

External Debt and Economic Growth in Latin America

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Abstract

This paper empirically explores the relationship between external debt and growth for a number of Latin American and Caribbean economies. 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 levels, and not by private external debt levels. Regarding the channels through which debt accumulation affects growth, we find that this is mainly driven by the capital accumulation growth. In addition, neither total factor productivity growth nor private savings rates are affected by external debt levels. We do not find evidence of nonlinear effects for these relationships. The data set consist of a panel of 20 Latin American and Caribbean countries with data averaged over each of the seven 5-year periods between 1970 and 2002. Methodologically, the paper uses a dynamic system GMM panel estimator.

JEL classification: F34; H63; O10; O40

Keywords: External debt; Economic growth; Capital accumulation; Productivity growth; Private savings rate; Latin America and the Caribbean

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1 Introduction

Debt crisis have been a recurrent theme in Latin American economic history. For example, even prior to the region-wide crisis of the 1980s, the largest Latin American borrower - Brazil - had defaulted six times on its sovereign obligations starting from 1826. Similarly, the relationships between these crisis instances and the external sector have been subject of a long-drawn debate. However, in the advent of financial globalisation, entailing both increased capital mobility and the diversification of Latin American financing patterns away from bank lending toward more market-based mechanisms, this subject has regained the attention of policymakers worldwide. Efforts by the official sector in this context range from the debt sustainability analysis (DSA) which is now standard IMF practice in programme reviews to the joint IMF/World Bank HIPC initiative, as well as a growing trend to distinguish between public and private indebtedness in both policy diagnosis and academic studies (e.g. WEO September 2003). The fact that a number of economies which have undergone sovereign debt defaults or restructurings in recent years are Latin American (including Argentina and Uruguay (2002), and Ecuador (1999)), coupled with lingering fiscal concerns in key economies (such as Brazil) has helped keep the policy focus on this region.

At the same time, the broader economic literature on the nature of the relationship between debt and growth, though large, remains partly equivocal. Theoretical works such as Cohen (1991) suggest that low debt levels are positively associated with growth, even if countries are not able to borrow freely due to the risk of debt repudiation; an underlying assumption in these cases is that borrowed funds are associated with productive investment. In contrast, other theoretical contributions including Tornell and Velasco (1992) and Sachs (1989) show that large debt levels may have a significant negative impact on economic activity if the cost of high taxes associated with debt servicing is not internalised or there is some probability that future debt obligations exceed an economy's repayment ability. In this case, expected debt servicing costs imply higher taxes or real interest rates, ultimately crowding out private investment. While theory might suggest that non-linearities could be present in the relationship between debt and growth, only a limited number of empirical studies have actually found evidence of this, including Patillo et al. (2002), 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 external debt and growth in a Latin American context, 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 growth, total factor productivity growth, capital accumulation growth, and private savings rate) and five alternative explanatory variable sets, which 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. In order to uncover these relationships, we use the 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), and Patillo et al. (2002). The data set consist of a panel of 20 Latin American and Caribbean 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.

Our results suggest 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 levels, and not by private external debt levels. Regarding the channels through which debt accumulation affects growth, we find that this is mainly driven by the capital accumulation growth. In addition, neither total factor productivity growth nor private savings rates are affected by external debt levels. We do not find evidence of nonlinear effects for these relationships.

The rest of the paper is organized in five sections. The empirical methodology and the data used are discussed in sections 3 and 4 respectively. Section 5 presents the estimation results for the different dependent variables and debt indicators. Further, we also presents the results of considering nonlinear effects on GDP growth. 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 Descriptive Statistics

In this section we will present some descriptive statistics to become familiar with the values of some of the debt and growth variables in some selected countries in Latin America. In figure 1 we present the average total external debt as a ratio to GDP for the period 1970 and 2002. The total external debt is divided between public external debt and private external debt. The first conclusion from this figure is that the largest part of total external debt is composed of public external debt in contrast to private external debt. Further, the average total debt to GDP ratio for these Latin American countries has laid between 30% and 66%, which from an international perspective can not be considered excessively disproportionate.

In figure 1 we present the external public debt to GDP ratio for the same selected countries, but now taking the average for each of the four different decades between 1970 and 2002. Besides the fact that the values taken by the external public debt variable show a larger dispersion than in figure 1, it is interesting to note that in general the 80's and the 90's were the decades with largest average debt levels. Further, when comparing the 70's with the 00's, we see that in general the debt levels have increased in these Latin American countries.

The average external public debt to exports ratio for each of the four decades is presented in figure 3. In this figure too we see that in general the maximum debt levels were reached in the 80's and 90's. Nonetheless, it is less clear than the last figure that the ratio has increased when comparing the 70's and the 90's, which is probably a consequence of the increased focus on improving exports in

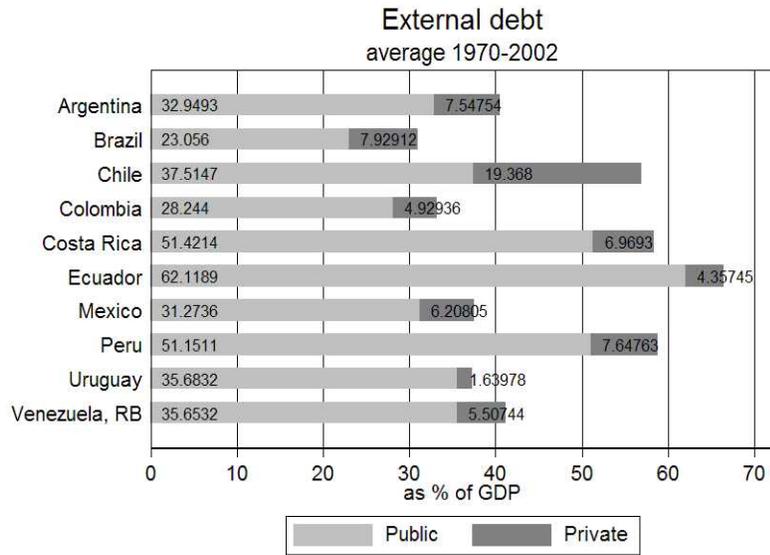


Figure 1: External Debt to GDP Ratio

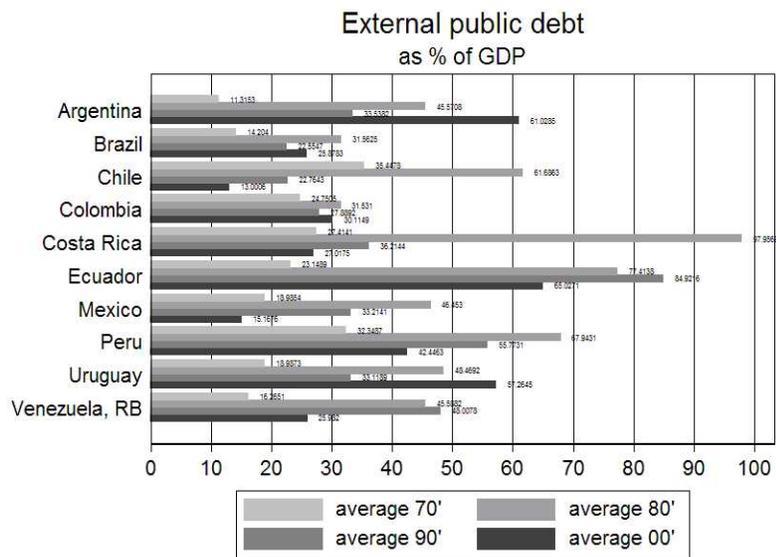


Figure 2: Public External Debt to GDP Ratio

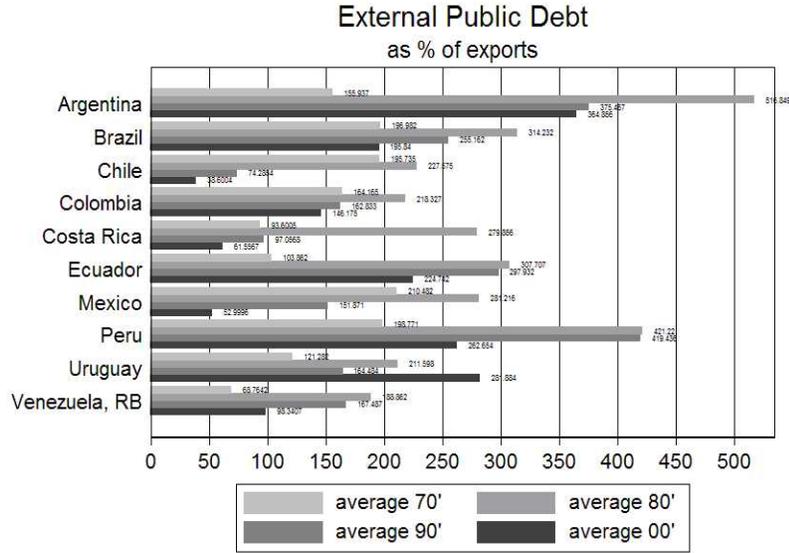


Figure 3: Public External Debt to Exports Ratio

the last two decades.

Figure 4 presents the per capita GDP growth rate for each of the four decades between 1970 and 2002. In general, we can conclude that the 70's was a decade of high growth and the 80's one of low growth. For the other two decades the evidence is mixed and no general pattern can be observed.

In the case of the total factor productivity growth rate (figure 5), no clear pattern can be distinguished for any of the four decades. Regarding the capital stock per capita in figure 5, it is noteworthy that for Brazil, Ecuador, Mexico and Uruguay its growth rates have been negative for all four decades. Only for Chile and Costa Rica have the growth rates been positive in all decades. In figure 7 the private savings rate as a percentage of gross private disposable income is presented. In general, the ratio has been around 17% and 25%, with the clear exception of Venezuela, where it has been above 25% in all four decades.

3 Econometric Methodology

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

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

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

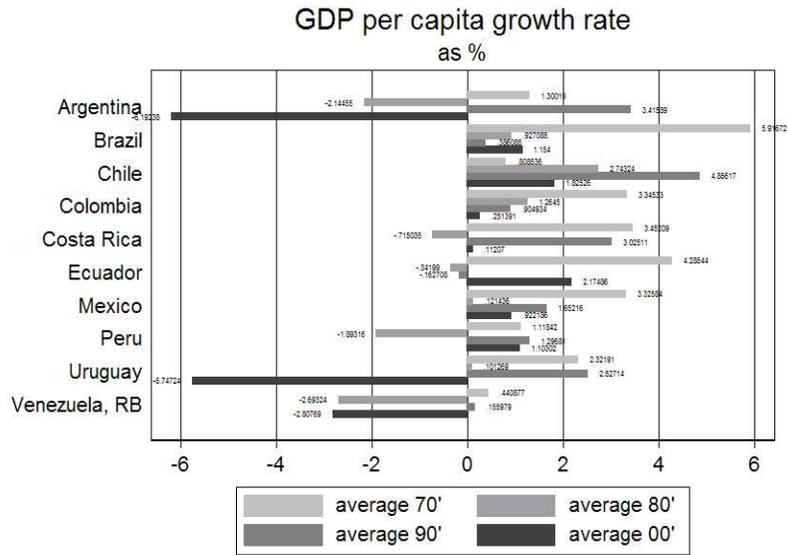


Figure 4: GDP per Capita Growth Rate

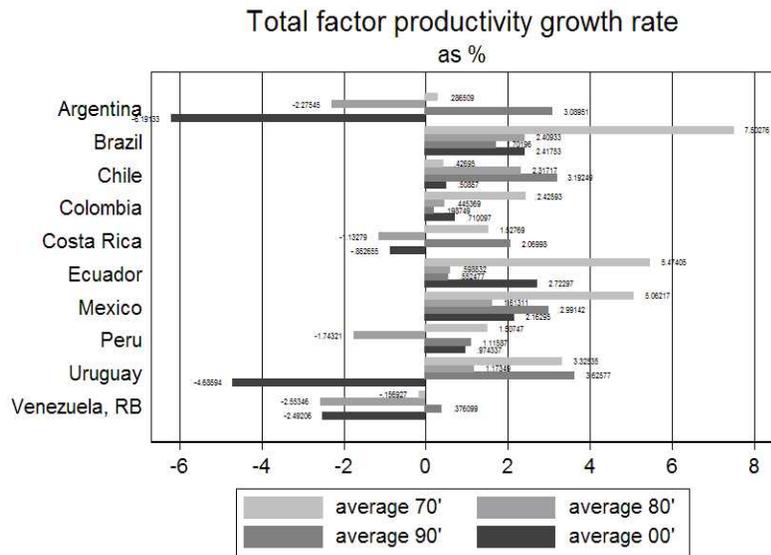


Figure 5: Total Factor Productivity Growth Rate

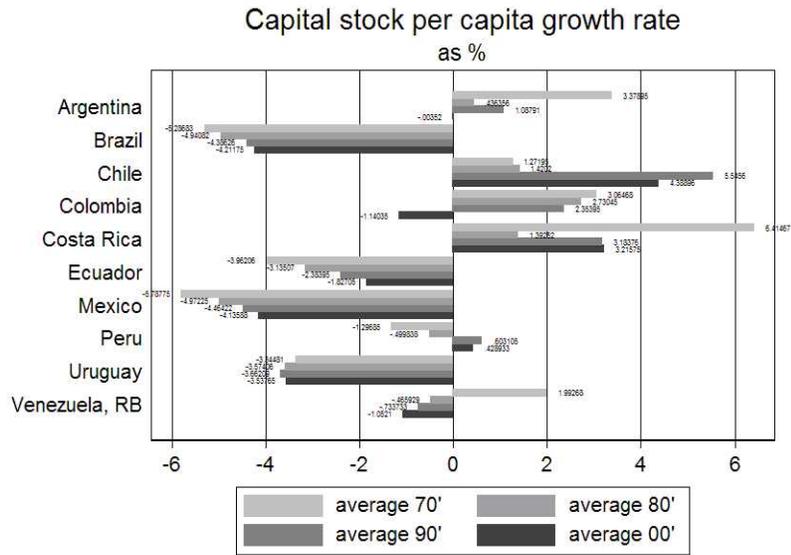


Figure 6: Capital Stock per Capita Growth Rate

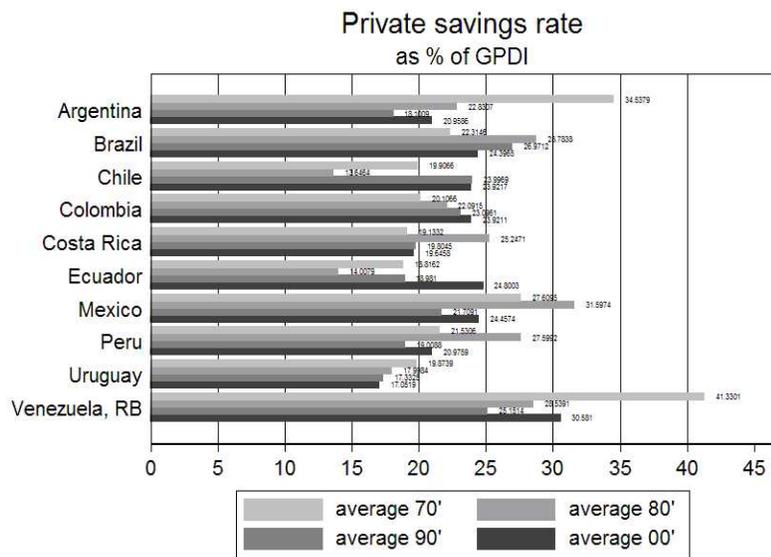


Figure 7: Private Savings Rate to GPDI Ratio

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 real 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 external debt and growth, but also the relation of external 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 capita¹, 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, as well as the fourth and fifth. 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 4. 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 4.

Evidently, equation (1) is linear in nature. However, we are also interested in investigating if there is any nonlinear relationship between external debt and economic growth.² Therefore, in order to allow for nonlinear effects of external debt, we will include a linear spline function in equation (1). In this case, equation (1) becomes

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

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. The specific threshold values for D^* will depend on the specific debt indicator that is used. The benchmark case values are introduced in subsection 5.2. Further, for each debt indicator a series of different threshold values are used in order to corroborate the results of the benchmark case (see section 6 for more details). Note, however, that we will only test the nonlinear effects of the total external debt ratios, interest payments ratios and debt service ratios with GDP growth.

¹The 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).

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

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 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 Latin American 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).

4 Data

The data set consists of a panel of 20 Latin American and Caribbean countries, with data averaged over each of the seven 5-year periods between 1970 and

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

⁴The 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).

⁵Recall that by including initial income per capita, growth regressions become dynamic in nature.

2002 (1970-74; 1975-80; etc.).⁶⁷ 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 movements. Therefore, the total number of observations is 140. However, due to data availability for some samples we had less than 140 observations and in some cases we had unbalanced panels.

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: total external debt-to-GDP ratio (*dbtgdgdp*), total external debt-to-exports ratio (*dbtexp*), total external debt-to-revenues ratio (*dbtrev*), public external debt-to-GDP ratio (*pubdgdgdp*), public external debt-to-exports ratio (*pubdexp*), public external debt-to-revenues ratio (*pubdrev*), private external debt-to-GDP ratio (*privdgdgdp*), private external debt-to-exports ratio (*privdexp*), private external debt-to-revenues ratio (*privdrev*), interest payment-to-GDP ratio (*intgdgdp*), interest payment-to-exports ratio (*intexp*), interest payment-to-revenues ratio (*intrev*), debt service-to-GDP ratio (*dbtsergdgdp*), debt service-to-exports ratio (*dbtsereexp*), and debt service-to-revenues ratio (*dbtserrev*). 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 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

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

⁷The countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay and Venezuela.

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

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 (yng), 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 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 Dharehwa 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.

5 Estimation results

5.1 Linear effects on GDP growth

Table 1 displays the estimation results of equation (1) 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 at the 1% level for all the five different independent variables sets. Specifically, the coefficient values range from -1.372 (column(2)) to -1.671 (column(4)). In the case of the total external debt-to-exports ratio (Table 2), the debt coefficients are also negative and significant at the 1% level, with values ranging from -1.107 (column (4)) to -1.493 (column (3)). These results are confirmed when using the total external debt-to-revenues ratio.¹⁰ Thus, for Latin American and Caribbean 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 the 1% level and ranging from -1.235 (column(5)) to -1.550 (column(4)). We find identical results in the case of the public external debt-to-exports ratio, with coefficients ranging from -1.190 to -1.469 (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 none of the debt coefficients are 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 be-

⁹These variables are used in the saving regressions of Beck et al. (2000).

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

tween 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.

5.2 Nonlinear effects on GDP growth

In this subsection we present the estimation results for the nonlinear relationship between the debt indicators and economic growth using equation 2. We have estimated this equation for the total external debt indicators, the interest payment indicators, and the debt service indicators. For each of these debt indicators, specific threshold values, D^* , must be chosen to specify the nonlinear relationship. As there is no theoretical nor empirical indication on any specific threshold value, we chose to estimate equation 2 for each debt indicator with an ad-hoc chosen benchmark value. However, we also performed a consistency test by estimating equation 2 with eight alternative threshold values. The specific threshold values for each debt indicator are presented in section 6. Further, we can note that the results from the benchmark case were confirmed when using these alternative threshold values.

When using the total external debt-to-GDP ratio, the total external debt-to-exports ratio, and the total external debt-to-revenues ratio, we use threshold values of 60%, 250%, and 300% respectively. In section 6 we will confirm these results using other threshold values. In table 7 we see that the significance of the debt variable $dbtgdg$ for all the samples is similar to the results in table 1. Further, the debt dummy variable, $dbtgdg3d1060$, is insignificantly different from zero for all the independent variables sets, except for the first set. Therefore, there is no convincing evidence of nonlinear effects of the total external debt-to-GDP ratio on economic growth. This result is confirmed in table 8, when using the total external debt-to-export ratio as the relevant debt variable. In this case, the debt dummy variable is $dbtexp3d2250$ and is also insignificant for all the different sets. We performed the same nonlinear estimation using the total external debt-to-revenues ratio with a threshold value of 300%. Again we did not find any evidence of nonlinear effects, as the variable $dbtrev3d3300$ is in-

¹¹The tables may be provided upon request from the authors.

significant for all five sets. Concluding, we can assert that none of the considered total external debt variables have nonlinear effects on economic growth.

In the cases of the interest payment-to-GDP ratio, interest payment-to-exports ratio, and interest payment-to-revenues ratio, we used the following benchmark case threshold values in order to control for the existence of nonlinear effects on growth: 2,5%, 12%, and 12%, respectively. For the interest payment-to-GDP ratio we found some mixed evidence of nonlinear effects. The results can be seen in table 9, where we see that the dummy variable coefficient is positive and significant for the first three independent variable sets. These positive and significant coefficients would be suggesting that when the interest payment-to-GDP ratio is higher than 2,5%, there is a positive relationship between it and the growth rate of the economy. Similar results are also obtained for the interest payment-to-exports ratio, where the dummy variable coefficient is positive and significant for the first three independent variable sets. Conversely, in the case of the interest payment-to-revenues ratio, all the dummy variable coefficients of the different sets were insignificantly different from zero. Thus, we can conclude that, although there is some evidence of nonlinear effects, the findings are not very robust. Further, the positive coefficient contradicts the common belief that the higher the level of interest payment, the worse its effects, if any, on growth. As a result, cautious should be taken in interpreting these results.

For the debt service indicators, we used as benchmark case the following values: 6% for the debt service-to-GDP ratio, 25% for the debt service-to-exports ratio, and 30% for the debt service-to-revenues ratio. We do not find any evidence that the debt service indicators had nonlinear effects on GDP growth.

5.3 Linear effects on TFP growth

In tables 10 and 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 and total external debt-to-exports ratio. Further, this relationship has also been estimated using the external debt-to-revenues ratio. In both tables, all the debt coefficients are negative but insignificantly different from zero. Therefore, there is no relationship between total external debt and TFP growth. Furthermore, it is clear that the negative relationship between total external debt and GDP growth is not 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 negative but no coefficient is significant. In the case of the private external debt indicators, none of the debt coefficients are significant. Thus, no relationship between private external debt and TFP growth is found.

In the case of the interest payment indicators, none of the coefficients are significant for the different independent variable sets. Thus, no relationship between interest payments and TFP growth is found. The same conclusion can

be drawn for the debt service indicators.

5.4 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. In tables 12 and 13 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 and total external debt-to-exports ratio respectively. Note again that we have also estimated this relationship using the total external debt-to-revenues ratio, but due to space reasons we do not present the results. For all three debt ratios, and for each of the five independent variable sets, we find a significant negative relationship between total external debt and capital stock growth. The coefficients range from -0.719 and -0.858 in the case of the total external debt-to-GDP ratio, and -0.606 and -0.766 for the total external debt-to-exports ratio (all significant at the 5% level). These results, in combination with the findings presented in subsection 5.3, 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 and exports ratios are presented in tables 14 and 15, respectively. 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 -0.684 to -0.857 in the case of the public external debt-to-GDP ratio, and -0.651 to -0.778 for the public external debt-to-exports ratio. These results are also confirmed for the public external debt-to-revenues ratio. 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 driven by the influence of public external debt.

In so far as the interest payment indicators and the debt service indicators are concerned, there is no evidence of any significant relationship between them and capital accumulation.

5.5 Linear effects on private savings rate

In this subsection we will present the results of the savings regression. 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 different and unique independent variable set, as explained in section 4. In the case of the total external debt indicators, we do not find that any of the coefficients for the debt ratios are significantly different from zero. The same insignificant results are obtained for the public external debt indicators and the private external debt indicators. Thus, there seems to be no relationship between external debt (total, private or public) and the private savings rate of an economy. The results

for these external debt indicators are presented in table 16. 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. Consequently, there is no evidence that favor any significant relationship between the different debt indicators and the private savings rate.

6 Consistency tests

In order to corroborate the results of section 5, we performed several consistency tests. First, all the estimated equations were estimated without outliers. We identified outliers using the method of Hadi (1994). Second, we also used 3-year averages, instead of using 5-year averages, which increased the time span to 11 periods and the sample size to 220 observations. Third, in the case of the nonlinear effects, the estimation of equation 2 was carried out using alternative threshold values for the dummy variables. In section A.2 of the appendix we display the specific threshold values for each debt indicator. After performing all these consistency tests, we did not obtain results that changed the benchmark case results from section 5. Consequently, the benchmark case results could not be refuted and are robust to all the consistency tests.¹²

7 Conclusions

This paper has investigated both the linear and nonlinear relationship between economic growth and external debt for a sample of Latin American economies. Further, it has tried to determine the channel through which external debt affects economic growth, by considering its effects on total factor productivity, capital accumulation and private savings, respectively. The results show 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 levels, and not by private external debt levels. Insofar as the channels through which debt accumulation affects growth are concerned, the results suggest that this is driven by the incidence on capital accumulation growth. In addition, neither total factor productivity growth nor private savings rates are affected by external debt levels. We have found no evidence of nonlinear effects for these relationships.

Although our results lend partial support to the view that Latin American public sectors may tend to crowd out economic activity by discouraging private investment, 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, this would be a suitable avenue for further research on this issue.

¹²The tables may be provided upon request from the authors.

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 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. Interest payment (*int*): Interest payments by central government to domestic sectors and to nonresidents for the use of borrowed money. Source: WDI.
5. 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.
6. GDP (*gdp*): Gross domestic product. Source: WDI.
7. Exports (*exp*): Exports of goods and services. Source: WDI.
8. Revenues (*rev*): Current revenue, excluding grants for central government. Source: WDI.
9. Real per capita GDP growth rate (*growth*): Annual percentage growth rate of GDP per capita based on constant local currency. Source: WDI.

10. 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 Dharehwa 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 Dharehwa Data Set.
11. 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

$$Y_i = A_i K_i^\alpha L_i^{1-\alpha}. \quad (3)$$

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.

12. Initial income per capita (*linitial*): The logarithm of lagged real (PPP) per capita GDP (constant prices). Source: PWT.
13. 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.
14. Government size (*lgov*): The logarithm of the ratio of General government final consumption expenditure to GDP. Source: WDI.
15. Inflation (*lpi*): The logarithm of one plus the inflation rate, which is calculated using the average annual consumer price index. Source: WDI.
16. 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.
17. Terms of trade growth (*ltot*): The logarithm of one plus the growth rate of the terms of trade. Source: WDI.
18. 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.

19. 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.
20. 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.
21. 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.
22. Real interest rate (*lrir*): The logarithm of one plus the real interest rate. Source: WDI.
23. Old dependency ratio (*oldr*): The share of population over 65 in total population. Source: WDI.
24. Young dependency ratio (*yngr*): The share of population under 15 in total population. Source: WDI.
25. Urbanization ratio (*urbpop*): The share of population that lives in urban areas. Source: WDI.
26. 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 6, we checked the benchmark case results of equation 2 using alternative threshold values for the total external debt, interest payment and debt service indicators. Specifically, for the total external debt-to-GDP ratio we estimated the equations with nine alternative threshold values ranging from 20% to 100% with 10% intervals. For the total external 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 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%.

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

	(1)	(2)	(3)	(4)	(5)
linitial	-1.781 (1.031)	-1.489 (1.040)	-1.518 (1.027)	-1.819 (0.999)*	-1.424 (1.040)
lschool	4.145 (0.908)***	3.966 (1.043)***	3.747 (1.037)***	3.607 (0.938)***	2.775 (1.044)**
dbtgdg	-1.489 (0.414)***	-1.372 (0.438)***	-1.573 (0.404)***	-1.671 (0.371)***	-1.423 (0.416)***
lgov		-0.095 (0.562)	-0.348 (0.527)		
ltrade		0.588 (0.685)	0.619 (0.647)		0.249 (0.714)
lpi		-0.625 (0.527)	-0.305 (0.454)		
lprivo			0.585 (0.378)		
lpop				-0.837 (2.623)	-1.773 (2.363)
linv				4.544 (0.863)***	4.675 (1.048)***
ltot					7.575 (8.413)
lfbal					9.812 (6.055)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.032	0.026	0.005	0.092	0.107
AR(2) test	0.887	0.669	0.201	0.710	0.366
Observations	140	136	134	134	123
No. of countries	20	20	20	20	19

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

	(1)	(2)	(3)	(4)	(5)
linitial	-1.432 (0.923)	-1.680 (1.027)	-1.712 (1.021)	-1.433 (0.894)	-1.655 (1.010)
lschool	3.404 (1.289)**	3.844 (0.962)***	3.620 (0.967)***	2.326 (1.336)*	2.597 (0.918)**
dbtexp	-1.139 (0.354)***	-1.315 (0.426)***	-1.493 (0.374)***	-1.107 (0.366)***	-1.413 (0.283)***
lgov		-0.075 (0.549)	-0.311 (0.518)		
ltrade		-0.742 (0.781)	-0.894 (0.736)		-1.170 (0.663)*
lpi		-0.627 (0.525)	-0.340 (0.460)		
lprivo			0.525 (0.384)		
lpop				-2.854 (3.124)	-2.039 (2.295)
linv				4.483 (1.049)***	4.885 (1.040)***
ltot					7.149 (8.522)
lfbal					9.931 (5.843)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.039	0.027	0.005	0.104	0.112
AR(2) test	0.794	0.668	0.197	0.747	0.379
Observations	138	136	134	134	123
No. of countries	20	20	20	20	19

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

	(1)	(2)	(3)	(4)	(5)
linitial	-2.091 (1.106)*	-1.772 (1.097)	-1.753 (1.089)	-2.097 (1.060)*	-1.645 (1.109)
lschool	4.195 (0.871)***	4.000 (1.033)***	3.793 (1.080)***	3.483 (0.842)***	2.622 (0.963)**
pubdgdg	-1.456 (0.421)***	-1.403 (0.476)***	-1.518 (0.442)***	-1.550 (0.336)***	-1.235 (0.343)***
lgov		-0.153 (0.487)	-0.385 (0.453)		
ltrade		0.775 (0.735)	0.796 (0.701)		0.199 (0.705)
lpi		-0.503 (0.575)	-0.285 (0.532)		
lprivo			0.417 (0.302)		
lpop				-1.473 (2.470)	-1.901 (2.281)
linv				4.558 (0.823)***	4.509 (1.024)***
ltot					8.791 (8.452)
lfbal					9.389 (5.284)*
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.038	0.031	0.008	0.094	0.109
AR(2) test	0.767	0.607	0.142	0.765	0.402
Observations	140	136	134	134	123
No. of countries	20	20	20	20	19

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

	(1)	(2)	(3)	(4)	(5)
linitial	-1.749 (0.972)*	-1.963 (1.091)*	-1.952 (1.091)*	-1.731 (0.938)*	-1.851 (1.079)
lschool	3.509 (1.219)***	3.882 (0.960)***	3.690 (1.013)***	2.416 (1.250)*	2.477 (0.878)**
pubdexp	-1.246 (0.352)***	-1.352 (0.476)**	-1.469 (0.428)***	-1.190 (0.318)***	-1.236 (0.246)***
lgov		-0.125 (0.490)	-0.333 (0.459)		
ltrade		-0.597 (0.742)	-0.691 (0.719)		-1.039 (0.685)
lpi		-0.506 (0.572)	-0.307 (0.528)		
lprivo			0.366 (0.307)		
lpop				-3.023 (2.966)	-2.122 (2.289)
linv				4.471 (1.013)***	4.694 (1.024)***
ltot					8.408 (8.594)
lfbal					9.439 (5.151)*
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.046	0.032	0.008	0.109	0.113
AR(2) test	0.733	0.618	0.147	0.769	0.409
Observations	138	136	134	134	123
No. of countries	20	20	20	20	19

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

	(1)	(2)	(3)	(4)	(5)
linitial	-1.539 (0.710)**	-1.546 (0.753)*	-1.436 (0.807)*	-1.776 (0.653)**	-2.377 (0.624)***
lschool	1.576 (0.909)*	1.979 (1.039)*	1.741 (0.980)*	-0.030 (0.953)	0.289 (1.093)
pridgdp	-0.076 (0.300)	-0.057 (0.310)	-0.194 (0.261)	-0.111 (0.281)	-0.022 (0.338)
lgov		-0.582 (0.619)	-0.757 (0.568)		
ltrade		-0.371 (0.618)	-0.371 (0.596)		-0.856 (0.607)
lpi		-1.141 (0.571)*	-0.912 (0.462)*		
lprivo			0.664 (0.339)*		
lpop				-7.295 (2.797)**	-5.695 (3.339)
linv				4.540 (0.921)***	3.928 (0.767)***
ltot					11.551 (7.103)
lfbal					16.356 (6.487)**
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.022	0.019	0.015	0.131	0.058
AR(2) test	0.585	0.547	0.343	0.993	0.586
Observations	119	117	116	117	110
No. of countries	19	19	19	19	18

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

	(1)	(2)	(3)	(4)	(5)
linitial	-1.538 (0.709)**	-1.555 (0.767)*	-1.463 (0.816)*	-1.791 (0.658)**	-2.379 (0.624)***
lschool	1.528 (0.896)	1.978 (1.036)*	1.741 (0.979)*	-0.123 (0.910)	0.296 (1.078)
pridexp	-0.020 (0.248)	-0.056 (0.310)	-0.189 (0.259)	-0.037 (0.199)	-0.029 (0.338)
lgov		-0.581 (0.624)	-0.757 (0.574)		
ltrade		-0.428 (0.772)	-0.562 (0.716)		-0.885 (0.813)
lpi		-1.144 (0.565)*	-0.925 (0.458)*		
lprivo			0.654 (0.344)*		
lpop				-7.495 (2.575)***	-5.678 (3.307)
linv				4.515 (0.940)***	3.934 (0.756)***
ltot					11.526 (7.097)
lfbal					16.337 (6.417)**
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.024	0.019	0.015	0.137	0.058
AR(2) test	0.561	0.545	0.337	0.973	0.589
Observations	119	117	116	117	110
No. of countries	19	19	19	19	18

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

	(1)	(2)	(3)	(4)	(5)
linitial	-1.860 (1.027)*	-1.506 (1.022)	-1.564 (1.023)	-1.840 (0.988)*	-1.455 (1.017)
lschool	4.569 (1.039)***	4.401 (1.215)***	4.165 (1.217)***	3.761 (0.972)***	3.044 (1.094)**
dbtgdgdp	-2.134 (0.472)***	-2.028 (0.489)***	-2.147 (0.539)***	-1.862 (0.443)***	-1.767 (0.588)***
dbtgdgdp3d1060	1.365 (0.524)**	1.737 (0.978)*	1.522 (0.971)	0.389 (0.470)	0.620 (0.560)
lgov		-0.299 (0.636)	-0.501 (0.567)		
ltrade		0.370 (0.704)	0.412 (0.684)		0.262 (0.715)
lpi		-0.945 (0.701)	-0.593 (0.632)		
lprivo			0.580 (0.392)		
lpop				-0.672 (2.695)	-1.531 (2.415)
linv				4.438 (0.857)***	4.564 (0.997)***
ltot					7.334 (8.421)
lfbal					9.883 (5.950)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.033	0.018	0.004	0.090	0.106
AR(2) test	0.805	0.465	0.121	0.721	0.378
Observations	140	136	134	134	123
No. of countries	20	20	20	20	19

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

	(1)	(2)	(3)	(4)	(5)
linitial	-1.414 (0.943)	-1.827 (1.071)	-1.857 (1.072)*	-1.373 (0.894)	-1.739 (0.963)*
lschool	3.362 (1.359)**	4.175 (1.123)***	3.912 (1.109)***	2.057 (1.369)	2.826 (1.011)**
dbtexp	-1.050 (0.541)*	-1.816 (0.454)***	-1.908 (0.479)***	-0.723 (0.491)	-1.722 (0.554)***
dbtexp3d2250	-0.225 (0.618)	1.310 (0.990)	1.098 (0.933)	-0.981 (0.592)	0.557 (0.721)
lgov		-0.134 (0.586)	-0.352 (0.530)		
ltrade		-1.081 (0.858)	-1.183 (0.851)		-1.307 (0.616)**
lpi		-1.029 (0.797)	-0.676 (0.692)		
lprivo			0.537 (0.395)		
lpop				-3.152 (3.191)	-1.892 (2.357)
linv				4.767 (1.140)***	4.839 (0.999)***
ltot					7.200 (8.643)
lfbal					10.398 (5.725)*
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.039	0.017	0.004	0.110	0.111
AR(2) test	0.807	0.469	0.116	0.750	0.378
Observations	138	136	134	134	123
No. of countries	20	20	20	20	19

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: Interest payments-to-GDP: Nonlinear effects on GDP growth

	(1)	(2)	(3)	(4)	(5)
linitial	-1.472 (0.725)*	-1.420 (0.775)*	-1.220 (0.701)*	-1.358 (0.771)*	-1.370 (0.863)
lschool	3.967 (1.337)***	4.050 (1.175)***	3.871 (1.210)***	2.406 (1.348)*	1.806 (1.293)
intgdp	-0.687 (0.416)	-0.797 (0.320)**	-0.855 (0.326)**	-0.149 (0.475)	-0.104 (0.371)
intgdp3d4025	1.607 (0.703)**	2.699 (1.078)**	2.736 (1.117)**	-0.033 (0.857)	0.902 (0.787)
lgov		-0.482 (0.490)	-0.764 (0.544)		
ltrade		-0.176 (0.669)	-0.181 (0.682)		-0.183 (0.698)
lpi		-1.892 (0.591)***	-1.751 (0.615)**		
lprivo			0.307 (0.431)		
lpop				-7.481 (2.973)**	-5.719 (2.233)**
linv				5.331 (1.348)***	4.383 (1.407)***
ltot					8.533 (11.236)
lfbal					19.736 (8.558)**
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.040	0.033	0.014	0.093	0.074
AR(2) test	0.249	0.469	0.841	0.155	0.251
Observations	107	105	103	103	98
No. of countries	20	20	20	20	19

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: Total external debt-to-GDP: Linear effects on TFP growth

	(1)	(2)	(3)	(4)	(5)
l.prod	0.199 (0.126)	0.168 (0.126)	0.103 (0.158)	0.143 (0.131)	0.154 (0.132)
l.initial	-0.992 (0.855)	-0.996 (0.903)	-1.031 (0.957)	-1.208 (0.820)	-1.077 (0.797)
lschool	2.248 (1.170)*	2.304 (1.196)*	2.363 (1.237)*	1.389 (1.255)	1.067 (1.085)
dbtgdg	-0.599 (0.388)	-0.502 (0.597)	-0.796 (0.575)	-0.725 (0.347)*	-0.365 (0.415)
lgov		0.386 (0.513)	0.297 (0.515)		
ltrade		-0.306 (0.748)	-0.343 (0.735)		-0.596 (0.645)
lpi		-0.609 (0.651)	-0.374 (0.593)		
lprivo			0.378 (0.312)		
lpop				-2.999 (2.848)	-2.355 (3.073)
linv				3.452 (1.027)***	3.264 (1.041)***
ltot					5.888 (10.269)
lfbal					7.975 (4.600)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.006	0.002	0.000	0.018	0.019
AR(2) test	0.164	0.178	0.809	0.165	0.083
Observations	134	132	130	129	120
No. of countries	20	20	20	20	19

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-exports: Linear effects on TFP growth

	(1)	(2)	(3)	(4)	(5)
l.prod	0.218 (0.124)*	0.169 (0.124)	0.105 (0.155)	0.175 (0.121)	0.153 (0.131)
l.initial	-0.796 (0.798)	-1.022 (0.928)	-1.086 (0.982)	-0.929 (0.784)	-1.110 (0.805)
lschool	1.904 (1.272)	2.225 (1.145)*	2.278 (1.189)*	0.721 (1.242)	0.996 (0.984)
dbtexp	-0.299 (0.349)	-0.428 (0.594)	-0.712 (0.546)	-0.246 (0.319)	-0.327 (0.321)
lgov		0.366 (0.513)	0.300 (0.510)		
ltrade		-0.752 (0.716)	-1.070 (0.699)		-0.937 (0.593)
lpi		-0.634 (0.664)	-0.415 (0.593)		
lprivo			0.342 (0.307)		
lpop				-3.991 (2.639)	-2.431 (3.039)
linv				3.350 (0.993)***	3.293 (1.035)***
ltot					5.822 (10.254)
lfbal					8.185 (4.509)*
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.006	0.002	0.000	0.018	0.020
AR(2) test	0.184	0.184	0.811	0.147	0.085
Observations	133	132	130	129	120
No. of countries	20	20	20	20	19

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

	(1)	(2)	(3)	(4)	(5)
l.capgrowth	0.793 (0.043)***	0.799 (0.044)***	0.784 (0.047)***	0.811 (0.037)***	0.808 (0.041)***
l.initial	-1.168 (0.409)**	-1.037 (0.373)**	-1.057 (0.389)**	-0.978 (0.425)**	-0.837 (0.428)*
lschool	1.451 (0.758)*	1.457 (0.714)*	1.349 (0.728)*	1.565 (0.655)**	1.628 (0.659)**
dbtgdg	-0.840 (0.238)***	-0.750 (0.269)**	-0.773 (0.278)**	-0.719 (0.213)***	-0.858 (0.255)***
lgov		-0.291 (0.393)	-0.452 (0.380)		
ltrade		0.484 (0.289)	0.584 (0.312)*		0.531 (0.342)
lpi		0.160 (0.302)	0.265 (0.267)		
lprivo			0.208 (0.286)		
lpop				0.092 (1.221)	-0.267 (1.267)
linv				2.072 (0.578)***	2.107 (0.636)***
ltot					9.051 (4.968)*
lfbal					-1.570 (3.241)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.005	0.003	0.004	0.002	0.001
AR(2) test	0.138	0.026	0.026	0.043	0.031
Observations	134	132	130	129	120
No. of countries	20	20	20	20	19

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: Total external debt-to-exports: Linear effects on capital growth

	(1)	(2)	(3)	(4)	(5)
l.capgrowth	0.809 (0.042)***	0.800 (0.044)***	0.787 (0.046)***	0.791 (0.044)***	0.809 (0.042)***
l.initial	-0.978 (0.340)***	-1.115 (0.390)**	-1.112 (0.405)**	-0.895 (0.422)**	-0.913 (0.455)*
lschool	1.223 (0.638)*	1.384 (0.687)*	1.267 (0.697)*	1.244 (0.648)*	1.455 (0.698)*
dbtexp	-0.606 (0.192)***	-0.698 (0.232)***	-0.699 (0.240)***	-0.652 (0.197)***	-0.766 (0.214)***
lgov		-0.281 (0.386)	-0.436 (0.373)		
ltrade		-0.225 (0.338)	-0.134 (0.324)		-0.266 (0.303)
lpi		0.149 (0.308)	0.232 (0.281)		
lprivo			0.173 (0.291)		
lpop				-0.578 (1.092)	-0.443 (1.260)
linv				2.020 (0.532)***	2.170 (0.643)***
ltot					8.916 (5.053)*
lfbal					-1.071 (3.180)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.003	0.003	0.004	0.001	0.001
AR(2) test	0.022	0.027	0.029	0.049	0.030
Observations	133	132	130	129	120
No. of countries	20	20	20	20	19

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: Public external debt-to-GDP: Linear effects on capital growth

	(1)	(2)	(3)	(4)	(5)
l.capgrowth	0.790 (0.042)***	0.790 (0.048)***	0.778 (0.051)***	0.809 (0.039)***	0.798 (0.047)***
linitial	-1.342 (0.514)**	-1.205 (0.469)**	-1.183 (0.478)**	-1.106 (0.490)**	-1.054 (0.526)*
lschool	1.457 (0.812)*	1.493 (0.778)*	1.381 (0.785)*	1.553 (0.686)**	1.689 (0.728)**
pubdgdg	-0.825 (0.258)***	-0.769 (0.310)**	-0.745 (0.308)**	-0.684 (0.249)**	-0.857 (0.297)***
lgov		-0.349 (0.352)	-0.488 (0.341)		
ltrade		0.588 (0.328)*	0.666 (0.346)*		0.566 (0.354)
lpi		0.207 (0.259)	0.261 (0.234)		
lprivo			0.129 (0.246)		
lpop				-0.019 (1.324)	-0.214 (1.175)
linv				2.034 (0.611)***	2.014 (0.630)***
ltot					9.754 (4.910)*
lfbal					-2.309 (3.093)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.007	0.004	0.005	0.002	0.001
AR(2) test	0.095	0.020	0.022	0.037	0.024
Observations	134	132	130	129	120
No. of countries	20	20	20	20	19

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 15: Public external debt-to-exports: Linear effects on capital growth

	(1)	(2)	(3)	(4)	(5)
l.capgrowth	0.800 (0.046)***	0.790 (0.048)***	0.780 (0.050)***	0.780 (0.050)***	0.799 (0.047)***
l.initial	-1.149 (0.433)**	-1.284 (0.488)**	-1.244 (0.493)**	-1.091 (0.495)**	-1.117 (0.552)*
lschool	1.279 (0.697)*	1.426 (0.749)*	1.318 (0.755)*	1.336 (0.684)*	1.526 (0.755)*
pubdexp	-0.651 (0.249)**	-0.726 (0.274)**	-0.696 (0.272)**	-0.712 (0.249)**	-0.778 (0.257)***
lgov		-0.330 (0.354)	-0.461 (0.339)		
ltrade		-0.150 (0.332)	-0.047 (0.325)		-0.240 (0.327)
lpi		0.197 (0.268)	0.238 (0.250)		
lprivo			0.102 (0.254)		
lpop				-0.593 (1.107)	-0.384 (1.186)
linv				1.994 (0.540)***	2.090 (0.636)***
ltot					9.535 (4.954)*
lfbal					-1.794 (3.025)
Hansen J test	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.004	0.003	0.004	0.002	0.001
AR(2) test	0.018	0.022	0.024	0.043	0.024
Observations	133	132	130	129	120
No. of countries	20	20	20	20	19

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: External debt indicators: Linear effects on private savings rate

	dbtgdg (1)	dbtexp (2)	pubdgdg (3)	pubdexp (4)	pridgdg (5)	pridexp (6)
l.psr	0.483 (0.087)***	0.467 (0.093)***	0.493 (0.085)***	0.475 (0.093)***	0.468 (0.076)***	0.476 (0.080)***
lrpdi	0.066 (0.024)**	0.041 (0.028)	0.074 (0.025)***	0.049 (0.027)*	0.023 (0.030)	0.020 (0.031)
grpdi	0.185 (0.165)	0.158 (0.161)	0.196 (0.165)	0.172 (0.162)	0.189 (0.193)	0.183 (0.191)
lrir	0.127 (0.038)***	0.114 (0.039)***	0.128 (0.040)***	0.116 (0.040)**	0.014 (0.018)	0.013 (0.019)
ltot	0.463 (0.168)**	0.421 (0.145)***	0.442 (0.157)**	0.425 (0.145)***	0.526 (0.156)***	0.508 (0.151)***
oldr	-1.818 (0.473)***	-1.756 (0.503)***	-1.873 (0.439)***	-1.794 (0.513)***	-1.144 (0.414)**	-1.218 (0.387)***
yngr	-0.567 (0.280)*	-0.593 (0.271)**	-0.559 (0.270)*	-0.598 (0.272)**	-0.437 (0.197)**	-0.455 (0.190)**
urbpop	-0.041 (0.056)	-0.001 (0.063)	-0.036 (0.055)	-0.017 (0.061)	0.001 (0.044)	0.016 (0.042)
gsr	-1.252 (0.270)***	-1.248 (0.283)***	-1.231 (0.273)***	-1.248 (0.287)***	-0.835 (0.183)***	-0.850 (0.185)***
lpi	-0.056 (0.018)***	-0.051 (0.018)***	-0.057 (0.018)***	-0.054 (0.017)***	-0.022 (0.011)*	-0.025 (0.011)**
debt indicator	0.015 (0.013)	-0.007 (0.014)	0.018 (0.011)	0.000 (0.010)	0.005 (0.004)	0.002 (0.003)
Hansen J test	1.000	1.000	1.000	1.000	1.000	1.000
AR(1) test	0.145	0.217	0.156	0.197	0.034	0.035
AR(2) test	0.331	0.274	0.359	0.290	0.091	0.099
Observations	81	81	81	81	76	76
No. of countries	18	18	18	18	17	17

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%.