal budget constraint—conceptually similar to the irrelevance threshold for external debt we discuss in this paper.

This paper differs from the existing debt-growth literature in several respects. First, as discussed, we check whether the debt-growth relationship is different across subsamples, varies according to debt levels, and is affected by country characteristics (such as the quality of policies and

[13] A parallel literature focuses on the sustainability of debt and attempts to identify the levels of debt at which default arises, see Reinhart, Rogoff, and Savastano (2003); and Kraay and Nehru (2004).

[14] The authors also find that at low debt levels the positive impact of debt on growth only weakly depends on the quality of policies, and not at all on the level of aid received.

institutions and the access to private capital markets). In doing so, we employ several regression techniques, including spline regressions and threshold estimation, some of which are new in this literature. Second, when we measure debt in net present value terms, we use a recent dataset first employed in Kraay and Nehru (2004).[15] Third, unlike some of the empirical studies on the relationship between debt and growth, all our regressions include official aid and debt service as controls. Controlling for net transfers is important as it addresses the question of whether, for a given level of net transfers, debt relief might be growth enhancing.[16] Fourth, we employ a ratio of debt to GDP rather than GNP, as GDP better reflects the independent productive capacity of the country. At the same time, similarly to the recent contributions to this literature, the estimation procedure controls for the endogeneity of debt using a Generalized Method of Moments (GMM) approach and attempts to further address Easterly's (2001) reverse causality critique by using Hodrick-Prescott filtered denominators in the relevant debt to GDP ratios.[17]

III. DATA

The dataset used in this paper is an unbalanced panel of 79 developing countries over the period 1970–2002. To smooth short-run fluctuations, we use three-year averages of all the variables. This leaves us with 11 time periods, from 1970–73 to 2000–02. We measure per capita GDP growth with the log difference of per capita GDP in constant 1995 U.S. dollars from the World Development Indicators (WDI) database of the World Bank. Population growth, and secondary school enrollment are also from WDI. The other non debt macroeconomic variables—investment, central government balance, terms of trade growth, inflation, net private capital flows, and the openness indicator—are from the World Economic Outlook (WEO) database of the IMF. Current GDP in national currency (in the denominator of the investment and fiscal balance ratios) is from WEO, and GDP in U.S. dollars is from WDI. Table 1 in the Appendix describes all the variables used in the econometric analysis, their units of measure, as well as data sources. Summary statistics of all the variables are reported in Appendix Table 2. [18]

The main debt variables we use are: 1) nominal debt (Debt) from Global Development Finance (GDF) dataset of the World Bank; and 2) a proxy for the net present value of total external debt (NPV), derived as the sum of public and private. For the net present value of public debt, we use a new series as in Kraay and Nehru (2004), updated through 2002. This series excludes private debt and is based on aggregating discounted public and publicly guaranteed loans, available at

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[15] The few other studies that previously employed net present value calculations were employing the Easterly's dataset which ends in late 1990s (available via the internet at: http://www.nyu.edu/fas/institute/dri/index.html).

[16] Hansen (2000) looks at the debt flows-growth relationship (as opposed to the debt stock-growth relationship analyzed in this paper) and argues that the effects of debt relief in HIPCs depend on whether relief is additional or not: non additional relief does not yield more growth; and if lower debt servicing are associated with less grants, the impact on growth might even be negative.

[17] See a more detailed explanation in the next section.

[18] As data for secondary education for the first part of the sample are available only every five years and our regression observations are based on three-year averages, we interpolated the missing observations.

the loan level in the Debtor Reporting System (DRS) of the World Bank.[19] Since no net present value calculation is available for private debt, and since its degree of concessionality is for substantially lower than public debt, we proxy the net present value of private external debt with private nominal debt (from GDF). Debt service, net transfers, and the variables on grants and concessional loans used to construct our aid variable are also from the GDF.

The cross-sectional variables used to account for time-invariant country-effects include rule of law from Kaufmann, Kraay, and Zoido-Lobatón (2002); dummies for legal origin from La Porta, and others (1997); ethnic fractionalization and distance from the equator from Easterly and Levine (1997). To assess whether the debt-growth relationship is influenced by country characteristics, we use the country policy and institutional assessment index (CPIA) from the World Bank. This index ranges from 1 to 5, and higher values are associated with a better policy environment. Finally, following Acemoglu, Johnson, and Robinson (2001), we use settler mortality as a proxy for the quality of institutions.

IV. METHODOLOGY AND RESULTS

In estimating our panel growth model, we start with OLS regressions which include some of the standard cross-sectional variables identified in the empirical growth literature. The addition of these variables allows us to control for the main differences across countries without imposing fixed country effects, which would introduce a bias in a dynamic panel. While such regressions shed some light on the main forces at work, following recent empirical growth literature we also present regressions based on the General Methods of Moments system estimator (SGMM; see Arellano and Bover, 1995; and Blundell and Bond, 1998). This dynamic panel data technique allows to control for unobservable (or omitted) country-specific factors, and reduces the potential bias in the estimated coefficients. At the same time, it controls for the potential endogeneity of some of the explanatory variables: in general, second to fourth lags of the debt variables as well as all of the other endogenous variables are used as instruments for all nonstrictly exogenous variables. Hansen and Sargan tests of overindentifying restrictions are performed to assess the validity of the instruments employed.[20]

While SGMM should be able to address Easterly's (2001) critique that the negative relationship between indebtedness and growth might be due to causality running from growth to the measure of indebtedness, in all our regression we also smooth the dollar GDP series—which deflates debt, aid, and net transfer ratios—using a Hodrick-Prescott filter. While the use of filtered GDP does not change substantially the behavior of the indebtedness indicators or their magnitude, it alleviates the mechanical correlation between growth and the debt ratios. Regressions using nonfiltered data yield qualitatively similar results.[21]

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[19] DRS is maintained by the Financial Data team of the Development Data Group. Aggregate statistics from DRS are published in Global Development Finance. We thank the team leader Ibrahim Levent for providing us with the series.

[20] We used the "xtabond2" Stata routine developed by David Roodman.

[21] We find some evidence that the use of filtered data helps alleviate the endogeneity problem. For instance, the aid estimates appear negative and significant in the nonfiltered regressions, but they turn insignificant in the filtered regressions.

A. Debt and Growth for HIPCs

In order to assess how indebtedness may affect growth in HIPCs and non-HIPCs, and in line with the most recent literature on the topic, we start by estimating a quadratic relationship between debt and growth via the following modified growth model:[22]

$$y_{it} = \alpha_t + \beta_1^{'} X_{it} + \beta_2 K_i + \beta_3 D_{it} + \beta_4 K_i D_{it} + \beta_5 D_{it}^2 + \beta_6 K_i D_{it}^2 + \\ + \beta_7^{'} T_{it} + \beta_8 K_i T_{it} + \beta_9 P_i + \varepsilon_{it} , \quad (1)$$

where y_{it} is the average growth rate in real GDP per capita over three-year periods; α_t denotes time-fixed effects; X_{it} is a matrix of standard control variables including (the logarithm of) initial GDP per capita, (the logarithm of) population growth, growth of terms of trade, (the logarithm of) secondary school enrollment, (the logarithm of) investment and central government balance (measured in term of GDP), inflation, and trade openness; K_i is a dummy variable representing HIPCs (H) in some specifications, and countries above the median level of debt (HD) in others; D_{it} denotes (the logarithm of) the stock of external debt to GDP, either in nominal or net present value terms. T_{it} is a vector that contains aid (measured in terms of GDP) and debt service (measured in terms of exports), to control for net official resources; and P_i denotes a vector of time-invariant cross-sectional variables, including rule of law, legal origin, ethnic fractionalization, and distance from the equator (these cross-sectional variables are included in the OLS but not in the SGMM regressions, because the latter methodology implicitly accounts for fixed effects).

In order to test whether the effect of debt on growth is the same in HIPCs and non-HIPCs, we interact the HIPC dummy with the debt variables. Notwithstanding the fact that all our regressions include official aid and debt service to control for net flows of debt, we cannot a priori rule out the possibility that the patterns of aid and debt service may be different between HIPCs and non-HIPCs. We thus allow for different slopes for these variables as well.

In this quadratic specification, failing to reject

$$Ho: \beta_3 = 0 \\ Ho: \beta_5 = 0 \quad (2)$$

would provide evidence against—or more precisely, would not allow us to reject the absence of—debt overhang in non-HIPCs; while failing to reject

$$Ho: \beta_3 + \beta_4 = 0 \\ Ho: \beta_5 + \beta_6 = 0 \quad (3)$$

would provide similar evidence for HIPCs.

[22] We also tried a linear specification, and did not find any robust significant relationship between debt and growth.

We estimate equation (1) by OLS with cross-sectional variables and by SGMM without these variables. Our results are summarized in Table 1 when K denotes a dummy for HIPCs. Estimates using debt measured in both net present value terms and nominal terms are reported in the table in separate columns. Results across econometric techniques as well as across debt measures yield similar results. However, we will mostly focus our discussion on the regressions estimated by SGMM, which also controls for endogeneity, and based on the net present value of debt, which is conceptually a better measure of the extent of indebtedness.

Across all specifications in Table 1, the coefficient estimates for the control variables are as expected. In support of the convergence hypothesis, the initial level of GDP has a statistically significant negative impact on growth. More precisely, columns 3 and 4 indicate a rate of convergence around one percent. The coefficient estimates for investment and fiscal balance have the anticipated positive sign while those for inflation and population growth are negative: independently of the measure of debt used, an increase in investment by 10 percentage points of GDP or an improvement of the fiscal balance to GDP ratio by 2 percentage points would be associated with a surge in per capita growth by a third of a percentage point. The coefficient on inflation is basically constant across specifications and suggests that a 10 percentage point increase in the Consumer Price Index (CPI) level of inflation tends to worsen the growth rate by about a fifth of a percentage point. On the other hand, terms of trade growth does not appear to have a statistically significant impact on growth. Openness and aid seem to have a small negative impact, but this is not a robust result. Finally, a 10 percent improvement in secondary school enrollment enhances per capita growth by one tenth of a percentage point. The positive impact of education only becomes significant in the SGMM regressions.

Focusing now on the debt variables, we find evidence of debt overhang—that is, of a concave relationship between debt and growth for non-HIPCs only. Indeed, it is easy to verify that the debt coefficient in levels is positive and significant (except in column 4) and that of debt square is negative and significant, and thus we reject hypothesis (2). However, no significant relationship is found for HIPCs, as indicated by the large p-values corresponding to the hypothesis test (3) of zero debt coefficients. This implies that at the margin, growth is not sensitive to further debt accumulation in HIPCs.

To check the robustness of the previous finding, we split the sample between HIPCs and non-HIPCs and run growth regression on each subsample. Results are reported in Table 2 and show that the same pattern survives. Across specifications, we find a very significant concave relationship for non-HIPCs, while for HIPCs neither the linear nor the quadratic coefficient is significantly different from zero. Results using the NPV of debt and SGMM (column 4) are less statistically significant when separate samples are used, but the pattern that emerges is similar. The text table A below suggests a debt overhang threshold (i.e., a threshold at which the marginal effect of debt turns negative) between 10 and 15 percent of GDP for non-HIPCs, when net present value of debt is used and a threshold between 20 and 29 percent of GDP, when nominal debt is used instead.

Text Table A. Debt Overhang Thresholds (% GDP) 1/, 2/

	Country Group		Debt Levels 3/	
	Non-HIPC	HIPC	Low	High
NPV of Debt (% GDP)				
Full sample	10 – 12	...	6 – 10	...
Split samples	15 – 16	...	9	...
Nominal Debt (% GDP)				
Full sample	20 – 21	...	14 – 17	...
Split samples	26 – 30	...	17 – 18	...

1/ Range estimates defined by OLS and SGMM regressions in Tables 1–4.
2/ In blank when no threshold exists in the relevant data range.
3/ A country is defined as low debt if its average debt ratio is below the median.

In our econometric analysis, we control for net transfers, so as to estimate the impact of a marginal debt reduction when net flows remain unchanged—that is, to isolate the debt overhang effect assuming that the extent of aid or the crowding-out effects of debt servicing are unchanged. It is worth noting that we do not find evidence that aid flows have an effect on growth—despite having allowed for a differential impact across HIPCs and non-HIPCs—a result which is consistent with recent literature (see, e.g., Easterly, Levine, and Roodman, 2003; and Rajan and Subramanian 2005). We also do not find evidence that debt service is detrimental for growth.

The result that debt overhang matters only for non-HIPCs contradicts some of the findings in the previous literature. This is however not surprising. Indeed, by suggesting that the debt growth relationship differs across countries, our analysis de facto explains why results may also differ across papers. Furthermore, the fact that the debt relationship is different in HIPCs and non-HIPCs raises the important question of why are HIPCs different. Are they different because they are highly indebted, or they are different because they lack good policies and institutions?

To shed some light on this important question we first check whether lack of a significant relationship between debt and growth is a characteristic of HIPCs, or a feature of other highly indebted countries in general. To do so we estimate our model replacing the dummy for HIPC with a dummy for "high-debt countries" (HD), defined as those countries with an average level of indebtedness above the median (of the averages).[23] The results of this exercise are presented in Table 3. We find robust evidence that debt overhang is limited to the low-debt group only, and that debt does not affect growth in the high-debt country group. Again, as a robustness check, we perform separate growth regressions for the two subsamples implied by the median level of debt. The results are presented in Table 4 and provide again evidence that, at the margin, debt does not seem to matter in high-debt countries, while it hampers growth beyond a threshold in low-debt countries. According to the text table above, the threshold level of net present value of debt at which the marginal impact of debt on growth becomes negative (the debt overhang threshold) lies between 6 and 10 percent for low-debt countries. When nominal debt is used, the threshold ranges from 14 to 18 percent.

[23] Table 3, in the Appendix, provides a classification of countries by debt levels and HIPC status. It shows that the overlap between the two classifications is substantial but not extreme.

Summarizing the main findings of this section, we found that for non-HIPCs and, more generally, for low-debt countries, debt levels beyond a certain threshold negatively affect growth. The fact that in HIPCs, and more generally in high-debt countries, debt seems to have no effects on growth suggests that there can be a second indebtedness threshold such that debt levels above such threshold just do not matter. However, while our findings suggest that what drives the difference in the debt-growth relationship between HIPCs and non-HIPCs is the fact that the former are much more indebted, we cannot a priori rule out the fact that HIPCs differ from non-HIPCs in some other dimensions, such as the quality of policies and institutions, and this is what indeed drives the result. In order to clarify this important issue, the next section explores both these hypotheses in greater detail.

B. Spline Specification

To check whether it is indeed the case that at very high levels of debt, debt stops affecting growth, we estimate a spline specification with two breaks. This allows for the effect of debt on growth to be different at low, medium, and high levels of debt. We thus estimate the following model:

$$y_{it} = \alpha_t + \beta_1^{'} X_{it} + \beta_2 D_{it} + \beta_3 (D_{it} - D_1) I_1 + \beta_4 (D_{it} - D_2) I_2 + \beta_5 T_{it} + \beta_6 P_i + \varepsilon_{it}, \qquad (4)$$

where X_{it} is the same matrix of controls as in the previous section, T_{it} is the vector of net transfer variables, P_i is the usual vector of cross-sectional variables included in the OLS regressions, and I_j, j=1,2, is an indicator function such that:

$$I_j = 0, \quad if \quad D_{it} < D_j, \quad and \quad I_j = 1, \quad if \quad D_{it} > D_j. \qquad (4a)$$

In order to derive the threshold D_1 and D_2 in a nonarbitrary way, we tried all possible combinations of D_1 and D_2, between about 10 and 80 percent of GDP separated by multiples of approximately 15 percentage points of GDP, such that $D_1 < D_2$.[24] The range covers 70 to 80 percent of the distribution, depending on the type of debt variable employed. We then chose the pair D_1 and D_2 which delivers the best fit, as measured by the ratio of the explained sum of squared to the total sum of squares.

Tables 5 and 6 report the OLS with cross-sectional variables and SGMM estimates of equation (4) in which debt is measured in net present value terms, while Tables 7 and 8 report the same regressions with debt measured in nominal terms. The coefficients of the nondebt variables are very similar to the ones of the quadratic specification presented in the previous section and are dropped from the tables for convenience of presentation. For each debt variable, in addition to the three spline coefficients β_2, β_3, and β_4, at the bottom of Tables 5-8 we report the overall coefficient for debt at medium levels ($\beta_2 + \beta_3$,) and at high levels ($\beta_2 + \beta_3 + \beta_4$), with the associated p-values. The endogenously determined spline thresholds appear just further below in the table.

[24] The approximation of the interval is due to the fact that calculations are performed on a logarithmic basis. Results based on equally spaced intervals calculated on the level of debt delivered qualitatively similar results.

Let's focus first on the regressions based on the NPV measure of debt (Tables 5-6). The main results for the whole sample (Table 5, columns 1 and 2) indicate a relationship between indebtedness and growth which is somewhat positive at low levels of debt, strongly negative at intermediate levels (the p-values of $\beta_2 + \beta_3$ are 0.00 and 0.07 for OLS and SGMM, respectively), and flat at high levels ($\beta_2 + \beta_3 + \beta_4$ are insignificant in both regressions). This result is consistent with the findings of the quadratic specification, suggesting that high levels of debt are not associated with a marginal debt overhang. The debt overhang threshold at which the marginal effect of debt turns negative is situated between 10 and 35 percent of GDP, while the debt irrelevance threshold (where the marginal effect of debt on growth becomes zero) is around 50 percent of GDP. Note that countries whose debt passes the debt irrelevance threshold still face average debt overhang, as they could enjoy higher growth by sufficiently reducing debt.

As discussed in the previous section, we also wonder whether the debt-growth relationship depends also on characteristics other than indebtedness. Separate regressions for HIPCs and non-HIPCs or for high-debt and low-debt countries—as in the quadratic specification—would not be particularly meaningful here, as they would split the sample along the same dimension as the one the spline function employs to differentiate the debt-growth relationship. We instead run the spline regressions on different samples based on characteristics that help distinguishing HIPCs from non-HIPCs, along the rationales discussed in the introduction for the possible lack of overhang in HIPCs. More precisely, we split the sample according to the quality of policies (proxied by the CPIA index of the World Bank), access to private capital markets (proxied by the net private capital inflow from the WEO), and quality of institutions (proxied by settler mortality).[25] For each variable, countries are separated according to whether their average value over the sample is above or below the median (of the country averages).[26]

Table 5 (columns 3-6) and Table 6 report results for the six splits. The results indicate a similar pattern across different splits. On the one hand, countries with good policies, institutions, or access to capital markets (countries with "good" conditions in the text table B below) have higher debt overhang thresholds (between 25 and 35 percent of GDP) and virtually no flat segment (the irrelevance threshold is found at the top of the range, 80 percent of GDP). On the other hand, countries with poor policies, access to capital markets, or institutions (countries with "bad" conditions in the text table B below) seem to start suffering from overhang at very low levels of debt (10 percent of GDP or possibly below). However, the negative marginal effect of debt on growth can disappear quickly as debt rises, as the debt irrelevance threshold for these countries lies between 15 and 50 percent of debt to GDP. Over the irrelevance threshold, they would still suffer from the average debt overhang, although they would not suffer from the marginal one.

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[25] Of course capital market access depends on countries' policies and institutions as well as on their level of indebtedness. While we are aware of this endogeneity issue, we nonetheless think that the split provides some interesting insights and thus deserves to be investigated.

[26] We also run a split for International Development Assistance (IDA) and non-IDA countries (not reported), which yields inconclusive results. This is most likely due to the fact that in our sample most of the IDA countries are highly indebted (see Table 5 in the Appendix). Hence, a split for IDA countries would suffer from the same problems as the HIPC/high-debt splits discussed above. This also implies that we cannot discriminate whether income level per se matters for the debt-growth relationship.

Text Table B. Debt Overhang and Irrelevance Thresholds

	Country Group		
	All 1/	"Good" Conditions 2/	"Bad" Conditions 3/
NPV % GDP			
Debt Overhang	(10)-35	23-35	(10)
Debt Irrelevance	53	(80)	15-53
Nominal Debt % GDP			
Debt Overhang	(10)-23	23-35	10-35
Debt Irrelevance	53-(80)	(80)	53

1/ Table 5 (or 7) col. 1-2.
2/ Table 5 (or 7) col. 3-4, Table 6 (or 8) col. 1-2, 5-6.
3/ Table 5 (or 7) col. 5-6, Table 6 (or 8) col. 3-4, 7-8.
Numbers in brackets relate to thresholds at the limits of the range.

One result that is independent of the split is the overhang effect ($\beta_2 + \beta_3$), which is very significant for all groups of countries. For the whole sample, the estimate of ($\beta_2 + \beta_3$) ranges between -1 and -2.7 (OLS with cross-sectional variables and SGMM, respectively). This suggests that reducing debt by a third (within the range of debt overhang and debt irrelevance) could enhance per capita growth by about one-third to a full percentage point. The effect of debt above the irrelevance threshold ($\beta_2 + \beta_3 + \beta_4$) is not significant for the countries in bad conditions (it is positive and significant for the countries in good conditions, but, as the threshold for these countries is identified at the top of the range, such a result should be de-emphasized). When debt is measured in nominal terms (Tables 7-8) the results are very similar, but with generally higher thresholds—which is to be expected—and a narrower range for the estimates of the effect of debt on growth in the overhang zone($\beta_2 + \beta_3$).

The key result is that debt overhang and debt irrelevance thresholds arise at different levels of indebtedness, depending on country characteristics. For example, countries with very high debt and very poor policies would face a practically flat debt-growth relationship because both thresholds are very close to zero, while countries with relatively low levels of debt and good policies, face a concave relationship. This implies that those countries that have better economic and policy conditions can afford to borrow more—before debt overhang starts being a concern—than those facing worse conditions. However, when indebtedness becomes excessive, countries with good conditions continue to face a marginal debt overhang, while countries with poor conditions do not (their marginal effect of debt on growth becomes null).[27]

[27] Overall, the results can explain why Pattillo, Poirson, and Ricci (2002), who did not distinguish across countries, found substantial variability in the estimates for overhang thresholds. On average, they find an overhang threshold at somewhat less than 20 percent of GDP.

This result is illustrated in Figure 5 where per capita growth is plotted as a function of debt, using the average coefficients and thresholds of Tables 5 and 7, and distinguishing between countries with "good" and "bad" conditions. As is clear from the figure, countries with "bad conditions" start suffering from a marginal debt overhang at very low levels of debt, and very soon enter in the debt irrelevance region, where there is no marginal debt overhang but there is average debt overhang. In countries with "good conditions," marginal debt overhang, while starting at higher debt levels, negatively affects growth over a larger interval.

In light of these results, it is not surprising that in the previous section we found no significant relationship between debt and growth in HIPCs. Over the sample span, most of the HIPCs suffered from elevated indebtedness, while at the same time exhibited worse policies and more limited access to private capital than other countries (see Appendix Table 2). To understand what might drive these results it is helpful looking at the determinants of resources flows and investment, which will be discussed in sub-section D below. Before we move to such an analysis, the next section explores the robustness of the nonlinear relationship between debt and growth.

C. Threshold Estimation

In the previous section we estimated a spline function of debt and growth. In order to derive the threshold levels in a nonarbitrary way, we tried all possible combinations along the distribution of debt and chose the pair that delivered the best fit in terms of the R-square. However, such a methodology does not allow us to assess the statistical significance of the thresholds by providing confidence intervals. To overcome such a problem, we follow Hansen (1996, 2000) and look for a nonlinear debt-growth relationship by applying threshold estimation.[28]

Threshold estimation takes the form:

$$y_{it} = \beta_1' X_{it} + \beta_2 D_{it} + \varepsilon_{it} \qquad D_{it} \leq \gamma \qquad (5)$$

$$y_{it} = \alpha_1' X_{it} + \alpha_2 D_{it} + \varepsilon_{it} \qquad D_{it} > \gamma \qquad (6)$$

where debt (D_{it}) is used both in the regression and as the threshold variable that splits the sample into two groups;[29] γ is the endogenously determined threshold level, and X_{it} is the vector of the control variables listed in subsection A above, including time effects. The main feature of the model is that it allows the regression parameters to differ depending on the value of D_{it}.

[28] Threshold estimation has been applied for nonparametric function estimation, as well as for empirical sample splitting of continuously distributed variable. Applying such a methodology, we can endogenously determine the threshold levels of debt (and their confidence intervals) at which the relationship between debt and growth changes. We adapted to our analysis the Gauss programs kindly made available by Hansen at: http://www.ssc.wisc.edu/~bhansen/

[29] The threshold variable could be the dependent variable, a regressor or a third variable, not included in the regression, and it is assumed to have a continuous distribution.

Hansen (2000) derives an asymptotic approximation to the distribution of the least-squares estimate of the threshold parameter, which allows testing for the existence of a threshold. We are not aware of any attempt to find such a distribution for SGMM estimates. Thus, the main shortcoming of this approach, compared to the one presented in section B, is that it does not allow to correct for endogeneity. This implies that we cannot rely too much on the point estimates and significance of the coefficients. Another shortcoming is that we cannot identify two thresholds directly, but only sequentially (see below). Hence, our threshold estimation should be considered mainly as a robustness test.

As the previous analysis indicated the presence of two debt thresholds, we perform multiple threshold regressions proceeding in a sequential way. First, we fit a threshold model to the data to estimate a first debt threshold level and the least-square coefficients of each subsample. We then compute confidence intervals for the parameters, including the debt threshold coefficient, and provide an asymptotic simulation test of the null of linearity against the alternative of a debt threshold. If we find evidence for a first debt threshold, we proceed to the second stage: drop the subsample below the threshold and repeat the procedure described above but apply it to the rest of the sample in search for a second debt threshold. This allows us to compute estimates for the two remaining subsubsamples and test the null hypothesis of no second debt threshold.

Running this specification on our entire sample of countries, we find two significant thresholds of debt.[30] The least square estimates of the first and second thresholds of the NPV of debt are, respectively, 17 and 37 percent, with confidence interval of [9,46] and [34, 79] percent. While the threshold levels and the sign pattern across debt segments are consistent with the results in our previous section, the statistical significance of the coefficients is much lower. The estimated effect of debt on growth is found to be positive, negative and positive for—respectively—low, medium, and high levels of debt (Table 9, columns 1, 2, 3), but none of them seems to be statistically different from zero. Hence, the empirical evidence provided by threshold estimation for the overall sample is somewhat inconclusive regarding whether the true relationship between debt and growth has three slopes or, on the contrary, is flat along all the distribution of debt.

Next we explore whether such inconclusive analysis hides heterogeneity in the debt-growth relationship across the two country groups that differ in the quality of their policies by running separate regressions (Tables 10 and 11). Among the countries with good CPIA, a sample split based on the level of NPV of debt produces a first threshold at 17.6 percent of GDP, with confidence interval [14, 30], and a second threshold at 71.7 percent, with confidence interval [69, 77]. We find a negative and significant impact of debt on growth in the intermediate range. Interestingly, such a point estimate is very close to the one found under the spline specification for the same set of countries (-1.4). Under the first and third debt segments, however, the debt coefficients are not statistically different from zero. Pair-wise t-tests of the equality of coefficients across regressions related to different debt segments can be rejected. In the case of good policies, therefore, there is clear evidence that the effect of debt on growth varies with the level of indebtedness.

[30] The test of the null hypothesis of no threshold against the alternative of threshold is performed using a Wald test under the assumption of homoskedastic errors. Using 1000 bootstrap replications, the p-value for the threshold model was 0. This suggests that there is evidence of a regime change at the specified levels of debt.

For the group of countries with bad policies, the overhang and irrelevance thresholds are found at lower levels of debt, at 17.3 and 35.1 percent of GDP respectively, so that the debt irrelevance threshold emerges much earlier in countries with bad policies.[31] However, unlike in the good CPIA group, the negative debt coefficient in the intermediate region is not significant for the bad CPIA countries. Hence, despite the evidence of regime changes at these two levels of debt, we cannot be sure that the relationship between debt and growth for countries with bad policies is nonlinear (with marginal overhang at intermediate levels of debt) or is simply flat at all levels of debt.

To conclude, we have performed threshold estimation as a robustness test for the results found using a spline specification. We have found reinforcing evidence that countries with good policies face a debt overhang threshold of about 20 percent of GDP, beyond which debt has a marginal negative impact on growth, and a debt irrelevance threshold at very high levels of debt (around 70 percent of GDP). In countries with bad policies, there is also reasonable evidence for two thresholds, and the irrelevance threshold is lower than in the case of good policies (a result which is consistent with the spline specification). However, the estimated debt coefficients do not appear to be significantly different from zero, although the pattern of signs for the coefficients of debt is consistent with that of countries with good policies. This result makes it difficult to conclude whether the debt-growth relationship for countries with bad policies is flat or whether it displays an overhang region. A word of caution relates to the use of the threshold point estimates as benchmark values for policy purposes: the confidence intervals for some of the threshold parameters are sufficiently large that there is considerable uncertainty regarding their true values.

D. Determinants of Resource Transfers and Investment

The previous analysis suggests that the debt-growth relationship is different in HIPCs and non-HIPCs, and more generally in countries with different levels of indebtedness. Why is this the case? One possibility, discussed in the introduction, is that donors/creditors (net) supply of funds to HIPCs—and to highly indebted countries in general—is not reduced by debt levels, and thus high debt does not hamper investment opportunities. To assess the plausibility of this explanation, in this section we first look at the determinants of resource flows in HIPCs and non-HIPCs, and then we investigate the determinants of investment in each group of countries.

When we analyze the determinants of resource transfers, we consider aggregate net transfers, and, as in Marchesi and Missale (2004), we distinguish between HIPCs and non-HIPCs.[32] Our main econometric specification is

$$Z_{it} = \alpha_t + \beta_1^{'} W_{it} + \beta_2 K_i + \beta_3 D_{it-1} + \beta_4 K_i D_{it-1} + \beta_5 P_{\mathrm{i}} + \varepsilon_{it} \ , \qquad (7)$$

[31] The 95 percent confidence intervals are [5, 37] and [34, 39], respectively.

[32] Aggregate net transfers is taken from the GDF dataset of the World Bank, and is defined as the sum of long-term net flows on debt excluding IMF credit (i.e., disbursements minus principal repayments), net Foreign Direct Investment (FDI) inflows, portfolio equity flows, grants excluding technical assistance grants, minus long-term interest payments and profit remittances on FDI.

where Z_{it} denotes transfer (measured in terms of GDP) to country *i* in period *t*; W_{it-1} is a vector of control variables including the (one period) lagged values of the dependent variable, (the logarithm of) initial GDP per capita, (the logarithm of) population, terms of trade growth, openness, and per capita GDP growth, K_i is the usual dummy variable related to HIPCs or high debt, and P_i denotes the usual vector of cross-sectional variables for the OLS regressions. Notice that since an increase in the debt stock between one period and the next induces an increase in aggregate transfers, to further control for endogeneity we lag the debt variables and their interactions by one period. We also assume that current period transfers are mainly affected by previous period variables and, as standard in this literature (e.g., Marchesi and Missale, 2004), we also lag all our controls by one period.

As in the previous section, we first estimate Equation (7) using OLS with the same vector of cross-sectional variables previously considered and then employ SGMM. Our regressions are summarized in Table 12 where debt is measured in net present value and in Table 13 where debt is measured in nominal terms. The coefficients have the expected sign and are in line with what previously found in the literature. Net transfers are highly autocorrelated and tend to go to poor countries.

When we look at the debt variables, we find that in non-HIPCs there is a negative and significant relationship between debt and net transfers, while for HIPCs no significant effect can be found (columns 2 and 4). In particular our test fails to reject the null that $Ho: \beta_3 + \beta_4 = 0$ both in our OLS and SGMM regressions.

The fact that net flows do not seem to decline with debt accumulation in HIPCs (unlike in non-HIPCs), may be explained by donors' behavior. Indeed, when we regressed the terms of lending, measured by the average grant element of new borrowing, on the stock of debt (Tables 14) we find a negative relationship in non-HIPCs while in HIPCs the relationship is positive. This suggests not only that official credit to HIPCs does not decline but that it becomes more concessional. Overall, there is indication that, in HIPCs, debt and debt repayments may not crowd out resources to the extent they do in other countries.

We then turn to the question of whether debt affects investment. We estimate a standard investment equation controlling for per capita GDP growth, terms of trade growth, openness, and (in the OLS specification) the same cross-sectional variables as in the previous equations. OLS and SGMM regressions are presented in Table 15 when debt is measured in NPV terms and Table 16 when debt is measured nominal terms. The coefficients for the control variables generally have the expected sign and are in line with previous literature. When we look at the debt variables, we find that when we do not distinguish between HIPCs and non-HIPCs there is a negative and significant relationship between investment and debt. However, if we allow the HIPCs and non-HIPCs' slopes to differ we find that in HIPCs investment is not affected by indebtedness levels, while it declines in non-HIPCs.

Finally, when we replace the HIPC dummy with a high-debt dummy, the results (not shown) are qualitatively similar. Again, for high-debt countries indebtedness does not affect either net transfer or investment. However, while in low-debt countries we find that debt negatively affects investments, we cannot distinguish between low- and high-debt countries with respect to net transfers. This might suggest that HIPCs have received more assistance than other highly indebted countries.

Summarizing the findings of this section, we found quite robust evidence suggesting that in HIPCs the donor community provides resources to prevent debt repayments from crowding out investments. This might well explain why, above a certain threshold, debt does not affect growth. In non-HIPCs, the story is likely to be a different one. Since these countries depend on international capital markets to a larger degree, resource flows are more responsive to indebtedness. Excessive debt levels might thus dry up private resources—often more effective in spurring economic activity than official assistance—and through this channel negatively affect growth.

V. Conclusions and Policy Implications

The idea that additional debt relief, beyond what has already been granted through the HIPC initiative, may help low-income countries move toward the Millennium Development Goals is gaining increasing consensus. Many questions, however, remain unanswered: is debt relief going to foster growth? Is there evidence that HIPCs suffer from a debt overhang, and that more debt relief is needed? The underlying question is: to what extent and under which conditions can debt be an impediment to growth? To shed some light on this important question, in this paper we looked at how indebtedness has affected growth and investment patterns in HIPCs and non-HIPCs as well as in countries with different levels of indebtedness or with policies or institutions of different quality in the past three decades.

We started by dividing our sample into HIPCs and non-HIPCs, as this set of countries is the main focus of the policy debate. We found that in HIPCs, indebtedness does not seem to affect either growth or investments over the sample. However, in non-HIPCs there is evidence of a quadratic relationship: when debt rises to sufficiently high levels, it starts having a negative marginal effect on per capita growth.

But HIPCs and non-HIPCs are not meaningful analytical categories. Hence, in a quest to investigate which of the characteristics that distinguish the two group of countries are driving the different results, we inspected further how the debt-growth relationship is affected by indebtedness levels and the quality of policies and institutions.[33] When allowing a spline specification with two breaks, we found a highly non-linear relationship between debt and growth: negative at intermediate debt levels, but not at very-low or very-high levels.[34] Since HIPCs experienced high indebtedness levels throughout the sample, it is thus not surprising that the debt-growth relationship turned out to be insignificant. One of the possible explanations is that donors provided highly indebted countries with additional gross resources and this avoided the crowding out of public investments. We found consistent evidence for this explanation as aggregate net transfer decreased with debt levels in all countries but HIPCs or high debt countries.

[33] Over the sample, the HIPCs were characterized by higher debt and lower-quality policies and institutions that other countries, even though the HIPCs are converging rapidly in both dimensions. HIPCs also differ in the level of per capita income, but the distinction between IDA status and HIPCs is too small (see the overlap between the IDA and the HIPC classification in Appendix Table 5) to draw inference on the independent effect of income.

[34] There is some evidence of a positive effect at low levels; this effect, however, is not robust.

Can one then dismiss debt relief as an effective way of providing resources to highly indebted countries, and argue against further debt cancellation? The answer is, not necessarily. The fact that high levels of debt do not matter for growth does not imply that intermediate levels of debt do not matter either: debt that is not too small (not below the debt overhang threshold) and not too big (not above the debt irrelevance threshold), does negatively affect growth. Moreover, the absence of marginal debt overhang at high levels of debt does not imply the absence of average debt overhang: even if small reductions in debt may have no impact on growth, large reductions might still significantly improve growth performance.[35]

To shed light on whether HIPCs would suffer from debt overhang once their debt is reduced, we investigated how different country characteristics affect the debt growth relationship. We found that the debt overhang and the debt irrelevance thresholds emerge at different levels of indebtedness depending on the country characteristics. On the one hand, countries with better institutions, better policies, and easier access to private capital seem to face a debt overhang when debt exceeds 15-30 percent of GDP (debt overhang thresholds). These countries continue to suffer from a negative marginal effect of debt on growth (marginal debt overhang) until debt reaches very high levels such as 70-80 percent of GDP (debt irrelevance thresholds). For higher levels of debt, the marginal effect of debt on growth is zero (no marginal debt overhang), even though the overall effect of debt remains negative (average debt overhang). A stylized picture capturing this patterns is presented in Figure 5. On the other hand, countries with worse conditions seem to exhibit a similar pattern but with lower thresholds (debt overhang thresholds mainly around 0 and 20 percent of GDP and debt irrelevance thresholds between 15 and 53 percent of GDP). However, for this group of countries the relationship between debt and growth is much less robust, casting doubts on whether debt matters at all. Note that the thresholds identified in this paper should be viewed cautiously. They are affected by considerable estimation uncertainty and might of course reflect factors that we were unable to fully capture in our analysis. For these reasons, we do not want to overemphasize our point estimates of the debt overhang and debt irrelevance thresholds, and we caution against using them as a metric to judge recent debt relief initiatives.

It is important to note that the fact that we found evidence of a debt irrelevance threshold at debt levels much lower than those the HIPCs used to have, implies that we cannot rely too much on past experience to judge current policy trade-offs. To be more precise, the fact that debt did not matter in a pre-debt-relief world does not imply that debt does not matter now. Indeed, one cannot rule out the possibility that the debt relief initiative has moved HIPCs within the marginal debt overhang region, where debt relief could be effective in fostering growth.[36] Moreover, to the extent that the effectiveness of debt relief depends on countries' characteristics, a one-size-fits-all debt relief policy might not be the most appropriate one: if the effect of debt on growth depends on the quality of policies and institution, the choice of providing debt relief should depend on the same factors. The results in the paper also imply that, once debt relief is granted,

[35] Our findings are consistent with the Spring 2005 IMF African Regional Economic Outlook, which found that lower debt was associated with the occurrence of sustained growth acceleration.

[36] One supportive piece of evidence is the current increase in litigation by commercial creditors in HIPCs. It suggests that creditors are recognizing that conditions have improved, and expect that there may now be some possibility of repayment.

new lending to these countries should be made contingent on improvements in the quality of policy environment.

Finally, an important issue under discussion is whether eligibility for further debt relief should be extended to other non-HIPC low-income countries. Our analysis indicates that the relationship between debt and growth depends on the level of debt and the quality of institutions and policies. Thus, our results suggest that debt relief should be given in a similar way to non-HIPC countries with similar levels of debt and quality of policies and institutions, as these are the key determinants of the effect of debt relief on growth.

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Figure 1. HIPC: Total Debt to GDP and Net Official Transfers to GDP

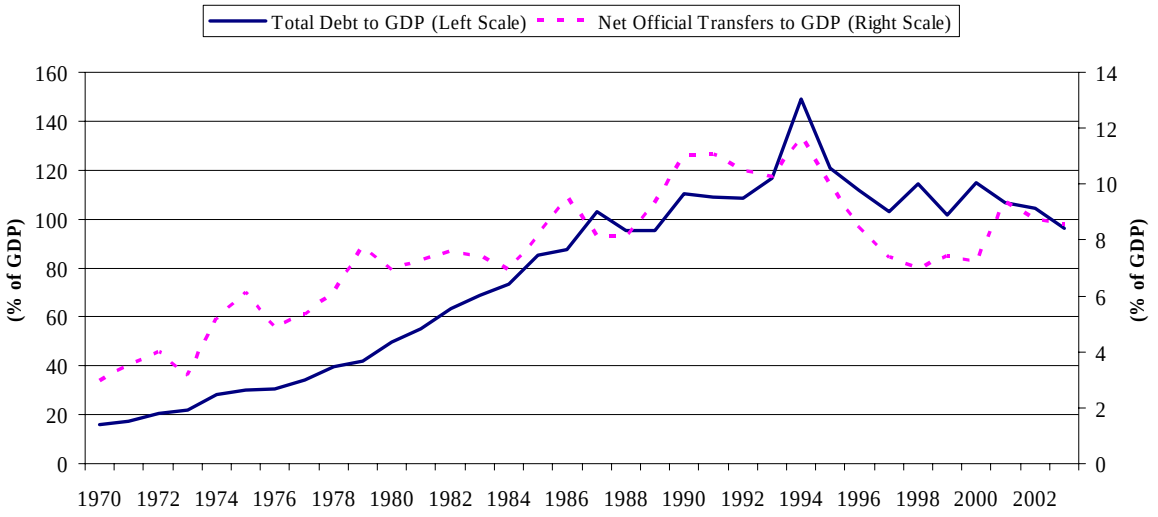


Figure 2. BRADY: Total Debt to GDP and Aggregate Net Transfers to GDP

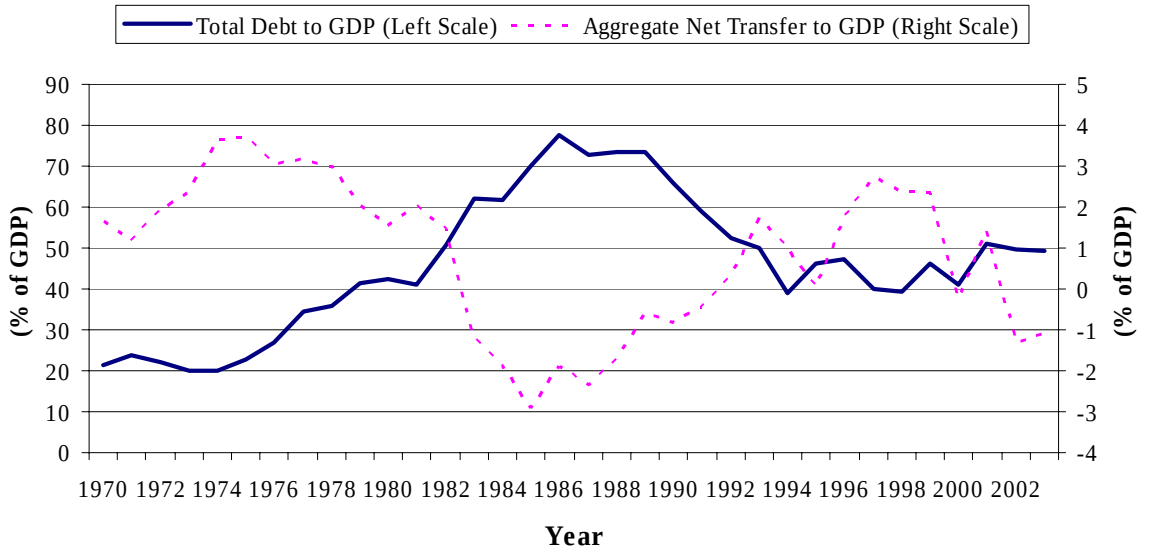


Figure 3. Net Official Transfers to GDP

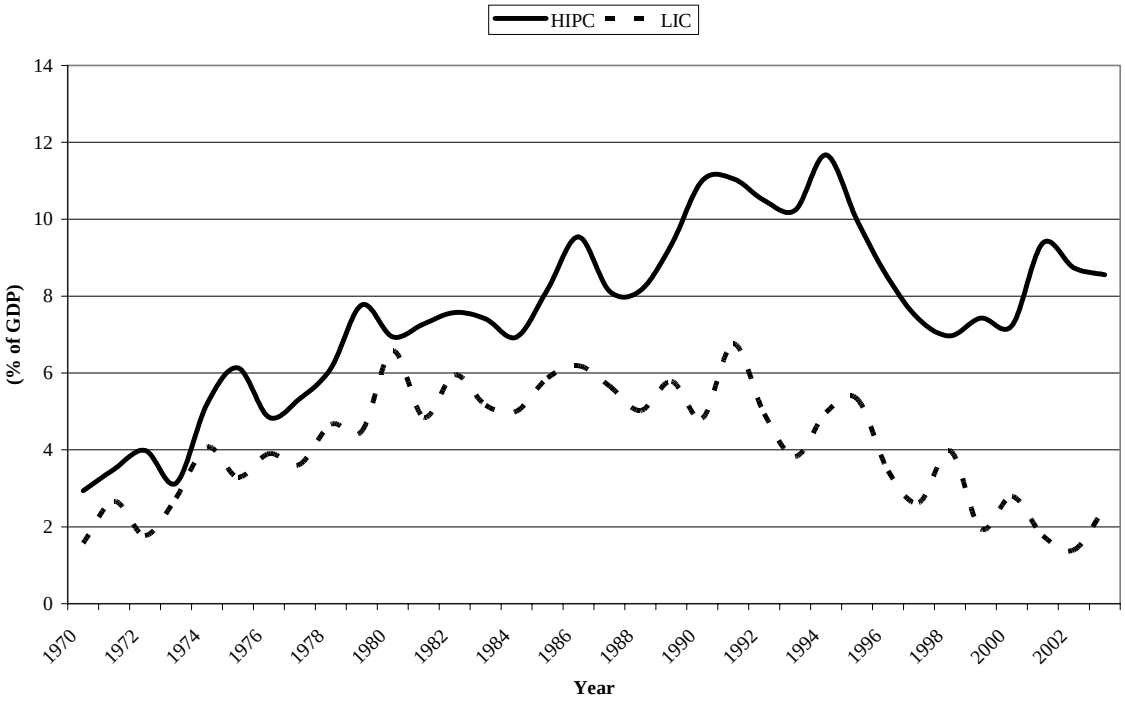


Figure 4a. HIPC: Debt Shares

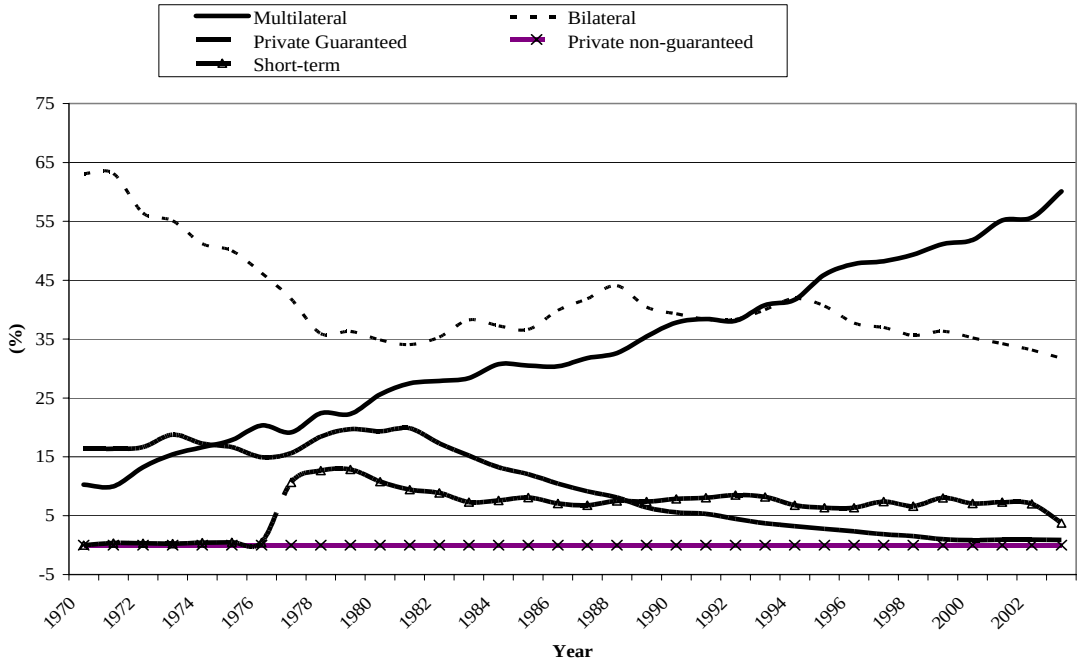


Figure 4b. BRADY: Debt Shares

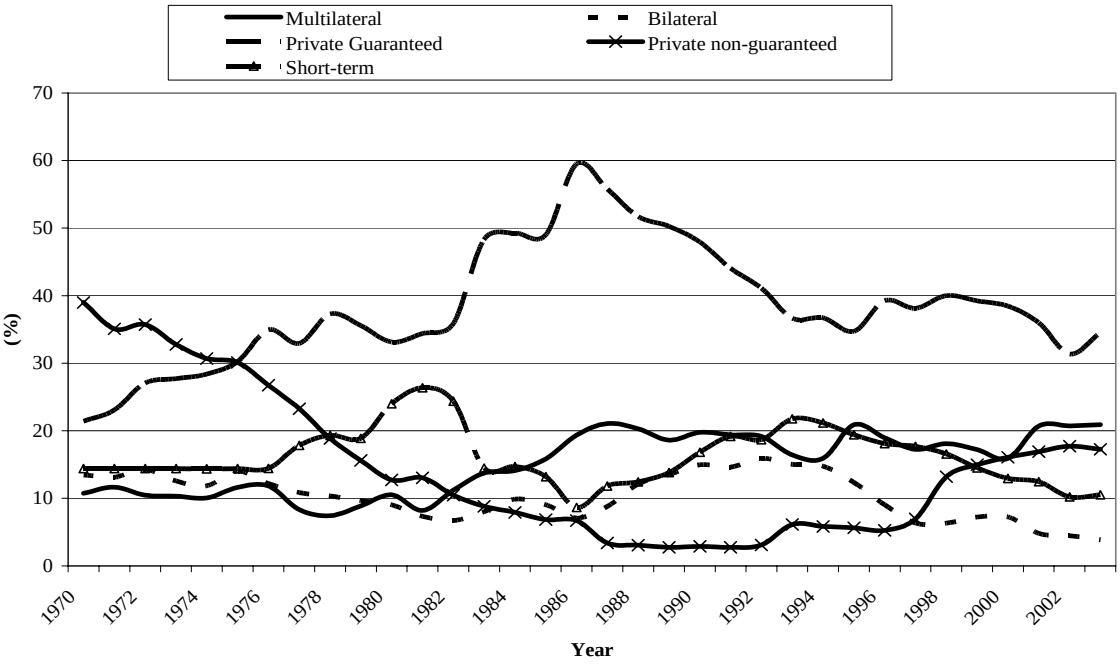
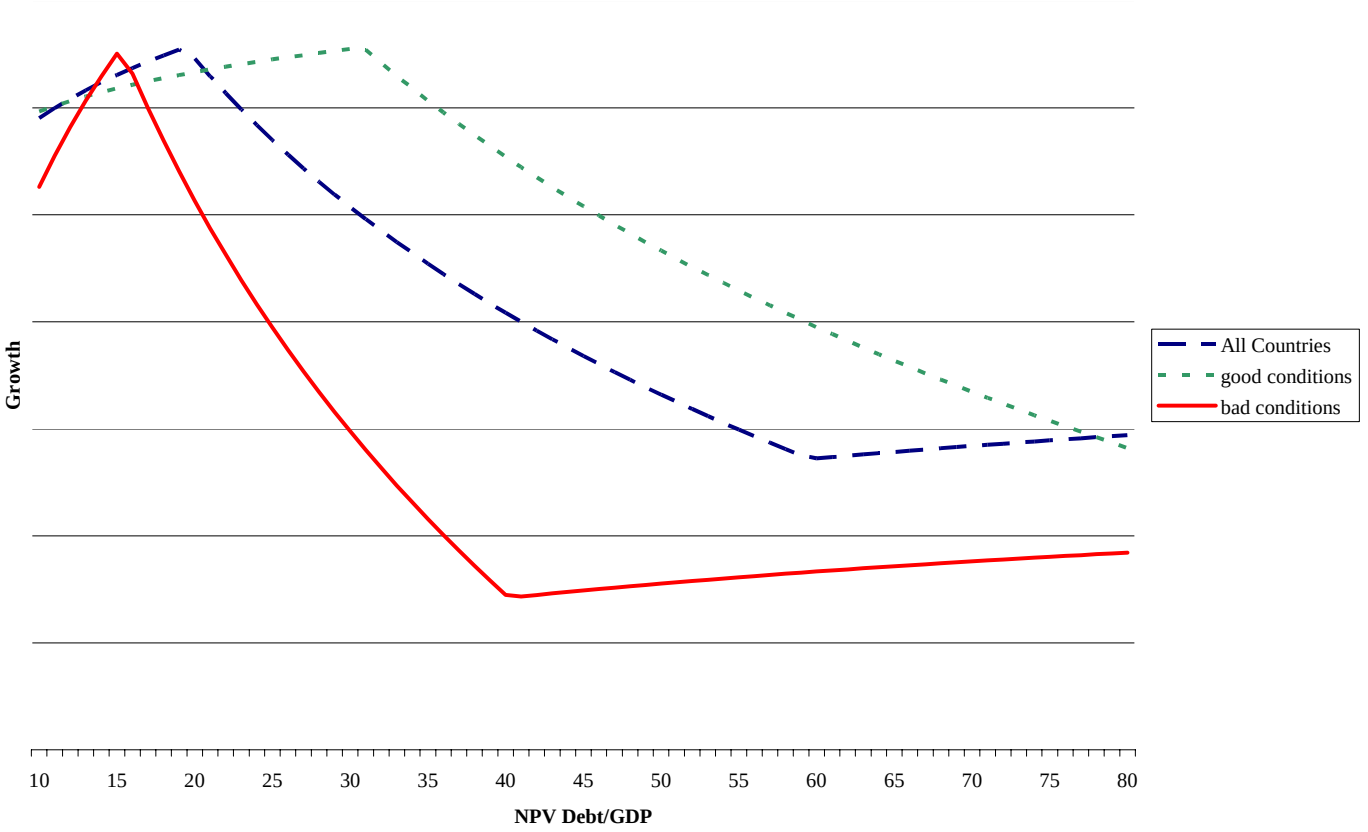


Figure 5. Debt and Growth



Source: Tables 5 and 7; averages across methods and debt measures. Data are normalized to have the same growth at the debt overhang threshold. For a definition of “good” and “bad” conditions, see the text.

Table 1. Growth Regressions: HIPCs vs. Non-HIPCs
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	OLS		SGMM	
	Nominal Debt	NPV Debt	Nominal Debt	NPV Debt
Log InGDP	-0.919***	-0.921***	-1.066***	-0.777**
	(0.217)	(0.214)	(0.276)	(0.325)
ToT Gr	0.025*	0.025	0.014	0.012
	(0.015)	(0.015)	(0.014)	(0.013)
Log PopGr	-0.472	-0.493	-1.107***	-1.108***
	(0.304)	(0.302)	(0.354)	(0.397)
Log SecEnr	0.239	0.213	1.101***	0.800*
	(0.328)	(0.329)	(0.387)	(0.473)
Log INV/GDP	3.062***	3.065***	2.770***	3.089***
	(0.454)	(0.451)	(0.461)	(0.545)
Budget/GDP	0.097***	0.096***	0.131***	0.145***
	(0.032)	(0.032)	(0.039)	(0.042)
Open	-0.011*	-0.010	-0.005	-0.005
	(0.006)	(0.006)	(0.006)	(0.007)
Infl	-0.022***	-0.022***	-0.022***	-0.020***
	(0.004)	(0.004)	(0.005)	(0.005)
Aid/GDP	-0.073	-0.084*	-0.058	-0.058
	(0.045)	(0.044)	(0.042)	(0.041)
DebtSer/EXP	-0.002	0.002	-0.013	-0.004
	(0.013)	(0.013)	(0.014)	(0.017)
HIPC (H)	2.605	0.451	4.763	2.634
	(1.805)	(1.483)	(3.506)	(2.821)
H*Aid/GDP	0.048	0.060	0.068	0.062
	(0.053)	(0.051)	(0.051)	(0.047)
H*DebtSer/EXP	-0.013	-0.018	-0.016	-0.026
	(0.022)	(0.023)	(0.020)	(0.024)
(a) Log Debt/GDP	2.661***	1.586***	2.976**	1.670
	(0.789)	(0.613)	(1.400)	(1.368)
(b) [Log Debt/GDP]^2	-0.434***	-0.316***	-0.494**	-0.363*
	(0.125)	(0.096)	(0.205)	(0.194)
(c) H* [Log Debt/GDP]	-2.892***	-1.811**	-3.667*	-2.582
	(0.982)	(0.796)	(2.012)	(1.704)
(d) H* [Log Debt/GDP]^2	0.506***	0.390***	0.563*	0.467*
	(0.155)	(0.124)	(0.290)	(0.250)
Constant	2.103	4.431*	-2.580	-2.194
	(2.555)	(2.344)	(2.942)	(2.671)
Observations	703	703	734	734
Number of Countries			79	79
AR(1) test			0.00	0.00
AR(2) test			0.87	0.87
R^2	0.34	0.34	0.42	0.28
Hansen/Sargan P-value			0.29	0.44
P-value: (a) + (c)=0	0.69	0.67	0.59	0.35
P-value: (b) + (d)=0	0.48	0.37	0.70	0.47

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent; All regressions include time dummies.

Table 2. Growth Regressions: HIPCs vs. Non HIPCs (subsamples)
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	OLS				SGMM			
	Nominal Debt		NPV Debt		Nominal Debt		NPV Debt	
	Non–HIPCs	HIPCs	Non–HIPCs	HIPCs	Non–HIPCs	HIPCs	Non–HIPCs	HIPCs
Log InGDP	-0.965***	-0.258	-1. 004***	-0.286	-0.961***	-0.859	-0.996***	-0.767
	(0.248)	(0.525)	(0.244)	(0.528)	(0.300)	(0.542)	(0.291)	(0.606)
ToT Gr	0.012	0.021	0.012	0.021	0.000	0.016	0.003	0.009
	(0.017)	(0.028)	(0.017)	(0.028)	(0.016)	(0.023)	(0.016)	(0.024)
Log PopGr	-0.639*	-1.141*	-0.672*	-1.129*	-0.810**	-1.628**	-0.933**	-1.879**
	(0.353)	(0.611)	(0.357)	(0.604)	(0.401)	(0.788)	(0.429)	(0.758)
Log SecEnr	-0.189	0.229	-0.184	0.199	1.312**	0.927**	1.253**	0.983**
	(0.519)	(0.500)	(0.519)	(0.507)	(0.519)	(0.454)	(0.525)	(0.443)
Log INV/GDP	4.242***	2.441***	4.253***	2.446***	3.820***	2.655***	3.923***	2.221***
	(0.677)	(0.543)	(0.669)	(0.553)	(0.705)	(0.651)	(0.762)	(0.735)
Budget/GDP	0.084*	0.085**	0.081	0.086**	0.175***	0.074	0.172***	0.069
	(0.051)	(0.041)	(0.051)	(0.041)	(0.044)	(0.051)	(0.044)	(0.052)
Open	-0.012	-0.014	-0.010	-0.015	-0.009	-0.012	-0.006	-0.014
	(0.008)	(0.011)	(0.008)	(0.011)	(0.007)	(0.013)	(0.007)	(0.011)
Infl	-0.024***	-0.023***	-0.024***	-0.024***	-0.022***	-0.024***	-0.021***	-0.023***
	(0.006)	(0.006)	(0.005)	(0.006)	(0.007)	(0.007)	(0.007)	(0.005)
Aid/GDP	-0.104**	0.017	-0.112**	0.014	-0.047	0.006	-0.048	0.010
	(0.048)	(0.041)	(0.047)	(0.039)	(0.042)	(0.043)	(0.043)	(0.045)
DebtSer/EXP	-0.005	-0.027	-0.000	-0.029	-0.018	-0.021	-0.009	-0.023
	(0.013)	(0.023)	(0.014)	(0.024)	(0.015)	(0.020)	(0.016)	(0.022)
Log Debt/GDP	3.106***	-0.127	1.930***	-0.206	3.474***	-1.622	1.531	-1.343
	(0.764)	(0.705)	(0.625)	(0.632)	(1.235)	(1.019)	(1.349)	(0.803)
[Log Debt/GDP]^2	-0.475***	0.017	-0.351***	0.047	-0.514***	0.147	-0.282	0.146
	(0.121)	(0.126)	(0.094)	(0.100)	(0.186)	(0.130)	(0.191)	(0.110)
Constant	0.097	1.449	2.696	0.556	-7.587**	3.308	-4.033	3.052
	(2.920)	(2.916)	(2.656)	(2.930)	(3.359)	(2.350)	(3.379)	(2.652)
Observations	424	279	424	279	446	288	446	288
Number of Countries					46	33	46	
AR(1) test					0.00	0.00	0.00	0.00
AR(2) test					0.08	0.29	0.08	0.30
R^2	0.37	0.34	0.37	0.34	0.51	0.52	0.29	0.29
Hansen/Sargan P-value					0.29	0.29	0.41	0.13

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent; All regressions include time dummies.

Table 3. Growth Regressions: High Debt vs. Low Debt
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	OLS		SGMM	
	Nominal Debt	NPV Debt	Nominal Debt	NPV Debt
Log InGDP	-0.912***	-0.801***	-0.997***	-0.720***
	(0.226)	(0.233)	(0.265)	(0.218)
ToT Gr	0.030**	0.028*	0.015	0.019
	(0.015)	(0.015)	(0.014)	(0.014)
Log PopGr	-0.403	-0.467	-1.218***	-1.270***
	(0.308)	(0.311)	(0.384)	(0.391)
Log SecEnr	0.383	0.470	1.105***	0.510
	(0.301)	(0.305)	(0.387)	(0.366)
Log INV/GDP	3.068***	3.111***	3.128***	2.956***
	(0.441)	(0.440)	(0.493)	(0.525)
Budget/GDP	0.089***	0.094***	0.122***	0.130***
	(0.033)	(0.032)	(0.038)	(0.040)
Open	-0.010	-0.011*	-0.006	0.000
	(0.006)	(0.006)	(0.007)	(0.007)
Infl	-0.022***	-0.022***	-0.021***	-0.013**
	(0.004)	(0.004)	(0.005)	(0.005)
Aid/GDP	-0.036	-0.018	-0.015	-0.011
	(0.057)	(0.051)	(0.057)	(0.050)
DebtSer/EXP	0.010	0.009	0.001	0.016
	(0.014)	(0.014)	(0.019)	(0.021)
High Debt (HD)	4.139**	2.228	4.521	1.221
	(1.882)	(1.711)	(4.197)	(4.297)
HD*Aid/GDP	-0.010	-0.020	-0.005	-0.061
	(0.057)	(0.049)	(0.056)	(0.049)
HD*DebtSer/EXP	-0.018	-0.017	-0.007	-0.010
	(0.019)	(0.018)	(0.022)	(0.022)
(a) Log Debt/GDP	3.417***	1.596***	4.229**	1.564
	(0.750)	(0.495)	(1.673)	(2.691)
(b) (Log Debt/GDP)^2	-0.601***	-0.355***	-0.804***	-0.434
	(0.144)	(0.105)	(0.249)	(0.433)
(c) HD* (Log Debt/GDP)	-4.034***	-2.253**	-4.046*	-1.519
	(1.075)	(0.926)	(2.350)	(2.844)
(d) HD* (Log Debt/GDP)^2	0.738***	0.458***	0.751**	0.390
	(0.177)	(0.146)	(0.329)	(0.457)
Constant	0.848	2.279	-5.056	-1.439
	(1.981)	(1.990)	(3.131)	(3.802)
Observations	703	703	734	734
Number of Countries			79	79
AR(1) test			0.00	0.00
AR(2) test			0.76	0.77
P-value Hansen/Sargan test			0.33	0.95
R^2	0.35	0.34	0.29	0.27
P-value: (a) + (c)=0	0.42	0.42	0.91	0.98
P-value: (b) + (d)=0	0.23	0.37	0.79	0.83

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent; All regressions include time dummies.

Table 4.Growth Regressions: High Debt vs. Low Debt (subsamples)
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	OLS				SGMM			
	Nominal Debt		NPV Debt		Nominal Debt		NPV Debt	
	Low Debt	High Debt	Low Debt	High Debt	Low Debt	High Debt	Low Debt	High Debt
Log InGDP	-1.228***	-0.567*	-0.874**	-0.551	-1.186***	-0.783**	-1.093***	-0.605*
	(0.318)	(0.329)	(0.384)	(0.345)	(0.277)	(0.346)	(0.320)	(0.353)
ToT Gr	0.046**	0.020	0.031	0.032	0.024	0.022	0.011	0.027
	(0.022)	(0.021)	(0.020)	(0.020)	(0.023)	(0.018)	(0.021)	(0.018)
Log PopGr	-0.251	-1.136**	0.144	-1.570***	-0.949**	-2.110***	-0.552	-2.159***
	(0.395)	(0.457)	(0.422)	(0.452)	(0.428)	(0.552)	(0.459)	(0.578)
Log SecEnr	-0.218	0.557	0.257	0.614	0.434	1.153***	1.156**	0.957**
	(0.499)	(0.393)	(0.444)	(0.411)	(0.416)	(0.398)	(0.533)	(0.442)
Log INV/GDP	4.257***	2.644***	3.140***	2.775***	3.816***	2.818***	2.827***	3.200***
	(0.801)	(0.524)	(0.757)	(0.564)	(0.765)	(0.682)	(0.706)	(0.722)
Budget/GDP	0.047	0.090**	0.032	0.144***	0.087*	0.088*	0.075	0.150***
	(0.053)	(0.038)	(0.039)	(0.042)	(0.051)	(0.047)	(0.049)	(0.047)
Open	-0.006	-0.018**	-0.005	-0.021*	0.005	-0.020**	0.005	-0.020**
	(0.010)	(0.008)	(0.008)	(0.011)	(0.009)	(0.008)	(0.009)	(0.009)
Infl	-0.011*	-0.029***	-0.009*	-0.030***	-0.008	-0.030***	-0.006	-0.029***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Aid/GDP	-0.113*	-0.011	-0.055	-0.011	-0.088	0.007	-0.053	-0.007
	(0.066)	(0.032)	(0.067)	(0.032)	(0.061)	(0.027)	(0.058)	(0.026)
DebtSer/EXP	0.020	-0.025	0.015	-0.026	0.013	-0.023	0.011	-0.025*
	(0.016)	(0.018)	(0.015)	(0.018)	(0.019)	(0.014)	(0.018)	(0.014)
Log Debt/GDP	4.067***	-0.564	1.719***	-0.559	5.773***	-0.208	1.780	-0.960
	(0.878)	(0.788)	(0.492)	(0.834)	(1.337)	(1.220)	(1.415)	(0.968)
$[\text{Log Debt/GDP}]^2$	-0.701***	0.120	-0.387***	0.105	-1.011***	0.006	-0.406*	0.109
	(0.163)	(0.121)	(0.101)	(0.121)	(0.224)	(0.154)	(0.236)	(0.129)
Constant	-2.157	2.812	0.050	2.623	-7.153**	1.449	-1.776	1.296
	(3.267)	(2.373)	(3.135)	(2.661)	(3.494)	(2.941)	(2.989)	(2.300)
Observations	343	349	347	356	366	357	370	364
Number of Countries					38	40	38	41
AR(1) test					0.00	0.00	0.00	0.00
AR(2) test					0.45	0.85	0.44	0.84
R^2	0.35	0.39	0.35	0.37	0.32	0.31	0.28	0.34
Hansen/Sargan P-value					0.29	0.35	0.31	0.20

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent; All regressions include time dummies.

Table 5. Spline Growth Regression, NPV of Debt, OLS and sys-GMM
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	ALL		Good Policies		Bad Policies	
	OLS	sys-GMM	OLS	sys-GMM	OLS	sys-GMM
Log InGDP	-0.766***	-0.867**	-0.855***	-0.904***	-0.660*	-0.931***
	(0.209)	(0.339)	(0.244)	(0.273)	(0.379)	(0.320)
ToT Gr	0.028*	0.011	0.011	0.004	0.035	0.022
	(0.015)	(0.013)	(0.017)	(0.017)	(0.024)	(0.021)
Log PopGr	-0.518*	-1.117***	-0.776**	-1.186***	-0.303	-1.811**
	(0.303)	(0.381)	(0.336)	(0.357)	(0.751)	(0.701)
Log SecEnr	0.367	1.469***	-0.103	0.139	0.667	1.357***
	(0.300)	(0.511)	(0.371)	(0.374)	(0.511)	(0.454)
Log INV/GDP	3.185***	3.483***	4.617***	3.821***	2.709***	2.738***
	(0.432)	(0.545)	(0.652)	(0.565)	(0.569)	(0.597)
Budget/GDP	0.092***	0.122***	0.109***	0.148***	0.085*	0.058
	(0.032)	(0.043)	(0.040)	(0.047)	(0.043)	(0.041)
Open	-0.011*	-0.012*	-0.003	0.006	-0.025**	-0.012
	(0.006)	(0.007)	(0.006)	(0.007)	(0.010)	(0.007)
Infl	-0.021***	-0.021***	-0.011	-0.005	-0.027***	-0.029***
	(0.004)	(0.005)	(0.007)	(0.005)	(0.005)	(0.005)
Aid/GPD	-0.043*	-0.015	-0.033	-0.073**	-0.017	-0.019
	(0.025)	(0.035)	(0.036)	(0.032)	(0.037)	(0.037)
DebtSer/EXP	0.005	-0.010	0.011	-0.004	-0.008	-0.001
	(0.012)	(0.014)	(0.014)	(0.017)	(0.020)	(0.015)
(a) Log NPV/GDP	0.887**	-0.599	0.367	0.012	1.400**	1.091
	(0.415)	(0.559)	(0.399)	(0.542)	(0.668)	(1.600)
(b) Log NPV/GDP*D1	-1.920***	-2.070	-2.360***	-1.459*	-6.586***	-6.415*
	(0.582)	(1.645)	(0.706)	(0.802)	(2.504)	(3.792)
(c) Log NPV/GDP*D2	1.604***	2.910	4.626***	3.880***	5.487**	5.261*
	(0.553)	(1.795)	(1.053)	(1.029)	(2.219)	(2.814)
Constant	2.429	-1.348	-1.809	-0.386	1.899	-0.923
	(1.669)	(2.127)	(2.627)	(2.217)	(2.590)	(3.505)
Observations	703	734	346	360	357	374
R^2	0.33	0.25	0.40	0.32	0.32	0.27
Coef. (a)+(b)	-1.033***	-2.669*	-1.993***	-1.446***	-5.185**	-5.324*
p-value test: (a)+(b)=0	0.00	0.07	0.00	0.01	0.02	0.05
Coef. (a)+(b)+(c)	0.572	0.241	2.634***	2.434***	0.302	-0.063
p-value test: (a)+(b)+c)=0	0.16	0.69	0.00	0.01	0.44	0.89
Debt overhang threshold	(10)	35	23	23	(10)	(10)
Debt irrelevance threshold	53	53	(80)	(80)	15	15
Number countries		79		36		43
Sargan/Hansen p-value		0.24		0.79		0.46
AR(2) P-Value		0.84		0.66		0.95

Notes: Robust standard errors in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Other control variables not reported.

Thresholds in brackets relate to values at the limit of the range

Table 6. Spline Growth Regression, NPV of Debt, OLS and sys-GMM (continued)
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	High K flows		Low K flows		Low settl. Mort		High settl. Mort	
	OLS	sys-GMM	OLS	sys-GMM	OLS	sys-GMM	OLS	sys-GMM
Log InGDP	-0.448	-0.620**	-1.012***	-1.057***	(0.314)	(0.295)	-0.660	-0.682*
	(0.290)	(0.285)	(0.332)	(0.241)	0.019	0.016	(0.413)	(0.396)
ToT Gr	0.052***	0.053***	0.013	-0.007	(0.020)	(0.019)	0.032	0.015
	(0.019)	(0.016)	(0.021)	(0.020)	-0.889**	-1.095***	(0.021)	(0.019)
Log PopGr	0.045	-0.307	-0.543	-1.407***	(0.391)	(0.351)	-0.261	-1.117
	(0.471)	(0.482)	(0.450)	(0.348)	0.337	0.928**	(0.607)	(0.686)
Log SecEnr	0.422	0.985*	0.344	0.723*	(0.487)	(0.403)	0.427	0.820*
	(0.512)	(0.503)	(0.421)	(0.388)	3.232***	2.672***	(0.377)	(0.451)
Log INV/GDP	4.515***	4.507***	2.467***	2.333***	(0.754)	(0.872)	3.039***	2.892***
	(0.697)	(0.722)	(0.536)	(0.580)	0.064	0.041	(0.580)	(0.505)
Budget/GDP	0.073	0.112**	0.128***	0.111*	(0.049)	(0.064)	0.086**	0.118**
	(0.046)	(0.042)	(0.037)	(0.057)	-0.008	0.002	(0.039)	(0.046)
Open	-0.013	-0.014**	-0.027***	-0.011	(0.008)	(0.010)	-0.009	-0.001
	(0.008)	(0.007)	(0.010)	(0.012)	-0.021***	-0.018**	(0.009)	(0.007)
Infl	-0.023***	-0.021***	-0.024***	-0.025***	(0.006)	(0.007)	-0.023***	-0.023***
	(0.006)	(0.008)	(0.005)	(0.007)	(0.314)	(0.295)	(0.006)	(0.005)
Aid/GDP	0.013	-0.009	-0.065**	-0.073	-0.186***	-0.226***	-0.015	0.003
	(0.049)	(0.028)	(0.031)	(0.044)	(0.062)	(0.068)	(0.030)	(0.033)
DebtSer/EXP	0.007	-0.011	-0.006	0.007	-0.003	-0.004	0.008	-0.000
	(0.017)	(0.014)	(0.016)	(0.022)	(0.015)	(0.017)	(0.019)	(0.016)
(a) Log NPV/GDP	-0.322	-0.670	1.701***	2.052**	0.774	0.602	0.795	0.170
	(0.673)	(0.716)	(0.404)	(0.986)	(0.564)	(0.516)	(0.489)	(0.922)
(b) Log NPV/GDP*D1	-1.349	-0.968	-4.292**	-5.468**	-2.668***	-2.500**	-2.177***	-1.343
	(0.919)	(1.224)	(1.765)	(2.582)	(1.004)	(0.974)	(0.741)	(1.191)
(c) Log NPV/GDP*D2	4.273***	4.367***	3.284*	3.669*	6.358***	6.145***	1.652**	0.823
	(1.303)	(1.176)	(1.689)	(2.073)	(1.691)	(1.566)	(0.761)	(0.930)
Constant	-1.968	-4.550	3.362*	0.193	2.243	2.026	-0.259	-1.346
	(3.534)	(2.777)	(1.875)	(2.499)	(3.429)	(3.758)	(2.708)	(2.411)
Observations	346	360	357	374	309	309	394	425
R^2	0.41	0.36	0.32	0.28	0.42	0.38	0.31	0.26
coef. (a)+(b)	-1.671***	-1.638**	-2.592	-3.417*	-1.894**	-1.898**	-1.38***	-1.17***
p-value test: (a)+(b)=0	0.00	0.02	0.10	0.08	0.01	0.01	0.01	0.05
coef. (a)+(b)+(c)	2.602***	2.729***	0.692*	0.253	4.464***	4.247***	0.27	-0.35
p-value test: (a)+(b)+c)=0	0.01	0.00	0.07	0.55	0.00	0.00	0.65	0.56
Debt overhang threshold	23	35	(10)	(10)	35	35	(10)	(10)
Debt irrelevance threshold	(80)	(80)	15	15	(80)	(80)	53	53
Number countries		40		39		32		47
Sargan/Hansen p-value		0.38		0.45		0.94		0.52
AR(2) P-Value		0.44		0.92		0.05		0.21

Notes: Robust standard errors in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent
Other control variables not reported.
Thresholds in brackets relate to values at the limit of the range

Table 7. Spline Growth Regression, Nominal Debt, OLS and sys-GMM
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	ALL		good policies		bad policies	
	OLS	sys-GMM	OLS	sys-GMM	OLS	sys-GMM
Log InGDP	-0.803***	-0.868**	-0.909***	-0.950***	-0.736*	-1.076***
	(0.211)	(0.340)	-0.249	-0.273	(0.397)	(0.320)
ToT Gr	0.028*	0.009	0.011	0.003	0.033	0.019
	(0.015)	(0.014)	-0.017	-0.017	(0.025)	(0.022)
Log PopGr	-0.541*	-1.193***	-0.808**	-1.229***	-0.418	-1.914***
	(0.302)	(0.385)	-0.332	-0.366	(0.747)	(0.621)
Log SecEnr	0.333	1.374***	-0.128	0.159	0.644	1.303***
	(0.297)	(0.490)	-0.382	-0.369	(0.521)	(0.462)
Log INV/GDP	3.219***	3.377***	4.634***	3.922***	2.755***	2.942***
	(0.429)	(0.500)	-0.641	-0.593	(0.570)	(0.611)
Budget/GDP	0.092***	0.125***	0.114***	0.152***	0.079*	0.058
	(0.032)	(0.046)	-0.039	-0.046	(0.043)	(0.039)
Open	-0.011*	-0.014**	-0.006	0.003	-0.024**	-0.013*
	(0.006)	(0.007)	-0.006	-0.007	(0.010)	(0.007)
Infl	-0.021***	-0.021***	-0.012	-0.006	-0.027***	-0.029***
	(0.004)	(0.005)	-0.007	-0.005	(0.005)	(0.005)
Aid/GDP	-0.041	-0.010	-0.020	-0.061*	-0.030	-0.025
	(0.027)	(0.037)	(0.041)	(0.034)	(0.038)	(0.042)
DebtSer/EXP	0.002	-0.017	0.005	-0.013	-0.003	0.004
	(0.011)	(0.014)	(0.014)	(0.016)	(0.019)	(0.015)
(a) LogDebt/GDP	0.872**	0.676	0.519	0.355	2.259***	3.449*
	(0.357)	(1.196)	(0.341)	(0.493)	(0.756)	(1.866)
(b) LogDebt/GDP*D1	-2.647***	-1.520	-3.158***	-2.309**	-3.542***	-5.045**
	(0.709)	(1.494)	(0.819)	(0.974)	(1.211)	(2.433)
(c) LogDebt/GDP*D2	2.216***	0.981	4.569***	3.668***	1.994**	1.745*
	(0.723)	(1.022)	(1.051)	(1.179)	(0.836)	(1.028)
Constant	2.029	-2.838	-1.646	-1.114	0.102	-5.497
	(1.691)	(3.014)	(2.707)	(2.526)	(2.488)	(4.436)
Observations	703	734	346	360	357	374
R^2	0.33	0.26	0.40	0.33	0.32	0.27
coef. (a)+(b)	-1.775***	-0.844	-2.638***	-1.954***	-1.283*	-1.596*
p-value test: (a)+(b)=0	0.00	0.14	0.00	0.01	0.06	0.05
coef. (a)+(b)+(c)	0.441	0.137	1.931***	1.714*	0.711	0.149
p-value test: (a)+(b)+c)=0	0.31	0.86	0.01	0.05	0.23	0.82
Debt overhang threshold	23	(10)	35	35	(10)	(10)
Debt irrelevance threshold	53	(80)	(80)	(80)	53	53
Number countries		79		36		43
Sargan/Hansen p-value		0.20		0.75		0.48
AR(2) P-Value		0.75		0.64		0.90

Notes: Robust standard errors in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Other control variables not reported.

Thresholds in brackets relate to values at the limit of the range

Table 8. Spline Growth Regression, Nominal Debt, OLS and sys-GMM (Continued)
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	High K flows		Low K flows		Low settl. Mort		High settl. Mort	
	OLS	sys-GMM	OLS	sys-GMM	OLS	sys-GMM	OLS	sys-GMM
Log InGDP	-0.558*	-0.660**	-0.874**	-0.989***	(0.330)	(0.319)	-0.687*	-0.775*
	(0.308)	(0.299)	(0.339)	(0.242)	0.024	0.022	(0.405)	(0.389)
ToT Gr	0.053***	0.054***	0.009	-0.008	(0.020)	(0.019)	0.029	0.010
	(0.020)	(0.016)	(0.021)	(0.019)	-0.873**	-1.070***	(0.021)	(0.018)
Log PopGr	-0.076	-0.363	-0.513	-1.336***	(0.386)	(0.353)	-0.286	-1.075
	(0.465)	(0.482)	(0.450)	(0.381)	0.293	0.883*	(0.611)	(0.669)
Log SecEnr	0.332	0.948*	0.219	0.691*	(0.496)	(0.451)	0.376	0.879*
	(0.515)	(0.517)	(0.424)	(0.374)	3.143***	2.532***	(0.377)	(0.452)
Log INV/GDP	4.566***	4.674***	2.395***	2.341***	(0.752)	(0.848)	3.125***	3.065***
	(0.699)	(0.690)	(0.541)	(0.602)	0.055	0.030	(0.582)	(0.524)
Budget/GDP	0.073	0.116**	0.118***	0.105*	(0.048)	(0.061)	0.086**	0.121**
	(0.045)	(0.043)	(0.038)	(0.057)	-0.007	0.002	(0.039)	(0.047)
Open	-0.013*	-0.015**	-0.025***	-0.012	(0.008)	(0.010)	-0.012	-0.005
	(0.008)	(0.006)	(0.010)	(0.012)	-0.021***	-0.019**	(0.009)	(0.007)
Infl	-0.022***	-0.022***	-0.025***	-0.025***	(0.006)	(0.008)	-0.022***	-0.024***
	(0.006)	(0.008)	(0.005)	(0.007)	(0.330)	(0.319)	(0.006)	(0.005)
Aid/GDP	0.015	-0.001	-0.076**	-0.072	-0.184***	-0.232***	-0.011	0.012
	(0.054)	(0.031)	(0.031)	(0.046)	(0.065)	(0.074)	(0.032)	(0.034)
DebtSer/EXP	0.003	-0.017	-0.003	0.003	-0.005	-0.007	0.003	-0.007
	(0.017)	(0.014)	(0.016)	(0.022)	(0.015)	(0.018)	(0.018)	(0.015)
(a) LogDebt/GDP	0.522	-0.222	1.007**	1.484**	0.639	0.363	0.914**	0.681
	(0.582)	(0.790)	(0.398)	(0.568)	(0.666)	(0.685)	(0.428)	(0.654)
(b) LogDebt/GDP*D1	-2.241**	-1.580	-2.877*	-2.719**	-2.125*	-1.929	-3.146***	-2.781*
	(0.921)	(1.167)	(1.541)	(1.240)	(1.083)	(1.196)	(1.146)	(1.453)
(c) LogDebt/GDP*D2	3.322***	3.859***	3.094*	1.796	5.315***	5.555***	2.302**	1.682
	(1.132)	(1.165)	(1.594)	(1.146)	(1.528)	(1.498)	(1.163)	(1.319)
Constant	-2.986	-5.513*	2.724	-0.597	2.049	2.750	-0.857	-2.622
	(3.444)	(3.101)	(1.948)	(2.580)	(4.028)	(4.627)	(2.573)	(2.427)
Observations	346	360	357	374	309	309	394	425
R^2	0.40	0.36	0.32	0.28	0.42	0.38	0.31	0.25
coef. (a)+(b)	-1.719***	-1.802***	-1.870	-1.235	-1.486**	-1.566*	-2.23**	-2.10*
p-value test: (a)+(b)=0	0.01	0.01	0.18	0.20	0.05	0.06	0.02	0.06
coef. (a)+(b)+(c)	1.603*	2.057**	1.224**	0.561	3.829***	3.989***	0.07	-0.42
p-value test: (a)+(b)+(c)=0	0.07	0.02	0.03	0.34	0.00	0.00	0.91	0.47
Debt overhang threshold	23	35	35	23	35	35	23	23
Debt irrelevance threshold	(80)	(80)	53	53	(80)	(80)	53	53
Number countries		40		39		32		47
Sargan/Hansen p-value		0.37		0.34		0.94		0.55
AR(2) P-Value		0.44		0.99		0.05		0.25

Notes: Robust standard errors in parentheses. * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.
Other control variables not reported.
Thresholds in brackets relate to values at the limit of the range

Table 9. Threshold Estimation Regressions, NPV of Debt, OLS, Full Sample
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	Log NPV/GDP <2.84 (NPV/GDP <17)	2.84>Log NPV/GDP >3.62 (17>NPV/GDP >37.4)	Log NPV/GDP >3.62 (NPV/GDP >37.4)
Log InGDP	0.366	-1.745***	-0.869***
	(0.748)	(0.351)	(0.283)
ToT Gr	0.032	0.017	0.026
	(0.032)	(0.020)	(0.022)
Log PopGr	0.995	-1.415**	-1.126**
	(0.727)	(0.571)	(0.466)
Log SecEnr	-0.288	1.029**	0.694
	(0.762)	(0.504)	(0.512)
Log INV/GDP	1.366	2.832***	3.275***
	(1.323)	(0.592)	(0.602)
Budget/GDP	-0.024	0.148***	0.142***
	(0.039)	(0.050)	(0.049)
Open	0.022	0.015*	-0.032***
	(0.016)	(0.008)	(0.010)
Infl	0.025	-0.022***	-0.025***
	(0.048)	(0.007)	(0.004)
Aid/GDP	0.044	-0.216***	-0.001
	(0.118)	(0.059)	(0.031)
DebtSer/EXP	0.004	0.074***	-0.027**
	(0.047)	(0.026)	(0.014)
Log NPV/GDP	0.248	-0.306	0.639
	(0.556)	(0.990)	(0.425)
Constant	-6.513	7.321	4.407
	(6.867)	(4.449)	(3.017)
Observations	128	204	371
R-squared	0.36	0.48	0.42

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent; All regressions include time dummies.

Table 10. Threshold Estimation Regressions, NPV of Debt, OLS, Good CPIA
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	Log NPV/GDP<2.87 (NPV/GDP<17.6)	2.87>Log NPV/GDP>4.27 (17.6>NPV/GDP>71.7)	Log NPV/GDP>4.273 (NPV/GDP>71.7)
Log InGDP	0.290	-1.343***	-0.464
	(0.831)	(0.300)	(0.982)
ToT Gr	-0.010	0.043*	0.019
	(0.043)	(0.023)	(0.042)
Log PopGr	0.747	-1.409***	-3.015
	(1.392)	(0.455)	(2.553)
Log SecEnr	-0.454	0.382	-1.475
	(1.307)	(0.487)	(2.127)
Log INV/GDP	4.910	4.637***	3.897
	(3.009)	(0.611)	(2.592)
Budget/GDP	-0.076	0.152***	-0.024
	(0.162)	(0.043)	(0.098)
Open	0.024	-0.000	-0.037
	(0.038)	(0.008)	(0.025)
Infl	0.038	-0.008	-0.040
	(0.100)	(0.008)	(0.066)
Aid/GDP	-0.001	-0.081*	-0.003
	(0.437)	(0.043)	(0.088)
DebtSer/EXP	0.041	0.028	-0.136**
	(0.050)	(0.019)	(0.055)
Log NPV/GDP	0.297	-1.472*	2.409
	(0.976)	(0.754)	(2.768)
Constant	-17.320	7.104*	-2.022
	(15.946)	(4.118)	(29.801)
Observations	65	226	55
R-squared	0.52	0.47	0.68

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent; All regressions include time dummies.

Table 11. Threshold Estimation Regressions, NPV of Debt, OLS, Bad CPIA
Dependent Variable: Per Capita GDP Growth (PCGDP Gr)

	Log NPV/GDP<2.85 (NPV/GDP<17.3)	2.85>Log NPV/GDP>3.56 (17.3<NPV/GDP<35.1)	Log NPV/GDP>3.56 (NPV/GDP>35.1)
Log InGDP	-0.364	-2.651***	-0.700
	(1.686)	(0.742)	(0.542)
ToT Gr	0.149**	-0.037	0.027
	(0.059)	(0.042)	(0.034)
Log PopGr	-2.023	-2.733***	-0.340
	(1.864)	(0.888)	(0.909)
Log SecEnr	1.560	1.966**	0.542
	(1.287)	(0.779)	(0.855)
Log INV/GDP	-2.497	2.620***	3.180***
	(1.615)	(0.964)	(0.753)
Budget/GDP	-0.072	0.123	0.160**
	(0.052)	(0.106)	(0.066)
Open	0.017	0.038**	-0.045***
	(0.026)	(0.019)	(0.015)
Infl	0.038	-0.039	-0.029***
	(0.060)	(0.026)	(0.005)
Aid/GDP	0.039	-0.347***	0.011
	(0.192)	(0.095)	(0.046)
DebtSer/EXP	-0.179**	0.210***	-0.039*
	(0.086)	(0.069)	(0.021)
LogNPV/GDP	0.901	-0.559	0.990
	(1.324)	(2.040)	(0.612)
Constant	14.494*	3.820	3.107
	(8.564)	(8.291)	(3.793)
Observations	66	97	194
R-squared	0.42	0.59	0.45

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent; All regressions include time dummies.

Table 12. Determinants of Resource Flows, NPV Debt
Dependent Variable: Aggregate Net Transfers (ANT/GDP)

	OLS		**SGMM**	
	(1)	(2)	(3)	(4)
ANT/GDP$_{-1}$	0.675***	0.659***	0.693***	0.646***
	(0.044)	(0.043)	(0.072)	(0.088)
Log InGDP	-1.656***	-1.279***	-1.907***	-0.731
	(0.283)	(0.300)	(0.424)	(0.722)
ToTGr$_{-1}$	0.015	0.015	0.026	0.024
	(0.021)	(0.021)	(0.024)	(0.024)
Log PopGr	-1.256**	-1.348**	-1.896**	-1.723*
	(0.621)	(0.631)	(0.934)	(1.023)
Open$_{-1}$	0.002	0.004	-0.011	-0.015
	(0.008)	(0.008)	(0.018)	(0.020)
PCGDP Gr$_{-1}$	-0.006	0.003	0.015	0.025
	(0.060)	(0.059)	(0.111)	(0.112)
(a) Log NPV/GDP $_{-1}$	-0.015	-0.746**	-0.347	-1.987**
	(0.288)	(0.356)	(0.633)	(0.859)
(b) H* Log NPV/GDP$_{-1}$		0.938**		1.611*
		(0.457)		(0.856)
HIPC (H)		-1.557		-3.147
		(1.594)		(3.081)
Constant	11.378***	11.180***	16.638***	14.245**
	(2.514)	(2.851)	(3.993)	(6.535)
Observations			655	655
Number of Countries			79	79
Sargan/HansenP-Value			0.88	0.94
AR(2) P-Value	628	628	0.97	0.95
R^2	0.65	0.66	0.65	0.65
P-value test: (a) + (b)=0		0.59		0.58

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 13. Determinants of Resource Flows, Debt
Dependent Variable: Aggregate Net Transfers (ANT/GDP)

	OLS		SGMM	
	(1)	(2)	(3)	(4)
INV/GDP$_{-1}$	0.666***	0.650***	0.706***	0.657***
	(0.044)	(0.044)	(0.068)	(0.077)
Log InGDP	-1.673***	-1.421***	-1.813***	-0.999
	(0.279)	(0.304)	(0.458)	(0.780)
ToTGr$_{-1}$	0.016	0.016	0.026	0.023
	(0.021)	(0.021)	(0.025)	(0.024)
Log PopGr	-1.280**	-1.344**	-1.952**	-1.780*
	(0.623)	(0.635)	(0.966)	(1.040)
Open$_{-1}$	0.002	0.003	-0.017	-0.018
	(0.008)	(0.008)	(0.018)	(0.020)
PCGDP Gr$_{-1}$	-0.002	0.008	-0.001	0.009
	(0.060)	(0.060)	(0.106)	(0.109)
(a) Log Debt/GDP $_{-1}$	0.260	-0.545	-0.149	-1.792*
	(0.315)	(0.384)	(0.703)	(0.941)
(b) H* Log Debt/GDP $_{-1}$		1.078**		1.909**
		(0.501)		(0.936)
HIPC (H)		-2.563		-5.280
		(1.875)		(3.791)
Constant	10.577***	11.597***	16.372***	15.897**
	(2.625)	(3.061)	(4.298)	(7.332)
Observations			655	655
Number of Countries			79	79
Sargan/HansenP-Value			0.92	0.94
AR(2) P-Value	628	628	0.97	0.98
R2	0.65	0.66	0.65	0.65
P-value test: (a) + (b)=0		0.17		0.88

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 14. Determinants of Lending Terms
Dependent Variable: Average Grant Element (GREL/GDP)

	OLS		SGMM	
	Nominal Debt	NPV Debt	Nominal Debt	NPV Debt
GREL/GDP$_{-1}$	0.633***	0.620***	0.530***	0.516***
	(0.041)	(0.042)	(0.108)	(0.104)
Log InGDP	-6.573***	-6.383***	-6.618**	-5.971**
	(1.035)	(1.011)	(3.158)	(2.797)
ToTGr$_{-1}$	-0.031	-0.033	-0.041	-0.028
	(0.056)	(0.056)	(0.086)	(0.084)
Log PopGr	-0.732	-0.833	-0.539	-0.362
	(1.333)	(1.341)	(2.087)	(2.129)
Open$_{-1}$	0.021	0.021	0.014	0.016
	(0.019)	(0.019)	(0.056)	(0.051)
PCGDP Gr$_{-1}$	-0.319**	-0.327**	-0.159	-0.184
	(0.158)	(0.159)	(0.348)	(0.347)
(a) Log NPV/GDP $_{-1}$	-2.385**	-2.820***	-2.217	-3.573
	(1.133)	(1.076)	(2.509)	(2.509)
(b) H* Log NPV/GDP $_{-1}$	2.524*	2.609**	5.664**	5.360***
	(1.352)	(1.210)	(2.289)	(2.015)
HIPC (H)	-5.327	-4.446	-18.222*	-13.600*
	(5.437)	(4.479)	(9.764)	(7.580)
Constant	75.842***	76.197***	67.033**	64.959**
	(11.376)	(11.114)	(28.834)	(24.667)
Observations	628	628	655	655
Number of Countries			79	79
Sargan/HansenP-Value			0.82	0.82
AR(2) P-Value			0.49	0.56
R^2	0.80	0.80	0.77	0.77
P-value test: (a) + (b)=0	0.89	0.82	0.02	0.22

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 15. Determinants of Total Investment, NPV Debt
Dependent Variable: Total Investment (INV/GDP)

	OLS		SGMM	
	(1)	(2)	(3)	(4)
INV/GDP_{-1}	0.655***	0.652***	0.599***	0.588***
	(0.032)	(0.032)	(0.049)	(0.045)
$PCGDP\ Gr_{-1}$	0.440***	0.431***	0.610***	0.547***
	(0.050)	(0.049)	(0.090)	(0.098)
$ToTGr_{-1}$	-0.011	-0.013	-0.037**	-0.036**
	(0.018)	(0.017)	(0.015)	(0.015)
Open	0.033***	0.032***	0.022*	0.022*
	(0.007)	(0.007)	(0.012)	(0.012)
(a) $Log\ NPV/GDP_{-1}$	-0.314*	-0.807***	-0.619**	-1.363***
	(0.180)	(0.222)	(0.300)	(0.399)
(b) $H^*\ Log\ NPV/GDP_{-1}$		0.890**		1.332*
		(0.3336)		(0.686)
HIPC (H)		-3.447**		-5.005**
		(1.256)		(2.488)
Constant	4.367***	6.300***	8.314***	11.255***
	(1.098)	(1.218)	(1.467)	(1.930)
Observations	628	628	655	655
Number of Countries			79	79
Sargan/HansenP-Value			1.00	1.00
AR(2) P-Value			0.80	0.78
R^2	0.73	0.73	0.71	0.72
P-value test: (a) + (b)=0		0.75		0.95

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 16. Determinants of Total Investment, Debt
Dependent Variable: Total Investment (INV/GDP)

	OLS		SGMM	
	(1)	(2)	(3)	(4)
INV/GDP_{-1}	0.655***	0.652***	0.613***	0.610***
	(0.032)	(0.033)	(0.049)	(0.045)
$PCGDP\ Gr_{-1}$	0.441***	0.435***	0.631***	0.599***
	(0.050)	(0.049)	(0.088)	(0.096)
$ToTGr_{-1}$	-0.013	-0.014	-0.037**	-0.036**
	(0.018)	(0.017)	(0.015)	(0.016)
Open	0.033***	0.033***	0.017	0.016
	(0.007)	(0.007)	(0.011)	(0.011)
(a) $Log\ Debt/GDP_{-1}$	-0.385*	-0.936***	-0.606*	-1.145**
	(0.205)	(0.270)	(0.337)	(0.506)
(b) $H^*\ Log\ Debt/GDP_{-1}$		0.975**		0.936
		(0.384)		(0.858)
HIPC (H)		-3.905**		-3.702
		(1.532)		(3.353)
Constant	4.647***	6.841***	8.476***	10.581***
	(1.147)	(1.336)	(1.634)	(2.476)
Observations	628	628	655	655
Number of Countries			79	79
Sargan/HansenP-Value			1.00	1.00
AR(2) P-Value			0.80	0.79
R^2	0.73	0.73	0.71	0.72
P-value test: (a) + (b)=0		0.89		0.71

Notes: Robust standard errors in parentheses; * significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 1. List and Sources of Variables

Variable	Variable Name	Definitions/Explanations	Source
Per capita real GDP		GDP per capita in constant 2000 US dollars.	WDI
Per capita real GDP growth	L PCGDP Gr	Log difference of per capita real GDP.	WDI
Population growth	L PopGr	Annual population growth (in %).	WDI
Secondary school enrollment	L SecEnr	Secondary school enrollment (in % gross).	WDI
Terms of trade growth	ToT Gr	Log difference of terms of trade.	WEO
Investment to GDP	LINV/GDP	The ratio of gross fixed capital formation to GDP, both in local currency.	WEO
Public investment to GDP	LPUBINV/GDP	The ratio of gross public fixed capital formation to GDP, both in local currency.	WEO
Private investment to GDP	LPRIVINV/GDP	The ratio of gross private fixed capital formation to GDP, both in local currency.	WEO
Central government balance to GDP	Budget/GDP	The ratio of central government balance to GDP, both in local currency.	WEO
Inflation	Infl	Log difference of consumer price index.	WEO
Openness	Open	Exports and imports of goods and services divided by GDP, all in US dollars.	WEO for the trade series and WDI for GDP
Debt stock to GDP	LDebt/GDP	The ratio of total debt stocks to GDP, both in US dollars.	GDF for the debt series and WDI for GDP
NPV debt to GDP	LNPV/GDP	The ratio of net present value of debt to GDP, both in US dollars.	World Bank data for NPV debt and WDI for GDP
Debt service to exports	DebtSer/EXP	The ratio of total debt service paid to exports of goods and services, both in US dollars.	GDF for the debt series and WEO for the exports series.
Aid to GDP	Aid/GDP	The sum of grants (excluding technical cooperation), multilateral and bilateral concessional disbursements and IMF purchases divided by GDP. All in US dollars.	GDF for all series except for GDP, and WDI for GDP.
Aggregate net transfers to GDP	ANT/GDP	The ratio of aggregate net transfers to GDP, both in US dollars.	GDF for the transfer series and WDI for GDP
Official net transfers to GDP	ONT/GDP	The ratio of official net transfers to GDP, both in US dollars	GDF for the transfer series and WDI for GDP

Table 1. List and Sources of Variables (Concluded)

Variable	Variable Name	Definitions/Explanations	Source
Private net transfers to GDP	PNT/GDP	The ratio of private net transfers to GDP, both in US dollars	GDF for the transfer series and WDI for GDP
Private Capital Flows to GDP	PrivK/GDP	The ratio of private capital flows to GDP, both in US dollars	WEO
CPIA index	CPIA	Country policy and institutional assessment index. It ranges from 0 to 1, with higher values indicating better policies	World Bank
Rule of law	Rule		La Porta et al
Legal origin		Dummies for English, French, socialist, German and Scandinavian legal origin	Kauffman et al
Ethnic fractionalization	Ef		Easterly and Levine
Distance to Equator	Disteq	Distance to Equator from Capital City	Rodrik et al

Table 2. Summary Statistics: Mean Values

	1970–1979	1980–1989	1990–1995	1996–2002	1970–2002
Aggregate net transfer to GDP					
ALL	5.5	6.0	5.7	3.7	5.4
HIPC	7.2	10.2	12.5	8.4	9.4
Non-HIPC	4.3	3.3	1.5	1.5	3.0
Central government balance to GDP					
ALL	-5.2	-5.7	-3.6	-3.2	-4.8
HIPC	-5.0	-6.3	-6.1	-2.6	-5.3
Non-HIPC	-5.3	-5.3	-2.0	-3.4	-4.4
CPIA					
ALL	2.6	2.9	3.0	3.3	2.9
HIPC	2.3	2.7	2.8	3.0	2.7
Non-HIPC	2.9	3.1	3.2	3.5	3.1
Grants to GDP					
ALL	3.6	5.5	7.0	4.1	4.9
HIPC	5.3	8.2	13.6	9.8	8.4
Non-HIPC	2.4	3.8	3.0	1.4	2.8
Growth per capita					
ALL	1.9	0.2	0.6	1.2	1.0
HIPC	0.6	-0.7	-1.6	1.3	-0.2
Non-HIPC	2.7	0.7	2.0	1.2	1.7
Inflation					
ALL	13.6	22.6	25.3	9.4	17.9
HIPC	12.5	22.6	23.6	7.5	17.1
Non-HIPC	14.3	22.5	26.3	10.3	18.4
Investment to GDP					
ALL	20.2	19.8	19.9	20.3	20.0
HIPC	17.4	16.6	16.1	17.2	16.9
Non-HIPC	22.1	22.0	22.2	21.8	22.0
Net Private Capital Flows to GDP					
ALL	2.1	2.0	0.6	1.7	1.7
HIPC	1.6	1.9	-1.6	3.1	1.3
Non-HIPC	2.4	2.1	1.9	1.1	2.0
NPV of debt to GDP					
ALL	12.6	40.8	59.3	44.8	35.8
HIPC	15.1	50.4	94.6	71.1	49.2
Non-HIPC	10.8	34.4	37.7	32.3	27.4
Official net transfers to GDP					
ALL	4.2	6.6	6.0	2.8	5.1
HIPC	5.8	10.3	12.7	8.1	8.9
Non-HIPC	3.0	4.2	1.8	0.3	2.7
Openness to GDP					
ALL	57.3	56.7	62.5	69.1	59.9
HIPC	56.9	51.1	55.1	62.0	55.2
Non-HIPC	57.5	60.5	67.1	72.4	62.8

Table 2. Summary Statistics: Mean Values (Concluded)

	1970–1979	1980–1989	1990–1995	1996–2002	1970–2002
Population growth					
ALL	2.5	2.5	2.2	2.0	2.4
HIPC	2.6	2.8	2.4	2.8	2.6
Non-HIPC	2.4	2.3	2.0	1.7	2.2
Private investment to GDP					
ALL	10.5	11.1	13.5	14.0	11.9
HIPC	7.2	8.2	9.2	9.2	8.3
Non-HIPC	12.1	13.0	16.0	16.2	13.9
Private net transfers to GDP					
ALL	1.4	-0.6	-0.3	0.9	0.3
HIPC	1.5	-0.1	-0.2	0.3	0.5
Non-HIPC	1.3	-0.8	-0.3	1.2	0.3
Public investment to GDP					
ALL	9.5	8.9	6.4	6.3	8.1
HIPC	10.7	9.0	6.8	7.9	8.8
Non-HIPC	9.0	8.8	6.1	5.5	7.7
Secondary school enrolment					
ALL	20.5	30.8	37.7	47.6	36.1
HIPC	11.7	18.8	19.9	20.0	18.2
Non-HIPC	26.8	38.6	48.5	60.3	46.7
Terms of trade growth					
ALL	1.3	-0.8	-0.4	-0.9	0.0
HIPC	-0.3	-1.2	-0.3	-2.1	-0.8
Non-HIPC	2.5	-0.5	-0.5	-0.4	0.5
Total NPV of debt to GDP					
ALL	19.7	55.5	76.7	60.4	48.7
HIPC	20.3	67.8	121.0	88.2	64.0
Non-HIPC	19.3	47.5	49.5	47.1	39.1
Total debt service to GDP					
ALL	3.1	6.0	6.3	5.8	5.1
HIPC	2.6	5.6	6.3	4.6	4.5
Non-HIPC	3.4	6.3	6.3	6.4	5.4
Total debt to GDP					
ALL	28.2	68.3	89.7	71.0	59.7
HIPC	31.3	88.2	144.3	113.5	82.1
Non-HIPC	26.1	55.3	56.3	50.8	45.7

Table 3. Country Classification by HIPC Status and Debt Levels

	HIPC	Non HIPC
Debt above median	Burundi, Cameroon, Congo, Dem. Republic of, Congo, Republic of, Cote d'Ivoire, Ethiopia, Ghana, Guinea, Guinea-Bissau, Guyana, Honduras, Kenya, Lao People's Dem. Republic, Madagascar, Mali, Mauritania, Mozambique, Nicaragua, Senegal, Sierra Leone, Sudan, Togo, Vietnam, Yemen, Zambia	Cambodia, Chile, Comoros, Costa Rica, Egypt, Gambia, Indonesia, Jamaica, Lebanon, Morocco, Nigeria, Panama, Papua New Guinea, Peru, Philippines, Syrian Arab Republic
Debt below median	Benin Burkina Faso Central African Republic Chad Malawi Niger Rwanda Uganda	Algeria, Argentina, Bangladesh, Botswana, Brazil, Cape Verde, Colombia, Djibouti, Dominican Republic, El Salvador, Guatemala, Haiti, India, Iran, Lesotho, Malaysia, Mauritius, Mexico, Nepal, Pakistan, Paraguay, South Africa, Sri Lanka, Swaziland, Trinidad and Tobago, Tunisia, Turkey, Uruguay, Venezuela, Zimbabwe

Table 4. Country Classification by HIPC Status and CPIA Index

	HIPC	Non HIPC
Good CPIA	Cameroon , Cote d'Ivoire, Ghana, Kenya, Malawi, Rwanda, Senegal, Togo, Vietnam	Algeria, Botswana, Brazil, Cape Verde, Chile, Colombia, Costa Rica, Gambia, India, Indonesia, Iran, Jamaica, Malaysia, Mauritius, Mexico, Morocco, Panama, Paraguay, Philippines, South Africa, Sri Lanka, Trinidad and Tobago, Tunisia, Turkey, Uruguay, Venezuela
Bad CPIA	Benin, Burkina Faso, Burundi, Central African Republic, Chad, Congo, Dem. Republic of, Congo, Republic of, Ethiopia, Guinea, Guinea-Bissau, Guyana, Honduras, Lao People's Dem. Republic, Madagascar, Mali, Mauritania, Mozambique, Nicaragua, Niger, Sierra Leone, Sudan, Uganda, Yemen, Zambia	Argentina, Bangladesh, Cambodia, Comoros, Djibouti, Dominican Republic, Egypt, El Salvador, Guatemala, Haiti, Lebanon, Lesotho, Nepal, Nigeria, Pakistan, Papua New Guinea, Peru, Syrian Arab Republic, Swaziland, Zimbabwe

Table 5. Country Classification by HIPC Status and IDA Status in 2004

	HIPC	Non HIPC
IDA	Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Dem. Republic of, Congo, Republic of, Cote d'Ivoire, Ethiopia, Ghana, Guinea, Guinea-Bissau, Guyana, Honduras, Kenya, Lao People's Dem. Republic, Madagascar, Malawi, Mali, Mauritania, Mozambique, Nicaragua, Niger, Rwanda, Senegal, Sierra Leone, Sudan, Togo, Uganda, Vietnam, Yemen, Zambia	Bangladesh, Cambodia, Cape Verde, Djibouti, Gambia, Haiti, India, Indonesia, Lesotho, Nepal, Nigeria, Pakistan, Papua New Guinea, Sri Lanka, Zimbabwe
Non-IDA		Algeria, Argentina, Botswana, Brazil, Chile, Colombia, Comoros, Costa Rica, Dominican Republic, Egypt, El Salvador, Guatemala, Iran, Jamaica, Lebanon, Malaysia, Mauritius, Mexico, Morocco, Panama, Paraguay, Peru, Philippines, South Africa, Swaziland, Syrian Arab Republic, Trinidad and Tobago, Tunisia, Turkey, Uruguay, Venezuela