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Bond Markets in Africa

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Abstract

African bond markets have been steadily growing in recent years, but nonetheless remain undeveled. African countries would benefit from greater access to financing and deeper financial markets. This paper compiles a unique set of data on corporate bond markets in Africa. It then applies an econometric model to analyze the key determinants of African government securities market and corporate bond market capitalization. Government securities market capitalization is directly related to better institutions and interest rate volatility, and inversely related to the fiscal balance, higher interest rate spreads, exchange rate volatility, and current and capital account openness. Corporate bond market capitalization is directly linked to economic size, the level of development of the economy and financial markets, better institutions, and interest rate volatility, and inversely related to higher interest rate spreads and current account openness. Policy implications follow.

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I. INTRODUCTION

The African Development Bank recently announced that it plans to launch a new bond program for infrastructure to raise up to US$40 billion for investments in projects such as ports and airports, highlighting the growing role for bond markets in financing development in sub-Saharan Africa.[2] Yet bond markets in these countries are at a nascent stage of development and there is a strong need to promote their development.

First, sub-Saharan Africa has been heavily dependent on external grants and concessional loans for funding capital spending and government deficits. Only a small number of countries have limited access to global capital markets.[3] Additionally, western donors are now facing substantial fiscal challenges and consequently donor flows to sub-Saharan Africa may be scaled back significantly. Without access to alternative sources of finance, including bond markets, many African countries could find it difficult to finance critical needs.

Second, well-functioning bond markets help sustain economic stability. The Asian experience supports this point. Since the 1997 Asian financial crisis, many Asian economies have made significant progress in strengthening bond market development. This has in turn helped these Asian economies weather the recent global financial crisis because deeper financial markets generated valuable funding sources for these countries to finance fiscal stimulus packages.

Third, the development of bond markets in sub-Saharan Africa can improve the intermediation of savings. Although Africa needs money, Africa is a net capital exporter to the rest of the world (IMF, 2012). This is mainly because there is a lack of effective intermediate channels to absorb this capital. Bond markets are an effective way to intermediate capital savers with capital users.

Fourth, promoting bond market development in sub-Saharan Africa can improve the structure of the African financial system. The African financial sector is dominated by banks. The non-banking sector and bond markets, both public and private, are still in their infancy. Bond markets and bank finance are complementary rather than incompatible. While banks tend to be more adept at providing short-term (working) capital, bond markets enjoy a comparative advantage in financing government deficits and infrastructure investment, and providing longer-term capital to companies for growth.

Fifth, deeper bond markets will enable central banks in sub-Saharan Africa to conduct monetary policy more effectively. At present, many banks have few domestic fixed-income

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[2] IHS Global Insight, August 20, 2012.

[3] Gross official developmental assistance to sub-Saharan Africa amounted to US$49 billion in 2010, accounting for 32 percent of total government consumption expenditure, with 83 percent grants and 17 percent concessional loans, according to World Bank and Organization for Economic Cooperation and Development data.

instruments to use for sterilization other than short-term government debt. Deeper bond markets would provide a wider, more effective range of instruments for monetary policy implementation.

This paper investigates empirically the determinants of local currency bond markets in sub-Saharan Africa. [4] Although a number of countries have issued sovereign bonds in foreign currencies, we focus on local currency bond markets because of the importance of the local currency markets compared to international sovereign bonds and because of the need to focus on African countries' ability to overcome what is referred to in the literature as "original sin," that is, the inability to issue debt in local currency. [5]

We use data for local currency government securities market capitalization for 36 countries, over the years 1980–2010, along with a newly developed database for corporate bond market capitalization. This sample makes the study the largest of its kind in terms of both number of countries included and number of years covered. To investigate the determinants of bond markets, we draw upon an econometric approach used in Eichengreen and Luengnaruemitchai (2004), Claessens, Klingebiel, and Schmukler (2007), and Adelegan and Radzewicz-Bak (2009), among others. We use generalized method of moments estimation, in view of possible endogeneity among variables relevant to bond market development.

This research aims to achieve three purposes. First, it outlines the current situation of local currency bond markets including both government securities and corporate bond markets in sub-Saharan African countries. Second, it discusses and estimates key determinants of bond market development in sub-Saharan Africa. Finally, it offers policy advice for enhancing bond market development in sub-Saharan Africa.

The structure of this paper is as follows. Section II reviews the relevant literature. Section III provides an overview of the government securities and corporate bond markets in sub-Saharan Africa. Section IV sets out the analytical framework and discusses the econometric methodology underpinning the empirical analysis. Section V presents and discusses the results from the estimation. Section VI draws out the policy implications of the findings from the previous section and concludes.

II. LITERATURE REVIEW

The research on African financial sector development is growing. Most of the literature has so far focused on financial development of the banking sector and stock markets (e.g., Detragiache et al., 2005; McDonald and Schumacher, 2007; Yartey and Adjasi, 2007;

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[4] Russ and Valderrama (2012) provide an overview of the theoretical literature regarding the choice between bank and bond finance.

[5] In 2010, we estimate international sovereign bonds, issued by sub-Saharan countries, at US$5 billion (according to Bloomberg International) compared to local currency government securities markets of US$135 billion.

Andrianaivo and Yartey, 2009; Anayiotos and Toroyan, 2009; Kablan, 2010; and Beck et al., 2011). Relatively little attention has focused on development of public and private bond markets.[6]

Several studies have examined the determinants of bond markets in more developed economies. Eichengreen and Luengnaruemitchai (2004) consider a broad set of determinants of bond market development, using panel data from 1990 to 2001, for a sample of 41 developing and developed countries, with a focus on emerging Asia. They regress several measures of domestic currency bond market capitalization on various explanatory variables, and estimate these equations using generalized least squares, with heteroskedasticity and panel-specific autocorrelation correction. For determinants of the stock of public bonds, they find that GDP at purchasing power parity, exports, English origin, distance from the equator, a positive investment profile, and an open capital account are positive and significant while GDP per capita at purchasing power parity, banking sector concentration, bureaucracy quality, the interest rate spread, exchange rate volatility, and the fiscal balance are negative and significant (Table 6, column 7 of their paper). For private bonds, they find that GDP at purchasing power parity, exports, Asia dummy, distance from the equator, corruption, accounting standards, domestic credit, and bureaucracy quality are positive and significant while English origin, the interest rate spread, and exchange rate volatility are negative and significant (Table 6, column 4 of their paper). They conclude that market size matters; poor accounting standards hinder development of private debt markets, along with corruption and low bureaucratic quality. Well-capitalized bank systems promote bond markets. Stability of exchange rates encourages bond market development, and an absence of need for public financing discourages public bond markets. Capital controls also discourage bond market development.

Eichengreen, Panizza, and Borensztein (2008) extend this analysis, using panel data on a range of developing and developed countries, with a focus on Latin America. They construct separate measures of the dependent variable for government bonds, private bonds (corporate plus financial), corporate bonds, and financial bonds. Their results (Table 9, columns 1–4 of their paper) confirm many of those of Eichengreen and Luengnaruemithai (2004). They find that country size is positive and significant, with a concave relationship. GDP per capita is also positive and concave and trade openness is positive and significant. The domestic interest rate is negative and significant only for government bonds. Interest rate volatility is positively correlated with the private bond market and negatively with the government bond market. Domestic credit is positively and concavely related to financial bonds. The interest rate spread is positively correlated with the corporate but not public bond market. The opposite is found for financial bonds. Stricter capital controls are correlated with large public bond markets, but do not influence private bond markets. Larger public debt is linked to large public bond markets but is not significant with regard to private bond market determinants.

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[6] Felman et al. (2011) and Gray et al. (2011) investigate market infrastructure aspects of development of bond markets in Asia and other emerging economies.

They find counterintuitive results regarding some of the institutional and corporate governance variables. For instance, they find that stronger creditor rights result in smaller private bond markets. Countries with legal codes of French origin have larger bond markets and those with German and Scandinavian legal codes have the largest bond markets. Latitude is negative and significant along with the Latin American dummy variable. They conclude that a limited number of policy variables and country characteristics explain the difference in private bond capitalization between Latin America and advanced economies. Country size and level of development are critical along with development of the financial system and historical and geographical factors. Policy variables such as macroeconomic stability, openness, investor protection, cost of contract enforcement, and pension privatization also have some explanatory power.

Burger and Warnock (2006) use a cross section of up to 49 countries and examine the determinants of public and private bond markets. They find similar determinants for the two. Countries with better inflation performance and stronger rule of law have larger sovereign and corporate bond markets. The main difference between the two is fiscal policy. Larger fiscal deficits are associated with larger government bond markets. They explore robustness to possible endogeneity of inflation, because of the critical interaction between inflation and bond market development. One approach employs lagged inflation and alternatively, they use an instrumental variables approach, where for private bond markets, the instrument for inflation with a measure of central bank independence and fiscal balance. With this extension, they nonetheless find that higher inflation leads to smaller domestic currency bond markets.

Claessens, Klingebiel, and Schmukler (2007) focus on public bond market development. Their data covers developing and developed countries, over the 1993–2000 period and they incorporate a range of explanatory variables covering macroeconomic and institutional factors. In contrast to the other studies, they specify the dependent variable in logarithms and address potential endogeneity of some of the explanatory variables through use of lagged or initial values. They find that economies that are larger and have greater domestic investor bases, measured by the size of the financial system, have larger domestic bond markets. Less flexible exchange regimes are associated with less domestic debt relative to foreign borrowing. Other relevant variables include inflation, fiscal burden, legal origin, and capital account openness.

Similarly, Jeanne and Guscina (2006) construct a data set on public domestic debt in 19 emerging economies, over the 1980–2002 period. They find that a country's history of high inflation has had a strong influence on the level of domestic currency debt.

More recently, Bae (2012) examines the determinants of bond market development, using data from 43 developing and developed countries over the 1990–2009 period, with a focus on China. This study distinguishes public, private, and financial bond markets. The main findings are that the degree of economic development, measured by GDP per capita, is the

most important variable. In government bond markets, the fiscal balance is robust, with higher deficits leading to larger bond markets. In financial bond markets, no variable is robust, except GDP per capita. In corporate bond markets, low interest rates, a large banking sector, and well-developed government bond markets are conducive to market development. Institutional quality does not seem important.

The only study to bring focus to corporate debt in sub-Saharan Africa is Adelegan and Radzewicz-Bak (2009), which applies the panel data framework of Eichengreen and Luengnaruemitchai (2004) to analyze the determinants of domestic debt market capitalization for 23 African countries, over the period 1990–2008. [7] They regress public and private debt stocks on various determinants, using generalized least squares, with correction for heteroskedasticity and autocorrelation. For the public debt stock, they find that the investment profile, exchange rate variability, no capital controls, and the fiscal balance are all positive and significant while the quality of the bureaucracy and the interest rate spread are negative and significant (Table 12, column 3 of their paper). For the private debt stock, they find that domestic bank credit, exchange rate variability, no capital controls, and the fiscal balance are positive and significant while GDP per capita and interest rate variability are negative and significant (Table 12, column 2 of their paper). Their sample size is limited, especially for the corporate bond market estimation, possibly compromising the robustness of the results.

The endogeneity of the explanatory variables has not generally been sufficiently addressed in the relevant literature. The assumption that explanatory variables are exogenous to bond market development may not be valid, making problematic the task of identifying determinants. For example, the fiscal balance drives debt stocks but the interest on an existing debt stock may drive the fiscal balance, especially if the debt stock is significant. Thus fiscal balance might be endogenous in the model. Similarly, we expect that the interest rate volatility and spread may be endogenous in a model explaining the debt stock. As such, the existing research is helpful, but further examination of the influence of accounting for potential endogeneity of some key explanatory variables would be warranted.

Our empirical specification draws upon Eichengreen and Luengnaruemitchai (2004), Eichengreen, Panizza, and Borensztein (2008), Adelegan and Radzewicz-Bak (2009), and Bae (2012). This study makes several contributions relative to this literature. First, it carefully distinguishes in its measurement of government securities market capitalization, marketable from non-marketable central bank debt. Debt associated with extension of

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[7] One of the key constraints on this research is the lack of any centralized database. Christensen (2005) collects data from national sources on domestic debt securities, covering effectively 20 African countries between 1980–2000; Abbas and Christensen (2007) extend this, using monetary survey data from 1975–2004; Panizza (2008) collects data from multiple sources on domestic and external debt over the period 1990–2007 for 130 countries, including 28 African countries. However, all these databases exclude corporate bonds— even though there are over 20 countries actively involved in issuing corporate debt over the past decade, with an increasing number of countries participating recently.

lending to government by the central bank may constitute a significant proportion of domestic government debt in African countries, yet may not provide an indication of the development of the domestic currency bond market. Second, this research provides a much more complete coverage of sub-Saharan African domestic government securities and corporate debt. The empirical investigation involves a large sample of observations, with 36 countries covered over the period 1980 to 2010 (Table 1). [8] Also, a database for corporate debt is developed for sub-Saharan Africa, which includes 24 countries that had active corporate bond markets over the period 1980 to 2010 (Table 2). Moreover, the intention is that this database may provide the groundwork for a fuller database in the future, which may be expanded regularly over time and as more countries become active within the corporate debt market. Third, this study contributes by employing a wide array of variables drawn from the existing literature (Table 3). Fourth, it confronts the issue of endogeneity by using generalized method of moments estimation.

III. CURRENT SITUATION OF GOVERNMENT SECURITIES AND CORPORATE BOND MARKETS IN SUB-SAHARAN AFRICA

This section presents stylized facts of local currency government securities and corporate bond markets in sub-Saharan Africa. It first provides an overview of the current status of these markets and their development relative to other developing and emerging market and advanced economies. Second, this section analyzes the recent evolution of these markets. Finally, it examines local currency bond market development in light of heterogeneity across the African continent.

Local currency bond markets in sub-Saharan African countries are still at a nascent stage of development with market capitalization of both government securities and corporate bonds typically much lower than those of other developing, emerging, and advanced economies as a percentage of GDP (Table 4 and Figure 1). The government securities market capitalization as a percent of GDP was 14.8 percent in 2010 in sub-Saharan Africa. In contrast, Asian and Central European countries surpass this measure, and generally speaking most Latin American countries do as well, excluding Argentina and Chile.

This disparity is even greater for corporate bonds. On average, the capitalization of corporate bonds was 1.8 percent of GDP in 2010 for these countries, whereas this figure was generally much larger for other developing and emerging economies, with the exception of Poland. Moreover, the low level of development of the bond market is particularly apparent upon comparison with the capitalization of more advanced economies, and, in the case of the

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[8] For some countries, there are no or insufficient domestic government debt data, whereas for other countries, we had concerns over data reliability and quality. Therefore, we restrict the analysis to 36 countries between 1980–2010. More precisely eight countries were dropped for the following reasons: Benin, Burkina Faso; and Equatorial Guinea (no government debt data); São Tomé (insufficient government debt data); Liberia, Mozambique, and Niger (inconsistencies with reported central bank lending); and Zimbabwe (unreliable data).

corporate bond market, the capitalization ranges from 26.5 percent of GDP for Canada to 98.6 percent for the United States.

Also evident is a notable disparity for sub-Saharan Africa in terms of the relative importance of government securities and corporate bonds in local currency. In this region, the local currency bond market is dominated by government securities, with a share of 89.2 percent of the total market capitalization, compared to the share of corporate bonds which stands at just 10.8 percent, in 2010. This contrasts with the situation in other areas of the world. Aside from Poland, the share of corporate bonds in total bonds in sub-Saharan Africa is smaller than in other developing and emerging economies.

We can also look at these data by subgroups (Table 5). We divide the sample into eight groups: South Africa; all sub-Saharan African countries in the sample excluding South Africa; Central African (or CEMAC) member states; West African (or WAEMU) member states; oil exporters; fragile countries that have recently emerged from conflict; low-income countries; and middle-income countries. [9, 10] With the exception of South Africa, these subgroups display both relatively low percentage capitalizations and a relatively less developed corporate bond market compared to the government securities market. The middle income countries have the most developed corporate bond market capitalization, followed by the WAEMU countries.

In recent years, the government securities market capitalization has tended to fall, with market capitalization falling from 18.7 percent of GDP in 2006 to as low as 14.1 percent in 2009 (Figure 2). Only in 2010, in the face of widening fiscal deficits, did average capitalization expand somewhat to 14.8 percent. In contrast, corporate bond market capitalization for sub-Saharan Africa has grown as a share of GDP from 1 percent in 2006 to 1.8 percent in 2010 (Figure 3). When taken together, the share of corporate bonds in total bonds has increased rather rapidly from just 5.1 percent in 2006 to 10.8 percent in 2010. Furthermore, the relative importance of corporate bonds as a source of finance is broad-based, because the trends are robust across the subgroups.

Table 6 breaks down this information further by country and time period 1990–2000 and 2001–10 to show that even within the subgroups, there may be considerable heterogeneity

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[9] Economic and Monetary Community of Central Africa (CEMAC) countries in the sample include: Cameroon, Central African Republic, Chad, Republic of Congo, and Gabon. West African Economic and Monetary Union (WAEMU) countries in the sample include: Ivory Coast, Guinea-Bissau, Mali, Senegal, and Togo. Oil exporters, fragile countries, low and middle income countries are taken from the International Monetary Fund classification of sub-Saharan African countries. Oil exporters include: Angola, Cameroon, Chad, Republic of Congo, Gabon, and Nigeria. Fragile countries include: Burundi, Central African Republic, Comoros, Democratic Republic of Congo, Ivory Coast, Eritrea, Guinea, and Guinea-Bissau. Low income countries include: Ethiopia, The Gambia, Kenya, Madagascar, Malawi, Mali, Rwanda, Sierra Leone, Tanzania, and Uganda. Middle income countries include: Botswana, Cape Verde, Ghana, Lesotho, Mauritius, Namibia, Senegal, Seychelles, South Africa, Swaziland, and Zambia.

[10] See Diouf and Boutin-Dufresne (2012) for development of WAEMU bond markets.

across sub-Saharan Africa. Countries with low government securities market capitalization include: Angola, Botswana, Burundi, Chad, Gabon, Guinea, Lesotho, Mali, Senegal, and Swaziland. Countries with a historically high government securities market capitalization are: Eritrea, Ethiopia, The Gambia, Mauritius, Seychelles, South Africa, and Uganda. Countries experiencing a substantial positive growth in government bond market capitalization include: Central African Republic, Guinea-Bissau, Mauritius, and Sierra Leone. Countries experiencing a substantial contraction in capitalization include: Republic of Congo, Nigeria, and South Africa, the former two perhaps reflecting strong oil revenues that have led to lower need for government financing.

There is less heterogeneity for the corporate bond market because most have a low capitalization, particularly for the earlier period, 1990–2000. The main exception is South Africa, which had a corporate bond market capitalization of 16.6 percent of GDP in the first period and 15.9 percent in the latter period. Both values are far in excess of those corresponding to other countries. Whereas certain countries have yet to become active in terms of issuing corporate debt (e.g., Angola, Burundi, Eritrea, The Gambia, Guinea, Lesotho, Seychelles, and Sierra Leone), strong growth is evident over these periods for certain countries, which have either issued a substantial amount of corporate debt for the first time (e.g., Ethiopia and Namibia), or whose pre-existing markets have experienced considerable expansion relative to income (e.g., Botswana, Guinea-Bissau, Mali, Nigeria, and Senegal).

The growth in the corporate bond market has recently been strong for many sub-Saharan African countries (Figures 4 and 5). Both the aggregate size and the number of countries with active markets has increased, with the capitalization climbing from approximately zero in 1989 to over 1.3 percent of GDP in 2010. However, South Africa has had a different experience. From 1989 to 2000, the South African capitalization as a percent of GDP declined from around 25 percent to less than 15 percent, which may be explained by the economic and political uncertainty surrounding the period corresponding to the end of the apartheid era in 1994. Since 2000, however, South Africa's bond markets have been on the road to recovery, and as of 2010, the corporate bond market capitalization climbed to almost 20 percent of GDP.

In sum, over recent years the corporate bond market has become an increasingly important component of the total bond market in the region. Although corporate bonds remain at a nascent stage of development, the market has been expanding in a consistent fashion. Moreover, the growth of corporate bonds relative to government securities suggests that the corporate bonds could in the future be a very important source of finance for many sub-Saharan African countries.

IV. ANALYTICAL FRAMEWORK

This section sets out the analytical framework, which extends the baseline econometric model of Eichengreen and Luengnaruemitchai (2004) to two-phase estimation under fixed effects to account for both time-variant and time-invariant variables. Furthermore, a generalized method of moments framework is introduced to account for possible endogeneity among the variables relevant to bond market development.

Baseline Econometric Model

Eichengreen and Luengnaruemitchai (2004) investigate the importance of a set of fundamental factors that they hypothesize are linked to bond market development. They classify the explanatory variables into a number of natural groups, including structural (economic size and trade openness), financial (size of the banking sector and the bank interest rate spread), developmental (income per capita and institutions), and macroeconomic (the overall fiscal balance, interest rate and exchange rate variability and whether capital controls are in place). In view of this, the model we employ is of the form:

[1] $Y_{i,t} = \alpha + \delta(\mu_i + \mu_t) + \sum_{k=1}^{K} \beta_k X_{i,kt} + \sum_{l=1}^{L} \gamma_l Z_{i,lt} + \varepsilon_{i,t}$

where $Y_{i,t}$ is the dependent variable, bond market capitalization (public or corporate bond market capitalization); $X_{i,t}$ are time-variant explanatory variables (GDP, trade openness, private sector credit, GDP per capita, institutional variables, fiscal balance, interest rate spread, interest and exchange rate variability, and capital account openness); $Z_{i,t}$ are time-invariant explanatory variables (area and legal origin); and μ_i and μ_t are country- and time-fixed effects respectively. [11] Country specific effects control for systematic differences across countries, including that the data come from different sources and differences in criteria for classifying corporate bonds, whereas time specific effects control for common shocks across countries, such as global shocks.

Several panel data models are employed along the lines of the above specification: pooled ordinary least squares (POLS), random effects (RE), and fixed effects (FE) models, with $\delta = 0$ in equation 1 in the pooled model, whereas if $\delta = 1$, the model collapses to a two-way specific effects model. Whereas a number of researchers employ the fixed effects model to account for differences across countries, this involves the assumption that the fixed effects are uncorrelated with regressors. However, if this assumption is violated, as is often the case, the estimator is biased in the same way as least squares estimates. Therefore, the specification above is flexible in its treatment of specific effects. Furthermore, because the standard fixed effects estimator does not identify the effect of time-invariant variables on

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[11] The definition and measurement of these variables are provided in more detail below.

bond market capitalization, an additional phase of estimation is introduced in the form of a regression of the estimated country-specific effects, $\hat{\mu}_i$, on $Z_{i,t}$ variables:

[2] $\quad \hat{\mu}_i = \theta + \sum_{l=1}^{L} \gamma_l Z_{i,lt} + \eta_{i,t}$

To account for endogeneity, we use generalized method of moments (GMM) estimators. The principle of this method is to choose instruments which satisfy a set of orthogonality conditions. We employ the system GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), which uses the baseline panel data specification of our model, including time dummies, to obtain a system of two equations: one differenced and one in levels. [12] Variables in levels in the second equation are instrumented with their own first differences, which usually increases efficiency. Endogeneity within the system is determined on a priori grounds on the basis of those variables which are most likely to be endogenous, although we explore different scenarios in this regard.

Thus the estimations, carried out using pooled, random and fixed effects methods, and generalized method of moments estimators, provide robust evidence on the model. We now discuss in more detail the definitions of key variables in the model.

Dependent Variables

Two variants of the dependent variable are constructed: a measure of government bond market capitalization (gdebt) and corporate bond market capitalization (cdebt). The first dependent variable is measured as the value of government domestically issued and marketable securities as a percentage of GDP. The second is the value of corporate bonds outstanding as a percentage of GDP. We note that government debt is central government debt while corporate debt includes bonds issues by corporate entities, which may have a relatively large share of state-sponsored or public enterprises, which are corporate in nature. In much of the region, there are few firms large enough to issue corporate debt on their own and thus much of the marketable corporate debt derives from public or quasi-public enterprises. Moreover, because the focus of this study is on bond market development as a market-based phenomenon, the exclusion of non-marketable debt implies the use of net rather than a gross measure of public debt to form the measure of government securities market capitalization.

Data for total outstanding domestic local currency government securities are obtained for the majority of countries from the International Monetary Fund's World Economic Outlook (WEO) database, with data for the remaining countries obtained either from the International Monetary Fund's International Financial Statistics (IFS) database or the World Bank's

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[12] We use stata-based programming for this econometric work and xtabond2 for the GMM estimation (see Rodman, 2006, for details of implementation).

African Development Indicators (ADI) database. Data for central bank lending to the government is obtained from the International Monetary Fund's Monetary and Financial Statistics (MFS) database.

Collection of the data for domestically issued corporate bonds required considerable effort, since no centralized database exists for sub-Saharan African countries. Data are collected for local currency corporate bonds, from multiple sources, the vast majority of which are primary sources, including: stock exchanges, securities commissions, capital market authorities and central banks. The sources often do not provide a full breakdown of the type of corporate bonds issued. Rather the total market capitalization is reported. These data may thus include parastatal, quasi-government, and supranational corporate bonds as well as those issued by financial institutions and multinational corporations. Furthermore, in a few cases data are obtained through secondary sources, including the African Development Bank and Adelegan and Radzewicz-Bak (2009) study. Similar, if not, identical figures are published by primary and secondary sources where data exist for both.

Independent Variables

The independent variables include measures of economic size (econsize), trade openness (tradeopen), banking sector size (credit), bank lending spread (spread), interest rate variability (intvol), exchange rate variability (xrvol), capital account openness (capopen), the fiscal balance (fiscal), economic development (gdpcap), law and order (laworder), corruption (corruption), investment profile (invprofile), bureaucracy (bureaucracy), composite risk (comprisk), countries whose legal origin is English (legalorigin), and country size in terms of land area (area). These factors are defined below and are discussed in light of their theoretical relationship with bond market development below. Tables 7a and 7b present simple correlations of the variables.

Economic size. Countries with smaller economic size are less likely to have well-developed bond markets because they would tend to lack the scale efficiencies required for deep and liquid markets. The typical amount of capital raised from issuance may be too small to attract multinational companies and foreign investors, for instance, and to justify inclusion by leading investment banks in global bond markets indices, in which case there will be no demand by investors to hold local securities in order to track the index (Eichengreen and Luengnaruemitchai, 2004). In addition, infrequent buying and selling would tend to lead to greater price volatility and discourage risk-average investors. GDP at purchasing power parity is employed as a suitable proxy for economic size and a country's area in squared kilometers as a proxy for geographic size. Data are obtained from the ADI database. Our priors are supported by the scatter plots of government and corporate bond market development on GDP in Figures 6 and 7, with a positive slope clearly evident in both cases.

Trade openness. It is argued that more open economies encourage securities market development because established interests may not be able to insist on policies that suppress

competing sources of supply when the economy is exposed to international competition (Rajan and Zingales, 2003). However, it may also be the case that countries which are less integrated with external economies have more incentive to develop domestic bond market markets in order to meet their financing needs (Adelegan and Radzewicz-Bak, 2009). Our priors on this variable are thus ambiguous. Following Eichengreen and Luengnaruemitchai (2004), trade openness is measured as the total exports of goods and services as a percentage of GDP. Data are obtained from the ADI database. Figure 8 points to a slightly positive association between trade openness and bond market development for government bonds while Figure 9 points to a negative association for corporate bonds. One explanation is that corporations in more closed economies may face external financing constraints that prompt greater domestic market development.

Banking sector size. Greater development of bank lending may discourage bond finance because in some ways the two are competitors. On the other hand, banks may seek bond markets to place surplus funds. And banks serve as dealers and market makers. They may thus foster development of a liquid and well-functioning bond market (Harwood, 2000 and Hawkins, 2002). As such, bank and bond finance could either be complements or substitutes. Following Levine and Zervos (1998), banking sector size is proxied by the private sector domestic credit as a percentage of GDP. Data are ADI database. Figures 10 and 11 indicate a positive association between bond market development and private sector credit in the domestic economy, which suggests complementarities.

Bank lending spread. We would expect the lending spread to be important to bond market development because interest rates, being the cost of debt, would be integrally linked to the willingness to borrow through debt issuance. Higher interest rates would discourage bond issuance. However, the bank lending spread, in contrast to the interest rate itself, could reflect the degree of competition and efficiency in the bank sector and thus, a higher spread could encourage the bond market, if it is associated with greater inefficiency (Eichengreen, Panizza, and Borensztein, 2008). The bank lending spread is measured by the bank signature lending rate minus LIBOR. Data are obtained from the ADI database and the British Bankers' Association. Figures 12 and 13 show a negative association between the bank lending spread and bond market capitalization.

Interest rate variability. Interest rate variability could be important if investors have different degrees of risk aversion. Interest rate variability may reduce the attractiveness of holding bonds for a risk-averse investor and a high degree of variability, with fixed-rate assets, would tend to preclude development of longer-term issues. Interest rate variability may also reflect a thin market. For this study, the standard deviation of interbank interest rates is employed as a proxy for interest rate variability. Since this variability may change over the sample, this measure is calculated as the logarithm of the standard deviation over 10-year periods. In addition, where the interbank rate is not available, as is the case for a number of countries, the treasury bill rate is used instead. Data are obtained from the IFS database. Figures 14 and 15 reveal mixed outcomes for government and corporate bond markets, with a positive

relation evident for the former and a negative one for the latter. Thus volatility seems to discourage corporate debt but may appear to have less influence on government debt markets. This is likely because corporate bonds are driven more by market forces while governments often tend to enjoy caped investor base in underdeveloped financial markets such as Africa.

Exchange rate variability. Similarly, exchange rate variability could be relevant to participants in financial markets, with several countervailing effects on bond market development. On the one hand, pegged or relatively fixed exchange rates may encourage foreign investors to demand for bonds, which would encourage bond market development but could on the other hand lead some to underestimate the risk of lending to banks and corporations and the resulting foreign competition may slow the development of domestic intermediation (Goldstein, 1998). To measure the exchange rate variability, the standard deviation of the change in the logarithm of the nominal exchange rate is calculated. As for the case of interest rate variability, the calculation of the standard deviation is over 10-year periods to account for changes in volatility over the sample period. Data are from the IFS database. Figures 16 and 17 reveal mixed outcomes for government and corporate bond markets, with a negative relation evident for the former and a positive one for the latter. Thus exchange rate volatility seems not implausibly to encourage domestic debt markets.

Capital account openness. Capital account openness may also be relevant to bond market development. On the one hand, some have suggested that openness to foreign portfolio investment enhances governance quality of local corporations and access of domestic debt to foreigner investors (Adelegan and Radzewicz-Bak, 2009). On the other hand, capital controls may provide an incentive for governments and firms to source finance from local rather than external capital markets. The Chinn-Ito Index, developed by Chinn and Ito (2006), is employed to proxy for capital account openness. This measure is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER), including indications of the presence of multiple exchange rate regimes, current account transactions, capital account transactions, and the requirement of the surrender of export proceeds (a higher number indicating a more closed account). While containing variation over time and referring to the intensity of capital controls, the index has a relevant coverage of countries and time period for this study. The index is updated to 2010. Figures 18 and 19 reveal mixed outcomes for government and corporate bond markets, with a positive relation evident for the former and a negative one for the latter. Taking stock, we see that the government bond market is more developed in cases where the exchange rate is less volatile and capital controls are weaker, whereas the corporate bond market is more developed for countries with more volatile exchange rates and stronger capital controls.

Fiscal balance. Fiscal policy can affect bond market development in several ways. On one hand, according to Harwood (2000), a well-developed government securities market may indirectly promote the development of a corporate bond market in that it "helps promote a

class of dynamic, profitable fixed-income dealers" (p. 13). On the other hand, a large supply of government debt securities may crowd out private debt securities, slowing corporate bond market development. Therefore, according to these arguments the relationship is theoretically ambiguous. The measure of fiscal balance in this study is calculated as a three-year moving average of past budget balances. As has been noted in the literature, the moving average of past budget balances is preferable to many alternative measures, especially a single year, because the budget balance in a single year may be dominated by transient factors (Eichengreen and Luengnaruemitchai, 2004). Data are obtained from the ADI database. Figures 20 and 21 reveal a negative association between fiscal balance and capitalization of the government and corporate bond markets, a not implausible result for government debt markets and suggestive of complementarities between government and corporate debt markets.

Economic development. There are a number of reasons why economic development may foster bond market development. For example, less developed countries have volatile investment environments and governments are typically heavily involved in commercial activity. Second, less developed countries often have weak creditor rights, inadequate transparency, and poor corporate governance. For instance, La Porta et al. (1998) argue that the rule of law varies as a function of GDP per capita. Therefore, GDP per capita can be thought of as capturing these aspects of underdevelopment in the event that they are not fully captured by other explanatory variables. Data are obtained from the ADI database. Figures 22 and 23 confirm these priors, with both showing a positive empirical link between GDP per capita and bond market development.

Law and order.[13] La Porta et al. (1998) predict that common law systems in the British tradition, which are thought to offer stronger investor protection than systems in the French civil law tradition, should promote the development of financial markets. Furthermore, countries with English legal systems are more likely to have market-based financial systems while countries with legal systems based on civil law are more likely to have bank-based financial systems (Levine and Demirguc-Kunt, 1999). To proxy for strength of the legal system, two measures are employed. First, a dummy variable is constructed, indicating whether a country's legal origin is English, based on data published in the CIA World Factbook (English origin takes value 1 and non-English origin a value of 0). Second, the International Country Risk Guide's (ICRG's) index of law and order is employed, which is based on the aggregation of two separate assessments for law and order, with each sub-component comprising zero to three points. The law sub-component is an assessment of the strength and impartiality of the legal system, while the order sub-

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[13] Additionally, we use a composite risk index, c*omprisk$_{i,t}$*, instead of the separate factors for law and order, investment profile, corruption, and bureaucracy. This composite measure, which is discussed further below, is based on multiple factors, including the aforementioned institutional variables and can be thought of as capturing these aspects of underdevelopment above and beyond that captured by our other explanatory variables.

component is an assessment of popular observance of the law. Thus, a country can enjoy a score of 6, which equates to a very high level of law and order, or a rating of 0, which indicates instead a very low level. The advantage of the ICRG measure over the dummy variable approach is that it is provided annually and on a country-by-country basis, hence it also contains information on the evolution of law and order, while distinguishing between countries which have the same legal traditions. Figures 24 and 25 suggest a slight advantage to government bond markets and slight disadvantage to corporate bond markets, where there is stronger law and order, the latter a somewhat surprising result. Figures 28 and 29 suggest that English legal origin has a slight positive association with government and corporate bond market capitalization, consistent with priors.

Corruption. Corruption is a threat to investment since it distorts the economic and financial environment and introduces instability into the political process. Corruption within the financial sector also makes it more difficult to conduct business effectively, and could force the withdrawal or withholding of investment, whereas corruption may also undermine law enforcement. This indicates a negative association between corruption and bond market development. The ICRG index of corruption is employed for this study, which provides an indication of corruption within the political and financial system. A corruption index score of 6 points equates to very low corruption and a score of 0 indicates very high corruption. Figures 26 and 27 suggest that this variable has a slight negative relation with government bond markets and a strongly positive relation with corporate bond market capitalization.

Investment profile. Bonds are a way for investors to limit risk, since entities issuing bonds are generally of higher credit quality than those issuing equity claims (Harwood, 2000). It may not always be the case, however, that there are sufficient high quality issuers with sound business models and records of financial prudence. The ICRG measure of investment profile is employed, which provides an assessment of factors affecting the risk to investment. The risk rating assigned is the sum of three subcomponents (contract viability/expropriation, profits repatriation, and payment delays), each with a maximum score of 4 points and a minimum score of 0 points. For the aggregate index, a score of 12 points equates to very low risk for investors and a score of 0 points to very high risk. As expected, a positive empirical association is evident from Figures 30 and 31 suggest that countries scoring more highly in terms of investment profile having more developed bond markets.

Bureaucracy. If bureaucracy, governance, and regulation are weak, investors will be reluctant to take positions in markets characterized by opportunistic participants and delivery risk. Moreover, elements of an adequate regulatory framework include disclosure standards, penalties for accountants and auditors providing false information, and sanctions for insider trading and market manipulation, whereas a clear and consistent implementation of regulations may also be important. To proxy for bureaucracy and governance, the ICRG measure of bureaucracy is employed, which provides an assessment of the institutional strength and quality of the bureaucracy over time and across countries. A score of 4 points equates to very high institutional strength and quality of the bureaucracy and a score of 0 is

very unfavorable. Figures 32 and 33 show a positive empirical association, with countries scoring more highly in terms of bureaucracy having more developed bond markets.

Country size. Countries that are larger may achieve significant economies of scale in domestic markets and thus would tend to have more developed markets for a range of goods and services, including financial services. We would thus expect larger countries to have more developed corporate bond markets. The result for government bonds might be more ambiguous because small countries would need to rely more heavily on public funding. Figures 34 and 35 suggest that larger countries have relatively small government bond markets and relatively large corporate bond markets.

Comprisk. This variable is a composite of law and order, corruption, investment profile, and bureaucracy variables. It is the sum of the index value and because all the variables are defined with the better outcome as a higher number, the higher the value of this variable, the better the quality of institutions or the lower the risk. Figures 36 and 37 suggest that higher quality institutions or lower risk stimulate bond market development.

Endogeneity

In principle, a number of variables considered in this study could both depend on and influence each other. We hypothesize that the endogenous variables are: the dependent variables, bond market capitalization ($gdebt_{i,t}$ or $cdebt_{i,t}$), and then several of the explanatory variables, interest rate variability ($intvol_{i,t}$), bank interest rate spread ($spread_{i,t}$), and fiscal balance ($fiscal_{i,t}$). Our estimation is a reduced form, which takes into account both demand and supply side factors. Focusing first on the two interest rate variables, both demand and supply for bonds depend on prevailing market interest rates. However, the government also has the capacity to influence market rates. Hence the supply of bonds could drive interest rates and thus there is reverse causality from bonds to interest rates. Focusing on the fiscal balance, in Africa, many governments are constrained in their ability to borrow. Hence the size of the fiscal deficit may be driven by the availability of debt finance. Hence for all three variables, we employ a generalized method of moments estimator to take account of potential endogenous relationships.

V. EMPIRICAL FINDINGS

Tables 8a and b and 9a and b present the results of the estimation for government securities and corporate bond market capitalization under pooled, random effects, fixed effects, and GMM estimations. For each model, three separate estimations are undertaken, one without the risk variables and two with the risk variables, one in which the four variables are entered separately and one in which the composite variable is used. There is a significant loss of sample when we use the risk variables, and thus we present all three results. The outcomes are reported in the "a" tables in columns 1–9 under least squares, random effects, and fixed effects, and in the "b" tables for the GMM estimations. The two variants of the GMM estimation make different endogeneity assumptions. The A1 and A2 estimations assume only

the fiscal balance is endogenous and the B1 and B2 assume that the fiscal balance, interest rate variability, and interest rate spread are endogenous.

Government Securities Markets

Table 8a presents our initial exploration making use of pooled or least squares, random effects, and fixed effects regression, with three variants of each in terms of explanatory variables. We find two variables, spread and fiscal balance, have a consistent negative sign and are significant. These results suggest that a larger interest rate spread discourages government securities market capitalization and as the fiscal balance improves, there is less need for a government securities market. The latter result is intuitive, while the former suggests that market interest rates may move in step, and when bank rates increase, treasury rates rise as well, hence the larger spread discourages government securities issuance.

Observation of the estimated coefficients under the random effects and fixed effects models indicates that the results are similar, for the significant variables. The Hausman test, provided in these tables, indicates a general preference for the fixed effects over the random effects specification.

Focusing on the fixed effects results, we find that in addition to the spread and fiscal balance variables, economic size has a negative effect on the government securities market, consistent with the idea that larger economies facilitate greater options for government funding and thus there is less reliance on government securities markets. Trade openness is negative and significant, but only when the risk variables are included. Capital account openness is negative and significant as well. These results suggest that more open economies facilitate greater financing options and thus discourage domestic financing markets. Bank credit share in the economy produces inconsistent estimates. In the specification in which the risk variables are included, the coefficient is negative, but only significant when the risk variables are specified separately, weakly suggestive of the idea that private market development may crowd out government securities. Exchange rate volatility is negative and significant, plausibly suggesting that volatility with regard to the external value of domestic interest payments discourages development of domestic bond markets. Legal origin is positive and significant suggesting that English origin encourages government securities markets, the expected result. The composite risk variable is positive and significant, suggesting that countries with relatively low risk environments or stronger institutions have more developed government securities markets. Among the four variables in the composite index, law and order appears to have the strongest effect. Area is negative and significant, but only when the risk variables are excluded. Altogether, the results are generally plausible and suggest that government policies to ensure a sound macroeconomy and better institutions promote government securities markets.

Turning to the GMM estimations in Table 8b, we find a high degree of similarity of the results under the two different specifications. [14] Focusing thus on the specification "B" with the assumption about endogeneity of fiscal balance, interest rate volatility, and interest rate spread, we find a high degree of similarity with the fixed effects estimations, especially with regard to the negative spread, and negative and significant fiscal balance, exchange rate volatility, and trade and capital openness variables and the positive and significant legal origin, composite risk, and law and order variables. Interestingly, we obtain a positive effect of economic size, in contrast to the earlier negative result, and now find that GDP per capita is negative and significant after controlling for risk, whereas previously it was not significant. Interest rate volatility is now positive, which may reflect that securities markets are preferred to some other forms of financing, such as bank loans, when there is high interest rate volatility. Finally, land area is now negative and significant, suggesting larger countries have less need of government securities markets.

Corporate Bond Market

Table 9a presents our initial exploration for the corporate bond market, making use of three estimation procedures with three variants of explanatory variables, as in the government markets estimation. The sample is notably smaller, because we use only those countries with active bond markets, 24 as opposed to the 36 countries used for the government securities markets, and with complete data. We find that economic size and GDP per capita are generally positive and significant, the latter consistently so, suggesting that larger and more developed economies are more likely to have corporate bond markets, consistent with our expectations. Interestingly, there are no other variables that are consistent in sign and significance across the variations. In addition, the specification tests indicate whether the random or fixed effects model is the preferred specification and in this case, the Hausman test suggests the random effects model is more appropriate.

Focusing, thus, on the random effects outcome, we find that in addition to economic size and GDP per capita, land area is positive and significant, in the specification with the composite risk variable, while the comprisk variable is negative and significant. The former result is intuitively plausible, while the latter result is surprising but may given the earlier result that lower risk encouraged government securities markets, suggest some degree of substitutability of these markets with corporate bond markets. When disaggregating the risk variable, we find that bureaucratic quality has a positive and significant effect on corporate bond markets, which is plausible. The macroeconomic policy and openness variables are not significant, and credit share in the economy is negative and significant, only in the regression without risk variables. In short, in contrast to the government securities market, we find that there are fewer variables that are significantly linked to corporate bond market capitalization, but we

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[14] We also explore using different lag lengths and subsets of the instruments and find results are quite robust to changes.

do find the plausible result that economic size has a positive relationship and the somewhat unintuitive result that lower risk or better quality of institutions exerts a drag on corporate bond market development, which may reflect some substitutability between government securities and corporate bond markets. The results thus suggest that government influences corporate bond market development indirectly through speeding up economic growth but that specific policies are less clearly linked to corporate bond market development.

Turning to the GMM estimations in Table 9b, we find that controlling for endogeneity of some key policy variables enlarges the number of factors that are significantly related to corporate bond market development. Focusing thus on the specification "B" with the assumption about endogeneity of fiscal balance, interest rate volatility, and interest rate spread, we find that similar to the random effects estimations, economic size and GDP per capita are positive and significant, and generally, land area is as well. In contrast to the earlier random effects findings, we find that trade openness is negative, consistent with the findings for government securities markets, and capital account openness has a positive effect, in the regressions that control for risk (and a negative effect otherwise). Interestingly, credit share in the economy now has a strongly significant effect on corporate bond market development, suggesting that these bond markets thrive where credit's role in the economy is already well established. Interest rate spread exerts a negative effect in the regressions that control for risk, whereas interest rate volatility has a mixed effect across "B" specifications. Furthermore, as fiscal balance improves, corporate bond market development lags, though the variable is not always significant. In contrast to the earlier findings for the government securities market, legal origin in non-English origin countries leads to greater development of the bond market and law and order and lower corruption are positively related, more intuitive results than the negative relation of the risk variables in the random effects estimation. Altogether, the results display greater variation between the random effects and GMM estimates than for the government securities market. Nonetheless, there are a number of plausible results, mainly centered on larger size and greater development of the economy leading to more developed corporate bond markets. Credit market development is complementary to bond market development. Reduced risk or improved institutions appears to exert a positive effect here as in the government securities markets. The policy variables show a more mixed pattern.

Although previous results obtained using specific effects models generally concur with those obtained using GMM estimation, evidently there are some differences in view of the discussion above. Moreover, as is formalized by Hausman test outcomes reported in Tables 8b and 9b, these differences are sufficient to suggest that GMM estimation is helpful in addressing endogeneity. [15]

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[15] Diagnostic evaluation of relevant test statistics reported in Tables 8b and 9b suggests that GMM findings are useful since the null hypothesis of the Arellano-Bond AR tests for estimation consistency and Hansen test for instrument validity are typically not rejected.

Sensitivity and Robustness

To investigate the robustness of the results, we present Table 10, which uses the GMM estimates with the four endogenous variables and the composite risk variable, for both the government securities and corporate bond market results, to assess the sensitivity of the results to changes in the sample. Columns (1) through (6) of each dependent variable are run with different samples, the first column reflecting the baseline result from Tables 8b or 9b, and then the subsequent columns reflecting a truncated period, 1993–2010, all countries excluding South Africa, all countries excluding fragile states, all countries excluding WAEMU states, and all countries excluding CEMAC states. [16] The results suggest a fairly high degree of similarity across the different estimations, bolstering the robustness of the results presented in Tables 8 and 9.

VI. CONCLUDING FINDINGS AND POLICY IMPLICATIONS

Concluding Findings

This paper contributes to our understanding of sub-Saharan African government securities and corporate bond markets. While African countries have relied on government securities for financing fiscal deficits, domestic securities markets remain underdeveloped and most countries are overly dependent on foreign borrowing and bank borrowing, a few still from their central banks. Corporate bond markets remain at a nascent stage of development in most sub-Saharan African countries and, with the exception of South Africa, are small. In recent years, however, corporate bond markets have begun growing steadily and look set to become ever more important as a source of finance in the future, as African countries attempt to close the infrastructure and development gap with more advanced economies.

Our results suggest that it is useful to look separately at government securities and corporate bond markets in sub-Saharan African countries. Turning first to government securities markets, we find that, using a GMM specification, a combination of structure, policy, and institutions variables appear to exert a statistically significant effect on government securities markets. The interest rate spread, the fiscal balance, exchange rate volatility, trade and capital openness variables, and land area are negatively correlated with the development of the market, while English legal origin, lower composite risk (or better institutions), law and order, and domestic interest rate volatility variables are positively correlated. Generally speaking, these results are intuitive. Our results present a contrast with those in Eichengreen and Luengnaruemitchai (2004) and Adelegan and Radzewicz-Bak (2009), the two most comparable studies. Eichengreen and Luengnaruemitchai find a positive effect of GDP at purchasing power parity, exports, and an open capital account, while we find the former not significant and the latter two variables negative. However, the results are similar in that the interest rate spread, exchange rate volatility, and fiscal balance are negative. Adelegan and

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[16] These country groups have regional stock exchanges.

Radewicz-Bak (2009) find fairly dissimilar results, especially that an improved fiscal balance encourages the government securities market.

Turning next to corporate bond markets, we find that, using a GMM specification, a somewhat narrower set of significant variables. We find that economic size, GDP per capita, and land area are positive and significant, suggesting, in contrast to the government securities market findings, that large size, however measured, appears to be the key factor. We find that trade openness is negative, consistent with the findings for government securities markets, but capital account openness has a positive effect, in the regressions that control for risk. Interestingly, credit share in the economy now has a strongly significant effect on corporate bond market development, suggesting that corporate bond markets thrive in economies where credit is well entrenched. Interest rate spread exerts a negative effect, in the regressions that control for risk, whereas interest rate volatility has a mixed effect. An improving fiscal balance appears to set back corporate bond markets, though the variable is not always significant. In contrast to the earlier findings for the government securities market, legal origin in non-English origin countries leads to greater development of the bond market and law and order and lower corruption are positively related. When compared to previous results in Eichengreen and Luengnaruemitchai (2004), they find comparable results for the importance of economic size and credit share, and interestingly, the same negative effect of English origin. Adelegan and Radzewicz-Bak (2009) also find that credit share is positive but find that economic size, measured by GDP per capita, is negative, a contrasting result.

Policy Implications

From the above exercise, we can draw the following policy implications. Sub-Saharan African governments should strive to develop their economies and this will in turn lead to greater corporate bond market development and deeper government securities markets, which will have a virtuous influence on economic development. Both corporate and government securities market development benefits from improved macroeconomic policies and institutions.

Table 1. Countries in the Sample, Definition of Variables and Sources

Countries in the Sample

Angola	Congo, Rep.	Kenya	Senegal
Botswana	Cote d'Ivoire	Lesotho	Seychelles
Burundi	Eritrea	Madagascar	Sierra Leone
Cameroon	Ethiopia	Malawi	South Africa
Cape Verde	Gabon	Mali	Swaziland
Central African Rep.	Gambia, The	Mauritius	Tanzania
Chad	Ghana	Namibia	Togo
Comoros	Guinea-Bissau	Nigeria	Uganda
Congo, Dem. Rep.	Guinea	Rwanda	Zambia

Definition of Variables and Sources

Variable	Description	Sources
Dependent Variable		
Gdebt	Government securities market capitalization (percent of GDP)	International Monetary Fund, WEO and IFS; World Bank, ADI
Cdebt	Corporate bond market capitalization (percent of GDP)	As listed in Table 2
Independent Variables		
Econsize	GDP, PPP (US$ billions)	World Bank, ADI
Tradeopen	Total exports including goods and services (percent of GDP)	World Bank, ADI
Credit	Domestic credit to private sector (percent of GDP)	World Bank, ADI
Gdpcap	GDP per capita, PPP (US$ thousands)	World Bank, ADI
Spread	Bank interest rate spread (lending rate minus LIBOR)	World Bank, ADI and British Bankers' Association
Intvol	Standard deviation of log of interbank rate	International Monetary Fund, IFS
Xrvol	Standard deviation of log first difference of nominal exchange rate (local currency per US$)	International Monetary Fund, IFS
Capopen	Chinn-Ito Index integrated IMF measure for capital account openness	Chinn and Ito (2008)
Fiscal	Three year moving average of overall fiscal balance including grants (percent of GDP)	World Bank, ADI
Area	Country size (square kilometers in thousands)	World Bank, ADI
Comprisk	Composite political, economic and financial risk	ICRG
Bureaucracy	Quality of bureaucracy	ICRG
Corruption	Corruption within political system	ICRG
Invprofile	Risk to investments	ICRG
Laworder	Strength of legal system	ICRG
Dummy Variables		
Legalorigin	Value of 1 for country with an English legal origin, 0 otherwise	CIA World Factbook 2010

Table 2. Sub-Saharan Africa Corporate Bond Market Database, 1980–2010

Country	Securities Exchange	Activity	Source
Botswana	Botswana Stock Exchange	1997–2010	MCM (2009), Botswana Stock Exchange
Cameroon	Dar es Salaam Stock Exchange, BVMAC[1]	2005–2010	African Development Bank
Cape Verde	Bolsa de Valores de Cabo Verde	2007–2010	Bolsa de Valores de Cabo Verde
CAR[2]	BVMAC	2007–2010	African Development Bank
Chad	BVMAC	2007–2010	African Development Bank
Congo, Rep.	BVMAC	2007–2010	African Development Bank
Cote d'Ivoire	BRVM[3]	1999–2010	BRVM Regional Securities Exchange
Ethiopia	None	2006–2010	National Bank of Ethiopia
Gabon	BVMAC	2007–2010	African Development Bank
Ghana	Ghana Stock Exchange	1996–2010	Ghana Securities Exchange Commission
Guinea-Bissau	BRVM	1999–2010	BRVM Regional Securities Exchange
Kenya	Nairobi Stock Exchange	1996–2010	Kenya Capital Markets Authority
Mali	BRVM	1999–2010	BRVM Regional Securities Exchange
Mauritius	Stock Exchange of Mauritius	1990–2006	Mauritius Stock Exchange
Namibia	Namibia Stock Exchange	2001–2010	Bank of Namibia, Namibian Stock Exchange
Nigeria	Nigerian Stock Exchange	1981–2010	MCM (2009), Securities Exchange Commission
Rwanda	Rwanda Stock Exchange	2008–2010	Rwanda Stock Exchange
Senegal	BRVM	1999–2010	BRVM Regional Securities Exchange
South Africa	Bond Exchange of South Africa	1989–2010	Bank for International Settlements
Swaziland	Swaziland Stock Exchange	1990–2010	Central Bank of Swaziland
Tanzania	Dar es Salaam Stock Exchange	2002–2010	MCM (2009), Dar es Salaam Stock Exchange
Togo	BRVM	1999–2010	BRVM Regional Securities Exchange
Uganda	Uganda Securities Exchange	1998–2010	Uganda Capital Markets Authority
Zambia	Lusaka Stock Exchange	2000–2010	Lusaka Stock Exchange

Source: IMF staff compilations.

[1] BVMAC is the Bourse Régionale des Valeurs Mobilières d'Afrique Centrale.

[2] CAR is the Central African Republic.

[3] BRVM is the Bourse Régionale des Valeurs Mobilières.

Table 3. Descriptive Statistics, 1980–2010[1]

Variable	Mean	Std. Dev.	Min	Max
Gdebt (percent of GDP)	17.36	16.74	0.06	127.79
Cdebt (percent of GDP)	2.31	4.65	0.00	24.82
Econsize (US$ billions)	22.24	57.46	0.19	524.20
Tradeopen (percent of GDP)	31.88	20.13	3.21	119.30
Credit (percent of GDP)	18.73	20.73	0.00	161.91
Gdpcap (US$ thousands)	2.21	3.26	0.21	23.07
Spread	12.83	17.05	-8.50	210.61
Intvol (standard deviation of the log of the interbank rate)	0.31	0.22	0.00	1.66
Xrvol (standard deviation of the log change in the nominal exchange rate)	0.20	0.19	0.06	1.49
Capopen (Chinn-Ito Index)	-0.75	1.06	-1.86	2.46
Fiscal (three-year moving average, percent of GDP)	-5.76	7.77	-45.11	17.34
Area (square kilometers in thousands)	468.77	522.71	0.46	2267.05
Bureaucracy (range 0-4)[2]	1.50	0.91	0.00	4.00
Comprisk (range 0-100)	57.51	10.43	25.50	84.70
Corruption (range 0–6)	2.56	0.96	0.00	6.00
Invprofile (range 0–12)	6.56	1.97	0.00	6.00
Laworder (range 0–6)	2.91	1.14	0.00	6.00
Legalorigin (1 is English origin and 0 is non-English)	0.37	0.48	0.00	1.00

Sources: IMF staff compilations based on data from IMF IFS, WEO and World Bank, ADI; and national sources for corporate bond market capitalization as set out in Table 2.

[1] This is based on the full 36 country sample as in Table 1.

[2] Higher values for bureaucracy, comprisk, corruption, invprofile, and laworder provide a more favorable indication for institutional quality than lower values.

Table 4. Bond Market Capitalization Comparison, 2010

Region	Country	Market Capitalization (percent of GDP)		Contribution to Total Domestic Debt (percent)	
		Government	Corporate	Government	Corporate
Developing Countries and Emerging Markets					
Africa	All	14.8	1.8	89.2	10.8
	South Africa (SA)	31.2	20.0	60.9	39.1
	All excluding SA	14.2	1.3	91.8	8.2
	CEMAC	10.5	0.7	93.8	6.3
	WAEMU	14.1	2.3	86.0	14.0
	Oil exporters	7.7	1.1	87.5	12.5
	Fragile countries	18.4	1.2	93.9	6.1
	Low income	15.3	1.1	93.3	6.7
	Middle income	15.1	3.5	81.2	18.8
Asia	China	27.3	22.8	54.5	45.5
	Hong Kong	35.9	13.8	72.2	27.8
	Malaysia	57.3	57.0	50.2	49.8
	South Korea	43.8	59.5	42.4	57.6
	Thailand	50.5	12.8	79.7	20.3
Latin America	Argentina	13.3	2.6	83.7	16.3
	Brazil	39.4	22.7	63.4	36.6
	Chile	13.1	17.0	43.5	56.5
	Mexico	22.6	17.1	56.9	43.1
Central Europe	Czech Republic	23.3	11.2	67.5	32.5
	Hungary	57.3	7.0	89.1	10.9
	Poland	42.6	1.8	95.9	4.1
Developed Countries					
Global	Australia	27.4	51.0	35.0	65.0
	Canada	63.2	26.5	70.5	29.5
	Japan	205.4	37.8	84.5	15.5
	United States	75.7	98.6	43.4	56.6
	Europe	55.8	46.4	54.6	45.4

Sources: IMF staff compilations based on data from IMF IFS, WEO and World Bank, ADI; BIS; and national sources for corporate bond market capitalization as set out in Table 2.

Table 5. Sub-Saharan Africa Bond Market Capitalization, 2006–10

	Group	Year				
		2006	2007	2008	2009	2010
Government Securities	All	18.7	15.4	14.6	14.1	14.8
Market Capitalization	South Africa (SA)	27.3	23.9	22.4	27.0	31.2
(percent of GDP)	All excluding SA	18.4	15.1	14.3	13.7	14.2
	CEMAC	15.5	13.8	11.3	10.4	10.5
	WAEMU	14.8	14.7	15.6	12.7	14.1
	Oil exporters	9.7	8.9	9.1	9.1	7.7
	Fragile countries	20.1	18.5	19.0	18.4	18.4
	Low income	22.6	17.2	16.5	16.5	15.3
	Middle income	19.9	14.7	12.7	12.2	15.1
Corporate Bond Market	All	1.0	1.5	1.5	1.7	1.8
Capitalization	South Africa	18.2	19.4	19.2	19.9	20.0
(percent of GDP)	All excluding SA	0.5	0.9	1.0	1.2	1.3
	CEMAC	0.0	0.2	0.6	0.9	0.7
	WAEMU	1.6	2.2	2.3	2.5	2.3
	Oil exporters	0.2	0.3	0.6	0.8	1.1
	Fragile countries	0.6	0.9	1.0	1.1	1.2
	Low income	0.5	0.8	0.8	0.9	1.1
	Middle income	2.3	3.2	3.1	3.4	3.5
Contribution of Corporate	All	5.1	8.9	9.3	10.8	10.8
Bonds to Total Bonds	All excluding SA	2.7	5.9	6.7	7.8	8.2
(percent)	South Africa	39.9	44.7	46.1	42.4	39.1
	CEMAC	0.0	1.4	5.0	8.0	6.3
	WAEMU	9.8	13.0	12.8	16.4	14.0
	Oil exporters	2.0	3.3	6.2	8.1	12.5
	Fragile countries	2.9	4.6	5.0	5.6	6.1
	Low income	2.2	4.4	4.6	5.2	6.7
	Middle income	10.4	17.9	19.6	21.8	18.8

Sources: IMF staff compilations based on data from IMF IFS, WEO and World Bank, ADI; and national sources for corporate bond market capitalization as set out in Table 2.

Table 6. Sub-Saharan African Bond Market Capitalization, 1990–2000 and 2001–10[1]

Country	Government Securities Market Capitalization (percent of GDP)		Corporate Bond Market Capitalization (percent of GDP)	
	1990–2000	2001–10	1990–2000	2001–10
Angola	0.09	5.17	0.00	0.00
Botswana	12.97	4.88	0.07	2.02
Burundi	7.76	6.46	0.00	0.00
Cameroon	19.71	11.78	0.00	0.10
Central African Republic	0.00	14.03	0.00	0.21
Chad	1.49	5.73	0.00	0.05
Congo, Rep.	26.91	6.73	0.00	0.04
Cote d'Ivoire	19.13	12.33	0.01	0.40
Eritrea	57.77	54.62	0.00	0.00
Ethiopia	21.78	28.42	0.00	1.71
Gabon	4.49	8.62	0.00	0.52
Gambia	26.78	29.84	0.00	0.00
Guinea-Bissau	17.53	17.27	0.01	0.08
Ghana	13.74	28.17	0.04	3.47
Guinea	9.63	8.44	0.00	0.00
Kenya	15.02	20.84	0.03	0.46
Lesotho	4.46	9.25	0.00	0.00
Mali	2.38	2.05	0.02	1.42
Mauritius	22.76	32.39	0.23	0.20
Namibia	16.41	18.21	0.00	1.54
Nigeria	21.61	7.44	0.29	1.11
Rwanda	18.81	10.88	0.00	0.01
Senegal	0.11	2.54	0.05	0.99
Seychelles	55.02	81.18	0.00	0.00
Sierra Leone	7.83	28.50	0.00	0.00
South Africa	39.22	29.38	16.55	15.94
Swaziland	0.95	1.84	0.76	0.85
Uganda	39.99	40.30	0.04	0.20
Sub-Saharan Africa	17.30	18.83	0.65	1.12

Sources: IMF staff compilations based on data from IMF IFS, WEO and World Bank, ADI; and national sources for corporate bond market capitalization as set out in Table 2.

[1] This table excludes certain countries for which bond market capitalization data are not available over either 1990–2000 or 2001–10.

Table 7a. Correlation Matrix[1]

	Gdebt	Econsize	Tradeopen	Gdpcap	Credit	Intvol	Spread	Xrvol	Fiscal	Capopen	Area	Legalorigin	Invprofile	Laworder	Corruption	Bureaucracy	Comprisk
Gdebt	1.000																
Econsize	0.069	1.000															
Tradeopen	0.051	0.010	1.000														
Gdpcap	0.287	0.175	0.627	1.000													
Credit	0.201	0.682	0.122	0.346	1.000												
Intvol	0.176	0.079	-0.045	-0.080	-0.042	1.000											
Spread	-0.095	0.018	0.142	-0.042	-0.137	0.460	1.000										
Xrvol	-0.072	0.009	-0.041	-0.087	-0.128	0.265	0.243	1.000									
Fiscal	-0.201	0.169	0.293	0.257	0.043	-0.137	-0.062	-0.122	1.000								
Capopen	0.238	-0.062	0.194	0.340	0.079	0.076	0.113	-0.104	0.001	1.000							
Area	-0.163	0.342	-0.139	-0.091	0.076	0.229	0.142	0.433	0.086	-0.119	1.000						
Legalorigin	0.096	0.310	-0.157	-0.068	0.112	0.303	0.086	0.050	0.058	0.110	0.134	1.000					
Invprofile	0.127	0.226	0.073	0.379	0.379	-0.136	-0.085	-0.306	0.288	0.279	-0.053	0.189	1.000				
Laworder	0.156	-0.135	-0.065	0.110	0.057	0.061	-0.021	-0.187	-0.033	0.199	0.073	0.259	0.341	1.000			
Corruption	-0.030	-0.100	-0.261	-0.137	0.059	-0.170	-0.085	0.102	-0.136	0.052	0.152	-0.100	-0.067	0.207	1.000		
Bureaucracy	0.108	0.087	-0.035	0.257	0.245	-0.143	-0.217	-0.105	-0.124	0.244	-0.001	0.092	0.245	0.237	0.225	1.000	
Comprisk	-0.015	0.184	0.244	0.548	0.351	-0.245	-0.182	-0.304	0.390	0.248	0.053	0.125	0.753	0.550	0.105	0.392	1.000

Source: IMF staff estimates.

[1] Government securities sample.

Table 7b. Correlation Matrix[1]

	Cdebt	Econsize	Tradeopen	Gdpcap	Credit	Intvol	Spread	Xrvol	Fiscal	Capopen	Area	Legalorigin	Invprofile	Laworder	Corruption	Bureaucracy	Comprisk
Cdebt	1.000																
Econsize	0.730	1.000															
Tradeopen	-0.199	-0.183	1.000														
Gdpcap	0.392	0.262	0.374	1.000													
Credit	0.830	0.733	-0.083	0.515	1.000												
Intvol	-0.116	0.072	-0.288	-0.259	-0.095	1.000											
Spread	-0.154	-0.078	-0.053	-0.136	-0.159	0.290	1.000										
Xrvol	0.149	0.158	0.158	0.137	0.138	-0.088	0.002	1.000									
Fiscal	-0.057	0.085	0.217	0.226	-0.049	-0.068	-0.127	0.040	1.000								
Capopen	-0.212	-0.173	-0.053	0.209	-0.067	0.306	0.489	-0.080	-0.096	1.000							
Area	0.442	0.582	-0.376	0.032	0.364	0.155	-0.074	0.092	0.153	-0.153	1.000						
Legalorigin	0.224	0.440	-0.403	0.047	0.207	0.427	0.097	0.240	-0.026	0.298	0.539	1.000					
Invprofile	0.206	0.090	-0.023	0.570	0.324	-0.215	-0.238	0.213	0.027	0.277	-0.019	0.263	1.000				
Laworder	-0.125	-0.240	-0.108	0.121	-0.056	0.176	0.107	0.059	-0.119	0.277	0.067	0.261	0.282	1.000			
Corruption	0.510	0.166	-0.135	0.365	0.379	-0.225	-0.039	-0.037	-0.041	0.055	0.224	0.120	0.122	0.118	1.000		
Bureaucracy	0.447	0.313	-0.331	0.312	0.432	0.074	-0.325	0.217	-0.192	0.175	0.277	0.653	0.343	-0.024	0.420	1.000	
Comprisk	0.239	0.157	0.120	0.686	0.368	-0.188	-0.186	0.119	0.224	0.231	0.126	0.295	0.721	0.477	0.378	0.333	1.000

Source: IMF staff estimates.

[1] Corporate bond sample.

Table 8a. Determinants of Government Securities Markets

	Least Squares			Random Effects			Fixed Effects		
	1	2	3	1	2	3	1	2	3
Econsize	0.010	0.011	0.022	-0.052*	-0.018	-0.009	-0.065*	-0.053*	-0.052*
	(0.011)	(0.013)	(0.014)	(0.025)	(0.022)	(0.020)	(0.032)	(0.025)	(0.024)
Tradeopen	-0.079*	-0.063	-0.052	-0.038	-0.148*	-0.123	-0.121	-0.270**	-0.309**
	(0.038)	(0.041)	(0.042)	(0.059)	(0.071)	(0.067)	(0.068)	(0.094)	(0.093)
Gdpcap	1.526***	-0.691***	-0.669***	1.318**	-0.201	-0.358	0.763	-0.172	0.129
	(0.383)	(0.195)	(0.187)	(0.431)	(0.457)	(0.448)	(0.574)	(0.717)	(0.759)
Credit	0.083*	0.158***	0.155***	0.153*	0.005	0.077	0.231*	-0.117	-0.235*
	(0.038)	(0.041)	(0.046)	(0.071)	(0.071)	(0.073)	(0.093)	(0.115)	(0.119)
Intvol	21.380***	10.470**	9.985**	1.045	-0.082	-5.797	-9.219	-7.364	-7.505
	(3.482)	(3.163)	(3.035)	(4.354)	(4.125)	(4.201)	(5.093)	(4.721)	(4.750)
Spread	-0.284***	-0.175***	-0.175**	-0.259***	-0.166**	-0.274***	-0.371***	-0.268***	-0.309***
	(0.071)	(0.052)	(0.053)	(0.066)	(0.052)	(0.055)	(0.075)	(0.060)	(0.057)
Xrvol	-4.183	-8.605	-9.247	-21.610***	-26.600***	-17.530**	-13.320*	-24.730***	-23.170***
	(7.470)	(4.754)	(4.841)	(5.687)	(5.106)	(5.530)	(6.435)	(5.930)	(5.926)
Fiscal	-0.380**	-0.442***	-0.429***	-0.388***	-0.626***	-0.688***	-0.484***	-0.853***	-0.809***
	(0.129)	(0.121)	(0.122)	(0.099)	(0.100)	(0.111)	(0.113)	(0.113)	(0.115)
Capopen	2.154***	0.824	1.092*	-1.671*	-1.862*	-1.558*	-2.429**	-3.281***	-2.900**
	(0.552)	(0.506)	(0.481)	(0.720)	(0.769)	(0.783)	(0.794)	(0.914)	(0.986)
Area	-0.010***	-0.011***	-0.012***	-0.004	-0.006	-0.008	-0.005**	-0.001	0.001
	(0.001)	(0.002)	(0.002)	(0.006)	(0.005)	(0.004)	(0.002)	(0.002)	(0.003)
Legalorigin	1.946	2.716*	1.317	7.423	8.145*	4.960	6.546***	9.935***	8.343***
	(1.306)	(1.300)	(1.266)	(4.698)	(4.012)	(3.397)	(1.372)	(1.555)	(1.900)
Comprisk		0.087			0.341***			0.258*	
		(0.096)			(0.082)			(0.104)	
Invprofile			0.521			0.092			-0.076
			(0.420)			(0.383)			(0.400)
Laworder			1.659*			2.791***			4.098***
			(0.664)			(0.775)			(0.848)
Corruption			-0.524			0.138			0.099
			(0.689)			(0.726)			(0.825)
Bureaucracy			-1.559			-1.523			-1.006
			(0.917)			(1.015)			(1.105)
_Cons	11.520**	9.860	12.500*	14.560***	3.777	12.950	17.060**	15.320	21.620**
	(4.397)	(7.470)	(5.841)	(4.101)	(6.626)	(9.384)	(6.093)	(8.237)	(6.512)
N	506	328	328	506	328	328	506	328	328
Specific effects[1]	NO	NO	NO	YES***	YES***	YES***	YES***	YES***	YES***
Random effects vs fixed effects[2]							Fixed effects***	Fixed effects***	Fixed effects***

Source: IMF staff estimates.

*,**,*** indicates significance at 10%, 5% and 1% respectively. Results based on heteroskedasticity robust standard errors.

[1] The specific effects row in the table indicates whether country and time effects are included in the estimation. Since there are no specific effects in the pooled least squares model, a 'NO' is indicated, whereas a 'YES' is indicated for the two-way random and fixed effects models due to the inclusion of specific effects. The outcomes of the Breusch Pagan and F tests for random and fixed effects respectively are presented.

[2] The random effects vs. fixed effects row presents the outcome of a Hausman test for the correct specific effects model (see Hausman, 1978). If the fixed effects model is preferred, then fixed effects is indicated, along with the statistical significance of the test statistic, otherwise random effects is reported.

Table 8b. Determinants of Government Securities Markets

	GMM[1]					
	A1	A2	A3	B1	B2	B3
Econsize	0.015	0.005	0.022**	0.011	0.007	0.021***
	(0.013)	(0.009)	(0.011)	(0.015)	(0.005)	(0.005)
Tradeopen	-0.079***	-0.072**	-0.055	-0.079**	-0.107***	-0.096***
	(0.027)	(0.034)	(0.039)	(0.036)	(0.016)	(0.018)
Gdpcap	1.930***	-0.249	-0.093	2.098***	-0.710***	-0.637***
	(0.352)	(0.204)	(0.229)	(0.252)	(0.092)	(0.094)
Credit	0.113***	0.198***	0.168***	0.055	0.133***	0.108***
	(0.037)	(0.033)	(0.038)	(0.041)	(0.016)	(0.017)
Intvol	97.330***	41.410***	34.390***	29.930***	2.469	2.246
	(9.713)	(7.970)	(7.829)	(5.649)	(1.895)	(1.978)
Spread	-0.864***	-0.328***	-0.290***	-0.275***	-0.023	-0.025
	(0.146)	(0.095)	(0.098)	(0.091)	(0.027)	(0.028)
Xrvol	-39.810***	-29.470***	-27.010***	-15.480**	-9.275***	-8.900***
	(7.361)	(6.901)	(7.425)	(6.868)	(2.452)	(2.532)
Fiscal	-0.141	-0.626***	-0.545**	-0.148	-0.416***	-0.295***
	(0.191)	(0.218)	(0.247)	(0.170)	(0.059)	(0.064)
Capopen	-1.258	-3.517**	-2.386	-0.693	-2.529***	-2.407***
	(1.828)	(1.515)	(1.663)	(1.231)	(0.352)	(0.378)
Area	-0.018***	-0.020***	-0.019***	-0.012***	-0.012***	-0.013***
	(0.001)	-0.002	(0.002)	(0.002)	(0.001)	(0.001)
Legalorigin	-2.737	0.985	0.372	5.756***	4.977***	4.403***
	(2.747)	(1.432)	(1.529)	(1.677)	(0.507)	(0.572)
Comprisk		0.373***			0.179***	
		(0.117)			(0.037)	
Invprofile			0.688			0.143
			(0.502)			(0.189)
Laworder			2.117***			1.553***
			(0.664)			(0.282)
Corruption			0.735			0.429
			(0.671)			(0.289)
Bureaucracy			-0.058			0.899**
			(1.065)			(0.413)
_Cons	-3.011	-9.582	2.063	0.163	8.966***	12.300***
	(4.492)	(8.821)	(5.511)	(4.138)	(2.747)	(2.044)
N	506	328	328	506	328	328
Hansen Test[2]	1.000	1.000	1.000	1.000	1.000	1.000
Arellano-Bond AR(1) Test[3]	0.088	0.171	0.105	0.709	0.968	0.920
Arellano-Bond AR(2) Test	0.606	0.306	0.287	0.299	0.280	0.248
GMM versus FE[4]	GMM***	GMM***	FE	GMM***	GMM***	GMM***

Source: IMF staff estimates.

*,**,*** indicates significance at 10%, 5% and 1% respectively.

[1] GMM (A1, A2, A3) consider fiscal endogeneity; GMM (B1, B2, B3) consider fiscal, intvol, and spread endogeneity.

[2] Hansen test for validity of instruments (see Hansen, 1982).

[3] Arellano-Bond AR test for estimation consistency (see Arellano and Bond, 1991).

[4] Hausman test for differences in GMM and preferred fixed effects coefficients reported in Table 8a (see Hausman, 1978).

Table 9a. Determinants of Corporate Bond Markets

	Least Squares			Random Effects			Fixed Effects		
	1	2	3	1	2	3	1	2	3
Econsize	0.008*	-0.001	0.012***	0.012***	0.016***	0.013***	0.014***	0.014**	0.011*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)
Tradeopen	-0.053***	-0.087***	-0.029	-0.020	-0.025	-0.020	-0.022	-0.043	0.003
	(0.011)	(0.020)	(0.016)	(0.015)	(0.022)	(0.020)	(0.016)	(0.033)	(0.033)
Gdpcap	0.196**	0.578***	0.250***	0.934***	0.623***	0.870***	1.059***	1.228***	1.317***
	(0.067)	(0.123)	(0.065)	(0.137)	(0.121)	(0.124)	(0.144)	(0.192)	(0.193)
Credit	0.076***	0.102***	0.097***	-0.128***	-0.017	-0.015	-0.148***	-0.152***	-0.021
	(0.010)	(0.013)	(0.012)	(0.016)	(0.019)	(0.017)	(0.017)	(0.023)	(0.022)
Intvol	-2.014	-1.231	3.085**	1.573	1.522	0.091	1.095	2.072	-0.563
	(1.283)	(1.641)	(1.138)	(1.092)	(1.384)	(1.300)	(1.141)	(1.936)	(1.522)
Spread	-0.007	0.012	-0.063	0.001	-0.053	-0.025	0.003	0.005	-0.027
	(0.039)	(0.043)	(0.037)	(0.025)	(0.030)	(0.026)	(0.025)	(0.031)	(0.032)
Xrvol	0.956	-10.290*	-2.449	-4.253	-3.941	-2.410	-5.448*	-6.417*	-4.013
	(3.983)	(5.044)	(2.691)	(2.299)	(2.252)	(2.133)	(2.379)	(2.985)	(2.556)
Fiscal	-0.063*	0.082	0.014	0.034	0.041	0.046	0.045	0.049	0.039
	(0.029)	(0.045)	(0.033)	(0.03)	(0.032)	(0.033)	(0.031)	(0.043)	(0.039)
Capopen	-0.449	0.167	0.662***	-0.268	0.445	-0.543	-0.248	-0.948*	-1.332*
	(0.238)	(0.194)	(0.192)	(0.237)	(0.327)	(0.411)	(0.253)	(0.439)	(0.597)
Area	0.002**	0.005***	0.001	0.004	0.006**	0.005	0.014***	0.017***	0.004**
	(0.001)	(0.001)	(0.001)	(0.005)	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)
Legalorigin	-0.760	-0.157	-3.329***	2.049	0.371	0.943	-5.289**	5.047*	2.044
	(0.679)	(0.826)	(0.714)	(3.595)	(1.613)	(1.965)	(1.653)	(2.139)	(1.439)
Comprisk		-0.164**			-0.069*			-0.018	
		(0.057)			(0.034)			(0.045)	
Invprofile			-0.075			-0.098			-0.125
			(0.129)			(0.093)			(0.110)
Laworder			0.548**			0.265			0.456
			(0.204)			(0.252)			(0.340)
Corruption			0.247			-0.054			-0.074
			(0.204)			(0.186)			(0.224)
Bureaucracy			-0.283			1.748**			2.807***
			(0.515)			(0.538)			(0.743)
_Cons	0.586	9.765*	12.500***	-1.305	2.461	-6.723*	4.152***	5.757	-5.516*
	(0.742)	(3.814)	(2.723)	(2.966)	(3.155)	(3.113)	(0.923)	(3.146)	(2.507)
N	170	128	128	170	128	128	170	128	128
Specific effects[1]	NO	NO	NO	YES***	YES***	YES***	YES***	YES***	YES***
Random effects vs fixed effects[2]							Random effects***	Random effects***	Random effects***

Source: IMF staff estimates.

*,**,*** indicates significance at 10%, 5% and 1% respectively. Results based on heteroskedasticity robust standard errors.

[1] The specific effects row in the table indicates whether country and time effects are included in the estimation. Since there are no specific effects in the pooled least squares model, a 'NO' is indicated, whereas a 'YES" is indicated for the two-way random and fixed effects models due to the inclusion of specific effects. The outcomes of the Breusch-Pagan and F tests for random and fixed effects respectively are presented.

[2] The random effects vs. fixed effects row presents the outcome of a Hausman test for the correct specific effects model (see Hausman, 1978). If the fixed effects model is preferred, then fixed effects is indicated, along with the statistical significance of the test statistic, otherwise random effects is reported.

Table 9b. Determinants of Corporate Bond Markets

	GMM[1]					
	A1	A2	A3	B1	B2	B3
Econsize	0.006*	0.011***	0.012***	0.011***	0.008***	0.012***
	(0.004)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
Tradeopen	-0.091***	-0.041*	-0.045*	-0.058***	-0.039***	-0.027***
	(0.024)	(0.023)	(0.024)	(0.007)	(0.010)	(0.008)
Gdpcap	0.341	0.426***	0.328***	0.116***	0.312***	0.263***
	(0.230)	(0.145)	(0.088)	(0.040)	(0.048)	(0.030)
Credit	0.070***	0.071***	0.076***	0.063***	0.087***	0.091***
	(0.013)	(0.012)	(0.013)	(0.005)	(0.006)	(0.005)
Intvol	-7.285	-0.492	-0.947	-6.518***	0.732	3.000***
	(7.799)	(4.929)	(3.325)	(0.751)	(1.418)	(0.851)
Spread	0.334**	-0.019	0.009	-0.001	-0.043	-0.032*
	(0.164)	(0.111)	(0.082)	(0.025)	(0.027)	(0.019)
Xrvol	5.877	2.279	-0.124	4.190**	-3.749*	-1.781
	(10.310)	(9.601)	(4.133)	(1.802)	(2.017)	(1.485)
Fiscal	-0.001	-0.228**	-0.173*	-0.124***	-0.044	-0.008
	(0.124)	(0.099)	(0.090)	(0.021)	(0.027)	(0.023)
Capopen	-1.642**	0.788	0.655	-0.071	0.486***	0.376***
	(0.671)	(0.570)	(0.542)	(0.151)	(0.162)	(0.130)
Area	-0.001	0.004*	0.003	0.003***	0.002***	0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Legalorigin	2.206	-3.035*	-2.617**	-0.759	-2.360***	-3.015***
	(1.592)	(1.549)	(1.294)	(0.469)	(0.591)	(0.425)
Comprisk		-0.082*			-0.034*	
		(0.045)			(0.020)	
Invprofile			-0.183			-0.065
			(0.168)			(0.059)
Laworder			0.151			0.438***
			(0.285)			(0.106)
Corruption			0.040			0.356***
			(0.399)			(0.120)
Bureaucracy			-0.092			-0.014
			(0.758)			(0.219)
_Cons	-1.887	2.751	-0.699	1.774***	3.079*	-1.259
	(3.790)	(3.299)	(2.252)	(0.655)	(1.616)	(0.878)
N	170	128	128	170	128	128
Hansen Test[2]	1.000	1.000	1.000	1.000	1.000	1.000
Arellano-Bond AR(1) Test[3]	0.634	0.308	0.282	0.001	0.346	0.399
Arellano-Bond AR(2) Test	0.217	0.748	0.355	0.044	0.216	0.065
GMM versus FE[4]	RE	GMM***	GMM***	GMM***	GMM***	GMM***

Source: IMF staff estimates.

*,**,*** indicates significance at 10%, 5% and 1% respectively.

[1] GMM (A1, A2, A3) consider fiscal endogeneity; GMM (B1, B2, B3) consider fiscal, intvol, and spread endogeneity.

[2] Hansen test for validity of instruments (see Hansen, 1982).

[3] Arellano-Bond AR test for estimation consistency (see Arellano and Bond, 1991).

[4] Hausman test for differences in GMM and preferred random effects coefficients reported in Table 9a (see Hausman, 1978).

Table 10. Sample Sensitivity Analysis[1]

	Government Securities Markets						Corporate Bond Markets					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Econsize	0.007	0.001	-0.004	0.014***	0.003	0.026***	0.008***	0.008***	0.001	0.008***	0.008***	0.008***
	(0.005)	(0.006)	(0.007)	(0.005)	(0.005)	(0.005)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Tradeopen	-0.107***	-0.075***	-0.083***	-0.124***	-0.072***	-0.312***	-0.039***	-0.040***	-0.036***	-0.045***	-0.039***	-0.056***
	(0.016)	(0.020)	(0.018)	(0.017)	(0.017)	(0.028)	(0.010)	(0.007)	(0.005)	(0.011)	(0.010)	(0.013)
Gdpcap	-0.710***	-0.970***	-0.810***	-0.929***	-0.990***	-1.592***	0.312***	0.353***	0.273***	0.300***	0.312***	0.392***
	(0.092)	(0.110)	(0.098)	(0.094)	(0.096)	(0.161)	(0.048)	(0.032)	(0.022)	(0.048)	(0.048)	(0.047)
Credit	0.133***	0.233***	0.063**	0.124***	0.207***	0.027	0.087***	0.088***	-0.015**	0.084***	0.087***	0.084***
	(0.016)	(0.022)	(0.024)	(0.016)	(0.017)	(0.018)	(0.006)	(0.004)	(0.007)	(0.006)	(0.006)	(0.005)
Intvol	2.469	14.510***	5.739***	1.954	12.510***	-7.241***	0.732	2.677***	2.033***	-0.202	0.732	2.729***
	(1.895)	(2.437)	(1.973)	(1.917)	(2.030)	(2.184)	(1.418)	(0.902)	(0.585)	(1.415)	(1.418)	(1.032)
Spread	-0.023	-0.0477	-0.049*	-0.034	-0.095***	0.021	-0.043	-0.051***	-0.009	-0.043	-0.043	-0.045**
	(0.027)	(0.033)	(0.028)	(0.027)	(0.028)	(0.030)	(0.027)	(0.018)	(0.014)	(0.028)	(0.027)	(0.021)
Xrvol	-9.275***	-14.610***	-11.020***	-8.413***	-12.820***	8.925***	-3.749*	0.239	7.232***	-3.784*	-3.749*	-0.183
	(2.452)	(3.841)	(2.531)	(2.483)	(2.589)	(2.815)	(2.017)	(1.183)	(1.239)	(2.041)	(2.017)	(1.328)
Fiscal	-0.416***	-0.127	-0.371***	-0.406***	-0.338***	-0.362***	-0.044	-0.058***	0.047***	-0.041	-0.044	-0.038*
	(0.059)	(0.089)	(0.060)	(0.055)	(0.059)	(0.065)	(0.027)	(0.018)	(0.014)	(0.027)	(0.027)	(0.023)
Capopen	-2.529***	-1.492***	-2.069***	-2.284***	-2.229***	-2.540***	0.486***	0.425***	-0.467***	0.530***	0.486***	0.390***
	(0.352)	(0.441)	(0.352)	(0.337)	(0.374)	(0.383)	(0.162)	(0.110)	(0.087)	(0.165)	(0.162)	(0.112)
Area	-0.012***	-0.017***	-0.012***	-0.014***	-0.017***	-0.006***	0.002***	0.002***	0.000	0.003***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Legalorigin	4.977***	2.444***	5.019***	2.524***	2.427***	2.184***	-2.360***	-2.940***	1.686***	-2.309***	-2.360***	Dropped
	(0.507)	(0.663)	(0.523)	(0.520)	(0.570)	(0.632)	(0.591)	(0.388)	(0.372)	(0.597)	(0.591)	
Comprisk	0.179***	0.276***	0.234***	0.238***	0.277***	0.587***	-0.034*	-0.025*	-0.013	-0.038*	-0.034*	-0.016
	(0.037)	(0.048)	(0.038)	(0.037)	(0.039)	(0.055)	(0.020)	(0.014)	(0.011)	(0.020)	(0.020)	(0.019)
_Cons	8.966***	1.422	6.019**	8.886***	2.831	-8.505**	3.079*	1.738	0.713	3.689**	3.079*	-1.612
	(2.747)	(3.435)	(2.831)	(2.733)	(2.866)	(3.807)	(1.616)	(1.072)	(0.823)	(1.655)	(1.616)	(1.255)
N	328	262	316	300	309	246	128	124	106	126	128	116

Source: IMF staff estimates.

***, **, * indicates 1%, 5% and 10% significance respectively.

Column Notes:

(1) Full sample GMM estimation of B2 in Table 8b and 9b for government securities and corporate bond markets respectively.

(2) Estimation based on period 1993-2010.

(3) Estimation excludes South Africa.

(4) Estimation excludes Fragile Countries.

(5) Estimation excludes WAEMU Member States.

(6) Estimation excludes CEMAC Member States.

[1] Sensitivity analysis carried out with GMM estimation using specification B2 as in Tables 8b and 9b for government securities markets and corporate bond markets respectively.

Figure 1. Bond Market Comparisons, 2010
(percent of GDP)
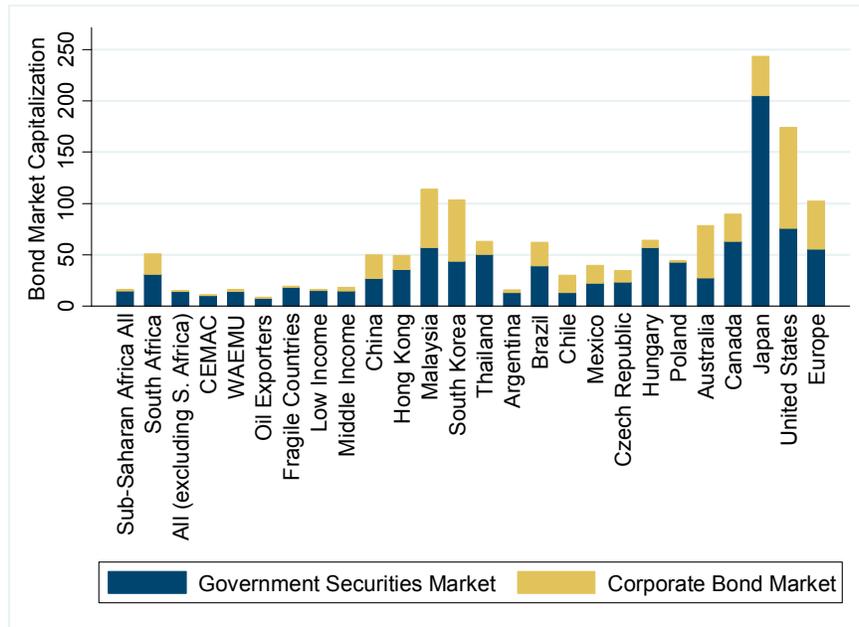
Sources: IMF staff compilation based on data from IMF, IFS, WEO and World Bank, ADI, BIS and national sources for corporate bond market capitalization as set out in Table 2.

Figure 2. Government Securities Markets Development, 2006–10
(percent of GDP)
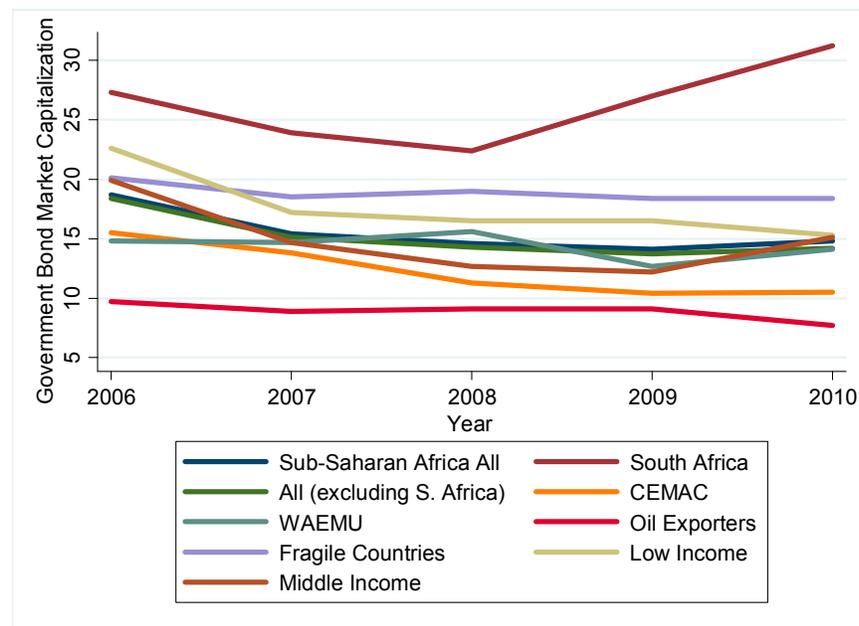
Sources: IMF staff compilation based on data from IMF, IFS, WEO and World Bank, ADI, BIS and national sources for corporate bond market capitalization as set out in Table 2.

Figure 3. Corporate Bond Markets Development, 2006–10
(percent of GDP)
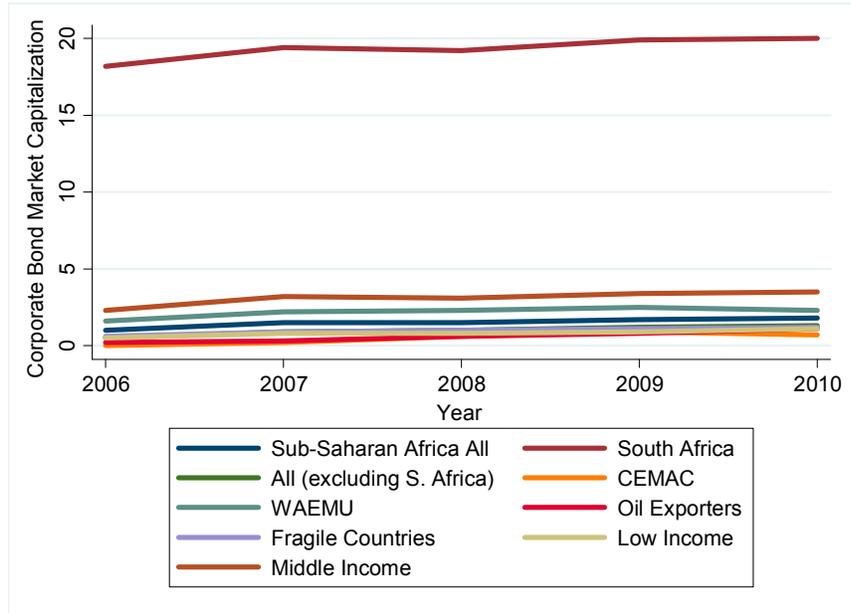
Sources: IMF staff compilation based on data from IMF, IFS, WEO and World Bank, ADI, BIS and national sources for corporate bond market capitalization as set out in Table 2.

Figure 4. Bond Markets Capitalizations, 1989–2010
(percent of GDP)
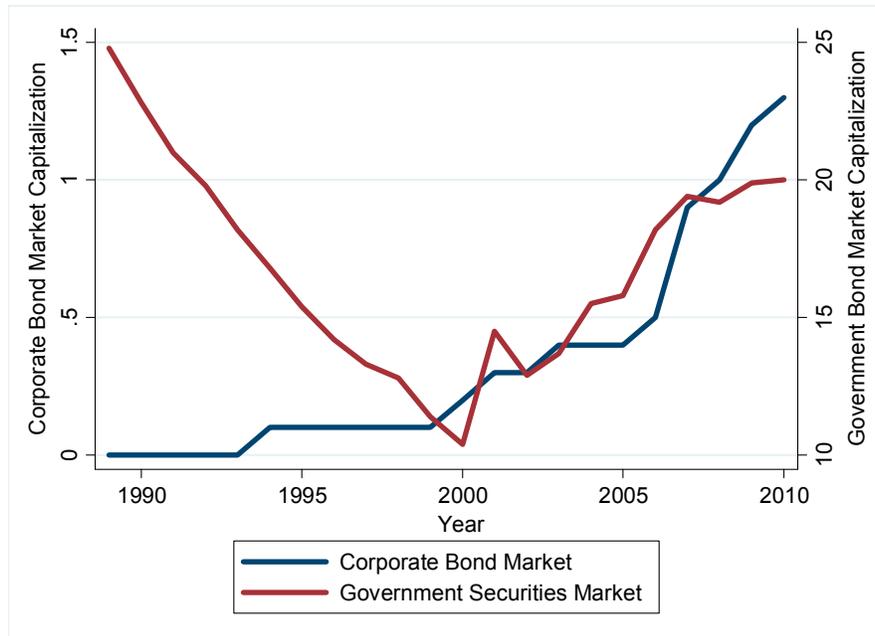
Sources: IMF staff compilation based on data from IMF, IFS, WEO and World Bank, ADI, BIS and national sources for corporate bond market capitalization as set out in Table 2.

Figure 5. Active Corporate Bond Markets, 1980–2010

Sources: IMF staff compilations based on data from BIS and national sources.

Figure 6. Government: Economic Size and Capitalization

Sources: IMF, IFS, WEO, World Bank, ADI

Figure 7. Corporate: Economic Size and Capitalization

Sources: National Sources in Table 2, World Bank, ADI
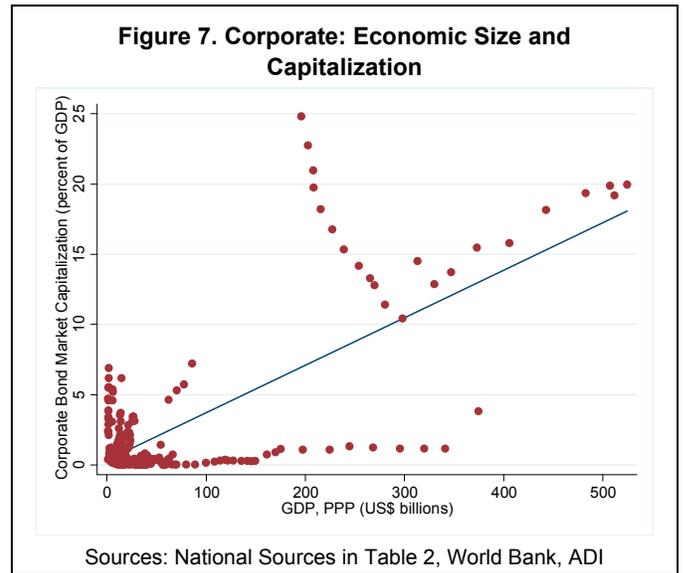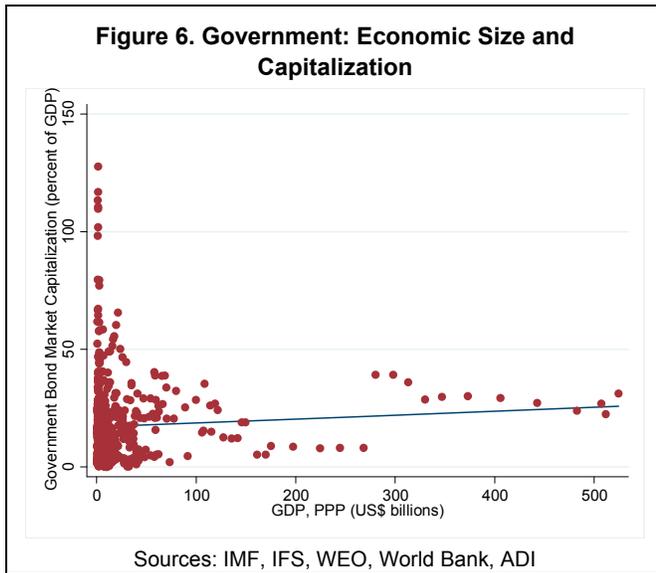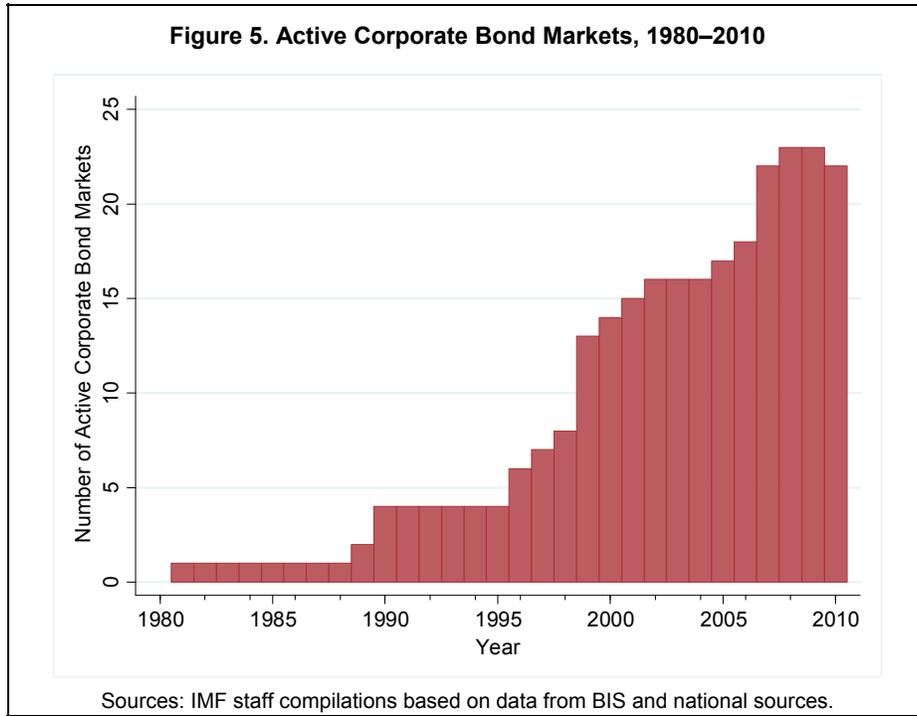
Figure 8. Government: Exports and Capitalization
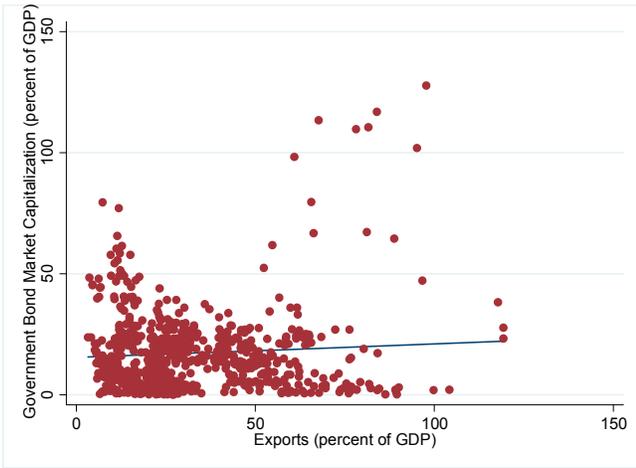
Sources: IMF, IFS, WEO, World Bank, ADI

Figure 9. Corporate: Exports and Capitalization
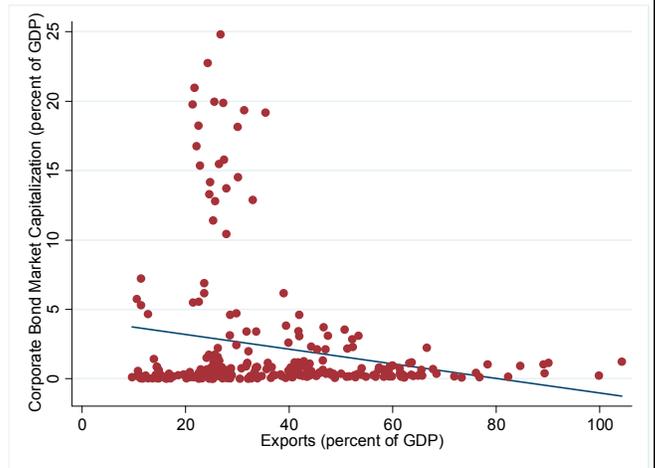
Sources: National Sources in Table 2, World Bank, ADI

Figure 10. Government: Credit and Capitalization
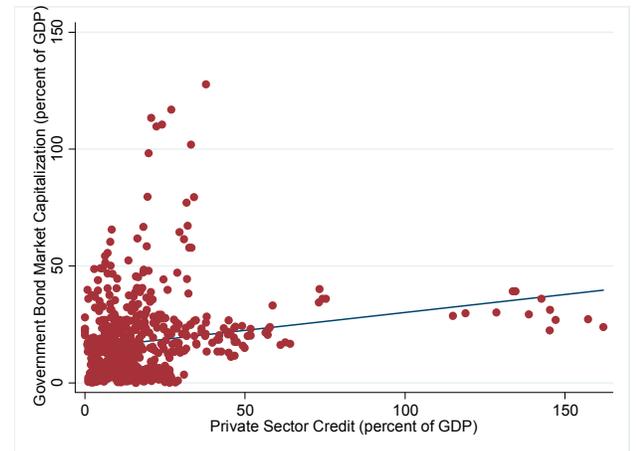
Sources: IMF, IFS, WEO, World Bank, ADI

11. Corporate: Credit and Capitalization
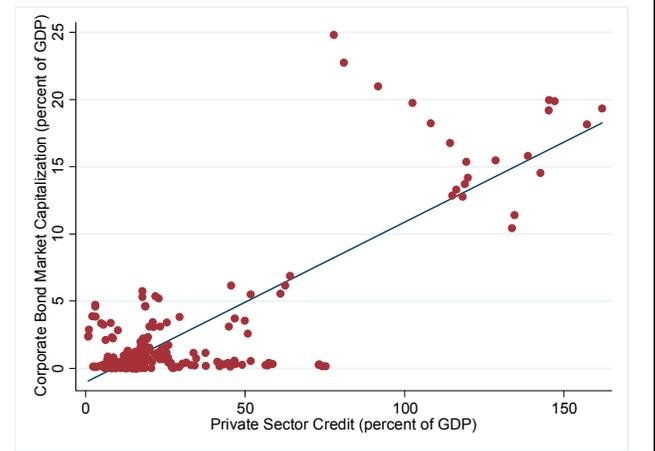
Sources: National Sources in Table 2, World Bank, ADI

Figure 12. Government: Spread and Capitalization
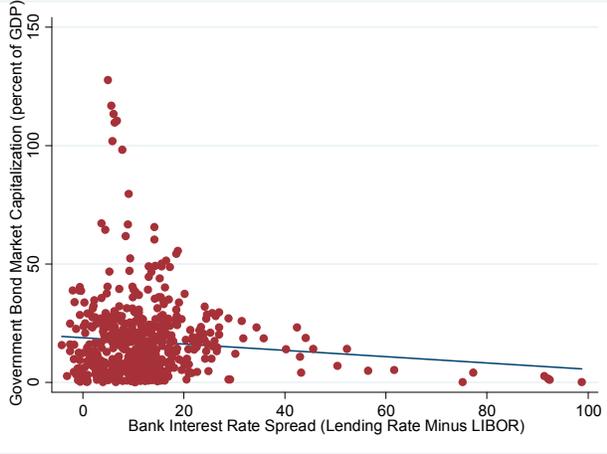
Sources: IMF, IFS, WEO, World Bank, ADI, BBA

Figure 13. Corporate: Spread and Capitalization
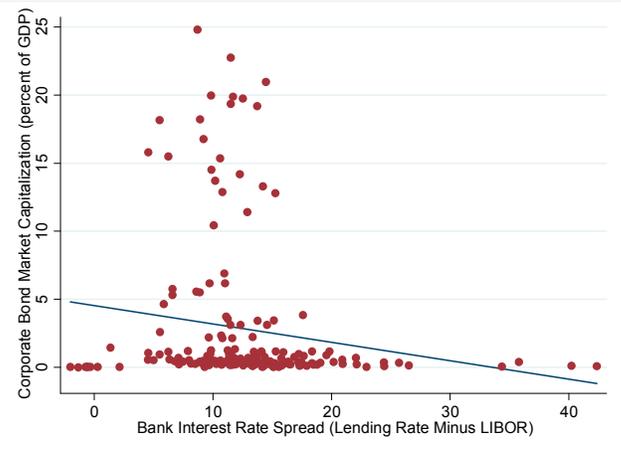
Sources: National Sources in Table 2, World Bank, ADI

Figure 14. Government: Interest Rate Volatility and Capitalization
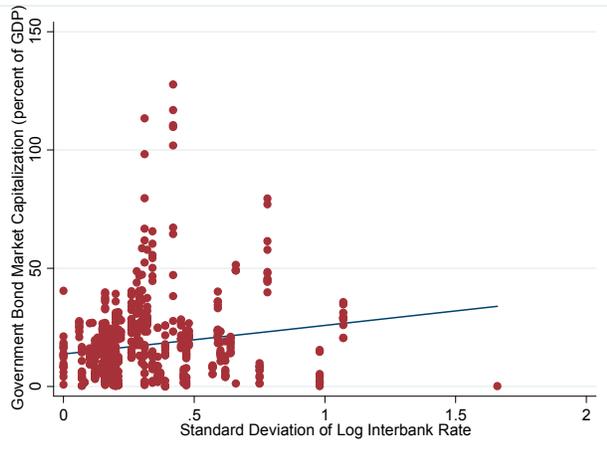
Sources: IMF, IFS, WEO, World Bank, ADI

Figure 15. Corporate: Interest Rate Volatility and Capitalization
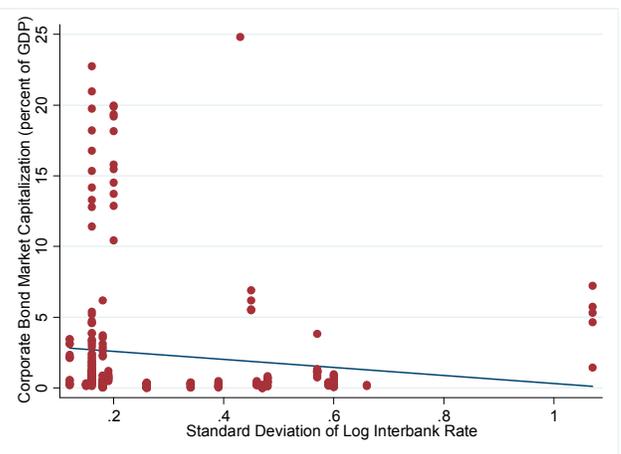
Sources: National Sources in Table 2, IMF, IFS

Figure 16. Government: Exchange Rate Volatility and Capitalization
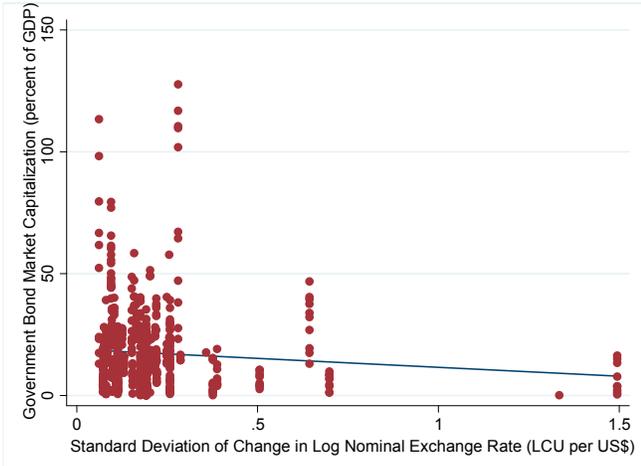
Sources: IMF, IFS, WEO, World Bank, ADI

Figure 17. Corporate: Exchange Rate Volatility and Capitalization
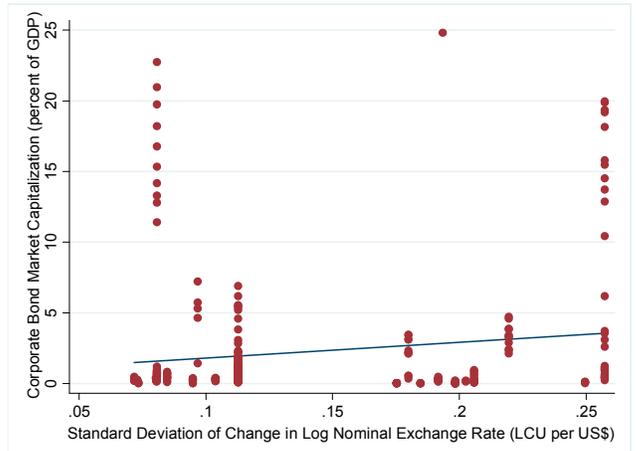
Sources: National Sources in Table 2, IMF, IFS

Figure 18. Government: Capital Openness and Capitalization
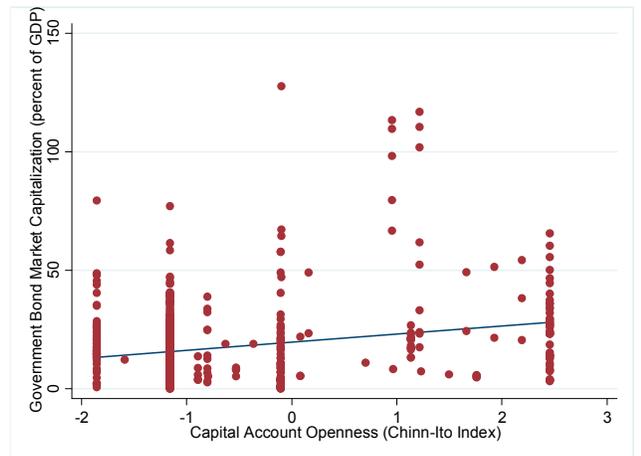
Sources: IMF, IFS, WEO, World Bank, ADI, Chinn and Ito (2008)

Figure 19. Corporate: Capital Openness and Capitalization
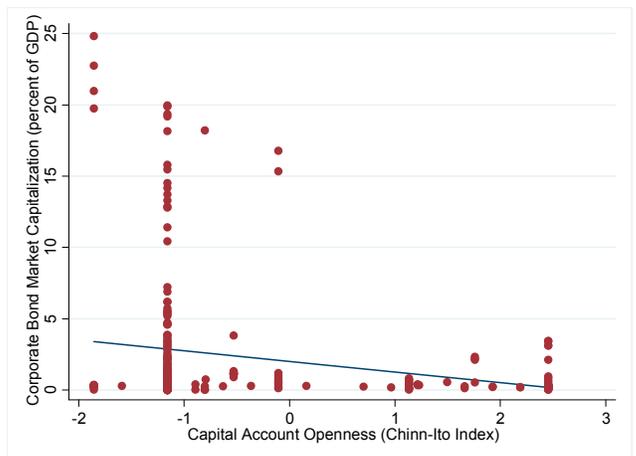
Sources: National Sources in Table 2, Chinn and Ito (2008)

Figure 20. Government: Fiscal Balance and Capitalization
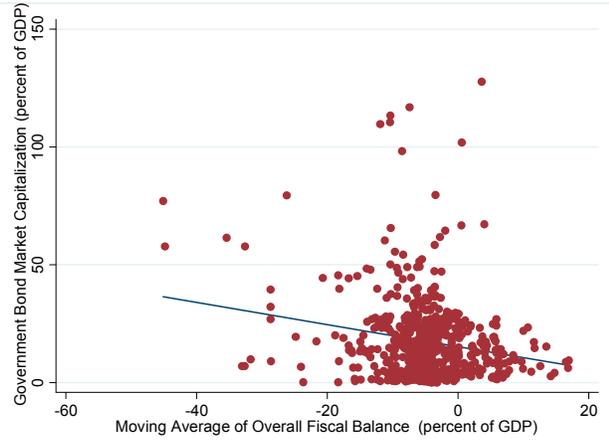
Sources: IMF, IFS, WEO, World Bank, ADI

Figure 21. Corporate: Fiscal Balance and Capitalization
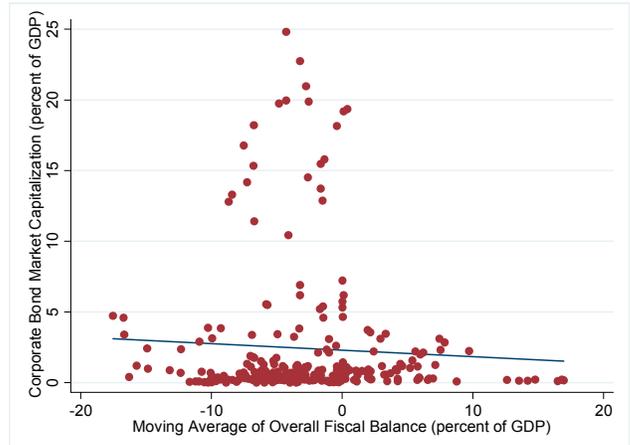
Sources: National Sources in Table 2, World Bank, ADI

Figure 22. Government: GDP per Capita and Capitalization
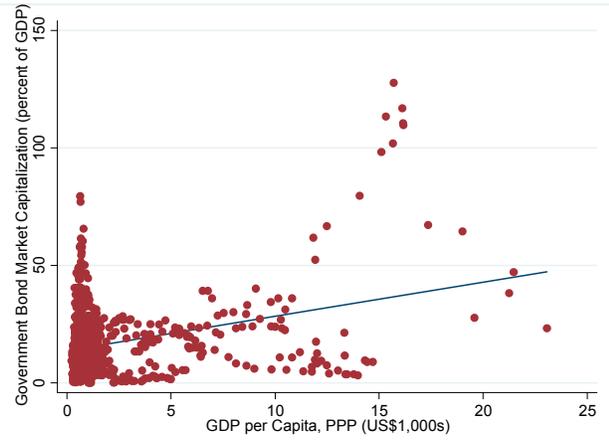
Sources: IMF, IFS, WEO, World Bank, ADI

Figure 23. Corporate: GDP per Capita and Capitalization
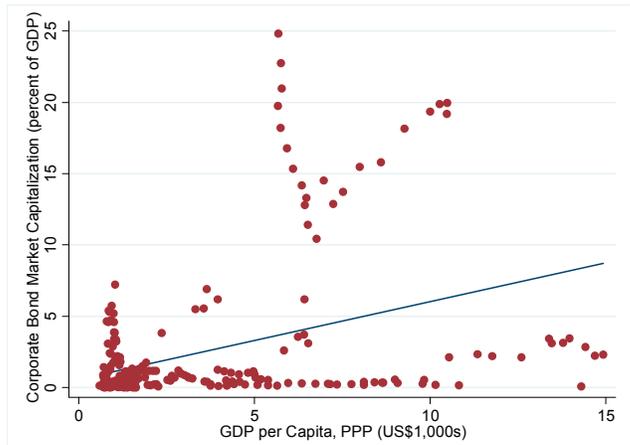
Sources: National Sources in Table 2, World Bank, ADI

Figure 24. Government: Law and Order and Capitalization
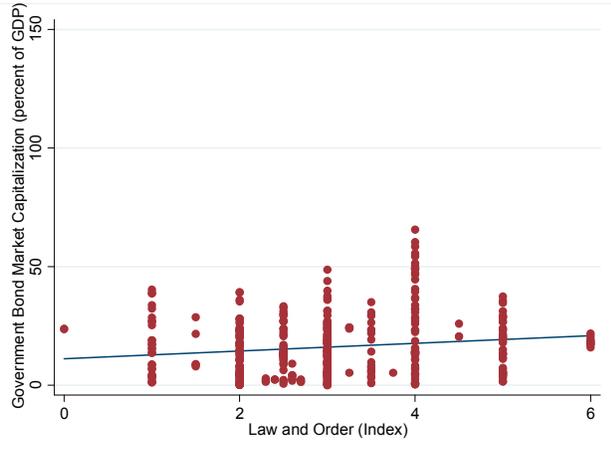
Sources: IMF, IFS, WEO, World Bank, ADI, ICRG

Figure 25. Corporate: Law and Order and Capitalization
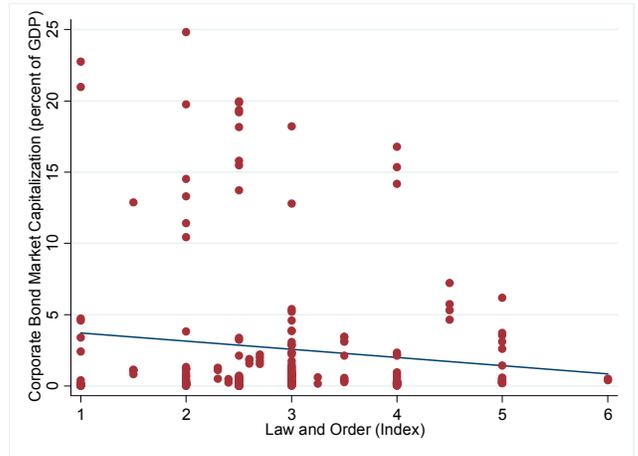
Sources: National Sources in Table 2, ICRG

Figure 26. Government: Corruption and Capitalization
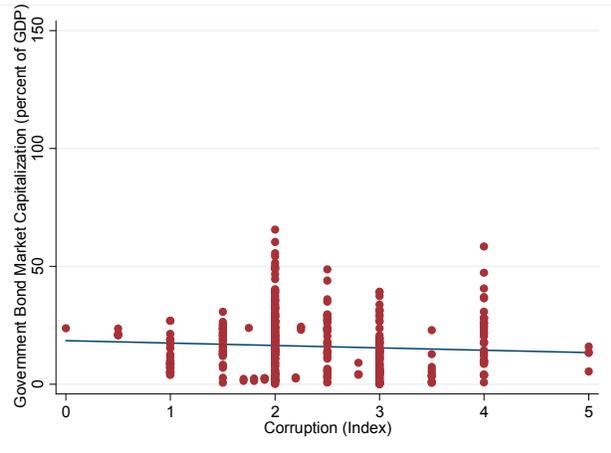
Sources: IMF, IFS, WEO, World Bank, ADI, ICRG

Figure 27. Corporate: Corruption and Capitalization
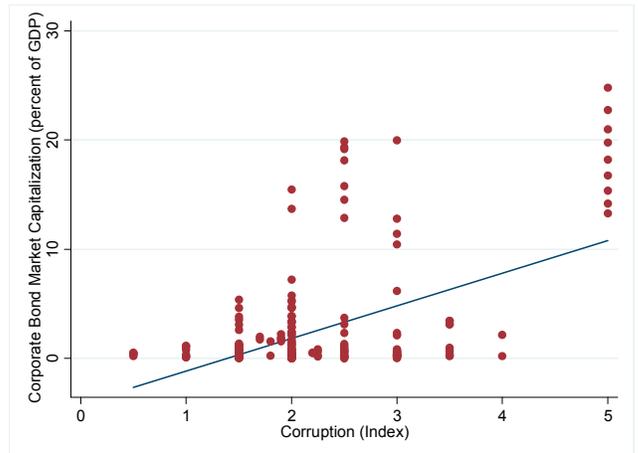
Sources: National Sources in Table 2, ICRG

Figure 28. Government: Legal Origin and Capitalization
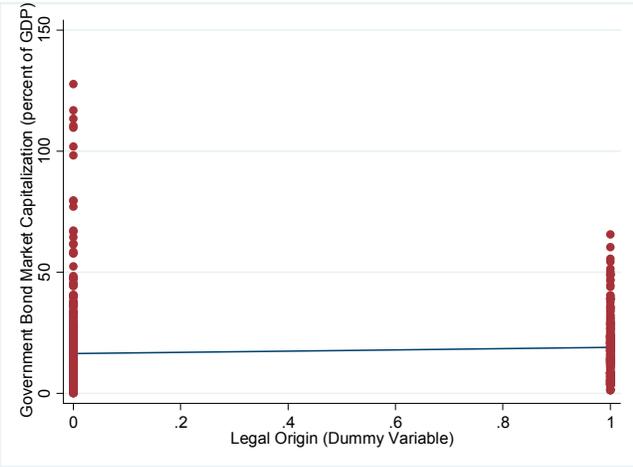
Sources: IMF, IFS, WEO, World Bank, ADI, World Factbook

Figure 29. Corporate: Legal Origin and Capitalization
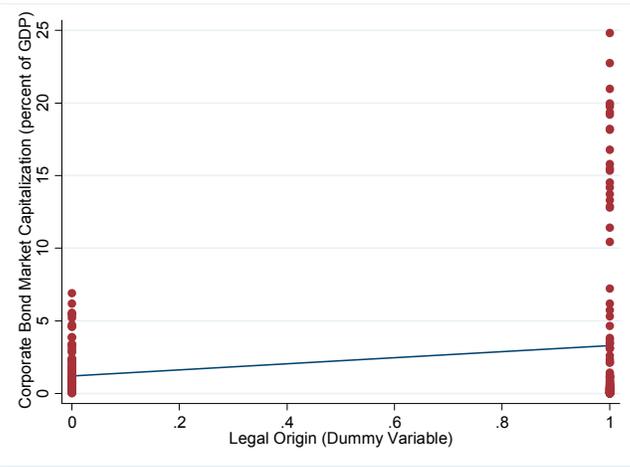
Sources: National Sources in Table 2, World Factbook

Figure 30. Government: Investment Profile and Capitalization
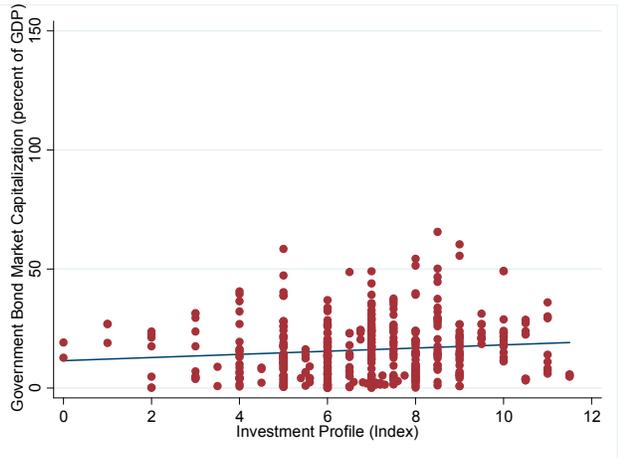
Sources: IMF, IFS, WEO, World Bank, ADI, ICRG

Figure 31. Corporate: Investment Profile and Capitalization
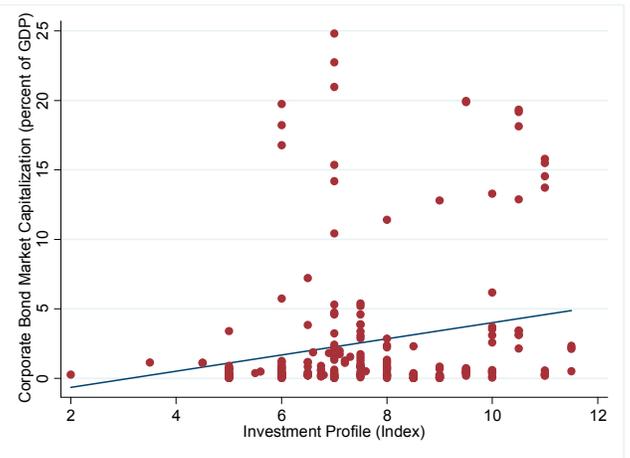
Sources: National Sources in Table 2, ICRG

Figure 32. Government: Bureaucracy and Capitalization
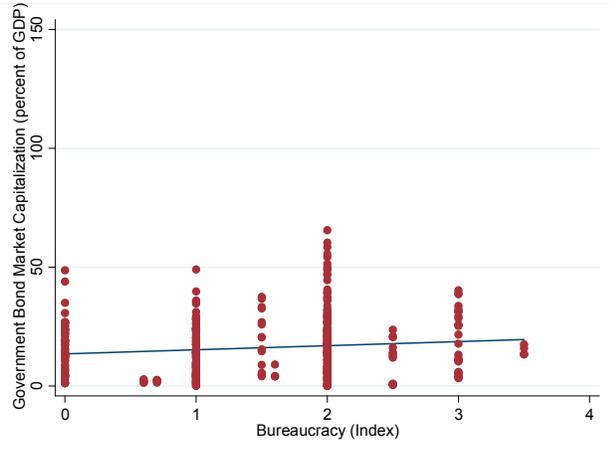
Sources: IMF, IFS, WEO, World Bank, ADI, ICRG

Figure 33. Corporate: Bureaucracy and Capitalization
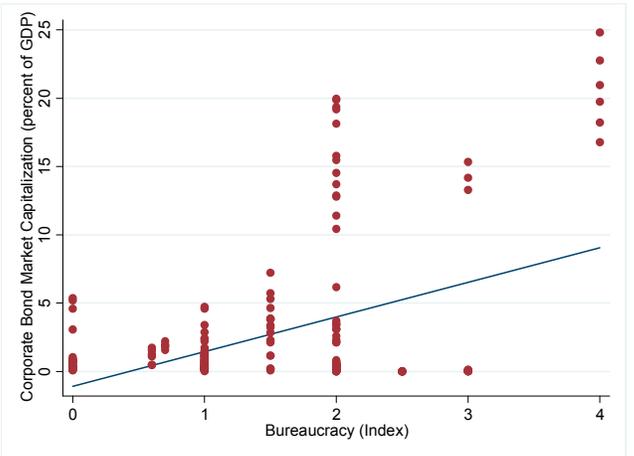
Sources: National Sources in Table 2, ICRG

Figure 34. Government: Area and Capitalization
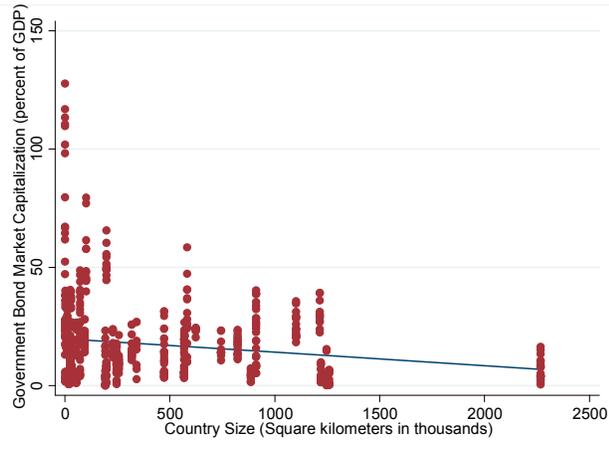
Sources: IMF, IFS, WEO, World Bank, ADI

Figure 35. Corporate: Area and Capitalization
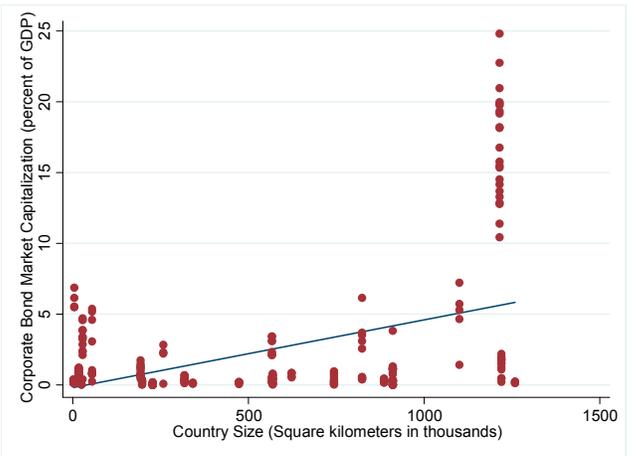
Sources: National Sources in Table 2, World Bank, ADI

Figure 36. Government: Composite Risk and Capitalization
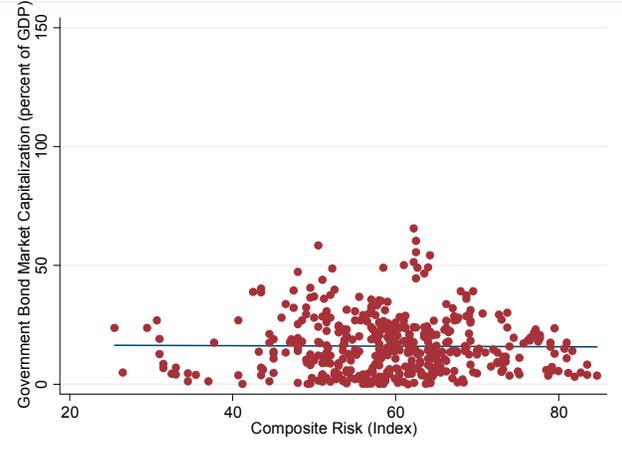
Sources: IMF, IFS, WEO, World Bank, ADI, ICRG

Figure 37. Corporate: Composite Risk and Capitalization
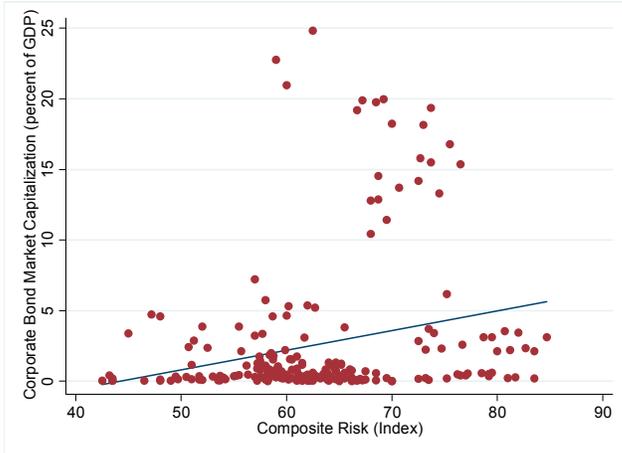
Sources: National Sources in Table 2, ICRG

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