Policy Research Working Paper 9139

Assessing the Returns on Investment in Data Openness and Transparency

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WORLD BANK GROUP
Africa Region
Office of the Chief Economist
January 2020

Policy Research Working Paper 9139

Abstract

This paper investigates the potential benefits for a country from investing in data transparency. The paper shows that increased data transparency can bring substantive returns in lower costs of external borrowing. This result is obtained by estimating the impact of public data transparency on sovereign spreads conditional on the country's level of institutional quality and public and external debt. While improving data transparency alone reduces the external borrowing costs for a country, the return is much higher when combined with stronger institutional quality and lower public and external debt. Similarly, the returns on investing in data transparency are higher when a country's integration to the global economy deepens, as captured by trade and financial openness. Estimation of an instrumental variable regression shows that Sub-Saharan African countries could have saved up to 14.5 basis points in sovereign bond spreads and decreased their external debt burden by US$405.4 million (0.02 percent of gross domestic product) in 2018, if their average level of data transparency was that of a country in the top quartile of the upper-middle-income country category. At the country level, Angola could have reduced its external debt burden by around US$73.6 million.

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The World Bank

Key Words: Economic data transparency, Data openness, Economic information, spreads

JEL Codes: F33, F39, G14

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1. Introduction

Since the 1960s, international institutions active in the field of development and most OECD countries have invested considerable resources in data capacity building in developing countries. For example, just between 2006 and 2015, the total amount spent by the World Bank Group in data capacity building was US$919.4 million, of which 45 percent went to Sub-Saharan Africa (World Bank 2017). This number provided by the World Bank's independent evaluation group might be on the low side, as it excludes support that may go through development policy financing which does not allow for earmarking.

While it is fair to acknowledge recent progress in household survey data collection in Africa, it is also clear that this massive financial effort has not yielded the expected fruits. To date, there are still very few African countries that can claim to have high-quality data produced regularly and made available to the public in a timely manner. Indeed, Jerven (2013) argues that the world bank GDP data for African economies tends to be underestimated due to outdated data, obsolete methods, lack of data availability and uneven use of methodologies in those countries. Even when data are collected, some countries do choose to keep them confidential.[1] The question is what explains these poor outcomes?

Our conjecture is that the development community has failed in data collection or capacity building for data collection in African countries because this has essentially been a donor-led and supply driven effort. There has been little attention paid to the demand side. In other words, we need to focus more attention on the benefits for countries of producing and sharing data. This could lead to countries' investing more of their own resources in them, a condition for sustained success. This paper contributes to the literature on the demand side interventions by uncovering the returns from investing in statistical transparency for countries. We focus on economic transparency defined as availability and access of economic information and statistical data (Geraats 2002b).

We explore the relationship between statistical data transparency and sovereign bond spreads while controlling for domestic and external macro-financial variables (classified as pull and push factors). The choice of sovereign bond spreads as the variable of focus is pertinent because of the substantial change in the composition of Sub-Saharan African external debt between 2007 and 2018 (see Figure 1). The share of sovereign bonds and non-Paris Club debt in total outstanding public external debt increased by 18 percentage points and 8 percentage points, respectively. Almost half of the public external debt outstanding and disbursed in 2018 for Sub-Saharan Africa is composed of international bonds and non-Paris Club lending (i.e. 30 percent for bonds and 21 percent for non-Paris club).

This paper improves on the existing literature in three different ways. First, we estimate the impact of public data transparency along with the level of institutional quality and public and external debt. Although greater data transparency alone reduces the external borrowing costs of a country, greater data transparency lowers the external borrowing costs even further when combined with

[1] Data transparency is not only an issue for low-income countries. It is also problematic in some higher-income countries as well, especially those that do not belong to the Paris Club and therefore are not subject to the standard disclosure requirements, see Horn, Reinhart and Trebesch (2019).

stronger institutional quality as well as lower public and external debt. Second, we show that the returns on investing in data transparency (captured by lower sovereign bond spreads) are higher when a country's economy integrates further in the global economy as captured by trade and financial openness. Finally, we calculate the benefits of improving data transparency in terms of reduced sovereign bond spreads and lower amounts of external debt for individual African countries.

Our main findings suggest that data transparency matters and can lead to substantive savings for countries issuing Eurobonds. And the returns to data transparency are even higher for countries with lower levels of debt and stronger institutions. However, institutional quality needs to exceed a threshold for the effect to kick-in. In other words, in a country with a very low level of institutional quality, just improving data transparency may not necessarily reduce bond spreads.

We find that if African countries could raise their level of data transparency to that of a country in the top quartile of upper-middle-income countries' category, the reduction in sovereign spreads would be significant. For 2018, the SSA region as a whole could have saved up to 14.5 basis points in sovereign bond spreads and decreased the external debt burden by US$405.4 million (0.02 percent of GDP). At the country level, the gains from lower sovereign bond spreads would be larger in a country with a low external debt to GDP ratio such as Nigeria (36 basis points) and lower in a country with higher public external debt such as Ghana (15 basis points). We find that Angola could have reduced its sovereign spreads by 11.1 basis points and its external debt by US$73.61 million (0.06 percent of GDP) in 2018 if it had the level of data transparency of a country in the top quartile of the upper-middle-income country group. Gabon would benefit the most as it could reduce its external debt by 0.22 percent of GDP (US$32.85 million).

The remainder of the paper is organized as follows. Section 2 overviews the literature on transparency and macro-financial outcomes, Section 3 describes the estimation technique and data and Section 4 investigates the relationship between sovereign bond spreads and data transparency variables while controlling for a set of macroeconomic and financial variables. Section 5 concludes.

2. Literature Review

Transparency facilitates the public access to accurate and timely economic information. Data openness and data transparency contribute to imposing market discipline to banks and other financial institutions. Accurate and timely information is valuable to both domestic and foreign investors in making better decisions. Also, greater information transparency improves efficiency of the domestic financial markets while the lack of transparency could hurt their "attractiveness" by raising uncertainty. Transparency, for example, improves resource allocation (Restuccia and Rogerson 2008, Hsieh and Klenow 2009) and makes governments more accountable, weakens the power of special interests, and leads to improved policies and institutions (Stiglitz 1999, Kaufmann and Bellver 2005).

Information is a dynamic process and knowledge becomes obsolete if it is not up to date. Imperfect information can lead to inefficiencies in credit markets by weakening the competitive forces that equal supply and demand of credit (Stiglitz and Weiss 1981). It can also increase the duration of uncertainty while acquiring information, as well as price dispersion (Stigler 1961). The lack of transparency could therefore increase the duration of crises' episodes (Furman and Stiglitz 1998), while the news, as public information, minimizes uncertainty as it generates more valuable information to the public (Frankel and Kamenica 2019).

From a macroeconomic perspective, the literature on transparency has focused on its relationship with economic crises on the one hand and with monetary policy decisions on the other. These two strands of literature prospered in the 1990s, with the prevalence of currency crises. For example, in the Mexican "Tequila crisis" in 1994-95, it is argued that a mix of weak fundamentals, lower institutional quality and lack of transparency were the culprit (Lustig 1995; Edwards 1998). Mexican authorities did not disclose full macro-financial information but released only selective information in 1994 (Edwards 1998). In the meantime, a major decline in the demand for Mexican pesos occurred in March 1994, foreign reserves became insufficient to cover for short-term liabilities in April 1994, and the amount of Tesobonos bonds issued by Mexican banks was roughly equal to the stock of international reserves (Calvo and Mendoza 1996). The lack of data transparency therefore eroded the credibility of policy makers. Similarly, in the case of the East Asian crisis in 1997, a combination of weak financial systems and fundamentals, and opacity among government, business and banks fueled contagion (Fischer 1998).

Geraats (2002a) reviews the relationship between transparency and monetary policy decisions and distinguishes five concepts of transparency including political, economic, procedural, policy and operational transparency. While political transparency helps establishing quantitative targets and clarity about the institutional structure, economic, procedural and policy transparency help monitor monetary policy actions (ex-ante accountability). Finally, operational transparency evaluates policy outcomes (ex post accountability). Geraats' (2002b) analysis of monetary policy transparency further distinguishes between the uncertainty effect and the incentive effect. Central bank transparency is the absence of asymmetric information between monetary policy makers and the other agents in the economy. Gelos and Wei (2002) suggest that there is a natural relationship between lack of transparency and asymmetric information. According to De Gregorio (2008), there are two kinds of asymmetries of information that require central bank communication. The first is uncertainty with respect to the objectives of the central bank and the second is the central bank's technical ability to achieve their goals (i.e. the inflation target).

Geraats (2002b) suggests that some degree of transparency is a necessary but not sufficient condition of accountability of central banks. This is because transparency implies information disclosure while accountability lets central banks face responsibility for monetary policy actions and potential repercussions when policy appears insufficient. Democratization also directly increases public accountability demand and promotes independence for central banks as government becomes more open. Consequently, transparency is one of the ways to improve public accountability (Dincer and Eichengreen 2007). Enabling accountability requires some degree of

openness, and hence safeguards the democratic legitimacy of independent central banks (Geraats 2002b). It is essential to have openness as a part of public governance (Stiglitz 1999).

This paper focuses on economic transparency defined as availability of and access to economic information and statistical data (Geraats 2002b). Transparency of statistical data relates to open access data and information accountability. There is a healthy literature on the relationship between data transparency and macroeconomic and financial factors, especially sovereign bond spreads and institutional quality.

Clare and Courtenay (2001) find that transparency increases predictability of monetary policy. Glennerster and Shin (2008) examine whether greater transparency (measured by IMF binary transparency data) reduces the cost of borrowing in sovereign bond markets. They find that there are diminishing marginal benefits of transparency when a country has smaller and less liquid debt markets. Alfaro and Kanczuk (2019), on the other hand, examine how undisclosed debt affects debt sustainability by modeling international investors' behavior with and without debt transparency. They find that disclosure of nontraditional debt (their proxy of debt transparency) increases welfare for the borrowing countries and reduces debt sustainability. Horn, Reinhart and Trebesch (2019) build a new data set for China's total loans and grants to 152 countries and find that the lack disclosure in debt data leads to mispricing sovereign bonds and associated default risks.[2]

On a related literature, Gelos and Wei (2002) investigate the impact of transparency on the behavior of international investment funds and explore whether a developing country's opacity explains mutual funds' investment position. Their findings suggest that international investors prefer more transparent markets to invest while the degree of herding among funds is greater in opaque markets. Tebaldi et al. (2018) examine the determinants of sovereign bond spreads for emerging markets from 1994 to 2014 and they conclude that the main determinants are GDP growth, real effective exchange rates and political liberalization. Presbitero et al. (2016) examine drivers of sovereign bond issuances in developing countries from 1995 to 2014, and find that countries with higher public debt and weak governance are less likely to issue sovereign bond debt. Also, countries with sound external positions, strong economic growth and lower public debt tend to issue sovereign bonds at a lower premium than other countries. Finally, global conditions matter for bond issuances as countries issue more in the periods of greater liquidity, high commodity prices, and when primary spreads are lower.

Berliner (2014) studies the impact of the freedom of information (FOI) laws, which institutionalize transparency, and finds that FOI improves the credibility of policy makers and lowers corruption. Transparency, associated with better socioeconomic and human development, leads to higher competitiveness and lower corruption (Bellver and Kaufmann, 2005). Geraats (2001) suggests that economic transparency depends on a country's institutional framework. The fundamental solution

[2] We know little about China's overseas lending behavior because the country, as a non-Paris Club lender, is not obligated to report on its official lending. This poses a serious challenge to debt sustainability analyses for borrowing countries, as opacity masks the stock and composition of debt.

to the lack of transparency comes with an improvement of accounting standards and disclosure rules as well as with deeper institutional development (Radelet 1998).

Although greater data transparency would reduce the cost of borrowing, enriched data transparency combined with better institutional quality would further enhance the benefits of investing in open data. Higher level of institutional quality plays a key role in the financial market development because greater data transparency along with a higher quality of institutions help reduce information asymmetries and eliminate and/or revise inaccurate information. The review of the literature suggests that the quality of institutions improves economic outcomes, creates the incentives and exerts constraints on economic actors (Acemoglu, Johnson and Robinson 2005). Stronger institutions may also lead to greater resilience to shocks (Johnson, Boone, Breach and Friedman 2000), better allocation of capital (Wurgler 2000), and more developed financial sector (La Porta, Lopez-de-Silanes, Shleifer, and Vishny 1997, 1998). Therefore, data transparency might be a by-product of good institutions and economic performance rather than the other way around (Glennerster and Shin 2008).

3. Estimation Technique and Data

3.1 Econometric Methodology

We regress sovereign bond spreads on pull and push factors —including indicators of data transparency— using both fixed effects and instrumental variables estimations. External (push) factors and internal (pull) factors can influence investors' behavior as they may impact the cost of borrowing. We run Fixed Effects and Instrumental Variables (IV) estimations. We use instrumental variables techniques for panel data to overcome two main challenges. The first is controlling for the presence of unobserved period- and country-specific effects. The second challenge is that data transparency is highly likely to be jointly endogenous with shocks to sovereign bonds spreads. To address the first challenge, we include country and time effects in the regression. For the second, we control for biases due to the presence of simultaneous or reverse causality in the regression analysis. We control for the endogeneity of data transparency by using Freedom of Information (FOI) and the lagged values of explanatory variables as instruments.[3] Our IV estimations robustly show that data transparency instrumented with FOI can predict bond spreads and that FOI cannot predict future shocks to bond spreads.

Our baseline regression equation of capital flows presents the following specification:

$$\Psi_{it} = \alpha_i + \beta_t + \gamma' X_{it} + \varepsilon_{it}$$

[3] We also conducted regressions instrumented with the lagged values of policy variables. These results are available from the authors upon request. The political indicators used as instruments are the index of political constraints expressed as 3-veto points and 5-veto points in the policy-making structure (polcon3 and polcon5, respectively) from Henisz (2000 2002), the polity score and the executive constraints from the Polity IV codebook, measures of checks and balances and government stability from the WBG database of political institutions (Beck et al. 2001).

where the dependent variable Ψ_{it} is the sovereign bond spreads for country i in period t. α_i is a country effect and β_t is a time effect. The matrix X_{it} contains information on our pull and/or push factors including data transparency variables while γ is its coefficient vector. Finally, ε_t captures the residuals.

3.2 Data Description

We gather annual data of sovereign bond spreads for 72 countries from 1995 to 2018 from Bloomberg L.P. The explanatory variables consist of pull (internal) and push (external) factors. Pull factors include the GDP per capita (in US dollars at 2010 prices), economic growth, CPI inflation (average percentage change in consumer prices), general government primary balance to GDP (in percentages), current account balance to GDP (in percentages), general government gross debt to GDP (in percentages), external debt to GDP (in percentages) and the ratio of the sum of import and export to GDP as a proxy of trade openness from the World Bank's World Development Indicators (WDI). Financial openness is proxied by the Chin and Ito (2006, 2008) index. The quality of institutions is proxied by the ICRG index from the PRS group, which captures the level of the quality of domestic institutions. Push factors include the VIX index (which measures the implied volatility computed from S&P 500 index options) as an indicator of global risk aversion, and the US 10-year Treasury bond yield from the Federal Reserve Bank of St. Louis' FRED database.

Our instrumental variables are the Freedom of Information index[4] taken from the website of freedominfo.org, and lagged values of the ICRG index, public or external debts, the interaction terms of ICRG with the data transparency indicator and (public or external) debt with the data transparency indicator, lagged trade and financial openness variables as instrumental variables.

Transparency Data

Data transparency indicators are proxied by public data transparency indices from the World Bank and IMF. The World Bank's statistical capacity indicator (SCI) captures the availability, collection and practices in the production of official statistics by the country, and the IMF's subscription and compliance to the Special Data Dissemination Standard (SDDS) are binary variables. We refer to the indicators of the World Bank as the WB data transparency and the indicator of the IMF as the IMF data transparency.

The World Bank's Statistical Capacity Indicator (SCI) measures a country's ability to collect, analyze, and disseminate high quality public data of an economy. This indicator is a composite score that evaluates the capacity of a country's statistical system. It is based on a diagnostic framework assessing the following areas: (i) methodology, (ii) data sources, and (iii) periodicity and timeliness. Countries are scored against 25 criteria in these areas, using publicly available information and/or country input. Therefore, the overall Statistical Capacity score is calculated as a simple average of all three dimensions (i.e. practice, collection, availability) with a scale of 0-100. Higher scores mean that a country has a stronger statistical capacity. The methodology indicator (or practice score) measures the country's ability to adhere to internationally

[4] Banisar (2006).

recommended standards and methods. This score is calculated from the weighted average of 10 underlying indicator scores. The data source indicator (or collection score) measures whether a country conducts data collection activities in line with internationally recommended periodicity, and whether data from administrative systems are available. This score is calculated from the weighted average of 5 underlying indicator scores. The periodicity and timeliness indicator (or availability score) assesses the availability and periodicity of key socioeconomic indicators if data are available to the public users in time. This score is calculated from the weighted average of 10 underlying indicator scores.

The IMF's Special Data Dissemination Standard (SDDS) measures if a country releases more frequent, timely and accurate macroeconomic statistics. This indicator captures a timing of subscribing to SDDS and/or the data when the subscribing country meets SDDS specification (and first posted its e-GDDS national data summary data page) which varies across countries and is primarily determined by internal IMF procedures that are not associated to events in these countries. Once a country adopts this standard of data transparency, the country has less intensive reason to reverse this system, consequently, this becomes a long-term commitment. In our empirical analysis, we use two binary data transparency indicators from the IMF: (a) a dummy variable that takes the value of 1 for the years after the country subscribes with the SDDS, and (b) a dummy variable that takes the value of 1 when the country comes into compliance with SDDS specifications (and/or posts its first national data summary page).

3.3 Basic Statistics

We first explore basic statistics on sovereign bond spreads and data transparency for the sample of Sub-Saharan African (SSA) countries and of non-SSA developing countries. Sub-Saharan African countries have increasingly tapped international capital markets. Calderon and Zeufack (2018) document the rapid rise in sovereign international bond issuances across SSA countries during the period 2014-18 —which is one of our subperiods of analysis. When looking at the costs of borrowing, SSA countries tend to have larger sovereign spreads compared with other sub-groups such as non-SSA countries, East Asia (EA) and South Asia (SA). The WB data transparency has remained almost unchanged for all country groups over the sample period while the IMF data transparency has improved in the period 2014-18.

Table 1 shows the averages of these sovereign bond spreads, World Bank statistical capacity index and its components as well as IMF data transparency variables across these groups such as all developing countries, SSA countries and non-SSA countries for the periods 1995-2018, 2009-2018 and 2014-2018. Sovereign spreads are higher among SSA countries than non-SSA developing countries. Sovereign bond spreads decreased from 561 to 413 and from 504 to 380 for all and non-SSA countries respectively from 1995-2018 to 2014-2018. Bond spreads also decreased from 999 to 561 for SSA from 1995-2018 to 2014-2018. WB data transparency among SSA countries are lower than those of non-SSA countries, especially in the area of adherence to international standards and methods in the production of data. On the other hand, the IMF data transparency 'standard compliance' among SSA becomes lower than that of non-SSA countries from 1995-2008

to 2009-2018 and 2014-2018. The IMF data transparency 'subscription' improves from 1995-2008 to 2009-2018 and 2014-2018 for SSA compared with non-SSA.

Figures 2.a and 2.b compare the averages of WB data transparency and IMF data transparency (standard compliance) among sub-groups such as SSA, non-SSA, East Asia and South Asia for the periods 1995-2008, 2009-18 and 2014-18. For instance, there is not much improvement in WB data transparency according to Figure 2.a among those sample periods. The average score for WB data transparency in SSA is about 63 in three periods while there is little improvement from 76 to 78, from 73 to 76 and from 73 to 75 for non-SSA, EA and SA respectively from 1995-2008 to 2014-2018. Averages of IMF data transparency (standard compliance) in Figure 2.b, on the other hand, show more significant improvement for all sample groups: from 0.04 to 0.38 in SSA, from 0.22 to 0.6 in non-SSA, from 0.27 to 0.51 in EA and from 0.2 to 0.56 in SA from the period of 1995-2008 to the period of 2014-18. Figure 3 decomposes WB data transparency into three components: methodology, periodicity and timeliness, and data source indicators. There are small changes in those composition indicators for all the sample groups among sample periods. Figure 3 shows, for example, small changes in methodology, periodicity and timeliness, and data source indicators from the period of 1995-2008 to the period of 2014-18. Consequently, the overall progress in WB data transparency is minimal between the period of 1995-2008 and the period of 2014-18.

Figure 4 shows average sovereign bond spreads among the country groups of SSA, non-SSA, EA and SA. If we compare the period 1995-2008 with 2014-18, sovereign bond spreads have decreased for most of the sample groups except EA while bond spreads in EA are the lowest. For instance, the lowest average spread among the different country groups is 240 for EA in the periods of 1995-2008 and 239 of 2014-18. The highest average sovereign spread is 999 for SSA in the period of 1995-2008 although SSA successfully reduces its spread by 561points in the period of 2014-18.

4. Empirical Evidence

This section analyzes the empirical results from the fixed effects and instrumental variable estimations. Our results from fixed effects robustly show that improving data transparency benefits a domestic economy by reducing sovereign bond spreads when the country has a higher institutional quality.

4.1 Fixed Effect Results

Baseline Specifications

Table 2 presents the regressions of sovereign bond spreads on domestic and global factors using fixed effects estimation. We find that lower GDP per capita and lower economic growth are associated with widened sovereign bond spreads in developing countries. For instance, in Table 2 a one-point increase in GDP per capita would reduce sovereign spreads by 0.64 point in regression [1] of Table 2 when controlling for WB data transparency (SCI) and they decline by 0.753 point

in regression [2] of Table 2 when controlling for IMF data transparency (SDDS). Our overall results support that countries with higher income per capita tend to exhibit lower spreads. Data transparency interacted with institutional quality (proxied by the ICRG index) reduces sovereign bond spreads significantly while data transparency interacted with public debt increases spreads.

We calculate the benefits of investing in data transparency across Sub-Saharan African countries using the coefficients from regression [4] in Table 2. If the level of data transparency in Sub-Saharan Africa (measured by the average of the statistical capacity index of the World Bank) improves to that of the top quartile of the middle-income country group, sovereign bond spreads could decrease by 47.99 percentage points. Data transparency, therefore, reduces spreads by 119 basis points and will improve an additional 36 basis points when combined with institutional improvement (as measured by increases in the ICRG index). The total benefits are 155 basis points from improving both data transparency and ICRG together in 2018. The stock of Eurobonds issued in the Africa region by the end of 2018 is about US$82.3 billion and the average spread for the region is 405 basis points in the same year. Therefore, Sub-Saharan African countries could have saved US$9.8 billion in 2018 if they had the level of data transparency of Thailand. The total dollar amount saved from improving both data transparency and institutional quality could have reached US$12.8 billion in 2018.

CPI inflation seems to be another significant pull factor. Higher inflation increases the sovereign spreads (Table 2). Therefore, inflation stabilization and adequate management of inflation expectations by the central bank are important to reduce spreads. Primary balance to GDP and current account to GDP unfortunately did not show any significance in our regressions. Some push factors such as global market volatility, as proxied by the VIX, and the US Treasury bond yield matter: the coefficients of global market volatility are positive and significant while the coefficients of US Treasury bond yield are negative and significant (Table 2). Higher global market volatility and lower US bond yields increase the sovereign spread. Therefore, both pull and push factors matter for sovereign bond spreads.

Channels of Transmission

Table 3 explores whether the different components of data transparency have an impact on sovereign spreads. Similar to the results from Table 2, greater GDP per capita and higher economic growth reduce sovereign bond spreads in developing countries. An inspection of the regression estimates using the components of data transparency shows that, for example, the interaction coefficient between methodology assessment and ICRG as well as periodicity and timeliness assessment and ICRG would contribute to reducing sovereign spreads together. Improving the methodology and periodicity components of data transparency as an integral part of an overall institutional reform is associated with a greater reduction in sovereign spreads.

Higher public debt burden increases sovereign spreads (columns [1] to [3] in Table 3). The interaction between public debt and the different components of data transparency (methodology assessment, periodicity and timeliness assessment and data source assessment) also has a positive and significant coefficient (columns [4] to [6] in Table 3). Therefore, the benefits of improving data transparency —as measured by reduced spreads— is lower in countries with greater public debt burden.

Finally, the coefficient estimates of CPI inflation are positive and significant in the sovereign spread regressions (Table 3). Other pull factors, such as the primary balance and current account, fail to have any significance on spreads. External factors, in contrast, have a significantly robust impact on spreads, therefore, push factors matter while controlling for the composition of data and data transparency. In the case of global market volatility, VIX has a positive and significant relationship with spreads. Therefore, global risk aversion tends to increase spreads (Table 3). The coefficients of US Treasury bond yield have a negative and significant effect on spreads, consequently, lower bond yield reduces both spreads. Therefore, both pull and push factors explain the behavior of spreads.

4.2 Instrumental Variables (IV) Results Using Freedom of Information

Fixed Effects results presented in the previous section may be biased by the presence of unobserved period- and country-specific effects, and a joint endogeneity between data transparency and shocks to sovereign bond spreads. Therefore, we introduce an instrumental variable to overcome these biases. This paper finds the best set of instrumental variables by including the Freedom of Information (FOI) indicator. Our set of instruments comprise the Freedom of Information (FOI) index, and the lagged values of the following variables: ICRG, the interaction term between data transparency and ICRG, government debt (either public or external debt) and the interaction between data transparency and government debt.

Our IV estimations robustly show that data transparency instrumented with FOI can predict bond spreads and that FOI cannot predict future shocks to bond spreads. We robustly conclude that enhancing data transparency reduces sovereign bond spreads alone, and this benefit increases when a country has a better quality of institutions and its public and external debts are under control.

Tables 4 and 5 show the results of IV regressions which present highly significant negative interaction coefficients between data transparency and ICRG and highly significant positive interaction coefficients between data transparency and public debts variables. For instance, a one-point increase in data transparency index conditional on lower public debts would reduce sovereign spreads by 0.00225 and conditional on an improvement in ICRG would decrease sovereign spreads by 0.604. Table 5 shows the results of highly significant negative interaction coefficients between data transparency and ICRG and highly significant positive interaction coefficients between data

transparency and external debts. For example, a one-point increase in the data transparency index conditional on lower external debt would reduce sovereign spreads by 0.00224 and conditional on an improvement in ICRG would decrease sovereign spreads by 0.713. As a consequence, a combination of higher data transparency and better institutional quality would reduce bond spreads, and hence lower the costs of borrowing.

The econometric results from Tables 4 and 5 are consistent with the results from fixed effects and are more robust. For example, the coefficients of GDP per capita and GDP growth are consistently positive and significant, therefore, higher GDP per capita and higher economic activity would reduce sovereign bond spreads (lower costs of borrowing). Robust results of positive and significant coefficients of CPI inflation indicate that higher domestic inflation increases the costs of borrowing. The coefficients of VIX are robustly positive and significant and the coefficients of 10-year US Treasury bond yield are robustly negative and significant. Accordingly, higher global market volatility and lower US bond yield increase the costs of borrowing. As a result, both push (global market volatility and US Treasury bond yields) and pull (i.e. GDP, CPI inflation, institutional quality, data transparency) factors matter for sovereign bonds spreads.

Table 6 includes trade and financial openness variables as well as its interactions with data transparency indicators. Overall the results from IV estimations are consistent with the results from the fixed effect estimations. Trade openness and financial openness have a negative and significant impact on sovereign bond spreads. Therefore opening-up markets will bring more benefits in terms of lower borrowing costs. For instance, a one-point increase in trade openness and in financial openness decreases borrowing costs by 0.53 points ([1] in Table 6) and by 0.899 points ([3] in Table 6), respectively. When both variables are jointly included in the specification, a one-point increase in both trade and financial openness reduces borrowing costs by 0.51 and 0.0635, respectively in the same regression ([5] in Table 6). The interaction term between data transparency and trade openness is negative and statistically significant when using the IMF data transparency index ([6] in Table 6). The coefficient estimate suggests that a one-point increase in this interaction reduces borrowing costs by 0.434 points. The interaction between IMF data transparency and financial openness does not show any significant results. GDP growth reduces sovereign bond spreads while the VIX index increases spreads robustly. GDP per capita also reduces bond spreads. Higher CPI inflation, higher global market volatility and lower US bond yield increase bond spreads, and hence raise the cost of borrowing.

In Table 6 we find robust results with the World Bank data transparency variable and, additionally, we find some significant results when decomposing the World Bank data transparency index into its methodology, periodicity and timeliness, and data source components. Next, we introduce the lag of trade and financial openness variables as instrumental variables, to control for endogeneity, and include those interactions with data transparency indicators in Table 7.

Table 7 shows that the results from the IV estimations are robust and consistent with the findings from previous regressions. GDP growth, for instance, reduces sovereign bond spreads while the VIX index increases spreads robustly. GDP per capita also reduces bond spreads. Higher CPI inflation, higher global market volatility and lower US bond yield increase bond spreads, and

hence raise the cost of borrowing. A one-point increase in the World Bank data transparency index conditional on a better ICRG reduces sovereign bond spreads by 0.49 ([5] in Table 7). In the same regression, a one-point increase in the data transparency conditional on greater trade and financial openness reduces borrowing costs by 0.109 and 0.00388, respectively. Consequently, opening-up markets in goods and financial assets brings more benefits in terms of lower borrowing costs as long as the country has a better level of institutional quality. Table 7 also shows robust estimations for the interaction terms between data transparency and public debt in [5] and between data transparency and external debt in [6]. Data transparency, conditional on higher public debt and conditional on higher external debt, is positively corelated with larger bond spreads. This implies that there are increasing marginal costs of borrowing to having higher (public and external) debt.

4.3 Calculating Impacts of Data Transparency by Country

We calculate how much a country could directly benefit from improving data transparency. First, we calculate the impact of data transparency on sovereign bond spreads conditional on the level of external public debt by region and by country. Then we compute how much a country could gain in terms of lower spreads by improving their data transparency to levels determined by a certain benchmark. Finally, we also estimate how much a country could reduce their external debt burden by improving data transparency. We use the IV estimation from Table 5 [1] to calculate those impacts. Figure 5.a shows the impact of data transparency on sovereign bond spreads conditional on the level of external public debt for five different regions such as Africa, emerging Asia, Latin America, emerging Europe and the Middle East. We use the 2018 average bond spreads for each region to calculate the change of spreads in basis points. We take the coefficient of the World Bank data transparency index of 3.112 in Table 5 [1] and the interaction with external debt (while holding constant for the level of institutional quality). Our estimates suggest that if there is, for instance, a 10 percent improvement in data transparency, and we account for the average of external public debt in SSA (average of 22.42 percent of GDP from 2009 to 2018), the sovereign bond spreads in the region could be reduced by 0.7 basis points (see Figure 5.a). This drop in sovereign spreads is slightly larger than that of Latin America and Asia. Figure 5.b shows changes in sovereign spreads across Sub-Saharan African countries. An increase of 10 percent in data transparency leads to the largest declines in sovereign spreads in Nigeria, Zambia and Cameroon whereas the cost of external borrowing increases in Mozambique. This finding implies that countries with lower stock of external debt tend to have largest drop in spreads in the event of improved data transparency. In the case of Mozambique, a high and unsustainable external debt position more than offsets any progress in data transparency.

Figure 6 shows the potential gains from greater data transparency across Sub-Saharan African countries measured in terms of lower external public debt burden expressed in million dollars and as a percentage of GDP. We calculate the gains from improving data transparency to the level of two benchmarks: the top quartile of the middle-income countries and the top quartile of the upper-middle-income countries. We compute the likely reduction in their amount of external debt using the outstanding Euro bonds (expressed in millions of US dollars and as a percentage of GDP). For example, from Table 8, if Angola improves its level of data transparency to the top quartile of the

middle-income-country group, the country could reduce its sovereign spreads by 10.16 basis points. Angola could also reduce its external debt burden by US$67.41 million (0.06 percent of GDP). Likewise, if Angola could meet the average level of data transparency of upper-middle-income countries, the country could reduce its sovereign spreads by 11.08 basis points and its external debt by US$73.61 million (0.06 percent of GDP).

If Ghana could bring up its data transparency level just to that of a country in the top quartile of the lower-middle-income category, Vietnam for example, it could reduce its bond spreads by 1.94 basis points, and hence its external debt burden could decline by US$17.09 million (0.03 percent of GDP). Ghanaian sovereign spreads would be reduced by 32.28 basis points (0.05 percent of GDP) if its data transparency level was that of a country in the top quartile of the upper-middle-income countries, Thailand, for example.

A comparison of gains from data transparency as percentage of GDP across SSA reveals that Gabon would benefit the most as it could reduce its external debt by 0.22 percent of GDP (US$32.85 million) if it improves its data transparency level to that of a country in the top quartile of the upper-middle-income category. This is because Gabon has the lowest level of data transparency among Sub-Saharan African countries. For the SSA region as a whole, an improvement in data transparency level to that of a country in the top quartile of the upper-middle-income category could decrease the external debt burden by US$405.38 million (0.02 percent of GDP).

5. Conclusion

This paper investigates the benefits from improving data transparency in Sub-Saharan African countries. Our findings suggest that data transparency matters and can lead to substantive savings for countries issuing Eurobonds. And the returns to data transparency are even higher for countries with lower levels of debt and stronger institutions. However, institutional quality needs to exceed a threshold for the effect to kick-in. In other words, in a country with a very low level of institutional quality, just improving data transparency may not necessarily reduce bond spreads. The combination of data transparency and better debt management may bring even higher returns. Our results suggest that data transparency, conditional on higher public debt and conditional on higher external debt, is positively corelated with larger bond spreads, implying increasing marginal costs of borrowing to having higher (public and external) debt. Higher data transparency may therefore lower public and external debt and decrease the cost of borrowing for African countries.

The results from our instrumental variable estimations robustly support our main messages. We use these estimates to compute the direct benefits that could accrue to African countries in terms of reduced sovereign bond spreads and lower public and external debt. For the SSA region as a whole, an improvement in the data transparency level to that of a country in the top quartile of the upper-middle-income category could have saved up to 14.5 basis points in sovereign bond spreads and decreased the external debt burden by US$405.4 million (0.02 percent of GDP) in 2018. At the country level, if Angola had improved its level of data transparency to that of the top quartile of the upper-middle-income country group in 2018, the country could have reduced its sovereign

spreads by 11.1 basis points and its external debt by US$73.61 million (0.06 percent of GDP). A comparison of gains from data transparency as percentage of GDP across SSA reveals that Gabon would benefit the most, as it could reduce its external debt by 0.22 percent of GDP (US$32.85 million) if it improves its data transparency level to that of a country in the top quartile of the upper-middle-income category. Enhancing data transparency may also reduce domestic financial market risks and improve macroeconomic policy formulation.

Together, these results suggest that African countries stand to win big by investing in better data collection, dissemination and disclosure and should therefore seriously consider committing more of their own resources to this agenda. Data transparency is good economics.

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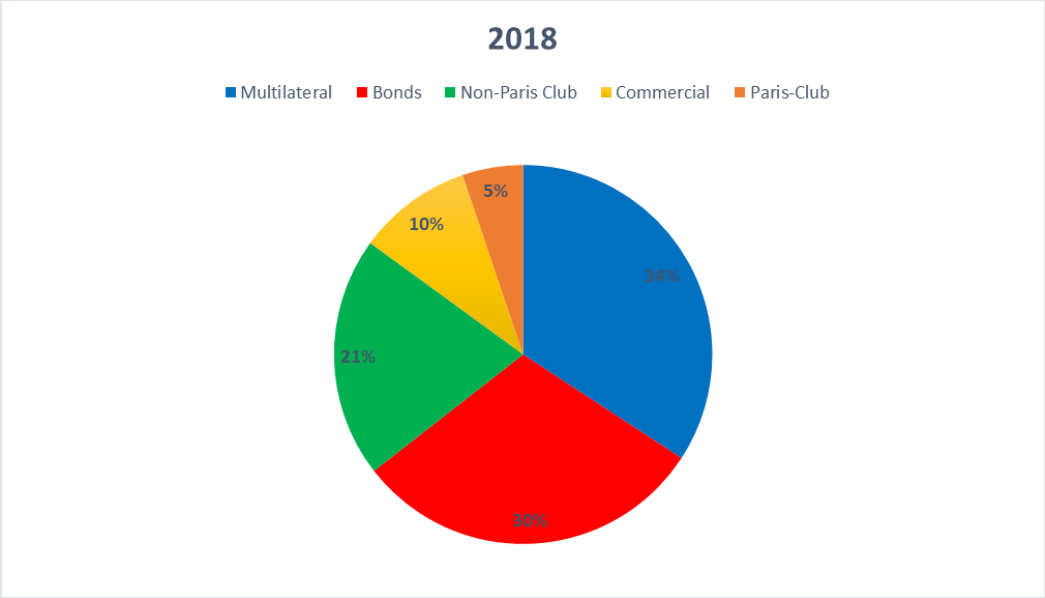
Figure 1: Composition of Outstanding Public External Debt in Sub-Saharan Africa, 2018 (percentages)



Source: World Bank

Table 1: Data transparency and country sovereign spreads: **Basic Statistics, 1995-2018**

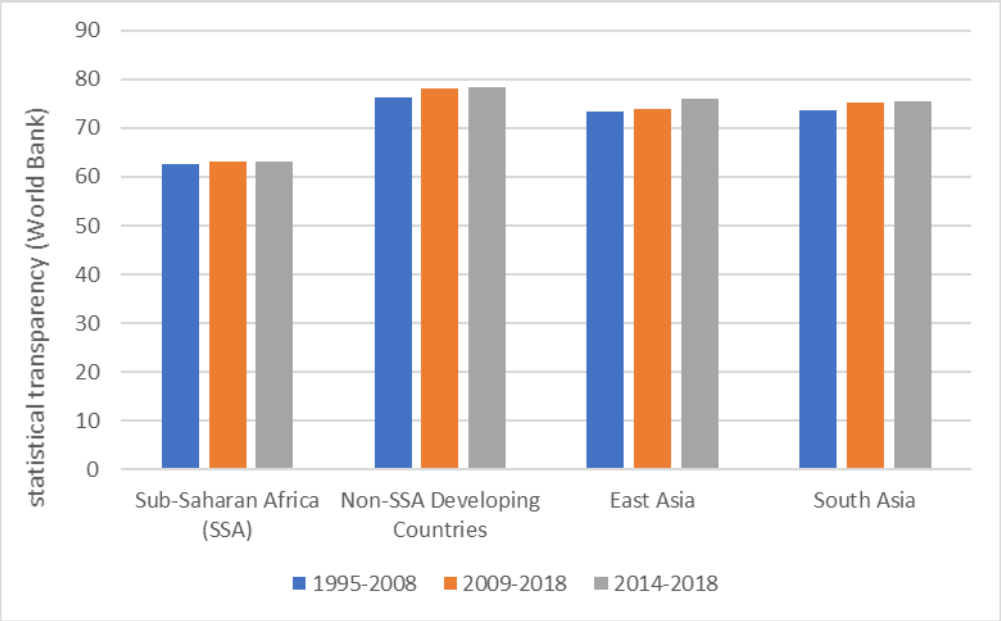
(Annual data)

	1995-2008			2009-2018			2014-2018		
	EMDEs	**SSA**	**Non-SSA EMDEs**	**EMDEs**	**SSA**	**Non-SSA EMDEs**	**EMDEs**	**SSA**	**Non-SSA EMDEs**
Sovereign Spreads (in bps)	561	999	504	418	506	402	413	561	380
Sovereign Bond Return Index	295	327	294	443	282	466	416	266	439
Statistical Capacity Index (SCI)	73.7	62.6	76.3	75.3	63.1	78.1	75.4	63.0	78.3
- Methodology Indicator	64.1	47.5	68.0	67.2	50.2	71.2	68.2	50.8	72.3
- Source Data Indicator	84.9	81.6	85.6	85.3	82.1	86.1	84.7	80.9	85.6
- Periodicity and Timeliness Indicator	72.2	58.7	75.4	85.3	82.1	86.1	73.3	57.3	77.1
Data Transparency									
- SDDS Subscription	0.4315	0.4286	0.4321	0.9110	0.9333	0.9066	0.9342	0.9500	0.9311
- SDDS Standard Compliance	0.1957	0.0476	0.2248	0.4849	0.2333	0.5344	0.5644	0.3833	0.6000

Notes. The sovereign bond spread and return comes from Bloomberg. WB data transparency is obtained from the World Bank, Statistical Capacity Index (SCI) while the IMF data transparency is obtained from the IMF, SDDS data.

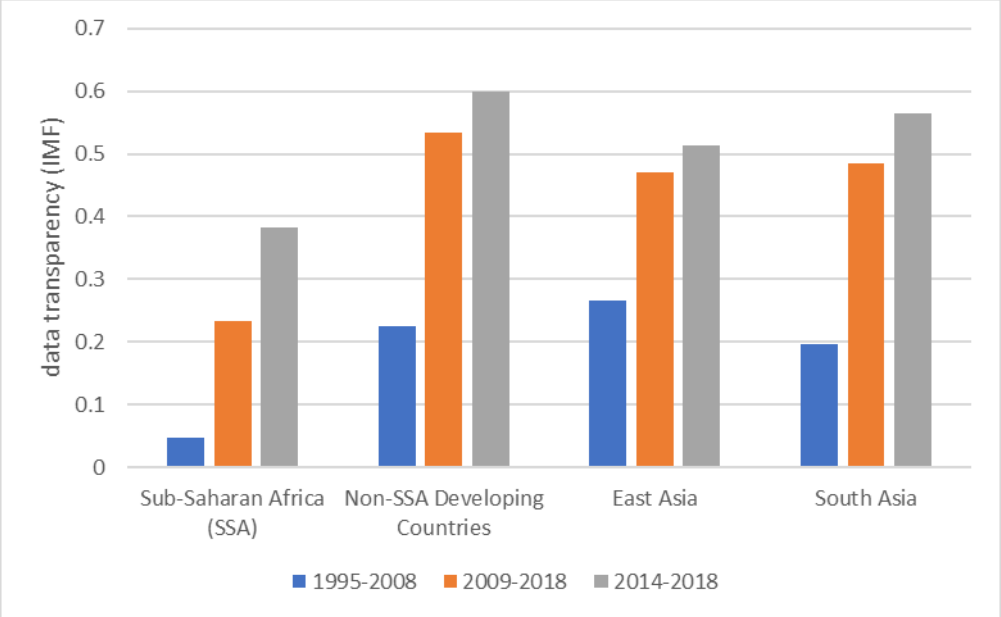
Figure 2: Data Transparency Index by region: Averages by periods

a. World Bank Data Transparency Index



Source: World Bank

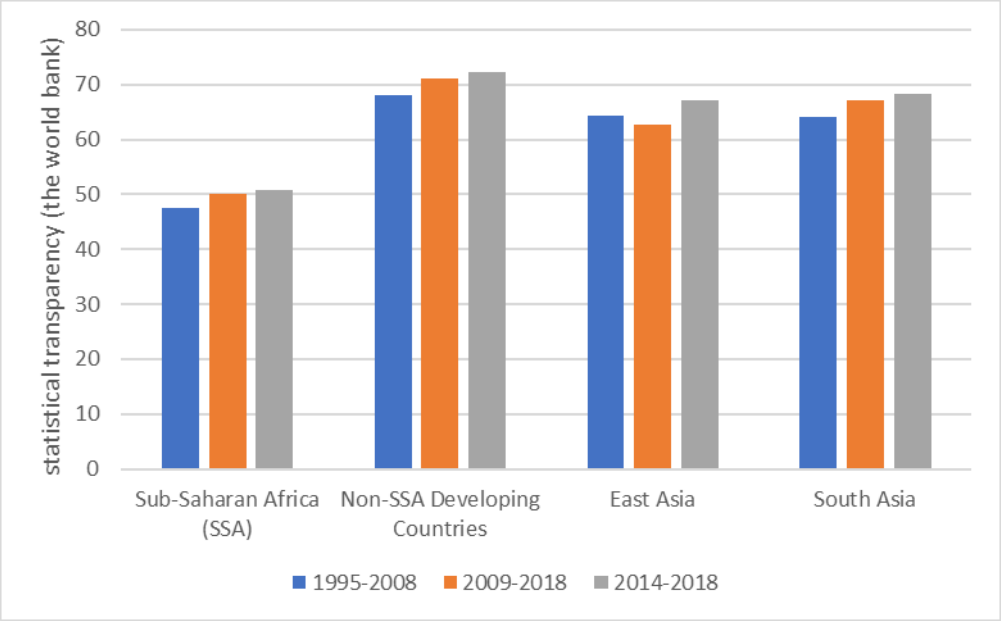
b. IMF Data Transparency (standard compliance)



Source: IMF

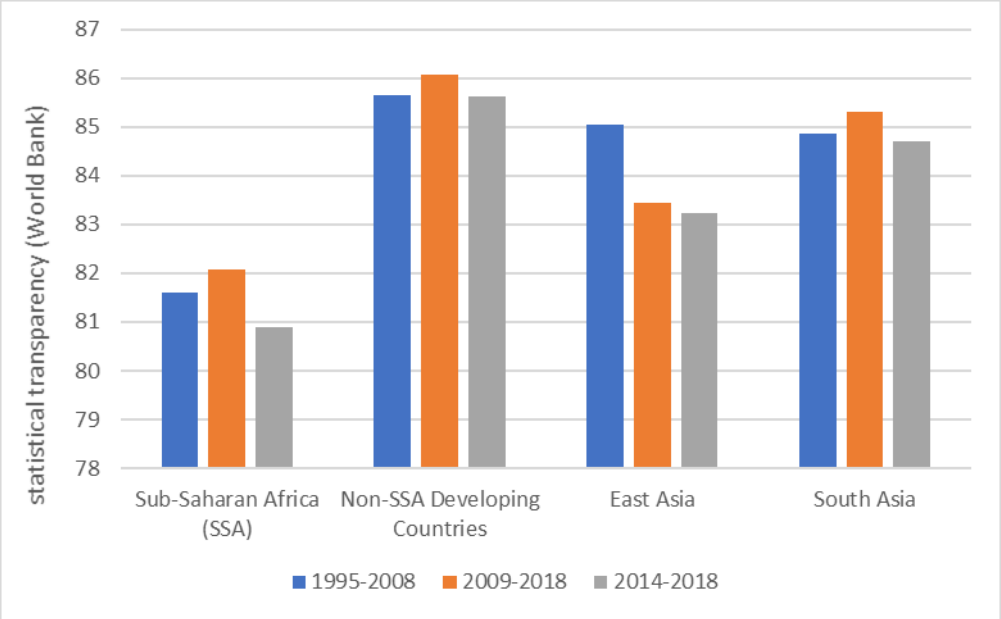
Figure 3: WB Data Transparency Data by components: Averages by periods

a. Methodology



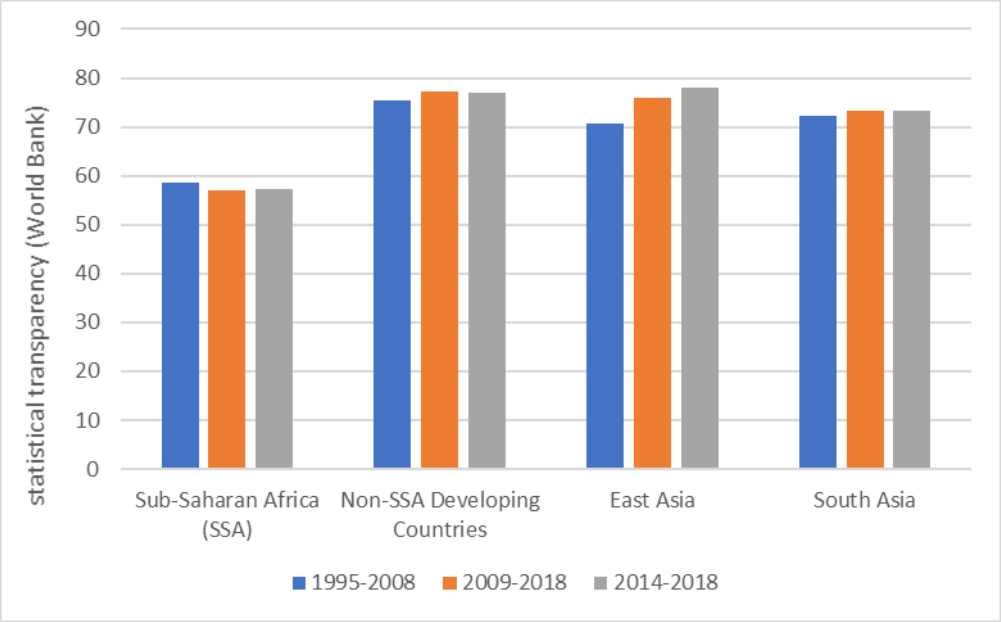
Source: World Bank

b. Periodicity and Timeliness



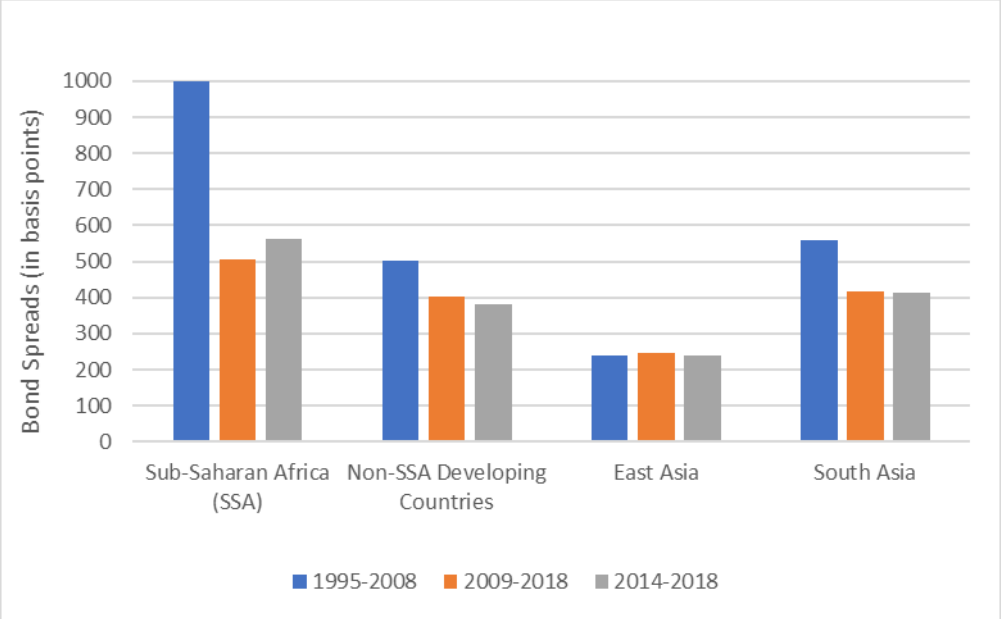
Source: World Bank

c. Data Source



Source: World Bank

Figure 4: Sovereign Bond Spreads: Averages by region and periods



Source: Bloomberg

Table 2: Data Transparency and Sovereign Bond Spreads: Linear and Conditional Impact, fixed effect

	dependent variable: spread 1995-2018					
Variables	[1]	[2]	[3]	[4]	[5]	[6]
GDP per capita (constant 2010 US$)	-0.640***	-0.753***	-0.696***	-0.415**	-0.543***	-0.583***
	(0.196)	(0.152)	(0.154)	(0.198)	(0.156)	(0.156)
Growth (annual %)	-0.0316***	-0.0288***	-0.0293***	-0.0290***	-0.0274***	-0.0284***
	(0.00624)	(0.00544)	(0.00544)	(0.00612)	(0.00537)	(0.00541)
CPI Inflation (average consumer prices)	0.0561**	0.0677***	0.0585**	0.0704**	0.0656***	0.0497**
	(0.0282)	(0.0237)	(0.0237)	(0.0277)	(0.0233)	(0.0235)
Primary Balance to GDP (%)	0.00360	0.00156	0.00421	0.00520	0.00563	0.00377
	(0.00762)	(0.00710)	(0.00709)	(0.00751)	(0.00708)	(0.00701)
Current Account Balance to GDP (%)	0.00199	-0.000538	-0.00152	0.00162	-0.00164	-0.000941
	(0.00455)	(0.00429)	(0.00428)	(0.00447)	(0.00425)	(0.00427)
Public Debt to GDP (%)	0.0124***	0.0145***	0.0159***	-0.0444***	0.0101***	0.0147***
	(0.00157)	(0.00132)	(0.00131)	(0.0159)	(0.00201)	(0.00152)
VIX Index	0.508***	0.600***	0.580***	0.548***	0.649***	0.605***
	(0.0571)	(0.0573)	(0.0576)	(0.0565)	(0.0574)	(0.0573)
US 10-year Treasury Bond Yield	-0.386***	-0.273***	-0.254***	-0.294***	-0.201**	-0.196**
	(0.0824)	(0.0789)	(0.0786)	(0.0832)	(0.0792)	(0.0796)
ICRG Index	-1.933***	-2.062***	-1.945***	9.165**	-1.398***	-1.506***
	(0.391)	(0.297)	(0.297)	(4.589)	(0.373)	(0.316)
Transparency Index (WB)	0.226			9.737**		
	(0.215)			(4.326)		
Transparency Dummy (IMF) Subscription		-0.352***			2.892**	
		(0.0679)			(1.386)	
Transparency Dummy (IMF) Standard compliance			-0.311***			4.141***
			(0.0594)			(1.359)
Transparency (WB) x ICRG				-2.550**		
				(1.052)		
Transparency (IMF) Subscription x ICRG					-0.892***	
					(0.334)	
Transparency (IMF) Standard compliance x ICRG						-1.110***
						(0.323)
Transparency (WB) x public debt				0.0139***		
				(0.00380)		
Transparency (IMF) Subscription x public debt					0.00717***	
					(0.00203)	
Transparency (IMF) Standard compliance x public debt						0.00357*
						(0.00193)
Constant	16.51***	18.85***	17.72***	-27.19	14.39***	14.89***
	(2.600)	(1.758)	(1.786)	(19.00)	(2.116)	(1.898)
Observations	560	723	723	560	723	723
R-squared	0.440	0.506	0.506	0.467	0.522	0.519
No. Countries	57	61	61	57	61	61

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Data Transparency and Sovereign Bond Spreads: Channels of Transmission, fixed effect

	dependent variable: spread 1995-2018					
Variables	[1]	[2]	[3]	[4]	[5]	[6]
GDP per capita (constant 2010 US$)	-0.634***	-0.614***	-0.606***	-0.417**	-0.526***	-0.543***
	(0.196)	(0.199)	(0.193)	(0.196)	(0.194)	(0.196)
Growth (annual %)	-0.0319***	-0.0321***	-0.0316***	-0.0276***	-0.0312***	-0.0309***
	(0.00622)	(0.00623)	(0.00624)	(0.00611)	(0.00609)	(0.00624)
CPI Inflation (average consumer prices)	0.0564**	0.0526*	0.0543*	0.0792***	0.0610**	0.0563**
	(0.0282)	(0.0280)	(0.0280)	(0.0278)	(0.0274)	(0.0280)
Primary Balance to GDP (%)	0.00405	0.00424	0.00343	0.00642	0.00669	0.00281
	(0.00759)	(0.00760)	(0.00762)	(0.00747)	(0.00745)	(0.00766)
Current Account Balance to GDP (%)	0.00198	0.00203	0.00210	0.00163	-0.000339	0.00247
	(0.00455)	(0.00456)	(0.00457)	(0.00445)	(0.00449)	(0.00457)
Public Debt to GDP (%)	0.0124***	0.0124***	0.0125***	-0.0120	-0.0648**	-0.00373
	(0.00157)	(0.00157)	(0.00158)	(0.00766)	(0.0308)	(0.00861)
VIX Index	0.513***	0.512***	0.507***	0.557***	0.531***	0.520***
	(0.0569)	(0.0571)	(0.0572)	(0.0560)	(0.0558)	(0.0574)
US 10-year Treasury Bond Yield	-0.384***	-0.382***	-0.381***	-0.288***	-0.293***	-0.359***
	(0.0823)	(0.0825)	(0.0822)	(0.0827)	(0.0827)	(0.0835)
ICRG Index	-1.926***	-1.983***	-1.921***	2.566	19.35***	0.211
	(0.391)	(0.395)	(0.391)	(2.113)	(6.657)	(2.843)
Methodology Assessment	0.103			4.143**		
	(0.0983)			(2.055)		
Periodicity and Timeliness Assessment		0.0663			19.10***	
		(0.267)			(6.335)	
Data Source Assessment			0.123			1.784
			(0.0993)			(2.582)
Methodology x ICRG				-1.093**		
				(0.495)		
Periodicity and timeliness x ICRG					-4.863***	
					(1.504)	
Data source x ICRG						-0.470
						(0.641)
Methodology x public debt				0.00677***		
				(0.00193)		
Periodicity timeliness x public debt					0.0177**	
					(0.00696)	
Data source x public debt						0.00405*
						(0.00210)
Constant	16.96***	17.17***	16.62***	-1.881	-67.24**	8.374
	(2.508)	(2.546)	(2.550)	(8.951)	(28.18)	(11.62)
Observations	560	560	559	560	560	559
R-squared	0.440	0.439	0.440	0.471	0.468	0.445
No. Countries	57	57	57	57	57	57

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Data Transparency and Sovereign Bond Spreads (IV), Baseline with Total Public Debt

IV variables	Freedom of information, lag of ICRG, lag of interaction between transparency and ICRG, lag of public debts and lag of interaction between transparency and public debts	dependent variable: spread					
		1995-2018					
	Variables	[1]	[2]	[3]	[4]	[5]	[6]
	GDP per capita (constant 2010 US$)	-0.525**	-0.413**	-0.518**	-0.450**	-0.421***	-0.653***
		(0.211)	(0.207)	(0.215)	(0.207)	(0.163)	(0.176)
	Growth (annual %)	-0.0340***	-0.0331***	-0.0358***	-0.0351***	-0.0346***	-0.0431***
		(0.00635)	(0.00630)	(0.00634)	(0.00635)	(0.00545)	(0.00590)
	CPI Inflation (average consumer prices)	0.0632**	0.0684**	0.0602**	0.0627**	0.0699***	0.0414
		(0.0283)	(0.0280)	(0.0282)	(0.0285)	(0.0243)	(0.0281)
	Primary Balance to GDP (%)	0.00477	0.00675	0.00519	0.00424	0.00976	0.0120
		(0.00752)	(0.00743)	(0.00749)	(0.00756)	(0.00771)	(0.00773)
	Current Account Balance to GDP (%)	0.00116	0.00111	0.000819	0.00163	-0.00182	-0.000514
		(0.00449)	(0.00444)	(0.00449)	(0.00452)	(0.00446)	(0.00476)
	VIX Index	0.510***	0.537***	0.506***	0.503***	0.633***	0.551***
		(0.0558)	(0.0554)	(0.0555)	(0.0559)	(0.0599)	(0.0657)
	US 10-year Treasury Bond Yield	-0.371***	-0.339***	-0.380***	-0.380***	-0.224***	-0.207**
		(0.0812)	(0.0810)	(0.0810)	(0.0812)	(0.0842)	(0.0936)
	Transparency Index (WB)	2.745***					
		(0.560)					
	Methodology Assessment		2.417***				
			(0.507)				
	Periodicity and Timeliness Assessment			2.535***			
				(0.717)			
	Data Source Assessment				2.224***		
					(0.493)		
	Transparency Dummy (IMF) Subscription					4.375**	
						(1.846)	
	Transparency Dummy (IMF) Standard compliance						12.22***
							(4.107)
	Transparency (WB) x ICRG	-0.604***					
		(0.113)					
	Methodology x ICRG		-0.612***				
			(0.120)				
	Periodicity and timeliness x ICRG			-0.574***			
`				(0.121)			
	Data source x ICRG				-0.531***		
					(0.117)		
	Transparency (IMF) Subscription x ICRG					-1.375***	
						(0.449)	
	Transparency (IMF) Standard compliance x ICRG						-3.135***
							(0.973)
	Transparency (WB) x public debt	0.00225***					
		(0.000395)					
	Methodology x public debt		0.00272***				
			(0.000421)				
	Periodicity and timeliness x public debt			0.00210***			
				(0.000374)			
	Data source x public debt				0.00230***		
					(0.000404)		
	Transparency (IMF) Subscription x public debt					0.0159***	
						(0.00139)	
	Transparency (IMF) Standard compliance x public debt						0.0125***
							(0.00202)
	Constant	7.543***	7.940***	7.883***	7.883***	8.234***	10.19***
		(1.910)	(1.813)	(2.006)	(1.868)	(1.487)	(1.600)
	Observations	532	532	532	530	713	713
	No. Countries	57	57	57	57	61	61

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Data Transparency and Sovereign Bond Spreads (IV), Baseline with External Public Debt

IV variables	Freedom of information, lag of ICRG, lag of interaction between transparency and ICRG, lag of external debts and lag of interaction between transparency and external debts	dependent variable: spread					
		1995-2018					
	Variables	[1]	[2]	[3]	[4]	[5]	[6]
	GDP per capita (constant 2010 US$)	-0.524**	-0.448*	-0.562**	-0.493**	-0.241	-0.536***
		(0.233)	(0.231)	(0.237)	(0.227)	(0.181)	(0.204)
	Growth (annual %)	-0.0470***	-0.0475***	-0.0469***	-0.0470***	-0.0399***	-0.0438***
		(0.00736)	(0.00735)	(0.00737)	(0.00739)	(0.00627)	(0.00723)
	CPI Inflation (average consumer prices)	0.0836**	0.0784**	0.0840**	0.0813**	0.111***	0.0877***
		(0.0334)	(0.0335)	(0.0332)	(0.0336)	(0.0299)	(0.0339)
	Primary Balance to GDP (%)	0.0143	0.0155*	0.0144*	0.0142	0.0128	0.0297***
		(0.00877)	(0.00878)	(0.00872)	(0.00885)	(0.00881)	(0.00964)
	Current Account Balance to GDP (%)	-0.00374	-0.00411	-0.00357	-0.00368	-0.0102**	-0.00800
		(0.00505)	(0.00504)	(0.00508)	(0.00509)	(0.00517)	(0.00568)
	VIX Index	0.475***	0.482***	0.474***	0.471***	0.574***	0.565***
		(0.0637)	(0.0638)	(0.0634)	(0.0643)	(0.0685)	(0.0816)
	US 10-year Treasury Bond Yield	-0.394***	-0.384***	-0.389***	-0.402***	-0.272***	-0.135
		(0.0887)	(0.0891)	(0.0891)	(0.0891)	(0.0922)	(0.105)
	Transparency Index (WB)	3.112***					
		(0.609)					
	Methodology Assessment		2.976***				
			(0.557)				
	Periodicity and Timeliness Assessment			3.475***			
				(0.821)			
	Date Source Assessment				2.900***		
					(0.535)		
	Transparency Dummy (IMF) Subscription					7.675***	
						(1.986)	
	Transparency Dummy (IMF) Standard compliance						25.87***
							(4.536)
	Transparency (WB) x ICRG	-0.713***					
		(0.122)					
	Methodology x ICRG		-0.747***				
			(0.132)				
	Periodicity and timeliness x ICRG			-0.744***			
				(0.134)			
	Data source x ICRG				-0.696***		
					(0.127)		
	Transparency (IMF) Subscription x ICRG					-2.148***	
						(0.485)	
	Transparency (IMF) Standard compliance x ICRG						-6.452***
							(1.096)
	Transparency (WB) x external debt	0.00224***					
		(0.000744)					
	Methodology x external debt		0.00233***				
			(0.000769)				
	Periodicity and timeliness x external debt			0.00213***			
				(0.000711)			
	Data source x external debt				0.00233***		
					(0.000762)		
	Transparency (IMF) Subscription x external debt					0.0209***	
						(0.00234)	
	Transparency (IMF) Standard compliance x external debt						0.0146***
							(0.00378)
	Constant	8.143***	8.688***	7.385***	8.539***	6.970***	9.091***
		(2.066)	(1.982)	(2.245)	(2.003)	(1.607)	(1.811)
	Observations	438	438	438	436	570	570
	No. Countries	47	47	47	47	47	47

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: IMF Data Transparency and Sovereign Bond Spreads (IV), Interactions with Trade and Financial Openness

		dependent variable: spread					
IV variables	Freedom of information, lag of ICRG, lag of interaction between transparency and ICRG, lag of public debts and lag of interaction between transparency and public debts	1995-2018					
Variables		[1]	[2]	[3]	[4]	[5]	[6]
	GDP per capita (constant 2010 US$)	-1.243***	-1.200***	-0.441**	-0.254	-1.409***	-1.115***
		(0.208)	(0.241)	(0.183)	(0.194)	(0.239)	(0.275)
	Growth (annual %)	-0.0266***	-0.0299***	-0.0352***	-0.0377***	-0.0264***	-0.0290***
		(0.00559)	(0.00606)	(0.00603)	(0.00655)	(0.00596)	(0.00637)
	CPI Inflation (average consumer prices)	0.0650**	0.119***	0.0578**	0.0872***	0.0630**	0.0964***
		(0.0257)	(0.0296)	(0.0286)	(0.0320)	(0.0280)	(0.0319)
	Primary Balance to GDP (%)	0.0126	0.00976	0.0211**	0.0185*	0.0151*	0.0154*
		(0.00768)	(0.00834)	(0.00872)	(0.00953)	(0.00846)	(0.00911)
	Current Account Balance to GDP (%)	-0.00208	-0.00894*	-0.00607	-0.0141**	-0.00597	-0.0138**
		(0.00472)	(0.00512)	(0.00501)	(0.00556)	(0.00519)	(0.00565)
	VIX Index	0.608***	0.517***	0.648***	0.586***	0.616***	0.553***
		(0.0601)	(0.0671)	(0.0694)	(0.0764)	(0.0679)	(0.0746)
	US 10-year Treasury Bond Yield	-0.501***	-0.576***	-0.203**	-0.275***	-0.547***	-0.532***
		(0.0913)	(0.0954)	(0.0933)	(0.0975)	(0.100)	(0.104)
	ICRG Index						
	Trade Openness	-0.530***	-0.417**			-0.510**	-0.352*
		(0.180)	(0.175)			(0.199)	(0.192)
	Financial Openness			-0.0899*	-0.135***	-0.0635	-0.148***
				(0.0488)	(0.0448)	(0.0486)	(0.0445)
	Transparency Dummy (IMF) Subscription	4.656**	5.166**	7.351***	6.953***	5.378**	5.718**
		(1.883)	(2.324)	(2.054)	(2.161)	(2.168)	(2.569)
	Transparency (IMF) Subscription x ICRG	-1.561***	-1.276**	-2.113***	-1.986***	-1.643***	-1.212**
		(0.465)	(0.509)	(0.499)	(0.527)	(0.514)	(0.560)
	Transparency (IMF) Subscription x public debt	0.0127***		0.0153***		0.0122***	
		(0.00141)		(0.00155)		(0.00156)	
	Transparency (IMF) Subscription x external debt		0.0175***		0.0215***		0.0169***
			(0.00264)		(0.00251)		(0.00291)
	Transparency (IMF) Subscription x Trade Openness	0.171	-0.221			0.0722	-0.434***
		(0.160)	(0.143)			(0.183)	(0.159)
	Transparency (IMF) Subscription x Financial Openness			0.0972*	0.0537	0.112**	0.102*
				(0.0516)	(0.0537)	(0.0519)	(0.0528)
	Constant	17.76***	17.08***	8.436***	7.105***	19.17***	16.03***
		(1.928)	(2.226)	(1.651)	(1.716)	(2.217)	(2.550)
	Observations	654	529	631	512	589	476
	No. Countries	57	45	58	46	55	44

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: World Bank Data Transparency and Sovereign Bond Spreads (IV), Interactions with Trade and Financial Openness

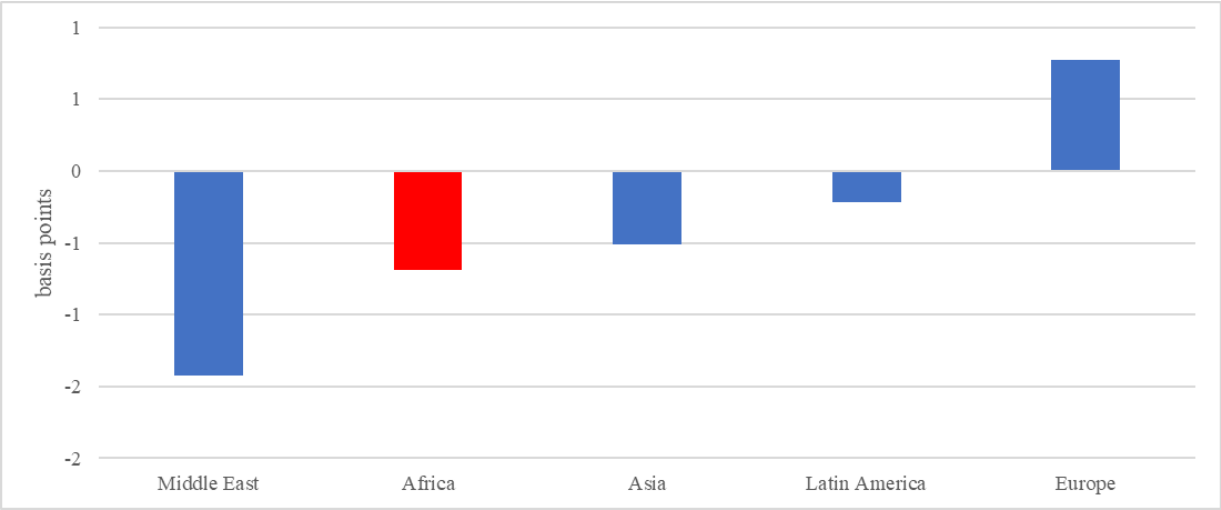
		dependent variable: spread					
IV variables	Freedom of information, lag of ICRG, lag of interaction between transparency and ICRG, lag of public debts and lag of interaction between transparency and public debts OR lag of external debts and lag of interaction between transparency and external debts, lag of trade openness (in logs) and lag of financial openness	1995-2018					
Variables		[1]	[2]	[3]	[4]	[5]	[6]
	GDP per capita (constant 2010 US$)	-0.545**	-0.625**	-0.458*	-0.527*	-0.630**	-0.762**
		(0.235)	(0.267)	(0.245)	(0.274)	(0.283)	(0.320)
	Growth (annual %)	-0.0298***	-0.0407***	-0.0353***	-0.0457***	-0.0309***	-0.0405***
		(0.00673)	(0.00740)	(0.00708)	(0.00791)	(0.00731)	(0.00804)
	CPI Inflation (average consumer prices)	0.0898***	0.0806**	0.0709**	0.0657*	0.0739**	0.0649*
		(0.0294)	(0.0336)	(0.0328)	(0.0374)	(0.0332)	(0.0374)
	Primary Balance to GDP (%)	0.0166**	0.0169*	0.0198**	0.0174*	0.0182**	0.0172*
		(0.00800)	(0.00879)	(0.00883)	(0.00982)	(0.00892)	(0.00985)
	Current Account Balance to GDP (%)	0.00189	0.000288	0.000251	-0.00441	0.000449	-0.00106
		(0.00482)	(0.00523)	(0.00503)	(0.00573)	(0.00553)	(0.00602)
	VIX Index	0.561***	0.481***	0.541***	0.516***	0.559***	0.525***
		(0.0568)	(0.0646)	(0.0650)	(0.0748)	(0.0662)	(0.0755)
	US 10-year Treasury Bond Yield	-0.406***	-0.461***	-0.333***	-0.382***	-0.431***	-0.471***
		(0.0892)	(0.0983)	(0.0903)	(0.0982)	(0.100)	(0.110)
	Transparency (WB) x ICRG	-0.577***	-0.664***	-0.583***	-0.612***	-0.490***	-0.548***
		(0.121)	(0.132)	(0.123)	(0.134)	(0.133)	(0.143)
	Transparency (WB) x trade openness	-0.140***	-0.160***			-0.109**	-0.138***
		(0.0395)	(0.0426)			(0.0486)	(0.0509)
	Transparency (WB) x financial openness			-0.00603	-0.0261***	-0.00388	-0.0201**
				(0.00893)	(0.00989)	(0.00887)	(0.00986)
	Transparency Dummy (WB) x public debt	0.00243***		0.00344***		0.00279***	
		(0.000434)		(0.000479)		(0.000511)	
	Transparency Dummy (WB) x external debt		0.00112		0.00324***		0.00164*
			(0.000798)		(0.000879)		(0.000970)
	Constant	8.830***	9.163***	6.799***	7.185***	9.679***	10.52***
		(2.286)	(2.510)	(2.223)	(2.440)	(2.739)	(2.987)
	Observations	482	407	454	380	422	354
	No. Countries	51	44	54	46	50	43

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

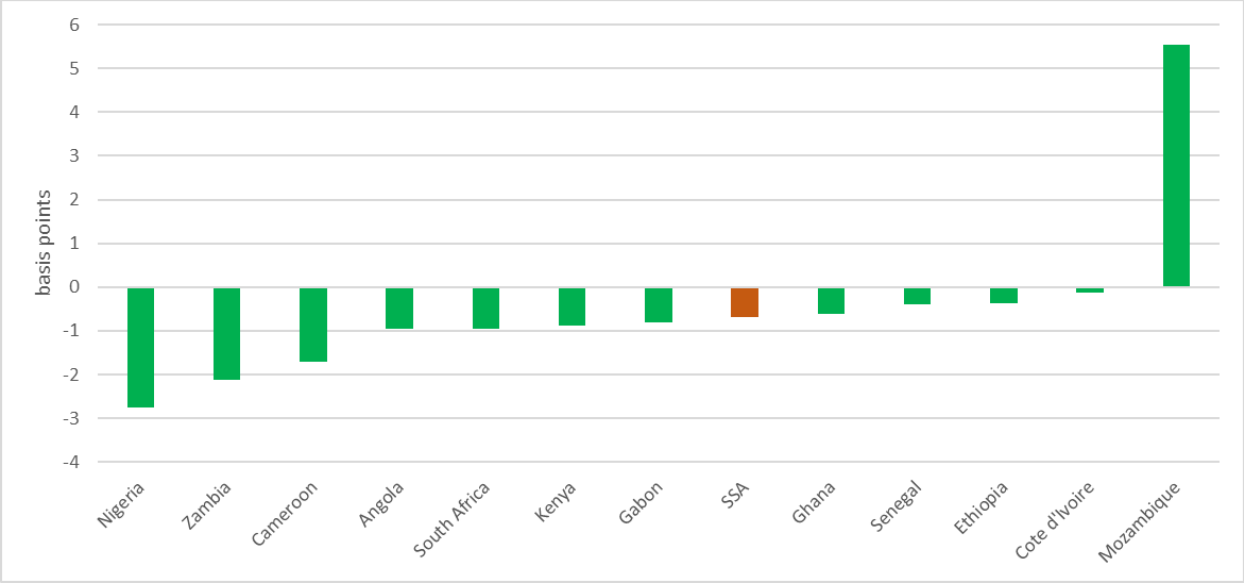
Figure 5: Impact of a 10% Change in Data Transparency on Sovereign Bond Spreads Conditional on the Level of External Public Debt

a. By Region



Source: World Bank, Bloomberg and PRS Group

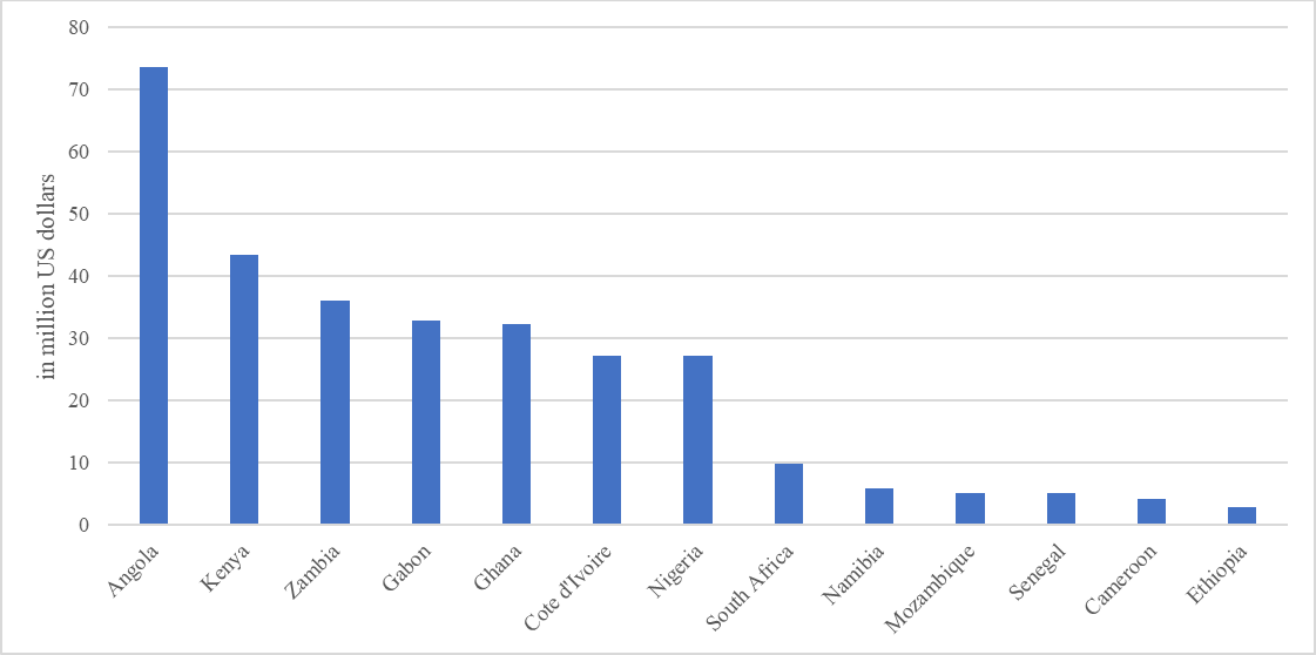
b. By Country



Source: World Bank, Bloomberg and PRS Group

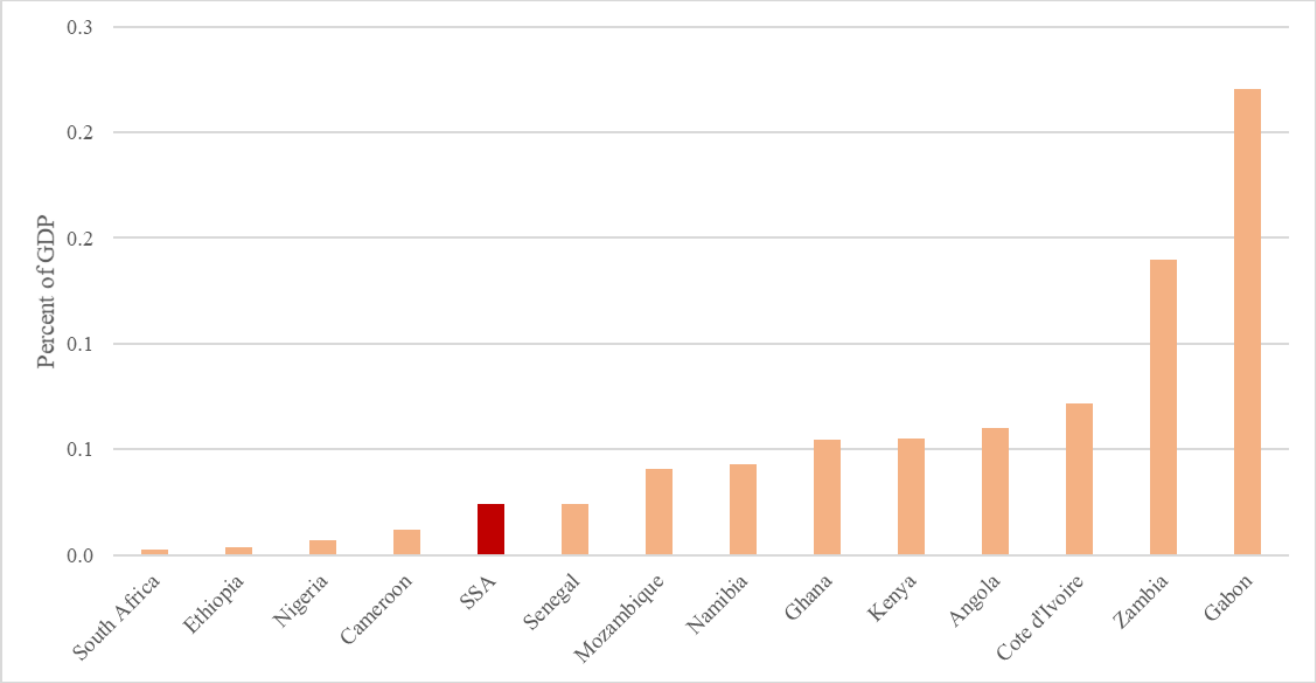
Figure 6: Potential Reduction in External Public Debt from Higher Data Transparency

a. in Million US dollars



Source: World Bank, Bloomberg and PRS Group

b. in percentage of GDP



Source: World Bank, Bloomberg and PRS Group

Table 8: Potential Changes in Sovereign Bond Spreads and Reduction in External Public Debt from Higher Data Transparency

	Change in Spreads (bps) if data transparency improves to:		Reduction in external debt if data transparency improved to: Top quartile of middle income			Reduction in external debt if data transparency improved to: Top quartile of upper middle income		
Country	Top quartile of middle income	Top quartile of upper middle income	*(US$ million)*	*(% GDP)*	*(% Export)*	*(US$ million)*	*(% GDP)*	*(% Export)*
Angola	-10.16	-11.08	67.41	0.06	0.16	73.61	0.06	0.18
Cameroon	-4.64	-5.52	3.52	0.01	0.05	4.19	0.01	0.06
Cote d'Ivoire	-3.94	-4.66	23.04	0.06	0.15	27.30	0.07	0.18
Ethiopia	-2.22	-2.91	2.23	0.003	0.03	2.94	0.004	0.04
Gabon	-13.61	-14.49	30.81	0.21	0.42	32.85	0.22	0.45
Ghana	-2.85	-3.66	25.08	0.04	0.11	32.28	0.05	0.14
Kenya	-6.20	-7.01	38.35	0.05	0.32	43.47	0.06	0.36
Mozambique	-4.71	-7.06	3.43	0.03	0.06	5.16	0.04	0.09
Namibia	-4.09	-4.61	5.19	0.04	0.11	5.86	0.04	0.12
Nigeria	-2.59	-3.43	20.50	0.01	1.29	27.18	0.01	1.71
Senegal	-0.43	-1.18	1.86	0.01	0.04	5.13	0.02	0.10
South Africa	-0.04	-0.58	0.71	0.0002	0.001	9.80	0.003	0.01
Zambia	-10.36	-11.86	31.48	0.12	0.31	36.11	0.14	0.35
SSA	-4.12	-4.87	342.74	0.02	0.14	405.38	0.02	0.16

Note: The change in spreads is calculated as the impact of data transparency on sovereign spreads while holding constant the level of institutional quality and external debt. The reduction in public external debt is computed by multiplying the change in spreads by the outstanding stock of Eurobonds.

Source: World Bank, Bloomberg and PRS Group