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A stock-taking exercise and analysis of key drivers

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ABSTRACT

This paper studies the current state and drivers of the development of government local currency bond markets (LCBMs) in Sub-Saharan Africa, a region whose progress in developing such markets has only recently received attention in the literature. We argue that well-developed LCBMs could reduce countries' exposure to external shocks; help wash away or reduce 'original sin'; facilitate the mobilisation of domestic savings; and may have important financial, macroeconomic and institutional spill-over effects. With detailed information collected from various sources the paper first shows that quite a number of African countries have made significant strides in this area. Increasingly, governments in the region issue fixed-rate local currency bonds with tenors of ten years and more on a regular basis. This does not imply all is well. We find that LCBMs in Africa often have low liquidity, feature very few corporate securities and generally have relatively narrow investor bases dominated by commercial banks. The second part of the study presents new results on the drivers of LCBMs based on an econometric analysis of new panel data collected by the OECD. Our results indicate that LCBM capitalisation in selected African countries is negatively correlated with governments' fiscal balance and relatively high inflation, and positively related to common law legal origins, better institutional quality and strong democratic political systems.

Disclaimer: The views expressed in this paper are personal and do not represent the views of the organisations the authors are affiliated with. Any remaining errors are those of the authors only.

1.   INTRODUCTION

Concerns about financial stability associated with the external financing of developing countries have led to a renewed interest in the development of domestic capital markets. Most notably, in November 2011 the G20 endorsed an action plan to support the development of local currency bond markets (LCBMs) in emerging markets and other developing economies.[1] It called upon international organisations to cooperate in data collection and analytical work on LCBMs. This resulted in a joint 'diagnostic framework' developed by the IMF, World Bank Group, EBRD and the OECD (IMF, World Bank, EBRD, & OECD, 2013), a toolkit designed to help country authorities analyse the state of their LCBMs and identify reform priorities.

This paper focuses on government LCBM development in Sub-Saharan Africa more specifically, long time a blind spot in bond market research; mostly due to its relative under-development and a lack of reliable, comparable data. Only very recently a number of studies have analysed LCBMs in the region (Adelegan & Radzewicz-Bak, 2009; Blommestein & Horman, 2007; Mu, Phelps, & Stotsky, 2013).

Four important reasons can be distinguished for the further development of liquid LCBMs in Sub-Saharan Africa. First, the global financial and economic crisis of 2008-2009 and its spill-overs have demonstrated that developing economies such as those in Africa remain vulnerable to external shocks, including sudden stops in private capital flows (see Essers, 2013 for an overview). Moreover, developing countries may face a more limited availability of official, concessional finance in the (near) future (Dabla-Norris, Minoiu, & Zanna, 2014; Dang, Knack, & Rogers, 2013; Gravier-Rymaszewska, 2012).[2] This would in particular affect aid-dependent African countries. Well-developed LCBMs, with a broad local investor base, would reduce countries' exposure to external finance shocks, acting as a 'spare tyre' that stabilises the domestic economy (see e.g., Anderson, Caputo Silva, & Velandia-Rubiano, 2011; Turner, 2012).

Second, developing economies, and lower-income countries (LICs) in particular, have traditionally not been able to borrow in their local currency from abroad or even domestically (except with ultra-short maturities), a phenomenon known as 'original sin' (Eichengreen & Hausmann, 1999; Hausmann & Panizza, 2011; see Khan, 2005 on Africa). Original sin often leads to severe currency mismatches, with destabilising effects in case of real exchange rate pressure (Eichengreen, Hausmann, & Panizza, 2005a; Goldstein & Turner, 2004). LCBM development has the potential to 'wash away' (or at least reduce) original sin by: (i) changing debt denomination from predominantly foreign to local currencies, (ii) by lengthening maturities, and (iii) by attracting a significant share of non-resident investors to buy longer-term local currency bonds (Essers & Cassimon, 2012).

Third, Sub-Saharan Africa is in urgent need of additional funds for growth-enhancing investment. Recent OECD and World Bank reports, for example, point to a significant gap in Africa's infrastructure funding needs in the range of $30 billion to $50 billion a year (Foster & Briceño-Garmendia, 2010; OECD, 2012). Part of this shortage could potentially be bridged using government and corporate infrastructure project bonds (Mbeng Mezui & Hundal, 2013). More generally, LCBMs could help mobilising Africa's domestic savings by improving financial inter-

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[1] See publicdebtnet.org/export/sites/PDM/public/MoreAboutUs/G8/G20_LCBM_3_4_Nov_2011_Cannes.pdf.

[2] Indeed, OECD-DAC figures for 2011 and 2012 indicate 2% and 4% declines in overall net ODA disbursements, respectively, explained by austerity-related aid budget cuts in several donor countries. See oecd.org/dac/aidtopoor-countriesslipsfurtherasgovernmentstightenbudgets.htm.

mediation, discouraging capital flight and even encouraging capital to return; much of Africa's private wealth has traditionally been held abroad, making the region a net capital exporter vis-à-vis the rest of the world (Collier, Hoeffler, & Pattillo, 2001; Ndikumana & Boyce, 2011).

Fourth, the process of government LCBM development in particular has positive spill-over effects. These include boosting broader financial market development, as government bonds fulfil the role of 'safe asset' in the domestic economy and provide a pricing benchmark for corporate bonds, equities and more complex (derivative) risk management products; encouraging sounder macroeconomic and monetary policy, as governments are forced to put their house in order and central banks use government securities in their open-market transactions; and furthering institutional quality, as LCBMs require a strong legal framework and may contribute to building governments' domestic accountability (Abbas & Christensen, 2010; IMF *et al.*, 2013; Kumhof & Tanner, 2005; Mu *et al.*, 2013; Richard, Roy, & Chemonics International, 2010; World Bank & IMF, 2001).[3]

Note, however, that LCBMs are no panacea in every respect; especially in their initial stages of development, government LCBMs could potentially even crowd out private sector credit (Christensen, 2005). Large holdings of government bonds by domestic banks may reduce their efficiency and shrink their private sector loan portfolios (Emran & Farazi, 2009; Hauner, 2009; Ismihan & Ozkan, 2012). It has also been noted that debt service costs and refinancing/interest rate risks on local currency bonds are higher when compared with non-market funding such as concessional bilateral and multilateral loans (Beaugrand, Loko, & Mlachila, 2002; Christensen, 2005; Hanson, 2007).

The optimal public debt structure is one that balances important trade-offs: local vs hard currency, domestic vs external creditors, short vs long maturities, and nominal vs price-indexed debt (Blommestein, 2005; Panizza, 2008, 2010). As in advanced and emerging economies, African LCBM development should ultimately be part of a broader, risk-based public debt management strategy (Blommestein, 2005; Blommestein & Santiso, 2007).

The contribution of this paper to the existing literature on LCBMs in Sub-Saharan Africa is twofold. First, by bringing together cross-country comparable information from various sources, including the OECD, the African Financial Market Initiative (AFMI) and private sector data providers, we are able to present a detailed and consistent account of the current state of African LCBMs and highlight important cross-country differences.

Second, we introduce a new detailed panel dataset covering government LCBM capitalisation in selected Sub-Saharan African countries for the period 2003-2012. This data set was compiled from selected national authorities as part of the OECD's Project on African Public Debt Management and Bond Markets. To our knowledge, the current paper is the very first making use of this alternative dataset for econometric analysis, complementing the small but growing empirical literature on LCBM development in Africa and other developing regions.

The paper is structured as follows. In section 2 we conduct a stock-taking exercise and show that quite a few African countries have made significant progress in developing their LCBMs. Increasingly, governments in the region issue fixed-rate bonds with tenors of ten years and more on a regular basis. This does not imply all is well, since African LCBMs have often

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[3]   This spill-over argument is largely similar to the 'collateral benefits' thesis developed by Kose, Prasad, Rogoff, and Wei (2009) in the context of financial globalisation (i.e., with respect to external finance). To the extent that some of the assumed rewards of LCBMs, such as better monetary policy or improved domestic accountability, are also pre-conditions for building deep LCBMs, this may give rise to threshold effects and the existence of multiple equilibria in LCBM development (cf. Van Campenhout & Cassimon, 2012, again for external finance).

low liquidity, feature very few corporate securities and generally have relatively narrow investor bases. After reviewing the literature on the determinants of domestic debt and LCBMs, Section 3 analyses the new panel dataset collected by the OECD. This part of the study presents original results on the drivers of LCBMs based on this new panel dataset and using different econometric estimators. We show that LCBM capitalisation in selected African countries is negatively correlated with governments' fiscal balance and relatively high inflation, and positively related to common law legal origins, better institutional quality and strong democratic political systems. Section 4 concludes.

2. TAKING STOCK: SUB-SAHARAN AFRICA'S LCBMS IN PERSPECTIVE

2.1. Domestic vs. external public debt in Sub-Saharan Africa

To place LCBMs in a broader perspective, it is useful to first distinguish between domestic and external public debt. Panizza (2008) identifies three possible ways to make this distinction: first, based on the currency in which the debt is issued; second, based on the residency of the creditor, which is the criterion officially adopted by the IMF, World Bank, BIS, OECD and others; and third, based on the place of issuance and legislation governing the debt contract. The second definition of domestic and external public debt is analytically most correct, but difficult to apply in practice with respect to bonded debt, since it requires periodic surveys to identify the ultimate bond holders (which is often very difficult to accomplish). That is why, typically, the third method, which classifies external debt as debt issued on international markets, and in some instances the first method, according to currency denomination, are used as more feasible alternative taxonomies, e.g., in joint IMF-World Bank Debt Sustainability Analyses (IMF & IDA, 2013, p. 15).

Figure 1 shows the historical evolution of (simple, unweighted) average domestic and external public debt as a percentage of GDP, for the whole of Sub-Saharan Africa and separately for countries that have benefitted from the Heavily Indebted Poor Country (HIPC) initiative (since 1996) and its successor, the Multilateral Debt Relief Initiative (MDRI), and those that have remained outside such initiatives.[4] From Figure 1 it is obvious that, largely due to external debt relief under HIPC and MDRI, total public debt ratios have come down dramatically since 2000 and domestic public debt now constitutes an important part, around 40%, of Africa's public debt stock. On average, the build-up of domestic public debt by African non-HIPCs was larger than by HIPCs. Nonetheless also HIPCs tapped domestic markets as they were limited in their non-concessional external borrowing (and prohibited from monetising deficits) as part of IMF programmes (Arnone & Presbitero, 2010).

Figure 1: Evolution of average domestic and external public debt in

[4]   Country-specific public debt figures can be found in Essers and Cassimon (2012, pp. 15-16).

Sub-Saharan Africa

Notes: 1980-1989, 1990-1994 and 1995-2000 averages are from Christensen (2005), which excludes arrears and direct

■ Average domestic public debt (% of GDP)　■ Average external public debt (% of GDP)
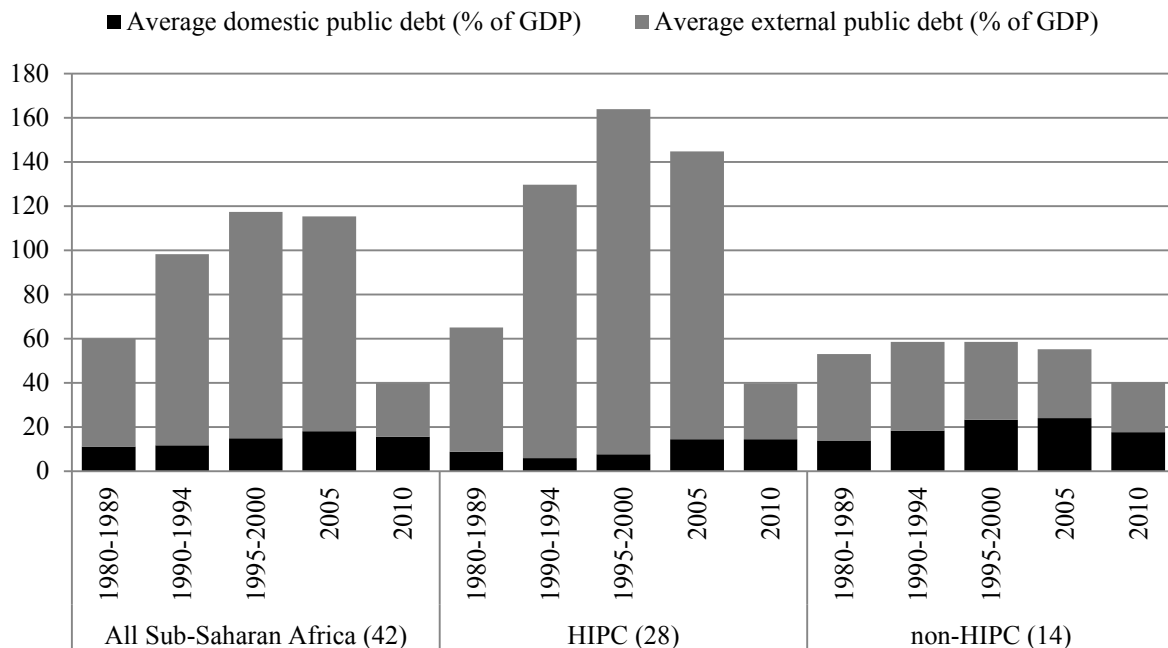
advances from central and commercial banks from domestic public debt; 2005 and 2010 figures are based on IMF Article IV Staff Reports and other IMF Country Reports (various years). 2005 and 2010 data are for most countries limited to central government debt, but sometimes include debt of state and local governments and/or public companies. Domestic-external debt classification is, again in most cases, based on place of issuance. HIPCs include Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Republic of Congo, Côte d'Ivoire, Ethiopia, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, São Tomé and Príncipe, Senegal, Sierra Leone, Tanzania, Togo, Uganda and Zambia. Non-HIPCs include Angola, Botswana, Cape Verde, Gabon, Kenya, Lesotho, Mauritius, Namibia, Nigeria, Seychelles, South Africa, Sudan, Swaziland and Zimbabwe. Comoros, Equatorial Guinea, Eritrea, Djibouti, Mauritania, Somalia and South Sudan are excluded for data availability reasons.

Importantly, not all of the domestic public debt reported in Figure 1 consists of (longer-tenor) bonds denominated in local currency. Domestic public debt may include a whole range of financial liabilities, including (but not limited to) securities such as bonds, notes, bills and commercial paper; loans such as overdrafts, mortgages and repos; currency and deposits; insurance technical reserves; financial derivatives; and other accounts payable, such as trade credits and central bank advances. This in turn means that the benefits of LCBMs as noted above do not fully and automatically materialise in countries with large domestic public debt.

Ideally, one would decompose domestic public debt figures, not only by type of instrument, but also by currency, maturity and creditor type. This would allow one to get a fuller picture of domestic debt vulnerabilities and better assess the state of LCBMs in Sub-Saharan Africa. Such detailed information is, however, not systematically available for a larger sample of African countries. Nonetheless, some useful information has been collected by individual researchers. (see Presbitero, 2012 for an overview and discussion of different databases). For a sample of (African) HIPCs, Arnone and Presbitero (2010) show that between 1994 and 2003 the growing domestic public debt stock was strongly biased towards short-term instruments (mainly treasury bills), suggesting that external debt's currency mismatches were initially replaced by domestic debt's maturity mismatches (see also Christensen, 2005). Moreover, central bank advances are still an important category of domestic debt, especially for HIPCs, where they showed an increase post 2007. Nonetheless, using 1996-2011 data on the domestic debt

structure of 15 low-income countries (again mostly African), Bua, Pradelli, and Presbitero (2014) find that the share of longer-term securities has grown over time.

2.2.   Current state of LCBMs in Sub-Saharan Africa

In this paper we focus on LCBMs (marketable domestic public debt securities), in particular on longer-term government local currency bonds. Table 1 presents information on a number of fairly detailed quantitative and qualitative LCBM indicators for selected Sub-Saharan African countries. These cross-sectional data represent the most up-to-date information we were able to collect from various sources, primarily OECD (2013), Mu *et al.* (2013), the African Development Bank's AFMI website, Standard Chartered Bank's *Local market Compendium* 2014 and Ecobank's *Middle Africa Market Update,* and have been cross-checked where possible. To our knowledge, these detailed indicators are not available in panel data format (apart from central government and corporate LCBM capitalisation figures, see below). Table 1, although uneven in terms of data coverage, gives some idea of the various stages of LCBM development countries in the region have attained.[5]

South Africa's government LCBM is by far the largest and most developed in Sub-Saharan Africa. In relative terms (i.e., as a percentage of GDP), its outstanding central government marketable debt is only surpassed by tiny Mauritius and Eritrea (a country that only issues treasury bills). Other relatively large government LCBMs are those of Kenya, Ghana, Ethiopia, Malawi and Nigeria. Also Zambia, Uganda, Namibia and Tanzania had government marketable debt stocks in excess of 10% of GDP in 2012.

Note that quite a few African governments are now able to issue domestic longer-term bonds in local currency. In addition to South Africa, also Kenya, Namibia and Nigeria have successfully issued bonds with original maturities of 20 years or more. The governments of Botswana, Mauritius, Angola, Lesotho, Swaziland and a number of former HIPCs (including Tanzania, Uganda, Zambia, Ethiopia and Mozambique) have issued bonds with tenors of at least 10 years. Many of these governments have concrete plans to issue local currency debt with even longer maturities, thereby eliminating or, at least, reducing original sin in Sub-Saharan Africa (Essers & Cassimon, 2012).

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[5]   All countries in Table 1 are non-CFA (*Communauté Financière Africaine*); for overviews of the regionally organised LCBMs of CEMAC (Economic and Monetary Community of Central Africa) and WAEMU (West African Economic and Monetary Union) countries we refer to Beaugrand *et al.* (2002), Sy (2010) and Diouf and Boutin-Dufresne (2012). CEMAC members are Cameroon, Central African Republic, Chad, Republic of Congo, Equatorial Guinea and Gabon. WAEMU members are Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo.

Table 1: LCBM indicators for selected Sub-Saharan African countries

Country	Central government LCBMs										Corporate LCBMs
	Capitalisation of marketable debt, % of GDP (year)	Full bond tenor span	Common bond tenors	Common bond coupon types	Published bond auction calendar/ auction frequency	Primary dealer system	Main resident investors	Foreign investors	Restrictions on foreign investment	Bid-ask spread on secondary market (year)	Capitalisation, % of GDP (year)
Angola	7.8 (2012)	1Y-12Y	1Y-6Y	pre-determined / fixed; indexed; foreign currency	Yes / weekly	No	mainly commercial banks; also institutional investors (pension funds and insurance companies), central bank, and mining and oil companies	negligible	Yes, strict exchange controls	no secondary market	no corporate bond market
Botswana	3.7 (2010)	2Y-15Y	existing bond issues tapped at auction	fixed; floating	No / de facto half-yearly	Yes	mainly institutional investors (insurance companies and pension funds); also commercial banks and central bank	negligible	Yes, only up to 20% of bonds issued	20bps (2013)	3.1 (2010)
Burundi	2.2 (2008)	2Y-5Y	N/A	N/A	No / ad hoc	No	mainly local commercial banks (65% in 2011); also institutional investors	negligible	No	very illiquid secondary market	no corporate bond market
Eritrea	45.5 (2010)	only bills	none	none	No / none	No	N/A	N/A	N/A	no secondary market	no corporate bond market
Ethiopia	20.6 (2009)	5Y-10Y	N/A	fixed; floating; foreign currency	No / ad hoc	No	commercial banks and institutional and retail investors	none	Yes; infrastructure bonds only available to Ethiopian nationals and diaspora	no secondary market	7.2 (2010)
Ghana	23.7 (2010)	1Y-7Y	1Y-7Y	fixed	No / de facto weekly	Yes	mainly commercial banks (35% in 2013); also national pension fund, retail investors, insurance companies, firms	considerable (>30% in 2013)	Yes, only allowed in bonds with tenors ≥3Y	50bps (2013)	<0.1 (2010)
Kenya	24.7 (2012)	1Y-30Y	2Y-20Y	fixed	Yes / monthly	No	mainly local commercial banks (50% in 2013); also institutional investors (incl. mutual/pension funds and insurance companies) (30%)	limited (<1% in 2013)	No	50bps (2013)	0.7 (2010)
Lesotho	5.0 (2010)	3Y-10Y	N/A	fixed	Yes / two-monthly	No	mainly commercial banks (90% in 2012); also institutional investors	negligible	No	very illiquid secondary market	no corporate bond market
Madagascar	6.6 (2012)	only bills	none	fixed	No / none	No	mainly commercial banks (80% in 2012)	negligible	No	very illiquid secondary market	no corporate bond market
Malawi	19.1 (2012)	2Y-5Y	N/A	fixed	No / ad hoc	No	mainly central bank (75% in 2012); also commercial banks (15%), pension funds	negligible	Yes, only up to 10% of any class of security	very illiquid secondary market	N/A
Mauritius	40.5 (2012)	3Y-15Y	3Y-5Y	fixed; floating; indexed	Yes / monthly	Yes	diversified: institutional investors (incl. pension funds and insurance companies) (55% in 2013); commercial banks (40%); also central bank, retail investors	limited (<1% in 2013)	No	50-100bps (2013)	0.16 (2006)

Table 1 (Continued)

Mozambique	4.5 (2012)	3Y–10Y	3Y–5Y	fixed; floating	Yes / at unequal intervals	Yes	mainly commercial banks (65% in 2013); also central bank, insurance companies, investment management companies	negligible	Yes, exchange controls and foreign investment only allowed in specific bond issues	very illiquid secondary market	few corporate bonds
Namibia	11.1 (2010)	2Y–22Y	N/A	fixed	Yes / two-weekly	No	mainly pension funds and insurance companies	N/A	No	illiquid secondary market	6.2 (2010)
Nigeria	15.2 (2012)	2Y–20Y	3Y–20Y	fixed; floating	Yes / monthly	Yes	mainly local commercial banks (55% in 2012) and institutional investors (incl. pension funds and insurance companies) (20%), also central bank	considerable (20% in 2012)	No	8–12bps for ≤3Y); 3–6bps for >3Y (2013)	3.8 (2010)
Rwanda	8.8 (2010)	2Y–5Y	N/A	fixed	Yes / quarterly	No	mainly commercial banks, pension funds and insurance companies; also retail investors	limited	No	very illiquid secondary market	<0.1 (2010)
Sierra Leone	7.5 (2012)	1Y (and 5Y non-traded)	1Y	fixed	Yes / monthly	Yes	mainly commercial banks (75% in 2013); also central bank, institutional and retail investors	N/A	No	very illiquid secondary market	no corporate bond market
South Africa	34.9 (2012)	1Y–35Y (> for indexed)	2Y–10Y for fixed; 7Y–30Y for indexed	fixed; indexed	Yes / weekly	Yes	mainly institutional investors (incl. pension funds and insurance companies) (45% in 2013); also commercial banks (15%), central bank, retail investors, mutual funds and other	considerable (35–40% in 2013)	No	2–4bps for fixed; 3–5bps for indexed (2013)	20.0 (2010)
Swaziland	6.4 (2010)	2Y–10Y	N/A	fixed; floating	Yes / at unequal intervals	Yes	mainly commercial banks (70% in 2013); also non-bank financial institutions (20%), central bank and others	limited	No	very illiquid secondary market	0.7 (2010)
Tanzania	10.4 (2012)	2Y–15Y	2Y–10Y	fixed	Yes / two-weekly	Yes	mainly commercial banks (55% in 2013); also institutional investors (incl. pension funds and insurance companies) (40%), central bank	N/A	Yes, only nationals and EAC foreigners can invest in bonds	50bps (2013)	0.3 (2010)
Uganda	13.0 (2012)	2Y–15Y	2Y–3Y	fixed	Yes / monthly	Yes	mainly commercial banks (50% in 2013); also institutional investors (incl. national social security fund and insurance companies), central bank	considerable (10–20% in 2013)	No	50bps (2013)	0.4 (2010)
Zambia	13.6 (2012)	2Y–15Y	2Y–5Y	fixed	Yes / quarterly	No	mainly commercial banks (35–50% in 2013); also institutional investors (incl. pension funds and insurance companies) (>30%), central bank (15%)	limited (5% in 2012)	No	100bps (2013)	0.6 (2010)

Notes: Data are sourced from OECD (2013), Mu et al. (2013), AFMI website (africanbondmarkets.org; last consulted: 16 October 2014), Standard Chartered Bank's Local market Compendium 2014, Ecobank's Middle Africa Market Update (various issues) and country-specific documents. Capitalisation figures are for end of year in parentheses. 'Indexed' = bond coupon indexed to domestic inflation rate. 'Floating' = bond coupon linked to domestic or international reference interest rate. 'N/A' = not available.

Another notable feature associated with overcoming original sin is that most government bonds have fixed-rate coupons. But there are exceptions, such as Angola where, next to fixed-rate local currency (kwanza) bonds, issues include bonds denominated in and indexed to foreign currency (dollars) as well as inflation-indexed local currency bonds (see OECD, 2013). About two thirds of the African countries listed in Table 1 publish an official bond auction calendar and hold bond auctions at least quarterly; several among them hold such auctions even monthly. Half of the counties use primary dealer systems, where a number of accredited financial firms (usually local commercial banks) act as principal intermediaries in the government LCBM.

In spite of these positive developments, which have resulted in an expansion of African local currency marketable debt, important policy challenges remain. Liquidity in most African LCBMs remains shallow, concentrated in government debt instruments in a handful of countries (notably South Africa and Nigeria). Corporate LCBMs are at an early stage of development, while being even more illiquid than government local currency debt.[6] Only in South Africa there is currently a vibrant corporate LCBM; other African corporate bond markets are starting to grow, but from a very low base (Mu *et al.*, 2013). Activity is driven by relatively few issuers, mostly parastatals and commercial banks.

Local banks continue to be the dominant investor class in African government LCBMs, although local insurance companies and pension funds have increased significantly their holdings of local currency debt. Another striking development is the strong increase of non-resident holdings of local currency debt in a handful of countries. Table 1 provides some further country-specific detail on these trends and other structural features of African LCBMs. Domestic commercial banks often hold 50% or more of outstanding government securities, especially in countries with the least developed LCBMs (such as Lesotho, Sierra Leone, Swaziland and Burundi). In some cases this reflects regulatory or supervisory requirements for banks to hold government debt in portfolio. But this situation may also mirror other forms of 'financial repression' (Blommestein & Horman, 2007).

The dominant role of local commercial banks has important implications for African LCBMs. First, a sound banking system is thought to be a key precondition for bond market development (IMF *et al.*, 2013). Second, in the event of a domestic banking crisis, these significant bond holdings by local banks become noteworthy overnight debt for the government (Panizza, 2010). Third, when banks are the dominant investor class this reduces or eliminates the envisioned financial system diversification benefits of LCBMs. Indeed, LCBMs will then no longer act as an alternative financing channel when countries are facing a banking stress-induced credit crunch. In the words of Eichengreen (2008, p. 2), 'the spare [tyre] may go flat at the same time as the other'. Fourth, excessive holdings of local currency government debt by local banks increase the likelihood of crowding out private sector credit. This last point is of particular relevance in the African context, where private companies rely primarily on bank lending, partly due to the underdevelopment of corporate LCBMs (Christensen, 2005).

A very encouraging development in a number of African LCBMs, however, is the growing role of local non-bank, institutional investors. For example, South African pension funds are the largest group of local investors in government bonds. Local pension funds and/or insurance companies are also major bond holders in Botswana, Mauritius, Namibia and Tanzania,

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[6]   Limited secondary bond market liquidity and the underdevelopment of corporate relative to public bond markets are not at all unique to Sub-Saharan Africa. Similar observations are made by Didier and Schmukler (2014) in their study of the LCBMs of emerging economies in Asia, Latin America and Eastern Europe.

while they account for non-negligible shares in Kenya, Nigeria, Uganda, Zambia and others. These institutional investors seek to match long-term assets with long liabilities (Adelegan & Radzewicz-Bak, 2009). As a result, the expansion of the institutional investor base has gone hand-in-hand with the lengthening of bond maturities.

Another dimension covered (although very unevenly) in Table 1 is the presence of foreign (non-resident) investors in government LCBMs and the existence of restrictions on foreign investment in government bonds. This partial evidence suggests a very diverse pattern. For example, in Ethiopia foreigners are banned completely from investing in infrastructure bonds. Both Angola and Mozambique have in place strict exchange controls, whereas Botswana and Malawi apply quotas to foreign investment in certain bond issues. Tanzania has only very recently opened up its bond markets to residents of the East African Community (EAC), as part of its EAC common market commitments. The available estimates indicate that, de facto, only South Africa, Ghana, Nigeria and Uganda have markets with a considerable presence of non-resident investors.

Foreign bond investment in emerging LCBMs has both pros and cons. On the one hand, foreign investor participation can expand considerably the investor base, improving liquidity and demand for longer-maturity bonds (IMF *et al.*, 2013). This participation may put extra pressure on improving the quality of financial intermediation and associated market infrastructure, thereby strengthening market functioning (Peiris, 2010; World Bank & IMF, 2001). On the other hand, significant reliance on non-resident investors could amplify market stress, given the volatility and potential rapid reversal of foreign capital flows. This increases the vulnerability of host countries to shocks, especially of those with weaker fundamentals (Ebeke & Lu, 2014; Khan, 2005; Pomerleano, 2010).

3. Drivers of government LCBMs in Sub-Saharan Africa: an econometric assessment

Having sketched a cross-sectional overview of the current state of African LCBMs in the previous section, we now turn to an examination of the factors that have driven LCBM development in the region in recent years. To this end, we will introduce and analyse a novel, detailed panel dataset on government LCBM capitalisation in selected Sub-Saharan African countries. We start, however, with a review of previous studies on the determinants of domestic public debt, and LCBMs more specifically.

3.1. Literature review

The question of what drives domestic public debt and LCBM development in emerging markets and other developing countries has been the subject of a relatively new, but growing literature.

First, a number of studies have focused on the determinants of the domestic component of the original sin phenomenon, i.e., the inability of a country to borrow long-term in its own currency domestically. With cross-sectional data for up to 21 emerging markets from JP Morgan reports, Hausmann and Panizza (2003) tentatively find that domestic original sin is determined by higher average inflation and the absence of capital controls. For a larger panel of emerging markets, with hand-collected data on 33 countries over 1994-2004, Mehl and Reynaud (2005) are able to confirm the association with inflation but not with capital controls. They also

identify the slope of the yield curve of government debt, the size of the investor base and, to a lesser extent, the debt service burden as predictors of domestic original sin.

The same dataset (extended to 2006) allows Mehl and Reynaud (2010) to gauge the determinants of a 'risky' composition of domestic public debt, defined as debt that is denominated in foreign currency, has short maturities or is indexed. They find that economic size, size of the investor base, inflation and the fiscal balance are all related with the riskiness of domestic public debt. Only inflation bears on all three forms of risky debt. Based on a 1980-2005 dataset of 19 emerging markets' central government debt structure collected by Jeanne and Guscina (2006), Guscina (2008) shows that an unstable macroeconomic environment, low institutional quality and political uncertainty limit the development of markets for (traded) domestic debt, and shift debt structure away from local currency long-term fixed-rate domestic debt towards foreign currency, short-term and/or indexed debt. Forslund, Lima, and Panizza (2011) use data assembled by Panizza (2008) to investigate the correlates of the domestic share of total government debt for up to 95 emerging and developing countries over 1994-2006. They conclude that a large set of candidate variables, although mostly taking the theoretically expected signs in panel regressions, do not go far in explaining regional variation in government debt composition. In countries with moderate or no capital controls a negative correlation between inflation and the domestic debt share is observed, which is absent in countries with high capital controls (where governments can force their debt on investors despite low monetary credibility).

Other studies have adopted a narrower focus, on LCBMs instead of domestic public debt as a whole. Burger and Warnock (2006) rely on unpublished BIS statistics augmented with Merrill Lynch data in a 2001 cross-section of 49 developed and emerging market countries to analyse the determinants of longer-term LCBMs, both government and corporate (and irrespective of the place of issuance). Their main findings are that countries with a better historical inflation performance, a stronger rule of law and more creditor-friendly legislation have greater LCBM capitalisation and depend less on foreign currency bonds. It is argued that the determinants of bond markets are very similar to those of the domestic banking system. Also using BIS statistics, for a 1993-2000 panel of 35 developed and emerging market countries, Claessens, Klingebiel, and Schmukler (2007) successfully link country size, size of the banking system and stock market, low inflation, a higher fiscal burden, British legal origin, democracy, capital account openness and more flexible exchange rates to larger government LCBMs and a greater local currency share in total bonded government debt. Similarly, Eichengreen and Luengnaruemitchai (2006) employ BIS panel data for 41 countries over 1990-2001 and find country size, institutional quality, greater fiscal deficits and capital account openness to be positively correlated with the capitalisation of domestically issued local currency government bonds. In contrast with Claessens *et al.* (2007) they argue that exchange rate stability has encouraged LCBM development. The work of Eichengreen and Luengnaruemitchai (2006) is expanded upon by Eichengreen, Panizza, and Borensztein (2008), who use a larger sample of 56 countries over 1990-2004 and distinguish between government, corporate and financial sector domestic bonds. Their analysis of government LCBMs identifies country size, GDP per capita, trade openness, total government debt, institutional quality, stricter capital controls, a privatised pension system and lower domestic interest rates as the main correlates. When the sample is restricted to 21 emerging market economies, country size is no longer a significant factor and having a fixed exchange rate regime gains importance. Bae (2012) draws on 1990-2009 BIS panel data for 43 developed and emerging market countries. He finds that GDP per capita and the fiscal balance explain most of the variation in outstanding domestic government bonds. Institutional quality seem to matter only for

foreign (US) participation in government LCBMs. Lastly, Bhattacharyay (2013) studies government and corporate bond markets in 11 East Asian economies over 1998-2008 and concludes that their size is correlated with GDP, GDP per capita, trade openness, banking sector development and interest and exchange rate variability.

Apart from Forslund *et al.* (2011), none of the above has considered Sub-Saharan African countries other than South Africa. The current paper is most related to two recent studies with a particular focus on the Sub-Saharan African region. Adelegan and Radzewicz-Bak (2009) have collected data from IMF and World Bank databases and country desks on domestic government and corporate debt stocks in 23 Sub-Saharan African countries over 1990-2008. Their analysis suggests that economic structure, institutional quality, size of the banking sector, GDP per capita, domestic interest rates, exchange rates, capital controls and fiscal balances all matter for LCBM capitalisation but often have different effects on government and corporate debt. A recent paper by Mu *et al.* (2013) extends the dataset of Adelegan and Radzewicz-Bak (2009) with extra IMF and primary national sources to obtain panel data on government LCBM capitalisation, more specifically domestically issued and marketable securities, for 36 African countries over 1980-2010 and on corporate LCBM capitalisation (including state-sponsored and public enterprise issues) for 24 African countries. Using a range of static and dynamic panel estimation techniques, the authors find that the interest rate spread, fiscal balance, exchange rate volatility, trade and capital account openness, and country area size are all negatively correlated with their measure of government LCBM capitalisation, whereas British legal origins, institutional quality and domestic interest rate volatility are positively correlated. Corporate LCBMs are positively linked to GDP, GDP per capita, area size, capital openness, banking sector size and higher-quality institutions, while interest rate spreads, trade openness and British legal origins seem to have a negative impact.

3.2. Empirical strategy and data description

3.2.1. Model specification

To investigate the determinants of African LCBM capitalisation in a multivariate context we estimate a series of panel data models which, in their most general form, can be written as follows:

$$Y_{i,t} = \alpha + \beta X_{i,t-1} + \delta \mu_i + \varepsilon_{i,t}; \tag{1}$$

where $Y_{i,t}$ is the dependent variable, i.e., the stock of government local currency bonds as a percentage of GDP for country i in year t; $X_{i,t-1}$ is a vector of one-year lagged[7] time-varying explanatory variables derived from the literature and described below, including size of the economy, overall level of economic development, trade openness, size of the banking sector, government fiscal balance, inflation, capital account openness, non-marketable government debt, overall institutional quality and the level of democracy, as well as time-invariant controls, such as country size and legal origins; μ_i are country-specific effects; and $\varepsilon_{i,t}$ is a well-behaved error term.

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[7] The reasons for using lagged variables here are twofold. First, as shown in Section 3.2.2, our dependent variable extends to the year 2012, whereas some explanatory variables were only available up to 2011 at the time of writing. The use of lagged values therefore increases our sample size. Second, it also diminishes endogeneity concerns.

In our search for LCBM development drivers, we will use and compare a variety of panel data estimation techniques and model specifications. We present summary statistics to assess the goodness of fit of the different specifications and, where possible, diagnostic tests for the assumptions inherent to the different estimators. However, given the relatively small size of our sample and limited within-country variation (see below), some of these tests may not provide definitive answers to questions of model choice. Therefore, to evaluate the overall robustness of our results, it is important to consider different estimators and specifications in parallel.

Our static panel estimators include: (i) pooled ordinary least squares (POLS), which assumes a common intercept across countries ($\delta = 0$ in Equation (1)); (ii) feasible generalised least squares (FGLS) with heteroskedastic error structures and panel-specific autocorrelation (which is the most commonly used estimator in the studies reviewed in Section 3.1); (iii) the random effects (RE) estimator, which models the country-specific constant terms μ_i as distributed randomly across countries and independently from the other explanatory variables; and (iv) the fixed effects (FE) ('within') estimator, which allows for the country-specific effects to be correlated with other regressors, eliminates all time-invariant unobserved heterogeneity between countries, but comes at the cost of less efficient estimates.

We also consider the possibility that LCBM capitalisation is a process of gradual adjustment, where market development in one period heavily influences the state of the market in the next period. To model these dynamics explicitly, we will add a lagged dependent variable $Y_{i,t-1}$ to Equation (1) and estimate the autoregressive relation by means of the 'difference' and 'system' generalised method of moments (GMM) estimators, which use internal instrumental variables to overcome dynamic panel bias and make it possible to control for the potential endogeneity (or predeterminedness) of other explanatory variables.

3.2.2.   Sample, data sources and descriptive statistics

In contrast with the studies surveyed in Section 3.1, we rely on the fourth and latest edition of the OECD's *African Central Government Debt Statistical Yearbook* (OECD, 2013) as the source for our dependent variable. As mentioned in Section 1, to our knowledge the current paper is the very first making use of this alternative dataset for econometric analysis. As such, our study naturally complements the existing empirical literature on LCBM development in Africa and elsewhere.

The Yearbook provides cross-country comparable quantitative information on African central government marketable debt instruments (bonds, notes and bills) and non-marketable debt (mostly official bilateral, multilateral and commercial loans but also central bank advances), as well as more qualitative country-specific policy notes. Its format follows the methodology of the *Statistical Yearbook on Central Government Debt* for OECD countries. All data is derived from national sources based on a questionnaire that has been circulated since 2010 among African debt management offices and agencies participating in the OECD Project on African Public Debt Management and Bond Markets (see Blommestein & Ibarlucea Flores, 2011). The fourth edition of the Yearbook covers 17 countries, of which 15 in Sub-Saharan Africa, over the span of ten years, from 2003 to 2012: Angola, Cameroon, Gabon, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Sierra Leone, South Africa, Tanzania, Uganda, Zambia (all Sub-Saharan Africa) and Morocco and Tunisia.

The dependent variable of our choice, for the purposes of the current paper, is year-end outstanding local currency marketable central government debt as a percentage of

GDP (irrespective of the residency of creditors) (*lc_mdebt_gdp*). Local currency debt is defined in the Yearbook as debt denominated in, or indexed to, local currency. This may include debt for which settlements occur in foreign currency, provided that the cash flows are not indexed to foreign currency (i.e., economic exposure needs to be to the local currency). Limiting ourselves to Sub-Saharan Africa only, leaves us with LCBM capitalisation figures for an almost balanced panel sample of 137 observations.[8] Because of the limited coverage of countries, we cannot claim that our results will be fully representative of LCBM development in Sub-Saharan Africa. Nevertheless, we still think they constitute a useful check of findings based on IMF, World Bank, BIS, investment bank or researchers' self-collected data. A comparison of our dependent variable with figures from Mu *et al.* (2013), which should be similar (except for the fact that the latter do not explicitly exclude domestically issued *foreign currency* marketable debt), shows that the data generally correspond well (see Figure A.1 in Annex). Figure A.2 in Annex plots the evolution of LCBM capitalisation in our sample. There seems to be no clear common trend over the relatively short period of 2003-2012. In Mauritius, for example, market capitalisation has steadily declined from 2003 to 2008 and remained stable thereafter, whereas in South Africa it has increased rapidly after reaching a trough in 2009. The expansion of South Africa's LCBM in recent years is also apparent from Figure A.3 in Annex, which plots the size of the four largest LCBMs in absolute (nominal) US dollar terms. Other noticeable expansions are those of Nigeria, over the whole of the 2003-2012 period, and of Angola in 2008.[9]

The independent variables in our analysis were assembled from different databases and selected in line with the literature and maximum data availability for our specific sample. Below we discuss their definitions and the rationale for incorporating them as potential determinants of LCBM development, starting with variables included in the baseline model. As will become clear, it is not always straightforward to predict the direction of the relationship between our dependent variable and each of the regressors; expected supply and demand effects sometimes run in opposite ways (cf. Forslund *et al.*, 2011).

Table A.1 in Annex lists all variables, their labels and definitions as well as their source. Figure A.4 in Annex shows the correlations between our measure of LCBM capitalisation and single, one-year lagged explanatory variables by means of bivariate scatter plots. Data points for South Africa and Mauritius, which are outliers in some dimensions, are indicated in red and blue, respectively.

Country size

It can be argued that larger-sized economies have scale advantages in developing deep and liquid bond markets as the greater availability of (potential) buyers and sellers reduces price volatility and encourages investment (Eichengreen & Luengnaruemitchai, 2006) or because of important fixed costs in establishing bond market infrastructure (Claessens *et al.*, 2007). Also, small economic size is considered a crucial determinant of international original sin, i.e. the inability to borrow abroad in local currency (Eichengreen, Hausmann, & Panizza,

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[8]   Our dependent variable has missing values for Gabon in the years 2003-2007 and 2010-2012, and for Namibia in 2008-2012, which results in 15 (countries) times 10 (years) minus 13 (missings), or 137 observations.

[9]   In April 2014 Nigeria revised the base year for its GDP calculations (from 1990 to 2010), resulting in a 89% increase in its 2013 GDP estimate, from 42 to 80 trillion naira. Apart from making Nigeria Africa's largest economy (overtaking South Africa), these revisions will lead to new, lower debt-to-GDP and LCBM capitalisation figures for 2013 and the preceding years. In this paper we use the old nominal GDP series to scale our measure of Nigerian LCBM development, which is arguably how investors and other market participants perceived the Nigerian economy prior to the rebasing. See www.bloomberg.com/news/2014-04-06/nigerian-economy-overtakes-south-africa-s-on-rebased-gdp.html.

2005b; Hausmann & Panizza, 2003; Özmen & Arinsoy, 2005). LCBMs of larger economies are said to more easily attract foreign investors due to the greater diversification benefits they offer, which in turn could spur the further development of these markets. Since foreign participation plays a minor role in Sub-Saharan African LCBMs, with a few exceptions (see Section 2), we do not expect this argument to be of major relevance here. On the other hand, smaller (often less-diversified) countries may need to rely more heavily on domestic public funding, lacking the creditworthiness to borrow sizeable amounts from abroad (Mu *et al.*, 2013). We use the log of GDP at purchasing power parity (PPP), sourced from the IMF's World Economic Outlook (WEO) database, as our preferred measure of economic size (*ln_gdp_ppp*). We complement it with a geographic measure of size, the log of a country's surface area in squared kilometres (*ln_area*), from the World Bank's African Development Indicators (ADI) database.

Panel (a) of Figure A.4 suggests no clear relation between log GDP and our LCBM measure. Panel (b) shows a significantly negative association of log surface area with government bonds, but only because of the relatively high LCBM capitalisation in island state Mauritius.

Economic development

Financial development, in its various aspects, is often thought to co-evolve with broader economic development; a large body of literature points to the existence of a complex, bi-directional finance-growth relationship (see e.g., Calderon & Liu, 2003; Demetriades & Hussein, 1996; Levine, 2005). Financial intermediation makes capital formation and investment possible by bringing together savers and borrowers (from both the public and private sector). But as an economy grows, the demand for financial services and instruments is also expected to increase. This is what Patrick (1966) refers to as the 'demand-following' phenomenon in financial development. We take the log of GDP per capita (PPP), from the WEO, as a broad proxy for the developmental stage of the economy (*ln_gdppc_ppp*). To the extent that GDP per capita is correlated with better governance and policies, stronger creditor rights and a more favourable investment climate, it may also capture some aspects of institutional development not fully covered by the more explicit measures we consider (see further) (Eichengreen & Luengnaruemitchai, 2006).

In line with our priors, panel (c) of Figure A.4 indicates that LCBM capitalisation is positively correlated with economic development. This positive correlation however disappears when leaving out both South Africa and Mauritius.

Trade openness

The expected relationship of government LCBM development with trade openness is somewhat ambiguous. On the one hand, authors such as Rajan and Zingales (2003) argue that in countries that are more open to trade, incumbent interest groups are less able to insist on policies that protect their advantage in relationship-based financing and suppress competing sources of finance, such as securities markets (which could erode the incumbent parties' rents). On the other hand, however, for given financing needs, less integrated countries may be more incentivised to develop domestic bond markets (Mu *et al.*, 2013). Following the literature surveyed in Section 3.1, we measure trade openness as the ratio of total exports of goods and services to GDP (*x_gdp*), with data from the ADI database.

It seems that in our particular sample the first effect dominates the second; panel (d) of Figure A.4 points to a weak, non-significant positive association between trade openness and LCBM capitalisation, at least when Mauritius is included.

Banking sector size

Bank- and (bond) market-based finance can be either substitutes or complements (see e.g., Levine, 2002; Song & Thakor, 2010). To the extent that banks already cater directly to the government there may be no immediate need to set up deep LCBMs. But, at the same time, local banks often serve as primary dealers and market makers (Eichengreen *et al.*, 2008). In most African countries banks are also important (if not the dominant class of) government bond investors themselves (see Section 2.2), whether or not because of specific government-imposed requirements to which they need to adhere. We follow previous studies and the broader literature on bank financing in taking as a proxy for banking sector size domestic credit provided to the private sector (as a percentage of GDP) (*domcred_gdp*), which we obtain from the ADI database.

Panel (e) of Figure A.4 provides support for the complementarity hypothesis; it shows a significant positive relation between private sector domestic credit and government LCBM capitalisation. This relationship increases in strength when South Africa and Mauritius are excluded.

Fiscal balance

Another potentially important demand-side variable is the fiscal balance, i.e., government revenue minus government expenditure. Ceteris paribus, countries running negative fiscal balances (deficits) have greater need for issuing government bonds than those with positive fiscal balances (surpluses). That said, the fiscal balance may well be endogenous to LCBM development. Especially in Africa, many governments face constraints in their ability to borrow so that the size of the fiscal deficit may be in part driven by the availability of bond financing (Mu *et al.*, 2013). On the demand side, large and sustained negative fiscal balances could perhaps undermine the trust of potential LCBM investors. To smoothen out transient factors we use a three-year moving average of the general government fiscal balance, defined as the difference between revenue and total expenditure including the net acquisition of non-financial assets by the government (and expressed as a percentage of GDP), from the WEO (*avfiscbal_gdp*) (cf. Eichengreen & Luengnaruemitchai, 2006).

The expected negative association between past fiscal balances and LCBMs is clearly apparent from panel (f) of Figure A.4.

Inflation

A lack of monetary policy credibility, as evident from high and/or volatile inflation rates, is often seen (and has been empirically established) as a key impediment to developing LCBMs (Burger & Warnock, 2006; Claessens *et al.*, 2007; Hausmann & Panizza, 2003; Mehl & Reynaud, 2005). If creditors, domestic or foreign, fear that their claims may be inflated away by the government, this will prevent the latter from issuing local currency bonds (to the extent that these bonds are not indexed to domestic prices or foreign currency). Calvo (1988) shows that governments with non-indexed local currency debt generally have difficulties in credibly committing to a stable monetary policy. This may be especially so in some African countries, where governments marked by political uncertainty and politicised central banks have a hard time convincing bond investors to lock in fixed rates of return for longer periods (unless governments resort to financial repression of course). In countries with a history of high inflation governments will need to offer higher coupon rates on fixed-rate bonds ex ante, which could result in higher real interest costs if the expected inflation does not materialise ex post (rendering the

issuance of such bonds less attractive to governments in the first place). As a simple measure of monetary policy credibility we look at the inflation rate based on the consumer price index (*infl_cp*), collected from the WEO.

Panel (g) of Figure A.4 shows that inflation is indeed negatively related to LCBM development, although the statistical significance of this negative association depends on the presence of three outlying data points, i.e., Angola's inflation rates of 108.9% in 2002, 98.3% in 2003 and 43.6% in 2004.

Capital account openness

The effect of capital account openness on LCBM development is again theoretically ambivalent. Just as trade openness, an open capital account can expose countries to market discipline, which would make domestic investors more interested in bonds (Claessens *et al.*, 2007); it is also a necessary trait to attract foreign investors. Conversely, governments may use capital controls to prevent domestic capital from leaving the country and create a captive investor base (Forslund *et al.*, 2011). We employ a time-varying index of de jure capital account openness developed by Chinn and Ito (2006) and updated to 2011 (*kaopen*). The Chinn-Ito index is based on a set of dummy variables that code the presence of different sorts of restrictions on cross-border financial transactions as reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Higher values of the index signify less capital controls and thus a more open capital account.

In panel (h) of Figure A.4 we observe a weak, non-significant positive correlation between capital account openness and LCBM capitalisation, which disappears when excluding Mauritius from our sample.

Legal origins

La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) and others have argued that in countries whose legal rules originate in the British common law tradition investors tend to be much better protected than in countries where the legal system is based on civil law, in particular French civil law. These legal origins may be especially important for LCBMs (Claessens *et al.*, 2007). Based on data from Andrei Shleifer's website, we construct a dummy variable indicating whether the country in question has common law legal origins or not (*comlaw*). In our Sub-Saharan African sample, nine out of 15 are common law countries (Kenya, Malawi, Namibia, Nigeria, Sierra Leone, South Africa, Tanzania, Uganda and Zambia); the other six all have a French civil law tradition (Angola, Cameroon, Gabon, Madagascar, Mauritius and Mozambique).

Panel (i) of Figure A.4 suggests a positive link between common law legal origins and LCBMs, which is highly significant if we disregard Mauritius (a country with relatively large LCBMs despite its legal system being mostly civil law-based).

Other government debt

While some factors we have considered so far, such as economic development and fiscal balance, may be correlated with both (local currency) marketable debt and non-marketable debt, there could be trade-offs between these two sorts of government debt. With the exception of South Africa, Mauritius, Namibia and Angola, all countries in our sample have enjoyed

substantial external debt relief or at least debt restructuring in recent years[10]; eight of them have participated in the HIPC initiative and MDRI. Since HIPC granted debt relief on non-marketable external debt (bilateral, African Development Bank, World Bank and IMF loans), while at the same time 'forcing' countries to use their domestic debt markets (including marketable securities such as treasury bills) (see section 2.1), we would expect a negative relation between local currency bond markets and other government debt. To ensure consistency we use non-marketable central government debt as a percentage of GDP from the OECD's Statistical Yearbook as our preferred measure (*nmdebt_gdp*). Almost all of this debt is foreign currency-denominated, except for central bank advances in some countries.

Panel (j) of Figure A.4 indeed hints at a negative relation between non-marketable debt and LCBM capitalisation, but one which hinges on the inclusion of Mauritius and South Africa (which both have very little non-marketable debt).

Institutional quality

Many formal and informal institutional arrangements beyond those captured by dichotomous time-invariant legal origins could possibly have an effect on the functioning and development of government LCBMs, including contract and property rights enforcement, the impartiality of the legal system, strength of the regulatory framework and corruption (Mu *et al.*, 2013).

Since we have no priors on the relative importance of different institutional dimensions we construct a composite index from four of the most commonly used time-varying indicators of the International Country Risk Guide (ICRG) provided by the Political Risk Services (PRS) Group. Our measure is the simple sum of rescaled 0-to-1 ICRG scores on countries' investment profile (which evaluates subareas of contract viability and expropriation, profits repatriation and payment delays); law and order (which evaluates the legal system and popular observance of the law); bureaucracy quality (which evaluates whether the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services); and corruption (which evaluates issues such as patronage and business-politics ties) (*comprisk_icrg*). Higher values of the composite index indicate better overall institutional quality.

As expected, we observe a positive relation between overall institutional quality and LCBM development in panel (k) of Figure A.4. Note that Mauritius is not rated on these specific institutional dimensions by the PRS Group.

Democracy

It is often argued that the strength of democratic political systems has a distinct impact on the choice of government policies (although this is not a consensus view, see e.g., Mulligan, Gil, & Sala-i-Martin, 2004). This means that there may also be an impact on the pace and scope of financial sector development, including progress in the development of LCBMs.

Haber, North, and Weingast (2007) argue that the openness and competitiveness of a country's political system tend to be reflected in the openness and competitiveness of its financial system. Moreover, checks-and-balances and direct constraints on the power of democratic governments are said to increase political stability and enhance the credibility of commit-

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[10]   See Das, Papaioannou, and Trebesch (2012). South Africa restructured parts of its external debt owed to commercial creditors in 1987, 1989 and 1993. Angola received a debt treatment from its official bilateral Paris Club creditors in 1989.

ments towards investors/creditors (North & Weingast, 1989). More generally, inclusive political institutions may be necessary requirements for the kind of economic institutions that are inherent to successful financial markets and economic development (Acemoglu & Robinson, 2012).

We follow Claessens *et al.* (2007) in using as an explanatory variable the institutionalised democracy index of the Polity IV database (*democ*) (Marshall, Gurr, & Jaggers, 2013). This 0-to-10 index scores countries on the competitiveness of political participation, the openness and competitiveness of executive recruitment, and constraints on the chief executive; with higher scores meaning stronger democratic institutions.

The positive correlation between democracy and LCBM capitalisation in Panel (l) of Figure A.4 is statistically highly significant (with or without Mauritius and South Africa).

Table A.1 in Annex provides descriptive statistics for our dependent and independent variables. It is clear that the lion share of variation arises from differences *between* countries rather than from *within*-country changes over time, except for independent variables inflation and non-marketable debt. For this reason, we believe it is important to not only look at FE estimations, which make it possible to control for all unobserved time-invariant heterogeneity but, by construction, ignore between-country variation. We will come back to this issue in the next section.

Having described our empirical strategy and data in some detail, we will now attempt to identify the key drivers of government LCBM capitalisation in a multivariate setting.

3.3. Results and discussion

3.3.1. Baseline estimation results

Table 2 presents the estimation results for different specifications of Equation (1) and employing, in turn, POLS, FGLS, RE and FE estimators. Because of our limited sample, both in terms of countries and years, it is hard to find variables that are robustly correlated with the capitalisation of African LCBMs. However, there seem to be a number of macroeconomic and institutional variables which do show significant effects and consistent signs throughout. We observe that having better fiscal balances in the past three years is negatively correlated with LCBM capitalisation, probably because of the lesser need for governments to issue bonds, as indicated earlier. This result is in line with previous studies, for Africa and other regions. Again as expected, we also find past inflation rates to exert a negative effect on capitalisation, although the effect is economically small. Smaller-sized countries have on average relatively larger government LCBMs, which may be counterintuitive but could be due to our specific sample of countries (something we test in the next subsection). Countries with a common law tradition have government LCBMs that are significantly larger than countries with legal origins rooted in French civil law, a result that is also found in many other studies.[11] Partial correlations of the overall quality of institutions and strength of democracy with LCBMs are positive and, in three out of four estimations, significant.

POLS and FGLS estimates further suggest that the banking sector, the size of which is proxied by domestic credit to the private sector, and LCBMs are complements. No such complementarities are found when using the RE estimator, and the FE estimator seems to point at a substitution effect between banks and bonds. Similarly, trade openness is found to be signifi-

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[11] Of course, as country area size and legal origins are time-invariant variables they are dropped in the FE estimations.

cantly and positively correlated with LCBM capitalisation in most POLS and FGLS specifications but not when employing RE or FE. We do not discern any clear effects of GDP, GDP per capita, capital account openness or non-marketable government debt.

Breusch-Pagan LM tests lead to a clear rejection of the null of no country-specific effects, whereas Hausman-type overidentification tests strongly reject the null that such country effects are uncorrelated with the other regressors, and that for all five model specifications (see bottom of Table 2).[12] This indicates that the RE estimator is preferred over the POLS estimator and that FE is preferred over RE. However, diagnostic tests such as the Hausman test may perform poorly in small samples and when the within-country time variation of variables is limited, which very much applies to our panel (see above). Similarly, the FE's sole focus on within-country differences may not be appropriate to evaluate whether certain slowly-changing variables, such as institutional quality or the strength of democracy, drive LCBM development; it makes sense to also consider and compare the results of other, non-FE estimators.

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[12]   More specifically, we use the artificial regression approach described in Wooldridge (2002, pp. 290-291) and apply it to the RE model without time-invariant variables (which would also be dropped in the FE model). The Hausman-type test we perform is robust to arbitrary heteroskedasticity and within-group correlation.

Table 2: Estimation results – baseline models

	POLS					FGLS					RE					FE				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
L.ln_gdp_ppp	0.486	0.112	-0.095	0.093	0.957	0.281	-0.797+	-0.818+	-1.097*	-0.744	0.595	-0.568	0.518	-0.853	-0.544	4.924	13.564	-3.701	-5.735	14.898
	[1.877]	[0.971]	[0.865]	[0.991]	[1.088]	[0.626]	[0.528]	[0.534]	[0.583]	[0.667]	[2.665]	[1.655]	[2.132]	[1.138]	[1.326]	[19.944]	[20.622]	[10.630]	[12.408]	[20.649]
ln_area	-4.237***	-3.566***	-2.779***	-0.995	-3.119***	-4.024***	-3.902***	-3.400***	1.600+	-3.211***	-4.473*	-4.183*	-3.305**	3.529*	-3.575*					
	[1.146]	[0.688]	[0.718]	[1.535]	[0.760]	[0.680]	[0.546]	[0.451]	[1.080]	[0.601]	[2.430]	[2.169]	[1.684]	[1.909]	[1.866]					
L.ln_gdppc_ppp	-3.188	-1.416	-0.962	-1.774	1.190	2.463+	1.352	1.858+	-0.936	4.074***	0.140	-0.006	3.788	1.873	0.371	-3.810	-19.757	10.897	9.958	-22.500
	[4.031]	[2.332]	[2.425]	[1.917]	[2.855]	[1.583]	[1.336]	[1.383]	[1.030]	[1.394]	[3.931]	[3.154]	[3.617]	[2.044]	[2.717]	[30.048]	[31.524]	[17.003]	[18.071]	[32.055]
L.x_gdp	0.162	0.308***	0.256***	0.198**	0.214*	-0.064*	0.086**	0.071*	0.039	0.038	-0.017	0.105	-0.062	-0.031	0.096	-0.068	-0.004	-0.118+	-0.038	-0.008
	[0.126]	[0.084]	[0.079]	[0.074]	[0.110]	[0.037]	[0.041]	[0.040]	[0.039]	[0.039]	[0.087]	[0.101]	[0.084]	[0.062]	[0.101]	[0.061]	[0.055]	[0.083]	[0.069]	[0.050]
L.domcred_gdp	0.220***	0.168***	0.153***	0.127**	0.069	0.104***	0.132***	0.127***	0.106***	0.041+	-0.008	0.040	0.003	-0.034	0.019	-0.151*	-0.098*	-0.095+	-0.090+	-0.088+
	[0.069]	[0.043]	[0.049]	[0.046]	[0.068]	[0.035]	[0.030]	[0.029]	[0.032]	[0.031]	[0.054]	[0.044]	[0.081]	[0.051]	[0.052]	[0.074]	[0.051]	[0.067]	[0.061]	[0.052]
L.avfiscbal_gdp		-0.567***	-0.573**	-0.316**	-0.569***		-0.188***	-0.154**	-0.160***	-0.151**		-0.255**	-0.173*	-0.148+	-0.277**		-0.167+	-0.136+	-0.144+	-0.183+
		[0.167]	[0.209]	[0.134]	[0.174]		[0.068]	[0.067]	[0.061]	[0.059]		[0.126]	[0.103]	[0.095]	[0.132]		[0.104]	[0.085]	[0.092]	[0.108]
L.infl_cp		-0.122**	-0.094**	-0.072**	-0.109+		-0.035+	-0.040+	-0.037+	-0.026		-0.080**	-0.066***	-0.060***	-0.082**		-0.098+	-0.060+	-0.052+	-0.104*
		[0.055]	[0.040]	[0.029]	[0.067]		[0.027]	[0.028]	[0.025]	[0.025]		[0.033]	[0.023]	[0.020]	[0.037]		[0.056]	[0.035]	[0.034]	[0.059]
L.kaopen		0.640	0.434	-0.238	0.562		-0.060	-0.101	-1.181***	-0.272		-0.091	0.115	-0.766	-0.285		-1.190	-0.480	-0.587	-1.596
		[0.691]	[0.669]	[0.825]	[0.622]		[0.344]	[0.328]	[0.397]	[0.308]		[1.121]	[1.120]	[1.029]	[1.166]		[1.492]	[1.149]	[1.233]	[1.670]
comlaw		7.275***	7.551***	9.393***	6.384***		6.943***	7.822***	10.03***	7.434***		8.776**	8.740**	13.87***	7.545**					
		[1.853]	[1.916]	[1.914]	[1.767]		[1.146]	[1.192]	[1.243]	[1.167]		[3.683]	[3.842]	[3.403]	[3.135]					
nmdebt_gdp		-0.019					0.016+					0.010					0.007			
		[0.015]					[0.011]					[0.016]					[0.014]			
L.comprisk_icrg			4.339+					3.154**					2.861					2.937+		
			[3.029]					[1.474]					[2.249]					[2.103]		
L.democ				1.018**					1.158***					0.853*					0.585	
				[0.463]					[0.175]					[0.483]					[0.472]	
constant	79.980**	52.057**	41.094*	15.276	25.074	47.560***	47.530***	36.660***	-13.858	16.201	69.776+	60.758+	23.246	-57.069+	47.578+	33.791	121.090	-47.809	-42.428	134.085
	[31.491]	[18.482]	[19.391]	[23.617]	[23.549]	[13.720]	[11.518]	[11.880]	[16.373]	[13.064]	[48.875]	[42.212]	[34.337]	[34.784]	[34.885]	[158.256]	[166.327]	[90.590]	[91.223]	[168.682]
Time FE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Observations	137	137	118	127	137	137	137	118	127	137	137	137	118	127	137	137	137	118	127	137
Overall F/χ² p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.033	0.000	0.000	0.000	0.000
R²/R²-within (for FE)	0.734	0.849	0.803	0.760	0.870						0.406	0.629	0.566	0.526	0.700	0.074	0.205	0.242	0.176	0.224
Intra-class correlation ρ											0.854	0.771	0.844	0.878	0.747	0.976	0.992	0.972	0.974	0.993
Breusch-Pagan p-value											0.000	0.000	0.000	0.000	0.000					
Hausman p-value																0.029	0.000	0.000	0.000	0.000

Notes: Dependent variable is lc_mdebt_gdp, year-end outstanding local currency marketable central government debt (% of GDP). Sample countries, years and independent variables as defined in the text and Annex Table A.1. All independent variables are one-year lagged, except for ln_area, comlaw and nmdebt_gdp. Standard errors, clustered at the country level, are reported in brackets. ***$p<0.01$; **$p<0.05$; *$p<0.10$; +$p<0.20$.

3.3.2.   *General robustness tests*

There are many ways in which we can modify our baseline specifications and test the robustness of the above findings.[13]

One possible alteration is to add time fixed effects, in order to control for common factors or trends (such as, e.g., global liquidity or risk aversion). Table A.2 in Annex shows the estimation results when including year dummies in the baseline specifications of Table 2. These models may be 'overfitted' (especially the two-way FE model), as there are for example not even sufficiently degrees of freedom left to calculate the usual F-statistics for goodness of fit. Nevertheless, even with the extra year dummies our main results remain qualitatively unchanged. Past fiscal balances, inflation and country size are still negatively correlated with LCBM capitalisation (although the statistical significance of the fiscal balance variable further declines and disappears in the FGLS and FE estimations). As before, countries with a common law tradition, better institutions and a more democratic political system have, on average, larger LCBMs.

Second, in Tables A.3 and A.4 in Annex we exclude, in turn, South Africa and Mauritius from our sample, which can be considered outliers in terms of the relative (Mauritius) and absolute (South Africa) size of their LCBMs and in a number of other dimensions (see Figures A.2, A.3 and A.4). Apart from Mauritius' influence on the negative effect of country size, none of the earlier-reported results seems to be entirely driven by any of these two countries, however. If anything, the exclusion of Mauritius boosts the economic significance of the common law dummy (as expected, since Mauritius has French legal origins and still relatively large LCBMs). Excluding both South Africa and Mauritius again reduces the significance of our fiscal balance variable, but leaves the other results intact.

Third, we have used alternative measures for some of our key variables. Replacing the consumer price-based inflation variable with a GDP deflator-based measure somewhat reduces the economic significance of the inflation coefficient but produces otherwise almost identical results. When we cap consumer price inflation at 25%, which effectively eliminates three data points with extreme inflation from our sample (i.e., Angola in 2002, 2003 and 2004), the economic and statistical significance of the negative inflation effect on LCBMs increases, rather than decreases. Also, replacing the preferred three-year moving average fiscal balance measure with a simple one-year lag yields very similar results.

Next, in Table A.5 in Annex we further investigate the role of institutional quality in LCBM development. We substitute our baseline ICRG composite index by a similarly constructed index of institutional quality based on the World Bank's Worldwide Governance Indicators (WGI) (Kaufmann, Kraay, & Mastruzzi, 2010), which is also available for Mauritius; the new index is obtained as the sum of rescaled 0-to-1 WGI scores on dimensions of regulatory quality, the rule of law, government effectiveness and the control of corruption (*compinst_wgi*). Again we find that LCBM development is positively correlated with better institutions. This positive correlation is highly significant, apart from when the FE estimator is applied (which is probably due to the even more limited time variation in this institutional quality index). The rest of Table A5, where we insert the different ICRG scores separately rather than in the form of an composite index, shows that it is not straightforward to pinpoint the positive effect of overall institutional quality to one particular dimension. The strongest results are for the investment profile (*invpro-*

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[13]   To save space not all estimations mentioned in the text are reported. The full robustness results are available from the authors upon request.

file_icrg) and bureaucratic quality indicators (*burqual_icrg*), the coefficients of which are statistically significant in five and six out of eight specifications, respectively. Counter-intuitively, we find a negative correlation of law and order (*laworder_icrg*) with LCBMs that is statistically significant in five of the reported regressions.

Lastly, instead of the broad Polity IV institutionalised democracy index, we have used one of its components, executive constraints, which more narrowly measures the extent of institutionalised restraints on the decision-making powers of a country's chief executives, be it individuals or collective bodies, and ranges from 1 ('unlimited authority') to 7 ('executive parity or subordination'). In line with our previous results, this variable is found to be positively and highly significantly correlated with LCBM development in POLS, FGLS and RE regressions, but not in the case of FE.

3.3.3.   *GMM estimation results*

Up to now we have not allowed for dynamic behaviour of the dependent variable in our specifications, in spite of LCBM capitalisation likely being a cumulative process. LCBM development in one period is expected to be an important determinant of the state of the LCBM in the next period; most obviously because LCBM capitalisation is a stock variable (with longer-maturity bond issues staying on governments' books for several years), but perhaps also due to the typically gradual nature of adaptations to the existing market infrastructure, or the persistence of a good/bad reputation in repaying bonds. As indicated before, the most straightforward way of introducing dynamics into our model is by adding a one-year lag of the dependent variable, $Y_{i,t-1,}$ in Equation (1). For such an autoregressive model (of order 1), however, estimators such as POLS, FGLS, RE and even standard FE are biased and inconsistent (especially in short-term panels as ours), because of the correlation of the lagged dependent variable with the error term (Nickell, 1981). At the same time, the estimation techniques employed so far do not allow us to claim causality, for example from lower fiscal balances to better capitalised LCBMs. Even after controlling for time-invariant unobserved cross-country heterogeneity by FE, it could still be that there is a two-way relationship between the fiscal balance and LCBM capitalisation (or spurious correlation with an unobserved time-invariant third factor). One possible way to get around these endogeneity concerns is by instrumental variable (IV) estimation. However, finding external instruments that are strongly correlated with the fiscal balance as well as uncorrelated with the errors of the proposed models, is very difficult in practice.

The difference and system GMM estimators developed and popularised by Holtz-Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) can potentially tackle both the dynamic panel bias and the endogeneity issue. Whereas these estimators were originally developed for microeconomic panel data research with many cross-sectional units (large N) and short time series (small T), they are now also commonly used in macroeconomic research (for an early example, see Bond, Hoeffler, & Temple, 2001).[14] The idea behind difference GMM is to first apply a first-difference transformation to the dynamic model, in order to remove the fixed effects, and then to instrument the first-differenced lagged dependent variable and other potentially non-exogenous regressors with suitable lags of the untransformed (level) explanatory variables. Identification of the model and the validity

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[14]   Of the studies mentioned in Section 3.1 both Mu *et al.* (2013) and Mehl and Reynaud (2005) report system GMM estimations. Only the latter authors, who analyse domestic original sin, include a lagged dependent variable in one of their models.

of using particular lags as internal instruments are based on the assumed orthogonality restrictions (also called moment conditions), through which explanatory variables are classified as either strictly exogenous (i.e., uncorrelated with past, current or future errors), predetermined (i.e., correlated with past errors but not with current or future errors) or endogenous (i.e., correlated with past and current errors but not with future errors).

One possible problem with the difference GMM estimator is that it may produce large finite sample bias and very imprecise estimates, in particular when the process under study is highly persistent, i.e., the autoregressive parameter on $Y_{i,t-1}$ is substantial (in which case lagged levels of variables are only weak instruments for first differences); when time series are short; and/or when the variance of fixed effects is large relative to the variance of idiosyncratic errors.[15] In these instances, Arellano and Bover (1995) and Blundell and Bond (1998) suggest using the system GMM estimator, which exploits additional moment conditions to improve efficiency and reduce finite sample bias. In addition to the first-differenced equation instrumented by lagged levels, system GMM uses lagged differences of explanatory variables as instruments for the original level equation. The validity of these extra conditions and novel instruments rests on the assumption that deviations of the dependent variable from its long-run (conditional) mean are not systematically related to the fixed effects. This implies that the subjects studied (here: countries) should not be too far from their steady states at the beginning of the study period (see Roodman, 2009a).

Table 3 presents the results of applying difference and system GMM estimators to the dynamic, autoregressive LCBM capitalisation model, implemented using the well-known *xtabond2* Stata package created and described in detail by Roodman (2009b). The reported results are all based on two-step versions of the GMM estimators, small sample statistics, and the Windmeijer (2005) correction for standard errors (without which these standard errors would be downward biased). Importantly, Roodman (2009a) points out that GMM estimations with too many instruments tend to overfit the endogenous variables (thereby failing to isolate their exogenous components), while concurrently weakening the power of Hansen tests for instrument validity. There is, however, no formal definition of what constitutes 'too many' instruments (although some advance the rule of thumb that the number of instruments should not exceed the number of cross-sectional units in the panel). The overall instrument count can be contained by limiting the number of lags used to instrument for particular variables and/or by 'collapsing' the instrument matrix, as suggested by Roodman (2009a). Also, we need to determine a priori which variables (other than the lagged dependent variable which is endogenous by construction) to classify as endogenous, predetermined or strictly exogenous.

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[15]   In the extreme case of the process being a random walk, where the autoregressive parameter equals 1 and the series has a unit root, there will be no correlation at all between the first-differenced series (which becomes just white noise) and lagged levels of the series. This implies that the difference GMM estimator, which uses the first difference transformation and instruments using lags, does not identify the autoregressive parameter and will not provide any information on this parameter, even in samples of considerable size (Bond, Nauges, & Windmeijer, 2005).

Table 3: GMM estimation results – dynamic panel models

	Difference GMM									System GMM								
	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)	(3a)	(3b)	(3c)	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)	(3a)	(3b)	(3c)
L.lc_mdebt_gdp	0.699***	0.812***	0.867***	0.600	0.958*	1.019*	0.695***	0.804***	0.862***	0.858***	0.794***	0.736***	0.702***	0.793***	0.687***	0.835***	0.791***	0.728***
	[0.138]	[0.186]	[0.230]	[0.627]	[0.449]	[0.475]	[0.136]	[0.187]	[0.231]	[0.147]	[0.141]	[0.128]	[0.203]	[0.167]	[0.105]	[0.145]	[0.134]	[0.128]
ln_gdp_ppp	26.545*	-2.860	-5.314	13.751	-1.397	-2.733	26.744*	-2.183	-4.892	0.440+	0.292	0.244	-1.010	0.582+	-1.089	0.086	0.496*	0.408*
	[14.337]	[27.067]	[29.010]	[40.574]	[32.859]	[34.346]	[14.124]	[27.057]	[29.113]	[0.326]	[0.353]	[0.244]	[4.208]	[0.419]	[4.328]	[1.010]	[0.264]	[0.212]
ln_area										-0.367	-0.443	-0.724+	3.374	-1.446**	2.806	0.730	-0.384	-0.723+
										[0.545]	[0.499]	[0.485]	[9.987]	[0.593]	[7.758]	[1.534]	[0.457]	[0.458]
ln_gdppc_ppp	-37.512*	5.290	9.410	-18.684	2.218	4.499	-37.876*	4.155	8.702	-1.060+	-0.249	0.168	5.397	-0.296	3.711	3.611	0.047	0.390
	[20.999]	[38.852]	[42.593]	[61.023]	[47.867]	[50.719]	[20.801]	[38.908]	[42.827]	[0.632]	[0.600]	[0.532]	[10.007]	[0.530]	[7.429]	[6.131]	[0.639]	[0.540]
x_gdp	-0.004	0.118	0.125	0.005	0.149	0.158	-0.002	0.119	0.125	0.086+	0.097*	0.090*	-0.271	0.130**	-0.042	-0.039	0.084+	0.080*
	[0.097]	[0.141]	[0.161]	[0.094]	[0.154]	[0.179]	[0.099]	[0.141]	[0.161]	[0.049]	[0.053]	[0.045]	[0.411]	[0.052]	[0.214]	[0.166]	[0.053]	[0.041]
domcred_gdp	-0.003	-0.039	-0.043	0.008	-0.008	-0.009	-0.003	-0.038	-0.042	0.016	0.014	0.022	-0.036	0.020	-0.039	-0.063	-0.002	0.011
	[0.059]	[0.071]	[0.080]	[0.038]	[0.060]	[0.064]	[0.059]	[0.071]	[0.080]	[0.033]	[0.023]	[0.023]	[0.148]	[0.022]	[0.082]	[0.082]	[0.021]	[0.018]
avfiscbal_gdp	-0.081	-0.467+	-0.474+	-0.066	-0.407	-0.404	-0.081	-0.464+	-0.472+	-0.236+	-0.397**	-0.379**	0.131	-0.445**	-0.357*	-0.129	-0.386**	-0.369**
	[0.156]	[0.339]	[0.349]	[0.146]	[0.337]	[0.348]	[0.154]	[0.342]	[0.351]	[0.141]	[0.136]	[0.159]	[0.251]	[0.177]	[0.197]	[0.203]	[0.143]	[0.165]
infl_cp	-0.226***	-0.207***	-0.127	-0.164+	-0.172**	-0.108	-0.226***	-0.207***	-0.127	-0.214**	-0.207***	-0.080+	0.131	-0.206***	-0.068*	-0.145	-0.210***	-0.071+
	[0.069]	[0.065]	[0.114]	[0.110]	[0.079]	[0.139]	[0.068]	[0.065]	[0.114]	[0.073]	[0.043]	[0.053]	[0.326]	[0.054]	[0.034]	[0.140]	[0.044]	[0.050]
kaopen	1.003	0.566	0.395	0.756	0.713	0.596	0.999	0.565	0.396	0.099	0.059	0.055	0.489	0.239	-0.344	0.286	0.048	0.059
	[0.806]	[0.692]	[0.764]	[0.896]	[0.721]	[0.802]	[0.808]	[0.700]	[0.771]	[0.230]	[0.179]	[0.160]	[1.312]	[0.209]	[1.014]	[0.414]	[0.144]	[0.127]
comlaw										1.376	1.750	2.035+	-4.640	1.165	5.156	1.415	1.620	1.982+
										[1.342]	[1.459]	[1.294]	[10.597]	[1.674]	[5.430]	[1.100]	[1.276]	[1.139]
comprisk_icrg				3.115	4.971	5.692							4.550+	0.071	0.949			
				[4.221]	[5.036]	[5.132]							[3.196]	[1.622]	[1.639]			
democ							0.042	0.132	0.079							0.603	0.218	0.147
							[0.311]	[0.462]	[0.462]							[0.560]	[0.173]	[0.169]
constant										10.725	6.194	6.363	-74.087	17.817**	-59.361	-34.127	2.486	4.078
										[10.209]	[7.730]	[8.797]	[181.942]	[6.691]	[130.011]	[57.172]	[7.149]	[7.559]
Observations	94	94	94	87	87	87	94	94	94	109	109	109	101	101	101	109	109	109
# instruments	10	8	8	11	9	9	11	9	9	15	13	14	16	14	15	16	14	15
Overall F p-value	0.000	0.000	0.000	0.060	0.002	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.431	0.000	0.000	0.000
AR(1) p-value	0.019	0.022	0.047	0.473	0.126	0.149	0.020	0.023	0.048	0.020	0.017	0.033	0.019	0.024	0.040	0.009	0.014	0.033
AR(2) p-value	0.486	0.536	0.515	0.225	0.197	0.206	0.487	0.537	0.516	0.552	0.549	0.498	0.114	0.261	0.177	0.476	0.548	0.488
Hansen p-value	0.372	N/A	N/A	0.423	N/A	N/A	0.375	N/A	N/A	0.327	0.636	0.546	0.925	0.585	0.789	0.495	0.701	0.538
Difference-in-Hansen p-value										0.365	N/A	N/A	1.000	N/A	N/A	0.701	N/A	N/A

Notes: Dependent variable is lc_mdebt_gdp, year-end outstanding local currency marketable central government debt (% of GDP). Sample countries, years and independent variables as defined in the text and Annex Table A.1. Windmeijer-corrected standard errors are reported in brackets. Number of observations refers to number of data points in the transformed (first-differenced) equation in the case of difference GMM and to number of data points in the untransformed (level) equation in the case of system GMM. Columns (a): only avfiscalbal_gdp predetermined, number of instrument lags limited to 2 and instrument matrix collapsed; columns (b) only avfiscalbal_gdp predetermined, number of instrument lags limited to 1 and instrument matrix collapsed; columns (c): avfiscalbal_gdp and infl_cp predetermined, number of instrument lags limited to 1 and instrument matrix collapsed. 'N/A' means statistic could not be calculated because corresponding difference GMM specification is just identified. ***p<0.01; **p<0.05; *p<0.10; +p<0.20.

The models in Table 3 make different assumptions about endogeneity and use different instrument sets: in columns (a) the fiscal balance variable is modelled as a predetermined variable (potentially correlated with past errors), whereas the other independent variables are considered strictly exogenous, and the number of instruments is limited by collapsing the instrument matrix and taking a maximum of two lags for instruments; in columns (b) the fiscal balance is again the only predetermined variable, instruments are collapsed and only one instrument lag is used; and in columns (c) both the fiscal balance and inflation are assumed to be predetermined, with instruments collapsed and lag length of one. These specification choices allow us to keep the number of instruments at reasonable levels, close to or below our 15 cross-sectional units.[16]

Table 3 clearly shows the high degree of persistence in LCBM development; the autoregressive parameter on the lagged dependent variable (*L.lc_mdebt_gdp*) is in most cases estimated as being around 0.7 to 0.8. Similar as in the static FE models, and due to the limited within-country variation in our sample, it is difficult to robustly identify effects for most explanatory variables. The coefficients for time-invariant variable legal origins and slowly changing variables institutional quality and the strength of democracy almost always take the expected positive sign, but are estimated with relatively large standard errors.

However, in line with our findings from the static estimators, we find a significantly negative impact of inflation on LCBM development in six and seven out of nine difference GMM and system GMM estimations, respectively. The coefficient of the fiscal balance variable is also consistently negative but only significant at conventional levels in the system GMM estimations (which improve efficiency compared to difference GMM). The system GMM estimator further hints at a marginally significant positive impact of trade openness.

Looking at the diagnostic tests at the bottom of Table 3, the Arellano-Bond AR(2) tests reassuringly tells us that there is no second-order autocorrelation in differenced residuals and therefore no first-order correlation in the level residuals (which would invalidate the use of some of our instrument lags). In the cases where it could be calculated (because of overidentification), the Hansen test of overidentifying restrictions suggests that the null of joint validity of our instruments is never rejected. The reported Difference-in-Hansen tests indicate that the additional moment conditions of system GMM compared to the corresponding difference GMM estimator are fulfilled, i.e., they confirm the validity of the extra first-differenced instruments used in the level equation of system GMM.

We have also experimented with specifications where either the fiscal balance or inflation is modelled as an endogenous variable and we find that their coefficients become statistically insignificant. Interestingly, however, when replacing our baseline three-year moving average fiscal balance measure by a simple one-year measure (with inherently more within-country variation), which we then model again as endogenous in difference and system GMM estimations, we do find a significantly negative impact on LCBMs. This illustrates that, even by employing GMM estimators, it remains difficult to firmly establish causal relationships in our sample. Part of the difficulty can be ascribed to our relatively small sample size (GMM being a large N estimator) and, as indicated before, the limited time variation present in the dependent and most independent variables.

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[16] Models with a higher instrument count lead to very inefficient estimates and unreliable diagnostic test statistics.

4. Conclusion

This paper has studied the current state and drivers of LCBMs in Sub-Saharan Africa, a region whose progress in developing such markets has not received much systematic attention in the literature thus far. We have argued that well-developed LCBMs could reduce countries' exposure to external shocks; help wash away or reduce 'original sin'; facilitate the mobilisation of domestic savings; and have important financial, macroeconomic and institutional spill-over effects.

Bringing together information collected from various sources, the paper has shown that quite a number of African countries have made significant progress in developing LCBMs. Increasingly, governments in the region issue fixed-rate local currency bonds with tenors of ten years and more on a regular basis. Moreover, the non-bank, local institutional investor base has continued to grow. But we have also demonstrated that LCBMs in Africa often have low liquidity, feature very few corporate securities and, in general, still have relatively narrow investor bases dominated by commercial banks.

In the second part of our study we have presented original results on the drivers of LCBMs based on an econometric analysis of new panel data collected by the OECD. We show that LCBM capitalisation in selected African countries is negatively correlated with governments' fiscal balance and relatively high inflation, and positively related to common law legal origins, better institutional quality and strong democratic political systems.

Larger country samples and longer time series will, however, be needed to increase the representativeness of our analysis for Sub-Saharan Africa and to achieve better identification of any causal relations (exploiting the extra time variation). Moreover, the econometric work in this paper has narrowly focused on LCBM *capitalisation* in Sub-Saharan Africa, ignoring other dimensions of LCBM development. From our more detailed, multi-source cross-sectional analysis it is apparent that African countries' LCBMs differ in many other aspects too, including the liquidity of these markets and the length of tenors of bonds issued. Panel data on variables such as turnover on secondary markets, bid-ask spreads, or average original maturity of outstanding local currency bonds would surely enrich and strengthen our analysis, but are, to our knowledge, currently not (publicly) available for a wide range of countries in Sub-Sahara Africa.

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Table A.1: Labels, definitions, sources and descriptive statistics of baseline variables

Variable	Label	Definition	Source	Period	Obs.	Mean	Min	Max	Std. Dev.		
Dependent									overall	between	within
Local currency bond market (LCBM) capital-isation	lc_mdebt_gdp	Year-end outstanding marketable central government debt denominated in, or indexed to, local currency (in % of GDP)	OECD 2013 African Central Government Debt Statistical Yearbook (4th edition)	2003-12	137	15.423	1.066	58.662	11.894	11.997	2.798
Independent											
Total GDP	ln_gdp_ppp	Natural logarithm of GDP at purchasing power parity (PPP) (in international dollar billions)	IMF World Economic Outlook (WEO)	2002-11	150	3.413	1.201	6.324	1.208	1.223	0.230
Area size	ln_area	Natural logarithm of surface area (in squared kilometres)	World Bank African Development Indicators (ADI)	2003-12	150	12.753	7.621	14.036	1.599	1.649	0
GDP per capita	ln_gdppc_ppp	Natural logarithm of GDP per capita at PPP (in international dollars)	WEO	2002-11	150	7.698	6.278	9.651	1.015	1.033	0.166
Trade openness	x_gdp	Total exports of goods and services (in % of GDP)	ADI	2002-11	150	35.523	8.648	86.018	16.516	16.401	4.478
Domestic credit	domcred_gdp	Domestic credit to the private sector (in % of GDP)	ADI	2002-11	150	28.553	2.181	167.536	36.540	37.130	6.311
Fiscal balance	avfiscbal_gdp	3-year moving average of the general government fiscal balance, i.e., revenue minus total expenditure including the net acquisition of non-financial assets (in % of GDP)	WEO	2002-11	150	-0.896	-9.581	13.507	4.493	3.422	3.031
Inflation	infl_cp	Year-on-year change in annually averaged consumer price index (CPI) (in %)	WEO	2002-11	150	10.095	-3.659	108.893	12.443	7.804	9.880
Capital account openness	kaopen	Chinn-Ito coding of restrictions on cross-border financial transactions based on IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)	Chinn-Ito KAOPEN database	2002-11	150	-0.281	-1.864	2.439	1.488	1.515	0.237
Legal origins	comlaw	Dummy which equals 1 for countries with a British common law heritage and 0 otherwise	Andrei Shleifer's personal website: http://scholar.harvard.edu/shleifer	2003-12	150	0.600	0	1	0.492	0.507	0
Other government debt	nmdebt_gdp	Year-end outstanding marketable central government debt (in % of GDP)	OECD 2013 African Central Government Debt Statistical Yearbook (4th edition)	2003-12	123	32.398	1.126	139.192	32.112	18.922	26.517
Institutional quality ICRG	comprisk_icrg	Unweigthed sum of normalised (0-to-1) scores on four ICRG political risk dimensions: 'investment profile' (invprofile_icrg), 'law and order' (laworder_icrg), 'bureaucratic quality' (burqual_icrg) and 'corruption' (corrupt_icrg)	Political Risk Services (PRS) Group International Country Risk Guide (ICRG)	2002-11	140	1.887	1.003	2.646	0.321	0.314	0.103
Institutional quality WGI	compinst_wgi	Unweigthed sum of normalised (0-to-1) scores on four WGI governance dimensions: 'regulatory quality', 'rule of law', 'government effectiveness' and 'control of corruption'	World Bank World Governance Indicators (WGI)	2002-11	150	1.611	0.903	2.652	0.428	0.434	0.075
Democracy	democ	Polity IV institutionalised democracy index combining scores on 'competitiveness of political participation', 'openness and competitiveness of executive recruitment' and 'constraints on chief executive'	University of Maryland Polity IV Project database	2002-11	150	4.853	0	10	2.973	2.947	0.823

Figure A.1: Comparison of dependent variable of current paper with that of Mu et al. (2013)
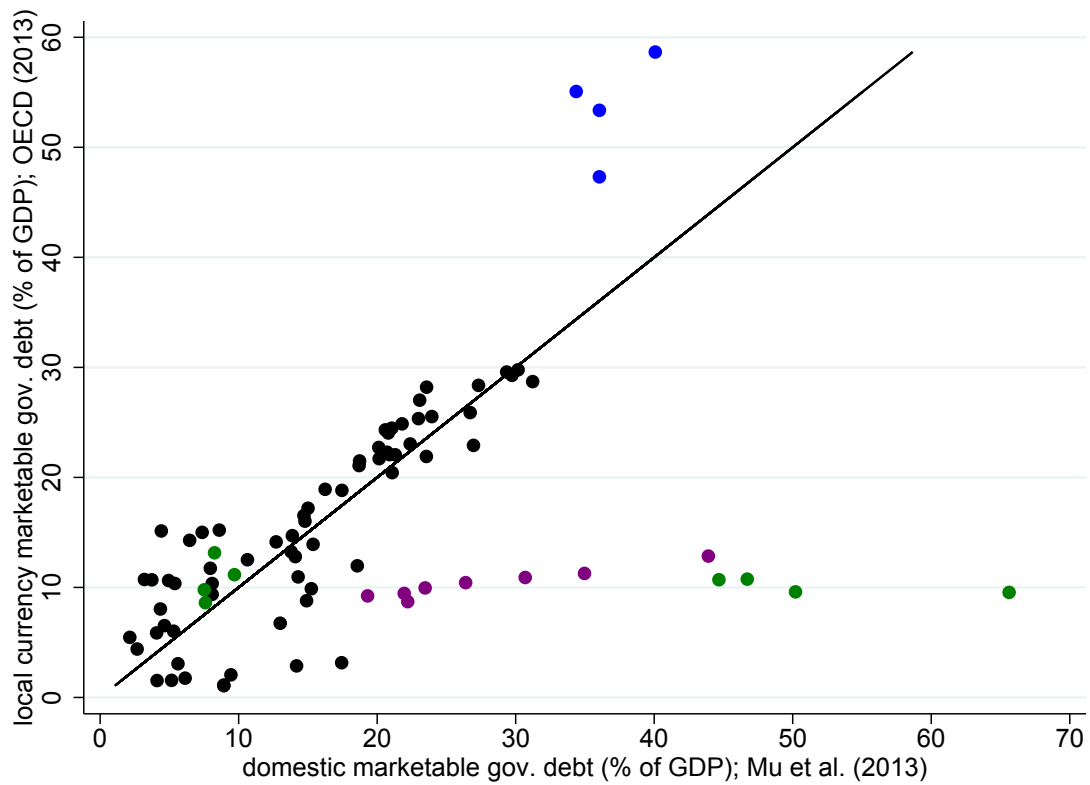
Notes: Straight line is 45° line. Data points for Mauritius are in blue, for Sierra Leone in purple, and for Uganda in green.

Figure A.2: Evolution of local currency marketable government debt (as % of GDP) for sample countries, 2003-2012
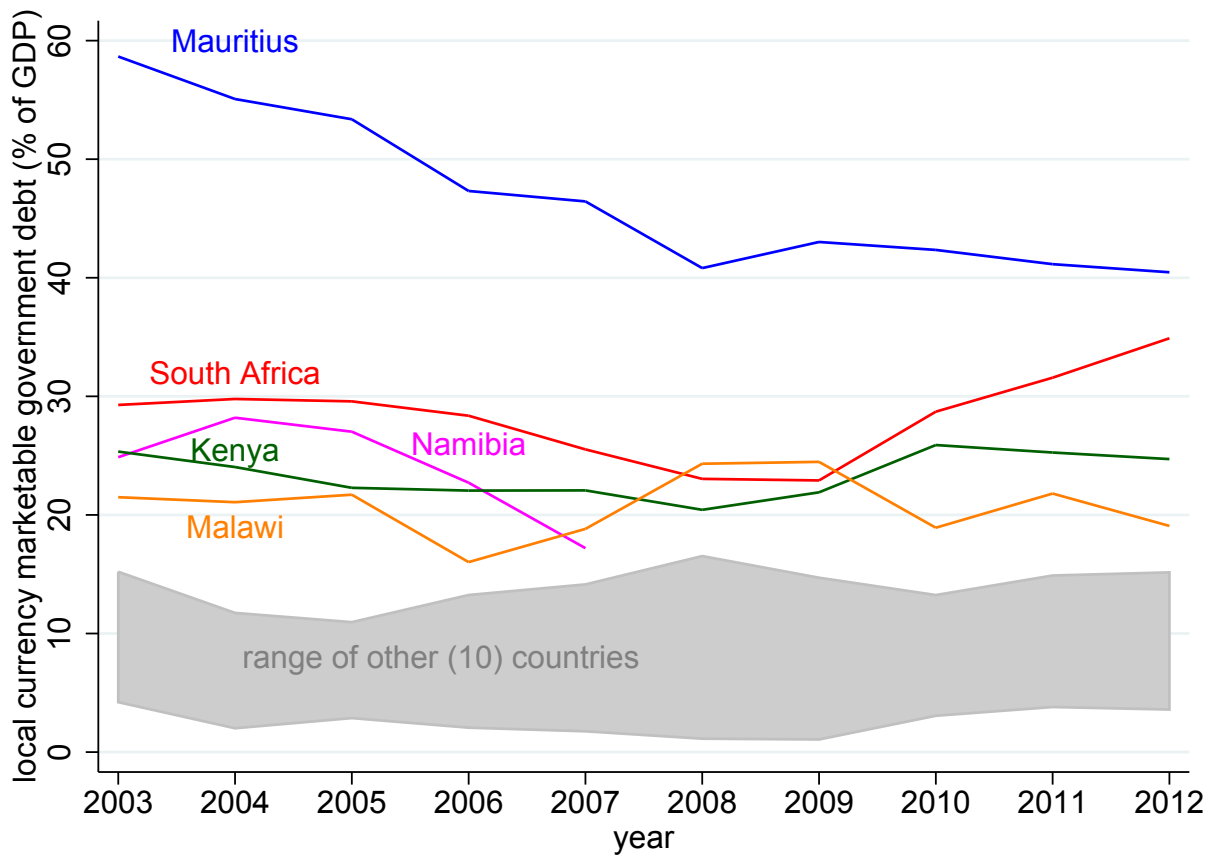
Notes: For presentation purposes, only five largest LCBMs (relative to GDP) are shown separately. Range represents the minimum and maximum values of LCBM capitalisation for other ten sample countries: i.e., in descending order of relative LCBM size over 2003-2012, Zambia, Nigeria, Tanzania, Uganda, Sierra Leone, Angola, Madagascar, Mozambique, Cameroon and Gabon.

Figure A.3: Evolution of local currency marketable government debt (in nominal US$ millions) for sample countries, 2003-2012
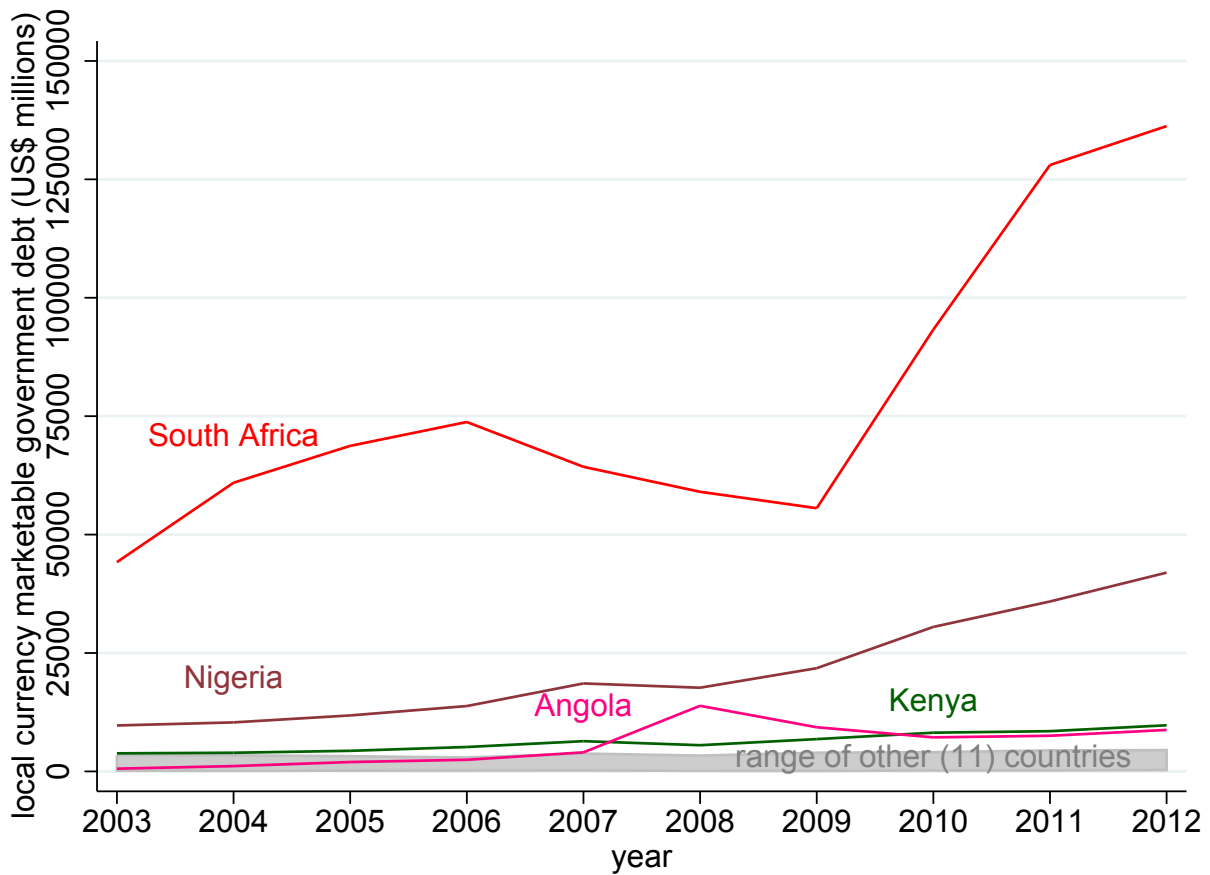
Notes: For presentation purposes, only four largest LCBMs (in absolute US$ terms) are shown separately. Range represents the minimum and maximum values of LCBM size for other eleven sample countries: i.e., in descending order of absolute LCBM size over 2003-2012, Mauritius, Tanzania, Zambia, Namibia, Uganda, Malawi, Cameroon, Madagascar, Mozambique, Sierra Leone and Gabon.

Figure A.4: Bivariate scatter plots: local currency marketable government debt vs. explanatory variables
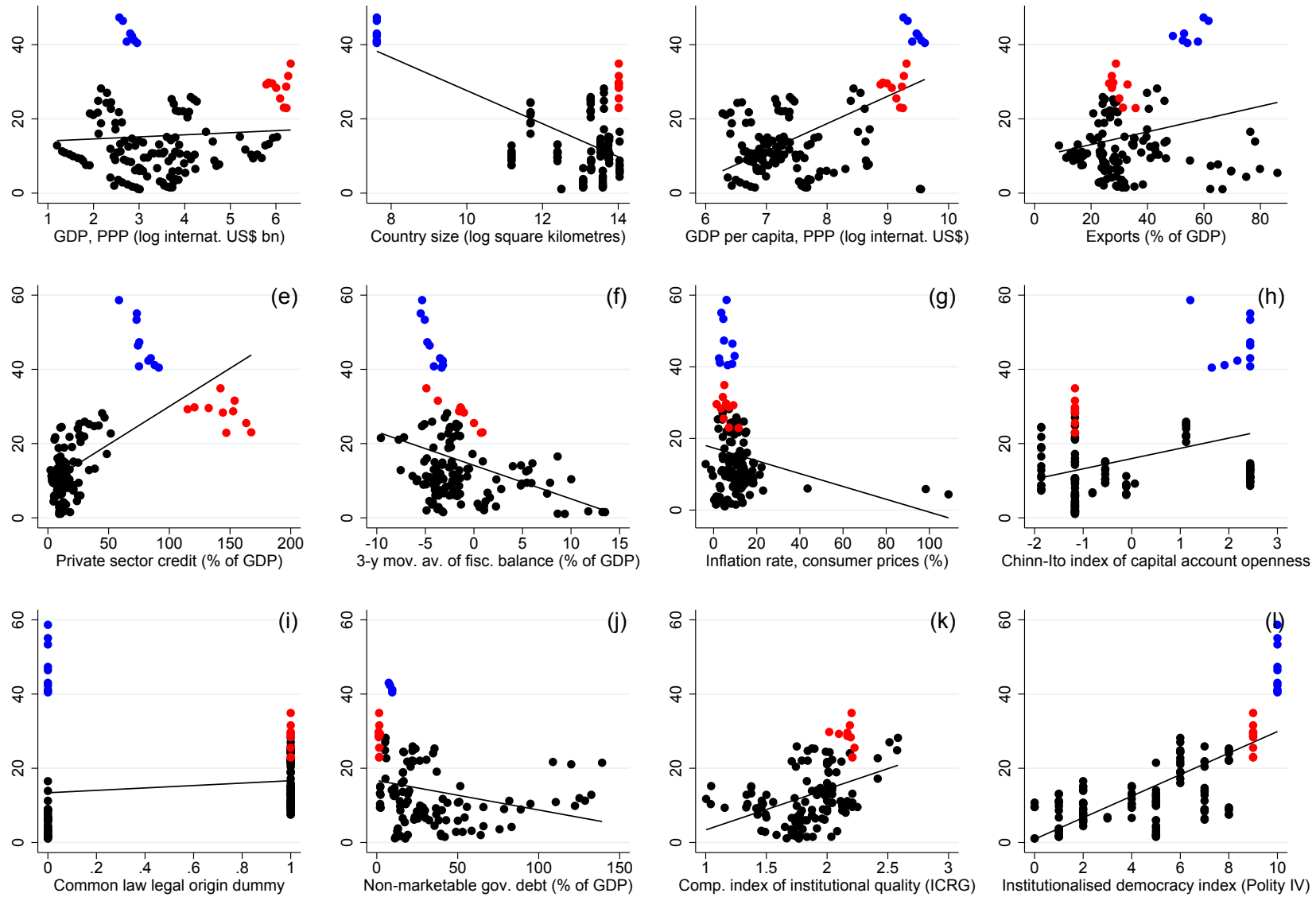
Notes: Sample countries, years and variables as defined in the text and Annex Table A.1. All explanatory variables are one-year lagged, except for country size, common law dummy and non- marketable government debt. Lines represent best linear fit. Data points for South Africa are in red, and for Mauritius in blue.

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Table A.2: Estimation results – including year fixed effects

	POLS					FGLS					RE					FE				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
L.ln_gdp_ppp	0.919	0.477	-0.091	0.469	1.439	1.176*	-0.269	-0.768+	-0.509	0.117	4.440	2.750	-0.091	0.400	2.669	41.677	40.089	-4.003	-19.936	39.122
	[1.783]	[0.967]	[0.812]	[1.069]	[1.240]	[0.694]	[0.587]	[0.483]	[0.578]	[0.789]	[3.717]	[2.764]	[0.812]	[1.188]	[2.477]	[42.209]	[40.485]	[23.759]	[22.607]	[40.605]
ln_area	-4.400***	-3.746***	-3.239***	-1.616	-3.287***	-4.533***	-3.840***	-3.394***	0.672	-3.782***	-5.544**	-5.300***	-3.239***	1.680	-4.761***					
	[1.078]	[0.663]	[0.560]	[1.726]	[0.752]	[0.672]	[0.510]	[0.394]	[1.020]	[0.520]	[2.223]	[2.056]	[0.560]	[1.725]	[1.780]					
L.ln_gdppc_ppp	-2.853	-1.696	-2.252	-2.272	1.191	4.066**	1.652	0.801	-0.129	3.930***	1.392	1.193	-2.252	1.935	1.488	-31.742	-38.716	12.828	24.032	-39.142
	[4.126]	[2.335]	[2.204]	[1.729]	[2.839]	[1.713]	[1.337]	[1.222]	[0.956]	[1.304]	[4.231]	[3.366]	[2.204]	[2.120]	[2.802]	[42.524]	[41.510]	[23.669]	[25.023]	[41.800]
L.x_gdp	0.158	0.325***	0.282***	0.232***	0.221*	-0.046	0.134***	0.148***	0.083**	0.065*	0.029	0.124	0.282***	-0.007	0.112	-0.014	0.015	-0.094	-0.015	0.012
	[0.136]	[0.082]	[0.074]	[0.067]	[0.105]	[0.039]	[0.042]	[0.039]	[0.041]	[0.037]	[0.094]	[0.100]	[0.074]	[0.064]	[0.097]	[0.077]	[0.062]	[0.079]	[0.067]	[0.061]
L.domcred_gdp	0.209**	0.167***	0.162***	0.132***	0.06	0.072**	0.134***	0.147***	0.104***	0.044+	0.013	0.031	0.162***	-0.016	0.007	-0.062	-0.041	-0.062	-0.090	-0.040
	[0.071]	[0.043]	[0.046]	[0.042]	[0.067]	[0.033]	[0.029]	[0.027]	[0.030]	[0.030]	[0.061]	[0.050]	[0.046]	[0.047]	[0.050]	[0.056]	[0.056]	[0.070]	[0.070]	[0.057]
L.avfiscbal_gdp		-0.505***	-0.565**	-0.248+	-0.528**		-0.070	-0.125+	-0.079	-0.018		-0.136+	-0.565**	-0.075	-0.162+		-0.099	-0.083	-0.052	-0.117
		[0.157]	[0.224]	[0.173]	[0.178]		[0.087]	[0.085]	[0.073]	[0.072]		[0.098]	[0.224]	[0.081]	[0.103]		[0.096]	[0.075]	[0.089]	[0.104]
L.infl_cp		-0.151***	-0.117***	-0.096***	-0.136**		-0.066**	-0.055*	-0.052**	-0.050**		-0.083***	-0.117***	-0.064***	-0.085***		-0.078+	-0.068+	-0.061*	-0.083+
		[0.045]	[0.032]	[0.025]	[0.057]		[0.027]	[0.028]	[0.025]	[0.024]		[0.029]	[0.032]	[0.019]	[0.030]		[0.047]	[0.039]	[0.033]	[0.050]
L.kaopen		0.615	0.375	-0.178	0.521		0.228	-0.016	-0.665*	-0.146		-0.123	0.375	-0.509	-0.381		-0.891	0.034	-0.124	-1.141
		[0.697]	[0.602]	[0.856]	[0.621]		[0.354]	[0.288]	[0.366]	[0.367]		[1.173]	[0.602]	[1.096]	[1.158]		[1.400]	[1.121]	[1.296]	[1.536]
comlaw		7.266***	7.137***	9.090***	6.284***		6.205***	7.602***	9.668***	6.618***		9.426**	7.137***	12.80***	8.337***					
		[1.841]	[1.764]	[1.995]	[1.768]		[1.195]	[1.027]	[1.118]	[1.355]		[3.726]	[1.764]	[3.461]	[2.870]					
nmdebt_gdp			-0.075***					-0.017					-0.075***					-0.013		
			[0.018]					[0.015]					[0.018]					[0.020]		
L.comprisk_icrg				5.039+					3.487**					3.369+					2.695	
				[3.137]					[1.380]					[2.263]					[2.129]	
L.democ					1.074**					0.981***					0.773**					0.328
					[0.424]					[0.182]					[0.393]					[0.470]
constant	82.068**	58.850***	63.060***	26.456	29.579	40.657**	43.920***	44.730***	-9.691	24.630**	62.237+	57.545+	63.060***	-37.208	46.582+	120.766	176.030	-59.525	-97.094	180.593
	[31.426]	[18.735]	[17.999]	[23.412]	[24.105]	[16.006]	[11.907]	[11.008]	[15.158]	[11.754]	[43.652]	[37.501]	[17.999]	[29.349]	[31.520]	[180.765]	[179.872]	[102.339]	[110.168]	[182.065]
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	137	137	118	127	137	137	137	118	127	137	137	137	118	127	137	137	137	118	127	137
Overall F/χ² p-value	N/A	N/A	N/A	N/A	N/A	0.000	0.000	0.000	0.000	0.000	0.000	N/A	N/A	N/A	N/A	0.000	N/A	N/A	N/A	N/A
R²/R²-within (for FE)	0.760	0.868	0.831	0.776	0.891						0.631	0.760	0.831	0.609	0.824	0.230	0.289	0.322	0.226	0.295
Intra-class correlation ρ											0.818	0.786	0.000	0.862	0.779	0.998	0.998	0.972	0.994	0.998
Breusch-Pagan p-value											0.000	0.000	1.000	0.000	0.000					
Hausman p-value																0.000	0.000	0.000	0.000	0.000

Notes: Dependent variable is lc_mdebt_gdp, year-end outstanding local currency marketable central government debt (% of GDP). Sample countries, years and independent variables as defined in the text and Annex Table A.1. All independent variables are one-year lagged, except for ln_area, comlaw and nmdebt_gdp. All specifications include year dummies (not reported). Standard errors, clustered at the country level, are reported in brackets. 'N/A' means statistic could not be calculated due to insufficient degrees of freedom. ***$p<0.01$; **$p<0.05$; *$p<0.10$; +$p<0.20$.

Table A.3: Estimation results – excluding South Africa

	POLS					FGLS					RE					FE				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
L.ln_gdp_ppp	0.314	-0.119	-0.174	0.269	0.461	-0.786	-1.121**	-1.104+	-0.579	-0.454	-0.257	-1.134	-0.614	-1.636*	-1.027	5.403	14.505	-7.909	-9.904	16.016
	[1.163]	[0.626]	[0.769]	[0.882]	[0.833]	[0.702]	[0.563]	[0.695]	[0.625]	[0.657]	[2.719]	[1.835]	[1.773]	[0.965]	[1.764]	[21.100]	[22.006]	[10.685]	[12.259]	[22.026]
ln_area	-2.733**	-2.766***	-1.797**	-2.081+	-2.641***	-3.109***	-3.776***	-2.397***	0.181	-3.264***	-4.674*	-4.356*	-2.684*	2.247+	-4.141*					
	[1.200]	[0.702]	[0.756]	[1.260]	[0.720]	[0.806]	[0.639]	[0.685]	[0.983]	[0.628]	[2.787]	[2.534]	[1.436]	[1.372]	[2.489]					
L.ln_gdppc_ppp	-4.971+	-3.361+	-3.054	-3.566*	-1.344	0.715	0.401	-1.148	-2.870***	2.282+	-1.379	-1.491	1.157	-0.258	-0.813	-4.026	-21.657	12.574	11.81	-24.811
	[3.653]	[2.235]	[2.360]	[1.984]	[3.001]	[1.640]	[1.499]	[1.604]	[1.043]	[1.480]	[3.797]	[2.800]	[3.253]	[1.816]	[2.600]	[30.768]	[32.615]	[17.880]	[18.598]	[33.318]
L.x_gdp	0.142	0.282***	0.227***	0.224***	0.228**	-0.034	0.094**	0.108**	0.088**	0.062+	0.049	0.153*	-0.004	0.021	0.126+	-0.058	0.007	-0.048	0.021	0.003
	[0.107]	[0.076]	[0.072]	[0.059]	[0.100]	[0.038]	[0.041]	[0.042]	[0.038]	[0.040]	[0.080]	[0.087]	[0.075]	[0.047]	[0.083]	[0.057]	[0.049]	[0.077]	[0.056]	[0.043]
L.domcred_gdp	0.447***	0.355***	0.378***	0.334**	0.256*	0.199***	0.188***	0.291***	0.189***	0.103*	0.062	0.077	0.150+	0.079	0.025	-0.197	-0.108	0.067	0.066	-0.094
	[0.136]	[0.095]	[0.087]	[0.122]	[0.124]	[0.064]	[0.058]	[0.058]	[0.064]	[0.060]	[0.173]	[0.135]	[0.100]	[0.085]	[0.142]	[0.212]	[0.148]	[0.089]	[0.089]	[0.142]
L.avfiscbal_gdp		-0.330**	-0.212+	-0.178*	-0.374**		-0.041	-0.035	-0.056	-0.115*		-0.215*	-0.093	-0.103	-0.224*		-0.130+	-0.094	-0.099	-0.145+
		[0.141]	[0.121]	[0.096]	[0.151]		[0.058]	[0.063]	[0.058]	[0.063]		[0.117]	[0.097]	[0.091]	[0.120]		[0.094]	[0.079]	[0.091]	[0.098]
L.infl_cp		-0.078+	-0.053**	-0.043*	-0.079+		-0.033+	-0.043+	-0.046*	-0.023		-0.087***	-0.070***	-0.066***	-0.087**		-0.100+	-0.059+	-0.054+	-0.106+
		[0.045]	[0.024]	[0.022]	[0.051]		[0.025]	[0.028]	[0.024]	[0.025]		[0.033]	[0.022]	[0.020]	[0.035]		[0.057]	[0.034]	[0.034]	[0.060]
L.kaopen		0.315	0.130	-0.093	0.330		-0.198	-0.116	-0.839**	-0.352		0.071	0.025	-0.639	-0.221		-1.354	-0.507	-0.744	-1.773
		[0.474]	[0.499]	[0.607]	[0.467]		[0.268]	[0.317]	[0.367]	[0.307]		[1.029]	[1.095]	[1.029]	[1.138]		[1.473]	[1.184]	[1.308]	[1.654]
comlaw		7.479***	8.095***	8.024***	6.878***		7.004***	7.208***	8.178***	6.859***		7.159**	7.352**	11.16***	6.529*					
		[1.960]	[2.172]	[1.819]	[1.742]		[1.176]	[1.358]	[1.184]	[1.125]		[3.412]	[2.992]	[2.340]	[3.466]					
nmdebt_gdp			0.015					0.012					0.014					0.007		
			[0.012]					[0.009]					[0.016]					[0.014]		
L.comprisk_icrg				4.021+					2.814*					2.381					2.395	
				[2.455]					[1.590]					[2.227]					[2.026]	
L.democ					0.648+					1.024***					0.622+					0.600
					[0.458]					[0.192]					[0.401]					[0.484]
constant	71.161**	54.130***	39.675**	39.380+	36.731*	49.940***	52.900***	42.860***	16.450	28.040**	81.527*	73.770*	34.053	-23.501	65.069*	32.538	130.603	-53.214	-47.147	146.147
	[23.907]	[13.740]	[16.596]	[19.845]	[20.566]	[14.027]	[11.772]	[14.120]	[15.553]	[12.508]	[43.268]	[37.975]	[26.797]	[25.509]	[34.507]	[162.131]	[171.873]	[96.740]	[95.793]	[175.432]
Observations	127	127	108	117	127	127	127	108	117	127	127	127	108	117	127	127	127	108	117	127
Overall F/χ² p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.749	0.000	0.000	0.000	0.000
R²/R²-within (for FE)	0.777	0.868	0.831	0.726	0.877						0.602	0.699	0.642	0.572	0.689	0.053	0.193	0.221	0.162	0.215
Intra-class correlation ρ											0.767	0.734	0.890	0.871	0.766	0.978	0.994	0.979	0.982	0.995
Breusch-Pagan p-value											0.000	0.000	0.000	0.000	0.000					
Hausman p-value																0.000	0.000	0.000	0.000	0.000

Notes: Dependent variable is lc_mdebt_gdp, year-end outstanding local currency marketable central government debt (% of GDP). Sample countries, years and independent variables as defined in the text and Annex Table A.1; South Africa excluded. All independent variables are one-year lagged, except for ln_area, comlaw and nmdebt_gdp. Standard errors, clustered at the country level, are reported in brackets. ***p<0.01; **p<0.05; *p<0.10; +p<0.20.

Table A.4: Estimation results – excluding Mauritius

	POLS					FGLS					RE					FE				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
L.ln_gdp_ppp	0.137	-0.644	-0.728	0.093	0.187	-0.560	-1.736***	-1.335*	-1.097*	-0.880	0.365	-1.073	0.129	-0.853	-1.119	-11.379	-5.497	-4.358	-5.735	-4.541
	[1.864]	[0.853]	[0.915]	[0.991]	[1.087]	[0.631]	[0.631]	[0.789]	[0.583]	[0.782]	[2.259]	[1.063]	[1.580]	[1.138]	[0.959]	[11.690]	[12.440]	[10.784]	[12.408]	[12.934]
ln_area	-2.127	-0.436	1.023	-0.995	-0.400	-0.243	1.354	1.743+	1.600+	0.495	1.468	3.525*	4.193**	3.529*	3.600*					
	[2.510]	[1.474]	[1.640]	[1.535]	[1.438]	[1.078]	[1.176]	[1.164]	[1.080]	[1.130]	[2.968]	[1.999]	[2.043]	[1.909]	[1.944]					
L.ln_gdppc_ppp	-2.731	-1.249	-0.620	-1.774	1.069	1.315	0.226	-0.830	-0.936	1.702	1.904	1.987	3.625	1.873	2.002	20.102	9.794	11.829	9.958	7.949
	[4.303]	[2.320]	[2.209]	[1.917]	[3.037]	[1.764]	[1.383]	[1.393]	[1.030]	[1.370]	[2.888]	[2.078]	[2.888]	[2.044]	[1.946]	[16.672]	[18.196]	[17.090]	[18.071]	[19.232]
L.x_gdp	0.078	0.192**	0.127+	0.198**	0.120	-0.093***	0.038	0.027	0.039	0.018	-0.108+	-0.029	-0.108	-0.031	-0.032	-0.086	-0.040	-0.117+	-0.038	-0.041
	[0.136]	[0.086]	[0.090]	[0.074]	[0.116]	[0.033]	[0.040]	[0.043]	[0.039]	[0.038]	[0.072]	[0.063]	[0.088]	[0.062]	[0.063]	[0.084]	[0.069]	[0.084]	[0.069]	[0.068]
L.domcred_gdp	0.200**	0.143***	0.103*	0.127**	0.058	0.109***	0.122***	0.114***	0.106***	0.063**	-0.020	-0.013	-0.052	-0.034	-0.023	-0.102+	-0.079	-0.094+	-0.090+	-0.075
	[0.073]	[0.042]	[0.051]	[0.046]	[0.071]	[0.034]	[0.031]	[0.032]	[0.032]	[0.032]	[0.057]	[0.054]	[0.067]	[0.051]	[0.052]	[0.062]	[0.063]	[0.069]	[0.061]	[0.064]
L.avfiscbal_gdp		-0.368**	-0.456**	-0.316**	-0.389**		-0.091+	-0.084	-0.160***	-0.099*		-0.137+	-0.144+	-0.148+	-0.151+		-0.128+	-0.134+	-0.144+	-0.137+
		[0.138]	[0.159]	[0.134]	[0.135]		[0.060]	[0.067]	[0.061]	[0.057]		[0.095]	[0.103]	[0.095]	[0.097]		[0.090]	[0.085]	[0.092]	[0.093]
L.infl_cp		-0.082**	-0.071**	-0.072**	-0.074+		-0.034+	-0.037+	-0.037+	-0.034+		-0.062***	-0.068***	-0.060***	-0.063***		-0.053+	-0.058+	-0.052+	-0.057+
		[0.036]	[0.032]	[0.029]	[0.047]		[0.025]	[0.027]	[0.025]	[0.025]		[0.020]	[0.023]	[0.020]	[0.022]		[0.035]	[0.035]	[0.034]	[0.038]
L.kaopen		-0.047	-0.670	-0.238	-0.034		-0.643*	-1.303***	-1.181***	-0.199		-0.713	-1.069	-0.766	-0.940		-0.533	-0.714	-0.587	-0.801
		[0.708]	[0.735]	[0.825]	[0.577]		[0.367]	[0.402]	[0.397]	[0.304]		[0.990]	[1.226]	[1.029]	[1.035]		[1.177]	[1.262]	[1.233]	[1.357]
comlaw		9.614***	11.28***	9.393***	8.545***		9.832***	12.35***	10.03***	8.583***		13.95***	15.22***	13.87***	12.99***					
		[1.956]	[2.397]	[1.914]	[1.584]		[1.394]	[1.607]	[1.243]	[1.234]		[3.435]	[3.749]	[3.403]	[2.810]					
nmdebt_gdp		-0.018+					0.007					0.006					0.007			
		[0.010]					[0.011]					[0.015]					[0.014]			
L.comprisk_icrg				4.339+					3.154**					2.861					2.937+	
				[3.029]					[1.474]					[2.249]					[2.103]	
L.democ					0.896*					0.788***					0.523+					0.301
					[0.494]					[0.185]					[0.342]					[0.364]
constant	53.163	14.527	-6.455	15.276	-5.154	9.563	-11.430	-10.964	-13.858	-13.880	-18.060	-52.334+	-74.073*	-57.069+	-54.684*	-90.521	-36.719	-53.009	-42.428	-27.956
	[42.552]	[25.695]	[25.965]	[23.617]	[29.165]	[14.292]	[17.017]	[16.836]	[16.373]	[16.035]	[44.935]	[35.128]	[38.244]	[34.784]	[32.270]	[83.860]	[92.079]	[89.568]	[91.223]	[96.938]
Observations	127	127	114	127	127	127	127	114	127	127	127	127	114	127	127	127	127	114	127	127
Overall F/χ² p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.237	0.000	0.000	0.000	0.000	0.155	0.000	0.000	0.000	0.000
R²/R²-within (for FE)	0.467	0.743	0.768	0.760	0.781						0.065	0.544	0.616	0.526	0.623	0.096	0.160	0.247	0.176	0.168
Intra-class correlation ρ											0.900	0.847	0.888	0.878	0.842	0.988	0.972	0.974	0.974	0.965
Breusch-Pagan p-value											0.000	0.000	0.000	0.000	0.000					
Hausman p-value																0.000	0.000	0.000	0.000	0.000

Notes: Dependent variable is lc_mdebt_gdp, year-end outstanding local currency marketable central government debt (% of GDP). Sample countries, years and independent variables as defined in the text and Annex Table A.1; Mauritius excluded. All independent variables are one-year lagged, except for ln_area, comlaw and nmdebt_gdp. Standard errors, clustered at the country level, are reported in brackets. ***p<0.01; **p<0.05; *p<0.10; +p<0.20.

Table A.5: Estimation results – alternative measures of institutional quality

	POLS						FGLS						RE						FE					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
L.ln_gdp_ppp	1.056+	-0.004	-2.865**	-1.177**	-0.636	-3.195***	0.000	-1.180**	-2.067**	-1.374***	-1.722***	-3.248***	0.077	-0.871	-1.546+	-1.304+	-1.146	-3.195***	14.13	-5.768	-5.872	-5.507	-4.543	-4.894
	[0.732]	[0.761]	[1.104]	[0.448]	[0.866]	[0.484]	[0.564]	[0.496]	[0.815]	[0.510]	[0.630]	[0.619]	[1.308]	[0.998]	[1.044]	[0.925]	[1.078]	[0.484]	[20.618]	[12.637]	[12.519]	[13.260]	[12.950]	[14.393]
ln_area	-3.519***	-0.231	2.094	0.493	-0.445	3.246***	-3.627***	2.206**	2.057**	1.174+	1.400	3.082***	-3.835**	3.414*	3.543*	3.267**	3.800*	3.246***						
	[0.454]	[1.384]	[1.660]	[0.985]	[1.500]	[0.665]	[0.532]	[0.983]	[1.015]	[0.893]	[1.177]	[0.749]	[1.935]	[1.922]	[1.845]	[1.446]	[2.122]	[0.665]						
L.ln_gdppc_ppp	-1.140	-2.154	0.763	-0.906	-1.239	1.190	1.553	-1.283	-0.717	-0.910	0.271	0.534	-0.680	1.763	2.011	1.414	2.399	1.190	-20.795	10.16	10.474	9.802	8.429	9.194
	[2.076]	[2.364]	[2.475]	[1.556]	[2.401]	[1.379]	[1.238]	[1.218]	[1.153]	[1.130]	[1.421]	[1.276]	[2.860]	[2.172]	[2.291]	[2.021]	[2.033]	[1.379]	[31.748]	[18.407]	[18.213]	[18.775]	[18.871]	[20.118]
L.x_gdp	0.292***	0.209**	0.146+	0.117**	0.193**	0.096*	0.094**	0.054+	0.071**	0.058*	0.037	0.050+	0.105	-0.023	-0.021	-0.016	-0.039	0.096*	-0.001	-0.037	-0.038	-0.040	-0.049	-0.048
	[0.074]	[0.080]	[0.087]	[0.051]	[0.083]	[0.051]	[0.039]	[0.038]	[0.030]	[0.034]	[0.040]	[0.038]	[0.098]	[0.065]	[0.067]	[0.068]	[0.064]	[0.051]	[0.056]	[0.072]	[0.069]	[0.077]	[0.071]	[0.082]
L.domcred_gdp	0.087+	0.098**	0.111**	0.108**	0.142***	0.041+	0.066*	0.112***	0.138***	0.102***	0.120***	0.080**	-0.011	-0.018	0.011	-0.003	-0.030	0.041+	-0.097*	-0.079	-0.088	-0.079	-0.085+	-0.098+
	[0.054]	[0.045]	[0.043]	[0.035]	[0.046]	[0.027]	[0.039]	[0.035]	[0.031]	[0.031]	[0.032]	[0.032]	[0.035]	[0.050]	[0.051]	[0.048]	[0.054]	[0.027]	[0.051]	[0.063]	[0.072]	[0.063]	[0.059]	[0.071]
L.avfiscbal_gdp	-0.456**	-0.308**	-0.401***	-0.189+	-0.369**	-0.246**	-0.184***	-0.139**	-0.073	-0.092+	-0.096+	-0.050	-0.265**	-0.151+	-0.136+	-0.133+	-0.137+	-0.246**	-0.176+	-0.134+	-0.135+	-0.128+	-0.130+	-0.143+
	[0.171]	[0.116]	[0.127]	[0.110]	[0.136]	[0.109]	[0.071]	[0.060]	[0.061]	[0.057]	[0.061]	[0.060]	[0.129]	[0.094]	[0.097]	[0.097]	[0.095]	[0.109]	[0.110]	[0.088]	[0.094]	[0.091]	[0.091]	[0.093]
L.infl_cp	-0.078+	-0.080**	-0.078**	-0.036+	-0.082**	-0.036*	-0.026	-0.058**	-0.042+	-0.043*	-0.034+	-0.044+	-0.074+	-0.062***	-0.062***	-0.056***	-0.061***	-0.036+	-0.099+	-0.053+	-0.053+	-0.053+	-0.055+	-0.055+
	[0.045]	[0.028]	[0.031]	[0.018]	[0.036]	[0.019]	[0.026]	[0.024]	[0.027]	[0.023]	[0.025]	[0.026]	[0.034]	[0.020]	[0.019]	[0.019]	[0.020]	[0.019]	[0.057]	[0.035]	[0.035]	[0.037]	[0.036]	[0.038]
L.kaopen	0.174	-0.239	-0.325	-0.666	-0.052	-1.142***	-0.276	-0.870**	-0.176	-0.816**	-0.675*	-1.007***	-0.396	-0.818	-0.705	-0.685	-0.703	-1.142***	-1.194	-0.614	-0.598	-0.531	-0.491	-0.623
	[0.732]	[0.642]	[0.543]	[0.580]	[0.771]	[0.217]	[0.314]	[0.355]	[0.314]	[0.337]	[0.375]	[0.243]	[1.110]	[0.975]	[0.965]	[0.830]	[1.087]	[0.217]	[1.492]	[1.261]	[1.240]	[1.155]	[1.304]	[1.421]
comlaw	7.872***	11.240***	13.583***	9.607***	9.650***	16.081***	7.169***	10.117***	10.552***	9.929***	10.020***	13.604***	8.245***	14.127***	14.269***	12.799***	14.583***	16.081***						
	[1.421]	[2.403]	[2.897]	[1.755]	[2.304]	[1.312]	[0.915]	[1.360]	[1.640]	[1.195]	[1.485]	[1.344]	[3.130]	[3.218]	[3.197]	[3.151]	[3.642]	[1.312]						
L.compinst_wgi	7.609**						5.998***						7.794***						2.133					
	[3.234]						[2.105]						[1.896]						[5.259]					
L.invprofile_icrg		19.850**				10.708*		8.791**				7.790*		5.072				10.708**		2.141				0.773
		[9.108]				[5.115]		[4.090]				[4.079]		[4.289]				[5.115]		[5.850]				[6.188]
L.laworder_icrg			-15.81**			-18.770***			-6.943*			-15.250***			-4.653			-18.770***			4.192			5.575
			[7.211]			[2.998]			[3.583]			[2.810]			[8.231]			[2.998]			[10.035]			[10.429]
L.burqual_icrg				18.118***		15.506***				16.174***		15.746***				9.957*		15.506***				0.078		-0.942
				[4.022]		[2.025]				[2.628]		[2.760]				[5.622]		[2.025]				[9.791]		[9.955]
L.corrupt_icrg					0.303	7.442+					1.007	2.682					3.329	7.442*					3.647	4.126
					[7.481]	[4.219]					[2.396]	[2.353]					[3.056]	[4.219]					[2.982]	[3.696]
constant	36.047*	2.582	-18.266	-1.583	14.403	-47.700***	31.557**	-19.431	-10.932	-7.281	-12.823	-35.980***	48.471+	-53.499+	-49.690+	-47.078+	-59.624+	-47.700***	123.450	-40.033	-42.463	-36.769	-30.825	-38.282
	[16.986]	[22.268]	[27.494]	[14.356]	[26.532]	[12.246]	[12.676]	[15.483]	[14.552]	[13.542]	[17.399]	[13.664]	[37.757]	[33.280]	[32.543]	[28.761]	[37.758]	[12.246]	[167.015]	[94.417]	[92.432]	[95.680]	[95.179]	[103.399]
Observations	137	127	127	127	127	127	137	127	127	127	127	127	137	127	127	127	127	127	137	127	127	127	127	127
Overall F/χ^2 p-value	0.000	0.000	0.000	0.000	0.000	N/A	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R^2/R^2-within (for FE)	0.862	0.785	0.787	0.822	0.743	0.885							0.664	0.583	0.634	0.667	0.505	0.885	0.208	0.162	0.164	0.160	0.173	0.181
Intra-class correlation ρ													0.799	0.851	0.778	0.810	0.880	0.000	0.992	0.973	0.975	0.972	0.969	0.972
Breusch-Pagan p-value													0.000	0.000	0.000	0.000	0.000	1.000						
Hausman p-value																			0.000	0.000	0.000	0.000	0.000	0.000

Notes: Dependent variable is lc_mdebt_gdp, year-end outstanding local currency marketable central government debt (% of GDP). Sample countries, years and independent variables as defined in the text and Annex Table A.1. All independent variables are one-year lagged, except for ln_area and comlaw. Standard errors, clustered at the country level, are reported in brackets. 'N/A' means statistic could not be calculated due to insufficient degrees of freedom. ***$p<0.01$; **$p<0.05$; *$p<0.10$; +$p<0.20$.