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The Debt-Growth Nexus in Poor Countries: A Reassessment

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Abstract:

The paper investigates the relationship between external debt and economic growth, focusing on the role played by the policy and institutional framework. Results for a panel of 114 developing countries show that the debt-growth nexus depends on institutions and policies. The Debt-Laffer curve looses statistical significance once institutional quality is controlled for and debt overhang seems to be at work exclusively in countries with sound institutions. On the contrary, external debt proves to be irrelevant for countries with weak institutions. A policy implication is that efficient debt relief policies should be tailored to country-specific characteristics and conditional to a certain level of institutional quality.

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1 Introduction

The Highly Indebted Poor Countries (HIPC) Initiative was launched more than a decade ago by the International Monetary Fund (IMF) and the World Bank to ensure a permanent exit from debt dependence and provide budgetary support to implement the poverty reduction strategies. Notwithstanding great efforts and financial disbursements, the original policies failed to spur sustained economic growth in highly indebted countries and to ensure long-term debt sustainability. Thus, debt relief is still one of the critical issues on the policy agenda of governments and international institutions. At the G8 summit at Gleneagles in 2005 and at the following meetings donors and the international community agreed to further debt cancelation to the HIPCs. As a result, in March 2006, the Multilateral Debt Relief Initiative (MDRI) was introduced as a new policy tool to provide additional support and financing to the world's poorest and most indebted countries. Namely, all countries reaching completion point under the HIPC Initiative will receive up-front and irrevocable cancelation of their external debt owed to the World Bank, the African Development Bank and the IMF[1]. However, the international community bears large costs to finance debt relief programs, given that the HIPC Initiative is going to cost 68 billions of US dollar (in 2006 present value terms) and the MDRI debt relief will add other 38 billions of US dollar (in nominal terms) (International Development Association and International Monetary Fund, 2007*a*). An efficient use of these resources should require a careful cost-benefit analysis. In particular, the destination of a large share of scarce resources to a limited number of countries lacking the basic infrastructures and institutions to trigger economic growth means that there will be less available resources to assist other poor countries better equipped to use external assistance efficiently (Easterly, 2001; Arslanalp and Henry, 2006; Jayachandran and Kremer, 2006)[2]. Therefore, investigating the debt–growth nexus in poor countries is critical to draw sensible policy recommendations. Given the large costs, policy makers should have sound evidence that debt reduction is going to cause growth. As it stands, the current approach to debt relief proposals is based on an uniform treatment by donors to indebted poor countries. However, this is not necessarily the right or the most efficient one, since the evidence on the relationship between external debt and economic growth is not conclusive and shows the importance of country-specific characteristics (Rajan, 2005; Cordella, Ricci and Ruiz-Arranz, 2005).

[1]To graduate for debt cancelation, eligible countries have to undergo a two-step process, consisting of a *decision point* (DP), reached once they have a track record of macroeconomic stability and have prepared a Poverty Reduction Strategy Paper (PRSP), and a *completion point* (CP), achieved once a country has maintained macroeconomic stability under the IMF's Poverty Reduction and Growth Facility program, implemented a PRSP and carried out structural and social reforms for at least one year. At DP, countries start receiving interim relief on a provisional basis, while once graduated from CP the full amount of debt relief becomes irrevocable.

[2]This point is supported by the concerns expressed by the World Bank about the possibility that the costs of the HIPC Initiative and of the MDRI will reduce the total amount of resources available to the International Development Association (IDA – the World Bank lending arm for low-income countries), undermining its lending capacity (International Development Association, 2005).

This paper focuses on the economic consequences of high debts in poor countries, building on a stream of literature that aims at assessing the relationship between external debt and GDP growth. In addition, building on the hypothesis that this relationship could differ according to countries' specific characteristics (Cordella, Ricci and Ruiz-Arranz, 2005), the paper directly investigates the role played by institutions and policies in the debt-growth nexus. I acknowledge that the presence of a large indebtedness has other effects on poor countries, not only related to their macroeconomic performance, but also to the political and institutional framework, which could eventually impinge on economic growth. Besides, the HIPC Initiative and the MDRI deal with the critical issue of debt sustainability, which is clearly related to the overall economic performance. However, these aspects are not the object of the paper. Furthermore, the paper does not address the issue of the channels through which external debt affects growth[3].

Finally, before discussing the relevant literature on this topic, it is worth stressing that the paper does not explicitly address the effect of actual debt relief, as done recently by a very interesting and promising strand of literature (Depetris Chauvin and Kraay, 2005; Johansson, 2008, who do not find any significant effect of debt relief on growth and investment), but it is concerned with the more general implications of external debt on economic growth.

1.1 Related Literature

The rationale for a negative correlation between external debt and economic growth is related to the *debt overhang* effect (Krugman, 1988; Sachs, 1989; Cohen, 1993), according to which a large debt burden squeezes investments, because returns are "taxed away" by foreign creditors. This theoretical argument was developed in response to the Latin American crisis of the 1980s, which affected middle-income countries and debts contracted mainly with private creditors. However, the current debt crisis involves low-income countries, mainly located in Sub-Saharan Africa, without market access and highly dependant on concessional external lending. These countries, through large inflows of external credit at high concessional terms by multilateral institutions, keep on receiving net positive resource transfers which reduce the disincentive effect of external public debt (Bird and Milne, 2003). Besides, weak economic institutions and infrastructure, and not excessive debt burdens, are the major hindrance to investment in HIPC countries (Arslanalp and Henry, 2006). The current situation seems to adapt better to an extensive interpretation of debt overhang, which implies a disincentive on investments in human capital and new technologies, and the government's willingness to adopt structural reforms and fiscal adjustments, leading to a poverty trap (Sachs, 2002). Besides, the uncertainty associated with the level of external public debt (i.e. risk of default, rescheduling and arrears) increases the volatility of future inflows, leading to a situation in which investors are likely to exercise the "waiting" option (Serven, 1997). Thus, an unstable macroeconomic environment (i.e. high and volatile inflation and interest rates) is likely to generate a misallocation of resources, maybe due to short-termism, which

[3]On this, see Pattillo, Poirson and Ricci (2004) and Presbitero (2006) who both stress the relevant role played by Total Factor Productivity.

reduces the efficiency and productivity of capital, leading to a slowdown of economic growth[4].

Some earlier papers (among others, Elbadawi, Ndulu and Ndung'u, 1997; Pattillo, Poirson and Ricci, 2002, 2004; Clements, Bhattacharya and Nguyen, 2003) suggest that the debt–growth relationship follows a bell-shaped curve since, beyond a certain debt ratio, the impact of the stock of external debt on growth becomes negative[5]. In particular, Pattillo, Poirson and Ricci (2002) show that the marginal impact of external debt on growth in developing countries becomes negative for values of the Net Present Value (NPV) of debt ranging between 5 and 50 per cent of GDP, depending on the estimation methodology. Considering exclusively low-income countries, Clements, Bhattacharya and Nguyen (2003) estimate a similar growth model allowing for non-linearities in the effect of debt and find that the turning point of the "Debt-Laffer" curve is in correspondence of a NPV of debt–to–GDP ratio of about 20–25 per cent.

These studies provide some evidence of debt overhang in low- and middle-income countries although inconclusive, because of the lack of robustness of econometric results (Moss and Chiang, 2003; Depetris Chauvin and Kraay, 2005). Specifically, the main issue to deal with is the direction of causality, since it is neither clear nor necessary that high debt reduces economic growth. It could be the other way round (Easterly, 2001), or the pattern of debt accumulation and lower growth could be jointly determined by other factors (Lane, 2004), such as policies and institutions. The importance of institutional factors as determinants of economic growth is widely recognized (Acemoglu, Johnson and Robinson, 2005), while there is few evidence on what drives debt accumulation. A notable exception is the work by Colombo and Longoni (2007), who show that institutional and socio political variables play a key role in explaining the level of external debt.

Two recent papers by Cordella, Ricci and Ruiz-Arranz (2005) and Imbs and Ranciere (2005) move from the previous literature and extend the analysis in different ways finding mixed evidence on the presence of debt overhang. The former allows for different effects across countries sub-samples (defined in terms of market access and institutional quality), uses a new method to estimated the debt thresholds and better addresses the issue of reverse causality. Cordella, Ricci and Ruiz-Arranz estimate a debt-growth relationship with two breaks, finding evidence of debt overhang for intermediate levels of indebtedness. On the contrary, at low and high level of debt the relationship turns out to be not significant. Thus, over a certain threshold (a ratio between the NPV of external debt and GDP of around 60 per cent), the marginal (but not the average) debt overhang is absent. Moreover, the authors show that the debt overhang and the debt irrelevance zone differ according to countries' characteristics: countries with better institutions, better policies and easier market access exhibit higher thresholds than countries with worse conditions, for

[4]Even if not considered here, also debt flows could affect economic performance through the so-called *liquidity constraint* effect. Empirical findings on the effectiveness of the crowding out of investment are debatable (see, among others Cohen, 1993; Pattillo, Poirson and Ricci, 2002; Clements, Bhattacharya and Nguyen, 2003; Chowdhury, 2004; Hansen, 2004; Presbitero, 2006; Fosu, 2007).

[5]The main measures of external indebtedness are the ratios of external debt over GDP and over exports.

which the negative relation is generally less robust. Imbs and Ranciere use kernel estimators, which have the advantage of avoiding the imposition of any restriction on the the non-linearities in the debt-growth relationship, to test the presence of the Debt-Laffer curve in developing countries. Their results are consistent with a debt overhang effect starting when the NPV of external debt exceeds 40 per cent of GDP. Besides, the authors are able to show that, once fixed effects are considered, a smaller number of countries displays a Debt-Laffer curve. Therefore, this non-linearity could be driven by some omitted time invariant control which jointly determine low growth and high debt. The estimation of a growth equation controlling for different time invariant institutional variables partially confirms this hypothesis.

1.2 Main Findings and Outline of the Paper

With respect to the existing literature, this paper aims at ascertain whether and to what extent institutions and policies affect the debt-growth nexus. Unlike Imbs and Ranciere (2005), I control for a time variant institutional indicator and, instead of looking at different sub-samples (Cordella, Ricci and Ruiz-Arranz, 2005), I interact the institutional variable with debt indicators in order to find out a possible source of heterogeneity. Differently from an earlier version of the paper (Presbitero, 2007), the issue of reverse causality is addressed, other than estimating the growth model by System–GMM, also smoothing the denominator of the debt ratios to wash out the potential correlation between low growth and subsequent larger debt to GDP ratio (Cordella, Ricci and Ruiz-Arranz, 2005).

Results suggest that policies and institutions are likely to simultaneously affect debt accumulation and growth. The Debt-Laffer curve which is present in the sample of developing countries looses statistical significance once institutional quality is controlled for. Moreover, the debt-growth nexus clearly depends on the country-specific institutional framework. Different specifications show that debt overhang is effective exclusively in countries with good policies and institutions. On the contrary, external debt seems to be irrelevant for countries with weak institutions. Larger debts and more resource transfers could explain the lack of debt overhang. A number of robustness exercises do not significantly affect these findings.

From a policy perspective, the focus on the overall CPIA index for institutions and policy assessment and on a parsimonious model specification could provide an insight for International Financial Institutions to develop country-specific debt relief initiatives, following the same approach behind the so-called Debt Sustainability Framework. Further research is surely required, but the paper substantiates the hypothesis that one-size-fits-all policies are doomed to be inefficient. Debt relief could trigger economic growth exclusively in countries with a sound economic and political infrastructures. In absence of these preconditions, debt reduction would not provide the expected benefits (Arslanalp and Henry, 2006), since others are the binding constraints hindering the growth process. This conclusion is consistent with recent findings which suggest that debt relief is likely to benefit only countries with good institutions (Dessy and Vencatachellum, 2007; Harrabi, Bousrih and Mohammed, 2007).

The remainder of the paper is as follows: Section 2 presents the dataset and its sources and deals with the growth model and discusses methodological issues. Section 3 shows some descriptive evidence on the debt-growth nexus. Section 4 illustrates and comments the results and the robustness checks. Finally, Section 5 concludes, draws the main policy recommendations and presents some open questions. Additional tables are presented in Annex A.

2 Data and Variables

The dataset covers 114 developing (low- and middle-income) countries (listed in Table 8 in Annex A) over the period 1980–2004. The main sources are the World Development Indicators (WDI) and the Global Development Finance (GDF) published by the World Bank. Other data comes from the World Economic Outlook (IMF) and from a number of IMF Country Report Staff Papers.

More specifically, economic growth ($GROWTH$) is measured as log difference in the per capita real GDP (GDP), from the WDI. External debt is measured in net present value terms, in order to take into account the degree of concessionality embedded in multilateral loans[6]. The historical series on the Net Present Value (NPV) of Public and Public-Guaranteed (PPG) external debt is an internal dataset of The World Bank constructed by Dikhanov (2004). From these data, we construct two measures of external debt burden: the ratios of the NPV of external debt over GDP ($DEBT/GDP$) and over exports ($DEBT/EXP$)[7]. In the same vein of Cordella, Ricci and Ruiz-Arranz (2005), I take account of the possibility that the negative correlation between debt and growth is due to a causal relation running from growth to debt (Easterly, 2001) applying the Hodrick–Prescott filter (Hodrick and Prescott, 1997) to the denominator of both measures in order to smooth the series[8]. The educational indicators — the gross primary and secondary enrolment rates — are constructed updating the Barro and Lee (2001) dataset[9] with data from the WDI.

To take into account the institutional framework I use the Country Policy and Institutional Assessments (CPIA) indicator, which is a measure of the quality of policies and institutions developed by the World Bank, reflecting the its staff professional judgment, based on country knowledge, policy dialogue, and relevant public

[6]Robustness exercises will include also a nominal measure of external debt, from the WDI. See section 4.1 and Tables 9 and 10 in Appendix A.

[7]On the one hand, the ratio of external debt over exports is more informative on a country's capacity to generate enough foreign currency to meet its debt obligations. On the other hand it is more subject to the extreme volatility of exports in low–income countries. As a result, $DEBT/GDP$ is the preferred indicator of indebtedness used through the paper (a similar choice is done by Cordella, Ricci and Ruiz-Arranz (2005)).

[8]In doing this, I follow the suggestion of a referee, who rightly points out that using the lagged debt ratio, instead of the current one, is likely to introduce an opposite bias. Nevertheless, in Section 4.1 I will show also the results obtained using the lagged debt ratios (in this case the denominators are not smoothed). This robustness exercise is important to address the critique that the partial correlation between debt and growth depends on the choice between contemporaneous, initial or lagged debt ratios (Depetris Chauvin and Kraay, 2005).

[9]www.cid.harvard.edu/ciddata/ciddata.html, last accessed: August, 2008.

available indicators (for more information, see International Development Association, 2007)[10]. The CPIA assesses the quality of a country's present policy and institutional framework. Their ratings, ranging from 1 (low) to 6 (high), are based on all key factors that foster pro–poor growth and poverty alleviation (Economic Management, Structural Policies, Policies for Social Inclusion/Equity, Public Sector Management and Institutions). The broad coverage — the CPIA index is available for 136 countries — and the long time horizon (data go back to 1977) makes this indicator very useful for this panel analysis, since it overcome the usually lack of historical data for institutional indicators. Another advantage coming from using the overall CPIA score is that it is currently adopted by the World Bank–IMF Debt Sustainability Framework (DSF) to determine the country-specific debt burden thresholds used to assess debt sustainability (International Development Association and International Monetary Fund, 2007*b*; Kraay and Nehru, 2006)[11].

To wash out any business cycle variation, we average data over non-overlapping five years period, ending with 5 observations in time. Eventually, the plot of the data helped to highlight some outliers, generally related to the first observations in the former communist countries.

2.1 The Growth Model

The hypothesis to be tested is the possibility of heterogeneous effects of debt on economic growth according to countries' policies and institutions. In order to do so, a simple growth equation is estimated taking into account institutional quality and interacting it with the external debt indicator. The basic model is:

$$GROWTH_{i,t} = (\alpha - 1)GDP_{i,t-1} + X_{i,t}\beta' + \delta_1 DEBT_{i,t} + \delta_2 DEBT_{i,t}^2 + \eta_i + \tau_t + \epsilon_{i,t} \quad (1)$$

which, given that economic growth ($GROWTH$) is measured as log difference in the per capita real GDP (GDP), is equivalent to the dynamic panel model:

$$GDP_{i,t} = \alpha GDP_{i,t-1} + X_{i,t}\beta' + \delta_1 DEBT_{i,t} + \delta_2 DEBT_{i,t}^2 + \eta_i + \tau_t + \epsilon_{i,t} \quad (2)$$

where X is a set of standard control variables including: (1) the log of total investment (INV), (2) the population growth rate (POP), (3) the log of the primary enrolment rate ($EDUC$), (4) a measure of openness ($OPEN$, the logarithm of the ratio of import plus exports over GDP), (5) the variability of inflation, defined

[10] This data are now fully disclosed and published in the World Development Indicators, but the historical dataset is confidential. Data on the CPIA indicators and on the NPV of PPG external debt and were given to the author when he was an intern at the PRMED (Economic Policy and Debt Department) at The World Bank. I thank L. Bandiera and V. Nehru for the provision of the data.

[11] For this reason, and also for having a more complete picture of the institutional framework, I use the overall CPIA score, instead of relying on a sigle indicator. Moreover, experts generally agree on government assessment at the aggregate level, but not necessary with respect to specific assessment, so that stand-alone indicators could be seriously flawed by measurement errors (World Bank, 2008, section 5).

as the standard deviation of inflation in the five–year period (INF), which could be thought as a measure of macroeconomic instability, and (6) the rate of growth of terms of trade (TOT). The debt indicator ($DEBT$), which is the variable of interest, is alternatively the ratio of the NPV of external debt over (filtered) GDP ($DEBT/GDP$) or exports ($DEBT/EXP$). A quadratic term of the debt ratio is included to allow for possible non-linearities in the debt-growth relationship. Finally, η_i and τ_t respectively capture the country and time fixed effects and $\epsilon_{i,t}$ is the classical error term. Country-specific time invariant effects are taken into account including six regional dummies[12], while time fixed effects are controlled for including time dummies.

This basic setup is augmented including: (1) the institutional indicator ($CPIA$), and (2) interacting the debt indicators with the institutional one. In particular, this last strategy is done simply interacting the two continuous variables and, for robustness, interacting two alternative categorical measures of institutional quality with $DEBT$. Specifically, the sample is split up between countries with good or bad policies (according to an overall CPIA index below or above 3.5, which is the sample median) and also in three categories: weak ($CPIA \leq 3.25$), medium ($3.25 < CPIA < 3.75$) and strong ($CPIA \geq 3.75$) policies, according to the World Bank classification (International Development Association and International Monetary Fund, 2007*b*). The summary statistics of these variables are reported in Table 1. With respect to the institutional classification, observations are almost equally divided between bad versus good policies and between weak, medium and strong institutions.

2.2 Methodology

The dynamic structure of equation 1 makes the OLS estimator upwards biased and inconsistent, since the lagged level of income is correlated with the error term. The within transformation does not solve the problem, because of a downward bias (Nickell, 1981) and inconsistency. A possible solution is represented by the Generalized Method of Moments (GMM) technique. Blundell and Bond (1998) show that when α approaches to one, so that the dependent variable follows a path close to a random walk, the Differenced–GMM (Arellano and Bond, 1991) has poor finite sample properties and it is downwards biased, especially when T is small. Bond, Hoeffler and Temple (2001) argue that this is likely to be a serious issue for autoregressive model like equation 1, when the per capita GDP is observed in 3 or 5 years averages and T is necessarily small. Therefore, Blundell and Bond (1998) propose another estimator — the System–GMM — derived from the estimation of a system of two simultaneous equations, one in levels (with lagged first differences as instruments) and the other in first differences (with lagged levels as instruments). In multivariate dynamic panel models, the System–GMM estimator is shown to perform better than the Differenced–GMM when series are persistent (α close to unity) and there is a dramatic reduction in the finite sample bias due to the ex-

[12]Specifically, the regional dummies refer to: Europe and Central Asia, Sub–Saharan Africa, South Asia, East Asia and Pacific, Latin America and Caribbean, and North Africa and Middle East.

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
$GROWTH$	390	1.51	3.48	-12.62	27.01
$(DEBT/GDP)$	378	3.57	0.83	0.29	6.03
(linear)	378	48.70	49.46	0.33	412.77
$(DEBT/GDP)_{t-1}$	375	3.47	0.92	0.60	6.33
(linear)	375	48.08	52.56	0.99	584.10
$(DEBT/EXP)$	390	4.85	0.99	1.49	7.77
(linear)	390	204.09	268.08	3.45	2358.08
$(DEBT/EXP)_{t-1}$	386	4.77	1.12	0.91	7.95
(linear)	386	215.89	328.76	2.17	2866.55
$CPIA$	390	3.49	0.75	1.00	5.60
GDP_{t-1}	390	6.74	1.11	4.45	8.95
INV	390	2.97	0.35	1.72	4.46
POP	390	1.90	1.21	-3.83	7.62
$EDUC$	390	4.51	0.30	3.21	5.09
$OPEN$	390	4.17	0.52	2.61	5.45
TOT	390	0.44	5.64	-17.35	39.07
INF	390	97.89	687.44	0.23	9808.24

Notes: Summary statistics are calculated referring to the large sample used in the regressions reported in Table 5, apart from $(DEBT/GDP)$ and $(DEBT/GDP)_{t-1}$, which because of missing data refers to Table 4. $(DEBT/GDP)$ and $(DEBT/EXP)$ are the debt ratios calculated with smoothed denominators, while $(DEBT/GDP)_{t-1}$ and $(DEBT/EXP)_{t-1}$ are the lagged debt ratios calculated with the actual denominators.

ploitation of additional moment conditions (Blundell, Bond and Windmeijer, 2000). In presence of heteroscedasticity and serial correlation, the two-step System–GMM uses a consistent estimate of the weighting matrix, taking the residuals from the one-step estimate (Davidson and MacKinnon, 2004). Though asymptotically more efficient, the two-step GMM presents estimates of the standard errors that tend to be severely downward biased. However, it is possible to solve this problem using the finite-sample correction to the two–step covariance matrix derived by Windmeijer (2005), which can make two-step robust GMM estimates more efficient than one-step robust ones, especially for System–GMM (Roodman, 2006).

Bond, Hoeffler and Temple (2001) provide a useful insight in the GMM estimation of dynamic growth models[13], arguing that the pooled OLS and the LSDV estimators should be considered respectively as the upper and lower bound. As a result, whether the Differenced–GMM coefficient is close to or lower than the within group one, this is likely a sign that the estimates are biased downward (maybe because of a weak instrument problem). Thus, if this is the case, the use of System–GMM is highly recommended and its estimates should lie between OLS and LSDV. This conclusion is supported by the empirical testing of the augmented Solow model (Hoeffler, 2002; Nkurunziza and Bates, 2003). Presbitero (2006) estimates a model similar to equation 1 showing that the System–GMM is a good estimator, at least better than the Differenced–GMM, which is severely downward biased. In partic-

[13]One of the main problems of using the GMM estimators with macroeconomic and cross country data is that they are generally developed for micro data, in which the spatial dimension is very large, and their properties are valid asymptotically.

Table 2: Pairwise Correlations

	$GROWTH$	$(DEBT/GDP)$	$(DEBT/EXP)$	$(DEBT/GDP)_{t-1}$	$(DEBT/EXP)_{t-1}$	$CPIA$	GDP_{t-1}
$GROWTH$	1.00						
$(DEBT/GDP)$	-0.19*	1.00					
$(DEBT/EXP)$	-0.26*	0.78*	1.00				
$(DEBT/GDP)_{t-1}$	-0.13*	0.73*	0.88*	1.00			
$(DEBT/EXP)_{t-1}$	-0.11*	0.87*	0.63*	0.81*	1.00		
$CPIA$	0.33*	-0.29*	-0.33*	-0.25*	-0.21*	1.00	
GDP_{t-1}	0.10	-0.32*	-0.48*	-0.43*	-0.22*	0.37*	1.00
INV	0.46*	-0.05	-0.26*	-0.17*	-0.01	0.26*	0.22*
POP	-0.20*	0.29*	0.37*	0.33*	0.28*	-0.21*	-0.30*
$EDUC$	0.26*	-0.12*	-0.24*	-0.18*	-0.06	0.24*	0.48*
$OPEN$	0.20*	-0.11*	-0.46*	-0.38*	0.11*	0.10	0.22*
TOT	0.20*	-0.02	-0.08	-0.05	-0.04	-0.08	0.04
INF	-0.25*	0.16*	0.19*	0.12*	0.11*	-0.22*	-0.03
	INV	POP	$EDUC$	$OPEN$	TOT	INF	
INV	1.00						
POP	-0.13*	1.00					
$EDUC$	0.30*	-0.22*	1.00				
$OPEN$	0.45*	-0.13*	0.21*	1.00			
TOT	0.05	0.00	0.03	0.05	1.00		
INF	-0.13*	0.06	-0.02	-0.11*	-0.03	1.00	

Notes: Correlations are calculated referring to the dataset used in the regressions reported in Table 4. * significant at 5%. $(DEBT/GDP)$ and $(DEBT/EXP)$ are the debt ratios calculated with smoothed denominators, while $(DEBT/GDP)_{t-1}$ and $(DEBT/EXP)_{t-1}$ are the lagged debt ratios calculated with the actual denominators.

ular, there is evidence that using results obtained with the System GMM confirm that: (1) the System–GMM lies between the upper and lower bound represented by OLS and LSDV, (2) there is an efficiency gain, and (3) the instrument set is valid[14].

3 Descriptive Evidence

Table 2 illustrates the pairwise correlation between real per capita GDP growth ($GROWTH$) and the variables included in the analysis. As expected, larger debts and higher inflation and population growth are correlated with lower economic growth which, instead, is fostered by investment, trade openness, education, institutions and positive changes in terms of trade. The alternative measures of indebtedness are highly correlated. They all increase in periods of high inflation and are negatively correlated with the investment in physical and human capital, the level of real per capita GDP and institutional quality. The latter, finally, is better the richer a country is and it is correlated with greater investment and lower inflation.

Table 3 shows that the negative correlation between external debt and economic growth could be driven by the role played by institutions and policies, which are associated with a lower external debt and higher growth rates. In particular, countries with weak institutions have an average NPV of external debt equal to 63 per cent of GDP and exhibit negative growth rates. Instead, where the institutions are strong

[14]Whether these three conditions are met, the two-step System–GMM results can be taken as a benchmark for growth regressions (Bond, Hoeffler and Temple, 2001; Bond, Leblebicioglu and Schiantarelli, 2004; Nkurunziza and Bates, 2003; Hoeffler, 2002).

Table 3: External Debt, GDP Growth and Level, by Institutional Quality

Institutional quality (CPIA index)	NPV Debt/GDP	Real per capita GDP growth	Real GDP per capita	Aid/GDP	Obs
Weak	62.80	-0.04	959	10.30	120
Medium	49.23	1.77	1,222	10.75	125
Strong	35.47	2.83	2,347	4.67	133
Whole sample	48.70	1.57	1,534	8.48	378

Notes: Numbers refer to the dataset used in the regressions reported in Table 4. Numbers for Aid/GDP refers to 377 observations, given a missing value in the strong institutions category.

the debt ratio is equal to 35 per cent and the average growth rate is 2.8 per cent. Thus, this descriptive evidence suggests that excluding the measure of institutional quality from the empirical analysis could generate a decisive omitted variable bias.

Besides, other than considering the effects of institutions on GDP growth and external debt, it is worth noting that the relationship between debt and growth could differ according to countries' policy and institutional framework. Figure 1 clearly illustrates this point. On the one hand, in countries with bad policies (left panel) there is no a significant correlation between external debt and economic growth. On the other hand, the sub-sample of countries with good policies (right panel) shows a negative and significant correlation (-0.29) between debt and growth.

4 Results

Tables 4 and Tables 5 show the regression results of the estimation of the growth equation 1 measuring the debt burden, respectively, as the ratio of the NPV of external debt over (smoothed) GDP and over (smoothed) exports. The Tables provide qualitatively similar results and, in what follows, specific comments refer to Table 4.

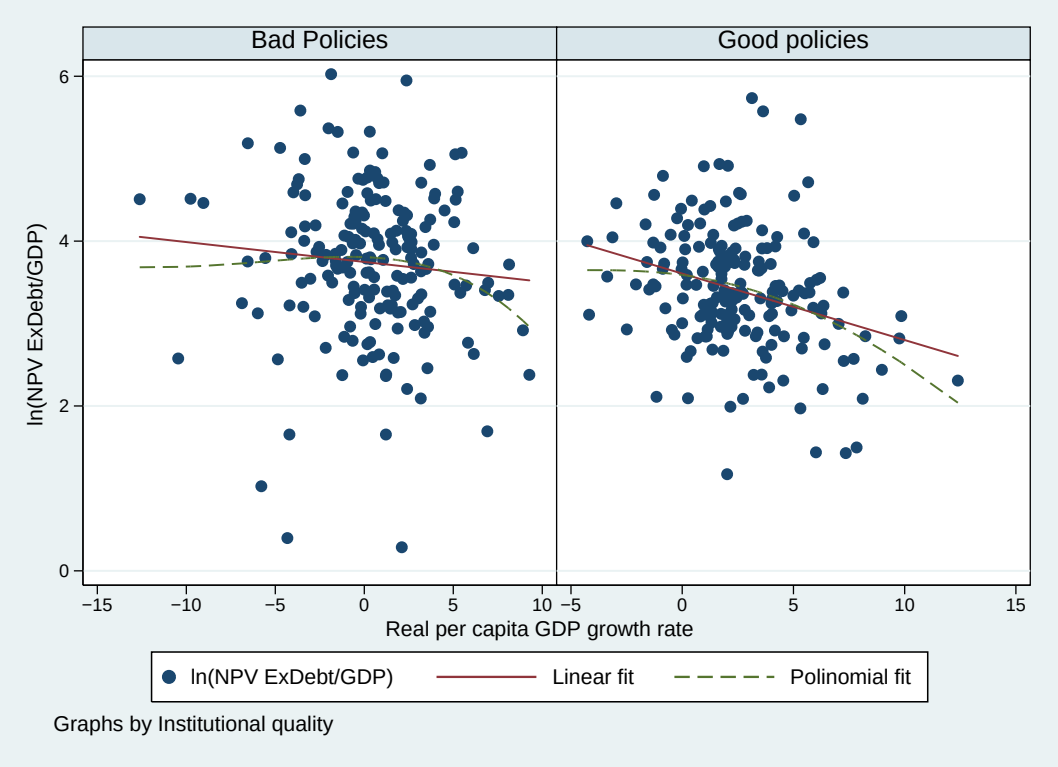
As regards the diagnostic, in all the specifications the Hansen–J statistic does not reject the Over-Identifying Restrictions (OIR), confirming that the instrument set can be considered valid[15], and the Arellano and Bond (1991) tests for serial correlation, supporting the model's specification[16].

Results on the control variables are broadly consistent with expectations. They show evidence of conditional convergence and of a positive effect of investment and education on economic growth, even if primary education is not always statistically significant. Trade openness exhibits a positive (but generally not statistically significant) effect on $GROWTH$. Finally, a rise in terms of trade fosters economic growth, while an unstable macroeconomic environment, proxied by the volatility of inflation, is associated with lower growth rates.

[15]The reported Hansen OIR test refer to all the instruments being exogenous. In addition, difference-in-Hansen statistics provide evidence further that different subsets of instruments are valid (on this, see Roodman (2007)).

[16]If the model is well specified, we expect to reject the null hypothesis of not autocorrelation of the first order – AR(1) – and to not reject the hypothesis of no autocorrelation of the second order – AR(2).

Figure 1: The Debt, Policies and Growth Relationship



Notes: Elaboration from the dataset used in the regressions reported in Table 4. The left panel refers to countries with an overall CPIA score minor than 3.5, while the right panel include countries which have an overall CPIA score equal to greater than 3.5.

Moving to the variables of interest, the first two columns show that there is evidence of non-linearities in the debt-growth relationship. The regression coefficients reported in columns (1), and (2) are consistent with a debt Laffer curve, whose maximum is in correspondence of a ratio of NPV of external debt over GDP equals respectively to 11 and 12. This values are very similar to the ones estimated by Pattillo, Poirson and Ricci (2002, see column 8 of their Table 6, pag. 27) and Cordella, Ricci and Ruiz-Arranz (2005, pag. 18), and not far from the the threshold of 20–25 calculated by Clements, Bhattacharya and Nguyen (2003). Nevertheless, the inclusion of the CPIA index (column 2) makes the relationship between debt and growth no more significant[17]. This finding is in line with the descriptive evidence discussed in section 3, according to which institutional quality could simultaneously determine economic growth and the degree of indebtedness. On its own, in fact, institutional quality strongly affects the GDP growth rate: a one point increase in the CPIA index almost doubles the average GDP growth rate, raising it by 1.1–1.4 points.

In the remaining four columns I inspect the possibility that the debt-growth relationship is heterogeneous with respect to institutions. Firstly, in column (3),

[17]In Table 5 the Debt-Laffer curve is not significant even without controlling for $CPIA$. Nevertheless, its inclusion dramatically reduce the statistical significance of the debt coefficients. This result is confirmed also in alternative specifications (see Table 6).

Table 4: NPV of PPG External Debt over GDP, System–GMM

Dep. Var.: $GROWTH$	(1)	(2)	(3)	(4)	(5)	(6)
GDP_{t-1}	-1.773***	-1.499***	-1.240***	-2.029***	-1.713***	-1.744***
	[0.448]	[0.535]	[0.434]	[0.396]	[0.417]	[0.404]
INV	5.104***	4.508***	4.198***	3.775***	4.148***	4.282***
	[1.012]	[1.226]	[1.131]	[1.119]	[1.147]	[1.159]
POP	0.683	0.700	0.699*	0.735**	0.602	0.708*
	[0.512]	[0.480]	[0.403]	[0.350]	[0.451]	[0.430]
$EDUC$	3.392**	3.126**	1.295	0.862	0.065	1.989
	[1.367]	[1.283]	[1.140]	[1.428]	[1.400]	[1.488]
$OPEN$	0.901	1.358	0.599	1.897**	1.078	0.668
	[1.226]	[1.145]	[0.848]	[0.947]	[0.710]	[0.808]
TOT	0.062**	0.076***	0.077**	0.089***	0.084***	0.090***
	[0.031]	[0.026]	[0.030]	[0.028]	[0.024]	[0.029]
INF	-0.001***	-0.000***	-0.001***	-0.001***	-0.001***	-0.001***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$(DEBT/GDP)$	2.415**	1.583	1.931*	-0.027	0.035	4.605**
	[1.232]	[1.659]	[1.098]	[0.465]	[0.470]	[2.099]
$(DEBT/GDP)^2$	-0.487***	-0.310				-0.664**
	[0.170]	[0.222]				[0.276]
$CPIA$		1.112***	3.630***			
		[0.315]	[1.164]			
$(DEBT/GDP) \times CPIA$			-0.690**			
			[0.306]			
Good $CPIA$ (0,1)				7.613***		16.493***
				[2.011]		[5.889]
$(DEBT/GDP) \times$ *Good* $CPIA$				-1.649***		-7.002**
				[0.537]		[3.234]
$(DEBT/GDP)^2 \times$ *Good* $CPIA$						0.760*
						[0.430]
Omitted categories: *Weak* $CPIA$ and $(DEBT/GDP) \times$ *Weak* $CPIA$						
Medium $CPIA$ (0,1)					5.484***	
					[1.996]	
Strong $CPIA$ (0,1)					8.031***	
					[2.217]	
$(DEBT/GDP) \times$ *Medium* $CPIA$					-1.189**	
					[0.505]	
$(DEBT/GDP) \times$ *Strong* $CPIA$					-1.616***	
					[0.574]	
Observations	378	378	378	378	378	378
Number of countries	110	110	110	110	110	110
Hansen OIR test	0.408	0.907	0.784	0.553	0.984	0.566
AR(1)	0.002	0.003	0.006	0.003	0.004	0.002
AR(2)	0.404	0.257	0.706	0.706	0.748	0.362
$(DEBT/GDP)$ & $(DEBT/GDP)^2$	0.001	0.138				
with *Bad* $CPIA$						0.043
with *Good* $CPIA$						0.000

Notes: The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The model is estimated by Two-Step System GMM, using Stata 10 SE package with XTABOND2 command. As instruments, we use all available lagged values of endogenous variables. The growth rate of terms of trade (TOT) and the (6) geographic and (4) time dummies (included in the regressions but not shown for reasons of space) are taken as strictly exogenous regressors. $(DEBT/GDP)$ is the ratio of the NPV of PPG external debt over (filtered) GDP. As diagnostic, the table reports the p-values of the Hansen test for overidentifying restrictions (OIR, the null is the validity of the instrument set) and of the Arellano and Bond autocorrelation tests of first and second order (AR(1) and AR(2), the null is no autocorrelation). The last three rows report the p–values of the two tailed t-test of annulment of $(DEBT/GDP)$ and $(DEBT/GDP)^2$, when inserted alone in the regression or interacted with the dummy *Good* $CPIA$.

Table 5: NPV of PPG External Debt over Exports, System–GMM

Dep. Var.: $GROWTH$	(1)	(2)	(3)	(4)	(5)	(6)
GDP_{t-1}	-1.626***	-1.619***	-1.846***	-2.086***	-2.212***	-2.139***
	[0.511]	[0.423]	[0.427]	[0.586]	[0.487]	[0.501]
INV	5.884***	4.439***	4.246**	4.110***	4.530***	3.831***
	[0.973]	[1.371]	[1.675]	[1.535]	[1.319]	[1.365]
POP	0.454	0.409	0.573	0.693	0.479	0.456
	[0.496]	[0.610]	[0.500]	[0.447]	[0.461]	[0.537]
$EDUC$	3.580**	2.903***	2.330**	2.379*	1.815	3.248***
	[1.647]	[1.116]	[1.153]	[1.310]	[1.374]	[1.143]
$OPEN$	0.381	1.208	1.580*	1.519	1.009	1.283
	[0.970]	[0.824]	[0.883]	[1.046]	[0.781]	[0.927]
TOT	0.063**	0.058**	0.067**	0.075***	0.072***	0.061**
	[0.025]	[0.028]	[0.030]	[0.026]	[0.023]	[0.027]
INF	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$(DEBT/EXP)$	1.719	2.089	1.192	0.173	0.730	4.033**
	[1.173]	[2.364]	[1.368]	[0.446]	[0.499]	[2.039]
$(DEBT/EXP)^2$	-0.219*	-0.209				-0.377**
	[0.123]	[0.229]				[0.191]
$CPIA$		1.368***	3.371*			
		[0.364]	[1.939]			
$(DEBT/EXP) \times CPIA$			-0.384			
			[0.360]			
Good $CPIA$ (0,1)				7.179**		16.427***
				[3.070]		[6.180]
$(DEBT/EXP) \times$ *Good* $CPIA$				-1.135**		-5.039**
				[0.556]		[2.256]
$(DEBT/EXP)^2 \times$ *Good* $CPIA$						0.397*
						[0.211]
Omitted categories: $Weak\ CPIA$ and $(DEBT/EXP) \times Weak\ CPIA$						
Medium $CPIA$ (0,1)					11.474***	
					[2.328]	
Strong $CPIA$ (0,1)					10.581***	
					[3.070]	
$(DEBT/EXP) \times Medium\ CPIA$					-2.013***	
					[0.449]	
$(DEBT/EXP) \times Strong\ CPIA$					-1.628***	
					[0.590]	
Observations	390	390	390	390	390	390
Number of countries	114	114	114	114	114	114
Hansen OIR test	0.440	0.614	0.597	0.551	0.926	0.805
AR(1)	0.002	0.002	0.000	0.000	0.001	0.000
AR(2)	0.425	0.412	0.861	0.989	0.576	0.598
$(DEBT/EXP)$ & $(DEBT/EXP)^2$	0.161	0.658				
with *Bad* $CPIA$						0.137
with *Good* $CPIA$						0.192

Notes: The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The model is estimated by Two-Step System GMM, using Stata 10 SE package with XTABOND2 command. As instruments, we use all available lagged values of endogenous variables. The growth rate of terms of trade (TOT) and the (6) geographic and (4) time dummies (included in the regressions but not shown for reasons of space) are taken as strictly exogenous regressors. $(DEBT/EXP)$ is the ratio of the NPV of PPG external debt over (filtered) exports. As diagnostic, the table reports the p-values of the Hansen test for overidentifying restrictions (OIR, the null is the validity of the instrument set) and of the Arellano and Bond autocorrelation tests of first and second order (AR(1) and AR(2), the null is no autocorrelation). The last three rows report the p-values of the two tailed t-test of annulment of $(DEBT/EXP)$ and $(DEBT/EXP)^2$, when inserted alone in the regression or interacted with the dummy *Good* $CPIA$.

equation 1 is augmented adding $CPIA$ and its interaction with $DEBT/GDP$. Results show that the marginal impact of external debt to economic growth is positive when the CPIA index is low and turns negative for larger values of $CPIA$. More specifically, the turning point is estimated to correspond to a CPIA score of around 2.8. In other words, the evidence suggests that are the countries with stronger institutions which suffers more from debt burdens. This finding is confirmed by alternative specifications. In columns (4) the CPIA score is included in the regression as a dummy variable assuming value 1 (*Good* $CPIA$) if the institutional index is equal or above 3.5 and it is interacted with the debt variable. The estimates show that the relationship between debt and growth is negative and significant only for countries with good policies. Column (5) allows for a slightly more flexible specification, since the CPIA score is stuck into the regression as a categorical variable (weak, medium and strong institutions) multiplied by $DEBT/GDP$. In this case, $GROWTH$ is not affected by debt burdens in countries with weak policies (CPIA score equal or below 3.25), while high external debts impinge on economic growth in countries with medium and strong policies. In particular, the marginal effect of debt on growth is equal to -1.1 (-1.6) for countries with medium (strong) policies.

Finally, in the last column, the specification reported in column (4) is augmented allowing for a quadratic in $DEBT/GDP$ in order to inspect the possibility that a Debt-Laffer curve arises in countries with bad or good policies. In the former (*Good* $CPIA = 0$) there is evidence of an inverted U relationship, with a maximum in correspondence to $DEBT/GDP$ equal to 31 per cent, while in countries with good policies a larger debt is associated with lower growth rates, since the quadratic specification has a minimum for a value of $DEBT/GDP$ much larger than its sample maximum.

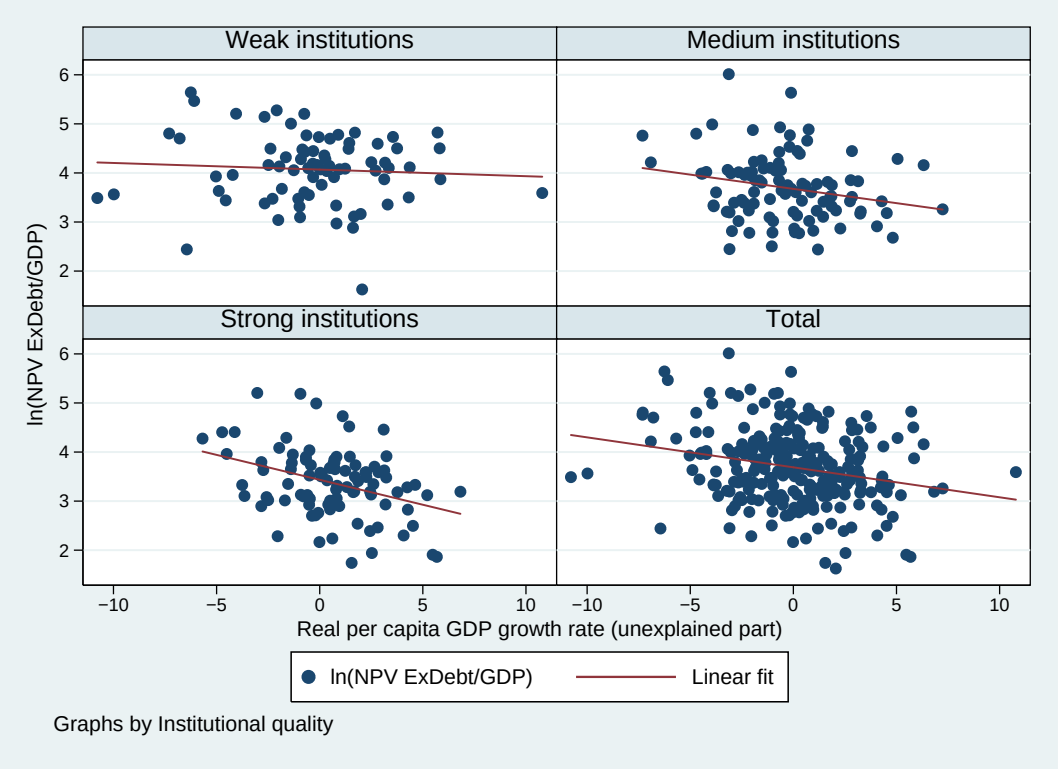
Taking $DEBT/EXP$ as a debt burden indicator provide similar results, apart from the fact that the Debt-Laffer curves in countries with bad or good institutions loose their statistical significance.

In sum, the evidence provided by the estimation of equation 1 suggest that institutional quality is a key element in the debt-growth relationship. The standard Debt-Laffer curve found by Pattillo, Poirson and Ricci (2002, 2004) and Clements, Bhattacharya and Nguyen (2003) looses its significance when the effect of policies is taken into account, suggesting that institutional quality could be a common determinant of both low growth and high debt, as suggested by the univariate analysis of the data (Section 3) and also by Imbs and Ranciere (2005)[18]. Moreover, in line with the evidence provided by Cordella, Ricci and Ruiz-Arranz (2005), the estimates show that the debt effect on growth differs according to countries' institutions and policies. Different specifications suggest that in countries with bad policies external debt accumulation is irrelevant for economic growth, similarly to what found by Cordella, Ricci and Ruiz-Arranz (2005), while in countries with good policies high debt are associated with lower growth[19]. Finally, there is no strong evidence of

[18]Differently from the estimates presented in this paper, Imbs and Ranciere (2005) control for time-invariant institutional variables, finding evidence that government effectiveness, rule of law and bureaucratic quality makes the linear debt coefficient in the OLS growth regression not significant. However, other institutional variables do not alter the negative link between external debt and growth.

[19]Cordella, Ricci and Ruiz-Arranz (2005, pag. 16) state that "*countries with very high debt and*

Figure 2: The Debt-Growth Nexus and Institutional Quality



Notes: Different panels refer to countries with weak ($CPIA \leq 3.25$), medium ($3.25 < CPIA < 3.75$) and strong ($CPIA \geq 3.75$) policies and institutions, and to the overall sample. The unexplained part of the real per capita GDP growth rate is the residual of the equation 1, as estimated in column (2) of Table 4, excluding $(DEBT/GDP)$ and $(DEBT/GDP)^2$.

any Debt-Laffer curve, even allowing for different effect of external debt on growth according to the institutional framework[20].

A visual representation of this result is provided by Figure 2, which plots the partial relation between external debt and economic growth for the three sub-samples of countries with weak, medium and strong institutions. The horizontal axis shows the residuals from a growth regression in which all the control variables of equation 1 and the overall CPIA score are included. The diagrams clearly point out the irrelevance of external debt for growth in countries with low CPIA scores, while this relationship is linear and negative for the other countries, especially the ones with strong institutions.

very poor policies would face a practically flat debt-growth relationship". This is the case discussed in this section, since countries with weak institutions, for which the debt-growth relationship is not significantly different from zero (see column (5) of Table 4), have higher debts than countries with better policies (Table 3). The negative link found for countries with good policies is not completely discordant from Cordella, Ricci and Ruiz-Arranz's findings: they estimate a negative relationship at debt levels between around 20 and 70 per cent of GDP (below 20 the curve is positive and beyond 70 it becomes flat), which covers about the 65 per cent of observation with *Good* $CPIA = 1$.

[20]See also further robustness results discussed in Section 4.1.

To gauge the economic significance of debt overhang, a simple calculation, based on coefficients reported in column (5) of Table 4, shows that a reduction in the ratio of the NPV of external debt over GDP from 60 to 20 per cent (which roughly corresponds to a change from the third to the first quartile of its sample distribution) is associated with an increase in the GDP growth rate of 1.06 (1.42) in countries with medium (strong) institutions. Besides, the effect is almost nil and statistically not significant in countries with a weak institutional framework.

Thus, these results imply that the link between debt and growth depends on institutional quality and that debt relief is likely to be effective only in countries with sound institutions. This finding is consistent with the conclusions reached by Dessy and Vencatachellum (2007) and by Harrabi, Bousrih and Mohammed (2007), who respectively estimate that the impact of debt relief on social expenditures and domestic credit to the private sector is positive and significant only in countries with good institutions. The lack of any significant association between external debt and economic growth in countries with weak institutions and bad policies seems to suggest that these countries do not suffer from debt overhang. In this context, economic growth is likely to be constrained by factors and positive net resource transfers from donors could help reduce the crowding out of public investment (on this, see also Cordella, Ricci and Ruiz-Arranz, 2005). This interpretation is substantiated by the fact that countries with weak and medium institutions receive more than twice aid with respect to GDP than countries with strong institutions (Table 3).

4.1 Robustness

The validity of the results discussed in the previous section is tested through a number of robustness tests. In particular, the main findings are robust to changes in the methodology and in the control variables set.

With respect to the first point, reverse causality is addressed taking lagged debt ratios instead of contemporaneous ones[21]. Results are shown in Tables 6 and 7 and are broadly consistent with the ones discussed in the previous section. In particular, when debt burden is scaled by GDP, there is evidence than past debts are associated with subsequent lower growth in countries with a CPIA score above 3.5 (column (4)). Besides, the estimates reported in the last column are consistent with debt being irrelevant in countries with bad policies and with a Debt-Laffer curve in the ones with good policies. However, in the latter case, which differs from the results obtained in Table 4, one can still argue that the basic effect of debt on growth is negative, since the maximum of the curve occurs in correspondence of a very low level of $(DEBT/GDP)_{t-1}$ (about the first decile of its sample distribution).

Finally, regarding the choice of the debt ratio, results are generally robust also measuring external debt in nominal terms, as showed in Tables 9 and 10 (reported in Annex A). Scaling nominal debt by (filtered) GDP or exports confirms the irrelevance of high debts for growth in countries with weak policies and institutions and the presence of debt overhang in countries with a good institutional framework (columns (3) to (5)). Moreover, coefficient reported in columns (6) do not reveal

[21] A similar strategy is followed also by Lora and Olivera (2007) to estimate the impact of debt on social expenditures.

Table 6: Lagged NPV of PPG External Debt over GDP, System–GMM

Dep. Var.: *GROWTH*	(1)	(2)	(3)	(4)	(5)	(6)
GDP_{t-1}	-1.765***	-1.669***	-1.248***	-1.442***	-1.022***	-1.668***
	[0.449]	[0.536]	[0.431]	[0.426]	[0.381]	[0.435]
INV	5.699***	4.695***	4.256***	4.192***	4.156***	4.566***
	[0.950]	[1.461]	[1.076]	[1.201]	[1.044]	[1.029]
POP	0.642	0.643	0.696	0.761	0.653	0.581
	[0.433]	[0.518]	[0.547]	[0.496]	[0.465]	[0.437]
EDUC	1.151	1.483	0.482	0.354	-0.824	0.389
	[1.526]	[1.718]	[1.601]	[1.844]	[1.611]	[1.702]
OPEN	0.618	1.104	1.177	1.276	0.047	1.184
	[1.115]	[1.071]	[0.888]	[1.095]	[0.779]	[0.955]
TOT	0.075**	0.086**	0.066***	0.081***	0.091***	0.093***
	[0.031]	[0.036]	[0.025]	[0.029]	[0.027]	[0.028]
INF	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$(DEBT/GDP)_{t-1}$	2.246	1.473	2.422	0.748	0.621	4.600
	[1.380]	[1.123]	[1.756]	[0.584]	[0.707]	[2.920]
$(DEBT/GDP)^2_{t-1}$	-0.413**	-0.260*				-0.562
	[0.189]	[0.156]				[0.390]
CPIA		1.256***	3.551**			
		[0.272]	[1.549]			
$(DEBT/GDP)_{t-1} \times CPIA$			-0.666			
			[0.424]			
Good CPIA (0,1)				6.049***		9.195*
				[1.681]		[5.270]
$(DEBT/GDP)_{t-1} \times$ *Good CPIA*				-1.266***		-3.071
				[0.480]		[2.915]
$(DEBT/GDP)^2_{t-1} \times$ *Good CPIA*						0.248
						[0.401]
Omitted categories: *Weak CPIA* and $(DEBT/GDP) \times$ *Weak CPIA*						
Medium CPIA (0,1)					3.337	
					[2.485]	
Strong CPIA (0,1)					6.119**	
					[2.495]	
$(DEBT/GDP)_{t-1} \times$ *Medium CPIA*					-0.568	
					[0.652]	
$(DEBT/GDP)_{t-1} \times$ *Strong CPIA*					-1.042	
					[0.642]	
Observations	375	375	375	375	375	375
Number of countries	110	110	110	110	110	110
Hansen OIR test	0.460	0.722	0.691	0.508	0.843	0.564
AR(1)	0.009	0.008	0.007	0.004	0.006	0.004
AR(2)	0.981	0.741	0.941	0.982	0.969	0.828
$(DEBT/GDP)$ & $(DEBT/GDP)^2$	0.019	0.182				
with *Bad CPIA*						0.256
with *Good CPIA*						0.012

Notes: The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The model is estimated by Two-Step System GMM, using Stata 10 SE package with XTABOND2 command. As instruments, we use all available lagged values of endogenous variables. The growth rate of terms of trade (*TOT*) and the (6) geographic and (4) time dummies (included in the regressions but not shown for reasons of space) are taken as strictly exogenous regressors. $(DEBT/GDP)_{t-1}$ is the lagged ratio of the NPV of PPG external debt over GDP. As diagnostic, the table reports the p-values of the Hansen test for overidentifying restrictions (OIR, the null is the validity of the instrument set) and of the Arellano and Bond autocorrelation tests of first and second order (AR(1) and AR(2), the null is no autocorrelation). The last three rows report the p-values of the two tailed t-test of annulment of $(DEBT/GDP)_{t-1}$ and $(DEBT/GDP)^2_{t-1}$, when inserted alone in the regression or interacted with the dummy *Good CPIA*.

Table 7: Lagged NPV of PPG External Debt over Exports, System–GMM

Dep. Var.: *GROWTH*	(1)	(2)	(3)	(4)	(5)	(6)
GDP_{t-1}	-1.532***	-1.665***	-1.608***	-1.576***	-1.571**	-1.624***
	[0.440]	[0.455]	[0.456]	[0.451]	[0.690]	[0.448]
INV	5.250***	4.528***	4.241***	4.437***	4.340***	4.110***
	[1.122]	[1.090]	[1.099]	[1.156]	[1.195]	[1.103]
POP	0.531	0.415	0.177	0.500	0.286	0.419
	[0.548]	[0.533]	[0.607]	[0.566]	[0.508]	[0.447]
$EDUC$	1.808	1.752	0.890	0.708	0.124	0.895
	[1.370]	[2.123]	[1.346]	[1.620]	[1.508]	[1.710]
$OPEN$	1.484	1.401	2.105**	1.901	1.509	2.041*
	[1.155]	[1.135]	[1.060]	[1.271]	[1.120]	[1.089]
TOT	0.062**	0.059**	0.057**	0.063**	0.065**	0.061**
	[0.028]	[0.026]	[0.022]	[0.026]	[0.025]	[0.025]
INF	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$(DEBT/EXP)_{t-1}$	1.483	1.385	3.258**	0.972*	1.248**	3.187*
	[1.107]	[1.093]	[1.615]	[0.590]	[0.545]	[1.859]
$(DEBT/EXP)^2_{t-1}$	-0.154	-0.122				-0.202
	[0.125]	[0.116]				[0.193]
$CPIA$		1.294***	5.404***			
		[0.316]	[1.870]			
$(DEBT/EXP)_{t-1} \times CPIA$			-0.848**			
			[0.391]			
Good CPIA (0,1)				6.514***		12.006**
				[2.092]		[4.755]
$(DEBT/EXP)_{t-1} \times$ *Good CPIA*				-1.082**		-2.935
				[0.447]		[1.988]
$(DEBT/EXP)^2_{t-1} \times$ *Good CPIA*						0.149
						[0.209]
Omitted categories: *Weak CPIA* and $(DEBT/EXP) \times$ *Weak CPIA*						
Medium CPIA (0,1)					5.936**	
					[2.665]	
Strong CPIA (0,1)					10.078***	
					[2.714]	
$(DEBT/EXP)_{t-1} \times$ *Medium CPIA*					-0.941	
					[0.574]	
$(DEBT/EXP)_{t-1} \times$ *Strong CPIA*					-1.568***	
					[0.589]	
Observations	386	386	386	386	386	386
Number of countries	114	114	114	114	114	114
Hansen OIR test	0.652	0.681	0.528	0.398	0.691	0.410
AR(1)	0.002	0.002	0.005	0.000	0.002	0.000
AR(2)	0.793	0.497	0.634	0.634	0.717	0.629
$(DEBT/EXP)$ & $(DEBT/EXP)^2$	0.403	0.390				
with *Bad CPIA*						0.041
with *Good CPIA*						0.730

Notes: The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The model is estimated by Two-Step System GMM, using Stata 10 SE package with XTABOND2 command. As instruments, we use all available lagged values of endogenous variables. The growth rate of terms of trade (TOT) and the (6) geographic and (4) time dummies (included in the regressions but not shown for reasons of space) are taken as strictly exogenous regressors. $(DEBT/EXP)_{t-1}$ is the lagged ratio of the NPV of PPG external debt over exports. As diagnostic, the table reports the p-values of the Hansen test for overidentifying restrictions (OIR, the null is the validity of the instrument set) and of the Arellano and Bond autocorrelation tests of first and second order (AR(1) and AR(2), the null is no autocorrelation). The last three rows report the p-values of the two tailed t-test of annulment of $(DEBT/EXP)_{t-1}$ and $(DEBT/EXP)^2_{t-1}$, when inserted alone in the regression or interacted with the dummy *Good CPIA*.

evidence of any Debt-Laffer curve: when significant (in Table 9 for *Good CPIA*), the quadratic specification has a maximum for a debt ratio below the first percentile of its sample distribution.

Then, I address the possibility that too many instruments overfit endogenous variables in the System–GMM, generating biased estimates and weakening the Hansen test for overidentifying restrictions, collapsing the instrument set, as suggested by Roodman (2007). Regression results show that the main findings are robust to a reduction in the number of instruments[22].

As regards the second point, results are generally robust to changes in the set of control variables. The inclusion the logarithm of the ratio of M2 over GDP and measuring human capital in terms of secondary instead of primary education leaves the main results unaffected, even if secondary education proves to be not significantly correlated with GDP growth. Similar results are obtained controlling for countries income classification (low- versus middle-income) and including a dummy for HIPCs. More importantly, we are also able to corroborate the basic findings of the paper controlling for net transfers. The differentiated impact of debt on growth between countries with good or bad policies could be due to different levels of external assistance. However, the inclusion of the logarithm of the ratios of total debt service and official aid over GDP confirm that debt overhang impinges exclusively on countries with better policies and institutions. Finally, the limited effect of debt overhang to countries with sound policies and institutions holds also trying different categorization of the overall CPIA score.

5 Concluding Remarks

This paper aims at ascertain whether and to what extent the debt-growth nexus depends on countries' institutional framework in order to better evaluate the efficiency of debt relief policies. The theoretical underpinnings of the HIPC Initiative are related to the presence of debt overhang, but recent research raised some concerns on high debts being a real constraint to economic growth in poor countries. In particular, Arslanalp and Henry (2006) conclude that *"The danger is that Gleneagles declaration may amount to a Pyrrhic victory: a symbolic win for advocates of debt relief that clears the conscience of the rich countries, but leaves the real problems of the poor countries unaddressed"*. A failure of institutions in HIPC countries to protect investors, property rights and contracts causes debt relief efforts to have a limited impact on growth, investment and social expenditures (Arslanalp and Henry, 2006; Dessy and Vencatachellum, 2007). A policy implication of this argument is that financial resources should be redirected to countries which are not part of debt relief programs, but have more stable and strong economic infrastructures. The evidence discussed in the paper partially challenges this conclusion. In some countries poor institutional quality actually makes external debt irrelevant for the debt-growth relationship. Nevertheless, in countries with strong institutions and policies debt relief is likely to foster economic growth.

[22] Additional robustness tables are not shown for reasons of space, but they are available from the author on request.

Therefore, the main policy implication of the paper is that debt relief policies should be tailored to country-specific characteristics, as already done in the DSF to evaluate the overall public debt sustainability. The dependence of debt overhang on the overall CPIA index would call forth debt reductions conditional to a certain level of institutional quality. Besides, a policy design that makes the amount of debt cancelation conditional upon an actual improvements in institutional quality would act as a strong incentive for recipients to strengthen institutions and policies, as suggested, among others, by Collier (2007) and Arnone, Bandiera and Presbitero (2008).

Of course, I acknowledge that the paper has many limitations that undermine its practical relevance for actual policy making. Nonetheless, it points out a simple suggestion on which more research should shed light, in order to better reckon the thresholds of the policy and institutional index which determine the debt irrelevance and the debt overhang zones. The availability of a reliable dataset on debt relief (Depetris Chauvin and Kraay, 2005) can allow for the estimation of actual heterogeneous impacts of debt relief on investment and economic growth, according to country-specific policy and institutional framework.

Moreover, the focus of the paper is explicitly on the economic efficiency of debt relief as a valid instrument to trigger economic growth. However, debt cancelation could have had other side effects on HIPC countries. If perceived as an endorsement of the international community of HIPCs' reforming efforts, it could lead to more resource inflows and foreign investment. As suggested by Cordella, Ricci and Ruiz-Arranz (2005), the recent evidence of a growing number of litigations by *vulture funds* against HIPCs [23] could be interpreted as a sign that commercial creditors are becoming more confident on future growth prospects of HIPCs. Finally, policy makers have to take into account also a number of other factors in order to implement efficient debt relief initiatives. In particular, as concerns the ineffectiveness of debt overhang in countries with a weak institutional framework, it is worth considering the concept of odious debt. As argued by Jayachandran and Kremer (2006), the efficiency gains from preventing odious debt could be larger than the ones from solving debt overhang.

In conclusion, I argue that the evidence discussed in the paper calls for a rethinking of actual debt relief policies, which have to avoid one-size-fits-all solutions and consider different countries other than the actual HIPC eligible ones, targeting financial resources towards better governed countries.

[23] On this see International Development Association and International Monetary Fund (2007*a*); Arnone, Bandiera and Presbitero (2008)

References

Acemoglu, Daron, Simon Johnson and James A. Robinson. 2005. Institutions as the Fundamental Cause of Long-Run Growth. In *Handbook of Economic Growth*, ed. Philippe Aghion and Steven Durlauf. Vol. 1A Amsterdam: North Holland chapter 6, pp. 385–472.

Arellano, Manuel and Stephen Bond. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies* 58(2):277–97.

Arnone, Marco, Luca Bandiera and Andrea F. Presbitero. 2008. "Debt Sustainability Framework in HIPCs: A Critical Assessment and Suggested Improvements." Università Politecnica delle Marche.

Arslanalp, Serkan and Peter Blair Henry. 2006. "Policy Watch: Debt Relief." *Journal of Economic Perspectives* 20(1):207–220.

Barro, Robert J. and Jong-Wha Lee. 2001. "International data on educational attainment: updates and implications." *Oxford Economic Papers* 53(3):541–563.

Bird, Graham and Alistair Milne. 2003. "Debt Relief for Low Income Countries: Is it Effective and Efficient?" *The World Economy* 26(1):43–59.

Blundell, Richard and Stephen Bond. 1998. "Initial conditions and moment restrictions in dynamic panel data models." *Journal of Econometrics* 87(1):115–143.

Blundell, Richard, Steve Bond and Frank Windmeijer. 2000. Estimation in dynamic panel data models: improving on the performance of the standard GMM estimator. IFS Working Papers W00/12 Institute for Fiscal Studies.

Bond, Stephen Roy, Anke Hoeffler and Jonathan Temple. 2001. GMM Estimation of Empirical Growth Models. CEPR Discussion Papers 3048 C.E.P.R. Discussion Papers.

Bond, Steve, Asli Leblebicioglu and Fabio Schiantarelli. 2004. Capital Accumulation and Growth: A New Look at the Empirical Evidence. IZA Discussion Papers 1174 Institute for the Study of Labor (IZA).

Chowdhury, Abdur R. 2004. External Debt, Growth and the HIPC Initiative: Is the Country Choice Too Narrow? In *Debt Relief for Poor Countries*, ed. Tony Addison, Henrik Hansen and Finn Tarp. New York: Palgrave Macmillan chapter 8, pp. 158–180.

Clements, Benedict J., Rina Bhattacharya and Toan Quoc Nguyen. 2003. External Debt, Public Investment, and Growth in Low-Income Countries. IMF Working Papers 03/249 International Monetary Fund.

Cohen, Daniel. 1993. "Low Investment and Large LDC Debt in the 1980's." *American Economic Review* 83(3):437–49.

Collier, Paul. 2007. *The Bottom Billion.* New York: Oxford University Press.

Colombo, Emilio and Enrico Longoni. 2007. "The Politics of External Debt in Developing Countries." University of Milan - Bicocca.

Cordella, Tito, Luca Antonio Ricci and Marta Ruiz-Arranz. 2005. Debt Overhang or Debt Irrelevance? Revisiting the Debt Growth Link. IMF Working Papers 05/223 International Monetary Fund.

Davidson, Russell and James G. MacKinnon. 2004. *Econometric Theory and Methods.* New York: Oxford University Press.

Depetris Chauvin, Nicolas and Aart Kraay. 2005. "What Has 100 Billion Dollars Worth of Debt Relief Done for Low-Income Countries?" The World Bank.

Dessy, Sylvain E. and Desire Vencatachellum. 2007. "Debt Relief and Social Services Expenditure: The African Experience, 1989–003." *African Development Review* 19(1):200–216(17).

Dikhanov, Yuri. 2004. "Historical Present Value of Debt in Developing Economies: 1980-2002." The World Bank.

Easterly, William. 2001. "Growth Implosions and Debt Explosions: Do Growth Slowdowns Cause Public Debt Crises?" *Contributions to Macroeconomics* 1(1):Article 1.

Elbadawi, Ibrahim A., Benno J. Ndulu and Njuguna Ndung'u. 1997. Debt Overhang and Economic Growth in Sub-Saharan Africa. In *External Finance for Low-Income Countries*, ed. Zubair Iqbal and Ravi Kanbur. Washington D.C.: IMF Institute chapter 5.

Fosu, Augustin Kwasi. 2007. "Fiscal Allocation for Education in Sub-Saharan Africa: Implications of the External Debt Service Constraint." *World Development* 35(4):702–713.

Hansen, Henrik. 2004. The Impact of External Aid and External Debt on Growth and Investment. In *Debt Relief for Poor Countries*, ed. Tony Addison, Henrik Hansen and Finn Tarp. New York: Palgrave Macmillan chapter 7, pp. 134–157.

Harrabi, Sana, Lobna Bousrih and Salisu Mohammed. 2007. "Debt Relief and Credit to the Private Sector in African Countries." *African Development Review* 19(3):469–480.

Hodrick, Robert J and Edward C Prescott. 1997. "Postwar U.S. Business Cycles: An Empirical Investigation." *Journal of Money, Credit and Banking* 29(1):1–16.

Hoeffler, Anke E. 2002. "The Augmented Solow Model and the African Growth Debate." *Oxford Bulletin of Economics and Statistics* 64(2):135–58.

Imbs, Jean and Romain Ranciere. 2005. The overhang hangover. Policy Research Working Paper Series 3673 The World Bank.

International Development Association. 2005. The Multilateral Debt Relief Initiative: Implementation Modalities for IDA. Technical report The World Bank.

International Development Association. 2007. Country Policy and Institutional Assessment - 2007 Assessment Questionnaire. Technical report The World Bank.

International Development Association and International Monetary Fund. 2007*a*. Heavily Indebted Poor Countries (HIPC) Initiative and Multilateral Debt Relief Initiative (MDRI) - Status of Implementation. Technical report The World Bank and IMF.

International Development Association and International Monetary Fund. 2007*b*. Staff Guidance Note on the Application of the Joint Bank-Fund Debt Sustainability Framework for Low-Income Countries. Technical report The World Bank and IMF.

Jayachandran, Seema and Michael Kremer. 2006. "Odious Debt." *American Economic Review* 96(1):82–92.

Johansson, Pernilla. 2008. Debt Relief, Investment and Growth. Working Paper 11 Lund University.

Kraay, Aart and Vikram Nehru. 2006. "When Is External Debt Sustainable?" *World Bank Economic Review* 20(3):341–365.

Krugman, Paul. 1988. "Financing vs. forgiving a debt overhang." *Journal of Development Economics* 29(3):253–268.

Lane, Philip R. 2004. "Empirical Perspectives on Long-Term External Debt." *Topics in Macroeconomics* 4(1).

Lora, Eduardo and Mauricio Olivera. 2007. "Public debt and social expenditure: Friends or foes?" *Emerging Markets Review* 8(4):299–310.

Moss, Todd J. and Hanley S. Chiang. 2003. The Other Costs of High Debt in Poor Countries: Growth, Policy Dynamics, and Institutions. Issue paper on debt sustainability Center for Global Development.

Nickell, Stephen J. 1981. "Biases in Dynamic Models with Fixed Effects." *Econometrica* 49(6):1417–26.

Nkurunziza, Janvier D. and Robert H. Bates. 2003. Political Institutions and Economic Growth in Africa. Technical Report 185 The Centre for the Study of African Economies Working Paper Series.

Pattillo, Catherine A., Helene Poirson and Luca Antonio Ricci. 2002. External Debt and Growth. IMF Working Papers 02/69 International Monetary Fund.

Pattillo, Catherine A., Helene Poirson and Luca Antonio Ricci. 2004. What Are the Channels Through Which External Debt Affects Growth? IMF Working Papers 04/15 International Monetary Fund.

Presbitero, Andrea F. 2006. "The Debt-Growth Nexus: a Dynamic Panel Data Estimation." *Rivista Italiana degli Economisti* 3(4):417–462.

Presbitero, Andrea F. 2007. The Debt-Growth Nexus in Poor Countries: A Reassessment. Economics Discussion Papers 2007-17 Kiel Institute for the World Economy.

Rajan, Raghuram G. 2005. "Debt Relief and Growth." *Finance & Development* 42(2):56.

Roodman, David. 2006. How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata. Working Papers 103 Center for Global Development.

Roodman, David. 2007. A Short Note on the Theme of Too Many Instruments. Working Papers 125 Center for Global Development.

Sachs, Jeffrey D. 1989. The Debt Overhang of Developing Countries. In *Debt, Stabilization and Development*, ed. Guillermo A. Calvo, Ronald Findlay, Pentti Kouri and Jorge Braga de Macedo. Oxford: Basil Blackwell.

Sachs, Jeffrey D. 2002. "Resolving the Debt Crisis of Low-Income Countries." *Brookings Papers on Economic Activity* 2002(1):257–286.

Serven, Luis. 1997. "Irreversibility, Uncertainty and Private Investment: Analytical Issues and Some Lessons for Africa." *Journal of African Economies* 6(3):229–68.

Windmeijer, Frank. 2005. "A finite sample correction for the variance of linear efficient two-step GMM estimators." *Journal of Econometrics* 126(1):25–51.

World Bank. 2008. *World Development Indicators 2008*. Washington, DC: The World Bank.

A Annex

Table 8: List of Countries

Country	**WB code**	**Region**	**Country**	**WB code**	**Region**
Albania	ALB	ECA	Latvia	LVA	ECA
Algeria	DZA	MENA	Lebanon	LBN	MENA
Argentina	ARG	LAC	Lesotho	LSO	SSA
Armenia	ARM	ECA	Lithuania	LTU	ECA
Azerbaijan	AZE	ECA	Macedonia, FYR	MKD	ECA
Bangladesh	BGD	SA	Madagascar	MDG	SSA
Belarus	BLR	ECA	Malawi	MWI	SSA
Belize	BLZ	LAC	Malaysia	MYS	EAP
Benin	BEN	SSA	Mali	MLI	SSA
Bolivia	BOL	LAC	Mauritania	MRT	SSA
Botswana	BWA	SSA	Mauritius	MUS	SSA
Brazil	BRA	LAC	Mexico	MEX	LAC
Bulgaria	BGR	ECA	Moldova	MDA	ECA
Burkina Faso	BFA	SSA	Mongolia	MNG	EAP
Burundi	BDI	SSA	Morocco	MAR	MENA
Cameroon	CMR	SSA	Mozambique	MOZ	SSA
Cape Verde	CPV	SSA	Nepal	NPL	SA
Central African Republic	CAF	SSA	Nicaragua	NIC	LAC
Chad	TCD	SSA	Niger	NER	SSA
Chile	CHL	LAC	Nigeria	NGA	SSA
China	CHN	EAP	Pakistan	PAK	SA
Colombia	COL	LAC	Panama	PAN	LAC
Comoros	COM	SSA	Papua New Guinea	PNG	EAP
Congo, Dem. Rep.	ZAR	SSA	Paraguay	PRY	LAC
Congo, Rep.	COG	SSA	Peru	PER	LAC
Costa Rica	CRI	LAC	Philippines	PHL	EAP
Cote d'Ivoire	CIV	SSA	Poland	POL	ECA
Croatia	HRV	ECA	Romania	ROM	ECA
Czech Republic	CZE	ECA	Russian Federation	RUS	ECA
Djibouti	DJI	MENA	Rwanda	RWA	SSA
Dominican Republic	DOM	LAC	Senegal	SEN	SSA
Ecuador	ECU	LAC	Sierra Leone	SLE	SSA
Egypt, Arab Rep.	EGY	MENA	Slovak Republic	SVK	ECA
El Salvador	SLV	LAC	Solomon Islands	SLB	EAP
Equatorial Guinea	GNQ	ECA	South Africa	ZAF	SSA
Eritrea	ERI	SSA	Sri Lanka	LKA	SA
Estonia	EST	ECA	St. Lucia	LCA	LAC
Ethiopia	ETH	SSA	Swaziland	SWZ	SSA
Gabon	GAB	SSA	Syrian Arab Republic	SYR	MENA
Gambia, The	GMB	SSA	Tajikistan	TJK	ECA
Georgia	GEO	ECA	Tanzania	TZA	SSA
Ghana	GHA	SSA	Thailand	THA	EAP
Guatemala	GTM	LAC	Togo	TGO	SSA
Guinea	GIN	SSA	Tonga	TON	EAP
Guinea–Bissau	GNB	SSA	Trinidad and Tobago	TTO	LAC
Guyana	GUY	LAC	Tunisia	TUN	MENA
Haiti	HTI	LAC	Turkey	TUR	ECA
Honduras	HND	LAC	Uganda	UGA	SSA
Hungary	HUN	ECA	Ukraine	UKR	ECA
India	IND	SA	Uruguay	URY	LAC
Indonesia	IDN	EAP	Uzbekistan	UZB	ECA
Jamaica	JAM	LAC	Vanuatu	VUT	EAP
Jordan	JOR	MENA	Venezuela, RB	VEN	LAC
Kazakhstan	KAZ	ECA	Vietnam	VNM	EAP
Kenya	KEN	SSA	Yemen, Rep.	YEM	MENA
Kyrgyz Republic	KGZ	ECA	Zambia	ZMB	SSA
Lao PDR	LAO	EAP	Zimbabwe	ZWE	SSA

Notes: The country code and the geographic region refer to the World Bank Country Classification (http://go.worldbank.org/K2CKM78CC0). ECA: Europe & Central Asia; SSA: Sub–Saharan Africa; SA: South Asia; EAP: East Asia & Pacific; LAC: Latin America & Caribbean; MENA: North Africa & Middle East.

Table 9: Nominal PPG External Debt over GDP, System–GMM

Dep. Var.: *GROWTH*	(1)	(2)	(3)	(4)	(5)	(6)
GDP_{t-1}	-1.832**	-1.742***	-1.555***	-1.918***	-1.720***	-1.917***
	[0.882]	[0.423]	[0.402]	[0.368]	[0.539]	[0.508]
INV	5.077**	4.592***	4.281***	3.719***	4.449***	4.211***
	[2.259]	[1.131]	[1.162]	[1.186]	[1.142]	[1.120]
POP	0.648	0.739	0.887**	0.728*	0.578	0.700*
	[1.505]	[0.463]	[0.431]	[0.395]	[0.475]	[0.368]
$EDUC$	3.715	2.423*	1.178	0.767	-0.641	1.765
	[8.994]	[1.246]	[1.275]	[1.427]	[1.789]	[1.481]
$OPEN$	1.171	1.226	1.092	1.766*	0.943	1.444
	[6.315]	[0.892]	[0.952]	[0.908]	[0.885]	[0.929]
TOT	0.052	0.071***	0.076**	0.093***	0.085***	0.095***
	[0.037]	[0.026]	[0.030]	[0.027]	[0.031]	[0.029]
INF	-0.001	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$(DEBT/GDP)$	3.309	2.925	1.945*	-0.046	0.287	3.799
	[8.174]	[2.590]	[1.060]	[0.486]	[0.569]	[3.353]
$(DEBT/GDP)^2$	-0.538	-0.440				-0.510
	[0.990]	[0.312]				[0.383]
$CPIA$		1.188***	4.356***			
		[0.305]	[1.250]			
$(DEBT/GDP) \times CPIA$			-0.758***			
			[0.282]			
Good CPIA (0,1)				8.893***		10.285
				[2.502]		[9.483]
$(DEBT/GDP) \times$ *Good CPIA*				-1.716***		-2.881
				[0.595]		[4.413]
$(DEBT/GDP)^2 \times$ *Good CPIA*						0.194
						[0.503]
Omitted categories: *Weak CPIA* and $(DEBT/GDP) \times$ *Weak CPIA*						
Medium CPIA (0,1)					8.709***	
					[2.419]	
Strong CPIA (0,1)					10.877***	
					[2.775]	
$(DEBT/GDP) \times$ *Medium CPIA*					-1.806***	
					[0.568]	
$(DEBT/GDP) \times$ *Strong CPIA*					-2.115***	
					[0.662]	
Observations	375	375	375	375	375	375
Number of countries	110	110	110	110	110	110
Hansen OIR test	0.412	0.880	0.688	0.553	0.946	0.792
AR(1)	0.012	0.004	0.010	0.005	0.006	0.002
AR(2)	0.678	0.537	0.769	0.774	0.593	0.710
$(DEBT/GDP)$ & $(DEBT/GDP)^2$	0.116	0.136				
with *Bad CPIA*						0.256
with *Good CPIA*						0.003

Notes: The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The model is estimated by Two-Step System GMM, using Stata 10 SE package with XTABOND2 command. As instruments, we use all available lagged values of endogenous variables. The growth rate of terms of trade (TOT) and the (6) geographic and (4) time dummies (included in the regressions but not shown for reasons of space) are taken as strictly exogenous regressors. $(DEBT/GDP)$ is the ratio of nominal PPG external debt over (filtered) GDP. As diagnostic, the table reports the p-values of the Hansen test for overidentifying restrictions (OIR, the null is the validity of the instrument set) and of the Arellano and Bond autocorrelation tests of first and second order (AR(1) and AR(2), the null is no autocorrelation). The last three rows report the p-values of the two tailed t-test of annulment of $(DEBT/GDP)$ and $(DEBT/GDP)^2$, when inserted alone in the regression or interacted with the dummy *Good CPIA*.

Table 10: Nominal PPG External Debt over Exports, System–GMM

Dep. Var.: *GROWTH*	(1)	(2)	(3)	(4)	(5)	(6)
GDP_{t-1}	-1.535***	-1.432***	-1.766***	-2.066***	-2.334***	-2.254***
	[0.466]	[0.424]	[0.519]	[0.519]	[0.542]	[0.548]
INV	5.708***	4.666***	4.434***	4.172***	4.520***	4.028***
	[1.089]	[1.245]	[1.553]	[1.470]	[1.240]	[1.283]
POP	0.393	0.470	0.699	0.608	0.517	0.382
	[0.560]	[0.574]	[0.528]	[0.459]	[0.504]	[0.526]
$EDUC$	2.533*	2.038*	1.832	2.451	1.421	2.663**
	[1.512]	[1.050]	[1.254]	[1.586]	[0.957]	[1.175]
$OPEN$	1.447	1.811	1.988*	1.913	1.528*	1.600*
	[1.082]	[1.113]	[1.018]	[1.250]	[0.896]	[0.950]
TOT	0.047*	0.056**	0.052**	0.068***	0.069***	0.062***
	[0.028]	[0.025]	[0.026]	[0.024]	[0.025]	[0.023]
INF	-0.001***	-0.000**	-0.001***	-0.001***	-0.001***	-0.001***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
$(DEBT/EXP)$	4.149*	4.060*	1.514	0.180	0.959	2.901
	[2.368]	[2.187]	[1.855]	[0.487]	[0.638]	[3.506]
$(DEBT/EXP)^2$	-0.401*	-0.363*				-0.236
	[0.224]	[0.213]				[0.310]
$CPIA$		1.414***	3.942			
		[0.350]	[2.919]			
$(DEBT/EXP) \times CPIA$			-0.448			
			[0.489]			
Good $CPIA$ (0,1)				7.312**		18.667*
				[3.220]		[9.949]
$(DEBT/EXP) \times$ *Good* $CPIA$				-1.056*		-5.187
				[0.545]		[3.578]
$(DEBT/EXP)^2 \times$ *Good* $CPIA$						0.369
						[0.320]
Omitted categories: $Weak\ CPIA$ and $(DEBT/EXP) \times Weak\ CPIA$						
$Medium\ CPIA$ (0,1)					14.446***	
					[2.792]	
Strong $CPIA$ (0,1)					14.006***	
					[3.753]	
$(DEBT/EXP) \times Medium\ CPIA$					-2.360***	
					[0.505]	
$(DEBT/EXP) \times$ *Strong* $CPIA$					-2.043***	
					[0.665]	
Observations	388	388	388	388	388	388
Number of countries	114	114	114	114	114	114
Hansen OIR test	0.279	0.673	0.700	0.581	0.919	0.652
AR(1)	0.002	0.002	0.000	0.000	0.000	0.001
AR(2)	0.485	0.605	0.988	0.770	0.368	0.568
$(DEBT/EXP)$ & $(DEBT/EXP)^2$	0.202	0.138				
with *Bad* $CPIA$						0.661
with *Good* $CPIA$						0.190

Notes: The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The model is estimated by Two-Step System GMM, using Stata 10 SE package with XTABOND2 command. As instruments, we use all available lagged values of endogenous variables. The growth rate of terms of trade (TOT) and the (6) geographic and (4) time dummies (included in the regressions but not shown for reasons of space) are taken as strictly exogenous regressors. $(DEBT/EXP)$ is the ratio of nominal PPG external debt over (filtered) exports. As diagnostic, the table reports the p-values of the Hansen test for overidentifying restrictions (OIR, the null is the validity of the instrument set) and of the Arellano and Bond autocorrelation tests of first and second order (AR(1) and AR(2), the null is no autocorrelation). The last three rows report the p-values of the two tailed t-test of annulment of $(DEBT/EXP)$ and $(DEBT/EXP)^2$, when inserted alone in the regression or interacted with the dummy *Good* $CPIA$.

Please note:

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The Editor