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Abstract

This paper empirically explores the relationship between debt and growth for a number of developing and industrial economies. For developing countries, we find that lower total external debt levels are associated with higher growth rates, and that this negative relationship is driven by the incidence of public external debt, and not by private external debt. Regarding the channels through which debt accumulation affects growth, we find that this is mainly driven by the capital accumulation growth. There is only limited evidence on the relationship between external debt and total factor productivity growth. In addition, for private savings rates there are mixed results. We do not find any support for an inverted-U shape relationship between external debt and growth. For industrial countries, we do not find any significant relationship between gross government debt and economic growth.

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1 Introduction

The recent default of Argentina on part of its public debt is the most important default in history. The reason is that the restructuring process involved more than USD 100 billion in government bonds and a wide number of small private bondholders of different nationalities. It was clear that a certain reduction of the public debt would be necessary in order to make the debt situation sustainable. Furthermore, the argentine government did put emphasis that the specific debt reduction should be large enough so that long run economic growth is not affected by the new debt situation. However, although the relationship between public debt and economic growth is a major concern for policymakers, and public opinion in general, there is little empirical work investigating this relationship. Furthermore, there is even less evidence on the specific channels through which debt affects growth.

A recent exception to this lack of empirical evidence is the work by Patillo et al. (2002) and Patillo et al. (2004), which empirically studies the relationship between total external debt and the growth rate of GDP for developing countries. It should be noted that these studies consider total external debt, but does not distinguish between public external debt and private external debt. They conclude that there is a nonlinear relationship, in the form of an inverted-U shape relationship, between total external debt and growth in developing countries. At low levels of total external debt, it affects positively growth, but this relationship becomes negative at high levels of it. The specific turning points are 35-40 percent for the debt-to-GDP ratio and 160-170 percent for the debt-to-exports ratio. Their paper also presents a short survey of the theoretical and empirical literature dealing with debt and growth. Further, Patillo et al. (2004) suggest that the channels through which total external debt affects economic growth are total factor productivity and capital accumulation. Other previous empirical studies on the nonlinear effects of debt on growth include Smyth and Hsing (1995), Cohen (1997) and Elbadawi et al. (1997).

This paper aims to shed light on these issues by redressing the relationship between debt and growth in both developing and industrial countries, and exploring the channels through which it may manifest itself. The paper provides a comprehensive treatment of this issue by exploring four different dependent variables (GDP per capita growth rate, total factor productivity growth rate, capital accumulation growth rate, and private savings rate). Further, the debt variables include debt ratios not commonly used (such as debt to years of government revenues) as well as a distinction between public and private external debt for developing countries. Further, it investigates the relationship between gross government debt and economic growth for industrial countries. Note that we will estimate these relationships separately for the sample of developing and industrial countries due to different debt variable definitions. The inclusion of industrial countries, the splitting up of total external debt into public external debt and private external debt, a different and more comprehensive set of explanatory variables, and a longer time span for the data, are the main differences between this paper and Patillo et al. (2002) and Patillo et al. (2004).

In order to uncover these relationships, we use the system GMM dynamic panel econometric technique proposed by Arellano and Bover (1995) and Blundell and Bond (1998). Previous applied growth studies that use this econometric methodology include among others Beck et al. (2000), Levine et al. (2000), Patillo et al. (2002), and Patillo et al. (2004). The data set consist of a panel of 59 developing countries and 24 industrial countries with data averaged over each of the seven 5-year periods between 1970 and 2002. There are several sources of the data, but our main source is the World Development Indicators 2004 of the World Bank.

The rest of the paper is organized in six sections. The empirical methodology and the data used are discussed in sections 2 and 3 respectively. Section 4 presents the estimation results for the different dependent variables and debt indicators for the sample of developing countries. Further, we also presents the results of considering nonlinear effects on GDP growth. In section 5 we present the results for the industrial countries. In section 6, we discuss and present the results from some consistency test that were made in order to confirm the results from the benchmark case. Finally, section 7 concludes.

2 Econometric Methodology

The basic regression equation that we use in order to uncover the relationship between debt and economic growth is of the type

$$Y_{i,t} = \alpha X_{i,t} + \gamma D_{i,t} + \eta_i + \lambda_t + \varepsilon_{i,t} \tag{1}$$

where $Y_{i,t}$ is the dependent variable, $X_{i,t}$ represents the set of explanatory variables, $D_{i,t}$ is the debt variable, η_i is an unobserved country-specific effect, λ_t is an unobserved time-specific effect, $\varepsilon_{i,t}$ is the error term, and the subscripts i and t represent country and time period, respectively.

When estimating equation (1), we use four different dependent variables, namely the growth rate of GDP per capita, the TFP growth rate, the capital accumulation growth rate per capita, and the private savings rate. The reason for estimating equation (1) for each of these four dependent variables is that we not only want to study the relationship between debt and growth, but also the relation of debt and the determinants of growth. Regarding $X_{i,t}$, we will use five alternative explanatory variable sets. The first set, which is the base set, includes initial income per capita[1], and educational attainment. The second set adds to the base set government size, openness to trade and inflation. The third set is like the second set, but also includes the level of financial intermediary development. The fourth set is equal to the first set plus population growth and the level of investment. The fifth set adds to the fourth set openness to trade, terms of trade growth and fiscal balance. Note that the second and third set are very similar between each other. The same is valid between the

[1]The inclusion of initial income per capita when the dependent variable is the real growth rate of GDP per capita makes equation (1) become dynamic in nature. See for example Durlauf et al. (2004).

fourth set and the fifth set. In addition, when estimating equation (1) for the growth determinants, $X_{i,t}$ includes the lagged dependent variable, which makes the regressions become dynamic in nature. The sources and definitions of these variables are defined more thoroughly in section 3. Further, when using the private savings rate as dependent variable (the saving regression), we will use a completely different explanatory variable set. The variables that are used are presented in section 3.

Evidently, equation (1) is linear in nature. However, we are also interested in investigating if there is any nonlinear relationship between debt and economic growth. Specifically, we are interested in determining whether there exists an inverted-U shape relationship between debt and growth, i.e. low levels of debt are associated with a positive relationship with growth, and high levels of debt are associated with negative growth rates.[2] Therefore, in order to allow for nonlinear effects of debt, we included a linear spline function in equation (1). In this case, equation (1) becomes

$$Y_{i,t} = \alpha X_{i,t} + \gamma D_{i,t} + \delta d_{i,t}(D_{i,t} - D^*) + \eta_i + \lambda_t + \varepsilon_{i,t} \tag{2}$$

where $d_{i,t}$ is a dummy variable which equals 1 if the value of the debt variable is above a certain threshold value D^* and 0 otherwise. If δ is significantly different from zero, we can conclude that there is a nonlinear relationship. In this case, the impact of debt will be different above and below the threshold D^*, i.e. there will be a structural break. However, in order for there to be an inverted-U shape relationship, γ should be positive and δ should be negative. Further, δ should be larger than γ in absolute terms. The specific threshold values for D^* will depend on the specific debt indicator that is used. However, as there is no theoretical nor empirical indication on any specific threshold value, we chose to estimate equation 2 for each debt indicator with nine ad-hoc chosen threshold values. In section A.2 of the appendix we display the specific threshold values for each debt indicator. In addition, equation 2 was estimated for each threshold value with the five alternative explanatory variable sets.

Methodologically, the paper uses the GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), called dynamic system GMM panel estimator.[3] Further, we use the robust one-step estimates of the standard errors, which are consistent in the presence of any pattern of heteroskedasticity and autocorrelation within panels.[4] There are two conditions that are necessary for the GMM estimator to be consistent, namely that the error term, ε, does not exhibit serial correlation and the validity of the instruments that are used. We

[2] It has been claimed by Patillo et al. (2002) and Patillo et al. (2004) that such a nonlinear relationship is present.

[3] See Bond (2002) for an introduction to the use of GMM dynamic panel data estimators.

[4] The two-step estimates of the standard errors is asymptotically more efficient than the one-step variant. However, in a finite sample the two-step estimates of the standard errors tend to be severely downward biased (Arellano and Bond, 1991; Blundell and Bond, 1998). Windmeijer (2000) derives a finite-sample correction to the two-step covariance matrix, which can make the two-step variant more efficient than one-step variant. We are, however, unable to implement the Windmeijer finite-sample correction because we have a limited number of cross sections (countries).

use two tests proposed by Arellano and Bond (1991) to validate these assumptions. The first test examines the assumption that the error term is not serially correlated. As this test uses the differenced error term, by construction AR(1) is expected to be present. Therefore, the Arellano-Bond test for autocorrelation determines whether the differenced error term has second-order, or higher, serial correlation. Under the null hypothesis of no second-order serial correlation, the test has a standard-normal distribution. The second assumption is corroborated by a test of over-identifying restrictions, which tests the overall validity of the instruments. Specifically, we use the Hansen J statistic, which is the minimized value of the two-step GMM criterion function. Under the null hypothesis of the validity of the instruments, this test has a χ^2 distribution with $(J-K)$ degrees of freedom, where J is the number of instruments and K the number of regressors. The reason for using this statistic, as opposed to the Sargan statistic, is that it is robust to heteroskedasticity and autocorrelation.

There are several reasons for using cross-section time-series data. First, adding the time-series dimension to the data augments the number of observations and the variability of the data. This is especially important for us given that we have a limited number of industrial and developing countries. Second, we are able to control for unobserved country specific effects and thereby reduce biases in the estimated coefficient estimates. Third, the GMM estimator controls for the potential endogeneity of all explanatory variables.[5] This is because the estimator controls for endogeneity by using "internal instruments", i.e. instruments based on lagged values of the explanatory variables. Note that it controls for "weak" endogeneity and not for full endogeneity (Bond, 2002).

3 Data

The data set consists of a panel of 59 developing countries and 24 industrial countries, with data averaged over each of the seven 5-year periods between 1970 and 2002 (1970-74; 1975-80; etc.).[6][7] All the variables that we use are averaged data over non-overlapping 5-year periods, as we want to capture the long run relationship between growth and debt, and not be subject to short run cyclical

[5] Recall that by including initial income per capita, the growth regression becomes dynamic in nature. Further, the growth determinant regressions include the lagged dependent variable, which also make them dynamic.

[6] Note that for the last period (2000-02), only three observations are available.

[7] The developing countries are Algeria, Argentina, Bangladesh, Bolivia, Brazil, Cameroon, Central African Republic, Chile, China, Colombia, Congo, Dem. Rep., Congo, Rep., Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Ethiopia, Gambia, The, Ghana, Guatemala, Guyana, Haiti, Honduras, India, Indonesia, Iran, Islamic Rep., Jamaica, Kenya, Lesotho, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritius, Mexico, Morocco, Mozambique, Myanmar, Nicaragua, Niger, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Rwanda, Senegal, Sierra Leone, South Africa, Sri Lanka, Sudan, Syrian Arab Republic, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Uruguay, Venezuela, RB, Zambia, and Zimbabwe. The industrial countries are Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Korea, Rep., Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States.

movements. Therefore, the total number of observations for the developing country panel is 413 and for the industrial country panel is 168. However, due to data availability for some samples we had less than these observations, and in most cases we had unbalanced panels. Note that the two country samples, developing and industrial, will be treated separately, due to differences in the debt variable definitions and sources.

The dependent variables are real per capita GDP growth rate (*growth*), total factor productivity growth rate (*prod*), capital stock growth rate per capita (*capgrowth*), and private savings rate (*psr*). For the debt variable, $D_{i,t}$, we use 15 different debt indicators for the developing countries: total external debt-to-GDP ratio (*dbtgdp*), total external debt-to-exports ratio (*dbtexp*), total external debt-to-revenues ratio (*dbtrev*), public external debt-to-GDP ratio (*pubdgdp*), public external debt-to-exports ratio (*pubdexp*), public external debt-to-revenues ratio (*pubdrev*), private external debt-to-GDP ratio (*privdgdp*), private external debt-to-exports ratio (*privdexp*), private external debt-to-revenues ratio (*privdrev*), interest payment-to-GDP ratio (*intgdp*), interest payment-to-exports ratio (*intexp*), interest payment-to-revenues ratio (*intrev*), debt service-to-GDP ratio (*dbtsergdp*), debt service-to-exports ratio (*dbtserexp*), and debt service-to-revenues ratio (*dbtserrev*). In the case of the industrial countries, we use 6 different debt indicators: gross government debt-to-GDP ratio (*opubdgdp*), gross government debt-to-exports ratio (*opubdexp*), gross government debt-to-revenues ratio (*opubdrev*), interest payment-to-GDP ratio (*intgdp*), interest payment-to-exports ratio (*intexp*), and interest payment-to-revenues ratio (*intrev*). Note that the main difference between industrial countries and developing countries is that for the former there exist data on total public debt from the OECD Economic Outlook, instead for the later there exists only data for external public debt from the WDI. Further, total external debt, private external debt and debt service data from the WDI is only available for developing countries. Beside the debt variable, the regressors include several variables to control for other factors associated with economic development. Specifically, we have five different explanatory variable sets. The first set consists of the initial income per capita to control for convergence (*linitial*) and average years of schooling as an indicator of the human capital stock in the economy (*lschool*). The second set includes, the variables from the first set, as well as government size (*lgov*) and inflation (*lpi*), which are used as indicators of macroeconomic stability, and openness to trade (*ltrade*) to capture the degree of openness of an economy. The third set adds to the second set a variable for financial intermediary development (*lprivo*). The fourth set includes, apart from initial income and schooling, population growth (*lpop*) and investment to GDP (*linv*). The fifth set includes the variables from the fourth set plus openness to trade (*ltrade*), terms of trade growth (*ltot*), and fiscal balance to GDP ($lfbal$).[8] In addition, the explanatory variable sets for the growth determinant regressions

[8]Note that the second and third sets are relatively similar to each other. Also, the fourth and fifth sets are related. The variables used in the second and third sets have been used in Beck et al. (2000) and Levine et al. (2000), and the ones in the fourth and fifth sets in Patillo et al. (2002) and Mankiw et al. (1992), among others.

include the lagged dependent variable.

When using the private savings rate as the dependent variable, we will only use one explanatory variable set, which will be different from the ones used for the other regressions. The chosen variables are determined by various theories of consumption, including the classical permanent-income and life-cycle hypothesis and the more recent theories accounting for consumption habits, subsistence consumption, precautionary saving motives, and borrowing constraints. The variables are one-period lag of private savings rate ($l.psr$), real per capita Gross Private Disposable Income ($lrpdi$), growth rate of real per capita GPDI ($grpdi$), real interest rate ($lrir$), terms of trade growth ($ltot$), old dependency ratio ($oldr$), young dependency ratio ($yngr$), urbanization ratio ($urbpop$), government savings rate (gsr), and inflation (lpi).[9]

The source for the data is mainly the World Development Indicators 2004 of the World Bank. However, we also used data from the OECD Economic Outlook, the International Financial Statistics database of the IMF, the Penn World Tables 6.1, the Barro-Lee database on educational attainment, the Financial Development and Structure database of the World Bank, and the Nehru and Dhareshwa Data Set on physical capital stock from the World Bank. Section A.1 of the appendix presents more detailed information about the sources and definitions of the different variables.

4 Estimation results for developing countries

4.1 Linear effects on GDP growth

Table 1 displays the estimation results of equation (1) for developing countries when the dependent variable is the GDP growth rate and the debt indicator is the total external debt-to-GDP ratio. The debt coefficient is negative and significant for all the five different independent variables sets, with the exception of set 2 where it is significant at the 10% level. Specifically, the coefficient values range from -0.864 (column(2)) to -2.146 (column(1)). In the case of the total external debt-to-exports ratio (Table 2), the debt coefficients are also negative and significant, with the exception of set 2, with values ranging from -0.791 (column (5)) to -1.969 (column (1)). These results are confirmed when using the total external debt-to-revenues ratio.[10] Thus, for developing countries, there is a significant negative relationship between the level of total external debt and the growth rate of the economy.

In the case of the public external debt-to-GDP ratio, the results are presented in table 3. We find a negative relationship with economic growth, with all the coefficients for the different independent variable sets being significant at least at the 5% level and ranging from -0.705 (column(5)) to -1.789 (column(1)). We

[9]These variables, with the exception of the lagged private savings rate, are used in the saving regressions of Beck et al. (2000).

[10]These results are not presented due to space considerations, but the tables may be provided upon request from the author.

find similar results in the case of the public external debt-to-exports ratio, with coefficients ranging from -0.639 to -1.983 (table 4). Further, these results are corroborated for the public external debt-to-revenues ratio.

When analyzing the results for the private external debt indicators, we find that the relationship with growth is not significant. In table 5, for example, we present the results when using the private external debt-to-GDP variable. Here only the debt coefficient for set 4 (column (4)) is significant. These results are supported for the case of the private external debt-to-exports ratio (table 6) and the private external debt-to-revenues ratio. As total external debt is composed of public external debt and private external debt, this suggests that the negative relationship between total external debt and growth is driven by the negative relationship that exists between public external debt, and not by the private component of it. In other words, it seems that high levels of public external debt are associated with low economic growth, but that high levels of private external debt are not necessarily associated with low economic growth.

The results of the linear relationship between GDP growth and the interest payment-to-GDP ratio, interest payment-to-exports ratio, and interest payment-to-revenues ratio are not presented due to space considerations.[11] However, the findings for the interest payment indicators for all five independent variables sets suggest that there is no significant relationship between GDP growth and interest payments. In the case of the debt indicators involving debt services, we have also chosen not to present them to save space. The results for all three debt service ratios, and for all five independent variable sets, show that there is an insignificant association between them and the growth rate of the economy.

4.2 Nonlinear effects on GDP growth

In this subsection we present the estimation results for the nonlinear relationship between the debt indicators and economic growth for developing countries using equation 2. As noted in section 2 nine alternative threshold values were used for each debt indicator. In section A.2 of the appendix we display the specific threshold values for each debt indicator.

When using the total external debt-to-GDP ratio, we find evidence of nonlinear effects when using a threshold value of 20%. In this case, however, there was no evidence supporting the existence of an inverted-U shape relationship. As can be seen in table 7, the debt variable coefficient, *dbtgdp*, is insignificantly different from zero, and the debt dummy variable coefficient, *dbtgdpdum*020, is negative, and significant for all the independent variables sets, i.e. there is no relationship between total external debt and growth when its ratio to GDP is bellow 20%, but there is a negative relationship when its ratio is above 20%. These nonlinear effects dissipated when using the threshold values above 20%. In the case of the total external debt-to-exports ratio, we did not find evidence of nonlinear relationships for any of the nine different threshold values. In table

[11] The tables may be provided upon request from the author.

8, we present the results for the total external debt-to-export ratio when using a threshold value of 150%.[12] We performed the same nonlinear estimation using the total external debt-to-revenues ratio with different threshold values. We find some evidence of nonlinear effects when the total external debt-to-revenues ratio was bellow 150%. In these cases, however, the debt variable coefficient was insignificantly different from zero, while the debt dummy variable coefficient was negative and significant, i.e. there is no evidence of an inverted-U shape relationship. In addition, these nonlinear effects disappeared when estimating equation 2 with threshold values above 150%. Concluding, we can assert that there is some evidence of nonlinear effects when using low debt threshold values, but no evidence of an inverted-U shape relationship between total external debt and growth.

It is to be noted that these results are in stark contrast to the results of Patillo et al. (2002), who claim that there is a positive relationship between total external debt and growth when the total external debt-to-GDP ratio is bellow 35-40%, or when the total external debt-to-exports ratio is bellow 160-170%. One possible explanation for this discrepancy is that Patillo et al. (2002) uses only one set of explanatory variables when estimating their growth regressions, which corresponds to our fifth explanatory variable set. As can be seen in table 9, when estimating the nonlinear relationship between the total external debt-to-GDP ratio and economic growth with a threshold value of 30%, only the debt dummy coefficient for the fifth explanatory variable set (column (5)) is negative and significant at the 5% level. Therefore, it is possible that their results are driven by the specific selection of explanatory variables.[13]

When considering the public external debt indicators, we did not find any evidence of nonlinear effects for both the ratios to GDP and exports. In the case of the public external debt-to-revenues ratio, we find evidence of nonlinear effects only when using the threshold value 100%. In this case, however, the debt variable coefficient was insignificantly different from zero, while the debt dummy variable coefficient was negative and significant, i.e. the inverted-U shape hypothesis was rejected. For the private external debt indicators, we did not find any evidence of nonlinear effects for the three ratios and all the nine threshold values.

In the cases of the interest payment indicators, we did not find any evidence of nonlinear effects. In the case of the debt service-to-GDP ratio, there is evidence of nonlinear effects and an inverted-U shape relationship with the growth rate when using threshold values bellow 3%. As can be seen in table 10, the debt variable coefficient, $dbtsergdp$, is positive and significant, while the debt dummy variable, $dbtsergdpdum003$, is negative and significant. Further, the debt dummy coefficient is larger in absolute value than the debt variable coefficient, which would be supporting the inverted-U shape relationship. These results are interesting when considering that when the linear relationship be-

[12] We decided to show the results for this specific threshold value because Patillo et al. (2002) claim that bellow this threshold there is a positive relationship with growth, and above there is a negative relationship.

[13] This is a common critique to the whole empirical growth literature (Durlauf et al., 2004).

tween debt service-to-GDP ratio and growth was estimated, we found an insignificant relationship. The nonlinear evidence is, however, not supported by the other two debt service ratios (exports and revenues), where the debt dummy variable coefficients are insignificant in all cases. Therefore, the results for the debt service-to-GDP ratio should be taken with caution.

4.3 Linear effects on TFP growth

In table 11 we present the results for the estimation of equation (1) when using the total factor productivity growth as the dependent variable and the total external debt-to-GDP ratio for developing countries. Further, this relationship has also been estimated using the total external debt-to-exports ratio and the total external debt-to-revenues ratio. Although all the debt variable coefficients are negative, they are not significant when using the total external debt-to-GDP ratio. Further, for the total external debt-to-exports ratio, the debt variable coefficients are not significant, but for the first set, which is negative and significant. However, for the total external debt-to-revenues ratio, the debt coefficients are negative and significant for the first four sets. Therefore, there is very weak evidence on the significance of the negative relationship between total external debt and TFP growth. Thus, it is doubtful that the negative relationship between total external debt and GDP growth is driven by the effect of TFP growth on GDP growth.

In the case of the debt indicators involving the public external debt, we can draw the same conclusions as for the total external debt indicators. All the coefficients of the different specifications are insignificant, but for the third and fourth set when using the public external debt-to-revenues ratio. In the case of the private external debt indicators, the debt coefficients are negative and significant for specification one and four for the private external debt-to-GDP ratio and specifications one to four for the private external debt-to-revenues ratio. Thus, no robust relationship between private external debt and TFP growth is found.

In the case of the interest payment and debt service indicators, none of the coefficients are significant for the different independent variable sets. Thus, no relationship between these indicators and TFP growth is found.

4.4 Linear effects on capital growth

In this subsection we analyze the relationship between the different debt indicators and per capita growth rate of the capital stock for developing countries. In table 12 we present the results of the estimation of equation (1) when using capital growth as the dependent variable and the total external debt-to-GDP ratio as the debt variable. Note again that we have also estimated this relationship using the total external debt-to-exports ratio and the total external debt-to-revenues ratio, but due to space reasons we do not present the results. For both the total external debt-to-GDP ratio and the total external debt-to-exports ratio, we find a significant negative relationship between total external

debt and capital stock growth. The coefficients range from -0.672 and -1.000 in the case of the total external debt-to-GDP ratio, and are all significant at the 5% level, but for the fourth set, which is significant at the 10% level. In the case of the total external debt-to-revenues ratio, although we find that all the coefficients are negative, only the second and third sets are significant. These results, in combination with the findings presented in subsection 4.3, suggest that the main driving factor behind the negative relationship between total external debt and GDP growth seems to be the influence of external debt on capital stock accumulation.

Regarding the indicators of public external debt, the estimation results for the GDP ratio is presented in table 13. Our findings show that there is a significant negative relationship between public external debt and capital accumulation. The negative coefficients are all significant at the 5% level and range from -0.620 to -1.110 in the case of the public external debt-to-GDP ratio. These results are similar to those obtained for the public external debt-to-exports ratio. In the case of the public external debt-to-revenues ratio, we find that the debt variable coefficient is significant for the first three sets. Regarding the private external debt, we do not find any significant relationship between these debt indicators and capital accumulation. Thus, we reach the conclusion that the negative relationship between total external debt and capital accumulation growth is mainly due to the influence of public external debt.

In so far as the interest payment indicators are concerned, there is no evidence on any significant relationship between interest payments and capital accumulation. For the debt service indicators, we find some evidence that it has a significant negative relationship with capital accumulation. For the debt service-to-GDP ratio, the last four sets have a significant debt coefficient. For the debt service-to-exports ratio and the debt service-to-revenues ratio, three of five sets and two of five sets have a significant debt variable coefficient, respectively.

4.5 Linear effects on private savings rate

In this subsection we will present the results of the savings regression for developing countries. The results for some of the external debt indicators are presented in table 14. The estimated equation is similar to equation (1) and we use the same system GMM estimator as before. The difference, however, is that we use a unique and different independent variable set, as explained in section 3. In the case of the total external debt indicators, we only find that the debt variable coefficient is significantly different from zero, with a negative value of -0.028, for the total external debt-to-exports ratio. The same results are obtained for the public external debt indicators, where the only significant debt coefficient is for the public external debt-to-exports ratio, with a negative value of -0.024. The significance of these coefficients in both cases is reverted when doing the same estimation with the data set without outliers. Thus, there seems to be no clear relationship between total and public external debt and the private savings rate of an economy. Regarding the private external debt

indicators, we find that the debt coefficients for all three ratios are positive. However, they are only significant for the private external debt-to-GDP ratio. Therefore, there is no strong evidence that there is a positive relationship between private external debt and the private savings rate. In the case of the interest payments indicators, as well as for the debt service indicators, we do not find any significant relationship between these ratios and the private savings rate.

5 Estimation results for industrial countries

5.1 Linear and nonlinear effects on GDP growth

In this subsection we will present the results for industrial countries when estimating equation (1) with the GDP growth as the dependent variable. Table 15 displays the results for the gross government debt-to-GDP ratio, where it is clear that all the debt coefficients are insignificant, except for the debt coefficient when using the fifth independent variable set. The debt coefficient when using the fifth independent set is positive and significant at the 1% level with a value of 0.355. This specific result would be indicating that there is a positive relationship between gross government debt levels and economic growth. These results are also obtained when using the gross government debt-to-exports ratio and the gross government debt-to-revenues ratio. We conclude therefore that, although we found a positive relationship between the three different debt ratios and economic growth for the fifth independent variable set, the evidence tends to support an insignificant relationship between gross government debt and economic growth for industrial countries.

In the case of the relationship between the interest payment ratios and economic growth for industrial countries, we did not find any evidence supporting a significant relationship between them.

Regarding the possibility of a nonlinear relationship between gross government debt and growth, we did not find any evidence that supported such an hypothesis.

5.2 Linear effects on TFP growth

From table 16, which shows the results for the gross government debt-to-GDP ratio for industrial countries, it is clear that no relationship between government debt and total factor productivity growth is found. All the debt coefficients for the five different independent variable sets are positive, but insignificant in four out of five sets. Similar results are found for the gross government debt-to-exports ratio and gross government-to-revenues ratio, which are not shown to save space.

When using the interest payment-to-GDP ratio, we find no evidence of any significant relationship between this ratio and TFP growth. The same applies

to the other two ratios (interest payment-to-exports ratio and interest payment-to-revenues ratios).

5.3 Linear effects on capital growth

The estimation of equation (1) when using the capital accumulation growth ratio as the dependent variable and the gross government debt-to-GDP ratio as the debt variable for industrial countries are presented in table 17. All the debt coefficients, but for the first set, are insignificantly different from zero. In the case when using the gross government debt-to-exports and the gross government debt-to-revenues ratio, we do not find that any of the debt coefficients are significant. We can therefore assert that there does not seem to be any significant relationship between gross government debt and capital accumulation growth.

In the case of the estimation of equation (1) when using the interest payment ratios as the debt variable, we do not find evidence of any relationship between them and capital accumulation growth for any of the three ratios.

5.4 Linear effects on private savings rate

In the case of the saving regression for industrial countries, and when using the gross government debt ratios, we find mixed results regarding the significance of the relationship between the debt ratios and private savings rates. In table 18 we see that the debt coefficient is insignificant for the gross government debt-to-GDP ratio, but negative and significant for the gross government debt-to-exports ratio and the gross government debt-to-revenues ratio. Thus, we conclude that there is some evidence supporting the negative relationship between the gross government debt level and private savings rates for industrial countries.

Table 18 shows also the estimation results when using the interest payment ratios. In this case, only the interest payment-to-exports is significant, and we can therefore conclude that no strong relationship between interest payments level and private savings rates is found.

6 Consistency tests

In order to corroborate the results of sections 4 and 5, we performed two consistency tests. First, all the estimated equations were estimated without outliers. We identified outliers using the method of Hadi (1994). Second, we used 3-year averages, instead of using 5-year averages, which increased the time span to 11 periods and the sample size to 649 observations for developing countries and 264 observations for industrial countries. After performing these consistency tests, we did not obtain results that changed the benchmark case results from sections 4 and 5. Consequently, the benchmark case results could not be refuted and are robust to both consistency tests.[14]

[14]The tables may be provided upon request from the author.

7 Conclusions

This paper has investigated both the linear and nonlinear relationship between debt and economic growth for developing and industrial countries. Further, it has tried to determine the channels through which debt affects economic growth, by considering its effects on total factor productivity, capital accumulation and private savings rates, respectively. In order to specify the growth regression, we have used five alternative independent variables sets commonly used in the empiric growth literature.

The results show that for developing countries there is a negative and significant relationship between total external debt and economic growth, i.e. lower total external debt levels are associated with higher growth rates. Further, when distinguishing between public external debt and private external debt, we find a negative relationship between public external debt and growth, but no significant relationship when only considering private external debt. Therefore, we conclude that the negative relationship between total external debt and economic growth is driven by the incidence of public external debt levels, and not by private external debt levels. Insofar as the channels through which external debt accumulation affects growth are concerned, the results suggest that this is mainly driven by the capital accumulation growth, with only limited evidence on the relationship between external debt and total factor productivity growth. In addition, private savings rates are not affected by external debt levels. Further, we have found very limited evidence of nonlinear effects for these relationships. When considering other debt indicators, such as interest payments and debt services, the results suggest that there is no robust relationship between these debt indicators and growth.

Our results for developing countries are in contrast to the results of Patillo et al. (2002), who find evidence of a nonlinear relationship between total external debt and growth. Moreover, they find that there is a positive relationship between total external debt and economic growth when the external debt level is bellow a certain threshold, and a negative relationship when it is above the threshold, i.e. an inverted-U shape relationship. In contrast, we find that there is only limited support for a nonlinear relationship, and no evidence of a positive relationship between total external debt and growth at low debt levels, i.e. there is no indication on the existence of an inverted-U shape relationship between external debt and growth.

In the case of industrial countries, we did not find any robust linear and nonlinear relationship between gross government debt and economic growth (nor the growth determinants, with the exception of the private savings rate). This is a very interesting result because it would be suggesting that for industrial countries higher public debt levels are not necessarily associated with lower GDP growth rates. Clearly, this is in stark contrast to the results for developing countries, where the relationship is negative and significant. The question that remains to be answered is what is the reason for the difference between developing and industrial countries.

Although our results lend partial support to the view that public external

debt in developing countries may tend to crowd out economic activity by discouraging capital accumulation, it would have been desirable to estimate these relationships with a complete set of public debt data (i.e. including domestic debt and not only external). If data were available for a sufficiently long span of time and large sample of countries, this would be a suitable avenue for further research on this issue.

A Appendix

A.1 Data sources and definitions

The data was mainly taken from the World Development Indicators 2004 of the World Bank (WDI). However, we also used data from the OECD Economic Outlook, the International Financial Statistics database of the IMF (IFS), the Penn World Tables 6.1 (PWT), the Barro-Lee database on educational attainment, the Financial Development and Structure database of the World Bank, and the Nehru and Dhareshwa Data Set on physical capital stock from the World Bank. All the variables are used in log form, with the exception of the growth rate of GDP, capital accumulation growth, TFP growth, private savings rates, GPDI growth, old dependency ratio, young dependency ratio, urbanisation ratio, and government saving rate. Bellow is a list of the sources and definitions of the different variables used in this study.

1. Total external debt (*dbt*): Debt owed to nonresidents repayable in foreign currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt. Source: WDI.

2. Government external debt (*pubd*): Public and publicly guaranteed debt comprises long-term external obligations of public debtors, including the national government, political subdivisions (or an agency of either), and autonomous public bodies, and external obligations of private debtors that are guaranteed for repayment by a public entity. Source: WDI.

3. Private external debt (*prid*): Private nonguaranteed external debt comprises long-term external obligations of private debtors that are not guaranteed for repayment by a public entity. Source: WDI.

4. Gross Government debt (*opubd*): General government gross financial liabilities. Source: OECD Economic Outlook.

5. Interest payment (*int*): Interest payments by central government to domestic sectors and to nonresidents for the use of borrowed money. Source: WDI.

6. Debt service (*dbtser*): Total debt service is the sum of principal repayments and interest actually paid in foreign currency, goods, or services on long-term debt, interest paid on short-term debt, and repayments (repurchases and charges) to the IMF. Source: WDI.

7. GDP (*gdp*): Gross domestic product. Source: WDI.

8. Exports (*exp*): Exports of goods and services. Source: WDI.

9. Revenues (*rev*): Current revenue, excluding grants for central government. Source: WDI.

10. Real per capita GDP growth rate (*growth*): Annual percentage growth rate of GDP per capita based on constant local currency. Source: WDI.

11. Real per capita capital stock growth (*capgrowth*): We estimate the capital stock following the perpetual inventory method with steady-state estimates of initial capital (King and Levine, 1994). The initial steady-state estimates of capital for 1960 are taken from the Nehru and Dhareshwa Data Set on physical capital stock from the World Bank. We used the Gross fixed capital formation series at constant prices from the WDI, and we assumed a depreciation rate of 7%. The capital stock was divided by total population from the WDI. Source: WDI and Nehru and Dhareshwa Data Set.

12. Total factor productivity growth (*prod*): In order to compute the data on TFP, a neoclassical production function with physical capital K, labor L, the level of total factor productivity A, and the capital share α is used. In addition it is assumed that all the countries have the same Cobb-Douglas type of production function, so that aggregate output for each country i, Y_i, is given by

$$Y_i = A_i K_i^{\alpha} L_i^{1-\alpha}. \tag{3}$$

Then, equation (3) is divided by L to get per capita production. Secondly, a log transformation is made and the time derivative is taken. Finally, assuming a capital share $\alpha = 0.3$ and solving for the growth rate of productivity, we have

$$prod = growth - 0.3 * capgrowth.$$

where *growth* is the real per capita GDP growth rate and *capgrowth* is real per capita capital stock growth.

13. Initial income per capita (*linitial*): The logarithm of lagged real (PPP) per capita GDP (constant prices). Source: PWT.

14. Average years of schooling (*lschool*): The logarithm of one plus the average years of schooling in the total population over 25. Source: Barro-Lee database.

15. Government size ($lgov$): The logarithm of the ratio of General government final consumption expenditure to GDP. Source: WDI.

16. Inflation (lpi): The logarithm of one plus the inflation rate, which is calculated using the average annual consumer price index. Source: WDI.

17. Openness to trade ($ltrade$): The logarithm of the sum of exports of goods and services and imports of goods and services as a share of GDP. Source: WDI.

18. Terms of trade growth ($ltot$): The logarithm of one plus the growth rate of the terms of trade. Source: WDI.

19. Financial intermediary development ($lprivo$): The logarithm of the ratio of Private credit by deposit money banks and other financial institutions to GDP. Source: Financial Development and Structure database.

20. Private savings rate (psr): The ratio of Gross private saving and Gross private disposable income (GPDI). Gross private saving is measured as the difference between Gross national savings, including NCTR and Overall budget balance, including grants. GPDI is measured as the difference between Gross national disposable income (GNDI) and Gross public disposable income. GNDI is the sum of Gross national income and Net current transfers from abroad. Gross public disposable income is the sum of Overall budget balance, including grants and General government final consumption expenditure. A similar method is used in Loayza et al. (1998). Source: WDI and IFS.

21. Real per capita GPDI ($lrpdi$): The log of GPDI divided by total population and multiplied by a PPP index. The PPP index is constructed by dividing real (PPP) per capita GDP (constant prices) and per capita GDP (current LCU). Sources: WDI and PWT.

22. Growth rate of GPDI ($grpdi$): Growth rate of GPDI per capita at constant prices, which equals to GPDI divided by total population and GDP deflator. Source: WDI.

23. Real interest rate ($lrir$): The logarithm of one plus the real interest rate. Source: WDI.

24. Old dependency ratio ($oldr$): The share of population over 65 in total population. Source: WDI.

25. Young dependency ratio ($yngr$): The share of population under 15 in total population. Source: WDI.

26. Urbanization ratio ($urbpop$): The share of population that lives in urban areas. Source: WDI.

27. Government savings rate (gsr): The ratio of Overall budget balance, including grants, and GPDI. Source: WDI and IFS.

A.2 Alternative threshold values for the dummy variables

As explained in section 2, we estimated equation 2 using alternative threshold values for each debt indicator. Specifically, for the total external debt-to-GDP ratio, the public external debt-to-GDP ratio, and the gross government debt-to-GDP ratio, we estimated the equation with nine alternative threshold values ranging from 20% to 100% with 10% intervals. For the total external debt-to-exports ratio, the public external debt-to-exports ratio, and the gross government debt-to-exports ratio, the threshold values were 50%, 100%, 150%, 200%, 250%, 300%, 350%, 400%, and 500%. For the total external debt-to-revenues ratio, the public external debt-to-revenues ratio, and the gross government debt-to-revenues ratio, the threshold values were 100%, 150%, 200%, 250%, 300%, 350%, 400%, 450%, and 500%. For the interest payment-to-GDP ratio, the threshold values were 0.5%, 1%, 1.5%, 2%, 2.5%, 3%, 4%, 5%, and 6%. For both the interest payment-to-exports ratio and the interest payment-to-revenues ratio, the following threshold values were used: 2%, 5%, 8%, 10%, 12%, 15%, 16%, 20%, 25%. In the case of the debt service-to-GDP ratio, the threshold values 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, and 10% were used. For the debt service-to-exports ratio, the threshold values were 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, and 45%. Finally, for the debt service-to-revenue, we used 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, and 50%.

References

Arellano, M. and Bond, S. (1991). Some tests of specification for panel data: Monte carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58:277–297.

Arellano, M. and Bover, O. (1995). Another look at the instrumental-variable estimation of error-components model. *Journal of Econometrics*, 68:29–52.

Beck, T., Levine, R., and Loayza, N. (2000). Finance and the sources of growth. *Journal of Financial Economics*, 58:261–300.

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

Bond, S. (2002). Dynamic panel data models: A guide to micro data methods and practice. Institute for Fiscal Studies Working Paper No. 09/02, London.

Cohen, D. (1997). Growth and external debt: A new perspective on the african and latin american tragedies. Centre for Economic Policy Research Discussion Paper, No. 1753.

Durlauf, S. N., Johnson, P. A., and Temple, J. (2004). Growth econometrics. Vassar College Department of Economics Working Paper Series No 61.

Elbadawi, I., Ndulu, B., and Ndung'u, N. (1997). *Debt Overhang and Economic Growth in Sub-Saharan Africa*. IMF Institute, Washington DC.

Hadi, A. S. (1994). A modification of a method for the detection of outliers in multivariate samples. *Journal of the Royal Statistical Society*, 56:393–396.

King, R. G. and Levine, R. (1994). Capital fundamentalism, economic development , and economic growth. *Carnegie-Rochester Conference Series on Public Policy*, 40:259–292.

Levine, R., Loayza, N., and Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics*, 46:31–77.

Loayza, N., Lopez, H., Schmidt-Hebbel, K., and Serven, L. (1998). The world saving data base. Unpublished working paper. World Bank, Washington, DC.

Mankiw, N. G., Romer, D., and Weil, D. N. (1992). A contribution to the empirics of economic growth. *The Quarterly Journal of Economics*, 107(2):407–437.

Patillo, C., Poirson, H., and Ricci, L. (2002). External debt and growth. IMF Working Paper 02/69, April 2002.

Patillo, C., Poirson, H., and Ricci, L. (2004). What are the channels through which external debt affects growth? IMF Working Paper 04/15, January 2004.

Smyth, D. and Hsing, Y. (1995). In search of an optimal debt ratio for economic growth. *Contemporary Economic Policy*, 13:51–59.

Windmeijer, F. (2000). A finite sample correction for the variance of linear two-step gmm estimators. Institute for Fiscal Studies Working Paper No. 00/19, London.

Table 1: Total external debt-to-GDP: Linear effects on GDP growth for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	-1.782	-0.553	-1.143	-2.092	-1.276
	(0.841)**	(0.670)	(0.577)*	(0.372)***	(0.327)***
lschool	4.399	1.862	2.575	1.258	0.817
	(1.253)***	(1.077)*	(0.777)***	(0.774)	(0.450)*
dbtgdp	-2.146	-0.864	-0.996	-1.202	-0.873
	(0.642)***	(0.471)*	(0.423)**	(0.329)***	(0.314)***
lgov		-1.371	-0.725		
		(0.763)*	(0.622)		
ltrade		1.536	1.408		0.087
		(0.474)***	(0.463)***		(0.373)
lpi		-2.076	-1.531		
		(0.919)**	(0.883)*		
lprivo			0.329		
			(0.127)**		
lpop				-4.877	-4.612
				(3.053)	(2.389)*
linv				5.545	5.568
				(0.668)***	(0.517)***
ltot					4.183
					(1.274)***
lfbal					14.367
					(4.507)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.000	0.000	0.000	0.000	0.012
AR(2) test	0.654	0.347	0.343	0.511	0.364
Observations	396	366	345	377	282
No. of countries	59	59	59	59	47

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2: Total external debt-to-exports: Linear effects on GDP growth for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	-1.974	-0.541	-1.225	-2.213	-1.320
	(0.844)**	(0.720)	(0.651)*	(0.527)***	(0.325)***
lschool	4.043	1.967	2.765	0.906	0.680
	(1.326)***	(1.089)*	(0.815)***	(0.853)	(0.449)
dbtexp	-1.969	-0.627	-0.886	-1.252	-0.791
	(0.585)***	(0.435)	(0.403)**	(0.410)***	(0.277)***
lgov		-1.148	-0.639		
		(0.795)	(0.667)		
ltrade		0.649	0.364		-0.752
		(0.524)	(0.528)		(0.384)*
lpi		-2.229	-1.692		
		(0.910)**	(0.895)*		
lprivo			0.301		
			(0.110)***		
lpop				-6.156	-4.490
				(3.485)*	(2.379)*
linv				5.199	5.659
				(0.779)***	(0.522)***
ltot					4.319
					(1.259)***
lfbal					14.374
					(4.502)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.000	0.000	0.000	0.000	0.012
AR(2) test	0.791	0.311	0.338	0.656	0.380
Observations	392	366	345	376	282
No. of countries	59	59	59	59	47

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3: Public external debt-to-GDP: Linear effects on GDP growth for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	-1.773	-0.543	-1.154	-2.142	-1.324
	(0.786)**	(0.690)	(0.596)*	(0.323)***	(0.336)***
lschool	4.068	1.734	2.719	1.182	0.615
	(1.144)***	(1.031)*	(0.790)***	(0.754)	(0.480)
pubdgdp	-1.789	-0.868	-0.884	-1.038	-0.705
	(0.572)***	(0.392)**	(0.355)**	(0.286)***	(0.265)**
lgov		-1.362	-0.723		
		(0.758)*	(0.650)		
ltrade		1.432	1.306		-0.031
		(0.457)***	(0.440)***		(0.360)
lpi		-2.054	-1.672		
		(0.906)**	(0.883)*		
lprivo			0.268		
			(0.099)***		
lpop				-4.475	-4.759
				(3.078)	(2.394)*
linv				5.538	5.622
				(0.634)***	(0.525)***
ltot					4.577
					(1.345)***
lfbal					13.911
					(4.414)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.000	0.000	0.000	0.000	0.012
AR(2) test	0.534	0.322	0.296	0.475	0.347
Observations	396	366	345	377	282
No. of countries	59	59	59	59	47

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: Public external debt-to-exports: Linear effects on GDP growth for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	-2.342	-0.379	-1.134	-2.392	-1.360
	(0.761)***	(0.726)	(0.678)*	(0.480)***	(0.336)***
lschool	4.006	1.568	2.595	1.255	0.545
	(1.258)***	(1.031)	(0.838)***	(0.868)	(0.495)
pubdexp	-1.983	-0.639	-0.775	-1.084	-0.664
	(0.453)***	(0.365)*	(0.336)**	(0.324)***	(0.237)***
lgov		-1.177	-0.597		
		(0.759)	(0.675)		
ltrade		0.445	0.412		-0.685
		(0.524)	(0.496)		(0.373)*
lpi		-2.230	-1.765		
		(0.878)**	(0.887)*		
lprivo			0.265		
			(0.099)***		
lpop				-5.076	-4.564
				(3.681)	(2.441)*
linv				5.271	5.761
				(0.753)***	(0.535)***
ltot					4.631
					(1.317)***
lfbal					14.361
					(4.416)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.000	0.000	0.000	0.000	0.012
AR(2) test	0.700	0.287	0.292	0.597	0.354
Observations	392	366	345	376	282
No. of countries	59	59	59	59	47

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Private external debt-to-GDP: Linear effects on GDP growth for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	0.308	-0.421	-0.608	-0.615	-0.929
	(0.790)	(0.527)	(0.494)	(0.550)	(0.389)**
lschool	0.890	1.113	0.751	-0.552	-0.284
	(1.116)	(0.884)	(0.716)	(0.791)	(0.618)
pridgdp	-0.355	-0.143	-0.222	-0.424	-0.229
	(0.252)	(0.168)	(0.150)	(0.132)***	(0.133)*
lgov		-1.290	-1.424		
		(0.765)*	(0.577)**		
ltrade		0.710	0.608		-0.210
		(0.495)	(0.382)		(0.385)
lpi		-1.789	-0.844		
		(0.902)*	(0.620)		
lprivo			1.168		
			(0.303)***		
lpop				-5.023	-5.422
				(3.033)	(2.665)**
linv				5.550	5.273
				(0.562)***	(0.540)***
ltot					4.310
					(1.407)***
lfbal					14.901
					(5.008)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.001	0.001	0.001	0.000	0.006
AR(2) test	0.315	0.345	0.393	0.380	0.041
Observations	268	261	248	262	224
No. of countries	46	46	46	46	40

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6: Private external debt-to-exports: Linear effects on GDP growth for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	0.160	-0.411	-0.630	-0.931	-0.939
	(0.766)	(0.532)	(0.492)	(0.543)*	(0.388)**
lschool	0.911	1.141	0.748	-0.322	-0.286
	(1.130)	(0.882)	(0.719)	(0.795)	(0.621)
pridexp	-0.336	-0.122	-0.215	-0.263	-0.235
	(0.241)	(0.177)	(0.154)	(0.126)**	(0.135)*
lgov		-1.262	-1.431		
		(0.764)	(0.576)**		
ltrade		0.581	0.396		-0.442
		(0.550)	(0.401)		(0.388)
lpi		-1.790	-0.854		
		(0.897)*	(0.620)		
lprivo			1.160		
			(0.303)***		
lpop				-6.049	-5.379
				(3.194)*	(2.677)*
linv				5.238	5.283
				(0.529)***	(0.539)***
ltot					4.313
					(1.411)***
lfbal					14.921
					(5.025)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.001	0.001	0.001	0.000	0.006
AR(2) test	0.343	0.340	0.388	0.355	0.042
Observations	267	261	248	262	224
No. of countries	46	46	46	46	40

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Total external debt-to-GDP: Nonlinear effects on GDP growth with a threshold of 20% for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	-2.068	-1.163	-1.378	-2.213	-1.400
	(0.872)**	(0.606)*	(0.565)**	(0.365)***	(0.350)***
lschool	4.185	2.524	2.557	1.062	0.831
	(1.208)***	(0.934)***	(0.693)***	(0.718)	(0.464)*
dbtgdp	0.856	0.845	0.605	0.321	0.765
	(0.735)	(0.710)	(0.743)	(0.563)	(0.680)
dbtgdpdum020	-2.672	-2.376	-2.096	-1.988	-2.202
	(0.969)***	(0.990)**	(0.970)**	(0.752)**	(0.852)**
lgov		-0.825	-0.489		
		(0.741)	(0.614)		
ltrade		1.232	1.107		0.155
		(0.518)**	(0.443)**		(0.353)
lpi		-1.872	-1.417		
		(0.965)*	(0.880)		
lprivo			0.352		
			(0.122)***		
lpop				-5.654	-4.287
				(2.798)**	(2.279)*
linv				5.265	5.441
				(0.598)***	(0.505)***
ltot					4.102
					(1.248)***
lfbal					12.302
					(4.402)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.000	0.000	0.000	0.000	0.011
AR(2) test	0.619	0.327	0.308	0.541	0.467
Observations	396	366	345	377	282
No. of countries	59	59	59	59	47

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Total external debt-to-exports: Nonlinear effects on GDP growth with a threshold of 150% for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	-1.990	-0.487	-1.255	-2.092	-1.325
	(0.781)**	(0.642)	(0.572)**	(0.500)***	(0.326)***
lschool	3.838	2.206	2.778	0.859	0.730
	(1.042)***	(0.972)**	(0.733)***	(0.798)	(0.457)
dbtexp	-0.465	-0.833	-0.835	-1.135	-0.691
	(0.672)	(0.644)	(0.594)	(0.497)**	(0.549)
dbtexpdum150	-1.467	0.521	-0.002	-0.042	-0.147
	(1.036)	(0.932)	(0.817)	(0.646)	(0.686)
lgov		-0.988	-0.565		
		(0.793)	(0.655)		
ltrade		0.424	0.142		-0.808
		(0.573)	(0.543)		(0.371)**
lpi		-2.380	-1.762		
		(0.932)**	(0.924)*		
lprivo			0.316		
			(0.114)***		
lpop				-6.603	-4.438
				(3.384)*	(2.386)*
linv				4.904	5.647
				(0.668)***	(0.511)***
ltot					4.337
					(1.256)***
lfbal					13.893
					(4.480)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.000	0.000	0.000	0.000	0.012
AR(2) test	0.833	0.261	0.333	0.655	0.401
Observations	392	366	345	376	282
No. of countries	59	59	59	59	47

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Total external debt-to-GDP: Nonlinear effects on GDP growth with a threshold of 30% for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	-1.836	-0.866	-1.355	-2.179	-1.411
	(0.845)**	(0.600)	(0.545)**	(0.383)***	(0.362)***
lschool	3.914	2.219	2.601	1.049	0.898
	(1.051)***	(0.976)**	(0.637)***	(0.757)	(0.464)*
dbtgdp	-0.241	-0.219	-0.289	-0.401	0.136
	(0.686)	(0.672)	(0.651)	(0.497)	(0.517)
dbtgdpdum030	-1.381	-1.145	-1.207	-1.258	-1.653
	(0.922)	(0.980)	(0.954)	(0.744)*	(0.782)**
lgov		-0.794	-0.518		
		(0.714)	(0.610)		
ltrade		1.232	1.183		0.099
		(0.473)**	(0.467)**		(0.348)
lpi		-1.920	-1.380		
		(0.931)**	(0.899)		
lprivo			0.362		
			(0.129)***		
lpop				-5.689	-4.239
				(2.863)*	(2.283)*
linv				5.295	5.493
				(0.571)***	(0.508)***
ltot					4.128
					(1.267)***
lfbal					12.348
					(4.407)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.000	0.000	0.000	0.000	0.009
AR(2) test	0.629	0.318	0.316	0.524	0.404
Observations	396	366	345	377	282
No. of countries	59	59	59	59	47

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10: Debt service payments-to-GDP: Nonlinear effects on GDP growth with a threshold of 3% for developing countries

	(1)	(2)	(3)	(4)	(5)
linitial	-0.244	-0.466	-0.829	-2.013	-1.104
	(0.792)	(0.518)	(0.498)	(0.464)***	(0.339)***
lschool	1.341	1.954	2.488	1.584	0.522
	(0.939)	(0.951)**	(0.782)***	(0.663)**	(0.482)
dbtsergdp	1.503	1.421	1.100	0.454	0.947
	(0.677)**	(0.562)**	(0.546)**	(0.502)	(0.537)*
dbtsergdpdum003	-2.352	-2.301	-2.011	-1.706	-1.685
	(0.956)**	(0.772)***	(0.776)**	(0.761)**	(0.761)**
lgov		-1.023	-0.742		
		(0.698)	(0.611)		
ltrade		0.462	0.549		-0.403
		(0.495)	(0.469)		(0.450)
lpi		-2.666	-2.139		
		(0.720)***	(0.733)***		
lprivo			0.352		
			(0.153)**		
lpop				-4.640	-5.052
				(3.278)	(2.432)**
linv				5.849	5.793
				(0.613)***	(0.558)***
ltot					4.143
					(1.299)***
lfbal					16.482
					(4.411)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.000	0.001	0.000	0.000	0.011
AR(2) test	0.356	0.155	0.218	0.627	0.336
Observations	396	366	345	377	282
No. of countries	59	59	59	59	47

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 11: Total external debt-to-GDP: Linear effects on TFP growth for developing countries

	(1)	(2)	(3)	(4)	(5)
l.prod	0.099	0.112	0.101	-0.092	0.003
	(0.071)	(0.074)	(0.077)	(0.069)	(0.076)
linitial	-0.797	-0.672	-0.707	-1.398	-0.808
	(0.538)	(0.504)	(0.403)*	(0.480)***	(0.362)**
lschool	1.058	1.549	1.370	1.205	0.556
	(0.906)	(0.813)*	(0.601)**	(0.847)	(0.511)
dbtgdp	-0.839	-0.140	-0.391	-0.528	-0.153
	(0.451)*	(0.401)	(0.340)	(0.268)*	(0.257)
lgov		-0.716	-0.670		
		(0.563)	(0.453)		
ltrade		0.693	0.434		-0.457
		(0.508)	(0.511)		(0.438)
lpi		-0.748	-0.337		
		(0.650)	(0.538)		
lprivo			0.289		
			(0.086)***		
lpop				-2.223	-3.343
				(3.058)	(2.246)
linv				4.454	4.256
				(0.679)***	(0.677)***
ltot					5.081
					(1.447)***
lfbal					12.087
					(3.446)***
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.000	0.000	0.000	0.001	0.009
AR(2) test	0.821	0.973	0.628	0.339	0.894
Observations	317	300	286	310	259
No. of countries	51	51	51	51	45

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 12: Total external debt-to-GDP: Linear effects on capital growth for developing countries

	(1)	(2)	(3)	(4)	(5)
l.capgrowth	0.632	0.599	0.614	0.574	0.640
	(0.062)***	(0.063)***	(0.061)***	(0.056)***	(0.051)***
linitial	-1.277	-0.817	-0.781	-1.368	-1.149
	(0.586)**	(0.370)**	(0.353)**	(0.359)***	(0.276)***
lschool	1.621	0.594	0.970	-0.080	0.141
	(1.119)	(0.690)	(0.569)*	(0.789)	(0.462)
dbtgdp	-1.000	-0.980	-0.961	-0.672	-0.691
	(0.371)***	(0.364)***	(0.330)***	(0.341)*	(0.333)**
lgov		-1.181	-1.177		
		(0.509)**	(0.493)**		
ltrade		1.034	1.195		0.838
		(0.377)***	(0.345)***		(0.328)**
lpi		-0.328	-0.305		
		(0.389)	(0.366)		
lprivo			-0.013		
			(0.052)		
lpop				-6.935	-5.770
				(2.554)***	(2.100)***
linv				2.991	2.194
				(0.688)***	(0.601)***
ltot					3.578
					(2.313)
lfbal					6.571
					(4.259)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.008	0.016	0.025	0.013	0.015
AR(2) test	0.306	0.466	0.515	0.320	0.609
Observations	321	302	288	314	261
No. of countries	51	51	51	51	45

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 13: Public external debt-to-GDP: Linear effects on capital growth for developing countries

	(1)	(2)	(3)	(4)	(5)
l.capgrowth	0.611	0.614	0.640	0.573	0.639
	(0.066)***	(0.058)***	(0.056)***	(0.054)***	(0.050)***
linitial	-1.460	-0.807	-0.762	-1.440	-1.206
	(0.620)**	(0.378)**	(0.371)**	(0.350)***	(0.278)***
lschool	1.773	0.490	0.684	-0.152	-0.002
	(1.165)	(0.667)	(0.591)	(0.764)	(0.479)
pubdgdp	-1.110	-0.839	-0.798	-0.699	-0.620
	(0.358)***	(0.310)***	(0.279)***	(0.295)**	(0.284)**
lgov		-1.239	-1.167		
		(0.501)**	(0.489)**		
ltrade		1.009	1.127		0.801
		(0.323)***	(0.333)***		(0.328)**
lpi		-0.283	-0.302		
		(0.354)	(0.335)		
lprivo			-0.032		
			(0.050)		
lpop				-7.226	-5.921
				(2.641)***	(2.087)***
linv				2.920	2.202
				(0.662)***	(0.590)***
ltot					3.954
					(2.343)*
lfbal					6.390
					(4.342)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.010	0.017	0.026	0.012	0.015
AR(2) test	0.344	0.539	0.587	0.349	0.627
Observations	321	302	288	314	261
No. of countries	51	51	51	51	45

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 14: External debt indicators: Linear effects on private savings rate for developing countries

	dbtgdp	dbtexp	pubdgdp	pubdexp	pridgdp	pridexp
	(1)	(2)	(3)	(4)	(5)	(6)
l.psr	0.598	0.556	0.595	0.558	0.630	0.640
	(0.057)***	(0.057)***	(0.057)***	(0.056)***	(0.051)***	(0.052)***
lrpdi	0.007	-0.006	0.005	-0.007	-0.001	0.002
	(0.014)	(0.015)	(0.014)	(0.016)	(0.012)	(0.012)
grpdi	0.437	0.381	0.451	0.413	0.526	0.534
	(0.174)**	(0.175)**	(0.173)**	(0.175)**	(0.177)***	(0.179)***
lrir	0.099	0.102	0.101	0.106	-0.002	-0.003
	(0.054)*	(0.050)**	(0.054)*	(0.051)**	(0.025)	(0.025)
ltot	-0.008	-0.011	-0.003	-0.002	0.038	0.031
	(0.034)	(0.031)	(0.034)	(0.031)	(0.032)	(0.030)
oldr	-1.135	-1.012	-1.078	-0.940	-0.602	-0.656
	(0.384)***	(0.395)**	(0.368)***	(0.369)**	(0.226)**	(0.228)***
yngr	-0.385	-0.416	-0.362	-0.377	-0.311	-0.301
	(0.164)**	(0.163)**	(0.158)**	(0.155)**	(0.128)**	(0.134)**
urbpop	-0.010	0.004	-0.009	0.001	-0.020	-0.018
	(0.033)	(0.035)	(0.033)	(0.035)	(0.022)	(0.023)
gsr	-0.714	-0.753	-0.735	-0.775	-0.512	-0.500
	(0.191)***	(0.189)***	(0.195)***	(0.192)***	(0.101)***	(0.104)***
lpi	-0.035	-0.024	-0.035	-0.026	-0.020	-0.021
	(0.010)***	(0.009)**	(0.010)***	(0.009)***	(0.011)*	(0.011)*
debt indicator	-0.016	-0.028	-0.015	-0.024	0.006	0.003
	(0.010)	(0.013)**	(0.010)	(0.011)**	(0.003)**	(0.003)
Hansen J test	1.000	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.017	0.020	0.016	0.020	0.015	0.013
AR(2) test	0.182	0.166	0.193	0.185	0.100	0.107
Observations	194	194	194	194	165	165
No. of countries	45	45	45	45	38	38

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the total external debt-to-GDP, total external debt-to-exports, public external debt-to-GDP, public external debt-to-exports, private external debt-to-GDP, and private external debt-to-exports ratios respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 15: Gross government debt-to-GDP: Linear effects on GDP growth for industrial countries

	(1)	(2)	(3)	(4)	(5)
linitial	-3.598	-3.276	-3.244	-3.327	-2.714
	(0.410)***	(0.614)***	(0.641)***	(0.336)***	(0.345)***
lschool	1.121	0.237	0.144	1.703	0.557
	(0.637)*	(0.595)	(0.598)	(0.796)**	(0.909)
opubdgdp	-0.316	-0.107	-0.116	-0.062	0.355
	(0.211)	(0.126)	(0.124)	(0.158)	(0.102)***
lgov		-1.019	-1.038		
		(0.932)	(0.964)		
ltrade		0.303	0.277		0.106
		(0.367)	(0.367)		(0.398)
lpi		-16.706	-15.903		
		(4.071)***	(4.308)***		
lprivo			0.051		
			(0.142)		
lpop				-2.718	-2.748
				(1.726)	(1.811)
linv				1.672	2.019
				(0.617)**	(0.693)***
ltot					1.989
					(0.723)**
lfbal					11.427
					(4.249)**
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.022	0.006	0.008	0.025	0.025
AR(2) test	0.757	0.897	0.991	0.502	0.513
Observations	153	153	150	153	140
No. of countries	22	22	22	22	22

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 16: Gross government debt-to-GDP: Linear effects on TFP growth for industrial countries

	(1)	(2)	(3)	(4)	(5)
l.prod	0.000	-0.006	0.149	-0.001	-0.002
	(0.007)	(0.006)	(0.154)	(0.009)	(0.008)
linitial	-1.784	-1.805	-1.629	-1.752	-1.100
	(0.316)***	(0.618)***	(0.549)***	(0.304)***	(0.365)***
lschool	0.601	0.116	0.213	0.651	-0.408
	(0.656)	(0.666)	(0.627)	(0.816)	(0.911)
opubdgdp	0.054	0.120	0.138	0.090	0.422
	(0.143)	(0.154)	(0.156)	(0.159)	(0.133)***
lgov		-0.724	-0.717		
		(0.915)	(0.745)		
ltrade		0.254	0.250		0.173
		(0.434)	(0.377)		(0.392)
lpi		-11.337	-12.677		
		(3.983)***	(3.506)***		
lprivo			-0.216		
			(0.224)		
lpop				0.020	0.085
				(1.590)	(1.907)
linv				0.355	0.646
				(0.856)	(0.747)
ltot					2.355
					(0.804)***
lfbal					8.906
					(3.692)**
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.018	0.008	0.003	0.019	0.024
AR(2) test	0.502	0.684	0.327	0.475	0.482
Observations	143	143	141	143	130
No. of countries	22	22	22	22	22

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 17: Gross government debt-to-GDP: Linear effects on capital growth for industrial countries

	(1)	(2)	(3)	(4)	(5)
l.capgrowth	-0.024	-0.023	0.611	-0.021	-0.021
	(0.002)***	(0.002)***	(0.077)***	(0.002)***	(0.002)***
linitial	-5.176	-4.924	-1.831	-4.944	-4.872
	(0.886)***	(0.829)***	(0.743)**	(0.856)***	(0.738)***
lschool	2.514	1.792	1.212	3.588	3.335
	(1.717)	(1.743)	(0.470)**	(1.740)*	(2.042)
opubdgdp	-0.669	-0.489	-0.026	-0.220	0.042
	(0.264)**	(0.250)*	(0.116)	(0.256)	(0.236)
lgov		-1.869	-0.384		
		(0.946)*	(0.305)		
ltrade		0.235	0.069		0.064
		(0.481)	(0.124)		(0.483)
lpi		-16.561	-3.093		
		(4.768)***	(3.198)		
lprivo			0.109		
			(0.141)		
lpop				-2.098	-2.300
				(1.817)	(1.777)
linv				4.612	4.573
				(1.425)***	(1.689)**
ltot					-1.893
					(1.603)
lfbal					8.169
					(5.267)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.666	0.202	0.056	0.710	0.959
AR(2) test	0.171	0.112	0.537	0.545	0.535
Observations	143	143	141	143	130
No. of countries	22	22	22	22	22

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the first, second, third, fourth and fifth independent variables sets respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 18: Debt indicators: Linear effects on private savings rate for industrial countries

	opubdgdp	opubdexp	opubdrev	intgdp	intexp	intrev
	(1)	(2)	(3)	(4)	(5)	(6)
l.psr	0.826	0.795	0.814	0.793	0.786	0.796
	(0.068)***	(0.074)***	(0.066)***	(0.069)***	(0.077)***	(0.070)***
lrpdi	0.017	0.022	0.005	0.008	0.007	0.006
	(0.017)	(0.010)**	(0.014)	(0.016)	(0.010)	(0.015)
grpdi	0.991	0.923	1.242	1.265	1.222	1.265
	(0.277)***	(0.249)***	(0.216)***	(0.183)***	(0.203)***	(0.189)***
lrir	-0.278	-0.221	-0.261	-0.324	-0.316	-0.320
	(0.105)**	(0.101)**	(0.106)**	(0.103)***	(0.102)***	(0.104)***
ltot	0.066	0.074	0.037	0.020	0.036	0.024
	(0.044)	(0.044)	(0.024)	(0.072)	(0.021)*	(0.025)
oldr	0.322	0.252	0.042	0.040	0.044	0.060
	(0.170)*	(0.155)	(0.161)	(0.156)	(0.165)	(0.178)
yngr	0.148	0.123	-0.076	-0.195	-0.167	-0.177
	(0.152)	(0.132)	(0.126)	(0.128)	(0.128)	(0.131)
urbpop	0.026	0.029	0.023	0.020	0.027	0.024
	(0.025)	(0.020)	(0.019)	(0.020)	(0.018)	(0.021)
gsr	-0.168	-0.235	-0.284	-0.160	-0.275	-0.194
	(0.053)***	(0.052)***	(0.078)***	(0.089)*	(0.077)***	(0.084)**
lpi	0.035	0.075	0.007	0.076	0.074	0.074
	(0.098)	(0.100)	(0.082)	(0.033)**	(0.030)**	(0.034)**
debt indicator	-0.006	-0.014	-0.008	0.003	-0.008	-0.000
	(0.005)	(0.004)***	(0.003)**	(0.005)	(0.003)**	(0.004)
Hansen J test	1.000	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.006	0.005	0.007	0.009	0.006	0.007
AR(2) test	0.836	0.725	0.858	0.797	0.793	0.770
Observations	130	130	121	131	131	131
No. of countries	22	22	22	24	24	24

Estimated using one-step system GMM dynamic panel-data estimator with time dummies (Arellano and Bover, 1995; Blundell and Bond, 1998). Columns (1), (2), (3), (4) and (5) display estimates for the gross government debt-to-GDP, gross government debt-to-exports, gross government debt-to-revenues, interest payments-to-GDP, interest payments-to-exports, and interest payments-to-revenues ratios respectively. The Hansen J test reports the p-values of a test of over-identifying restrictions. The AR(1) and AR(2) tests report the p-values of the Arellano-Bond test for autocorrelation. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.