1. Introduction

Transparency helps economies function better and makes them less vulnerable to crisis. Transparency in economic policies encourages greater public debate and scrutiny, enhances accountability of policymakers and credibility of policies, and helps to make markets more efficient. A key benefit of increased transparency through data dissemination is reducing uncertainty about economic developments and providing the basis for better appraisals of economic prospects, which can be expected to lower risk premiums when countries access financial markets. This paper focuses on the relationship between increased transparency through data dissemination and the sovereign bond spreads of emerging and frontier markets.

Previous studies have shown a favorable effect of transparency on countries' financing conditions in global capital markets that is materialized in lower sovereign bond spreads (Cady, 2005; Cady and Pellechio, 2006; Glennerster and Shin, 2008; Moretti, 2011; and Choi and Hashimoto, 2018). We revisit these findings using new methods to study the relationship between sovereign spreads and participation in the different tiers of the IMF Data Standards Initiatives, which is a multilateral framework to enhance transparency through the dissemination of economic and financial data.[1]

The first framework under the IMF data dissemination standards, the Special Data Dissemination Standard (SDDS), was established by the IMF Executive Board in 1996 and was designed to guide countries that have or might seek access to international capital markets in the dissemination of data. The General Data Dissemination System (GDDS) was launched in 1997 to guide countries in the development of sound statistical systems in support of eventual dissemination of data. Initially, the GDDS focused on the disclosure of statistical frameworks, description of data (metadata), and plans for development rather than data dissemination. The SDDS Plus, the third and highest tier of the framework, was established in 2012, building on the SDDS and aimed at economies with systemically important financial sectors. In 2015, the GDDS was enhanced to improve countries' incentives to publish data. The key element of the enhanced-GDDS (e-GDDS), which superseded the GDDS, is that countries, following standardized dissemination practices, publish data, and not just metadata, through a National Summary Data Page (NSDP), facilitating public access to timely, key macroeconomic and financial data.

This paper focuses on the experience of economies that have enhanced data dissemination by joining the SDDS, GDDS prior to 2015, and those that have launched the NSDPs under the e-GDDS and investigates the relationship with sovereign financing conditions. In doing so, it contributes to the literature by evaluating for the first time the experience of countries that implemented the e-GDDS. Furthermore, it uses novel methods, including local projection models to study the dynamic response of sovereign spreads to joining the data dissemination standards and the impact of the institutional environment on the relationship between transparency and sovereign financing conditions.[2]

The results suggest that sovereign borrowers benefit from better conditions to access financing in global capital markets when they join the IMF data dissemination standards. A significant reduction in sovereign spreads can be observed in the quarters following subscription to the SDDS or implementation of the e-GDDS by publishing macroeconomic and financial data through the NSDP. The latter effect, which is studied for the first time in this

[1] "Data Standards Initiatives" and "data dissemination standards" are used interchangeably in the paper.

[2] This paper does not cover SDDS Plus adherents as they are typically economies that play a leading role in international capital markets with systematically important financial sectors that are integral to the working of the international monetary system. Thus, their sovereign bonds are much less sensitive to their joining the data dissemination standards.

paper, is in addition to a favorable impact on spreads from joining the GDDS in the first place. The local projections method makes it possible to compare empirically the effects of joining the different tiers of the data dissemination standards. The comparisons show larger benefits from subscribing to the SDDS and the initial participation in the GDDS compared to the smaller but still significant benefits from publishing data through NSDPs.

The paper also investigates how governance and institutional environment can affect the relationship between increased transparency and sovereign financing conditions. When interacting the data standards participation variable with indicators of governance, we find that countries with relatively weaker governance tend to benefit the most from implementing the e-GDDS or subscribing to the SDDS. This benefit comes in the form of larger reductions in sovereign spreads potentially thanks to a signaling effect from countries' efforts to improve transparency when implementing the Data Standards Initiatives.

The rest of the paper is organized as follows. Section 2 explains the approach taken, describes the data used, and the results from event studies and the local projection models. The role of governance and institutional environments is also discussed. Section 3 offers the conclusions.

2. Empirical Analysis

The empirical analysis aims to assess whether strengthening transparency in the context of countries' adoption of the IMF data dissemination standards is related to declines in their sovereign borrowing costs by providing market participants with more timely data on key economic and financial developments. We use two types of empirical models that allow us to estimate the dynamic relationship of joining the data dissemination standards with the indicator of financing conditions in international markets. These models also allow us to mitigate potential endogeneity issues which may arise because of the relationship between countries' decision to implement the data dissemination standards and country characteristics or other economic developments which can affect sovereign borrowing costs.

We start with simple event analysis which tests for changes in sovereign spreads around the dates of adopting the data dissemination standards. The testing is done for short windows of time to mitigate the influence of other economic or institutional developments on spreads and thus focusing on the effects of implementing the standards.[3] We then use models for event studies with panel data to control for other determinants of sovereign spreads while deriving the dynamic relationship of spreads with the adoption of the data standards using the approach of Freyaldenhoven and others (2021).

The second empirical approach used is the local projection methods (Jordà, 2005) in a panel setting. This approach allows estimating the dynamic response of sovereign spreads following the impulse provided by adopting the data dissemination standards. In this method, the identification of the effects of interest can be obtained under the assumption that adopting the dissemination standards is determined by a policy decision unrelated to economic developments at the time of the adoption.

The analysis is based on an unbalanced panel data covering the period from December 1993 to March 2020.

[3] Potential issues of endogeneity when estimating the effects of joining the IMF data standards on sovereign spreads have been treated by Choi and Hashimoto (2018) using event studies. First, they show that forecast errors obtained from models for sovereign spreads change after joining the different data dissemination standards in a way suggesting that investors reward joining the SDDS and GDDS with lower borrowing costs. Second, they present evidence indicating that joining the dissemination standards is not driven by macroeconomic factors that may also bear upon sovereign spreads.

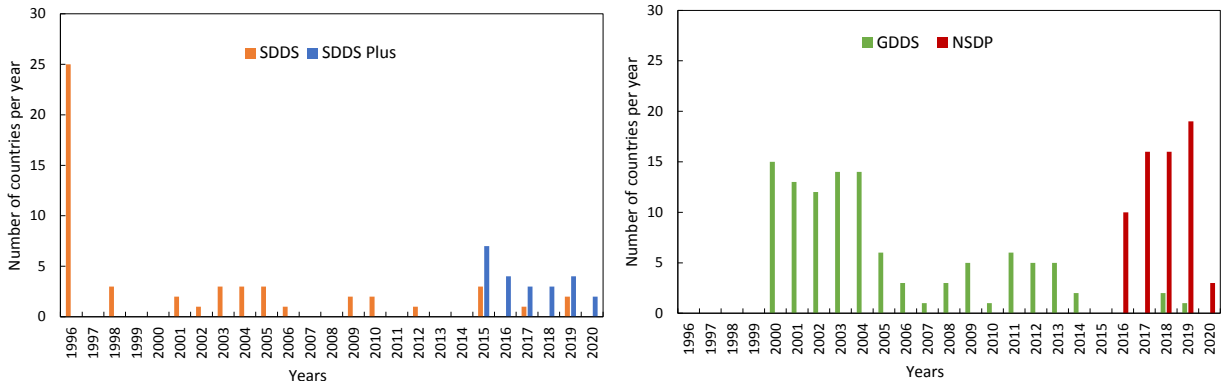
The end of the sample is set such as to avoid issues relating to the impact of the COVID-19 pandemic (see IMF, 2022, for a discussion of dissemination practices during the pandemic).

2.1. Data

Transparency reform through the adoption of IMF data dissemination standards. The adoption of the IMF data standards started in the mid-1990s (Figure 1), with the main/largest wave in subscriptions to the SDDS. Over time, while new subscribers have joined the standards, the total number of the SDDS countries declined as countries advanced toward the highest tier, SDDS Plus, starting in 2015. The first phase of the GDDS was launched in 1997 and focused on the training and education of country officials in preparation for the second phase that started in May 2000. In the first phase, plans for statistical development and metadata were posted in the DSBB portal of the IMF. This explains the wave in GDDS participation starting in 2000 that continued with similar levels in the next four years (Alexander and others, 2008). The number of e-GDDS countries that launched an NSDP and started publishing data surged after 2015, the year when the enhancement of the GDDS was introduced.

Three dummy variables indicating the date when a given economy joined the data dissemination standards were created, corresponding to the dates of subscribing to the SDDS, joining the GDDS, or implementing the e-GDDS by publishing data through the NSDP.[4] These dummy variables can take the value of 1 starting from the day of joining and zero prior to that, or can be impulse variables with the value of 1 in the quarter in which the economy joined the framework and zero otherwise.

Figure 1. Countries Joining the Data Standards Initiatives Per Year



Source: IMF staff calculations.
Note: Bars show the number of countries that joined the data dissemination standards each year. Red bars show the number of GDDS economies that started publishing data.

Indicator of financing conditions. The dependent variable is the measure of the sovereign borrowing cost proxied by the J.P. Morgan EMBIG spread index, which summarizes information on the spreads of different sovereign bonds of a given country.[5] This indicator is available for 30 countries that subscribed to the SDDS (and remained in the SDDS during the sample period) and 29 countries that participate in the GDDS, 21 of which have launched their NSDPs. The sovereign spreads data is available for the entire period covered in this paper (December 1993–March 2020).

[4] The dates are available at the website of the IMF Dissemination Standards Bulletin Board (DSBB) https://dsbb.imf.org.

[5] In addition to sovereign bonds, the index includes quasi sovereign bonds totally guaranteed by the government or issued by entities totally owned by the national government.

Variables representing global financial conditions. The effective Federal Funds Rate of the U.S. Federal Reserve is the reference rate used as indicator of global financial conditions and is available for the entire sample period. The Chicago Board Options Exchanges volatility index (VIX) represents the volatility of global financial markets. This index is a one-month ahead indicator of the volatility expected in the Standard & Poor's index based on stock option prices.

Country-specific macroeconomic variables. Different macroeconomic variables (GDP growth, inflation, public debt, fiscal balance, and current account) have been considered but availability of quarterly data is limited, especially for the e-GDDS countries. The only macroeconomic variable with enough observations to allow for a useful estimation is the inflation rate, which is used in subsection 2.3.

Credit ratings. Fitch sovereign credit ratings provide a standardized indicator of the creditworthiness of sovereign borrowers and is based on the analysis of a broad array of country-specific features. These ratings are widely used as summary indicators of the different characteristics of countries that impact their capacity to pay and, in turn, can affect financing conditions faced by borrowers.[6] The unbalanced sample of Fitch ratings starts in the third quarter of 1994 and ends at the end of the sample.

Indicators of governance and institutional environment. The indicators of governance are obtained from the Worldwide Governance Indicators database, using both the overall index (calculated as the composite index of the six different governance indicators)[7] and the specific indicator for government effectiveness (see Kaufmann, Kraay and Mastruzzi, 2010). In addition, we use the rating of quality of bureaucracy from the International Country Risk Guide (ICGR) which evaluates whether the bureaucracy in a country can govern without drastic changes or interruptions in government services when there is a change in government (see PRS Group, 2022).

2.2. Event Studies

Event studies show a decline in the average level of sovereign spreads around the date of countries' joining the data dissemination standards or implementing the e-GDDS. The paired t-tests shown in Table 1 compare the mean log sovereign spreads using windows of 30, 60, and 90 days before and after the change in the countries' data dissemination status. The null hypothesis is no change in the mean level of spreads when comparing before and after. All test statistics are negative, meaning that for the SDDS and (e-)GDDS and for all the windows there was a decrease in the mean of spreads after joining, with the reduction being statistically significant when using the 60- and 90-day- windows.

[6] Several papers have shown the usefulness of credit ratings to modelling sovereign spreads as they are designed to assess the creditworthiness of borrowers. See for instance: Eichengreen and Mody (1998); Arora and Cerisola (2001); Kaminsky and Schmukler (2002); Mora (2006); Cady and Pellechio (2006); Hilscher and Nosbusch (2007); Afonso, Furceri and Gomes (2012); and Choi and Hashimoto (2018).

[7] The indicators are voice and accountability; political stability and absence of violence or terrorism; government effectiveness; regulatory quality; rule of law; and control of corruption. See http://info.worldbank.org/governance/wgi/

Table 1. Changes in Mean Sovereign Spreads After Joining SDDS, GDDS, and Launching e-GDDS NSDPs

	SDDS		GDDS		NSDP	
Window	Test statistic	p-value	Test statistic	p-value	Test statistic	p-value
30 days	-1.37	0.15	-1.23	0.17	-0.88	0.26
60 days	-1.82	0.08	-1.11	0.20	-1.67	0.10
90 days	-1.87	0.06	-1.18	0.18	-1.96	0.06

Source: IMF staff calculations.
Note: The figures show the value of the t-test statistics and p-values for the test of the null hypothesis implying no change in the mean sovereign spreads around the date of the adoption of the SDDS, the GDSS and implementation of the e-GDDS.

To assess richer dynamic effects of joining the dissemination standards, we use the linear panel data model with shown in equation (1).[8] These models also focus on a short period of time around the date of joining the data standards and use high frequency observations. The left hand-side of the equation contains the log of the daily EMBIG sovereign spread index in country *i* at date *t* ($E_{i,t}$). The model includes country and time fixed effects, denoted respectively by α_i and γ_t as well as P country specific control variables denoted by $x_{i,t,j}$ with their corresponding parameters φ_j . The variable indicating the adoption of the data standards is $z_{i,t}$ which takes value of zero before joining and 1 starting at the day of adoption. The estimates of the dynamic effects from the change in $z_{i,t}$ are denoted by ρ_m and are calculated for a window of dates covering M+G periods around the date in which the country joined the dissemination standard. In this setting, joining the data standards can have dynamic effects on sovereign spreads up to M days before the date of joining and at most G days after the date of joining. The error term of the regression is $\varepsilon_{i,t}$.

$$E_{i,t} = \alpha_i + \gamma_t + \sum_{j=1}^{P} \varphi_j x_{i,t,j} + \sum_{m=-G}^{M} \rho_m z_{i,t-m} + \varepsilon_{i,t} \qquad (1)$$

Using daily observations of the EMBIG spread indices allows obtaining a large number of estimates but requires using daily control variables. Daily data is available for two variables with important roles in international capital markets that help to control for global market conditions: the Federal Funds rate, the reference rate that is a key determinant of financing conditions globally, and the VIX index, commonly associated with the degree of risk aversion in financial markets, which also affects sovereign borrowing conditions.[9] Other control variables include country-specific linear and quadratic trends to ensure that no trends in the data can influence the results, and indicators for the day of the week and the date in the month, which are included in case they influence the daily data of sovereign spreads.

Three models are estimated to assess the dynamic effects of: (i) subscribing to the SDDS; (ii) participating in the GDDS; and (iii) launching the NSDP by e-GDDS countries. The windows cover 90 days before and after the day in which an economy joined the corresponding standard (both M and G are set to 90 days). The estimates of the dynamic effects are reported in Figure 2 as a collection of estimates of ρ_m which show the partial correlation at different dates between joining the standards and sovereign spreads. The methodology requires a normalization with reference to a specific date to identify the estimates and this also serves to set a benchmark to compare other estimates. Figure 2 shows the values of estimates normalized in such a way that

[8] See Freyaldenhoven and others (2021).
[9] Since these variables are not country specific, time effects are excluded from the model.

the estimate for the day of joining the standard is equal to zero. This value and date are marked with a red diamond in Figure 2 while all other estimates are marked with black dots, and the corresponding vertical lines show 90 percent confidence intervals. For each day, the values of the estimates show the sign and magnitude of the relationship between joining the standards and sovereign spreads.

In the case of the SDDS (Figure 2a), the estimates show a clear change after the date of subscription. This estimation involves about 140,000 daily panel observations covering 30 countries. A series of specification tests show that none of the control variables listed above can be omitted from the estimation and no trend in the estimates ρ_m can be identified before joining the SDDS.[10] The absence of a trend suggests that the pattern shown by the estimates cannot be attributed to some confounding effect omitted from the model. The estimates for the period after SDDS subscription show mostly negative values, implying that subscribing to SDDS had a reducing effect on spreads. Many of the estimates are statistically significant at the 90 percent confidence level.

For the case of countries' joining the GDDS, the results show little change in the pattern of estimates (Figure 2b). This may not be surprising given that by participating in the GDDS (prior to its enhancement in 2015), countries were encouraged to publish methodological notes (metadata) and statistical development plans, with less emphasis on data dissemination. This estimation involves about 79,000 panel observations covering 28 countries.

In contrast, there is a clear change in the pattern of estimates following the implementation of the e-GDDS as countries start publishing data through the NSDP (Figure 2c). Almost all estimates after the launch of the NSDP are negative which implies a negative relationship between the event (that is, starting the dissemination of data through the NSDP) and sovereign spreads. While the pattern is clear, only some of the estimated partial correlations are statistically different from zero at the 90 percent confidence level. This estimation involves about 46,000 daily panel observations covering 18 countries. The specification tests support the inclusion of the control variables, except for the Fed Funds rate but it was checked that the results do not change without it; there is no trend in the estimates before the day of the launch of the NSDP, suggesting that the patterns shown are not likely related to some omitted factor; and the set of estimates after the launch of the NSDP cannot be omitted from the model.

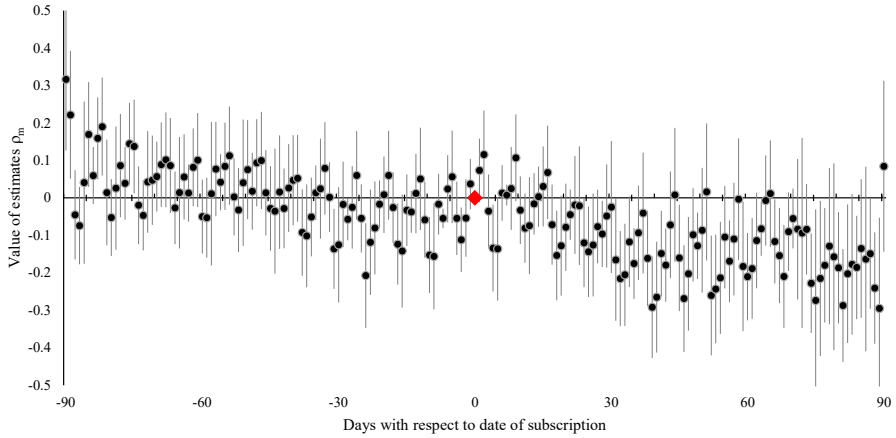
In summary, the results from simple event studies show a reduction in the mean sovereign spreads after joining the standards. More fully fledged models of event studies allowing for dynamic effects show a clear pattern of a significant decline in sovereign spreads after the countries subscribe to the SDDS. There is also some empirical evidence of negative correlations between sovereign spreads and data dissemination under the e-GDDS, but the estimates lack statistical significance.

It is important to note for the analysis presented in the following section that event studies focus on a short period of time before and after the adoption of the data dissemination standards to identify the relationship of this event with sovereign spreads and thus aim to avoid contaminating the identification of the estimated effect with the influence of other country-specific economic and institutional developments that take place over lower frequencies.

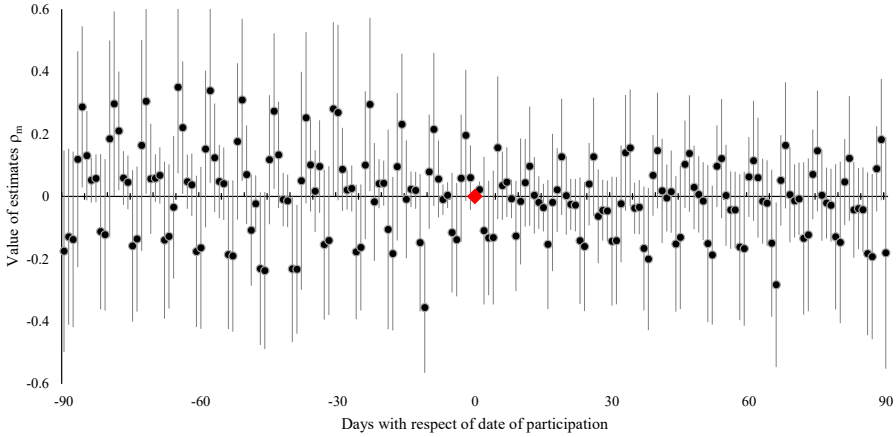
[10] For a detailed description of specification tests, see Freyaldenhoven and others (2021).

Figure 2. Event Studies Around the Date of Joining the Data Dissemination Standards

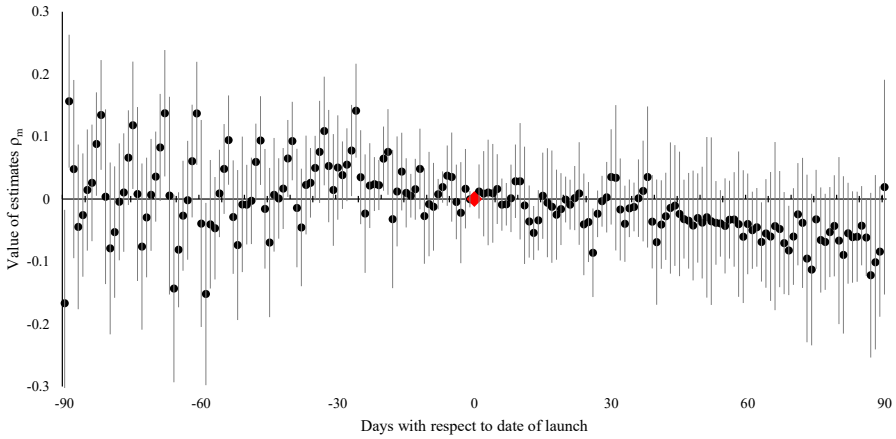
a) Subscription to SDDS



b) Participation in GDDS



c) Publication of data by e-GDDS participants (launching of NSDP)



Source: IMF staff calculations.

Note: The red diamond corresponds to the date of the event. The patterns of dots show the dynamic effects of joining the IMF data standards. Dots show the partial correlations, ρ_m, between joining the standard and sovereign spreads at different dates and vertical lines show the corresponding 90 percent confidence intervals.

2.3. Local Projection Methods

The cumulative response of sovereign spreads during the year following the quarter of joining the data dissemination standards is estimated using the local projection model in expression (2) (Jordà, 2005). The dependent variable is the cumulative change in the natural log of the EMBIG sovereign spread index in country *i* at different time horizons denoted by *h*, and *t* denotes quarters. The horizons cover from the first quarter of joining the frameworks, *h=0*, up to one year, *h=3*. This method requires that the cumulative effects for the different horizons are estimated in separate regressions corresponding to each horizon *h*. The three collections of estimates of interest —β^{S0}… β^{Sh}; β^{G0}… β^{Gh}; and β^{N0}… β^{Nh}— describe the dynamic response of spreads after the impulse represented by the countries' adoption of the different data dissemination standards, denoted by S (for SDDS), G (for GDDS) and N (for e-GDDS and launch of NSDP).

$$E_{i,t+h} - E_{i,t-1} = \alpha_i^h + \gamma_t^h + \delta_t^h + \beta^{Sh} S_{i,t} + \beta^{Gh} G_{i,t} + \beta^{Nh} N_{i,t} + \varepsilon_{i,t}^h + \varepsilon_{i,t}^{h-1} + \cdots$$
$$\sum_{j=1}^{p} \theta_{1,j}^{h} E_{t-j} + \sum_{j=0}^{p} \theta_{2,j}^{h} V_{t-j} + \sum_{j=0}^{p} \theta_{3,j}^{h} F_{t-j} + \sum_{j=1}^{p} \theta_{4,j}^{h} X_{t-j} + \cdots$$
$$\sum_{j=0}^{h-1} \theta_{5,j}^{h} V_{t+h-j} + \sum_{j=0}^{h-1} \theta_{6,j}^{h} F_{t+h-j} + \sum_{j=0}^{h-1} \theta_{7,j}^{h} X_{i,t+h-j} \qquad (2)$$

On the right-hand side, the first row describes the simplest model, which is subsequently expanded with the two rows/specifications that follow. The model in the first row includes country and time fixed effects, denoted respectively by α_i^h and γ_t^h, as well as seasonal dummies δ_t^h. Including country fixed effects helps mitigate any residual potential issues of endogeneity that would be present in cross-country estimations in which some country-specific characteristics could be related to countries' readiness to join the data dissemination framework. The estimates of interest are β^{Sh}, β^{Gh}, and β^{Nh}, which denote the estimated cumulative responses (at horizon *h*) of the sovereign spreads after joining SDDS, GDDS, or launching the NSDP, respectively. $S_{i,t}$, $G_{i,t}$, and $N_{i,t}$, are dummy variables indicating the quarter in which the countries joined the different data standards and zero otherwise. The first row of expression (2) includes the error term of the regression, $\varepsilon_{i,t}^h$, and the error term obtained from the regression corresponding to the preceding horizon *h-1*, $\varepsilon_{i,t}^{h-1}$. The inclusion of the latter term improves the efficiency of the estimation (Jordà, 2005).

The second and third rows of expression (2) are added to obtain a more complete specification and help avoid confounding the estimated effects of joining the standards. The second row includes lags of the sovereign spreads index (E_{t-j}) to control for both persistence in the series and, to some extent, the lagged effects of determinants of sovereign spreads. The lags of two global determinants of sovereign spreads are also included: V_{t-j}, denotes contemporary and lagged values of the VIX index, the indicator of volatility in financial markets; and F_{t-j} are contemporary and lagged values of the U.S. Federal Funds rate, the reference rate in global financial markets.[11] To take into account domestic economic developments, X_{t-j} includes lagged values of domestic variables. The third row of (2) includes terms to obtain a consistent estimation (Teulings and Zubanov, 2014). These terms are future realizations of global and domestic variables that capture variations of these determinants which can affect the cumulative change of spreads. Controlling for all the additional covariates should help us better identify the effects of implementing different data dissemination standards on sovereign spreads. Different models were estimated to investigate robustness and yielded similar results.[12]

[11] When the VIX index and/or the Federal Funds rate are included, the fixed time effects are excluded as they become redundant.
[12] All estimations use heteroskedasticity-robust standard errors clustered at the country level.

It is worth reiterating that the estimation requires that the adoption of the standards is considered an unexpected shock, uncorrelated with other developments. The event studies of the previous subsection and the analysis of Choi and Hashimoto (2018), in which the effect of the adoption of standards is well identified in a short time window, support this working assumption.

Overall, the results confirm that subscription to the SDDS brings the most of benefits and these are statistically significant. Participation in the GDDS also led to a reduction in sovereign spreads, but statistical significance of this result is less robust, depending on the time horizon. Implementing the e-GDDS and launching the NSDP to disseminate data is showed to bring benefits in the form of statistically significant reductions in sovereign spreads that are in addition to the favorable impact from the GDDS participation. In particular:

- Model 1 in Table 2 corresponds to the first row of expression (2). The results suggest that subscription to the SDDS is associated to a reduction of the spreads index that can be identified during the first and second quarters after subscription, and the reduction reaches 10 percent after one year. The effects of participating in the GDDS are not as clearly identified. There is a significant decrease of 7 percent in spreads index only two quarters after joining. Starting to publish data through NSDP brings additional benefits: the reduction in spreads index is between 6 and 8 percent and statistically significant during the year following the e-GDDS implementation (Figure 2, Model 1).

- Model 2 in Table 2 incorporates the variables shown in the second and third rows of expression (2) including lags of the log index of sovereign spreads and lags and leads of quarterly inflation rates, the Fed Funds rate, and the VIX index. The relationship between adopting the data dissemination standards and sovereign spreads is very similar to the ones in the Model 1. Subscribing to the SDDS has clear effects on spreads, reaching a 12-percent reduction in spreads index after one year. Participating in the GDDS also contributes to a reduction in spreads but this effect is smaller (about 6 percent), and statistical significance is not consistent over the different horizons. However, when e-GDDS participants launch their NSDP to disseminate data, the results show reductions between 5 and 8 percent in spreads index that are statistically significant during the year following the launch (Figure 2, Model 2).

- Model 3 in Table 2 expands Model 2 and incorporates additional country-specific characteristics by including the Fitch sovereign credit ratings. While this variable is specifically designed to assess sovereign capacity to pay and consequently highly correlated with sovereign spreads, the results from this specification confirm the findings in Models 1 and 2: there is a significant reduction in sovereign spreads in the quarters after joining the SDDS and implementing e-GDDS (Figure 2, Model 3). Robustness of these results further supports our working assumption that joining the data dissemination standards is a valid unexpected shock uncorrelated with other information, which makes the identification of the effects possible.

Table 2. Cumulative Effects on Sovereign Spreads of Joining Data Dissemination Standards (Percent)

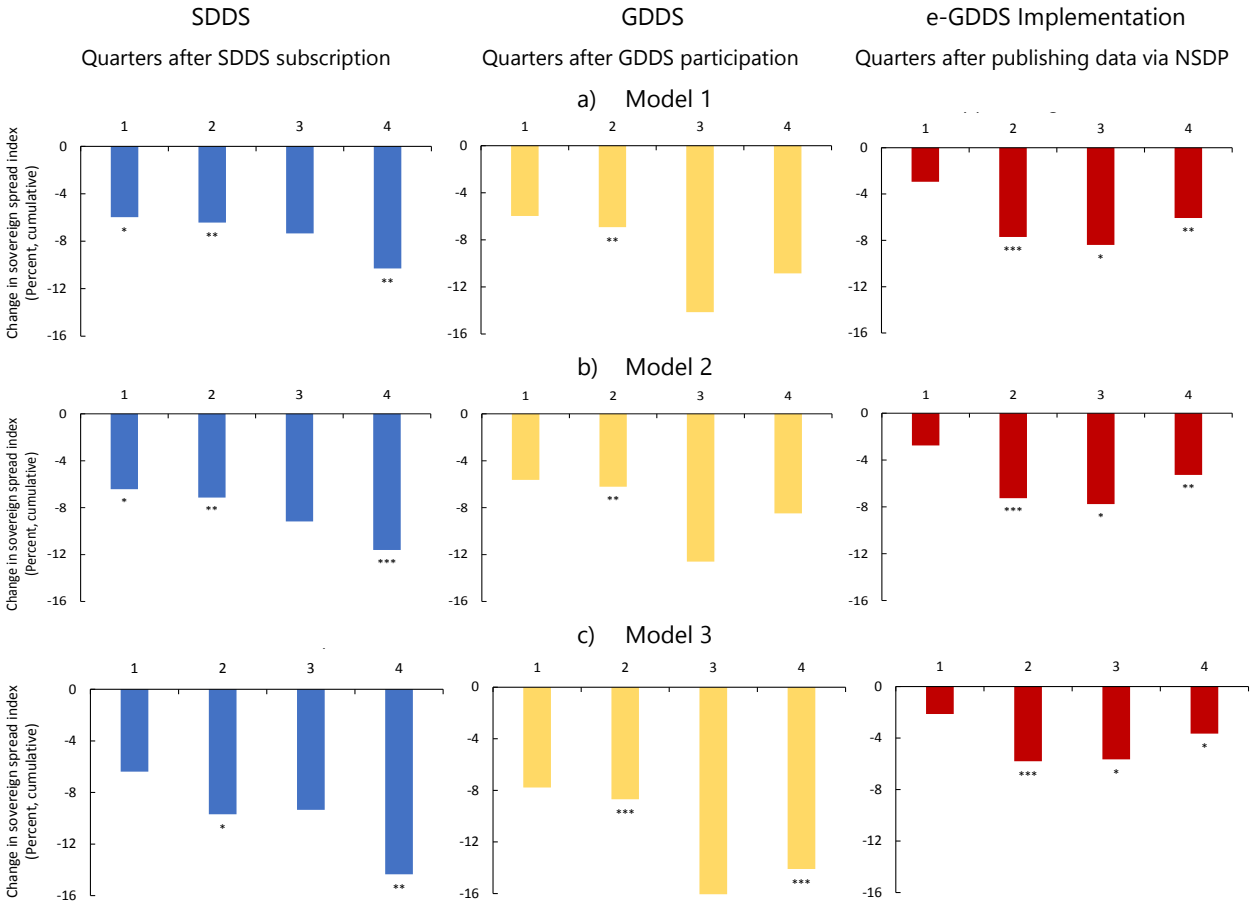
Model 1				Model 2				Model 3			
Quarter	SDDS	GDDS	NSDP	Quarter	SDDS	GDDS	NSDP	Quarter	SDDS	GDDS	NSDP
0	-6.0 *	-6.0	-2.9	0	-6.4 *	-5.6	-2.7	0	-6.4	-7.8	-2.1
1	-6.4 **	-6.9 **	-7.7 ***	1	-7.1 **	-6.2 **	-7.3 ***	1	-9.7 *	-8.7 ***	-5.8 ***
2	-7.3	-14.1	-8.4 *	2	-9.2	-12.6	-7.8 *	2	-9.3	-16.1	-5.7 *
3	-10.3 **	-10.8	-6.1 **	3	-11.6 ***	-8.5	-5.3 **	3	-14.3 **	-14.1 ***	-3.7 *
Covering 30 SDDS countries and 27 GDDS countries of which 20 have launched NSDPs; 2,769 panel observations.				Covering 29 SDDS countries and 27 GDDS countries of which 20 have launched NSDPs; 2,659 panel observations.				Covering 28 SDDS countries and 23 GDDS countries of which 18 have launched NSDPs; 2,312 panel observations.			

Source: IMF staff calculations.

These results are in line with the evidence presented in some earlier papers that suggest significant declines in sovereign spreads after joining the data dissemination standards. Cady (2005) found that spreads in the

primary bond market declined on average by close to 20 percent following subscription to the SDDS. This work was expanded in Cady and Pellechio (2006) to include the effects of participation in the GDDS, and they found that primary market launch spreads show a 19 percent decline for SDDS subscribers and a 9 percent decline for GDDS participants. More recently, Choi and Hashimoto (2018) estimated the overall effect of joining the SDDS or GDDS combining the indicators of participation (dummy variables) into a single series. They found a statistically significant reduction of 13 percent in the EMBIG spreads index over one year. In separate models for each standard, they found that the effect of participating in the SDSS was a 22 percent statistically significant reduction in sovereign spreads but for participants in the GDDS the estimated 11 percent reduction was not statistically significant.

Figure 3. Cumulative Change of Sovereign Spreads after Joining Data Dissemination Standards (Percent)



Source: IMF staff calculations.
Note: *, **, and *** denote statistical significance at the 0.10, 0.05 and 0.01 levels.

A novel feature of the models used in this paper is the possibility to formally compare the estimated effects of joining the different data dissemination standards. Specifically, by calculating those estimates simultaneously it is possible to apply formal tests to compare them for the different data standards for each horizon. The null hypotheses in these tests are that the cumulative changes are equal. Overall, there is no clear evidence that the magnitude of the effects, while being all negative, can be distinguished statistically according to the p-values reported in Table 3. A statistically significant difference can be found only in the comparison of the cumulative effect after four quarters of joining the SDDS or the GDDS with the effect of launching the NSDP in

the preferred Model 3. These results suggest that the additional effect of the NSDP is additional to the effect of joining the GDSS and smaller in magnitude.

Table 3. Comparison of Effects of Joining Data Dissemination Standards

Model 1				Model 2				Model 3			
Quarter	$\beta^S = \beta^G$	$\beta^S = \beta^N$	$\beta^G = \beta^N$	Quarter	$\beta^S = \beta^G$	$\beta^S = \beta^N$	$\beta^G = \beta^N$	Quarter	$\beta^S = \beta^G$	$\beta^S = \beta^N$	$\beta^G = \beta^N$
0	1.00	0.51	0.56	0	0.88	0.41	0.58	0	0.89	0.52	0.51
1	0.90	0.72	0.81	1	0.82	0.97	0.77	1	0.86	0.48	0.35
2	0.51	0.88	0.55	2	0.73	0.85	0.61	2	0.61	0.68	0.34
3	0.94	0.38	0.54	3	0.71	0.20	0.69	3	0.97	0.11	0.05

Source: IMF staff calculations.
Note: The figures show the p-values from testing the hypothesis that the effects are similar.

2.4. Role Of Institutional Environment

As joining the data dissemination standards is a signal of countries' efforts to strengthen transparency, it would be useful to investigate whether the countries' existing institutional environment has a bearing on the relationship between joining the standards and the change in financing conditions. More specifically, would the favorable effects of transparency on sovereign spreads depend on the quality of institutions or governance and, if so, how?

To distinguish the effects under different institutional environments, Model 3 is modified to include indicators of the institutional and governance conditions through interaction terms with the dummy variable for the adoption of the standards as showed in the second and third rows of expression (3). These indicators are smooth transition variables that vary over time and are based on the distance of the institutional indicator for each economy from the sample mean at any point in time. Specifically, in expression (3), $I_{i,t} = \frac{1}{1+exp(-\gamma z_{i,t})}$ is the smooth transition function (with γ=3), where $z_{i,t} = \frac{g_{i,t}-\mu_g}{\sigma_g}$ is a standardized transformation of the indicator of governance or institutions $g_{i,t}$ of country *i* at time *t*.

$$
\begin{aligned}
E_{i,t+h} - E_{i,t-1} &= \alpha_i^h + \gamma_t^h + \delta_t^h + \varepsilon_{i,t}^h + \varepsilon_{i,t}^{h-1} + \cdots \\
&\beta^{ShL} S_{i,t} * I_{i,t} + \beta^{GhL} G_{i,t} * I_{i,t} + \beta^{NhL} N_{i,t} * I_{i,t} + \cdots \\
&\beta^{ShH} S_{i,t} * (1 - I_{i,t}) + \beta^{GhH} G_{i,t} * (1 - I_{i,t}) + \beta^{NhH} N_{i,t} * (1 - I_{i,t}) + \cdots \\
&\sum_{j=1}^{p} \theta_{1,j}^{h} E_{t-j} + \sum_{j=0}^{p} \theta_{2,j}^{h} V_{t-j} + \sum_{j=0}^{p} \theta_{3,j}^{h} F_{t-j} + \sum_{j=1}^{p} \theta_{4,j}^{h} CR_{t-j} + \cdots \\
&\sum_{j=0}^{h-1} \theta_{5,j}^{h} V_{t+h-j} + \sum_{j=0}^{h-1} \theta_{6,j}^{h} F_{t+h-j} + \sum_{j=0}^{h-1} \theta_{7,j}^{h} CR_{i,t+h-j} \qquad (3)
\end{aligned}
$$

In this model, when the indicator of governance is at the lower part of the distribution (worse governance conditions), the value of the smooth transition function is closer to 1, and when the indicator is in the upper part of the distribution, the value of the transition function is closer to 0. As a result, relatively lower quality of governance or institutions allow the identification of estimates β^{ShL}, β^{GhL}, β^{NhL}. Conversely, relatively higher values of governance indicators help identify β^{ShH}, β^{GhH}, β^{NhH}. All other variables are as in Model 3 of Table 2.

Three indicators of governance are used in the estimations below: a composite indicator of governance; an indicator of government effectiveness (both from the Worldwide Governance Indicators database); and an indicator of the quality of bureaucracy from the International Country Risk Guide (ICRG). Table 4 shows the

cumulative changes in spreads one year after joining the data dissemination standards. The estimates suggest that among countries joining the SDDS, those with relatively weaker institutions benefit the most with estimated declines in spreads between 30–40 percent in the year after subscription, while those at the top of the distribution of governance indicators do not show declines in spreads. In the case of GDDS participation, countries at both the top and bottom of the distribution of governance benefit from a decrease in spreads ranging from 14 to 18 percent. Finally, countries with lower governance scores benefit from implementing the e-GDDS, with a statistically significant cumulative reduction in the spreads index between 7 and 10 percent.

In summary, the estimations with the three different indicators of governance tend show a similar pattern, suggesting that countries with relatively weaker governance are set to benefit the most from increasing transparency through data dissemination. A potential explanation for this finding is that joining the standards becomes a stronger signal of transparency in the context of a relatively weak governance and institutional environment, including when countries start publishing data via NSDP under the enhanced-GDDS.

Table 4. Effects of Joining Data Dissemination Standards in Different Institutional Environments (Percent)

Variable	SDDS		GDDS		NSDP	
	β^{ShL}	β^{ShH}	β^{GhL}	β^{GhH}	β^{NhL}	β^{NhH}
Governance	-31.2 ***	9.4	-18.1 ***	-5.2	-9.9 ***	5.5
Government efficiency	-41.1 ***	9.6	-13.6 *	-15.8 **	-8.8 ***	4.4
Quality of bureaucracy	-30.3 ***	5.4	-13.6 *	-15.5 **	-6.9 **	2.3

Source: IMF staff calculations.
Note: Figures denote cumulative percent changes in spreads index after four quarters (*h=4*). *, **, and *** denote statistical significance at the 0.10, 0.05 and 0.01 levels.

3. Conclusions

Providing essential macroeconomic data to all interested stakeholders can help reduce uncertainty about current economic developments and prospects, which can lower risk premia, reduce sovereign spreads, and improve countries' financing conditions in international markets. This paper studies the relationship between increased transparency when countries implement the IMF Data Standards Initiatives and sovereign spreads.

Event studies identify a decline in sovereign spreads for the countries that enhance data transparency by joining the data dissemination standards. The tests show declines in the mean sovereign spreads after joining the standards, and more full-fledged models of event studies with dynamic effects show a clear pattern of statistically significant negative relationship between sovereign spreads and subscribing to the SDDS.

Cumulative effects estimated with local projection models suggest that there is a significant negative relationship between increased transparency and sovereign bond spreads, including for the publication of data under the enhanced-GDDS which is studied for the first time in this paper. The decrease in sovereign spreads index is more marked when subscribing to the SDDS: between 10 percent and 14 percent across models during the year following the subscription. Participating in the GDDS (prior to 2015) is also associated with a reduction in spreads, but the declines tend to be smaller and less robust to identify statistically. Starting data dissemination through NSDP under the enhanced-GDDS is also associated with improvements in countries' financing conditions, with an estimated reduction of spreads ranging from 6 to 4 percent that is additional to the benefits from participating in the GDDS in the first place. Furthermore, these favorable effects are showed to manifest more significantly in countries with relatively weaker governance as they would likely set to benefit the most from increasing transparency through data dissemination.

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