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International Sovereign Bonds by Emerging Markets and Developing Economies: Drivers of Issuance and Spreads

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Strategy and Policy Review Department

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Abstract

What determines the ability of low-income developing countries to issue bonds in international capital and what explains the spreads on these bonds? This paper examines these questions using a dataset that includes emerging markets and developing economies (EMDEs) that issued sovereign bonds at least once during the period 1995-2013 as well as those that did not. We find that an EMDE is more likely to issue a bond when, in comparison with non-issuing peers, it is larger in economic size, has higher per capita GDP, and has stronger macroeconomic fundamentals and government. Spreads on sovereign bonds are lower for countries with strong external and fiscal positions, as well as robust economic growth and government effectiveness. With regard to global factors, the results show that sovereign bond spreads are reduced in periods of lower market volatility.

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I. INTRODUCTION

Over the past decade or so, a number of low-income developing countries (LIDCs)[2] have issued sovereign bonds in the international capital markets, driven in part by African frontier markets. [3] Since 2005, some 14 LIDCs have issued international sovereign bonds, 10 of which are in Sub-Saharan Africa. In 2013, LIDCs issued sovereign bonds amounting to US$4 billion, and this trend continued in 2014, with Côte d'Ivoire, Ethiopia, Ghana, Kenya, Senegal, Vietnam, and Zambia having issued bonds totaling about US$8 billion (Table 1). Given the declining trend of aid flows[4], sovereign bond issues could contribute to the financing of investment projects.

What determines the ability of LIDCs to issue bonds in the international capital markets? What are the factors that influence the spreads on these bonds? What can LIDCs learn from the experience of emerging markets and developing economies (EMDEs) that have market access? To address these questions, this paper examines the experience of 104 EDMEs during the period 1995-2013, including 49 that had issued sovereign bonds at least once in the international capital markets, with the remainder having never issued.

This paper builds on an extensive literature on access to international capital markets for EMDEs and contributes to this work in two ways.[5] First, the analysis of sovereign bond issuance (SBI) by EMDEs is extended by jointly estimating the factors that influence the spread on these bonds. Second, the paper captures the experience in recent years when several LIDCs issued international sovereign bonds for the first time, thus extending the analysis on emerging markets by Eichengreen and Mody (2000) and Gelos and others (2011), as well as work done on first-time issues by EMDEs (Gregorian, 2003; Thomas, 2009; IMF, 2013; Guscina and others, 2014; Gueye and Sy, 2015).[6]

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[2] The definition of income groups follows the IMF World Economic Outlook (WEO), which distinguishes advanced economies (AEs) and emerging market and developing economies (EDMEs). Low income developing countries (LIDCS)—60 countries in all—are a sub-group of lower income EMDEs, defined in IMF (2014). Frontier markets—14 countries in all—are LIDCs that have some degree of access to international capital markets (see IMF (2014) for further discussion).

[3] See IMF (2013); Standard and Poor's (2013); AfDB, OECD and UNDP (2014); Gueye and Sy (2015); te Velde (2014).

[4] According to the 2015 OECD DAC bilateral aid (excluding debt relief) to the least-developed countries fell by 8 percent in 2014. See OECD at: http://www.oecd.org/development/development-aid-stable-in-2014-but-flows-to-poorest-countries-still-falling.htm

[5] See Eaton and Taylor (1986) and Eaton (1993) for an overview of the literature.

[6] This paper builds on the literature that identifies the determinants of EMDEs' sovereign bond spreads in both primary (Kamin and von Kleist, 1999) and secondary markets (Bellas and others, 2010; Rocha and Moreira, 2010; Baldacci and others, 2011; Siklos, 2011; Comelli, 2012; Kennedy and Palerm, 2014; Csontó, 2014; Guscina and others, 2014). These papers generally show that global risk aversion, macroeconomic fundamentals (especially the fiscal stance) and political risk are significantly correlated with interest rate spreads.

Simple comparisons of the data on EMDEs that issued sovereign bonds in global capital markets (issuers) and those that did not issue (non-issuers) provides useful insights. Issuers typically have higher per capita real GDP, deeper financial markets, stronger external positions, greater government effectiveness,[7] and are more likely to have had an IMF program in place over the previous 3 years (compared to non-issuers). Among countries that have issued, we separate the sample between regular issuers (those that have issued in 5 or more years during 1995-2013) and occasional issuers. We find that regular issuers have higher per capita real GDP, stronger external reserve positions, and more effective governments (than occasional issuers).

The econometric analysis indicates that an EMDE is more likely to issue sovereign bonds in the global market when it is large and has higher per capita GDP (than those that are smaller and less developed), and has sound macroeconomic fundamentals (measured by the external debt-to-GDP ratio and fiscal position) and strong government effectiveness. Spreads on sovereign bonds are lower for countries with strong external position (reflected in external reserve position and current account balance) and fiscal positions, as well as robust economic growth and government effectiveness. There is evidence that once an EMDE issues for the first time, there is a high likelihood that it will reissue in the future and at lower spreads. We find a robust catalytic role of IMF programs for market access. With regard to global factors, we find that bond spreads are lower in periods of declining global market volatility (measured by VIX), though the US rate does not seem to have a robust relation with either issuances or spreads.

The rest of the paper is organized as follows. Section II discusses the data and some stylized facts about sovereign bond issuances over the period 1995-2013. Section III presents the empirical approach and the associated econometric results, while the section IV concludes.

II. STYLIZED FACTS

A. The Dataset

The analysis is based on a sample of a set of 104 EDMEs during 1995-2013. Forty-nine of these countries have issued international sovereign bonds at least once since 1995.[8] The other 55 countries are used as a "control" group; these are countries with per capita income level in the same range as the ones that issued bonds (i.e., countries with a GDP per capita lower than

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[7] Government effectiveness, published in the World Bank's Worldwide Governance Indicators, captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (Kaufmann and others, 2010)).

[8] See Table 2 for countries used in the sample, including those that issued international bonds. Three countries that issued during the sample period are excluded due to lack of data (Iraq, Serbia and Montenegro).

US$10,000 in 1995[9]), but which did not issue bonds in global capital market. In contrast to some of the existing literature (Thomas 2009; Gelos and others 2011), the paper focuses on international bonds, excluding commercial bank syndicated loans to national governments.[10] The motivation for focusing on sovereign bonds is twofold. First, the volume of syndicated loans is smaller than from sovereign bonds (Figure 1).[11] Second, looking exclusively at sovereign bonds—for which information on size and spread at issue is available—allows a joint analysis of factors associated with the likelihood to issue and the associated price.[12]

Data on sovereign bonds are from Bloomberg and include information on the date of issuance, maturity, amount, yield and spread at issue. Data on macroeconomic and institutional variables are from the *World Economic Outlook* database and the *World Development Indicators*.

The set of domestic factors included in the model as potential determinants of sovereign bonds follows the existing empirical literature on market access.[13] The analysis takes into account differences in economic development and macroeconomic performance by including per capita real GDP, GDP growth, inflation, current account balance as a ratio to GDP, international reserves in months of imports, fiscal balance as a ratio to GDP, and external public and publicly guaranteed debt as a ratio to GDP. The importance of the institutional setting is taken into account by incorporating institutional strength in the analysis, measured by an index of government effectiveness.

The paper also considers participation in IMF lending programs as a potential determinant of sovereign bond issuance and spread (Mody and Saravia, 2006). On the one hand, IMF-supported programs may act as a seal of approval, reassuring investors and catalyzing private capital flows; on the other hand, IMF-supported programs could generate moral hazard and signal high financial and sovereign risks (Bird, 2007). The hypothesis that sovereign bond issuance could be persistent is tested by including in both equations a dummy variable equal to one for countries that have issued at least once in the previous three years. Finally, the

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[9] The adoption of this threshold implies the exclusion from the sample of some richer countries (Antigua & Barbuda, The Bahamas, Bahrain, Brunei, Kuwait, Oman, Qatar, Seychelles and UAE).

[10] Private placements are excluded. In the recent LIDC experience, only Tanzania issued a US$ 600 million floating rate note in 2013 via a private placement. For a discussion of government securities and corporate bond markets (see Mu and others, 2013).

[11] The increase in syndicated loans in 2008 and 2009 was due to large borrowing from countries in Europe (e.g., Hungary, Poland, and Ukraine).

[12] Limited and non-random data availability on prices of syndicated loans prevent an extension of our analysis to the issuance and price of syndicated loans (see Cerutti and others 2014 for a discussion of data issues).

[13] Throughout the paper, we use a standard terminology and consider a country as having market access or not only on the ground of bond issuance (Grigorian, 2003; Gelos and others, 2011). We acknowledge that this is a simplification, as access to markets depends also on the amounts issued relative to funding needs, tenor, currency of denomination and interest rate against benchmarks.

paper considers country size, measured by population, since it could affect the ability to borrow because of the fixed costs associated with market access and the potential punishment of a default (Faria and others, 2010; Gelos and others, 2011).

To mitigate the influence of extreme values, GDP growth, inflation, private credit, total debt, fiscal balance, current account, reserves have been winsorized at the 1st and 99th percentiles.[14] Summary statistics, definition and sources of all variables are provided in Table 3.

B. Descriptive Analysis

Sovereign bond issuances by EMDEs in global markets have steadily increased over time, moving from an annual average of 8 per year in the late 1990s, to 12 in the 2000s and 20 since 2010 (Figure 2). During 1995-2013, LIDCs issued 20 sovereign bonds (8.4 percent of all SBIs in the sample) and, with the exception of Moldova, started issuing more recently (Table 1).[15] Global sovereign bond issuances are concentrated geographically: 110 issuances are from Europe and Central Asia, 89 from Latin America and the Caribbean, 16 from Sub-Saharan Africa, 11 from Middle East and North Africa, 6 from South Asia and 5 from East Asia and Pacific region.

Spreads at issue declined somewhat during 2005-09, underpinned by strong global conditions, and picked up thereafter, possibly reflecting the expanding role of frontier markets. The latter were able to place international bonds at higher spreads than the average EMDE (Figure 3). The average primary spread for the 18 LIDCs that issued international bonds was 434 basis points, while the average spread of the bonds issued by EMDEs was 310 basis points (the difference between the two sample averages being statistically significant).

In line with developments in the 1980s and 1990s, sovereign bond issuances have been influenced by global factors. The number of bond issuances slumped significantly during the peak of the global financial crisis, when the volatility of markets increased substantially and investors retreated from risky-asset classes. Starting in 2010, as risk appetite improved and global interest rates further declined, international investors, inclined to diversify their asset portfolio, resumed their search for yield in a low-interest rate environment and sovereigns took advantage of low global interest rates to finance themselves in international markets. As a result, bond issuances picked up considerably (Figure 2).

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[14] The main results are not affected when these observations are trimmed (i.e., set to missing values) rather than winsorized (i.e., extreme values are set equal to the 1st and 99th percentiles).

[15] Vietnam issued in 2005, Ghana and the Republic of Congo were the first African countries to issue sovereign bonds in 2007, while Senegal issued in 2009, Côte d'Ivoire in 2010, Nigeria in 2011, Bolivia, Zambia and Mongolia in 2012, and Honduras, Rwanda and Tanzania in 2013.

Before formally testing the correlation between country-specific characteristics in the run-up to a bond issuance in an econometric model, we undertake some simple cross-country analyses, aimed at determining possible systematic and persistent differences across countries that issued bonds regularly or occasionally and those that did not issue. The analysis follows Gelos and others (2011) and divides the sample into three sub-groups:

- *No-issuance countries* (NI): 55 countries that did not issue a sovereign bond in the sample period 1995-2013;
- *Occasional issuers* (OI): 31 countries that issued sovereign bonds for less than 5 years;
- *Regular issuers* (RI): 18 countries that issued sovereign bonds for 5 or more years over the time period 1995-2013.[16]

The analysis shows that access to international capital markets is correlated with country characteristics measuring the level of economic, financial and institutional development; fiscal and external balances; and external reserve position. Table 4 reports the average values of the macroeconomic and institutional indicators for the whole sample and for the three groups, over the entire sample period. A series of mean-comparison t-tests are conducted to assess whether differences across groups are statistically significant. The cross-country comparison highlights some interesting patterns.

- In comparison with occasional and regular issuers, countries that did not issue at all have lower per capita real GDP, are less financially developed and have a worse external position, but, on average, grow at a faster rate.
- Sovereigns that issued bonds have more effective governments and are more likely to have had an IMF program than countries that did not issue.
- There are differences between occasional and regular issuers: the latter have higher per capita real GDP, stronger institutions, and more external reserves.
- There are no statistically significant differences across the three country groups with regard to inflation and fiscal position.

Finally, Figure 4 shows the correlations between primary spreads and country characteristics in the run-up to issuing sovereign bonds. Macroeconomics variables are measured as the average of the three-year period prior to each issuance. The charts show that lower primary yield spreads are associated with faster growth, higher per capita real GDP, stronger institutions, current account surpluses, and higher international reserves. By contrast, there is limited evidence to a significant simple correlation between primary spreads and the fiscal position, either considering the government balance or external public debt.

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[16] Adjusting the threshold to 10 issuances rather than 5 does not alter the results. In that case, the 7 regular access countries are Brazil, Croatia, Hungary, Jamaica, Lithuania, Poland, and Ukraine.

III. THE EMPIRICAL ANALYSIS

A. Empirical Specification

Access to international debt markets can be modeled as a two-step process. The first relates to the willingness of sovereigns to access global markets and of the latter to supply funds. The second concerns the price at which demand and supply are settled. If unobserved factors that determine bond issuance also affect spreads, a standard linear model for the determinants of sovereign spreads at issue would be biased because of sample selection, given that the dependent variable (the spread in the primary market) is observed only for a non-random subset of country-year observations. Empirically, this problem can be addressed by specifying a sample selection model *à la* Heckman (1979). According to this procedure, in the first stage (selection equation), the probability of sovereign bond issuance is estimated by a standard probit regression, and in the second stage (outcome equation) the primary spread is a linear function of the set of variables and of the inverse Mills ratio calculated from the first-stage regression, which corrects for sample selection bias.

Access to international capital markets is likely to be the result of demand and supply factors: disentangling these two would require an exogenous shock in the demand or in the supply schedule. Focusing exclusively on EMDEs (many of which are LIDCs) should help minimize the cases of voluntarily absence from the market (lack of demand), given that these countries generally need large amounts of external funds to finance domestic investment (Eaton and Gersovitz, 1980; Gelos and others., 2011). Countries, however, could still self-select out of international credit markets, especially in the case of sovereigns with sufficient access to grants and concessional loans. We take this possibility into account by controlling for participation in IMF-supported lending programs and, as robustness check, we control also for the amount of aid inflows. In addition, countries could base their demand for international bonds on expected borrowing costs. While it is difficult to fully control for these costs, especially for first-time issuers for whom there are no secondary market bond spreads, the information on expected borrowing costs is indirectly taken into account by inclusion of a comprehensive set of domestic and global controls in the selection equation. However, in the absence of an identification strategy, the empirical exercise focuses on factors associated with sovereign bond issuance without implying causality.

In the selection equation, the likelihood of a sovereign bond issuance (SBI) in the global market by a country is a function of: 1) the 10-year US treasury notes yield and the VIX index[17] as measures of global liquidity and volatility (*GLOBAL*); 2) a set of *j* time-varying domestic factors (*DOMESTIC*); and 3) country size (*POPULATION*). The latter is measured by the logarithm of population, which is taken as excluding restriction under the assumption

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[17] The CBOE Volatility Index (VIX), computed and disseminated by the Chicago Board Options Exchange, is a measure of market expectations of near-term volatility conveyed by S&P500 stock index option prices.

that it affects only the likelihood to issue but not the primary spreads, given that, in the presence of fixed costs for borrowing, smaller countries will access markets less frequently than larger countries (Faria and others 2010; Gelos and others 2011). The selection equation is as follows:

$$(1) \quad Prob(SBI = 1)_{i,t} =$$
$$\phi\left(\sum_{k=1}^{2} GLOBAL_t^k; \sum_{j=1}^{n} DOMESTIC_{i,(t-1;t-3)}^j; POPULATION_{i,(t-1;t-3)}\right)$$

where the dependent variable is a binary indicator that takes the value of one when country i issued at least one sovereign bond in year t, and zero otherwise, and $\Phi(.)$ is the normal cumulative distribution function. In the outcome equation, the primary spread on the sovereign bond (*SPREAD*) issued by country i in year t (observed exclusively in country-year observations where $SBI = 1$)[18] is a linear function of the same set of global and domestic factors, plus the inverse Mills ratio (*IMR*) which takes account of the selection bias:

$$(2) \quad SPREAD_{i,t} = \alpha + \sum_{k=1}^{2} \gamma_k GLOBAL_t^k + \sum_{j=1}^{n} \beta_j DOMESTIC_{i,(t-1;t-3)}^j + \rho IMR + \xi_{i,t}$$

In both equations, global conditions includes the contemporaneous values of the 10-year US treasury notes yield and the VIX index, which may affect both the supply of funds by investors and demand for financing by issuing countries. The set of domestic factors includes indicators of overall economic performance, past issuances and participation in IMF-supported programs, external sector position, liquidity, fiscal position, and government effectiveness, as discussed in Section II.A.[19] All domestic explanatory variables are measured as averages in the 3-year period prior to the year of issuance. Taking a 3-year period rather than measuring independent variables in *t-1* further mitigates possible endogeneity concerns (Gelos and others, 2011) and minimizes the incidence of outliers. In addition, this choice assumes that market access does not depend on domestic macroeconomic conditions in place just the year before the issuance, but it is influenced by what happened in the run-up of the issuance. Given that the inclusion of the dummy variable for lagged issuance—which accounts for persistence in market access—may create problems making the model dynamic, we start showing results for a model that excludes the dummy for past sovereign bond issuance.

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[18] If a sovereign issues more than one bond in a given year, the variable *SPREAD* measures the (unweighted) average of the spreads of all bonds issued in that year.

[19] As the literature identifies a number of determinants of market access and bond spreads, the set of explanatory variables used considers the trade-off between the inclusion of the most relevant determinants of market access and the reduction in the number of observations due to the inclusion of too many variables.

The model also includes regional[20] dummy variables to account for regional fixed effects and spillovers (Dell'Erba and others, 2013). The baseline analysis takes into account the role of global liquidity and volatility including the 10-year US treasury notes' yield and the VIX index. Alternatively, we replace these two variables with year-fixed effects, which capture global (common) time-variant shocks and allow focus on the role of domestic factors.

B. Results

The maximum likelihood estimates of the 2-equation system are shown in Table 5, which reports the coefficients and the associated robust standard errors (correcting for heteroskedasticity). For each model specifications, the first column reports the estimates of outcome equation (2) and the second refers to the selection equation (1).

Overall, the analysis shows that sovereign bond issuance and spreads depend on global conditions, macroeconomic performance (the fiscal position and indicators of liquidity), and institutional strength in the run-up to bond issuances. The results indicate that country size is a significant predictor of sovereign bond issuance, as there would be fixed costs for borrowing through issuance (Gelos and others, 2011), validating the exclusion restriction.[21] Regional dummy variables and global factors are statistically significant, suggesting the presence of spillovers in market access and the relevance of global demand- and supply-side factors in the sovereign bond market. As in Eichengreen and Mody (2000), the coefficient ρ on the estimated inverse Mills ratio in the outcome equation is negative and statistically significant,[22] suggesting that participation in the international debt market is actually non-random, and that the unobservable political, institutional and economic characteristics of countries affecting the likelihood SBI also inversely influence bond spreads.

The baseline specification (columns 1-2) suggests that global factors matter for market access. When market volatility increases, so do primary spreads: a one standard deviation of the VIX index corresponds to a 29 basis points change in spread. The effect of global interest rates is twofold: lower US rates are associated with a higher probability that countries issue sovereign bonds, but also with higher spreads. The estimated coefficients indicate that a 1 percentage point reduction in the US rate translates into a 29 basis-point increase in the primary spread. This result is consistent with that of Eichengreen and Mody (2000) and, as suggested when discussing the stylized facts (see above, Section II.B), it is likely to be the result of frontier markets accessing international bond markets in a period of declining global

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[20] For East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, and Sub-Saharan Africa.

[21] Inclusion of population in the outcome equation (2) confirms that country size is not correlated with primary spreads.

[22] The Wald test rejects the null hypothesis that the error terms in the two equations are orthogonal.

interest rates, but placing bonds at spreads higher than the average spread on bonds placed by EMDEs (Figure 3).[23]

Moving to domestic factors, the baseline specification shows that countries with higher per capita real GDP levels are more likely to issue sovereign bonds. The coefficient on real GDP growth shows that low-growth countries are penalized when issuing bonds as they tend to do so at higher spreads (Gelos and others, 2011; Eichengreen and Mody, 2000). The coefficients on inflation are generally not statistically significant. Countries that had an IMF-supported lending arrangement in the previous three years are more likely to issue, supporting the catalytic role of IMF lending (Mody and Saravia 2006).

The external sector position and liquidity matter for the terms of the issuance. Countries with lower current account deficits and higher international reserves face lower spreads (than those with higher external deficits and lower reserves). By contrast, there is no evidence of a robust association between the external position and the probability of bond issuance. The negative correlation between reserves and the probability of sovereign bond issuance, even if not significant, is consistent with the findings of Gelos and others (2011) and could suggest that a higher level of reserves insures sovereigns against exclusion from credit markets.

The fiscal position is a key determinant of market access. The coefficient on the public external debt-to-GDP ratio in the selection equation indicates that more indebted countries are less likely to issue sovereign bonds (Gelos and others, 2011) and when they do, they tend to pay higher prices: a 10 percent increase in the external debt-to-GDP ratio is associated with 10-12 basis-point increase in the primary spread (columns 7-9). The reinforcing effect of the debt-to-GDP ratio in the selection and outcome equations would suggest the presence of demand-side effects: high debt ratios would discourage demand from international investors and this shift would reduce the price of bonds, with a corresponding increase in primary spreads (Eichengreen and Mody, 2000). The negative coefficient on the government budget balance in the selection equation suggests that the demand for external borrowing is higher when fiscal deficit is larger, supporting the hypothesis that countries in the sample are capital scarce (Grigorian, 2003).

In the following specification (columns 3-4), the analysis of the effect of the fiscal deficit on sovereign bond issuance allows for a non-linear effect of the fiscal balance based on countries' income level. Incorporating an interaction term between the fiscal balance-to-GDP

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[23] This sort of sample selection effect is consistent with the early literature on emerging markets' bond spreads, when Fed tightening was associated with a narrowing, not widening, of bond spreads. One explanation is that initial market offerings during periods of Fed tightening, which were associated with turbulent market conditions, were only possible for the more creditworthy countries (Arora and Cerisola, 2001). Supply-side factors could be at play as well: with low yields, investors could look beyond the traditional markets and venture out in more risky frontiers markets, looking for higher spreads. The fact that the negative coefficient on US rates is not statistically significant when we exclude the period 2008-2013 (results not reported) suggests that the supply-side effects may have dominated in the last period of global low interest rates.

ratio and per capita real GDP, we find that fiscal discipline is especially important for poorer countries, for which a stronger fiscal position is associated with a higher likelihood to issue sovereign bonds and at lower primary spreads than their richer counterparts. In the selection equation, the positive coefficient on the government budget balance (as a share of GDP) and the negative one on its interaction with per capita real GDP indicate that the fiscal balance is positively associated with the probability to issue, but this effect becomes weaker for richer countries (actually, the coefficient turns positive for sufficiently high level of per capita real GDP).

In addition, when we allow for heterogeneity (captured by differences in per capita income), a stronger budget balance is found to be associated with lower spreads, especially for lower income countries. A one percentage point improvement in the fiscal balance translates, on average, into a 3 basis-point drop in spreads, but this effect is more than five times larger for lower income countries (with a per capita GDP of about US$400). Modeling this non-linearity does not alter the results of the other variables.

In columns 5-6, the model is augmented to account for the fact that sovereign bond issuance is likely to be persistent. The analysis finds that after its first issuance, a country is more likely to issue again in the future, and when it does, spreads are lowered: the reduction in spreads for repeat issuers is about 75 basis points compared to countries that did not issue in the previous three years. This result lends further support to the hypothesis of the presence of fixed costs in accessing international capital markets.[24]

Other model specifications (in columns 7 and 8) control for institutional strength, measured by the index of government effectiveness[25], which the existing literature has identified as a key driver of market access (Thomas 2009; Gelos and others 2011). Greater government effectiveness increases the likelihood of sovereign bond issuance as well as lowers its cost: a one standard deviation increase in the index of government effectiveness is associated with 98 basis-point reduction in primary spreads. Moreover, per capita real GDP and the effect of past IMF programs are no longer significantly associated with bond spreads. In addition, once we control for institutional quality, the coefficient on the US rate is less precisely estimated, while we still find evidence that spreads increase in periods of market volatility.

Finally, in columns 9 and 10, we model global shocks with time fixed effects rather than with the inclusion of the US rates and the VIX index. The results on the domestic factors are broadly unaffected (the negative correlation between inflation and the probability of bond issuance becomes significant and the coefficient on debt in the outcome equation is larger and more precisely estimated than in the alternative models) and time fixed effects are jointly

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[24] This finding is consistent with that of Guscina and others (2014) with first-time bond issuances trading at higher spreads, even after controlling for a standard set of macroeconomic and institutional variables.

[25] The inclusion of government effectiveness comes at the non-trivial cost of reducing the sample size.

significant, lending further support to the hypothesis that common global factors matter for market access by EDMEs.

C. Robustness

The robustness analysis focuses mainly on the potential role of additional domestic factors in affecting market access. We take the last specification of Table 5 (columns 9-10), including the dummy variable for past bond issuances, the interaction between the fiscal balance and per capita real GDP, government effectiveness and year fixed effects, as reference. The robustness of our findings is tested by including a set of alternative domestic macroeconomic control variables. The results are reported in Table 6. We use 3 rather than 6 regional dummy variables to avoid convergence issues when estimating the model. It is reassuring that the baseline results (Table 6, columns 1-2) are very similar to the ones reported in Table 5 (columns 5-6).

We start by controlling for the level of total public debt, rather than measuring exclusively public and publicly guaranteed external debt, and we find that the two debt indicators have similar effects, as higher public debt ratios are associated with a lower likelihood to issue and higher bond spreads (columns 3-4). We also control for the level of financial development and find a negative correlation between the ratio of credit to the private sector to GDP and the probability of issuance, suggesting that sovereigns with less developed credit markets rely more on external financing (column 5-6). The inclusion of a dummy variable for resource-rich economies[26] does not alter the baseline results (columns 7-8). Further, the Chinn and Ito (2006) *de jure* measure of financial openness shows that countries with more open capital accounts can issue at a significant lower spread than less financially open sovereigns. We also augment the model by adding the ratio of aid inflows to GDP, in order to control for the possibility that countries with easier access to grants and concessional loans could have a smaller demand for non-concessional financing (columns 11-12); our results indicate that countries depending more on foreign aid face larger spreads which may suggest that aid recipients could be perceived as riskier by markets.

Finally, in columns 13 and 14 all domestic variables are measured at time *t-1* (rather than averaged over the three-year period before the issuance). Results are almost identical to the baseline, with a notable exception being the significant positive association between inflation and bond spreads.

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[26] Bolivia, Republic of Congo, Côte d'Ivoire, Gabon, Mongolia, Nigeria, Vietnam and Zambia (see IMF, 2012).

IV. CONCLUSIONS

Our analysis offers the following messages for low-income developing countries, drawing on the experience of emerging markets and developing economies that have gained market access.

- **Bond spreads.** Countries with stronger budget balance positions, as well as external positions (measured by the current account balance and level of international reserves) experience lower spreads (than those with less strong fiscal and external positions). Spreads are lower in periods of declining global market volatility.

- **Bond issuance.** The fiscal position, as reflected in the fiscal balance and public debt level, matters importantly for market access. The likelihood of issuance increases with an improved government budget balance. Countries with larger debt burdens are less likely to issue bonds than their peers and, if they do, they do so at a premium. Strong government effectiveness is associated with both a higher likelihood of issuance and lower spreads. Finally, countries that are larger and have higher per capita GDP seem to have greater market access (than those that are smaller and less developed).

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Table 1: International Sovereign Bond Issuances by LIDCs

Issuer	Issue Date	Yield at issue	Tenor	Amt (USD mn)	Spread (bps)	S&P rating at issue
Moldova	12/10/96		3	30		
Moldova	6/6/97	9.88	5	75	340.0	Not rated
Vietnam	10/27/05	7.25	10	750	256.4	BB-
Ghana	9/27/07	8.50	10	750	387.0	B+
Republic of the Congo	12/7/07	8.77	22	480	458.0	Not rated
Senegal	12/15/09	9.47	5	200	691.0	B+
Vietnam	1/26/10	7.07	10	1000	332.7	BB
Côte d'Ivoire	4/8/10	17.35	23	2330	393.0	Not rated
Nigeria	1/21/11	7.13	10	500	372.0	B+
Senegal	5/6/11	9.34	10	500	596.4	B+
Zambia	9/13/12	5.63	10	750	383.6	B+
Bolivia	10/22/12	4.88	10	500	306.0	BB-
Côte d'Ivoire	11/15/12		20	187		Not rated
Mongolia	11/29/12	4.17	5	500	358.0	BB-
Mongolia	11/29/12	5.19	10	1000	358.0	BB-
Tanzania	2/27/13		7	600	600.0	Not rated
Honduras	3/12/13	7.50	11	500	547.9	B+
Rwanda	4/25/13	7.00	10	400	515.7	B
Nigeria	7/2/13	5.45	5	500	381.0	BB-
Nigeria	7/2/13	6.74	10	500	393.0	BB-
Ghana	7/25/13	8.00	10	750	540.0	B
Ghana	7/25/13		10	250		
Bolivia	8/15/13	6.25	10	500	347.5	BB-
Zambia	4/14/14	8.63	10	1000	592.6	B+
Kenya	6/24/14	6.88	10	1500	429.0	B+
Kenya	6/24/14	5.88	5	500	418.0	B+
Kenya	12/24/14	5.00	10	500		B+
Kenya	12/24/14	5.90	5	250		B+
Côte d'Ivoire	7/23/14	5.63	10	750	308.9	
Senegal	7/30/14	6.25	10	500	379.3	B+
Ghana	9/11/14	8.25	11	1000	572.0	B-
Vietnam	11/6/14	4.80	10	1000	238.7	BB-
Ethiopia	12/4/14	6.625	10	1000	435.6	B

Source: Bloomberg. Updated to end-December 2014.

Table 2: Sample

Country	SBI	Country	SBI	Country	SBI
Albania	1	Eritrea	0	Morocco	1
Algeria	0	Ethiopia	0	Mozambique	0
Angola	0	Fiji	1	Namibia	1
Armenia	1	Gabon	1	Nepal	0
Azerbaijan	0	Gambia, The	0	Niger	0
Bangladesh	0	Georgia	1	Nigeria	1
Belarus	1	Ghana	1	Paraguay	1
Belize	1	Grenada	1	Peru	1
Benin	0	Guatemala	1	Poland	1
Bhutan	0	Guinea	0	Romania	1
Bolivia	1	Guinea-Bissau	0	Russian Federation	1
Bosnia & Herzegovina	0	Guyana	0	Rwanda	1
Botswana	0	Honduras	1	Senegal	1
Brazil	1	Hungary	1	Sierra Leone	0
Bulgaria	1	India	0	Solomon Islands	0
Burkina Faso	0	Jamaica	1	Sri Lanka	1
Burundi	0	Jordan	1	St. Kitts and Nevis	0
C.A.R.	0	Kazakhstan	1	St. Lucia	0
Cambodia	0	Kenya	0	St. Vincent & Grenadines	1
Cameroon	0	Kyrgyz Republic	0	Sudan	0
Cape Verde	0	Laos	0	Suriname	0
Chad	0	Latvia	1	Swaziland	0
Chile	1	Lesotho	0	Syria	0
Comoros	0	Liberia	0	São Tomé and Príncipe	0
Congo, Republic of	1	Libya	0	Tajikistan	0
Costa Rica	1	Lithuania	1	Tanzania	1
Côte D'Ivoire	1	Macedonia, FYR	1	Togo	0
Croatia	1	Madagascar	0	Tunisia	0
Djibouti	0	Malawi	0	Uganda	0
Dominica	0	Maldives	0	Ukraine	1
Dominican Republic	1	Mali	0	Vanuatu	0
Ecuador	1	Mauritania	0	Vietnam	1
Egypt	1	Mauritius	1	Yemen	0
El Salvador	1	Moldova	1	Zambia	1
Equatorial Guinea	0	Mongolia	1		

Notes: Sovereign bond issuance (SBI) is equal to one for countries that issued at least a sovereign bond between 1995 and 2013. Countries for which the SBI indicator is equal to zero have never issued a sovereign bond.

Table 3: Variables' Definition, Sources and Summary Statistics

Variable	Definition	Source	Mean	St. Dev.	Min	Max	Obs
SBI (0/1)	Dummy equal to one if the country issued at least a sovereign bond in the year, and zero otherwise.	Bloomberg	0.109	0.312	0	1	1,749
SPREAD	Spread of the sovereign bond over the EMBI. If a country issues more than one bond in the year, SPREAD is the simple average of the single spreads.	Bloomberg	309.590	171.972	21.600	825.000	191
Real per capital GDP	Real per capita GDP in USD, in logarithms.	WDI	7.172	1.119	4.775	9.445	1,749
GDP growth	Real GDP growth rate.	WEO	4.329	3.621	-11.967	21.060	1,749
Inflation	Consumer rice index, annual percent change.	WEO	17.401	76.563	-4.148	1265.734	1,749
PPG external debt (%GDP)	Public and publicly guaranteed external debt (% of GDP).	WDI	58.491	45.712	2.203	304.203	1,749
Fiscal balance (%GDP)	General government net lending/borrowing (% of fiscal year GDP).	WEO and country reports	-2.287	4.223	-16.403	20.123	1,749
Current account (%GDP)	Balance on current account (% of GDP)	WEO	-5.369	8.086	-34.795	21.405	1,749
Reserves (in months of imports)	International reserves in months of imports	WDI, WEO and country reports	4.698	4.257	0.031	30.307	1,749
IMF program in the previous 3 year	Dummy equal to one if the country signed at least a loan agreement in the previous 3-year period	IMF historical data set	0.150	0.199	0	1	1,749
Resource rich dummy	Dummy equal to one for resource rich countries and zero otherwise.	IMF (2012)	0.200	0.400	0	1	1,749
Population (logs)	Total population, in logarithms.	WDI	15.516	1.843	10.642	20.923	1,749
Government effectiveness	Government effectiveness index, ranging from approximately -2.5 to 2.5, with higher values corresponding to better outcomes.	WGI	-0.482	0.599	-1.929	1.278	1,614
Total debt (%GDP)	Public debt (% of GDP).	WDI	65.306	50.900	5.474	328.583	1,747
Private credit (%GDP)	Domestic credit provided by banking sector (% of GDP).	Abbas and others (2011)	36.479	30.205	-40.464	149.421	1,745
Aid (% GDP)	Net official development assistance and official aid received (% of GDP)	WDI	7.532	9.032	-0.016	100.386	1,708
US rates	Yield on the 10-year US Treasury notes	Federal Reserve	4.320	1.310	1.800	6.570	1,749
VIX index	Chicago Board Options Exchange Volatility Index	CBOE	21.316	6.088	12.389	32.693	1,749

Notes: Data refer to annual data for 104 countries over the period 1995-2013. The variables GDP growth, inflation, private credit (% GDP), PPG external debt (% GDP), total debt (% GDP), fiscal balance (% GDP), current account (% GDP), and reserves (in months of imports) have been winsorized at the 1st and 99th percentiles. See text for a more detailed discussion of some variables.

Table 4: Country Characteristics by Access Frequency Groups

Variable	All countries		No-issuance countries		Occasional issuers		Regular issuers		Test of equality of means		
	Mean	N	Mean	N	Mean	N	Mean	N	NI-OI	NI-RI	OI-RI
Per capita real GDP	7.20	104	6.72	55	7.40	31	8.31	18	***	***	***
GDP growth	4.37	104	4.58	55	4.49	31	3.53	18		*	*
Inflation	12.37	104	14.05	55	11.15	31	9.38	18			
Private credit (% GDP)	37.43	104	31.38	55	40.86	31	49.99	18		**	
PPG External debt (% GDP)	58.84	104	64.23	55	54.73	31	49.46	18			
Fiscal balance (% GDP)	-2.30	104	-2.18	55	-2.14	31	-2.97	18			
Current account (% GDP)	-5.69	104	-6.88	55	-4.91	31	-3.43	18		**	
Reserves (in months of imports)	4.81	104	5.27	55	3.86	31	5.08	18			*
Resource-rich country	0.21	104	0.26	55	0.26	31	0.00	18		**	**
Population (logs)	15.52	104	15.24	55	15.44	31	16.48	18		**	**
IMF program in the previous 3 year	0.14	104	0.12	55	0.15	31	0.17	18		*	
Government effectiveness	-0.47	104	-0.67	55	-0.40	31	0.05	18	**	***	***

Notes: Based on a sample of 104 emerging markets and developing economies. Simple averages over the sample period 1995-2013 and across market access groups. The "regular issuers" (RI) group includes countries that issued in more than 5 years; "occasional issuers" (OI) includes countries that issued in 5 or less years; and "no-issuance countries" (NI) groups all countries that never issued a sovereign bond. The variables GDP growth, inflation, external debt, fiscal balance, current account, reserves have been winsorized at the 1st and 99th percentiles.

Table 5: Regression Results: Baseline

| Dep. Var.:	(1) SPREAD	(2) SBI	(3) SPREAD	(4) SBI	(5) SPREAD	(6) SBI	(7) SPREAD	(8) SBI	(9) SPREAD	(10) SBI
US rates	-29.561***	-0.107***	-29.003***	-0.106***	-29.796***	-0.081*	-10.853	-0.054		
	(9.523)	(0.040)	(9.500)	(0.041)	(9.741)	(0.042)	(8.827)	(0.047)		
VIX index	4.782***	-0.002	4.630***	-0.003	4.573***	-0.002	3.977***	-0.007		
	(1.503)	(0.008)	(1.489)	(0.008)	(1.462)	(0.009)	(1.484)	(0.009)		
Real per capita GDP	-121.760***	0.873***	-82.269***	0.707***	-77.397***	0.573***	-12.059	0.480***	-9.217	0.489***
	(18.878)	(0.078)	(18.955)	(0.103)	(18.810)	(0.105)	(22.822)	(0.130)	(21.019)	(0.129)
GDP growth	-12.538***	-0.017	-12.027***	-0.015	-11.917***	-0.016	-12.917***	-0.031	-13.865***	-0.018
	(4.315)	(0.018)	(4.350)	(0.019)	(4.328)	(0.018)	(4.627)	(0.021)	(3.734)	(0.023)
Inflation	0.062	-0.001	0.063	-0.001	0.017	-0.000	-0.567	-0.003	-0.122	-0.004*
	(0.095)	(0.001)	(0.093)	(0.001)	(0.093)	(0.001)	(0.386)	(0.002)	(0.414)	(0.002)
PPG external debt (%GDP)	0.323	-0.004**	0.558	-0.005**	0.512	-0.004**	1.033**	-0.005**	1.220***	-0.005**
	(0.467)	(0.002)	(0.464)	(0.002)	(0.467)	(0.002)	(0.489)	(0.002)	(0.438)	(0.002)
Fiscal balance (%GDP)	9.699*	-0.085***	-88.350***	0.356**	-87.485***	0.325**	-85.466***	0.336**	-72.149**	0.354**
	(5.500)	(0.023)	(30.611)	(0.154)	(32.955)	(0.143)	(31.099)	(0.145)	(29.868)	(0.150)
Current account (%GDP)	-5.631***	-0.008	-5.353***	-0.007	-4.740**	-0.007	-9.020***	-0.005	-10.038***	-0.005
	(2.060)	(0.009)	(2.058)	(0.010)	(2.063)	(0.010)	(1.986)	(0.010)	(2.002)	(0.010)
Reserves (in months of imports)	-11.813***	-0.027*	-11.796***	-0.025*	-11.273***	-0.014	-7.975**	-0.021	-7.799***	-0.021
	(3.605)	(0.015)	(3.583)	(0.015)	(3.513)	(0.015)	(3.225)	(0.016)	(2.921)	(0.016)
IMF program in the previous 3 year	94.664**	0.594**	92.074**	0.607**	92.465**	0.568**	19.193	0.619**	-0.289	0.633**
	(44.310)	(0.268)	(43.715)	(0.274)	(43.034)	(0.274)	(47.539)	(0.281)	(47.995)	(0.283)
Population		0.466***		0.475***		0.391***		0.400***		0.404***
		(0.039)		(0.040)		(0.043)		(0.046)		(0.045)
Fiscal balance (%GDP) * real pc GDP			12.006***	-0.056***	11.507***	-0.049***	10.459***	-0.050***	8.964**	-0.052***
			(3.708)	(0.019)	(3.994)	(0.018)	(3.755)	(0.018)	(3.553)	(0.019)
SBI in the previous 3 year					-74.553**	0.727***	-70.154**	0.652***	-72.560***	0.685***
					(29.527)	(0.124)	(27.494)	(0.130)	(27.001)	(0.132)
Government effectiveness							-163.807***	0.226*	-182.120***	0.230*
							(27.521)	(0.129)	(25.859)	(0.128)
Observations	1,749		1,749		1,749		1,614		1,614	
ρ	-0.414		-0.386		-0.435		-0.448		-0.500	
Wald test (p-value)	0.018		0.034		0.014		0.025		0.020	
Area FE	Yes		Yes		Yes		Yes		Yes	
Test area FE	0.000		0.000		0.000		0.000		0.000	
Year FE	No		No		No		No		Yes	
Test year FE	1.000		1.000		1.000		1.000		0.000	

Notes: the table reports the estimated coefficients and the associated robust standard errors, of the maximum likelihood estimated of equations (1) and (2). * Significant at 10%; ** Significant at 5%; *** Significant at 1%. The model is estimated by two-step Heckman, using Stata 13 SE package with HECKMAN command. The dependent variable is: 1) a dummy equal to one if the country issues a sovereign bond at time t, and zero otherwise (*SBI*) in the selection equation and 2) the spread on sovereign bonds at issue (*SPREAD*) in the outcome equation. The 10-year US Treasury notes yield and the VIX are measured at time t, while all the other variables are averages between t-3 and t-1. A constant, year dummies and six region dummies are included, but coefficients are not shown. The bottom rows report the p-values of a t-test for the joint significance of year and region dummies, and the p-value of the Wald test for the independence of the two equations ($\rho = 0$).

Table 6: Regression Results: Robustness

| Dep. Var.:	(1) SPREAD	(2) SBI	(3) SPREAD	(4) SBI	(5) SPREAD	(6) SBI	(7) SPREAD	(8) SBI	(9) SPREAD	(10) SBI	(11) SPREAD	(12) SBI	(13) SPREAD	(14) SBI
Real per capita GDP	-1.962 (25.309)	0.516*** (0.112)	-3.476 (25.688)	0.491*** (0.117)	-2.932 (24.715)	0.535*** (0.110)	-2.318 (28.744)	0.537*** (0.113)	10.725 (32.522)	0.513*** (0.114)	58.600* (30.347)	0.479*** (0.121)	-39.002** (18.235)	0.695*** (0.106)
GDP growth	-12.107*** (3.754)	-0.019 (0.023)	-15.690*** (3.553)	-0.016 (0.023)	-12.286*** (3.828)	-0.027 (0.024)	-12.050*** (3.709)	-0.021 (0.023)	-10.354*** (3.535)	-0.023 (0.023)	-11.551*** (3.840)	-0.019 (0.023)	-11.268*** (3.215)	0.007 (0.017)
Inflation	-0.102 (0.419)	-0.003* (0.002)	-0.137 (0.482)	-0.003* (0.002)	-0.094 (0.421)	-0.003* (0.002)	-0.103 (0.421)	-0.003* (0.002)	-0.260 (0.365)	-0.003 (0.002)	-0.064 (0.369)	-0.003 (0.002)	3.190*** (1.106)	-0.019*** (0.007)
PPG External debt (%GDP)	1.278*** (0.446)	-0.005** (0.002)			1.301*** (0.436)	-0.004* (0.002)	1.279*** (0.458)	-0.005** (0.002)	1.497*** (0.509)	-0.005** (0.002)	1.738*** (0.603)	-0.006** (0.003)	1.097*** (0.392)	-0.003 (0.002)
Fiscal balance (%GDP)	-96.671*** (32.105)	0.447*** (0.142)	-84.551*** (30.376)	0.432*** (0.154)	-96.813*** (31.460)	0.437*** (0.139)	-95.102** (38.488)	0.422*** (0.141)	-78.661** (34.457)	0.439*** (0.144)	-157.236*** (36.016)	0.455*** (0.144)	-0.731 (4.597)	-0.058** (0.023)
Fiscal balance (%GDP) * real pc GDP	11.704*** (3.861)	-0.061*** (0.018)	10.582*** (3.898)	-0.061*** (0.020)	11.753*** (3.757)	-0.061*** (0.018)	11.506** (4.541)	-0.058*** (0.018)	9.144** (4.363)	-0.060*** (0.019)	19.040*** (4.476)	-0.062*** (0.019)		
Current account (%GDP)	-7.438*** (2.023)	-0.007 (0.011)	-6.876*** (2.017)	-0.007 (0.011)	-7.583*** (1.996)	-0.007 (0.011)	-7.346*** (2.328)	-0.008 (0.010)	-7.727*** (2.074)	-0.007 (0.011)	-5.801** (2.676)	-0.003 (0.011)	-5.513*** (1.887)	-0.008 (0.009)
Reserves (in months of imports)	-9.386*** (3.003)	-0.030* (0.016)	-11.049*** (3.512)	-0.026* (0.015)	-9.276*** (2.965)	-0.035** (0.016)	-9.376*** (3.160)	-0.029 (0.016)	-8.615** (3.398)	-0.032** (0.016)	-7.292** (3.445)	-0.035** (0.017)	-9.273*** (3.061)	-0.035** (0.017)
Government effectiveness	-173.623*** (27.718)	0.200 (0.122)	-154.538*** (25.811)	0.168 (0.123)	-174.307*** (27.818)	0.302** (0.133)	-174.079*** (27.613)	0.227* (0.123)	-164.615*** (26.662)	0.177 (0.125)	-214.861*** (32.706)	0.233* (0.124)	-148.254*** (25.515)	0.183 (0.123)
IMF program in the previous 3 year	24.596 (49.532)	0.807*** (0.267)	45.524 (51.154)	0.731*** (0.273)	21.114 (49.228)	0.681** (0.267)	25.163 (49.956)	0.824*** (0.269)	66.511 (51.619)	0.765*** (0.296)	-16.378 (57.170)	0.786*** (0.269)	63.401 (45.045)	0.797*** (0.282)
SBI in the previous 3 year	-58.861** (29.239)	0.747*** (0.124)	-55.071 (42.607)	0.726*** (0.126)	-62.719*** (26.859)	0.734*** (0.125)	-57.966** (30.274)	0.752*** (0.124)	-36.257 (49.870)	0.734*** (0.125)	-88.637** (37.868)	0.783*** (0.125)	-43.947 (33.224)	0.703*** (0.134)
Population		0.381*** (0.042)		0.385*** (0.044)		0.395*** (0.043)		0.383*** (0.041)		0.382*** (0.043)		0.361*** (0.046)		0.428*** (0.045)
Total debt (%GDP)			0.938** (0.463)	-0.006** (0.003)										
Credit (%GDP)					-0.045 (0.419)	-0.006** (0.003)								
Natural resource-rich (0/1)							-7.100 (48.756)	0.212 (0.199)						
Capital account openness									-24.673*** (6.204)	0.060 (0.043)				
Aid (%GDP)											19.356** (7.712)	0.002 (0.016)		
Observations	1,614		1,612		1,610		1,614		1,599		1,573		1,605	
Wald test (p-value)	0.296		0.733		0.130		0.344		0.993		0.111		0.540	
Area FE	YES		YES		YES		YES		YES		YES		YES	
Test area FE	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
Year FE	YES		YES		YES		YES		YES		YES		YES	
Test year FE	0.000		0.000		0.000		0.000		0.000		0.000		0.000	

Notes: the table reports the estimated coefficients and the associated robust standard errors, of the maximum likelihood estimated of equations (1) and (2). * Significant at 10%; ** Significant at 5%; *** Significant at 1%. The model is estimated by two-step Heckman, using Stata 13 SE package with HECKMAN command. The dependent variable is: 1) a dummy equal to one if the country issues a sovereign bond at time t, and zero otherwise (*SBI*) in the selection equation and 2) the spread on sovereign bonds at issue (*SPREAD*) in the outcome equation. All control variables are averages between $t-3$ and $t-1$; in columns 13-14, instead, they are measured in $t-1$, with the exception of the dummies for past SBI and IMF programs in the previous three years. A constant, year dummies, and region dummies (columns 1-12 include 3 region dummies – Europe and Asia, Latin America and Africa – columns 13-14 include 6 region dummies) are included, but coefficients are not shown. The bottom rows report the p-values of a t-test for the joint significance of year and region dummies, and the p-value of the Wald test for the independence of the two equations ($\rho = 0$).

Figure 1: International Sovereign Bonds and Syndicated Loans to the Public Sector
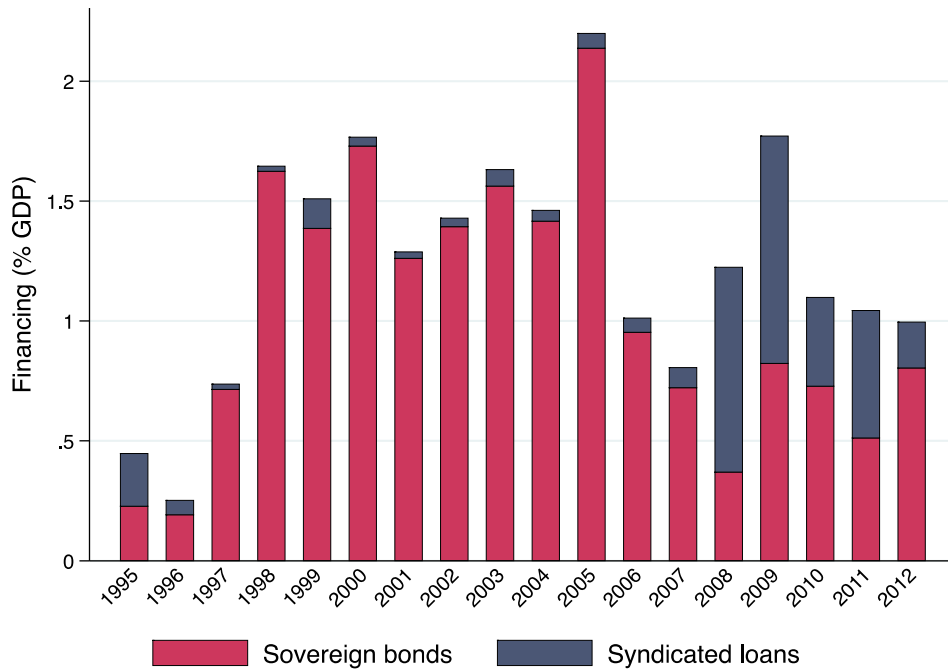

Notes: Based on annual data for 104 emerging markets and developing economies, over 1995-2013. GDP-weighted averages. Syndicated loans to the public sector include the central government and state/provincial authorities as borrowers. Source: Dealogic Loan Analytics and Bloomberg.

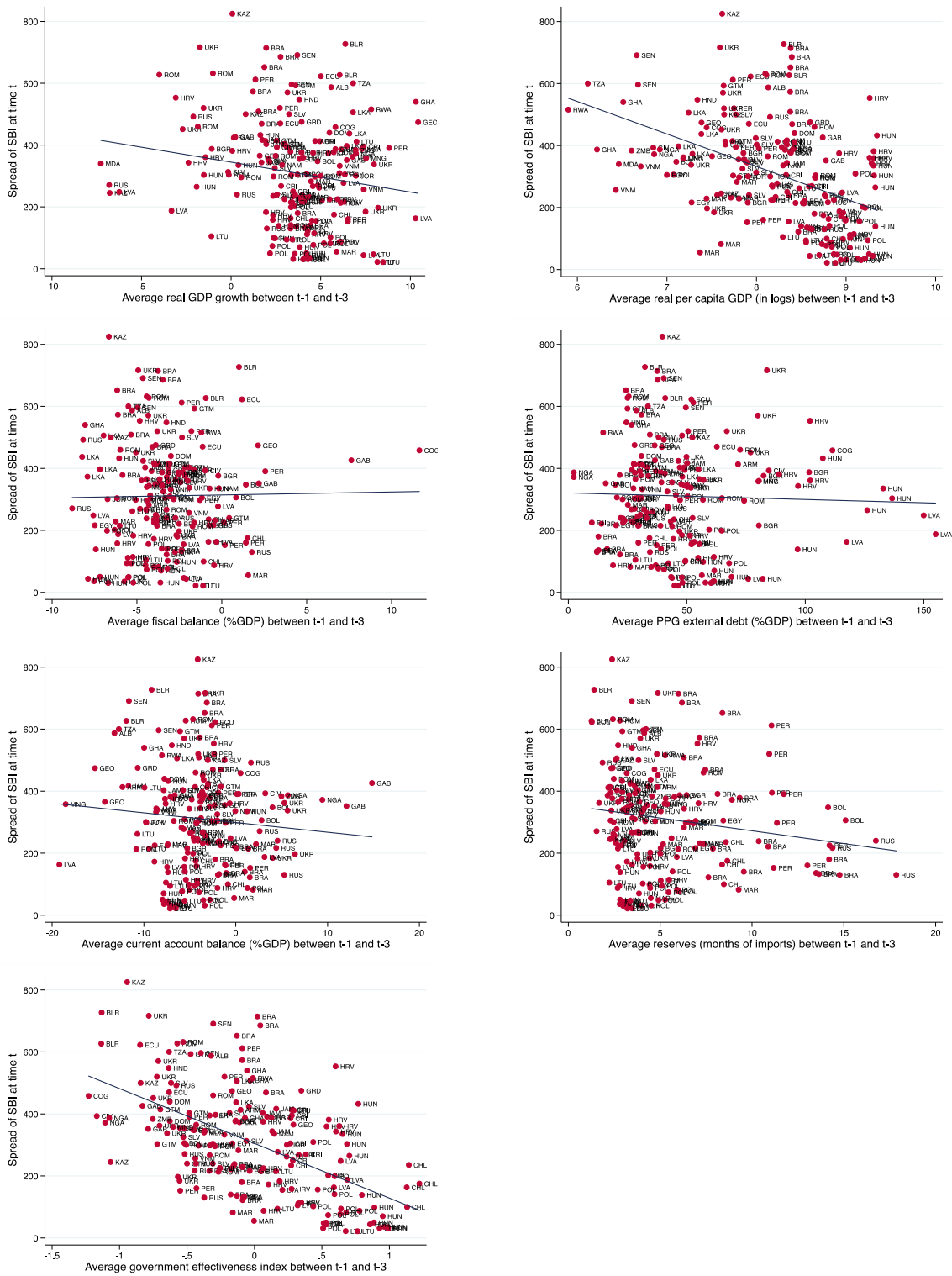**Figure 2: International Sovereign Bond Issuances and Global Conditions, 1995-2013**
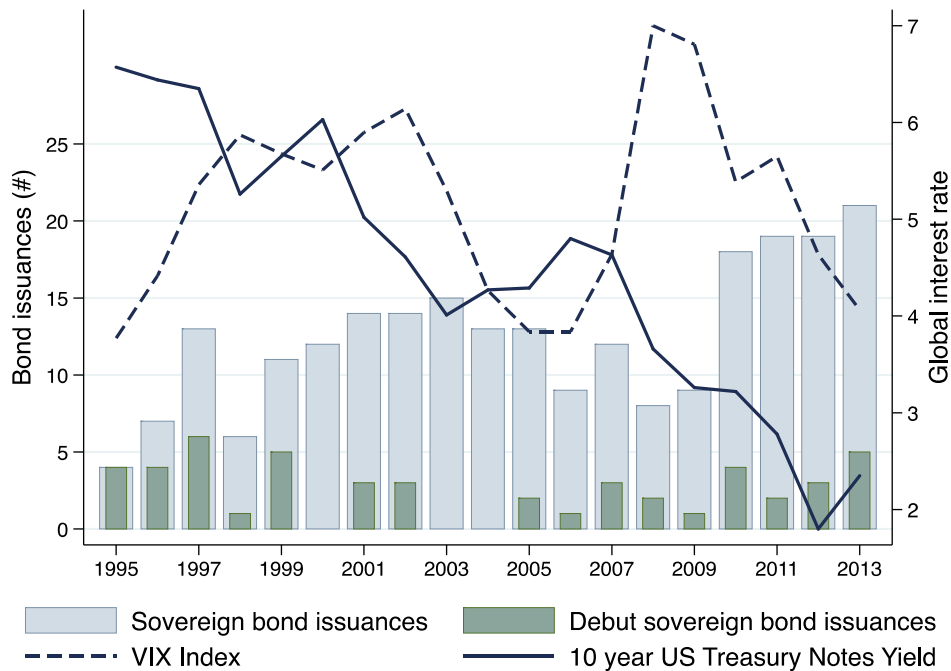
Notes: Based on annual data for 104 developing countries (49 issuers), over 1995-2013.

Figure 3: The Distribution of Bond Spread at Issue, 1995-2013
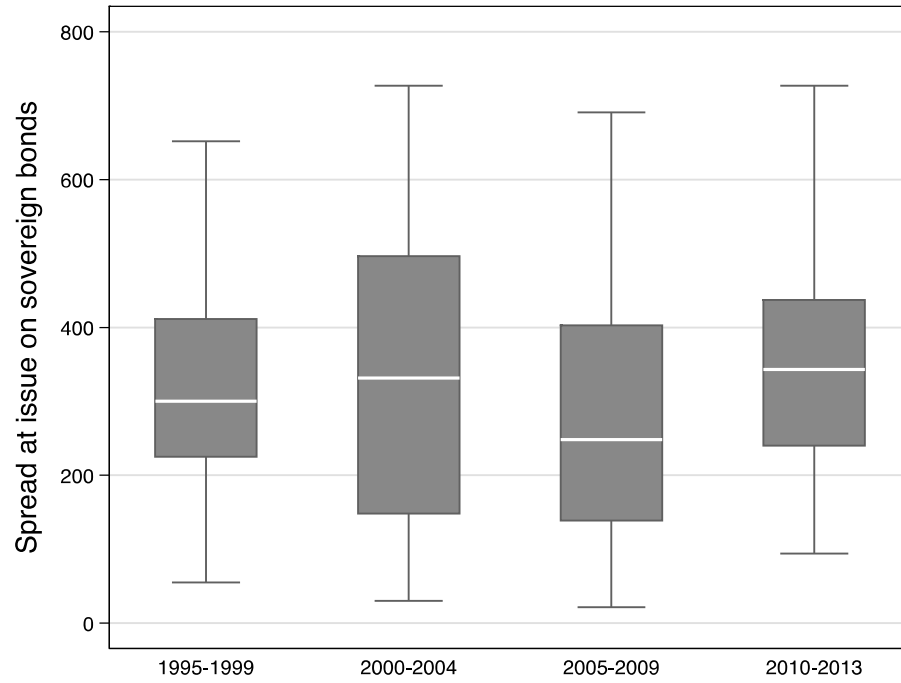
Notes: Based on data for 202 SBIs (by 49 countries), over 1995-2013.

Figure 4: Spreads and Country Performance Before Issuance

Notes: Based on data for 185 SBIs (by 49 countries), over 1995-2013.