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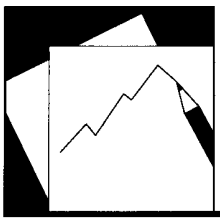

IMF Working Paper

The Role of Domestic Debt Markets in Economic Growth: An Empirical Investigation for Low-income Countries and Emerging Markets

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The Role of Domestic Debt Markets in Economic Growth: An Empirical Investigation for Low-income Countries and Emerging Markets

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Abstract

We develop a new public domestic debt (DD) database covering 93 low-income countries and emerging markets over the 1975-2004 period to estimate the growth impact of DD. Moderate levels of non-inflationary DD, as a share of GDP and bank deposits, are found to exert a positive overall impact on economic growth. Granger-causality regressions suggest support for a variety of channels: improved monetary policy; broader financial market development; strengthened domestic institutions/accountability; and enhanced private savings and financial intermediation. There is some evidence that, above a ratio of 35% percent of bank deposits, DD begins to undermine growth, lending credence to traditional crowding out and bank efficiency concerns. Importantly, the growth contribution of DD is higher if it is marketable, bears positive real interest rates and is held outside the banking system.

JEL Classification Numbers: E44, E62, F35

Keywords: Domestic Debt; Growth; Fiscal Policy; Sterilization; Institutions; Financial Development; Saving; Crowding Out; Panel Estimations; Low-Income Countries, Emerging Markets, Africa

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I. INTRODUCTION

Public domestic debt (DD) in low-income countries (LICs) and emerging markets (EMs) remains a controversial issue in academic and policy making circles.[1] The question is more pertinent than ever given the increased scope for expanding DD in many LICs and EMs following external debt reduction initiatives and a surge in international portfolio interest in local currency bonds. A meaningful policy response is, however, constrained by the lack of comprehensive empirical studies that examine DD's impact on savings, investment, financial deepening, institutions and, hence, growth. So far, most of the vast literature on the effects of public debt on capital accumulation and growth has been derived in the context of industrialized countries (Barro, 1974). These studies find that the optimal public debt ratio for developed countries ranges from about 30-70 percent of GDP.[2]

Policy advice has traditionally sought to limit the accumulation of DD. Given shallow financial markets, financial repression propensities, and poor debt management capacity, which are found in many LICs and even some EMs, many observers believe that DD expansion will have significant negative implications for private investment, fiscal sustainability and, ultimately, economic growth and poverty reduction. In addition, given that most LICs have access to very cheap external finance, in the form of concessionary loans and grants from international financial institutions, governments in poor countries have been advised to avoid seemingly expensive domestic borrowing. In other words, low DD issuance is considered beneficial for economic development.

In recent years, however, research has increasingly begun to echo the positive view of many market participants regarding the importance of DD instruments for monetary and financial systems, as well as the development of political institutions. Compared to other forms of budgetary finance, market based domestic borrowing is seen to contribute more to macroeconomic stability – low inflation and reduced vulnerability to external real and domestic monetary shocks – domestic savings generation and private investment. This seems to be supported by the experience of fast growing EMs such as China, India, and Chile, which have maintained relatively low external indebtedness and avoided major financial or fiscal crises.[3]

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[1] Since this paper is concerned with DD "markets", we define DD as the domestic currency indebtedness of a country's consolidated public sector to its citizens; thus, liquidity absorbing paper issued by the central bank is included, but government securities held by the central bank are excluded (see section 3 for details). We recognize that some governments, esp. in Latin American, have issued debt in foreign currency (or debt that is index linked) to domestic residents. This "foreign currency" DD is analytically quite different from our "domestic currency" DD, but the data does not permit us to discriminate between the two types.

[2] For the US, see Aiyagari and McGrattan (1998). The Maastricht ceiling for EU countries on total public debt/GDP ratios is 2/3. Since the governments bound by these criteria generally have very low external debt, 2/3 can also be seen as a proximate ceiling on the public DD/GDP ratio in advanced economies.

[3] For evidence favoring internal over external finance reliance in LICs, see Aizenmann, Pinto and Radziwill (2004).

Existing empirical studies on the implications of DD markets for LICs and EMs have mostly taken a fiscal sustainability view, while direct analysis of the relationship between public debt and economic growth has been limited to external debt – see Sachs (1989), Husain (1997), and Pattillo et al. (2002). This lack of interest in formally studying the impact of DD on growth could be attributed to i) data unavailability – reliable datasets on DD either do not exist or are not amenable to empirical analysis; ii) a wide-spread perception that DD is "endogenous" rather than an exogenous policy choice variable that governments can tweak to affect macro-financial outcomes: countries' DD issuance capacity is "determined" entirely by their level of income, pool of savings and institutional quality; and iii) the relatively small size of DD relative to external public debt in most LICs and EMs. These factors have, arguably, combined over the years to "crowd out" the amount of attention paid to DD.

The objective of this paper is to fill this void in the literature, by: bringing together the various arguments for and against DD issuance currently scattered across the literatures on capital markets, public finance, debt management and fiscal sustainability (section II); compiling a new DD database spanning the period 1975-2004 for 93 LICs and EMs, as well as consolidating existing databases on DD (section III); using panel econometric techniques to examine the endogeneity of DD and its impact on growth with a view to obtaining a sense of the optimal size and quality of DD (section IV); and presenting empirically-grounded policy conclusions on DD to guide macro-financial practitioners, especially in LICs (section V).

II. Existing Theoretical and Empirical Studies

A. Pros and cons of domestic debt

Issuing DD, whether to finance the fiscal deficit or to mop up monetary liquidity, involves a complex evaluation of the costs and benefits to the economy. Although practitioners' views on the subject abound, the academic literature on the pros and cons of DD issuance and the channels through which this type of financing can affect public finances, the financial sector, and the real economy is limited. Critics of DD are concerned with the repercussions on private sector lending, fiscal and debt sustainability, weakening bank efficiency, and inflationary risks.

The most prominent concern about DD is the crowding out effect on private investment. When governments borrow domestically, they use up domestic private savings that would otherwise have been available for private sector lending. In turn, the smaller residual pool of loanable funds in the market raises the cost of capital for private borrowers, reducing private investment demand, and hence capital accumulation, growth and welfare (Diamond, 1965). In shallow financial markets, especially where firms have limited access to international finance, DD issuance can lead to both swift and severe crowding out of private lending.

Second, critics of DD are also concerned with repercussions on fiscal and debt sustainability. DD is viewed as more expensive than concessionary external financing (Beaugrand et al, 2002).[4] As a result, the interest burden of DD may absorb significant government revenues and thereby crowd-out pro-poor and growth enhancing spending. In addition, reliance on domestic financing may also delay tax mobilization efforts, which may be necessary but politically costly. Given the short-term structure of the DD portfolio in many LICs and EMs – see, for example, Christensen (2004) on Sub-Saharan Africa (SSA) – governments also face a significant liquidity risk from having to constantly roll-over large amounts of debt.

Third, the cost of DD may rise sharply due to time inconsistency problems when government credibility is low. If the state has weak (direct) tax collection, as is the case in most LICs, the state will have a strong incentive to monetise deficits and use the net domestic financing window to both, generate seigniorage, and, reduce the real burden of existing DD. Under these circumstances, the government faces a classic time inconsistency problem and, therefore, either cannot issue nominal debt at all, or has to pay a significant premium to compensate investors for the potential risk of surprise inflation.[5]

Fourth, high-yielding government DD held by banks can make them complacent about costs and reduce their drive to mobilise deposits and fund private sector projects. The incentive to provide credit to the private sector is often weakened by a poor credit environment. Hence, from a risk weighted perspective, government debt is highly attractive, providing a constant flow of earnings, so that banks have less incentive to expand credit to riskier private borrowers or cut their overheads (Hauner, 2006).[6]

Proponents of DD stress its positive impact on growth, inflation, and savings from deeper and more sophisticated capital markets, which enhance the volume and efficiency of private investment. Consequently, they question the wisdom of forever pursuing zero net domestic financing (NDF) policies in countries where marketable DD is already small and capital markets under-developed. Such policies, by reducing the size of DD relative to GDP and deposits, could exert a negative impact on financial market development, and complicate the exit from foreign aid dependency.

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[4] Abbas (2005) questions Beaugrand et al.'s (2002) conclusion that DD is always more expensive than concessionary external debt, noting that they do not take account i) the impact of the higher variance of external debt service (due to currency risk) on the present value burden of external debt; and ii) the fact that the implicit interest rate on external debt – a large part whereof is in default – is not comparable to the implicit interest rate on DD – which is rarely defaulted on.

[5] See Agenor and Montiel (1999: chapter 5) on how government incentives to extract seigniorage through high inflation leads to an erosion of the underlying nominal tax base.

[6] The complacency effect should, however, diminish over time as competition reduces both yields in government securities auctions, and profits in the banking sector. Indeed, yields have fallen significantly lately as international investors have increased competition in African bond markets.

DD markets can help strengthen money and financial markets, boost private savings, and stimulate investment. First, government securities are a vital instrument for the conduct of indirect monetary policy operations and collateralized lending in interbank markets; the latter helps banks manage their own liquidity more effectively, reducing the need for frequent central bank interventions.[7] Consequently, central banks operating in well-developed DD markets do not have to rely as much on direct controls like credit ceilings, interest rate controls and high reserve requirements, all of which distort financial sector decisions and lead to financial disintermediation at the expense of private sector savings and investments (Gulde et al., 2006). Second, yields on government securities can serve as a pricing benchmark for long-term private debt issued by banks or enterprises and, hence, promote the development of a corporate bond market which boosts competition in the baking sector (Fabella and Mathur, 2003). Third, the availability of DD instruments can provide savers with an attractive alternative to capital flight as well as lure back savings from the non-monetary sector into the formal financial system (IMF, 2001). The possible benefits here can go beyond saving mobilization and extend to a reduction in the size of the black economy, widened tax base, increased financial depth, de-dollarization and improved perceptions of currency and country risk.

In addition to enhancing the volume of investment, DD can also improve the efficiency of investment and help increase total factor productivity. Banks in many developing countries face an inherently risky and unpredictable business environment, which makes them reluctant to engage with the private sector. As a result, banks play only a very limited role in providing longer term financing to important strategic sectors, such as agriculture and manufacturing, and prefer instead to finance consumption related trade activities (in the case of Africa, see Gulde et al., 2006). In providing banks with a steady and safe source of income, holdings of government securities may serve as collateral and encourage lending to riskier sectors. In other words, holdings of government debt may compensate for the lack of strong legal and corporate environments (Kumhof, 2004 and Kumhof and Tanner, 2005). The collateral function of DD may be particularly important when bank overheads cannot be reduced further, and lending risks remain high due to asymmetric information and/or weak contract enforcement (including of foreclosure laws).[8]

Third, in the longer-term, nominal debt contracts enhance political accountability and help governments build a track record to access international capital markets. Increasing the reliance on domestic financing may help mitigate the problems of external borrowing, which has been found to crowd out domestic institutions by weakening the state's dependence on its citizenry and hence severing the accountability channel that forces domestic institutional reform (Moss et al, 2006; Abbas, 2005). Furthermore, developing a track record may promote access to international financial markets. Research shows that countries that have successfully issued sovereign bonds on international markets have typically had a long prior experience with issuing domestic government bonds in their own markets (Kahn, 2005).

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[7] See, for example, IMF (2005b), Detragiache (2005) and Ndikumana (2001).

[8] See Chirwa and Mlachila (2004); Barajas et al. (1999; 2000); and Brock and Rojas-Suarez (2000).

B. Empirical Survey

Studies on DD have been constrained by a lack of reliable data, especially time series data for a large enough panel of countries. Fry (1997) is the only panel study on the impact of alternative deficit-financing strategies on economic growth in LICs and EMs. For over 66 LICs and EMs over the 1979-1993 period, Fry finds market-based DD issuance to be the least costly method of financing the budget deficit as opposed to external borrowing, seigniorage and financial repression, all of which are eventually seen to stifle growth, reduce domestic saving, and fuel inflation. Indeed, the real question, according to him, is not "whether" countries should switch to market based domestic financing, but "how" they should do so.

Several studies have examined the impact of domestic financing on bank efficiency and private sector lending. Using bank-level data on 73 middle-income countries over the post-1990 period, Hauner (2006) finds that banks, which allocate more credit to the government, are more profitable, but less efficient. However, applying aggregate country level data on commercial bank holdings of DD, the results are mixed: DD only begins to harm financial development at very high levels. Since Hauner's sample excludes sub-Saharan Africa and other poorer LICs, which typically have low DD, his results are already somewhat biased towards finding a low residual DD capacity. Furthermore, the study does not take into account the fact that the extent to which banks can "sit on" government bond interest income or "pass them on" to depositors and borrowing firms depends on the nature of competition in the financial sector.

Moreover, Hauner (2006) does not consider the possibility that banks' decision to hold DD may be economically efficient from a risk-diversification perspective. For instance if in the long-term, banks' real return on private lending were negatively correlated with their income from government securities, the overall risk of the bank portfolio would fall through a *risk-diversification effect.* This will lower depositors' required return, enabling banks to lower their lending rate for any given intermediation margin. Abbas (2007b) demonstrates the theoretical plausibility and empirical support for this negative correlation between private and government returns.[9]

Empirical evidence on the crowding out effects of DD at the macroeconomic level is mixed. In a study of the determinants of financial depth, such as loans and deposits scaled to GDP, Detragiache et al. (2005) include government domestic interest payments as a proxy for DD in 82 LICs and EMs over the 1990-2001 period. The coefficient on interest payments is found to be significantly negative, although not robustly so in regressions of bank assets scaled to GDP, thereby suggesting a standard crowding out effect, at first glance. However, domestic interest payments enter the loans to GDP and deposits to GDP regressions positively, significantly and robustly, suggesting a *crowding in* effect in line with Kumhof and Tanner's (2005) collateral argument.

[9] His theoretical argument, in summary, is that in an economic downturn, when private sector returns are falling, the government's domestic tax revenue and foreign aid receipts would also likely fall, leading to a widening of the fiscal gap. To the extent that the latter is financed domestically, yields on government paper will rise, boosting bank profitability and, thus, militating against the contemporaneous lower returns from private lending.

IMF (2005a) explicitly examines the impact of DD on private sector credit in the context of 40 LICs (including 15 mature stabilisers) over the 1993-2002 period.[10] Overall, the study finds "limited evidence of government recourse to domestic financing crowding out private sector borrowing in the mature stabilizers" (p. 34). Higher "levels" of DD are found to be associated with lower levels of corporate lending, but the relationship breaks down when first differences of the variables are used. The report also finds no robust evidence of a negative correlation between real T-bill rates and changes in DD for either the mature stabilizers or the broader LIC group. However, the report notes that crowding out may occur through channels other than interest rates, such as credit rationing, and cautions against a rapid buildup in DD, especially in the context of the availability of concessionary external financing.

C. Testable hypotheses

The foregoing suggests a complex cost-benefit calculus for DD and a series of plausible hypotheses (i-iii) must be tested in order to unravel it. For instance:

i) DD may have either a positive or negative net impact on growth. Furthermore, the impact of DD on growth may well be "non-linear".

DD could both have positive and negative effects on economic growth. These contrary views may be bridged by the existence of a non-linear impact of debt: at moderate levels, DD boosts growth but beyond a certain level, more traditional crowding out concerns may dominate. Hence, it may be important to identify whether such threshold exits, which could help evaluate whether debt in a given country has reached inappropriate levels.

ii) The macroeconomic impact of DD may work primarily through the investment efficiency channel rather than capital accumulation.

DD may both boost the pool of savings and enhance the volume of investment in the economy. In addition, the positive spill-over effects from DD markets to broader capital markets may promote more risk taking and support better allocation of capital to productive sectors. If these sectors have been underfinanced in the past, DD markets will help raise total factor productivity and expand the economy's production frontier.

iii) The institutional environment as well as the quality and span of DD markets may have a significant bearing on the growth impact of DD.

The institutional environment could have a complex interaction with DD. On one hand, better institutions can imply a competent policy framework, featuring optimal use of fiscal resources for the provision of public services, infrastructure development, maintenance of law and order, and property rights protection. This would tend to make the growth impact of DD, or any source of

[10] No explicit definition of DD is provided in the report; however, it appears that, like Hauner (2006), commercial bank credit to government is used as a proxy.

budgetary finance for that matter, higher. On the other hand, DD markets may be less important in stable institutional environments as the collateral or risk-diversification function that DD performs on banks' balance sheets will play a smaller role. Furthermore, the risk-diversification benefit will become less important as the overall magnitude of risk in the economy falls. A priori, it is not clear which of two effects dominates: i.e., whether good institutions complement DD for public service provision, or whether they substitute for the collateral and risk-underwriting functions that DD performs on banks' balance sheets.

The quality and breadth of DD markets should also be important. It is relevant to investigate how i) the composition of DD in terms of arrears and overdrafts versus auctioned securities (marketable T-bills and bonds) and ii) the holding of DD in terms of banks versus nonbank sectors, affect the growth impact of DD. Indeed, many of the benefits of DD discussed above: safe asset and collateral functions, monetary policy and liquidity management benefits, and benchmark yield curve for private lending, all clearly apply to securitized DD and not to debt issued in captive markets or accumulated due to fiscal irresponsibility.

Commercial bank holdings of DD are likely to be associated with lower financial system efficiency and greater crowding out, than when debt is held by the non-bank sector.[11] As indicated in Christensen (2004) and Gulde et al. (2006), the ability of LICs, in particular in SSA, to expand DD without crowding out bank lending to the private sector partly depends on the importance of the contractual savings sector (pension and insurance companies etc.). The participation by individual and contractual savings institutions in the government securities market boosts competition in the financial sector alleviating some of the concerns by Hauner (2006).[12]

III. DATA AND ECONOMETRIC FRAMEWORK

A. New domestic debt database

As mentioned earlier, reliable DD data has been, and still is, a serious problem in LICs and some EMs. There are only a handful of LICs which maintain and report public DD data in an organized and regular manner. Even among this small subset, regular reporting has been instituted only recently and consistent time series on DD are not available for a decent stretch of time. The absence of such data has also effectively precluded, in our view, serious research on DD, the consequent emergence of a "total" public debt (i.e. domestic + external) view on debt management and fiscal policy, and an understanding

[11] See Hauner (2006) on the possible efficiency concerns associated with commercial bank holdings of government securities.

[12] Other interesting attributes of DD could also matter for its growth impact, but are not covered here. These include whether the debt is short-term vs. long-term, index-linked, held by local or foreign residents, fixed or floating, backed by an active secondary market, and issued in benchmark maturities to enhance instrument liquidity. For the purposes of this paper, however, and given the data constraints, we are able to focus only on the marketability and holder-profile of DD.

of how debt structure choices are affected by and affect macro, fiscal, financial and institutional variables.

Researchers at IMF have recently attempted to collect DD data on subsets of LICs and EMs.[13] *Christensen (2004)* collected annual data on central government domestic securities from 1980-2000 on 26 Sub-Saharan African countries; however the data has many gaps, effectively covering only 20 countries. *Mellor* collected securitized and non-securitized central government DD on 70 IMF "program" countries from 1996-2004 – see Mellor and Guscina (forthcoming). The data is also usefully disaggregated by holder (banking system vs. nonbank sectors) and securitized vs. unsecuritized. A third database introduced by *Jeanne and Guscina (2006)* compiles securitized central government securities on 19 emerging markets, disaggregated by maturity and currency since 1980. We make selective use of the Mellor and Christensen databases in this paper.

Our main data source, however, is Abbas (2007a) who extracts from the IFS monetary survey data a DD series spanning 93 LICs and EMs over 30 years (1975-2004).[14] The definition used is commercial banks' gross claims on the central government *plus* central bank liquidity paper.[15] The series is then scaled to both GDP (DOMdebt) and commercial bank deposits (DD2dep). Table 1 provides a list of all the countries in the sample as well as a country-by-country breakdown of the evolution of these ratios over three decades, starting in 1975.

DD, as share of GDP, appears to have risen over time from 5.5 percent to 8.4 percent, but, as a share of deposits, has remained relatively stable around 21.5 percent. The ratios for both DOMdebt and DD2dep are higher in EMs at 10 percent and 27.7 percent, respectively, compared with SSA's 4.1 percent and 22.2 percent, respectively. Since substantial scope for economic expansion and financial deepening remains in SSA, the implied DD issuance capacity may be significant, going forward. Also, while the distribution of key DD ratios across SSA countries has been stable over time, the same in EMs has become significantly more dispersed, indicating increased heterogeneity among EMs; Figure 1 compares the ratios for the pre- and post-1990 periods for both SSA and EMs.[16]

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[13] This data has usually been extracted from IMF's country statistical appendices and staff reports, which contain useful data on domestic government securities for IMF member countries. However, it is quite difficult to extract continuous and consistent DD series from these documents, as the coverage and timeliness of the appendices and staff reports varies significantly from program to non-program countries and from program to non-program 'periods' for each individual country.

[14] Abbas (2007) also features a full discussion of the merits and demerits of alternative DD definitions.

[15] Formally, the definition is the following: Public sector domestic debt (DD) = DMB & OBI claims on CG + DMB & OBI holdings of liquidity paper; or the lines in IFS: DD= (22a & 42a) + (20c&40c), where DMB is deposit money banks, OBI is other banking institutions, and CG and CB denote central government and central bank, respectively.

[16] These period correspond broadly to the financial repression and financial liberalization eras, even though we recognize that the latter is an ongoing process.

B. Controls and causality variables

For Granger causality regressions to investigate the endogeniety of DD and the channels through it may affect the economy, we use the following variables: per capita income, private savings rate, institutions and financial development. Since reliable series on the latter two variables do not exist in IFI databanks, we invoke suitable proxies. For institutions, we use the International Country Risk Guide (ICRG) "composite index", which tracks countries' political economic and financial risks over time; the index rises as the risk reduces and stability increases. The series runs from 1986 onwards, is available for most of the 93 countries, and is denoted as "stability". Although we use it as a proxy for institutional quality, it can be construed as such only insofar as good institutions affect risk and stability.

To proxy for financial development, a "financial depth index" was constructed using the approach in Huang and Temple (2005). The index was developed from three underlying series – liquid liabilities of the financial system; private sector credit; and commercial bank share in banking system assets, using principal component analysis techniques – see Appendix II (A) for details on extraction methodology.[17] With private sector credit included as an integral part of the index, the latter's response to DD would also shed light on any crowding out effects.

Our control variables for the growth regressions are similar to those used in Pattillo et al. (2002): lagged income, population growth, investment, budget balance, openness to trade and terms of trade growth and the additional controls, inflation and external debt.[18] The summary statistics, definitions and correlation matrix for the main regression variables are presented in Appendix I. Our choice and number of countries is similar to Pattillo et al. (2002): 93, but our time period is 1975-2004 divided into 10 three-year periods.

C. Econometric specification for growth regressions

Preliminary support for the non-linear relationship hypothesized (in section II C) between DD and growth is provided by the scatterplots in Figure 2.[19] The plots suggest that growth may have a Laffer curve relationship with DD2dep, and a linear relationship with DOMdebt. This appears realistic in low financial depth contexts, where the *financial* size of a country would place a more binding constraint on DD capacity than *economic* size.

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[17] The three series are reported from 1960 onwards for all countries in our sample in the Financial Structure Database of Beck et al. (2006; updated from 2000).

[18] Education (lnEDU) was dropped as a control for two reasons: i) due to the poor measure of education (gross enrollment rates) the variable has been found insignificant in many cross country growth regressions. This was the unfortunate result we obtained as well, and it persisted over lagged specifications (i.e. lnEDU_1 and lnEDU_2); ii) there were many data gaps in the schooling series, so that the variable's inclusion would have resulted in a reduction of over 100 degrees of freedom.

[19] Although scatter plots are useful for "prior"-formation, they capture unconditional relationships between country means (over time) and, thus, should not be over-interpreted.

The empirical analysis is modeled on Pattillo et al. (2002) who investigate the nonlinear growth effects of external debt on a panel of 93 developing countries over the 1969-98 period, using 5-year averaged data and a conditional convergence framework. Like them, we employ fixed effects, system GMM (generalized method of moments) and pooled OLS regressions of PPP per capita real income growth on linear and non-linear debt terms and an elaborate set of controls.[20] For hypothesis (i) identified in section II ©, we estimate the following two equations:

$$g_{it} = \alpha_i + \beta' X_{it} + \gamma\, DOMdebt_{it-1} + \phi_t + \varepsilon_{it} \ldots \text{(i)}$$

$$g_{it} = \alpha_i + \beta' X_{it} + \gamma\, DOMdebt_{it-1} + \delta\, (DOMdebt*quart\_DOM)_{it-1} + \phi_t + \varepsilon_{it} \ldots \text{(ii)}$$

where g is growth in PPP GDP per capita, X is a vector of control variables, DOMdebt is the domestic debt/GDP ratio, α_i captures country heterogeneity and ϕ_t are period dummies. **Similar regressions are run for the domestic debt/deposits ratio (DD2dep).**

Our specification differs from Pattillo et al's (2002) in that we work with the actual DD ratios (as opposed to logs) while using quartile dummy interaction variables (instead of squared terms) to study non-linear growth effects.[21] For the case of DOMdebt, the corresponding quartile dummy is named *quart_DOM*, and for DD/deposits (DD2dep), *quart_DD2dep*. Our choice of specification is driven by the particular constraints posed by the DD database. For instance, many of the DD ratios in the sample – especially for LICs – were less than "1.00" (i.e. less than 1%). This precluded taking logs (which would have produced negative values), or squaring the non-logged ratios (as the squaring numbers less than 1.00 yields smaller not larger values). Moreover, given the high dispersion of the DD ratios – see Appendix Table A1a – squaring the ratios would have increased outlier problems.

For hypothesis (ii) of section II (C): whether DD impacts growth through investment efficiency of capital accumulation, investment is removed from the control set and the difference in results from the *with*-investment regressions observed.

And finally, for hypothesis (iii): the extent to which the growth impact of DD depends on the institutional environment in which the debt is issued, we have:

$$g_{it} = \alpha_i + \beta' X_{it} + \gamma\, DOMdebt_{it-1} + \theta\, (DOMdebt*quart\_STABILITY)_{it-1} + \phi_t + \varepsilon_{it} \ldots \text{(iii)}$$

The regressions with attributes of DD were similar in structure to the above, except that, instead of quart_STABILITY, the following ratios were used for interaction:

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[20] Note, that like Pattillo et al. (2002), we also lag the DD variables and their interaction terms to avoid possible regressor endogeneity.

[21] The dummy variable takes the value 0 if the relevant DD ratio is in the bottom (i.e. first) quartile, 1 if it is in the 2nd quartile, 2 if in the 3rd quartile and 3 if in the 4th quartile.

- Share of securities in total DD stock (**SDD2DD**) [range 0-100]
- Share of DD held by banking system (**shBANK**) [range 0-100]
- a period dummy (**ERA**) taking the value of 0 for pre-1990 observations (corresponding roughly to financial repression years) and 1 for 1990 onwards (corresponding to the financial liberalization years)
- dummy variable (**REALi**) taking the value of 0 for observations where the real interest rate (deposit rate minus inflation rate) was zero or negative, and 1 when it was positive

We also run regressions using Christensen's (2004) DD data on 20 SSA countries over 1980-2000. This dataset *covers* central government securities (unsecuritized debts excluded) and both bank and nonbank holdings of this debt, enabling us to indirectly test if these features have the expected positive impact on any observed growth effect of DD.

The priors on the coefficients of our control variable follow from the large number of empirical growth studies. GDP per capita growth should, in accordance with Solow's convergence hypothesis, have a negative impact on growth. High inflation and population growth rates are also expected to undermine real economic growth. Robust empirical evidence (Elbadawi et al., 1997 and Pattillo et al., 2002) suggests that external debt impacts growth negatively. In contrast, gross fixed capital formation, fiscal balance, terms of trade growth, and openness should have positive effects on growth.

The primary attraction of using *panel data* methods in these cross-country regressions is their ability to deal with time-invariant individual effects (α_i). If the effects are random, we can use the random effects (RE) estimator for unbiased and efficient estimation. However, if the effects are fixed, or if they are correlated with the regressors, RE is inconsistent, and fixed effects (FE) methods, which wipe out the individual heterogeneity altogether, must be employed to recover consistent estimates of β, γ and δ.

FE methods, however, are biased and inconsistent in *dynamic* panel data models of the type we are estimating. In particular, the coefficient on the lagged dependent variable (lnY_1) will be severely downward biased (numerically).[22] Reverting to OLS and RE for estimating this coefficient is also unhelpful as both are severely upward biased, as discussed in Bond et al. (2002). Secondly, FE models (like OLS or RE) cannot deal with endogenous regressors, a key concern in the present context. For these reasons, we rely, in the main, on system GMM[23] estimation of our regressions, which can simultaneously address the problems of endogeneity and lagged dependent variable.

[22] Dynamic panel data models feature a lagged dependent variable as regressor. In the context of our income growth equation, lnY_1 can be viewed as the lagged dependent variable. This is because growth is simply lnY – lnY_1; so that regressions of growth on alnY_1 + bX can equivalently be written as lnY – lnY_1 = alnY_1 + bX or lnY = (a+1)lnY_1 + bX, which is clearly a lagged dependent specification.

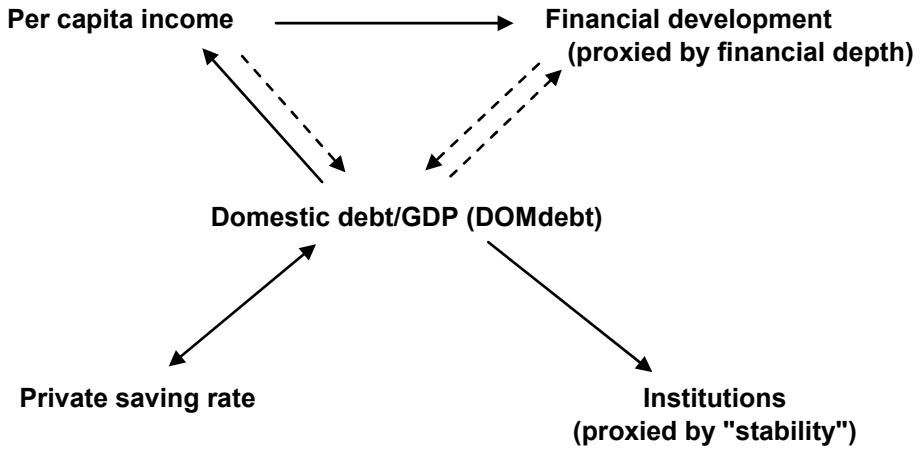
[23] "GMM" stands for generalized method of moments.

IV. EMPIRICAL RESULTS

A. Granger-causality tests on the endogeneity of DD

As a precursor to the growth regressions, we run a battery of Granger-causality panel regressions to study the extent to which DD is endogenous to, or drives, income, private savings, institutions (politico-economic stability) and financial development. Although these tests are very widely used in a range of contexts, it must be acknowledged that they are judgments on statistical causality and may not necessarily imply economic causality. This disclaimer applies equally to the causality inferences derived below.

Appendix II (B) details the econometric methodology underpinning the Granger causality regressions while Table 2 presents the results. The latter are also summarized in the following causality map, and seem to suggest support for two-way statistical causality links between DD and the other variables.[24] Institutions are not causal, income and financial depth are weakly causal, while private savings are strongly causal for DD. Evidence on reverse-causality suggests that DD is an important explanatory variable for private savings and institutions and, to a lesser extent, for financial development and income. Overall, this appears to weaken the case for approaching DD as a purely endogenous variable.[25]



[An arrow from X to Y implies that the null of "X does not Granger-cause Y" is rejected at the 5% level of significance; at 10% in case of broken arrow.]

[24] Key diagnostic tests are explained in the footnotes to Table 2 and appear to be fine for the reported regressions. The joint significance test on the βs of the causal (or *x*) variables is the Granger-causality test. Formally, our null hypothesis is: *Ho = x does not Granger cause y (joint β test is insignificant)*; so that a low p-value on the joint β test allows us to reject the null in favor of the alternative, i.e. a causal channel exists from *x* to *y*.

[25] The intermediating channels from DD to private saving in particular could be complex, ranging from a) Ricardian equivalence to b) widened pool of investment grade instruments to c) a strong collateral function of DD on bank balance sheets luring in private savings to the financial system, and d) strengthened accountability channels leading to greater policy credibility and increased public confidence in the economy.

DD and private savings were found to be closely associated. Higher private savings increase the scope for DD issuance while a larger supply of DD instruments provides incentives to increase private savings. Strengthening and expanding DD markets can, therefore, form a potentially virtuous cycle of higher private savings and stronger capital markets. Note that the size of the *long-run* marginal effect of DD on private saving: β_{LR} [= 0.82] in panel c of Table 2 far exceeds the rather low estimates [around 0.5] for the Ricardian offset ratios floating in the savings literature, ruling out a pure Ricardian explanation for the positive association – see Masson et al. (1998).

DD was found to weakly and positively Granger-cause financial depth positively. However, financial depth had a surprisingly weak causal contribution to income (panel e, Table 2), which seems at odds with other empirical studies that find a significant impact of financial development on economic growth.[26] The inconsistency can be resolved, partly, by noting that financial depth – which is highly sensitive to short-term credit and deposit booms – is only a crude proxy for financial development, which may be regarded as a "longer-term" concept. In that context, insofar as expanding DD markets are also a long-term phenomenon (especially when measured in relation to GDP), DD can serve as a better proxy for financial development than financial depth. Indeed, Beck et al.'s (2006) financial development dataset includes both data on financial depth and local bond market capitalization. To the extent that the latter is driven primarily by outstanding government bonds in LICs and EMs – see World Bank (2006: Fig. 2.2) – this seems like an implicit acknowledgement that the development of DD markets is, in and by itself, an integral part of the process of financial development.[27]

B. The behavior of control variables in growth regressions on DD

Coefficient signs and magnitudes for the control variables all appear to be empirically plausible, and broadly in line with our stated priors (Tables 3-4). For lagged income (lnY_1) and population growth (gPOP), a one percentage point rise corresponds to a decrease in per capita growth of about ½ of a percentage point. The INFLATION coefficient is negative and significant (although not in all regressions), confirming conventional wisdom that low inflation is a pre-condition for lasting growth. Gross fixed capital formation or investment (lnINVEST) is highly significant in all regressions and has the usual high semi-elasticity of around 3.5 -- similar to Pattillo et al. (2002), but significantly higher than Mankiw et al.'s (1992) range of 2.1-2.2. The coefficient on fiscal balance (FISBAL) is, expectedly, significant and positive in all regressions hovering in the 0.1 to 0.2 range, and virtually identical to the range found in Pattillo et al. (2002). The benefits of fiscal austerity underlined here will inform the policy implications on DD derived in section V. Finally, the results on EXTdebt are

[26] We see this as a puzzle because i) financial development is generally believed to be an important causal variable for income, and ii) DD, which we find to be causal for income, is likely to owe this at least partly to the agency of financial development.

[27] We could not incorporate the series on bond market capitalization in out financial development/depth index as continuous data on the former was only available for a handful of LICs.

also in line with expectations to the extent that the sign on all significant coefficients thereof is negative – consistent with the finding in Pattillo et al (2002).[28]

C. The growth impact and optimal size of DD

Results here suggest broad support for a positive overall contribution of "moderate" DD levels to economic growth. For the first DD ratio measured in percent of GDP, DOMdebt, we find a positive significant linear coefficient. The range for the coefficient was between 0.04 with OLS, 0.06 for FE and 0.07 for RE and GMM (Table 3A). Taking 0.06 as the average, increasing DD by one standard deviation (9.70%), implies an increase in the growth rate by 0.58 percentage points (0.13 standard deviations). The non-linear specification in this case (Table 3B) neither adds to overall explanatory power, nor throws up significant non-linear effects. That said, the linear coefficients are higher and the sign on the DOMdebt*(quart_DOM) term consistently negative in all four regressions, so that the possibility of a Laffer curve relationship between growth and DD, perhaps in a slightly richer group of countries, cannot be ruled out. In the current sample, however, with the fourth DOMdebt quartile beginning at 7.36%, there does not appear to be any evidence of diminishing returns to public DD.

However, regressions with DD/deposits (DD2dep) suggest a non-linear growth impact. The linear specification in Table 4A produces positive and significant coefficients for DD2dep in all but the FE regression, with the coefficients being smaller than those obtained for DOMdebt. This may partly be because of stronger in-sample non-linearities in the growth-DD2dep relationship compared with DOMdebt; in line with the scatterplots in Figure 3. The results on the non-linear specification (Table 4B) do indeed suggest support for this hypothesis. The coefficient of the linear DD2dep term strengthens noticeably compared with its counterpart in Table 4A, while the non-linear interaction term DD2dep*quart_DD2dep is negative and significant in all regressions. The turning points, or growth-maximizing levels of DD2dep, in the OLS and RE regressions are *out-of-sample*, but for the FE and GMM regressions are 35.7% and 65.4%, respectively. The FE maxima also appear closer to the 35-40% turning point suggested by the growth-DD2dep scatterplot in Figure 2.[29]

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[28] Other variables had unstable and insignificant coefficients. Terms of trade growth (gTOT) has an unstable sign and is insignificant in most regressions. The result appears to corroborate both the earlier skepticism on optimal management of commodity price booms and the more recent concerns on natural resource curses in lower and middle income countries. The results on openness or trade/GDP (lnOPEN) are complicated, and vary across both specifications and estimation methodologies.

[29] This suggests, in line with earlier discussion, that the supply of bank deposits may act as a more binding constraint, than economic size (GDP), on a government's capacity to issue DD without severely crowding out the private sector. To that extent, therefore, regressions with DD2dep may be more insightful than those with DOMdebt regarding the optimal level of DD in an economy. Note, however, that this line of reasoning does not take into account possible endogeneity of financial depth (and the supply of deposits) to the DD stock, as suggested by the Granger-causality regressions (Table 2, panel a).

D. The channels of influence: Investment volume vs. efficiency

The foregoing raises important questions about the channels through which DOMdebt might affect growth. A causality-centered treatment of this question proffered important causal links from DD to institutions, savings and financial depth. As far as growth is concerned, these channels could feature both volume effects that work primarily through the quantity of investment, and efficiency (quality of investment) effects that work through total factor productivity.

By including both investment and DD in our growth specifications, we have thus far been focusing on the efficiency contribution of DD, rather than its investment volume effect, currently picked up by the investment coefficient. To establish the relative weight of the volume and the efficiency contributions, we run regressions excluding investment as a regressor and study the difference. As can be seen from Table 5, the DOMdebt coefficient is consistently higher in such regressions. The ratio of the *with-investment* to the *without-investment* DOMdebt coefficients is 78.6% (average across all four regressions), indicating that the primary contribution of DD is through investment efficiency; mirroring Pattillo et al.'s (2002) conclusions on external debt.[30] [31] This, in turn, suggests, that should other determinants that constrain the quality of investment improve, such as private sector risk, the contribution of DD to growth will weaken. Some evidence of this emerges below.

E. Does DD complement, or substitute for, good institutions?

Results on the interaction of DD with institutions (STABILITY), suggest a substitutive rather than complementary relationship. For our preferred GMM estimation (regression 3, Table 6), the marginal growth effect of DD becomes negative at the 60th percentile (ICRG index = 62), indicating a non-linear relationship in the variable. Interpreted in economic terms, this suggests that the collateral and risk-diversification functions of DD might be more relevant in high-risk countries where banks cannot lend to the private sector as freely as they would wish to. To further understand this result, we look at the composition of the sub-sample for which the STABILITY index was greater than its optimal threshold of 62.

	Proportion in full sample	Proportion in sub-sample: ICRG>62
Sub-Saharan Africa	43%	19%
Emerging Markets	18%	33%

[30] The context, of course, in Pattillo et al. (2002) is how external debt *reduces* (not increases) growth.

[31] One must be careful with this inference, however, since our proxy for investment, gross fixed capital formation/GDP, only captures physical capital accumulation (and possibly with measurement error), while excluding the human, public, and institutional dimensions to capital.

SSA countries make up 43 percent of the total observations in the full sample (930=93*10), but only 19 percent of the *sub-sample* for which STABILITY>62. By contrast, EMs are significantly over-represented in this *sub-sample*. This seems to confirm Kumhof and Tanner's (2005) argument that DD has more of a positive role to play when there are structural and institutional factors constraining good quality lending. If one of these factors is the high undiversifiable risk arising from politico-economic instability, then a country that reduces such instability through improved governance and stronger domestic institutions is less likely to need, and/or benefit from, DD.

F. The impact of DD quality on its optimal size

The signs on the relevant interaction regressors employed here appear to underscore the importance of DD quality for its growth impact. Debt that is securitized, bears positive real interest rates and is diversely held is found robustly friendlier to growth. Some of these results, summarized in Table 7 (a-b), are obtained from data spanning 70 IMF program countries over the 1996-2004 period (the Mellor database). Similarly, regressions (e-f) employ data on 20 SSA countries since 1980 (Christensen's 2004 database). Less than 200 observations were available for each of these four regressions, so the results, especially the coefficient "sizes", should be interpreted with caution.

Regression (a) tests the *interaction of* the share of securitized DD in total central government DD (SDD2DD) *with* all banking system claims on the central government (ALLonCG). The linear ALLonCG term, which includes the central government's inflationary overdrafts from the central bank is negative and almost significantly so. However, the securitized component of central government DD [ALLonCG*SDD2DD] has a strongly positive coefficient, indicating the benefits of issuing DD as marketable securities. The positive coefficients on the interaction terms with ERA (financial liberalization post-1990 =1) and REALi (positive real interest rates =1) in regressions (c) and (d), respectively, provide further confirmatory evidence of this result.[32] Further as can be seen from the summary statistics on SDD2DD (right panel, Table 7), only about 27% of central government DD in IMF program countries is securitized, representing substantial scope for marketization, going forward.

[32] The real interest rate at which the marginal impact of DD becomes positive is +0.66% [= 0.0307÷0.047], which is not too far off from the -0.01% median observation for REALi in the right panel of Table 7.

The careful selection and interaction of terms in regression (b) test the hypothesis that the growth contribution of DOMdebt decreases in the share of DD held by the banking-system.[33] Summary statistics on this shBANK series indicate a median share of 50% and an interquartile range of 5.3 percent to 85.2 percent. The results indicate that DOMdebt becomes less growth-enhancing as shBANK rises.[34] The most obvious policy implication of this result is that public debt issuers should attempt to diversify debt holdings beyond commercial banks by encouraging participation from institutions (pension funds etc.), the retail sector, and if appropriate, foreign investors. Fortunately, with private domestic savings rebounding in LICs and EMs, contractual saving institutions expanding and foreign interest in their DD markets increasing, the conditions are quite conducive for undertaking such diversification.

Regressions (e) and (f) suggest that the result on positive overall growth payoff of DD documented earlier remains robust to the SSA subgroup and with an important alternative definition of DD, i.e. "all central government securities".[35] The estimated linear marginal effect for the DDSSA/GDP ratio is 0.16 and for DDSSA/deposits is 0.02, matching the earlier pattern of higher growth payoffs to DOMdebt compared with DDdep. The quadratic terms are negative but insignificant in both regressions, suggesting that current perceptions of DD capacity in SSA may be unnecessarily bearish. The fact that the quadratic term is not significant – even for DDSSA/deposits – may partly reflect i) the exclusion from the DDSSA measure of a less desirable component of DD: unsecuritized liabilities, overdrafts of the central bank etc.; and ii) the inclusion in the measure of a relatively desirable component: nonbank-held DD.

Indirectly, therefore, these results support the same hypotheses that regressions (a) and (b) lean towards: DD is more growth-friendly when issued as marketable securities and, to a diverse investor base, including the nonbank sectors.

G. Selected robustness tests

Before discussing any policy conclusions, the results reported here should be tested for robustness i) across estimation methods, ii) over different horizons and country sub-groups; and iii) after removing outliers. By using OLS, random effects, fixed effects and system GMM and establishing the stability of the results over this broad range of estimation techniques, (i) has already

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[33] Formally, the expression DD in this sentence refers to all central government (CG) domestic debt (including CG securities held by the central bank). Liquidity paper is naturally excluded.

[34] Since the data on shBANK is not broken into central bank and commercial banks, we cannot ascertain whether this result reflects i) the negative effects of higher inflationary finance by the central bank, or ii) the adverse efficiency and crowding out effects of high bank holdings of government debt. Since the latter would be inconsistent with the positive growth effects of bank-held DD documented in Tables 1-3, we are inclined to attribute the negative coefficient on shBANK to (i).

[35] The summary statistics for this "DDSSA" variable, reported in Table 7, indicate median DDSSA/GDP and DDSSA/Deposits ratios of 11% and 66% respectively. These are quite high, respectively, in relation to the DOMdebt ratio (2%) and the DD2dep ratio (19%) for SSA reported in Table 1, the difference caused by large central bank holdings of central government securities in these countries.

been addressed. For (ii), the regressions (e) and (f) on the SSA sub-sample partly addresses the issue of robustness over country-groups. Further, to test for robustness over horizon length, 3-year data is aggregated into 6-year data, to make sure that any residual cyclical effects are also smoothed out. As a result of the conversion, the total number of observations halves. Table 8 summarizes the results of OLS, FE and system GMM regressions of growth on DD/GDP (DOMdebt, linear, panel a) and DD/deposits (DD2dep, non-linear, panel b) using 6-year data. As can be seen, the DOMdebt coefficient strengthens compared with the 3-year case. By contrast, the evidence for a non-linear growth impact of DD2dep weakens: all the non-linear terms are insignificant while the linear coefficients are lower than their 3-year counterparts in two of the three regressions.

The final robustness check – sensitivity to outliers – based on the DFBETA post-estimation command in STATA is also green.[36] The command works with OLS and LSDV (FE) regressions, and computes the *influence* of each observation (country-period) on the coefficient of interest. DFBETA series for all three measures of DD were generated after running their corresponding OLS and FE regressions. Observations with $|\text{DFBETA}| > \sqrt{2}/N$ (N being the total number of observations) were then dropped from the sample and the regressions re-run on the new smaller samples. Table 9 reports the results from these *outlier-cleansed* regressions. As can be seen, in the case of DOMdebt, the coefficient size rises significantly for both the OLS and FE cases. For DD2dep (panel b), evidence for a non-linear growth impact endures, with a turning point for DD2dep at 35.4% for the FE case, very similar to the result obtained earlier.[37]

Overall, the foregoing permits a more confident restatement of our earlier results on the growth contribution of DD, i.e. that the contribution is generally positive for DOMdebt, with evidence of diminishing returns to DD2dep above a ratio of 35%.

V. Policy Conclusions and Way Forward

This paper has attempted to fill the remarkably large gap that exists in the formal study of the impact of DD markets in LICs and EMs. First, a comprehensive database on DD based on IFS monetary survey data on all commercial bank claims on the central government and central bank securities was developed. It covered 93 countries over the 1975-2004 period and revealed that DD markets play an increasingly important role in supporting economic development in developing countries. In proportion of GDP and deposits, DD amounted to an average of 6½ percent and 22 percent, respectively. The ratios were generally found to be between 3 to 5 percentage points higher in emerging markets compared with SSA.

[36] This robustness check was applied to the 3-year averaged data.

[37] Unfortunately, we do not have the benefit of DFBETA-adjusted GMM regressions, which would have enabled a fuller comparison.

Granger causality analysis revealed important interlinkages between DD and key macroeconomic, financial and institutional variables. The results indicated weak Granger causality from financial depth and income to DD, but strong causality from private savings to DD. In contrast, reverse causality was found from DD to financial depth (weak) and saving, institutions and income (strong). Overall, the analysis suggested that while a government's DD issuance capacity may be affected by the available pool of savings and, to a lesser degree, the level of income and financial depth, these variables as well as the underlying processes of financial and institutional development are also likely to respond positively to DD issuance, forming a potentially virtuous circle.

The panel data regressions confirmed a strong and non-linear positive impact of DD on economic growth. A battery of panel growth regressions were run using extensive controls, different estimation methods (OLS, FE and GMM) and rigorous robustness tests including a 6-year horizon for averaging, outlier treatment and different country sub-samples (like SSA). In all of our basic regressions the coefficient for DD was significant and positive. The standardized marginal effects suggest nontrivial orders of magnitude, with a one standard deviation increase in DOMdebt driving a 0.1 standard deviation increase in per capita growth. The growth contribution of DD scaled to deposits (DD2dep) appears more complex, with DD seen to support growth up to a ratio of 35% but strangling it at higher levels.[38] This lends some credence to the crowding out argument against DD, but also proffers a sense of what the optimal level of DD is. Given an average DD2dep ratio of 21.5% for our 93 countries, and considering the significant scope for financial deepening and institutional and foreign participation that exists in many of them, the outlook on DD issuance capacity in low-middle income countries looks broadly favorable.

The quality and span of DD markets can have a significant impact on the optimal size of DD. A higher level of DD can likely be sustained without compromising growth if DD is issued in the form of marketable securities, bears positive real interest rates, and is issued to investors outside the banking system. The latter result supports the hypothesis that institutional and retail participation in the government securities market boosts competition in the financial sector, both on the deposit-taking side – as banks have to compete with government for individual and institutional deposits – and, on the investment side – as banks compete with other sector in public securities auctions. This increased competition should put downward pressure on banks' overheads and intermediation margins, partly alleviating the efficiency concerns associated with high bank holdings of DD highlighted by Hauner (2006).

The growth regressions in Table 5 reveal that ¾ of the impact of DD on growth occurs through the investment efficiency or factor productivity channel, rather than the volume of capital accumulation itself. Intuitively, this could imply that the main function DD performs is that of protecting banks' profitability against the possibility of downside risks, thus permitting more

[38] Note that these results were obtained with a DD definition that excludes nonbank holding of government securities. Although this omission is likely to be unimportant quantitatively (as the holdings are typically small in LICs), qualitatively it should downward bias any positive growth effects of DD, for reasons discussed in the context of regressions on the "quality" of DD.

aggressive risk-taking vis-à-vis private sector lending. If risks are already manageable in the economy, say, due to a stable political economy, the benefits of DD are more pronounced. This seems to be confirmed by the interaction regression in Table 6, where the growth effect of DD was found to be diminishing in the measure for STABILITY.

The foregoing seems to imply that countries with the greatest capacity for DD issuance in terms stability and strong institutions, probably have the least need for it; while governments which are unable to expand DD issuance due to credibility constraints are likely to gain most from it. Moreover, since the coefficient on fiscal balance is consistently positive in all our regressions, such countries are additionally constrained to find non-deficit increasing methods of expanding DD. This is especially true for post-HIPC SSA countries, which have recently received large external debt waivers, and are under pressure to not undertake any non-concessionary financing, either from abroad or domestically.

Valid concerns about public debt sustainability suggest issuance that countries where fiscal control is still not firmly in place, should continue to approach DD cautiously. That said, there may still be some immediate scope for expanding the stock of marketable securities using central bank liquidity paper or non-deficit expanding bond issuance. The following range of options is illustrative of what LICs and EMs can do to expand DD markets without jeopardizing fiscal sustainability:

i) *Convert hitherto un-securitized liabilities into marketable debt*. Many LIC governments have such inheritances from past bank restructurings, central bank and commercial bank direct advances etc. Tanzania, in 2002, paid off a large chunk of its unsecuritized liabilities to the central bank by issuing longer-dated Treasury bonds at a time of high monetary liquidity in the economy.
ii) *Strengthen the functioning of existing markets – d*isseminate information on debt operations, adopt transparency in primary auctions, develop secondary markets, broaden investor base (allow pension funds, retail and foreign investors), and lengthen maturity structure (for latter, see below).
iii) *Sterilize foreign inflows modestly along the yield curve through long-term sterilization bonds.* This may help attenuate any Dutch disease effects induced by large foreign exchange inflows – aid-related or other – as well as reduce the risk of sterilization operations excessively increasing short-term interest rates. Pension funds with maturity matching needs (given long-term domestic currency liabilities) and foreign investors seeking higher returns are likely to generate the demand for such longer dated local currency instruments. The use of securities for sterilization purposes has risen sharply in recent years in both East Asian EMs and large aid-recipients in SSA.[39]
iv) *Unify Treasury/central bank securities to boost secondary market trading prospects and strengthen monetary policy.* McCauley (2003) traces the formal conversion of liquidity paper into central government debt in Singapore during 2001-2003. The operation boosted the central bank's Treasury holdings and enlarged the size and liquidity of benchmark issues (facilitating secondary

[39] Note, however, that if sterilization bonds are issued in lieu of external concessionary financing inflows in LICs, this could doubly raise public sector indebtedness by increasing the public external debt stock and the stock of liquidity paper on the central bank's balance sheet. The impact on total public debt sustainability should, therefore, be considered carefully before pursuing such a strategy.

market trading), both of which improved the central bank's ability to conduct effective open market operations.

Over time, as countries strengthen debt management practices and fiscal control, they could begin to rely more on DD financing through various mechanisms:

v) *Where feasible, substitute foreign financing with securitized DD.* In many LICs, marketable DD is likely to appear cheaper in budgetary cost terms than foreign currency borrowing, even concessionary, once the 10-15 percent annual (average) currency depreciation cost is imputed. This may be an argument, therefore, for a gradual resumption of moderate net domestic financing (NDF) in countries where DD as a share of GDP or deposits is very low, or, where government borrowing is not required to also finance the external deficit.[40]

vi) *Think outside the box*. Recent World Bank and EADB proposals have called for issuing local currency bonds to finance infrastructure investments in SSA. This may substantially boost the depth and liquidity of local currency bond markets in the region, and may ultimately provide a redemption route for "original sin" countries.[41]

vii) *Consider the possibility of converting foreign grants/debt relief into long-term domestic currency bond claims of SSA citizens on SSA governments.* Among other things, such a proposal will help establish much-needed *domestic* accountability channel to replace the weaker external accountability channels resulting from a streamlining of IFI conditionality. The key challenge here would be the distribution of the long-term bonds to citizens and resolving the time inconsistency problem associated with nominal debt contracts. Both could be partly resolved by allocating a share of the bonds for civil servants as part of a civil service pay increase. See Abbas (2005) for details of the scheme.

[40] In countries with large structural external deficits, a sudden switch from foreign currency debt to domestic debt may not be viable, as it will require a very sharp, possibly politically unacceptable, external sector (and fiscal) adjustment. However, the alternative of continuing to fully accommodate external and fiscal deficits with foreign aid is also problematic in that it prevents the exchange rate and absorptive adjustments needed to rein in the underlying structural deficit.

[41] The term original sin was coined by Eichengreen and Hausmann (1999; 2005 to describe some countries' inability to issue debt in their own currencies.

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APPENDIX I: DESCRIPTION OF DATA

Summary statistics for main regression variables

	N	min	max	mean	sd	cv	median
gY	930	-16.20	23.47	5.00	4.50	0.90	4.57
Y	930	171	20261	2669	2764	1.04	1644
gPOP	928	-8.63	8.20	2.25	0.99	0.44	2.32
INFLATION	807	-10.86	98.87	13.95	16.02	1.15	9.33
INVEST	852	2.08	61.51	20.32	7.38	0.36	19.75
FISBAL	930	-63.54	27.03	-4.78	6.02	-1.26	-4.03
gTOT	922	-50.01	78.44	0.86	10.60	12.31	-0.07
OPEN	919	0.69	239.35	64.43	38.71	0.60	54.85
DOMdebt	844	0	89.72	6.34	9.70	1.53	3.61
DD2dep	843	0	94.40	21.21	17.17	0.81	17.43
EXTdebt	791	6.06	384.61	74.21	59.15	0.80	57.64
prSAVING	733	-52.05	41.80	13.29	9.45	0.71	13.43
STABILITY	526	23.80	81.70	58.22	11.70	0.20	59.15

N = no. of observations
sd = standard deviation
cv = coefficient of variation
Time period: 1975-2004 (3 year averages)
"DD2dep" is domestic debt/deposits (in %)

Correlation matrix for main regression variables

	gY	lnY_1	gPOP	INFLATION	lnINVEST	FISBAL	gTOT	lnOPEN	DOMdebt	DD2dep	EXTdebt	prSAVING	STABILITY
gY	**1**												
lnY_1	-0.10	**1**											
gPOP	-0.04	-0.43	**1**										
INFLATION	-0.16	0.01	0.04	**1**									
lnINVEST	0.38	0.31	-0.16	-0.13	**1**								
FISBAL	0.09	0.24	-0.08	-0.11	0.13	**1**							
gTOT	0.05	-0.01	-0.04	-0.02	0.00	0.09	**1**						
lnOPEN	0.07	0.26	-0.10	-0.10	0.40	0.09	0.02	**1**					
DOMdebt	0.03	0.33	-0.23	-0.04	0.22	-0.13	-0.05	0.24	**1**				
DD2dep	-0.01	0.07	-0.05	-0.03	0.04	-0.21	-0.02	0.02	0.68	**1**			
EXTdebt	-0.32	-0.24	0.14	0.10	-0.13	-0.17	-0.04	0.20	-0.05	0.03	**1**		
prSAVING	0.19	0.44	-0.23	0.03	0.45	0.01	0.08	0.14	0.26	0.14	-0.31	**1**	
STABILITY	0.25	0.60	-0.39	-0.16	0.45	0.38	0.03	0.36	0.28	0.02	-0.38	0.38	**1**

Note: Since there were noticeably fewer observations for prSAVING and STABILITY, the correlation matrix for the "remaining variables" was computed by excluding the two variables.

variable	***description***	***source***
gY	100*(per capita PPP GDP growth)	World Bank: WDI
lnY_1	log of [lagged per capita PPP GDP]	World Bank: WDI
gPOP	100*(growth rate of population)	World Bank: WDI
INFLATION	100*[π/(1+π)] , where π is the annual % change in in CPI	World Bank: WDI
lnINVEST	log of [100*(gross fixed capital formation/GDP)]	IMF: IFS 93e
FISBAL	100*(fiscal balance/GDP)	IMF: WEO
gTOT	100*[growth in terms of trade (goods)]	IMF: WEO
lnOPEN	log of [100*(trade/GDP)]	World Bank: WDI
DOMdebt	100*[(banks' claims on CG) + (central bank securities)/GDP]	IMF: IFS [(22a+42a)+(20c+40c)]
DD2dep	100*[DOMdebt/All bank deposits (current, time, saving)]	Deposits: World Bank: WDI
EXTdebt	100*[(public + private) external debt/GDP]	World Bank: GDF
prSAVING	100*(Private savings/GDP)	IMF: WEO
STABILITY	ICRG "composite" risk index to proxy for politico-economic stability a of domestic institutions; high value of index indicates low risk	PRS group: www.icrgonline.com

APPENDIX II: FINANCIAL DEPTH INDEX AND GRANGER-CAUSALITY REGRESSIONS

A. Extracting the Financial Depth Index using Principal Component Analysis

Huang and Temple (2005) use liquid liabilities of the financial system/GDP (**LLY**), private sector credit provided by commercial (and other) banks/GDP (**PRIVO**) and commercial bank assets as a ratio of total banking system assets (**BTOT**) as the *principal components* of the underlying latent financial depth variable.[42] They also constructed other measures of financial development related to financial intermediation efficiency, and the existence and size of stock and bond markets, but the data on these had too many gaps for the countries we are interested in, i.e. LICs and EMs. As such, we focus on financial depth, which, indeed, is also the variable they use in their panel regressions.

Principal component analysis consists in taking N specific indicators (with LLY, PRIVO, BTOT, N=3) and solving for their uncorrelated principal components (P_1 .. P_N), that capture different dimensions of the underlying series. We only use the first component (P_1), formally defined by a vector of weights $a = (a_1, a_2, ..., a_N)'$ on the (standardized) indicators such that $a'X$ has the maximum variance for any possible weights, subject to the constraint $a'a = 1$.

The method is applied to the "log normalized" LLY, PRIVO and BTOT series to obtain the principal components (below). As can be seen, the weights are roughly similar for the three series, indicating that they are indeed highly correlated and hopefully capturing the same underlying latent variable, financial depth. P_1 explains about 84.6% of the variation in the series, and therefore sufficient for our purposes.

Principal components (weights)			
	P_1	P_2	P_3
LLY	**0.561**	0.776	0.288
PRIVO	**0.575**	-0.617	0.539
BTOT	**0.596**	-0.137	-0.791

Weights P_1 were applied to LLY, PRIVO and BTOT and used to construct the financial depth index referred to in the text (see also Figure 2).

[42] Combining the individual variables can also help alleviate measurement errors and outlier problems that might arise if only a single variable is used.

B. Econometric Framework to Test for Granger-Causality

The starting point for Granger-causality tests is dynamic single equation panel data regressions of the form:

$$y_{it} = \alpha_1 y_{it-1} + \alpha_2 y_{it-2} + \beta_1 x_{it-1} + \beta_2 x_{it-2} + n_i + \phi_t + \upsilon_{it} \ldots\ldots \text{(i)}$$

where y and x denote, respectively, the endogenous and exogenous variables of interest; n_i denotes unobserved country heterogeneity; ϕ_t period dummies;[43] υ_{it} the error term; i = 1,2…93; and for the chosen lag length of 2, t = 3…10.[44] A joint significance Wald test on β_1 and β_2 [= 0] helps ascertain if y is *Granger-caused by x*. Since panel regressions of this form involve a lagged dependent variable, it is problematic to employ standard fixed effects (FE) estimators to eliminate n_i.[45] Instrumental variable estimators, like the generalized method of moments (GMM) offer a robust solution to these problems by first-differencing (i) to produce:

$$\Delta y_{it} = \alpha_1 \Delta y_{it-1} + \alpha_2 \Delta y_{it-2} + \beta_1 \Delta x_{it-1} + \beta_2 \Delta x_{it-2} + \phi_t - \phi_{t-1} + \Delta \upsilon_{it} \ldots\ldots \text{(ii)}$$

and using appropriate lags of y and x to instrument for Δy and Δx.[46] The problem with these simple "difference GMM" estimators is that lagged levels of regressors are often weak instruments of the differenced variables. This is especially true when the underlying series are persistent, or the variance of the individual effects (n_i) is high relative to the variance of the transient shocks (υ_{it}). These conditions are likely to be met for the data we are using: the time series process for income (or GDP per capita) is known to be highly persistent; the variance of country heterogeneity is likely to be very high in our sample since it includes Asian emerging markets like China, Latin American oil-producers like Venezuela and very poor SSA countries like the Democratic Republic of Congo.

For precisely such cases, Arellano and Bover (1995) and Blundell and Bond (1998) have developed "system GMM" estimators, which can deliver significant improvements to model identification. Such estimators utilize additional assumptions about the initial conditions of the data process. In the context of growth regressions of the type we will be running later, the additional assumption pertains to there

[43] Period dummies are extremely important in these regressions to control for the financial repression "years" and other common shocks, such as the intermittent debt and financial crises.

[44] The 1st time period is 1975-1977 and the 10th is 2002-2004.

[45] The within-transformed lagged dependent regressor becomes correlated with the transformed error term, rendering the FE estimator biased.

[46] The Anderson-Hsiao difference estimator, can also circumvent the fixed effects bias, but performs badly with highly persistent series, such as income.

being no correlation between output growth and the country-specific effect in the absence of conditioning on other variables. Such an assumption is consistent with Solow's conditional convergence growth framework, and its violation would tend to have implausible long-run implications.

The system GMM estimator then uses lagged differences to instrument the level variables appearing in the extra moment conditions permitted by the additional initial condition assumptions. Simulations have suggested that system GMM deals with weak instrument biases more robustly than difference GMM. As a result, the former has become increasingly popular in cross-country panel econometric studies.

TABLES

Table 1 : Public domestic debt trends in LICs (1975-2004)

	Domestic Debt / GDP (%)				Domestic debt / Deposits (%)				
	1975-86	1987-95	1996-2004	1975-2004	1975-86	1987-95	1996-2004	1975-2004	
SSA average	**3.2**	**3.9**	**5.7**	**4.1**	**22.4**	**20.8**	**23.3**	**22.2**	**SSA average**
Benin	0.5	2.5	1.8	1.5	2.9	14.6	11.1	8.9	Benin
Botswana	2.9	4.3	6.4	4.4	15.4	27.0	26.5	22.2	Botswana
Burkina Faso	2.2	1.8	1.3	1.8	24.2	15.4	11.3	17.7	Burkina Faso
Burundi	0.6	1.1	1.7	1.1	9.1	10.2	13.3	10.7	Burundi
Cameroon	1.9	3.4	2.5	2.5	12.5	26.1	23.6	19.9	Cameroon
Cape Verde		19.0	21.6	20.3		35.6	38.5	37.0	Cape Verde
Central African Rep	2.5	0.8	1.0	1.6	36.2	19.4	26.3	28.2	Central African Rep
Chad	0.1	0.8	0.5	0.4	1.4	20.5	12.0	10.3	Chad
Comoros	1.0	0.5	0.3	0.7	20.4	8.3	6.1	12.5	Comoros
Congo, Dem. Rep	0.2	0.1	0.3	0.2	8.5	3.1	9.2	7.1	Congo, Dem. Rep
Congo, Rep.	4.6	4.4	1.4	3.6	38.4	38.3	19.5	32.7	Congo, Rep.
Cote d'Ivoire	0.8	4.8	4.7	3.2					Cote d'Ivoire
Djibouti		2.0	0.9	1.4		3.7	1.8	1.7	Djibouti
Ethiopia	4.8	11.2	11.2	8.6	31.3	50.7	29.7	36.7	Ethiopia
Gambia, The	2.9	5.2	11.5	6.2	19.0	29.8	46.2	30.4	Gambia, The
Ghana	2.7	3.4	9.8	5.0	28.6	26.4	54.9	35.8	Ghana
Guinea		0.2	1.7	1.0		4.1	24.4	14.3	Guinea
Guinea-Bissau		0.7	0.2	0.4		27.5	2.6	15.0	Guinea-Bissau
Kenya	4.3	6.7	9.1	6.5	21.5	33.6	29.3	27.5	Kenya
Lesotho	8.8	7.5	6.9	7.8	24.7	22.1	28.4	25.0	Lesotho
Madagascar	1.4	1.4	3.0	1.9	11.7	9.5	20.0	13.5	Madagascar
Malawi	5.8	5.1	6.0	5.7	34.4	30.4	41.8	35.4	Malawi
Mali	0.4	0.7	1.0	0.7	5.0	6.6	6.9	6.1	Mali
Mauritania	0.2	0.3	2.0	0.8					Mauritania
Mozambique	4.6	0.5	3.3	3.0	22.9	5.6	13.9	15.0	Mozambique
Namibia		1.8	4.6	3.2		5.9	12.7	9.3	Namibia
Niger	2.5	2.1	1.0	1.9	29.3	17.9	18.0	22.5	Niger
Nigeria	6.2	3.3	4.5	4.8	35.1	22.1	28.9	29.4	Nigeria
Rwanda	1.2	2.4	1.3	1.6	17.4	23.4	10.0	17.0	Rwanda
Senegal	2.0	1.8	3.2	2.3	11.3	11.1	17.1	13.0	Senegal
Seychelles	6.5	32.8	69.7	33.3	25.1	76.7	79.4	56.9	Seychelles
Sierra Leone	4.7	1.7	4.7	3.8	38.2	24.1	50.0	37.5	Sierra Leone
Sudan	3.0	0.1	0.3	1.4	22.1	0.9	3.9	10.3	Sudan
Swaziland	2.0	0.8	1.1	1.4	7.1	2.9	5.7	5.4	Swaziland
Tanzania	10.1	2.9	4.6	6.3	40.9	18.2	32.1	31.4	Tanzania
Togo	0.8	0.7	1.4	0.9	3.9	3.3	8.8	5.2	Togo
Tunisia	5.6	5.4	4.3	5.2	17.6	14.0	9.6	14.1	Tunisia
Uganda	1.5	0.3	5.0	2.2	23.8	3.8	37.2	21.8	Uganda
Zambia	8.6	6.7	5.1	7.0	40.5	36.9	29.7	36.2	Zambia
Zimbabwe					58.7	60.1	45.1	55.0	Zimbabwe
OTHER average	**6.9**	**6.1**	**8.7**	**7.2**	**18.1**	**17.1**	**20.1**	**18.4**	**OTHER average**
Algeria	4.5	8.8	13.3	8.4	13.5	27.3	41.1	25.9	Algeria
Bahrain	3.3	9.1	11.6	7.6	6.5	14.6	16.9	12.1	Bahrain
Bangladesh	2.1	3.2	5.3	3.3	15.5	15.0	18.3	16.2	Bangladesh
Bolivia		0.3	3.6	1.9		1.0	9.8	5.4	Bolivia
Cambodia		0.0	0.1	0.1		0.6	0.7	0.7	Cambodia
Costa Rica	4.3	2.4	8.4	4.9	14.0	7.9	24.5	15.3	Costa Rica
Dominican Rep	3.3	1.2	4.1	2.9	19.8	6.5	13.5	13.9	Dominican Rep
Ecuador	0.1	0.3	2.8	1.0	1.1	1.9	15.6	5.7	Ecuador
Egypt, Arab Rep	15.5	17.1	18.4	16.9	45.4	24.3	26.0	33.3	Egypt, Arab Rep
El Salvador	1.6	3.5	7.1	3.8	4.8	10.5	17.0	10.2	El Salvador
Fiji	4.6	5.5	5.1	5.0	16.3	12.1	13.2	14.1	Fiji
Guatemala	1.4	2.2	2.5	2.0	7.8	12.7	13.6	11.0	Guatemala
Guyana	46.1	28.3	22.4	33.7	48.9	50.4	38.3	46.2	Guyana
Haiti	0.4	0.1	2.5	0.9	2.8	0.7	8.0	3.7	Haiti
Honduras	5.4	6.9	1.2	4.6	27.9	30.0	3.5	21.2	Honduras
Iran, Islamic Rep	7.0	3.3	1.2	4.1	20.1	7.1	3.5	11.2	Iran, Islamic Rep
Jamaica	8.8	8.4	15.0	10.6	26.9	23.2	40.8	30.0	Jamaica
Lao PDR		1.9	1.0	1.4					Lao PDR
Lebanon	41.4	32.2	77.0	49.3	12.5	24.3	43.5	25.3	Lebanon
Libya	7.5	17.3	8.3	10.7	31.1	42.8	22.7	32.1	Libya
Morocco	11.5	19.5	18.1	15.9	43.7	50.9	29.3	41.5	Morocco
Myanmar									Myanmar
Nepal	2.7	5.1	5.8	4.3	17.4	22.1	16.2	18.5	Nepal
Nicaragua	2.6	0.1	10.8	4.3	10.5	0.4	30.9	13.6	Nicaragua
Panama	7.7	2.4	1.5	4.3	25.4	6.3	2.3	12.7	Panama
Papua New G.	3.8	6.9	11.9	7.2	17.3	23.4	41.2	26.3	Papua New G.
Paraguay	0.2	0.2	2.6	0.9	1.2	0.9	10.5	3.9	Paraguay
Peru	7.4	4.1	2.5	4.9	45.5	28.0	10.1	29.6	Peru
Sri Lanka	1.8	3.6	6.1	3.6	9.3	14.8	17.9	13.5	Sri Lanka
Suriname	0.5	0.0	0.0	0.2					Suriname
Syrian Arab Rep	2.5	3.9	9.2	4.9	10.8	14.5	21.8	15.2	Syrian Arab Rep
Trinidad & Tobago	3.2	5.3	8.7	5.5	9.9	13.1	20.4	14.0	Trinidad & Tobago
Uruguay	5.1	5.1	5.7	5.3	13.1	12.2	11.5	12.3	Uruguay
Venezuela, RB	2.0	4.9	5.0	3.8	6.6	19.1	30.8	17.6	Venezuela, RB
Vietnam		1.5	2.5	2.0		45.4	29.3	37.4	Vietnam
Yemen, Rep.		0.2	4.1	2.1		0.9	21.4	11.1	Yemen, Rep.
EM average	**7.8**	**8.5**	**14.3**	**10.0**	**25.8**	**25.6**	**32.3**	**27.7**	**EM average**
Argentina	5.9	8.1	12.3	8.5	32.0	63.0	25.8	39.4	Argentina
Brazil	6.1	8.6	34.1	15.2	54.3	25.4	80.7	53.5	Brazil
Chile	14.1	15.1	10.7	13.4	23.3	49.9	29.1	33.0	Chile
China		1.0	8.6	4.8		3.9	19.1	11.5	China
Colombia	1.7	0.9	5.5	2.6	13.0	6.7	24.3	14.5	Colombia
Cyprus	5.8	12.0	20.3	12.0	9.5	16.2	18.7	14.3	Cyprus
India	6.3	10.2	17.2	10.7	23.0	27.9	36.1	28.4	India
Indonesia	0.2	1.9	18.7	6.3	1.7	5.7	41.6	14.9	Indonesia
Korea, Rep.	5.8	5.4	9.0	6.6	19.9	16.1	15.1	17.3	Korea, Rep.
Malaysia	31.9	18.2	8.9	20.9	73.4	30.9	10.2	41.7	Malaysia
Mauritius	10.0	19.5	19.2	15.6	26.4	31.3	24.7	27.4	Mauritius
Mexico	10.4	12.7	18.8	13.6	37.5	36.7	71.3	47.4	Mexico
Pakistan	7.4	9.8	10.8	9.2	34.2	45.3	37.2	38.5	Pakistan
Philippines	3.5	7.2	13.5	7.6	17.1	23.2	25.6	21.5	Philippines
South Africa	6.8	4.7	6.0	6.0	14.5	9.7	10.8	11.9	South Africa
Thailand	6.2	4.2	4.6	5.1	17.1	7.1	5.1	10.5	Thailand
Turkey	3.2	5.7	24.4	10.3	15.5	35.9	73.2	38.9	Turkey
All LICs	**5.5**	**5.6**	**8.4**	**6.4**	**21.4**	**20.2**	**23.7**	**21.7**	**All LICs**

Notes:
(i) The dark lines separate the three groups of LICs: **SSA** (Sub-Saharan African excluding South Africa), **OTHER** (some Asian, North African, Middel Eastern & Laltin American LICs) and **EM** (emerging markets)
(ii) "Domestic debt" = [Banking sector's claims on central government (IFS 22a+42a) + securitised claims on central bank (IFS 20c+40c)] *divided by* GDP at current market prices (IFS line item 99b)
(iii) "Deposits" include current, time, fcy and saving deposits

Table 2 : Granger causality tests for domestic debt, financial depth, stability, income & saving
(system GMM regressions; all variables are log-normalised; coefficients of interest in **bold**)

a: Financial Depth & Domestic Debt

Dependent variable / *Regressors*	(1) FINDEPTH	(2) DOMdebt	(3) DOMdebt
DOMdebt_1	**-0.0433**	1.0033 **	0.8648 **
	-1.56	*7.10*	*7.80*
DOMdebt_2	**0.1272** *	-0.3748 **	-0.3851 **
	1.91	*-3.26*	*-4.13*
FINDEPTH_1	1.3448 **	**0.3339** **	**0.2547** *
	18.74	*2.54*	*1.84*
FINDEPTH_2	-0.3551 **	**-0.1523**	**-0.1352**
	-2.93	*-1.54*	*-1.21*
INCOME_1			0.4055 **
			2.08
Hansen's chi^2 test (prob>chi^2)	*0.371*	*0.432*	*0.174*
AR(1) test (prob>z)	*0.006 (-)*	*0.006 (-)*	*0.007 (-)*
AR(2) test (prob>z)	*0.885 (-)*	*0.713 (+)*	*0.366 (+)*
Joint test for H_0: $\beta_1 = \beta_2 = 0$ (prob>chi^2)	**0.158**	**0.019** **	**0.143**
H_0: $\beta_1+\beta_2=0$; prob>chi^2	**0.085** *	**0.235**	**0.426**
$\beta_{LR}=(\beta_1+\beta_2)/(1-\alpha_1-\alpha_2)$	8.15	0.49	0.23
Roots; for stability	2.77; 1.02	1.34 ± 0.94i	1.12 ±1.16i
	Stable	*Stable*	*Stable*

b: Stability (Institutions) & Domestic Debt

Dependent variable / *Regressors*	(1) STABILITY	(2) STABILITY	(3) DOMdebt
DOMdebt_1	**0.2474** **	**0.2873** **	0.7709 **
	3.24	*2.58*	*5.69*
DOMdebt_2	**-0.0297**	**-0.0708**	-0.1835 **
	-0.60	*-1.53*	*-2.71*
STABILITY_1	0.7758 **	0.7532 **	**0.0718**
	7.36	*9.37*	*0.83*
STABILITY_2	-0.1942 **	-0.2180 **	**-0.0207**
	-3.21	*-3.30*	*-0.20*
INCOME_1		0.1926 **	
		2.11	
Hansen's chi^2 test (prob>chi^2)	*0.941*	*0.223*	*0.619*
AR(1) test (prob>z)	*<0.001 (-)*	*0.001 (-)*	*0.011 (-)*
AR(2) test (prob>z)	*0.491 (-)*	*0.694 (-)*	*0.306 (-)*
Joint test for H_0: $\beta_1 = \beta_2 = 0$ (prob>chi^2)	**0.003** **	**0.034** **	**0.701**
H_0: $\beta_1+\beta_2=0$; prob>chi^2	**0.023** **	**0.029** **	**0.699**
$\beta_{LR}=(\beta_1+\beta_2)/(1-\alpha_1-\alpha_2)$	0.52	0.47	0.12
Roots; for stability	2.00 ± 1.08i	1.73 ± 1.26i	2.10 ± 1.02i
	Stable	*Stable*	*Stable*

c: Private Saving & Domestic Debt

Dependent variable / *Regressors*	(1) prSAVING	(2) DOMdebt
DOMdebt_1	**1.0631** **	0.1518 **
	11.07	*3.03*
DOMdebt_2	**-0.314**	0.0417
	-4.85	*0.74*
prSAVING_1	0.1430 *	**0.6400** **
	1.69	*7.3*
prSAVING_2	0.0638 *	**0.0116**
	1.65	*0.25*
Hansen's chi^2 test (prob>chi^2)	*0.528*	*0.778*
AR(1) test (prob>z)	*0.004 (-)*	*0.005 (-)*
AR(2) test (prob>z)	*0.399 (-)*	*0.372 (-)*
Joint test for H_0: $\beta_1 = \beta_2 = 0$ (prob>chi^2)	**0.089** *	**0.003** **
H_0: $\beta_1+\beta_2=0$; prob>chi^2	0.035 **	0.003 **
$\beta_{LR}=(\beta_1+\beta_2)/(1-\alpha_1-\alpha_2)$	0.82	0.56
Roots; for stability	1.69 ± 0.57i	1.52; -56.69
	Stable	*Stable*

d: Income & Domestic Debt

Dependent variable / *Regressors*	(1) INCOME	(2) DOMdebt
DOMdebt_1	**0.0671** **	0.7436 **
	2.45	*6.77*
DOMdebt_2	**0.0195**	-0.141 **
	0.98	*-2.31*
INCOME_1	1.3568 **	**0.2920** *
	16.13	*1.65*
INCOME_2	-0.3838 **	**-0.0044**
	-3.74	*-0.03*
Hansen's chi^2 test (prob>chi^2)	*0.075 * *	*0.344*
AR(1) test (prob>z)	*<0.001 (-)*	*0.002 (-)*
AR(2) test (prob>z)	*0.659 (-)*	*0.394 (-)*
Joint test for H_0: $\beta_1 = \beta_2 = 0$ (prob>chi^2)	**0.048** **	**0.098** *
H_0: $\beta_1+\beta_2=0$; prob>chi^2	0.031 **	0.04 **
$\beta_{LR}=(\beta_1+\beta_2)/(1-\alpha_1-\alpha_2)$	3.207	0.72
Roots; for stability	2.49; 1.05	2.64 ± 0.38i
	Stable	*Stable*

e: Financial Depth & Income

Dependent variable / *Regressors*	(1) FINDEPTH	(2) INCOME
INCOME_1	**0.2998** **	1.4868 **
	2.31	*26.53*
INCOME_2	**-0.3806**	-0.4857 **
	-0.96	*-6.90*
FINDEPTH_1	1.3435 **	**0.0009**
	18.61	*0.05*
FINDEPTH_2	-0.5504 **	**0.0038**
	-4.46	*0.21*
Hansen's chi^2 test (prob>chi^2)	*0.414*	*0.316*
AR(1) test (prob>z)	*0.009 (-)*	*<0.001 (-)*
AR(2) test (prob>z)	*0.253 (+)*	*0.373 (+)*
Joint test for H_0: $\beta_1 = \beta_2 = 0$ (prob>chi^2)	**0.059** *	**0.858**

Notes:

(i) INCOME is PPP GDP per capita from WEO; DOMdebt is 100*domestic debt/GDP (see text); FINDEPTH index is developed using Beck et al (2000) data (see text); prSAVING rate is from IMF: WEO database; STABILITY is ICRG composite risk index capturing a country's political, economic and financial risk (higher value denotes lower risk)
(ii) z-statistics in italics, unless otherwise stated; constant and time dummies included in all regressions (iii) ** significant at 5%, * = at 10%
(iv) data spans 93 countries and 10 three-year time periods constructed from 30-year annual data (1975-2004) (v) GMM results reported here were obtained using the xtabond2 two-step command in STATA; z-statistics are based on heteroskedasticity-consistent errors and the finite-sample adjustment of Windmeijer (2005). AR(1) and AR(2) are tests for first-order and second-order serial correlation. First order (negative) serial correlation is expected due to first-differencing, but identification of the models relies on the absence of second-order correlation. *Hansen's chi-squared* tests the additional moment conditions used by the system GMM estimator (vi) GMM instrumentation: for the difference equation, levels dated t-2 and t-3 are used as instruments; while for the moment conditions in levels, first differences dated t-1 are used as instruments (vii) the joint test for significance of βs relates, in any given column, to the coefficients appearing in bold in that column
(viii) for regressions in panel c, variables enter in non-normalised form (ix) β_{LR} captures the LR effect of the explantory variable on the regressand; where $\beta_{LR}>1$, the beta and the associated $\beta_1+\beta_2=0$ test are not reported; the coefficients on regressand lags are dentoed by α_1 and α_2 (x) Stability requires that the roots of the polynomial $1-\alpha_1 L-\alpha_2 L^2=0$ are outside the unit circle (xi) The test H_0: $\beta_1+\beta_2=0$ checks if there is support for the long-run "levels" relationship (captured by β_{LR}). Failure to reject the null implies $\beta_1=-\beta_2$, so that $Y_{it}=\beta_1(X_{it-1}-X_{it-2})$; in other words Y depends on changes in X, not the level of X; the relationship, therefore, is not long-term but short-term. A rejection of the null implies the opposite, and provides support for a long-run "levels" relationship.

Table 3: Growth regressions on DOMdebt (domestic debt/GDP)

A: LINEAR						*B: NON-LINEAR* (using interaction of DOMdebt with a DOMdebt quartile dummy)				
Dependent variable: per capita income growth **(gY=100*growth rate in PPP per capita income)**						*Dependent variable: per capita income growth* **(gY=100*growth rate in PPP per capita income)**				
	(1) *OLS*	(2) *RE*	(3) *FE*	(4) *GMM-sys*			(5) *OLS*	(6) *RE*	(7) *FE*	(8) *GMM-sys*	
lnY_1	-0.8275 **	-1.0733 **	-7.2849 **	-2.3040 **		lnY_1	-0.8253 **	-1.0574 **	-6.3615 **	-1.9714 **	
	-4.17	*-4.43*	*-8.86*	*-2.49*			*-4.11*	*-4.31*	*-9.00*	*-3.24*	
gPOP	-0.5021 **	-0.4342 **	-0.1671	-0.6990		gPOP	-0.4825 **	-0.4396 **	-0.1888	-0.5526	
	-3.36	*-2.71*	*-0.91*	*-1.33*			*-3.17*	*-2.73*	*-1.07*	*-1.15*	
INFLATION	-0.0237 **	-0.0236 **	-0.0005	-0.0156		INFLATION	-0.0220 **	-0.0233 **	-0.0317 **	-0.0092	
	-2.47	*-2.26*	*-1.55*	*-0.33*			*-2.25*	*-2.21*	*-2.59*	*-0.22*	
lnINVEST	3.4373 **	3.3271 **	2.0932 **	5.7036 **		lnINVEST	3.3317 **	3.3219 **	2.4884 **	3.7973 **	
	9.00	*7.90*	*3.53*	*3.11*			*8.65*	*7.87*	*4.83*	*2.99*	
FISBAL	0.1159 **	0.1305 **	0.1394 **	0.1611 *		FISBAL	0.1126 **	0.1265 **	0.1032 **	0.1575 **	
	3.77	*4.02*	*3.73*	*1.83*			*3.54*	*3.82*	*2.91*	*2.43*	
gTOT	-0.0015	-0.0031	-0.0063	-0.0114		gTOT	-0.0003	-0.0034	-0.0050	0.0024	
	-0.11	*-0.23*	*-0.46*	*-0.61*			*-0.02*	*-0.25*	*-0.39*	*0.12*	
lnOPEN	0.0453	0.2851	3.2017 **	2.2311 *		lnOPEN	0.0568	0.2855	2.6352 **	2.1346 **	
	0.16	*0.83*	*4.63*	*1.82*			*0.20*	*0.83*	*4.26*	*2.15*	
EXTdebt	-0.0091 **	-0.0095 **	-0.0226 **	0.0063		EXTdebt	-0.0089 **	-0.0093 **	-0.0140 **	-0.0079	
	-3.38	*-3.08*	*-4.57*	*0.51*			*-3.24*	*-3.02*	*-3.06*	*-1.54*	
DOMdebt	**0.0406** **	**0.0724** **	**0.0637** *	**0.0742** *		**DOMdebt**	**0.0909** **	**0.0894** **	**0.0667** *	**0.0981** *	
	2.22	*2.95*	*1.73*	*1.77*			*2.40*	*2.41*	*1.79*	*1.93*	
						DOMdebt*(quart_DOM)	**-0.0075**	**-0.0070**	**-0.0155**	**-0.0054**	
							-0.65	*-0.62*	*-1.36*	*-0.25*	
R^2 *overall*	*0.42*	*0.42*	*0.07*	0.203	Hansen's χ^2: prob>χ^2	R^2 *overall*	*0.42*	*0.41*	*0.07*	0.656	Hansen's χ^2: prob>χ^2
R^2 *within*		*0.41*	*0.51*	<0.001 (-)	A-Bond AR(1): prob>z	R^2 *within*		*0.41*	*0.48*	<0.001 (-)	A-Bond AR(1): prob>z
R^2 *between*		*0.47*	*<0.01*	0.329	A-BondAR(2): prob>z	R^2 *between*		*0.46*	*<0.01*	0.277	A-BondAR(2): prob>z

Notes:
(i) *t*-statistics (FE & OLS) and *z*-statisitcs (RE & GMM) in *italics*.
(ii) constant; time dummies included in all regressions.
(iii) ** sig. at 5%, * = at 10%.
(iv) data spans 93 countries and 10 three-year time periods constructed from 30-year annual data (1975-2004).
(v) Results obtained using STATA's *reg* (OLS), *xtreg* (RE; FE) and *xtabond2* (GMM-system; two-step) commands.
(vi) Domestic debt regressors are lagged one period.
(vii) z-statistics for GMM are heteroskedasticity-consistent.
(viii) Arellano-Bond AR(1) and AR(2) tests are for 1st and 2nd-order serial correlation in errors. 1st order negative serial correlation is expected due to first-differencing; model identification requires absence of 2nd-order correlation.
(ix) *Hansen*'s chi-squared test checks if the moment conditions used by the system GMM estimator are valid
(x) GMM instrumentation:
  (a) gTOT and gPOP were assumed exogenous, while the domestic debt variables, lnINVEST, lnOPEN and FISBAL were treated as endogenous.
  (b) instruments used for the difference equation: X_{t-2}, where X denotes an endogenous variable.
  (c) additional instruments used for the levels equation: ΔX_{t-1}, where X is an endogenous variable.
(xi) "quart_DOM" dummy = 0 if DOMdebt falls in 1st quartile, 1 if DOMdebt falls in 2nd quartile, 2 if DOMdebt falls in 3rd quartile, and 3 if DOMdebt falls in the 4th quartile; relevant DOMdebt percentiles are: **p25 = 1.26%, p50 = 4.61% & p75 = 7.36%.**

Table 4: Growth regressions on 'domestic debt to deposits ratio' [DD2dep: domestic debt/(current, time and saving deposits)]

A: LINEAR						*B: NON-LINEAR* (using interaction of DD2dep with a DD2dep quartile dummy)				
Dependent variable: per capita income growth **(gY=100*growth rate in PPP per capita income)**						*Dependent variable: per capita income growth* **(gY=100*growth rate in PPP per capita income)**				
	(1) *OLS*	(2) *RE*	(3) *FE*	(4) *GMM-sys*			(5) *OLS*	(6) *RE*	(7) *FE*	(8) *GMM-sys*
lnY_1	-0.8382 **	-1.0932 **	-6.6924 **	-1.8499 **		lnY_1	-0.8415 **	-1.1021 **	-6.6446 **	-1.7925 **
	-4.27	*-4.55*	*-9.58*	*-2.42*			*-4.19*	*-4.48*	*-9.35*	*-2.24*
gPOP	-0.5338 **	-0.4788 **	-0.1802	-0.4083		gPOP	-0.5044 **	-0.4517 **	-0.1460	-0.4699
	-3.52	*-2.98*	*-1.01*	*-1.12*			*-3.3*	*-2.78*	*-0.81*	*-1.34*
INFLATION	-0.0289 **	-0.0291 **	-0.0339 **	-0.0500		INFLATION	-0.0256 **	-0.0272 **	-0.0387 **	0.0023
	-2.95	*-2.74*	*-2.73*	*-1.47*			*-2.54*	*-2.5*	*-3.00*	*0.05*
lnINVEST	3.6083 **	3.6611 **	2.9434 **	5.5998 **		lnINVEST	3.6396 **	3.6777 **	2.8784 **	6.7292 **
	9.33	*8.63*	*5.78*	*3.44*			*9.36*	*8.6*	*5.59*	*4.73*
FISBAL	0.1145 **	0.1254 **	0.1003 **	0.0924		FISBAL	0.1018 **	0.1116 **	0.0754 **	0.2407 **
	3.64	*3.84*	*2.89*	*1.33*			*3.12*	*3.29*	*2.08*	*2.58*
gTOT	0.0025	0.0003	-0.0001	0.0013		gTOT	0.0035	0.0009	-0.0037	-0.0052
	0.18	*0.02*	*-0.01*	*0.08*			*0.25*	*0.07*	*-0.30*	*-0.27*
lnOPEN	0.0581	0.2598	2.3124 **	0.8511		lnOPEN	0.0601	0.2768	2.4235 **	1.5334
	0.20	*0.76*	*3.81*	*0.64*			*0.21*	*0.8*	*3.92*	*0.93*
EXTdebt	-0.0095 **	-0.0099 **	-0.0142 **	0.0028		EXTdebt	-0.0100 **	-0.0104 **	-0.0131 **	0.0019
	-3.48	*-3.20*	*-3.09*	*0.2*			*-3.60*	*-3.33*	*-2.75*	*0.19*
DD2dep	**0.0146** **	**0.0133** *	**0.0042**	**0.0322** **		**DD2dep**	**0.0280** **	**0.0258** **	**0.0188** *	**0.0513** **
	2.03	*1.71*	*0.47*	*2.12*			*2.56*	*2.38*	*1.70*	*2.13*
						DD2dep*(quart_DD2dep)	**-0.0056** *	**-0.0056** *	**-0.0067** **	**-0.0151** *
							-1.67	*-1.68*	*-1.97*	*-1.65*
						Maxima @ *DD2dep percentile*	out-of-sample	out-of-sample	**83** *nt*	**97** *th*
						@ *DD2dep ratio*	-do-	-do-	**35.71** %	**65.40** %
R^2 *overall*	*0.42*	*0.42*	*0.07*	0.215	Hansen's χ^2: prob>χ^2	R^2 *overall*	*0.42*	*0.42*	*0.06*	0.294	Hansen's χ^2: prob>χ^2
R^2 *within*		*0.41*	*0.49*	<0.001 (-)	A-Bond AR(1): prob>z	R^2 *within*		*0.42*	*0.47*	<0.001 (-)	A-Bond AR(1): prob>z
R^2 *between*		*0.46*	*<0.01*	0.440	A-BondAR(2): prob>z	R^2 *between*		*0.44*	*<0.01*	0.469	A-BondAR(2): prob>z

Notes:

(i) *t*-statistics (FE & OLS) and *z*-statisitcs (RE & GMM) in *italics*.

(ii) constant; time dummies included in all regressions.

(iii) ** sig. at 5%, * = at 10%.

(iv) data spans 93 countries and 10 three-year time periods constructed from 30-year annual data (1975-2004).

(v) Results obtained using STATA's *reg* (OLS), *xtreg* (RE; FE) and *xtabond2* (GMM-system; two-step) commands.

(vi) Domestic debt regressors are lagged one period.

(vii) z-statistics for GMM are heteroskedasticity-consistent.

(viii) Arellano-Bond AR(1) and AR(2) tests are for 1st and 2nd-order serial correlation in errors. 1st order negative serial correlation is expected due to first-differencing; model identification requires absence of 2nd-order correlation.

(ix) *Hansen's* chi-squared test checks if the moment conditions used by the system GMM estimator are valid

(x) GMM instrumentation:

(a) gTOT and gPOP were assumed exogenous, while the domestic debt variables, lnINVEST, lnOPEN and FISBAL were treated as endogenous.

(b) instruments used for the difference equation: X_{t-2}, where X denotes an endogenous variable.

(c) additional instruments used for the levels equation: ΔX_{t-1}, where X is an endogenous variable.

(xi) "quart_DD2dep" dummy = 0 if DD2dep falls in 1st quartile, 1 if DD2dep falls in 2nd quartile, 2 if DD2dep falls in 3rd quartile, and 3 if DD2dep falls in the 4th quartile; relevant DD2dep percentiles are:

p25	8.54 %
p50	17.43 %
p75	29.93 %

Table 5: *Linear specifications "excluding" investment (lnINVEST)*

Table 6: *GMM regressions including DOMdebt interactions with STABILITY*

Dependent variable: per capita income growth (gY=100*growth rate in PPP per capita income)							
	(1) *OLS*	(2) *FE*	(3) *GMM-sys*		(1) *OLS*	(2) *FE*	(3) *GMM-sys*
lnY_1	-0.5199 **	-7.4156 **	-1.9597 **	lnY_1	-0.9877 **	-5.2696 **	-1.4576 *
	-2.51	*-7.06*	*-2.06*		*-4.17*	*-7.44*	*-1.76*
gPOP	-0.5829 **	-0.1444	-0.7959	gPOP	-0.8217 **	-0.4041	-1.2352 **
	-3.67	*-0.72*	*-1.24*		*-3.65*	*-1.07*	*-2.70*
INFLATION	-0.0263 **	-0.0006 *	-0.0110	INFLATION	-0.0006 **	-0.0402 **	-0.0001
	-2.69	*-1.92*	*-0.19*		*-2.14*	*-3.22*	*-0.12*
lnINVEST	- - -	- - -	- - -	lnINVEST	3.7385 **	2.5725 **	5.1745 **
					7.69	*3.47*	*4.47*
FISBAL	0.1450 **	0.1628 **	0.2033 **	FISBAL	0.1628 **	0.1636 **	0.2918 **
	4.52	*3.94*	*2.62*		*4.12*	*3.46*	*3.05*
gTOT	-0.0015	0.0009	-0.0173	gTOT	-0.0007	-0.0222	-0.0265
	-0.10	*0.06*	*-0.73*		*-0.04*	*-1.31*	*-1.23*
lnOPEN	0.7101 **	3.3762 **	2.4579	lnOPEN	-0.3619	2.7658 **	1.5609
	2.58	*4.82*	*1.63*		*-1.05*	*3.10*	*0.98*
EXTdebt	-0.0097 **	-0.0206 **	0.0054	EXTdebt	-0.0078 **	-0.0045	-0.0027
	-3.45	*-3.74*	*0.36*		*-2.54*	*-0.79*	*-0.24*
DOMdebt	**0.0542** **	**0.0801** **	**0.0990** **	**DOMdebt**	**0.1204** **	**0.0757** **	**0.1568** *
	2.80	*2.10*	*2.31*		*3.56*	*1.94*	*1.83*
memo: **DOMdebt**	**0.0406** **	**0.0637** *	**0.0742** *	**DOMdebt*(quart_STABILITY)**	**-0.0288** **	**-0.0143**	**-0.0826** *
with lnINVEST included	*2.22*	*1.73*	*1.77*		*-2.1*	*-0.89*	*-1.69*
				Maxima @ *STABILITY percentile*	*out-of-sample*	*out-of-sample*	*60 th*
				@ *STABILITY value*			*62*
R^2 *overall*	*0.34*	*0.05*	0.151	R^2 *overall*	*0.30*	*0.03*	0.258
R^2 *within*		*0.48*	<0.001 (-)	R^2 *within*		*0.30*	<0.001
R^2 *between*		*<0.01*	0.260	R^2 *between*		*<0.01*	0.947

Hansen's χ^2: prob>χ^2
A-Bond AR(1): prob>z
A-BondAR(2): prob>z

Notes:
(i) *t* -statistics (for OLS and FE) and *z* -statisitcs (for RE and GMM) in *italics*.
(ii) Constant; time dummies included in all regressions.
(iii) ** sig. at 5%, * = at 10%.
(iv) Data spans 93 countries and 10 three-year time periods constructed from 30-year annual data (1975-2004).
(v) Results obtained using STATA's *reg* (OLS) *xtreg* (FE; RE) and *xtabond2* (GMM-system; two-step) commands.
(vi) Domestic debt regressors are lagged one period.
(vii) z-statistics for GMM are heteroskedasticity-consistent.
(viii) Arellano-Bond AR(1) and AR(2) tests are for 1st and 2nd-order serial correlation in errors. 1st order negative serial correlation is expected due to first-differencing; model identification requires absence of 2nd-order correlation.
(ix) *Hansen*'s chi-squared test checks if the moment conditions used by the system GMM estimator are valid
(x) GMM instrumentation:
  (a) gTOT and gPOP were assumed exogenous, while the domestic debt variables, lnINVEST, lnOPEN & FISBAL were treated as endogenous.
  (b) instruments used for the difference equation: X_{t-2}, where X denotes an endogenous variable.
  (c) additional instruments used for the levels equation: ΔX_{t-1}, where X is an endogenous variable.
(xi) The "quart_STABILITY" dummy = 0 if the STABILITY variable (ICRG composite index) falls in the 1st quartile, 1 if it falls in 2nd quartile, 2 if it falls in 3rd quartile, and 3 if it falls in the 4th quartile; the relevant "STABILITY" percentiles are as follows:

	p25	*p50*	*p75*
STABILITY (ICRG composite index)	50.8	59.15	66.9

Table 7: Interactions with attributes of domestic debt quality

Dependent variable: per capita income growth **(gY=100*growth rate in PPP per capita income)**

Attribute of DD being tested through interaction **(INT variables =>)**	*Share of securities in DD* **(SDD2DD)**	*Banking system's share in DD* **(shBANK)**	*Financial repression vs. financial liberalisation* **(ERA)**	*Bearing positive or negative real interest rate* **(REALi)**	*Regressions with Christensen's (2004) DD data on 20 SSA: DD includes CG securities held by central bank, banks and nonbanks* **(DDSSA)**	
	a	**b**	**c**	**d**	**e: as % of GDP**	**f: as % of deposits**
Control variables:						
lnY_1	-6.7032 **	-5.4523 *	-6.2995 **	-7.0100 **	-8.4418 **	-7.0812 **
	-2.37	*-1.85*	*-14.86*	*-9.15*	*-4.05*	*-3.43*
gPOP	-0.2329	0.0846	-0.2860	-0.1282	-0.2416	-0.2571
	-0.85	*0.20*	*-1.58*	*-0.71*	*-1.11*	*-1.12*
INFLATION	0.0044	0.0414	-0.0007 **	-0.0014	-0.0645 *	-0.0535
	1.00	*0.65*	*-2.66*	*-1.59*	*-1.86*	*-1.48*
lnINVEST	4.1701 **	1.9955 *	3.3646 **	2.8014 **	3.5150 **	4.3390 **
	7.15	*1.85*	*6.52*	*5.33*	*2.43*	*2.66*
FISBAL	-0.0240	0.0735	0.1288 **	0.0820 **	0.0288	0.0452
	-0.42	*0.83*	*3.70*	*2.19*	*0.34*	*0.49*
gTOT	-0.0135	-0.0196	-0.0006	0.0077	-0.0079	-0.0027
	-0.70	*-0.73*	*-0.05*	*0.58*	*-0.30*	*-0.10*
lnOPEN	-0.7008	-1.5980	2.4805 **	3.3450 **	2.7712 *	2.0907
	-1.48	*-0.93*	*4.03*	*5.17*	*1.78*	*1.22*
EXTdebt	-0.0070 *	-0.0042	-0.0049	-0.0188 **	-0.0164	-0.0095
	-1.95	*0.41*	*-1.34*	*-3.79*	*-1.33*	*-0.72*
DD Variables:						
ALLonCG	**-0.0187**					
	-1.64					
ALLonCG*SDD2DD	**0.1677** **					
	2.57					
DOMdebt		**0.0515** *	**-0.0319**	**-0.0307**		
		1.66	*-0.91*	*-1.04*		
DOMdebt*INT		**-0.0017** **	**0.0587** *	**0.0470** *		
		-3.60	*1.72*	*1.74*		
DDSSA					**0.1590** **	**0.0214** **
					3.09	*2.04*
DDSSA*quart_DDSSA					**-0.0114**	**-0.0002**
					-0.82	*-0.06*
No. of observations:	186	176	623	558	130	124

Notes:
(i) FE regressions reported only (due to space considerations); *t* -statistics in *italics*.
(ii) constant; time dummies included in all regressions.
(iii) ** sig. at 5%, * = at 10%.
(iv) for regressions a & b, data spans 70 IMF programme countries over 1996-2004, i.e. four 3-year periods (using Mellor's 2006 database); for regressions c & d, the full 93 country (1975-2004) sample was used; for regressions e-f, Christensen's (2004) DD data on 20 SSA countries (1980-2000) was used.
(v) **ALLonCG** = 100*[all banking sytem claims on central government/GDP]

Summary statistics for new variables introduced on DD quality

in %	**SDD2DD**	**shBANK**	**REALi**	**DDSSA/GDP**	**DDSSA/ Deposits**
p25	0	5.29	-6.01	3.96	34.35
p50	26.84	50.75	-0.01	10.58	65.55
p75	74.70	85.22	3.76	24.99	96.02

SDD2DD = Share of "securities" in total CG DD [Mellor's 2006 database on 74 IMF program countries over the period 1996-2004]; CG denotes central government.

shBANK: Banking system's (including central bank's] share of total CG DD [-do-] .

ERA: Dummy variable taking the value 0 for the "financial repression" era (1975-89) and 1 for the "financial liberalisation" period (1990-2004).

REAL i: Deposit rate minus inflation [WDI and IFS].

DDSSA: CG securities [Christensen's 2004 database on 20 SSA countries; 1980-2000].

Table 8: Robustness check 1 -- Selected regressions with 6 year data

Dependent variable: per capita income growth **(gY=100*growth rate in PPP per capita income)**						
	a. DOMdebt *(domestic debt/tGDP)* **LINEAR** (counterpart of Table 3A)			***b. DD2dep*** *(domestic debt/deposits)* **NON-LINEAR** (counterpart of Table 4B)		
	(1) ***OLS***	**(2)** ***FE***	**(3)** ***GMM-sys***	**(1)** ***OLS***	**(2)** ***FE***	**(3)** ***GMM-sys***
lnY_1	-0.9394 **	-5.4120 **	-1.7637 **	-0.8094 **	-5.1443 **	-1.5416
	-4.09	*-6.21*	*-2.22*	*-3.86*	*-6.21*	*-1.59*
gPOP	-0.6717 **	-0.3216	-1.8077 **	-0.7903 **	0.0310	-0.9176 **
	-3.04	*-0.94*	*-2.08*	*-3.82*	*0.09*	*-2.05*
INFLATION	0.0000	0.0002	0.0001	-0.0013 **	-0.0012 **	-0.0023
	-0.09	*0.42*	*0.04*	*-3.02*	*-2.54*	*-0.69*
lnINVEST	3.8625 **	1.8400 **	5.2615 **	2.8337 **	0.9883	4.0645 **
	8.65	*2.70*	*3.77*	*6.82*	*1.60*	*2.72*
FISBAL	0.1683 **	0.1094 **	0.1153	0.1202 **	0.0941 **	0.1016
	4.44	*2.36*	*1.35*	*3.11*	*2.09*	*1.50*
gTOT	-0.0052	0.0004	0.0569	0.0448 **	0.0024	0.0393
	-0.27	*0.02*	*0.71*	*1.98*	*0.11*	*1.64*
lnOPEN	-0.5231 **	2.2988 **	-0.7815	0.1094	2.5828 **	1.8763
	-2.06	*3.07*	*-1.05*	*0.38*	*3.53*	*1.24*
EXTdebt	-0.0054 *	-0.0102 **	0.0006	-0.0072 **	-0.0058	-0.0031
	-1.89	*-1.98*	*0.04*	*-2.71*	*-1.19*	*-0.25*
Domestic debt	**0.0732** **	**0.0587** *	**0.1302** *	**0.0208** **	**0.0262** **	**0.0421** **
	2.92	*1.66*	*1.76*	*2.13*	*2.39*	*2.09*
Domestic debt*quartile				**-0.0018**	**-0.0040**	**0.0036**
				-0.60	*-1.15*	*0.33*
memo (with 3 yr data):						
Domestic debt	**0.0406** **	**0.0637** *	**0.0742** *	**0.0280** **	**0.0188** *	**0.0513** **
Domestic debt*quartile				**-0.0056** *	**-0.0067** **	**-0.0151** *
R^2 *overall;* Hansen's χ^2	*0.40*	*0.03*	0.402	*0.39*	*0.02*	0.090
R^2 *within;* AR(1)		*0.41*	<0.001 (-)		*0.41*	0.057 (-)
R^2 *between;* AR(2)		*0.01*	0.495		*<0.01*	0.595

Notes:
(i) *t* -statistics (FE & OLS) and *z* -statisitcs (GMM) in *italics.*
(ii) constant; time dummies included in all regressions.
(iii) ** sig. at 5%, * = at 10%.
(iv) data spans 93 countries and 5 *six-year* time periods constructed from 10 *3-year* period data (1975-2004).
(v) results obtained using STATA's *reg* (OLS), *xtreg* (RE; FE) and *xtabond2* (GMM-system; two-step) commands.
(vi) regressor **Domestic debt** means *DOMdebt* (domestic debt/GDP) for panel **a** regressions,
and *DD2dep* (domestic debt/deposits) for panel **b** regressions; **quartile** means quartiles of DD2dep.
(vii) z-statistics for GMM are heteroskedasticity-consistent.
(viii) Arellano-Bond AR(1) and AR(2) tests for GMM regressions check for 1st and 2nd-order serial correlation in errors. 1st order negative serial correlation is expected due to first-differencing; model identification requires absence of 2nd-order correlation.
(ix) *Hansen's* chi-squared test checks if the moment conditions used by the system GMM estimator are valid
(x) GMM instrumentation:
(a) gTOT and gPOP were assumed exogenous, while the domestic debt variables, lnINVEST, lnOPEN and FISBAL were treated as endogenous.
(b) instruments used for the difference equation: X_{t-2}, where X denotes an endogenous variable.
(c) additional instruments used for the levels equation: ΔX_{t-1}, where X is an endogenous variable.

Table 9: Robustness check 2 -- Selected regressions with DFBETA outliers removed

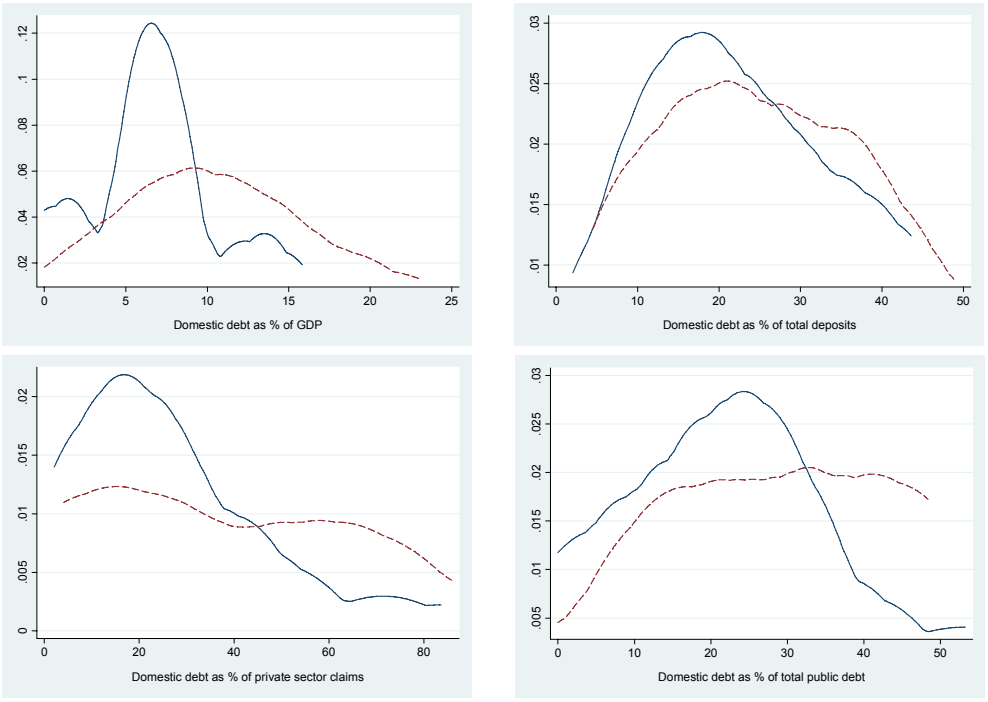
Dependent variable: per capita income growth **(gY=100*growth rate in PPP per capita income)**				
	a. DOMdebt *(domestic debt/GDP)* **LINEAR** (counterpart of Table 3A)		***b. DD2dep*** *(domestic debt/deposits)* **NON-LINEAR** (counterpart of Table 4B)	
	(**1**) ***OLS***	(**2**) ***FE***	(**1**) ***OLS***	(**2**) ***FE***
lnY_1	-0.7929 **	-8.2050 **	-0.7213 **	-6.6612 **
	-4.05	*-7.91*	*-3.69*	*-9.37*
gPOP	-0.7148 **	-0.1369	-0.4616 **	-0.1611
	-4.03	*-0.75*	*-3.10*	*-0.89*
INFLATION	-0.0288 **	-0.0004	-0.0255 **	-0.0368 **
	-3.11	*-1.46*	*-2.61*	*-2.83*
lnINVEST	3.2133 **	2.2811 **	3.6362 **	2.8442 **
	8.60	*3.20*	*9.53*	*5.50*
FISBAL	0.1243 **	0.1499 **	0.0889 **	0.0796 **
	4.09	*3.65*	*2.78*	*2.17*
gTOT	-0.0111	0.0032	-0.0032	0.0033
	-0.84	*0.22*	*-0.23*	*0.25*
lnOPEN	-0.1122	3.3060 **	0.0463	2.4173 **
	-0.41	*4.12*	*0.16*	*3.91*
EXTdebt, TOTdebt	-0.0073 **	-0.0244 *	-0.0102 **	-0.0129
	-2.79	*-4.36*	*-3.77*	*-2.72*
Domestic debt	**0.0541** **	**0.1213** *	**0.0225** **	**0.0178**
	2.10	*1.93*	*2.10*	*1.61*
Domestic debt*quartile			**-0.0056** *	**-0.0064** *
			-1.69	*-1.89*
memo (without DFBETA outliers removed):				
Domestic debt	**0.0406** **	**0.0637** *	**0.0280** **	**0.0188** *
Domestic debt*quartile			**-0.0056** *	**-0.0067** **
R^2 *overall*	*0.44*	*0.06*	*0.44*	*0.06*
R^2 *within*		*0.53*		*0.47*
R^2 *between*		*<0.01*		*<0.01*
Obs. in original regressions (Tables 5-7)	618	530	606	505
|DFBETA threshold|	0.0805	0.0869	0.0812	0.0890

Notes:
(i) *t* -statistics in *italics.*
(ii) constant; time dummies included in all regressions.
(iii) ** sig. at 5%, * = at 10%.
(iv) data spans 93 countries and 10 three-year time periods constructed from 30-year annual data (1975-2004).
(v) results obtained using STATA's *reg* (OLS) command; since DFBETA is a post-estimation command that works only after *reg* , the FE regressions had to be simulated using least squared dummy variable specifications (i.e. by including country dummies).
(vi) DFBETA series for each domestic debt coefficient in a particular regression were generated; DFBETA outliers were then defined as those observations for which $|DFBETA| > (2/\sqrt{n})$ where n is the total number of observations in the original regression.
For example, take regression a1 above: the original regression (Table 3: A1) corresponding to regression a1 had 618 observations, implying a DFBETA threshold of $\pm 2/\sqrt{618} = \pm 0.0805$. All observations with DFBETA outside this range (24 in this case) were construed as "outliers". Regression a1 (reported here) was run after dropping these outlier observations.
(vii) regressor **Domestic debt** means *DOMdebt* (domestic debt/GDP) for panel **a** regressions and *DD2dep* (domestic debt/deposits) for panel **b** regressions; **quartile** means quartiles of DD2dep.

FIGURES

FIGURE 1: PUBLIC DOMESTIC DEBT TRENDS : 1975-1989 vs. 1990-2004 (dashed line)
outliers removed

Emerging Markets



Sub-Saharan Africa

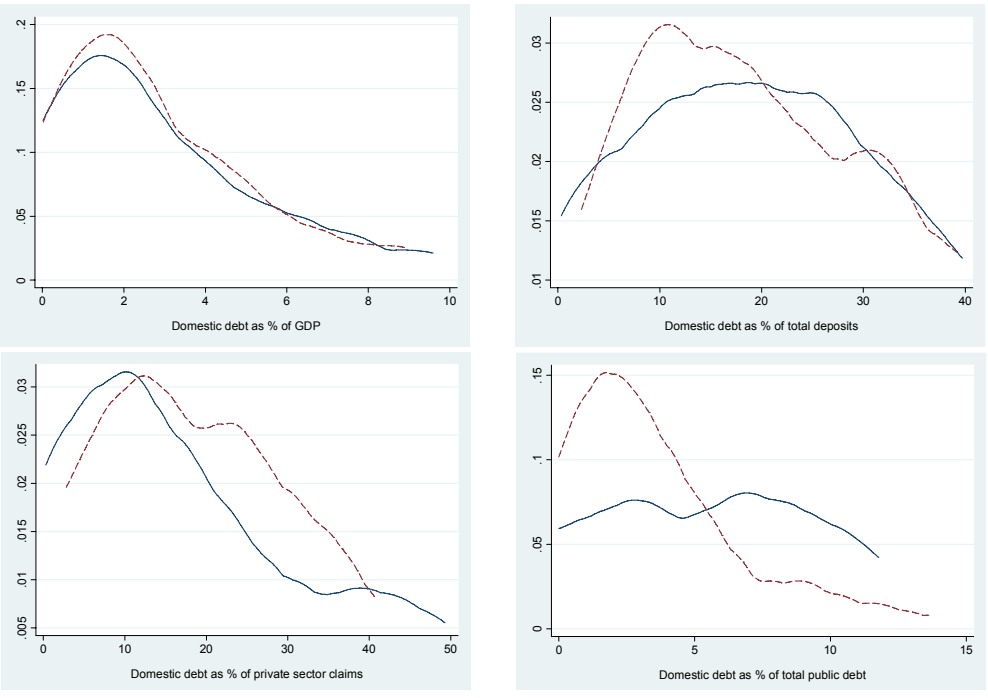
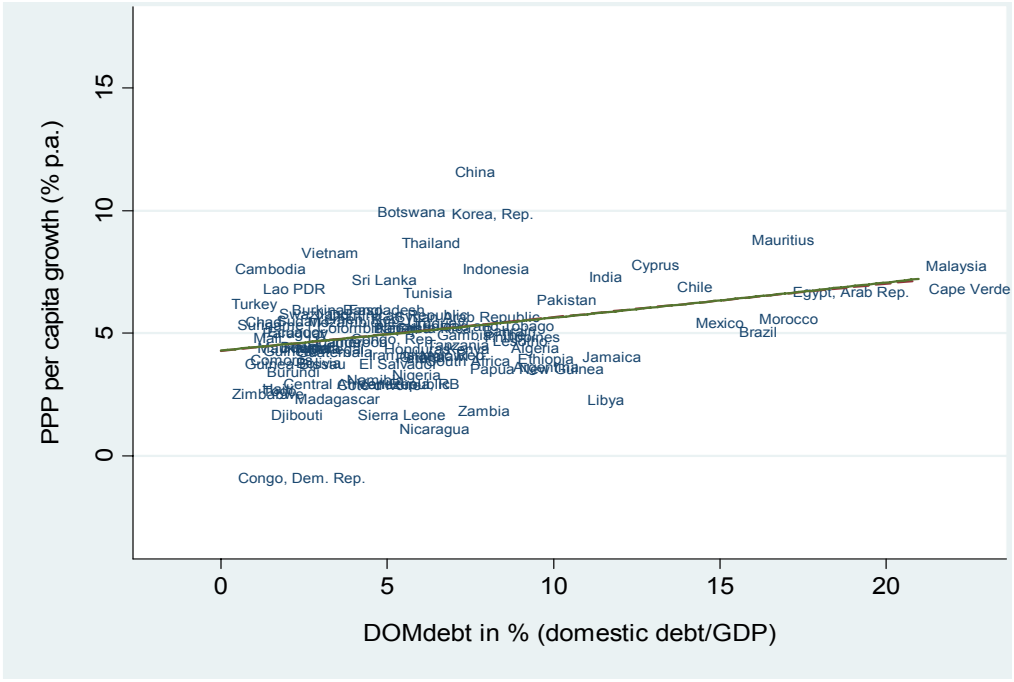
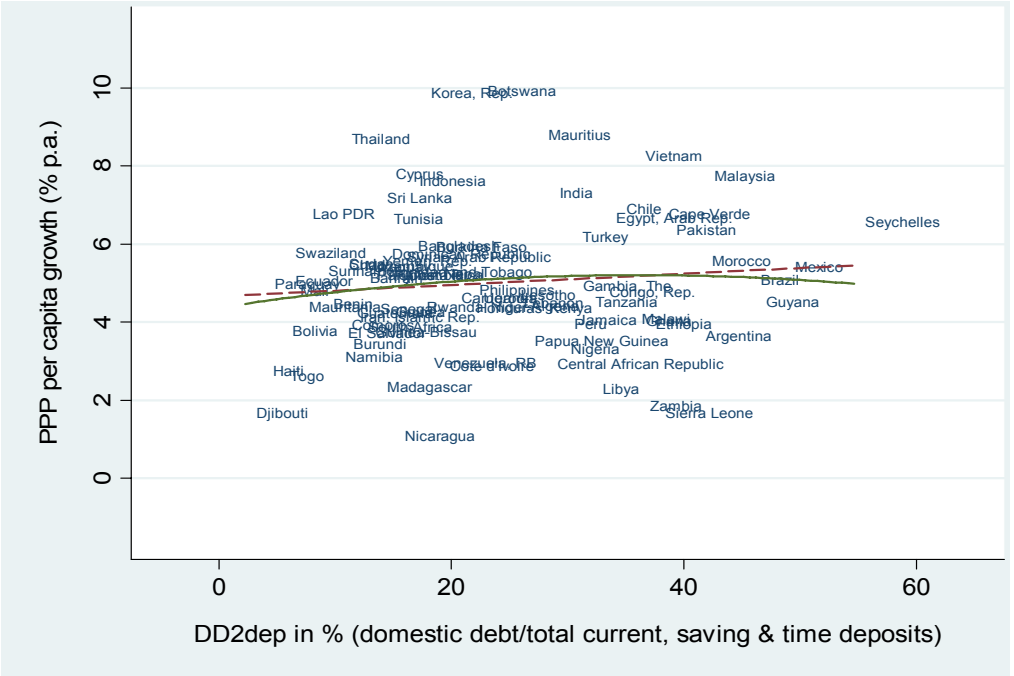


FIGURE 2: GROWTH - DOMESTIC DEBT SCATTER PLOTS

(country means over the period 1975-2004)





Note: Dashed line is linear prediction and unbroken line is quadratic prediction