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IMF programs and borrowing costs: does size matter?

Salim Chahine
Central Bank of Lebanon & ECGI

Ugo Panizza
Geneva Graduate Institute & CEPR

Guilherme Suedekum
Geneva Graduate Institute

Chemin Eugène-Rigot 2
P.O. Box 136
CH - 1211 Geneva 21
Switzerland

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Salim Chahine
Central Bank of Lebanon
& ECGI

Ugo Panizza
Geneva Graduate Institute
& CEPR

Guilherme Suedekum
Geneva Graduate Institute

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Abstract*

This paper studies whether IMF programs and their size affect borrowing costs by comparing the coupon of bonds issued around an IMF arrangement. By comparing bonds issued immediately before the inset of the program with bonds issued immediately after the program, we show that, on average, the approval of the program leads to a 72-basis points reduction in borrowing costs and program size matters. Our point estimates indicate that when program size increases by one percent of GDP, borrowing costs decrease by 23 basis points. We also show that program size only matters for ex-post programs (i.e., those implemented during crises). For precautionary ex-ante programs, borrowing costs increase with program size. However, the effect of program size is small and, therefore, ex-ante programs never lead to a statistically significant increase in borrowing costs and in most cases lead to a significant reduction in borrowing costs.

JEL Codes: F22 ; F33 ; F34 ; G01 ; G15
Keywords: IMF programs; Sovereign debt; Bond yields; International financial markets

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1 Introduction

The typical IMF program has two objectives. The first objective is to provide countries facing a crisis with interim financing while they are adjusting policies or responding to a large exogenous shock. The second objective is catalyzing private-sector financing and helping countries regain market access. Although an IMF agreement reflects the commitment of a country to adopt sound reforms and rectify its financial conditions, there is mixed evidence about whether an IMF lending program helps restore confidence in capital markets.[1] IMF lending agreements have different conditionality arrangements that entail different levels of reforms. They are usually the outcome of negotiations with governments' executives, and their implementation could be subject to pressures from special interest groups, such as labor unions and business groups, which could ultimately lead to programs' delay and failure.[2] In this paper, we focus on the second objective, and we study whether IMF agreements and the extent of their conditionality (ex-ante versus ex-post) and financing levels differentially facilitate market access by reducing borrowing costs in the primary bond market.

Seeking IMF support usually suggests a country faces severe economic and financial conditions (Bas and Stone, 2014). An IMF lending program may thus carry a "stigma" that can result in an adverse market reaction by investors (Essers and Ide, 2019). However, there are three reasons why an IMF program can potentially reduce borrowing costs and catalyze private-sector financing. The first reason is akin to the lender of last resort role of the typical central bank. By providing liquidity in times of crisis, the Fund can prevent a self-fulfilling run (Corsetti et al., 2006; Morris and Shin, 2006). Models that focus on liquidity provision show that the catalytic role of the program is increasing in program size. Thus, IMF lending is likely to reduce the probability of default, and the scale of lending increases the likelihood of successful policy reforms and debt repayment. The second reason relates to the signaling role of the program. An IMF lending program may be considered a "seal of approval" (Polak, 1991), which provides a "cushion" that clarifies and supports the required reforms. By agreeing to a program, the Fund certifies that a country's policies are sustainable with a high probability of success and that the country is committed to implementing certain policy reforms (Marchesi and Thomas, 1999; Stone, 2002**;** and Tirole, 2002). This certification can positively affect

[1] Krahnke (2023); Chapman, Fang, Li, and Stone (2017); Bauer, Cruz, and Graham (2012); and Steinwand and Stone (2008).
[2] Reinsberg et al. (2022) use the IMF Monitor Database and show that 512 out of 763 programmes between 1980 and 2015, were interrupted. They also find that 291 out of the 512 interrupted programs did not resume.

investors' expectations (Edwards, 2006; Mody and Saravia, 2006; Corsetti et al., 2006; Morris and Shin, 2006). In this case, large programs provide a strong signal because they require that: (i) there is a high probability that a country's debt will remain sustainable; (ii) the country has good prospects of regaining access to private capital markets; and (iii) the policy program is likely to succeed (IMF, 2023a, b).[3] The third reason is linked to creditors' moral hazard. Investors are thus likely to form expectations that depend on the ability of the IMF to enforce the terms of the agreement on borrower countries. However, investors may fear that IMF lending rewards and encourages "excessive risk-taking by banks" (Barro, 1998). Khranke (2023) shows that the increase of the size of the IMF program above a certain limit may push private investors out and lead to higher borrowing costs because the Fund's de facto preferred creditor's status may increase private creditors' losses in case of default (Krahnke, 2023; for a discussion of the optimality of the Fund's preferred creditor status see Cordella and Powell, 2021).

While most theoretical models suggest that IMF programs should have a catalytic effect, the empirical evidence is mixed. Papers that study the link between IMF programs and net capital inflows find either no evidence of a catalytic effect (Bird and Rowlands, 2002, 2008; Bauer et al., 2012), or even that IMF programs lead to lower net inflows (Jensen, 2004; Edwards, 2006). More recently, Krahnke (2023) studies the drivers of gross inflows and shows that the catalytic role of IMF programs decreases with program size. Work that focuses on gross inflows or borrowing costs (mostly bond spreads and interest charged on bank loans) finds that the presence of an IMF program is associated with higher gross flows and lower borrowing costs in bond financing (Mody and Saravia, 2006; Van der Veer and de Jong, 2010). Focusing on program size, Mody and Saravia (2006) find evidence that larger IMF programs increase the probability of bond issuance and reduce the spread of bonds issued by countries that are not too close to default, but the effect is not always statistically significant.[4] Eichengreen et al. (2006) show that the opposite is true for bank loans. Chapman et al. (2017) focus on crisis lending by the IMF from 1992 to 2002. They find that sovereign bond yields decrease with the IMF loan size and the number of conditions in a particular program, but they increase when the borrower-country is important to US foreign policy. They argue that market actors expect

[3] Zwart (2007) describes an environment in which there is both a liquidity effect and a signalling effect. However, in his model, the signalling effect is negative (the presence of an IMF country indicates that the country is in trouble) and this negative signal can only be compensated by the positive liquidity effect of a large program.
[4] Tartari and Tola (2019) show that increased IMF financial assistance lowers sovereign bond spreads in secondary markets.

a higher "moral hazard" in the presence of political bias and believe that the enforcement of conditionality and its implementation is less rigorous for influential borrowers.

However, not all lending conditions have the same status. IMF conditions could serve as a commitment device (Dhonte, 1997), or a persuasion mechanism to pursue the required reforms (Khan and Sharma, 2001). IMF conditionality could also signal the type of borrower and the level of asymmetric information in the selection process (Marchesi and Thomas, 1999) or a tool to alleviate potential moral hazard (Dreher and Vaubel, 2004). Given the critical role of conditionality in IMF lending, the fund has distinguished between ex-ante conditionality and ex-post conditionality. The former, usually considered as pre-qualification criteria, allows member states to benefit from financial aid without any policy adjustments. The latter requires countries to implement policy adjustments to receive IMF loans. This suggests that the ex-ante conditionality framework is less intrusive than ex-post conditionality but is restricted to a limited number of eligible borrowers (Babb and Carruthers, 2008).[5] Building on the above, we examine the changes in coupon rates of sovereign bonds' issuance around the IMF program, and we control for the moderating role of program size and conditionality, which are expected to affect the investment decisions of investors in the capital markets.

One important issue in studying the catalytic role of IMF lending is the endogeneity of bond issuance and IMF programs. Since the exact timing of the inset of an IMF program is partly driven by a series of exogenous features that are dictated by the IMF procedures, Mody and Saravia (2006) argue that their results, which are based on daily issuance data, are not affected by and endogeneity bias related to selection into an IMF program. They instead focus on the endogeneity of bond issuance and, following Eichengreen and Mody (2001), model selection using Heckman's (1979) model without external instruments. Instead of using daily data on bond issuance, Kranhke (2023) uses annual data on gross inflows and, following Lang (2016) and Gehring and Lang (2018), instruments program size with the interaction between time-varying IMF liquidity and the time-invariant country-specific history of participation in an IMF program. Essers and Ide (2019) only consider precautionary ex-ante programs and identify the effect of these programs on secondary market spreads by building a synthetic counterfactual.

[5] Ex-post conditionality covers macroeconomic choices related to budget deficit, interest rates or money supply. It extends to the adoption of certain economic policies or the implementation of fundamental changes such as privatization and trade liberalization.

Using a sample of 408 sovereign bond issuances spanning 68 IMF programs in 23 countries from November 2001 to February 2022, we contribute to the literature by proposing an alternative identification strategy and allowing for differences between precautionary ex-ante and ex-post programs.

On the one hand, like Mody and Saravia (2006), we focus on bond issuance rather than bond yields. Unlike these authors, we only use bonds issued by countries under an IMF program in a window around the program's approval. Our exercise is thus akin to a difference-in-difference strategy in which we compare the coupons of bonds issued during the six months before the inset of the program with bonds issued in the six months that follow the inset of the program. Our focus on a narrow window around the inset of the program allays concerns related to selection into the program because, as discussed above, the exact timing is dictated by exogenous IMF procedures. Of course, as we exclude countries with no issuances around the inset of the program, we cannot say anything about countries that access the Fund's resources while they do not have access to the international capital market. Our results should thus be interpreted as an assessment of IMF programs on borrowing costs for countries with continuous access to the international capital market. Focusing on this narrow sample of programs and countries has a cost in terms of degrees of freedom.[6] However, concentrating on countries that preserved some market access around the inset of an IMF program allows us to conduct an apple-to-apple comparison and obtain a more precise estimate of the impact of the program on borrowing costs. For this sample of countries, we find that the presence of an IMF program is associated with a statistically significant reduction in borrowing costs. The effect is also economically significant: our baseline point estimates indicate that the average coupon of bonds issued six months after the inset of a program is 70 basis points lower than the coupon of bonds issued six months before the beginning of the program. This difference corresponds to approximately 15 percent of the average coupon in our sample.

On the other hand, we extend prior research focused on the number of conditions (Chapman et al., 2017), and we split the sample between ex-ante and ex-post programs. We argue that using

[6] Over the 20-year period that we consider, 65 countries borrowed from the Fund on non-concessional terms through 163 programs, we obtain our baseline sample of 68 programs in 23 countries after excluding 75 programs (in 25 countries) for which there were no international issuances in a 12-month window around the program, 9 programs (in 7 countries) for which there were no international issuances in the six months before the approval of the program and 11 programs (in 10 countries) for which there were no international issuances in the six months after the approval of the program.

ex-ante conditionality associated with certain pre-set qualification criteria signals the fundamentals of recipients. Moreover, it reduces the expected intrusiveness of ex-post conditionality (IRC Task Force on IMF and Global Financial Governance Issues, 2019), and exhibits the use by the IMF of its larger conditionality powers (Dreher and Vaubel, 2004). This split allows market investors to better assess the asymmetric information concerns around sovereign bond issuance. We find a larger effect in ex-post programs (100 basis points versus 50 basis points). As the average coupon of bonds issued around an ex-post program is twice as large as that of bonds issued around an ex-ante program (6.6 percent versus 3.3 percent), the percentage reduction in borrowing costs is close to 15 percent in both cases. Our results are thus more supportive of the beneficial effects of precautionary ex-ante programs than the findings of Essers and Ide (2019), who, using synthetic control methods and secondary market spreads, find that the IMF Flexible Credit Line reduces borrowing costs but that the results are not robust.

Further, we study the effect of program size and show that, under plausible assumptions, our approach allows us to obtain a consistent estimate of our main parameter of interest, even if program size is endogenous. When we pool all our programs together, we find that borrowing costs decrease with program size. Our point estimates indicate that when program size increases by one percent of GDP, borrowing costs decrease by 23 basis points. We find an even larger effect when we only use ex-post programs. In this case, we find that when program size increases by one percent of GDP, borrowing costs decrease by 100 basis points. Surprisingly, we find the opposite result for ex-ante programs. We still find that, on average, a precautionary program reduces borrowing costs, but our results indicate that this effect is decreasing in program size. While we never find that ex-ante programs lead to significantly higher borrowing costs, we do find that the reduction in borrowing costs associated with precautionary programs is only statistically significant for small and medium-sized programs (up to 6 percent of GDP).

The rest of the paper is organized as follows: Section 2 describes our data; Section 3 illustrates our empirical strategy and presents our main results; Section 4 conducts a battery of robustness checks; and Section 5 concludes.

2 Data

To study the impact of IMF programs on borrowing costs, we merge macro-level information on IMF programs, country characteristics, and global financial conditions with bond-level data for all long-term sovereign bonds issued in international markets by countries undergoing an IMF program. Our focus is on countries that accessed the Fund's non-concessional credit facilities and issued long-term sovereign bonds in the international market within a twelve-month window (six months before and six months after) around the inset of the program. We only include countries that have issued bonds both before and after the inset of the programs included in our sample. The programs we consider include both *ex-post* arrangements—such as the Stand-By Arrangement (SBA) and the Extended Fund Facility (EFF)— and *ex-ante* arrangements, such as the Flexible Credit Line (FCL) and the Precautionary and Liquidity Line (PLL). Our baseline dataset includes 408 bond issuances spanning 68 IMF programs in 23 countries from November 2001 to February 2022. Bond-level data are sourced from Dealogic and S&P Capital IQ, data from IMF programs are from the IMF MONA database, and macro-level data are from the World Bank Open Data and Datastream.

Our main dependent variable is the bond's coupon at issuance. Data limitations prevent us from using the yield-to-maturity at issuance. However, in our sample, the coupon closely tracks the yield to maturity at issuance. Specifically, we have information on both coupons and yield to maturity for 70 percent of the bonds included in our baseline sample (287 out of 408). For this subsample of bonds, the average coupon is 5.39 (with a standard deviation of 2.47), and the average yield to maturity at issuance is 5.35 (with a standard deviation of 2.46). The correlation between the coupon and the yield to maturity is 0.99 and is statistically significant at the 1 percent confidence level.

In the full sample, the average coupon is 5.07 percent with a standard deviation of 2.8 (top panel of Table 1).[7] When we split the sample between bonds issued before and after the inset of the program, we find that bonds issued after the program have a slightly higher coupon (5.18 percent versus 4.92 percent). However, the difference between the two groups is not statistically significant. The average bond maturity in the full sample is 12.1 years, and bonds issued after the inset of the program have an average maturity that is nearly two years longer than the average maturity of bonds issued before the inset of the program (12.9 years versus 11.01 years, bottom panel of Table 1) We also find that average coupons for ex-post programs are significantly higher than the average coupon for ex-ante programs (6.64% versus 3.29%)

[7] The fact these values are close to the subsample of bonds for which we have information on yield to maturity suggests that the 278 bonds for which we have full information are representative of the full sample.

and average maturity is considerably shorter (9/4 years versus 15.1 years). This is expected because ex-post programs are granted to countries facing a crisis, while ex-ante programs are given to countries with strong fundamentals and good policies and institutions. Within the groups of ex-ante and ex-post programs, there is virtually no difference in average coupons of bonds issued before and after the inset of the program. The next section will show that things change dramatically using regression analysis and moving beyond simple univariate comparisons. Focusing on maturity, we find no difference between bonds issued before and after the inset of the program for ex-post programs but a much longer maturity for bonds issued after ex-ante programs (nearly 17 years versus 12.8 years, on average).

Table 1: Bond Characteristics around IMF Program Agreements

This table reports summary statistics for the coupons (top panel) and maturity (bottom panel) of all the bonds included in our sample. Each panel shows summary statistics for all bonds and then splits them for bonds issued within 180 days before and 180 days after the beginning of the program. Each panel also shows separate summary statistics for ex-ante and ex-post programs.

	Mean	Median	Std. Dev.	Obs.	Countries
	Coupon (%)				
All Bonds issued around IMF programs	5.07	4.75	2.81	408	23
Within 180 days before the program	4.92	4.62	2.99	179	23
Within 180 days after the program	5.18	4.88	2.67	229	23
Ex-Post Programs	6.64	6.88	2.73	216	19
Within 180 days before the program	6.60	6.88	2.97	93	19
Within 180 days after the program	6.67	6.88	2.55	123	19
Ex-Ante Programs	3.29	3.38	1.58	192	6
Within 180 days before the program	3.11	3.00	1.65	86	6
Within 180 days after the program	3.45	3.55	1.51	106	6
	Maturity (years)				
All Bonds issued around IMF programs	12.09	10.01	11.90	408	23
Within 180 days before the program	11.01	10.01	10.04	179	23
Within 180 days after the program	12.93	10.02	13.14	229	23
Ex-Post Programs	9.41	9.27	7.15	216	19
Within 180 days before the program	9.35	9.68	7.25	93	19
Within 180 days after the program	9.46	9.01	7.10	123	19
Ex-Ante Programs	15.10	10.04	15.08	192	6
Within 180 days before the program	12.79	10.03	12.17	86	6
Within 180 days after the program	16.96	10.40	16.90	106	6

Our key explanatory variables are a dummy that takes value one after the inset of the program, a continuous measure of program size, and the interaction between these two variables. To measure program size, we follow Krahnke (2023) and use GDP to scale the Fund's financial assistance to a given country. Specifically, we take the total access granted in SDRs to a country under the program, adjust it for the exchange rate on the day of the program approval (sourced from Datastream), and normalize it by the country's GDP in the previous year. Our controls include bond maturity (sourced from Dealogic and S&P Capital IQ), GDP per capita, the number of past IMF programs, and global financial conditions.

3 Empirical Strategy and Baseline Results

To assess the role of IMF programs on borrowing costs, we start by estimating a model in which we regress the bond's coupon at issuance over an IMF program dummy, bond characteristics, country-time varying characteristics, global financial conditions, and a set of fixed effects that control for global shocks in the month of issuance, country-program type time-invariant characteristics, and currency of issuance. Formally, we estimate:

$$C_{b(i,p,x),t(y)} = \alpha IMF_{i(p),t(y)} + \beta \ln\left(MAT_{b(i,p,x),t}\right) + \gamma GDP\ PC_{i,y-1} + \delta NP_{i,t(y)} + \\ +\theta \ln(VIX_{t(y)}) + \omega BB_{b(i,x),t} + \mu_{i,a} + \xi_x + \tau_{m(y)} + \varepsilon_{b(i,p,x),t(y)} \quad (1)$$

Where $C_{b(i,p,x),t(y)}$ is the coupon of bond b, issued by country i around a program p on day $t(y)$ and denominated in currency x; $IMF_{i(p),t(y)}$ is a dummy variable that takes value one if on day $t(y)$ country i had an IMF program of type p; $MAT_{b(i,p,x),t}$ is the maturity (in year) of the bond; $GDP\ PC_{i,y-1}$ is the GDP per capita of country i in year $y-1$; $NP_{i,t(y)}$ is the total number of IMF programs that country i had up to time $t(y)$, $VIX_{t(y)}$ is the VIX index on day $t(y)$, $BB_{b(i,x),t}$ is dummy variable that takes value one for an Ecuadorian bond issued in 2019 to conduct a liability management operation which resulted in a buy-back operation of a high-interest rate bond issued in 2015 and maturing in 2020 (more on this below); $\mu_{i,a}$ are country-program type fixed effects (where program type is either ex-ante or ex-post), ξ_x are currency fixed effects, and $\tau_{m(y)}$ are month fixed effects.[8]

Our key parameter of interest is α. Given that we only include bonds issued within a six-month window around an IMF program and we control for global shocks (both through the VIX and the month fixed effects) and for country and bond characteristics, α measures whether bonds

[8] The country program-type fixed effects vary across country and program type. For instance, the Colombian ex-post program of 15 January 2003 and the Colombian ex-ante program of 11 May 2009 are assigned separate fixed effects, while the Colombian ex-ante programs of 11 May 2009 and 7 May 2010 are assigned the same fixed effect. We will also report results that use country-program fixed effects and thus have separate fixed effects for each country and program.

issued in the aftermath of an IMF program have coupons which are significantly different from similar bonds issued before the program.

Table 2: IMF Programs and Borrowing Costs

This table reports a set of regressions where the dependent variable is the bonds' coupon, and the explanatory variables are a dummy that takes value one after the inset of the program (*IMF*), two dummies that separate ex-ante and ex post programs (IMF Ex post and IMF Ex ante), log bond maturity (ln(*MAT*)), GDP per capita (*GDP PC*), total number of IMF programs in a given country (*NP*), the log of the VIX index (ln(*VIX*)), and a dummy that takes value one for the Ecuador buy-back bond (*BB*). All regressions include country-program type, currency of issuance, and month-year fixed effects. Columns 1 and 3 include all bonds, column 2 excludes the Ecuador buy-back bond, column 4 only includes bonds issued around ex-post programs, and column 5 only includes bonds issued around ex-ante programs.

	(1)	(2)	(3)	(4)	(5)
IMF	-0.723**	-0.723**		-1.839	-0.557
	(0.318)	(0.317)		(1.612)	(0.335)
$IMF\ Ex\ post$			-1.043*		
			(0.543)		
$IMF\ Ex\ ante$			-0.507*		
			(0.265)		
$\ln(MAT)$	1.029***	1.029***	1.018***	1.309***	0.985***
	(0.101)	(0.101)	(0.104)	(0.138)	(0.0809)
NP	0.265	0.265	0.244	-1.773*	-0.00254
	(0.228)	(0.228)	(0.214)	(1.003)	(0.107)
$GDP\ PC$	-0.090***	-0.090***	-0.078**	-0.142	-0.103**
	(0.0242)	(0.024)	(0.030)	(0.419)	(0.0291)
$\ln(VIX)$	0.539	0.539	0.610	1.499***	-0.144
	(0.439)	(0.439)	(0.464)	(0.468)	(0.215)
BB	10.450***		10.730***	11.080***	
	(0.330)		(0.552)	(0.871)	
Observations	408	407	408	216	192
Countries	23	23	19	19	6
Type of IMF Program	All	Excl. BB	All	Ex-Post	Ex-Ante
Country-Program Type FE	✓	✓	✓	✓	✓
Currency-Issuance FE	✓	✓	✓	✓	✓
Month-Year FE	✓	✓	✓	✓	✓
Adjusted R^2	0.842	0.835	0.842	0.892	0.938

Robust standard errors clustered at the country-program type-level are reported in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

While we are confident that we can attach a causal interpretation to α *within our sample*, we are aware that our specification might suffer from selection bias because our sample only includes countries that issued bonds around an IMF program. Our results should thus be interpreted as an estimation of the impact of an IMF program on borrowing costs for countries that do have a program and issue bonds. We cannot say anything about countries that would like to have a program but are unable to meet the preconditions of an initial staff-level agreement or about the long period that might precede the beginning of the program.

As mentioned, $BB_{b(i,x),t}$ is a dummy variable that takes value one for a $1.125 billion 10-year bond issued by Ecuador in 2019 to raise the funds necessary to buy back a 5-year bond issued in May 2015. We use a dummy for this bond because its issuance was linked to an atypical liability management operation, allowing Ecuador to extend its external debt's average maturity and reduce its total interest costs.[9] The results are identical if we drop the bond from the sample.

We find that α is negative and statistically significant (column 1, Table 2). The point estimate implies that the inset of an IMF program is associated with a reduction in borrowing costs of 72 basis points. This is exactly the opposite of what we found in the simple mean comparison (which does not control for bond and country characteristics and global conditions) of Table 1. Note that the point estimate is also economically significant, indicating that an IMF program reduces borrowing costs by nearly 15 percent.

All other coefficients are as expected. GDP per capita is negatively associated with borrowing costs, and long-term bonds have higher coupons. The point estimate implies that a one-year increase in maturity is associated with a one percent (or 5 basis points) increase in the coupon. We also find that bonds issued during periods of high-risk aversion (as measured by the VIX index) and by countries that already had many IMF programs tend to have higher coupons. However, the coefficients are not statistically significant, probably because of the presence of country-program type and month fixed effects, which amplify the noise-to-signal ratio of variables with limited within-country and within-month variation (Barro, 2015). As mentioned, the results are identical if we drop the Ecuador buy-back bond (Column 2).

As a next step, we separate IMF programs with ex-post conditionality from those with ex-ante conditionality (see Section 2 for a definition and description of the two types of programs). We find that the program's effect remains significant and negative for both types of programs

[9] The bonds issued in 2015 carried a very high coupon because of the low price of oil (Ecuador's main export) and because they were among the first international issuances after President Correa's strategic default and secret bond buybacks that took place in the last quarter of 2008. IMF (2015) documents that the 2020 bond issued in 2015 had a spread which was about 200 basis points higher than that of a set of comparator countries. Feibelman (2017) and Porzekanski (2010) provide details (with very different perspectives) on the Ecuadorian default and successive buyback.

(column 3 of Table 2) but twice as large for ex-ante programs (100 versus 50 basis points). As the average coupon in the sample of bonds issued around ex-post programs is about twice that of bonds issued around ex-ante programs, the percentage reduction in borrowing costs brought about by the two types of programs is basically identical. We also estimate separate regressions for ex-ante and ex-post programs (columns 4 and 5) and find results quantitatively similar to those of column 3. Still, the coefficient attached to the IMF program dummy is no longer statistically significant. Below, we show that this lack of statistical significance is due to heterogeneity related to program size, which goes in opposite directions for ex-ante and ex-post programs.

Having established that, on average, IMF programs are associated with a reduction in borrowing costs, we now study whether the size of the program matters by estimating the following model:

$$C_{b(i,p,x),t(y)} = \alpha IMF_{i(p),t(y)} + \phi \widetilde{SDR}_{i(p),t(y)} + \psi\left(IMF_{i(p),t(y)} \times \widetilde{SDR}_{i(p),t(y)}\right) + \\ +\beta \ln\left(MAT_{b(i,p,x),t}\right) + \gamma \ln\left(GDP\ PC_{i,y-1}\right) + \delta NP_{i,t(y)} + \theta \ln\left(VIX_{t(y)}\right) + \\ + \omega BB_{b(i,x),t} + \mu_{i,a} + \xi_x + \tau_{m(y)} + \varepsilon_{b(i,p,x),t(y)} \qquad (2)$$

In Equation (2), $\widetilde{SDR}_{i(p),t(y)} = SDR_{i(p),t(y)} - \overline{SDR}$, where $SDR_{i(p),t(y)}$ is country i, program p SDR access over GDP at time $t(y)$ and $\overline{SDR}$ is the average value of $SDR_{i(p),t(y)}$. Thus, α measures how an IMF program with average SDR access affects borrowing costs and ψ measures how the relationship between borrowing costs and the presence of an IMF program varies with the size of the program. Formally:

$$\frac{\partial C}{\partial IMF} = \alpha + \psi \widetilde{SDR}_{i(p),t(y)}$$

All other variables of Equation (2) are as in Equation (1).

As discussed above, our strategy of focusing on a narrow window around a program allays concerns about causality in the estimation of α. However, the endogeneity related to program size might affect our other key parameter of interest ψ.

To show that our estimate of ψ is consistent, we start by recognizing that SDR access is determined by both exogenous and endogenous (with respect to the crisis to which the program is responding to) criteria. The size of programs with normal access are mostly exogenous because they are based on a country's IMF quota, which is a slowly changing variable and clearly predetermined with respect to the inset of the crisis.[10] Programs with a size that goes beyond normal access need to conform to the Exceptional Access Policy, which requires that: (i) the country is experiencing exception balance of payment pressure; (ii) debt is sustainable with high probability; (iii) there are good prospects for regaining market access within the time frame of the program; and (iv) the program is likely to be successful.[11]

Before the program is approved, investors know for sure about point (i) as they observe the depth of the crisis and price it when buying government bonds issued by the crisis country. Thus, the positive correlation between the size of the possible program and the depth of the crisis leads to a positive endogeneity bias in the estimated effect of program size on borrowing costs before the program is approved (this is parameter ϕ in Equation (2)).[12] After the IMF Board approves a large program, investors acquire new positive pieces of information: according to the IMF Board, debt is sustainable with high probability; the country is likely to regain market access, and the program will likely succeed. This is the new positive information associated with implementing a large program, and this positive information should lead to a reduction of borrowing costs with no obvious endogeneity bias.

In fact, it is also possible to provide formal proof that under certain conditions, $\hat{\psi}$ is consistent even if $\hat{\phi}$ is biased (the proof follows closely Nizalova and Murtazashvili, 2016). Consider a simplified version of Equation (2):

[10] Between 2016 and March 2023 normal access limits were 145 percent of quota in a given year and 435 percent of quota overall. In March 2023, these limits were temporarily increased to 200 percent and 600 percent, respectively (IMF, 2023a). Prior to 2016, normal access limits were 200 percent and 600 percent of quota, respectively. The decision to reduce access quota in 2016, was linked to the doubling of members' quota under the 14th review of quotas which was initiated in 2010 and concluded in 2016. The combination of reduced access limits and higher quotas led to a 45 percent average increase of access in SDR terms (IMF 2016).

[11] Note that these criteria have evolved over time since the exceptional access policy was first established in 2002. For details see IMF (2023b).

[12] This is from the standard omitted variable bias formula. Assume that the true model is: $C = \alpha + \phi SDR + \lambda X + u$ and that X is the depth of the crisis. This latter variable is positively associated with borrowing costs ($\lambda > 0$) and positively correlated with program size. If we estimate $C = \alpha + \phi SDR + u$, we get that: $\hat{\phi} = \phi + \lambda \frac{Cov(SDR,X)}{Var(SDR)}$. Since $Cov(SDR,X) > 0$, we have $\lambda \frac{Cov(SDR,X)}{Var(SDR)} > 0$ and $\hat{\phi} > \phi$.

$$C = \alpha I + \phi S + \psi(N) + \varepsilon^* \quad (3)$$

Where $I = IMF$, $S = SDR$, $N = I \times S$, $\varepsilon^* = \varepsilon + \lambda X$, and X is a measure of the size of the crisis which is positively correlated with SDR. It is possible to show (see Appendix of Nizalova and Murtazashvili, 2016) that:

$$plim\, \hat{\psi} = \psi + plim\, \frac{\sigma_X}{\sigma_N} \frac{r_{NX}(1-r_{IS}^2)+r_{SX}(r_{NI}r_{IS}-r_{NS})+r_{IX}(r_{NS}r_{IS}-r_{NI})}{1-r_{NS}^2-r_{NI}^2-r_{IS}^2+2r_{NS}r_{NI}r_{IS}} \quad (4)$$

Where σ_j is the sample standard deviation of variable j and r_{jv} is the sample correlation between variables j and v. Since we only consider events that happen around a program, we can safely assume that the expected values of r_{IX} and r_{IS} are equal to zero. This reduces Equation (4) to:

$$plim\, \hat{\psi} = \psi + plim\, \frac{\sigma_X}{\sigma_N} \frac{r_{NX}-r_{SX}r_{NS}}{1-r_{NS}^2-r_{NI}^2} \quad (5)$$

Besides excluding a correlation with S, the independence of I (within our sample), also implies that this variable independent of X, conditional on S. Because of $E(IS) = 0$, we have that $r_{NS} = \sigma_S \frac{E(I)}{\sigma_{S\times I}}$. Note that $\sigma_{S\times I}$ is not the covariance of S and I (which is 0 because of the independence of I and S), but the standard deviation of $S \times I$. This result, together with the independence of I and X, conditional on S can be used to show that $r_{NX} = r_{SX} r_{NS}$. Thus, $plim\, \frac{\sigma_X}{\sigma_N} \frac{r_{NX}-r_{SX}r_{NS}}{1-r_{NS}^2-r_{NI}^2} = 0$ and $plim\, \hat{\psi} = \psi$.

Our empirical results show that, for country-year with average program size, post-program borrowing costs decrease by 71 basis points (column 1 of Table 3; this is virtually the same as what we found in Table 2) and that, before the inset of the program, countries with high-SDR access had higher borrowing costs. The point estimate implies that a one percent of GDP increase in program size is associated with a 30 basis points increase in pre-program borrowing costs (remember that this estimate is likely to suffer from an upward bias). More interestingly, we find that the interactive coefficient is negative and statistically significant. It indicates that each percent of GDP in program size decreases post-program borrowing costs by 23 basis points.

Table 3: Size of IMF Programs and Borrowing Costs

This table reports a set of regressions where the dependent variable is the bonds' coupon, and the explanatory variables are a dummy that takes value one after the inset of the program (IMF), the demeaned value of program size ($\widetilde{SDR}$), the interaction between IMF and $\widetilde{SDR}$, the log bond maturity ($\ln(MAT)$), GDP per capita ($GDP\ PC$), total number of IMF programs in a given country (NP), the log of the VIX index ($\ln(VIX)$), and a dummy that takes value one for the Ecuador buy-back bond (BB) and a dummy that takes value one for large programs (LP). All regressions include country-program type, currency of issuance, and month-year fixed effects. Columns 1 and 5 include all bonds, column 2 excludes the Ecuador buy-back bond, column 3 only includes bonds issued around ex-post programs, and column 4 only includes bonds issued around ex-ante programs.

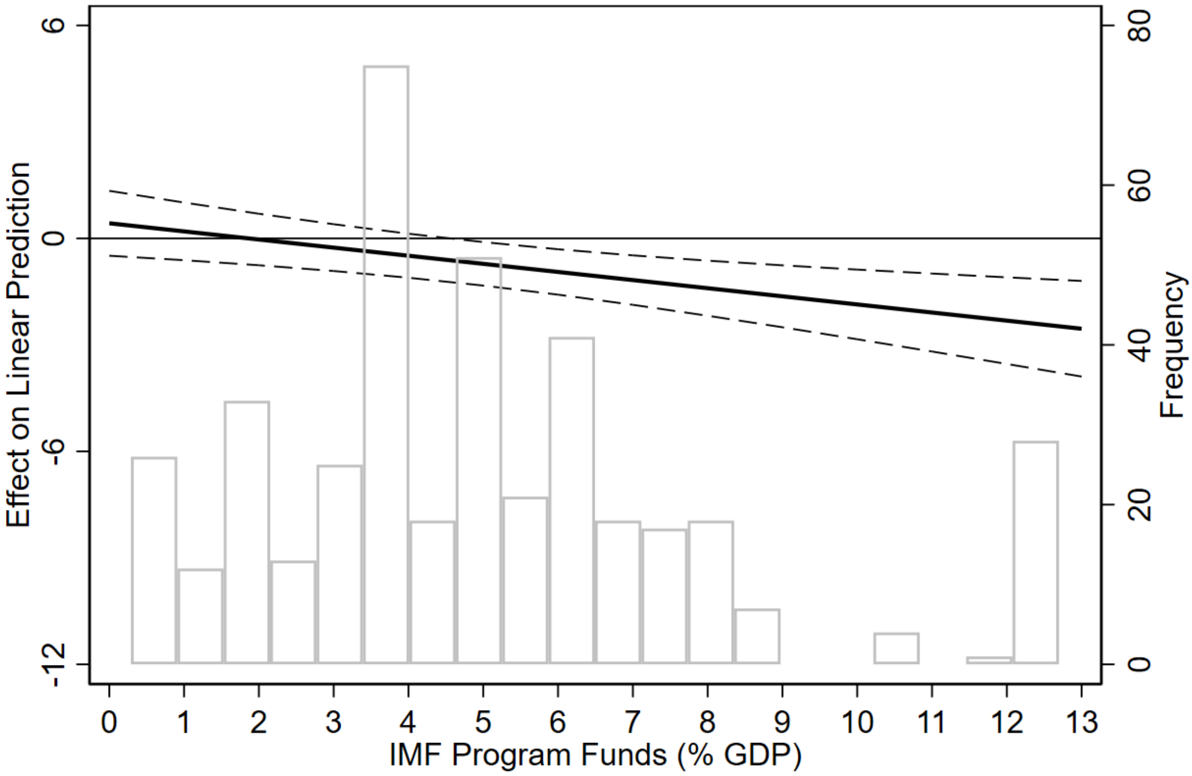
	(1)	(2)	(3)	(4)	(5)	(6)
IMF	-0.709**	-0.709**	-1.422**	-0.619*	-0.682**	-2.771***
	(0.313)	(0.312)	(0.547)	(0.268)	(0.298)	(0.193)
$\widetilde{SDR}$	0.300***	0.300***	0.315***	0.033	0.558***	1.453***
	(0.098)	(0.098)	(0.035)	(0.045)	(0.197)	(0.0621)
$IMF \times \widetilde{SDR}$	-0.229***	-0.229***	-0.993***	0.283***	-0.326**	-0.731***
	(0.074)	(0.074)	(0.168)	(0.040)	(0.123)	(0.0555)
$\ln(MAT)$	1.051***	1.051***	1.314***	0.979***	1.140***	1.309***
	(0.099)	(0.099)	(0.141)	(0.085)	(0.104)	(0.144)
NP	0.204**	0.204**	-6.783***	0.261	0.500***	1.015**
	(0.0983)	(0.0982)	(0.631)	(0.173)	(0.179)	(0.439)
$GDP\ PC$	-0.070***	-0.070***	-0.315	-0.069*	-0.031	0.262***
	(0.023)	(0.023)	(0.188)	(0.032)	(0.035)	(0.085)
$\ln(VIX)$	0.824*	0.824*	1.054***	-0.0950	0.478	1.218***
	(0.478)	(0.478)	(0.364)	(0.281)	(0.404)	(0.387)
BB	10.720***		10.890***		10.910***	13.380***
	(0.248)		(0.326)		(0.273)	(0.163)
LP					-3.784**	-12.050***
					(1.168)	(0.538)
Observations	408	407	216	192	408	216
Countries	23	23	19	6	23	19
IMF Program Type	All	Excl. BB	Ex-Post	Ex-Ante	All	Ex-Post
Country-Program Type FE	✓	✓	✓	✓	✓	✓
Currency-Issuance FE	✓	✓	✓	✓	✓	✓
Month-Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.855	0.849	0.902	0.939	0.878	0.905

Robust standard errors clustered at the country-program type-level are reported in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 1 plots the marginal effect of program size (the horizontal axis of the figure uses SDR instead of its demeaned value $\widetilde{SDR}$). Post-program borrowing costs are higher (but the difference with respect to pre-program borrowing costs is not statistically significant) for small programs (when SDR access is less than 2.5 percent of GDP). However, they become significantly lower than pre-program borrowing costs when SDR access reaches 5 percent of GDP. The results are identical when we drop the Ecuador buy-back bond (Column 2).

Figure 1: Borrowing Costs and Program Size (Ex-Post and Ex-Ante Programs)

The figure is based on the estimations of column 1 of Table 3 and shows (on the left-hand side axis) the effect of an IMF program on borrowing costs for programs with different sizes. The solid back line shows the point estimates and the dashed lines show the 95 percent confidence interval. The vertical bars show the frequency of programs with different sizes.



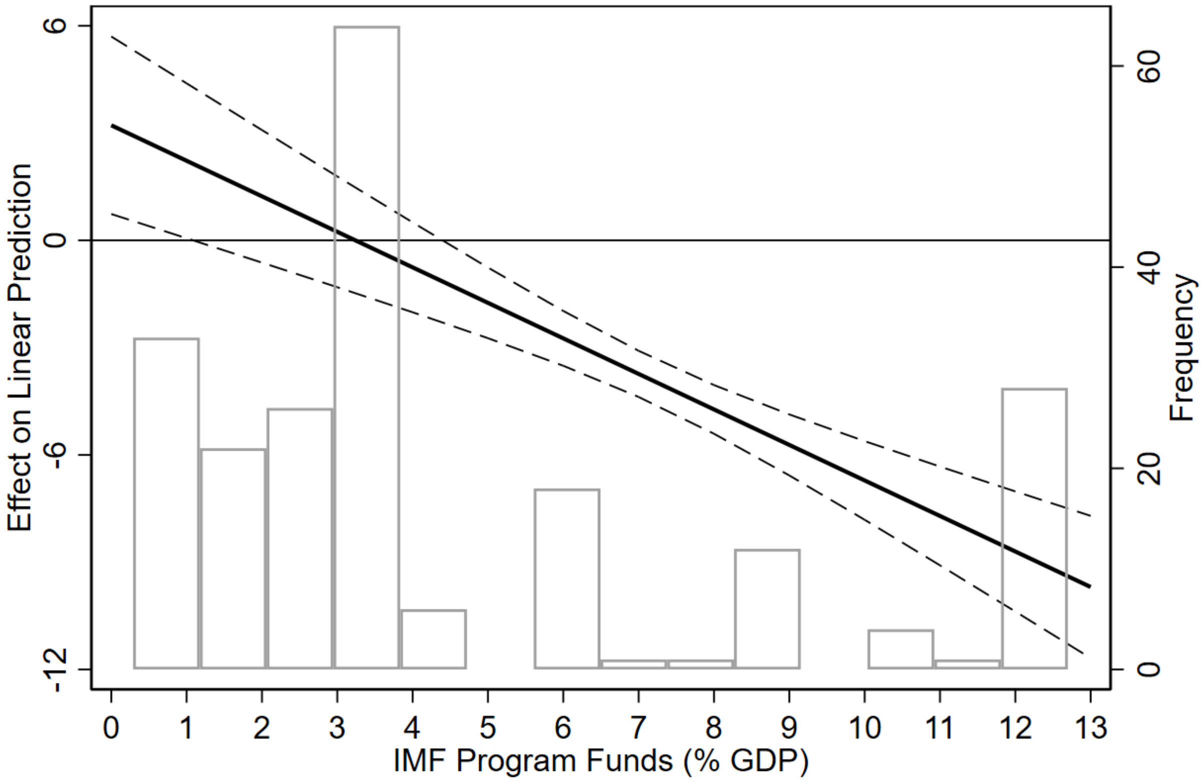
Next, we run separate regressions for ex-ante and ex-post programs. We do not use triple interactions because they are difficult to interpret and do not allow for different coefficients across the full set of controls and fixed effects.

The results for ex-post programs are qualitatively like those we obtained for the full sample. However, the average reduction in borrowing costs is much larger. Post-program coupons for the country-year with the average program size are 142 basis points lower than pre-program borrowing costs (column 3). This is twice as large as our finding in column 1. The coefficient of program size is instead similar to that of column 1: the point estimate implies that borrowing costs increase by 32 basis points when program size increases by one percent of GDP (again, this estimate is likely to be upward biased). The interactive term shows that post-program borrowing costs decrease by 100 basis points when program size increases by one percent of GDP (column 3, Table 3). This decrease is more than three times what we found in column 1.

Figure 2 plots the marginal effects of an IMF program at different program sizes. Post-program borrowing costs are higher than pre-program borrowing costs when the program is less than 3 percent of GDP (marginally significant for very small programs of less than 1 percent of GDP). However, they decrease rapidly and become significantly smaller than pre-program borrowing costs when the programs exceed 4 percent of GDP.

Figure 2: Borrowing Costs and Program Size (Ex-Post Programs)

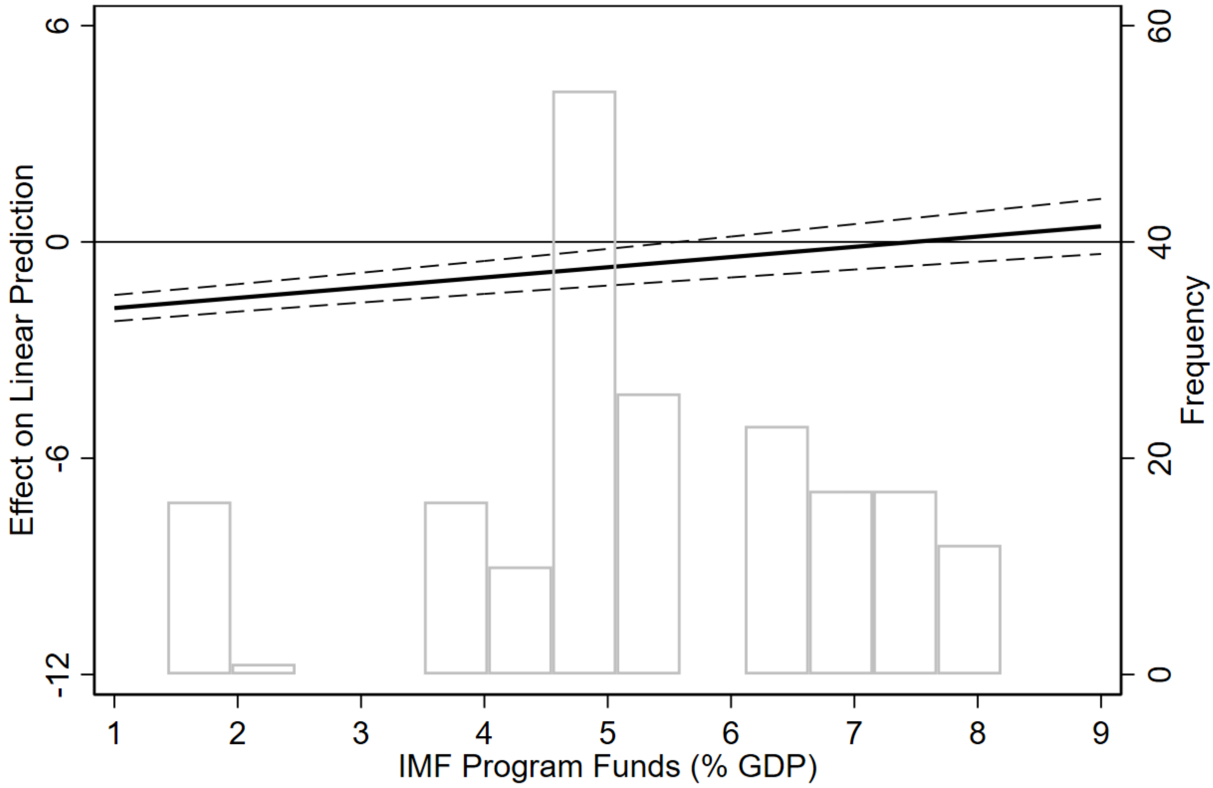
The figure is based on the estimations of column 3 of Table 3 and shows (on the left-hand side axis) the effect of an IMF program on borrowing costs for ex-post programs with different sizes. The solid back line shows the point estimates and the dashed lines show the 95 percent confidence interval. The vertical bars show the frequency of programs with different sizes.



When we focus on ex-ante programs, we find that the main effect of the program dummy remains negative and statistically significant, but it is less than half that of the sample of ex-post programs (0.6 versus 1.4; compare columns 3 and 4 of Table 3). The main effect of program size remains positive, but it is now close to zero and far from being statistically significant. There are two possible interpretations for this result. The first is what the point estimate tells us: program size matters for borrowing costs before ex-post programs, and it does not matter for ex-ante programs. The second has to do with endogeneity. Ex-post programs tend to happen during crisis periods in countries with weak policies and institutions, and program size can be a proxy for the depth of the crisis, leading to the pre-program endogeneity bias discussed above. Ex-ante programs, instead, tend to be implemented in countries that usually have strong institutions yet face some financial and economic turmoil in either tranquil periods or when there are global shocks.[13]

Figure 3: Borrowing Costs and Program Size (Ex-Ante Programs)

The figure is based on the estimations of column 4 of Table 3 and shows (on the left-hand side axis) the effect of an IMF program on borrowing costs for ex-ante programs with different sizes. The solid back line shows the point estimates and the dashed lines show the 95 percent confidence interval. The vertical bars show the frequency of programs with different sizes.



Focusing on our second key coefficient of interest, we find that the interaction between the program dummy and program size is now *positive* and statistically significant. This latter result is puzzling as it implies that larger ex-ante programs are associated with higher post-program borrowing costs. However, Figure 3 shows that the marginal effect is never positive and statistically significant. It is negative and statistically significant for small and medium-sized programs (up to 6 percent of GDP), and it becomes positive (but never statistically significant) only for large programs with SDR access that surpasses 8 percent of GDP. This result indicates

[13] Examples of the first type of ex-ante programs are the Colombian, Mexican and Polish FCL agreements signed between 2009 and 2019 and the Moroccan PLL agreements of 2012 and 2014. Examples of the second type are agreement signed in response to the Covid pandemic such as the 2020 and 2021 FCL agreements of Colombia, Mexico and Peru and the 2021 PLL agreement of Panama.

that ex-ante programs significantly reduce borrowing costs when the program is not very large and have no significant effect on borrowing costs when they become very large.

As our sample includes a few very large programs, we check whether our results are robust to controlling for a possible differential effect of these large programs. To this end, we augment Equation (2) with a large program dummy, which takes value one for programs with SDR access (scaled by GDP) at least two standard deviations above the average program.[14] Columns 5 and 6 of Table 3 show that our results are robust to controlling for large programs (note that there are no programs for which the dummy takes value one in the sample of ex-ante programs).

As a final step, we estimate a model that controls for IMF program (rather than country-program type) fixed effects:

$$C_{b(i,p,x),t(y)} = \alpha IMF_{i(p),t(y)} + \psi\left(IMF_{i(p),t(y)} \times \widetilde{SDR}_{i(p),t(y)}\right) + \beta \ln\left(MAT_{b(i,p,x),t}\right) + \theta \ln\left(VIX_{t(y)}\right) + \omega BB_{b(i,x),t} + \mu_{i,p} + \xi_x + \tau_{m(y)} + \varepsilon_{b(i,p,x),t(y)} \quad (6)$$

The key difference between Equation (2) and Equation (6) is that the former includes a set of fixed effects that only vary across country and program type ($\mu_{i,a}$), while the latter include a full set of country-program fixed effects ($\mu_{i,p}$). Given that GDP per capita and program size do not vary within a specific program, we cannot include GDP per capita or estimate the main effect of program size when we control for country-type fix. However, we can still estimate the interaction between program size and the IMF program dummy because the latter varies within programs.

Controlling for program fixed effects confirms that the program size is associated with a reduction of borrowing costs in the full sample and the sample of ex-post programs (columns 1 and 2 of Table 4). Instead, we do not find any significant effects of ex-ante programs (column 3 of Table 4).

[14] The dummy takes value one for the following three programs: Ukraine, 2010 (SDR access was 12.5 percent of GDP); Ukraine 2015 (SDR access was 12.7 percent of GDP); and Jamaica 2016 (SDR access was 11.6 percent of GDP).

Summing up, we find that: (i) IMF programs lead to a reduction in borrowing costs in a 6-month window around the program; (ii) on average, the post-program reduction in borrowing costs is positively associated with program size (as measured by SDR access over GDP); and (iii) that ex-post programs drive the latter results.

Table 4: Size of IMF Programs and Borrowing Costs with Program Fixed Effects

This table reports a set of regressions where the dependent variable is the bonds' coupon, and the explanatory variables are a dummy that takes value one after the inset of the program (*IMF*), the interaction between IMF and the demeaned value of program size ($IMF \times \widetilde{SDR}$), the log bond maturity (ln(*MAT*)), GDP per capita (*GDP PC*), total number of IMF programs in a given country (*NP*), the log of the VIX index (ln(*VIX*)), and a dummy that takes value one for the Ecuador buy-back bond (*BB*). All regressions include country-program, currency of issuance, and month-year fixed effects. Column 1 includes all bonds, column 2 only includes bonds issued around ex-post programs, and column 3 only includes bonds issued around ex-ante programs.

	(1)	(2)	(3)
IMF	-1.094	-2.771***	-0.570
	(0.966)	(0.195)	(0.907)
$IMF \times \widetilde{SDR}$	-0.398***	-0.731***	0.573
	(0.147)	(0.0547)	(0.769)
$\ln(MAT)$	1.188***	1.309***	0.954***
	(0.112)	(0.167)	(0.096)
$\ln(VIX)$	0.792**	1.218***	-0.115
	(2.200)	(3.310)	(-0.200)
BB	11.770***	13.380***	
	(0.839)	(0.164)	
Observations	408	216	192
Countries	23	19	6
IMF Program Type	All	*Ex-Post*	*Ex-Ante*
Country-IMF Program FE	✓	✓	✓
Currency-Issuance FE	✓	✓	✓
Month-Year FE	✓	✓	✓
Adjusted R^2	0.872	0.874	0.938

Robust standard errors clustered at the country-program type-level are reported in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4 Robustness Checks

In our first robustness check, we also compare SDR access to that of peer countries (defined as countries with GDP per capita which is no more than 10 percent different from that of the studied countries). Specifically, $\widetilde{SDR}_{i(p),t(y)}$ is now defined as the difference between SDR access of country i and average SDR access of countries with similar GDP per capita. Table 5 shows that our results are robust to this alternative definition of $\widetilde{SDR}_{i(p),t(y)}$.

Table 5: Borrowing Costs and IMF Program Size Relative to Peer Borrowing Countries

This table reports a set of regressions where the dependent variable is the bonds' coupon, and the explanatory variables are a dummy that takes value one after the inset of the program (*IMF*), the interaction between IMF and the difference between program size and average program size of comparable countries ($IMF \times \widehat{SDR}$), the log bond maturity (ln(MAT)), the log of the VIX index (ln(VIX)), and a dummy that takes value one for the Ecuador buy-back bond (BB). All regressions include country-program, currency of issuance, and month-year fixed effects. Column 1 includes all bonds, column 2 only includes bonds issued around ex-post programs, and column 3 only includes bonds issued around ex-ante programs.

	(1)	(2)	(3)
IMF	-0.383	-1.101***	-0.100
	(0.847)	(0.314)	(0.444)
$IMF \times \widehat{SDR}$	-0.403***	-1.037***	0.087
	(0.136)	(0.078)	(0.226)
$\ln(MAT)$	1.195***	1.309***	0.959***
	(0.116)	(0.167)	(0.0963)
$\ln(VIX)$	0.942**	1.218***	-0.109
	(0.363)	(0.368)	(0.598)
BB	11.600***	11.920***	
	(0.835)	(0.263)	
Observations	408	216	192
Countries	23	19	6
Type of IMF program	All	*Ex-Post*	*Ex-Ante*
Country-IMF Program FE	✓	✓	✓
Currency-Issuance FE	✓	✓	✓
Month-Year FE	✓	✓	✓
Adjusted R^2	0.870	0.874	0.910

Robust standard errors clustered at the country-program type-level are reported in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Next, we use the model of Table 2 but replace bonds issued by countries under an IMF program with those issued by similar countries in the same time window.[15] The results of this placebo exercise (Table 6) confirms that we are not picking up some generalized trend in borrowing costs that happens around the approval of IMF programs. We also we pool bonds issued by program and non-program countries and estimate the following model:

$$C_{b(i,p,x),t(y)} = \alpha IMF_{i(p),t(y)} + IMF_{i(p),t(y)} \times Program_{i(p),t(y)}\left(\eta + \lambda \widehat{SDR}_{i(p),t(y)}\right) + \beta \ln\left(MAT_{b(i,p,x),t}\right) + \theta \ln\left(VIX_{t(y)}\right) + \omega BB_{b(i,x),t} + \mu_{i,p} + \xi_x + \tau_{m(y)} + \varepsilon_{b(i,p,x),t(y)} \quad (7)$$

Where $C_{b(i,p,x),t(y)}$ is the coupon of bonds issued around IMF programs by both program and non-program comparable countries, $IMF_{i(p),t(y)}$ is a dummy that takes value one after the inset

[15] For instance, the Egypt had a program approved on 11 November 2016. We replace Egypt with non-program countries with a similar GDP per capita at the time of program and that issued bonds around 11 November 2016.

of the program and $Program_{i(p),t(y)}$ is a dummy that takes value one for the program country. All other variables are defined as in Equation (6).[16]

In Equation (7), the coefficient η shows the post-program difference in borrowing costs between countries that are under an IMF program and similar countries that are not under a program. Column 1 of Table 7 estimates the model without the triple interaction and shows that being in an IMF program leads to a reduction in borrowing costs. When we control for program size, we corroborate our previous finding that larger programs are associated with lower borrowing costs (column 2 of Table 7) and that this effect is driven by ex-post programs (column 3 of Table 7). For ex-ante programs, instead, we find a reduction in borrowing costs which is independent of program size (column 4).

Table 6: Placebo of Peer Non-Borrowing Countries

This table reports the placebo regressions described in the text. The explanatory variables are a dummy that takes value one after the inset of the program (*IMF*), the log bond maturity (ln(*MAT*)), and the log of the VIX index (ln(*VIX*)). Columns 1, 3 and 5 include country-program type fixed effects, while columns 2, 4 and 6 include country-program fixed effects. All regressions include currency of issuance, and month-year fixed effects. Columns 1 and 2 include all peer countries that issued bonds around IMF programs, columns 3 and 4 only include bonds issued around ex-post programs, and columns 5 and 6 only include bonds issued around ex-ante programs.

	(1)	(2)	(3)	(4)	(5)	(6)
IMF	0.0578	-0.473	-0.738	-0.178	-0.166	-0.985
	(0.200)	(0.291)	(0.464)	(0.214)	(0.381)	(0.805)
$\ln(MAT)$	0.626**	0.793***	0.863***	0.887***	0.415	0.659***
	(0.179)	(0.132)	(0.233)	(0.173)	(0.282)	(0.237)
$GDP\ PC$	-0.078		-0.542***		-0.198*	
	(0.060)		(0.102)		(0.105)	
$\ln(VIX)$	0.759	0.707	0.619	0.479	1.977	2.096
	(1.234)	(0.608)	(0.813)	(0.476)	(1.477)	(1.263)
Observations	442	442	266	266	176	176
Countries	25	25	18	18	17	17
IMF Program Type	All	All	Ex-Post	Ex-Post	Ex-Ante	Ex-Ante
Country-Program Type FE	✓	x	✓	x	✓	x
Country-IMF Program FE	x	✓	x	✓	x	✓
Currency-Issuance FE	✓	✓	✓	✓	✓	✓
Month-Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.637	0.612	0.747	0.639	0.677	0.632

Robust standard errors clustered at the country-program type-level are reported in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[16] Note that country-program fixed effects absorb the effects of $Program_{i(p),t(y)}$, $\widetilde{SDR}_{i(p),t(y)}$ and their interaction $Program_{i(p),t(y)} \times \widetilde{SDR}_{i(p),t(y)}$. Moreover, given that SDR takes value zero for non-program countries, the triple interaction $IMF_{i(p),t(y)} \times Program_{i(p),t(y)} \times \widetilde{SDR}_{i(p),t(y)}$ absorbs the double interaction $IMF_{i(p),t(y)} \times \widetilde{SDR}_{i(p),t(y)}$.

Table 7: Borrowing Costs in Program and Non-Program Countries

This table reports a set of regressions where the dependent variable is the bonds' coupon, and the explanatory variables are a dummy that takes value one after the inset of the program for both program and non-program comparable countries (*IMF*), a dummy that takes value one for program countries (*Program*), the interaction between IMF and program and the triple interaction between IMF program and program size ($IMF \times Program \times \widehat{SDR}$), the log bond maturity (ln(*MAT*)), the log of the VIX index (ln(*VIX*)), and a dummy that takes value one for the Ecuador buy-back bond (*BB*). All regressions include country-program, currency of issuance, and month-year fixed effects. Columns 1 and 2 include all bonds, column 3 only includes bonds issued around ex-post programs, and column 4 only includes bonds issued around ex-ante programs.

	(1)	(2)	(3)	(4)
IMF	-0.030	-0.044	-0.034	-0.659
	(0.249)	(0.241)	(0.267)	(0.429)
$IMF \times Program$	-0.585**	0.272	0.082	-1.266**
	(0.280)	(0.375)	(0.809)	(0.495)
$IMF \times Program \times \widehat{SDR}$		-0.218**	-0.593**	0.361***
		(0.105)	(0.294)	(0.106)
$\ln(MAT)$	0.955***	0.975***	1.122***	0.792***
	(0.096)	(0.098)	(0.141)	(0.109)
$\ln(VIX)$	-0.086	0.007	-0.390	1.412**
	(0.393)	(0.375)	(0.450)	(0.583)
BB	12.000***	12.000***	13.580***	
	(0.443)	(0.443)	(0.807)	
Observations	850	850	482	368
Countries	48	48	37	23
IMF Program Type	All	All	Ex-Post	Ex-Ante
Country-IMF Program FE	✓	✓	✓	✓
Currency-Issuance FE	✓	✓	✓	✓
Month-Year FE	✓	✓	✓	✓
Adjusted R^2	0.700	0.704	0.736	0.793

Robust standard errors clustered at the country-program type-level are reported in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5 Conclusions

This paper complements a strand of literature which examines the catalytic finance effects of IMF programs. Building on prior research which refers to the liquidity, signaling, or moral hazard arguments, we investigate whether IMF programs, with both ex-ante and ex-post conditionality, facilitate market access by lowering borrowing costs in the primary bond market. We contribute to the literature by introducing an alternative identification akin to a difference-in-difference strategy and only focusing on countries that can issue bonds in a 12-month window around the inset of an IMF program. By concentrating on this narrow window, we address concerns about selection into the program, as exogenous IMF procedures determine the timing.

We find a statistically and economically significant reduction in borrowing costs associated with the presence of an IMF program. Baseline estimates indicate that, on average, the coupon of bonds issued six months post-program initiation is 70 basis points lower than the coupon of bonds issued six months before. When distinguishing between ex-ante and ex-post programs, we observe a more pronounced effect in ex-post programs (100 basis points versus 50 basis points). Still, the percentage reduction in borrowing costs remains close to 15 percent in both cases.

We also study the effect of program size. Pooling all programs together, we find that borrowing costs decrease with program size. The point estimates indicate a 23-basis point reduction for every one percent increase in program size relative to GDP. The effect is larger for ex-post programs, where a one percent increase in program size corresponds to a 100-basis point reduction in borrowing costs. For ex-ante programs, we find the opposite result. Although precautionary programs consistently reduce borrowing costs on average, the effect is not statistically significant for large programs.

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