The Impact of International Bond Issuance on Developing Countries' External Government Debts*

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ABSTRACT

This study quantitatively examines how the initiation of international sovereign bond issuance affects the level and creditor composition of external debt, using a difference-in-differences approach and double machine learning. Countries that issue international bonds have significantly higher external debt—approximately 19 percentage points more over ten years—than non-issuers. This increase stems not only from new bond issuance but also from greater borrowing from multilateral creditors. These findings diverge from earlier studies that viewed international bonds primarily as substitutes for concessional financing. No significant differences in GDP growth or per capita GDP were found between issuers and non-issuers, suggesting that expanded external financing has not necessarily improved economic outcomes. IMF and World Bank analyses further indicate that higher external debt heightens the risk of debt distress. Overall, the initiation of international bond issuance reflects unmet financing needs rather than the substitution of debt sources. While such issuance can mobilize development capital, it also increases debt vulnerabilities without strong fiscal discipline, transparency, and institutional management. For creditors, international bond issuance should not be viewed as a signal of creditworthiness; broader assessments of fundamentals and debt sustainability are essential. Ghana's 2022 default illustrates how market-based borrowing can amplify exposure to global shocks.

Key words: International sovereign bonds, External debt, Developing countries, Difference-in-differences, Double machine learning, Debt sustainability

JEL Classification: C1, E6, F34, H63

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1. Introduction

Developing countries' external government debt has historically helped to address fiscal and balance of payments financing needs that cannot be met through domestic resources alone (Reinhart & Rogoff, 2009). However, the recent rapid increase in debt levels highlights new challenges, including proper debt management and maintaining creditworthiness (International Monetary Fund, 2024).

Traditionally, developing countries' external debt creditors have been mainly multilateral and bilateral official creditors. However, a prolonged low-interest environment and abundant liquidity have led to increased funding from the private sector. In particular, the issuance of international sovereign bonds—foreign-currency-denominated government bonds issued in international bond markets—has become increasingly prominent. Historically, countries with high credit ratings were deemed investment-grade and were likelier to offer these bonds. Yet, non-investment-grade countries with higher credit risks have also recently begun issuing international bonds.

This study aims to clarify how the initiation of international bond issuance affects the level and structure of an overall external debt. The findings of the analyses are summarized as follows. First, difference-in-differences (DiD) analyses using double machine learning (DML) reveal that countries initiating international bond offerings experience a significantly higher level of external debt over time. In this regard, the initiation of international bond issuance appears to contribute to an overall increase in external debt among developing countries. Second, examining creditor-specific changes following international bond issuance suggests that the volume of international bonds significantly contributes to a net increase in external debt without reducing debt from other creditors (i.e., no substitution effect). Additionally, borrowing from multilateral creditors is statistically significant, as it indicates that developing countries' governments may be likelier to seek additional financial support from multilateral creditors after initiating funding through international bonds—contrary to previous studies. Furthermore, no statistically significant differences were found between issuing and non-issuing countries in GDP growth rates or per capita GDP when assessing whether expanded access to external financing has improved economic outcomes. Moreover, debt sustainability analyses conducted by the International Monetary Fund (IMF) and the World Bank indicate that higher external debt levels increase the risk of debt distress, affecting both external debt and the overall government debt burden.

The remainder of this paper is structured as follows. Section 2 explores recent trends in developing countries' external debt. Section 3 outlines the purpose of the analysis and reviews the relevant literature. Sections 4 and 5 present the analyses and discuss the findings. Finally, Section 6 concludes the study.

2. Trends in Developing Countries' External Government Debt

This section examines broader trends in external government debt among developing countries to provide context for the analysis of recent debt dynamics in later sections. In this paper, "developing countries" are defined in accordance with the World Bank classification, referring to lower- and lower-middle-income countries (LMICs), as higher-middle-income countries include large economies such as China and India.

2.1. Increase in Developing Countries' External Government Debt

Gross external debt refers to the total outstanding amount of non-contingent current liabilities requiring principal and interest payments by the debtor to non-residents on future dates. Both developed and developing countries can incur external debt, with the public and private sectors serving as potential borrowers. However, in developing countries, a substantial portion of external debt is incurred by governments borrowing from multilateral creditors such as multilateral development banks (e.g., the World Bank, regional development banks) and other intergovernmental agencies such as the IMF, or public financial institutions in advanced economies (bilateral creditors) (Thomas, 2009).

External government debt in developing countries has risen sharply in recent years, increasing from approximately $560 billion in 2010 to over $1.3 trillion by 2022 (Figure 1). This trend is attributed to factors on both the demand and supply sides of capital in external borrowing. On the demand side, developing country governments faced a series of negative shocks, including the Global Financial Crisis in 2008, the European financial crisis in 2010, and the COVID-19 pandemic in 2020. While lower-income countries were less directly exposed to international financial markets, these crises had indirect effects, such as reductions in trade, foreign direct investment, and official development assistance, which in turn constrained fiscal resources. These indirect channels increased financing needs and spurred additional external borrowing. On the supply side, accommodative monetary policies implemented by the Federal Reserve, the European Central Bank, and other central banks in advanced economies led to prolonged excess liquidity globally. This favorable environment facilitated capital inflows into developing countries, enabling them to easily meet financing needs.

Many developing countries had already faced elevated debt vulnerabilities before the COVID-19 pandemic. Following the pandemic's onset, advanced economies generally recovered relatively quickly and began monetary tightening, whereas recovery in many developing countries—especially in Africa—has been slower. This divergence, compounded by persistent fiscal gaps, has further exacerbated their debt burdens.

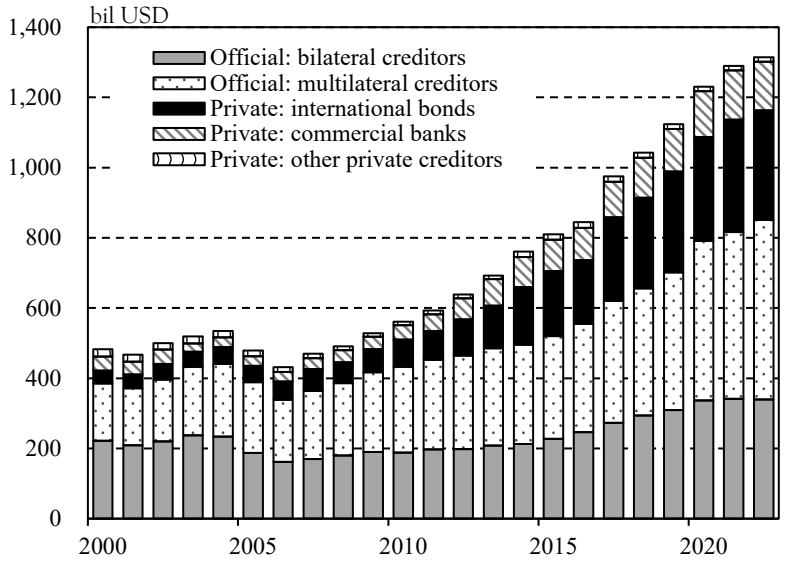

Fig. 1 Developing Countries' External Government Debts
Data: World Bank International Debt Statistics, series DT.DOD.DPPG.CD (External debt stocks, public and publicly guaranteed, DOD, current US$).
Note: Extract lower- and lower-middle-income countries from the IDS.

2.2. Changes in Financing Channels

The funding channels for the governments of developing countries have evolved amid these financial environment shifts. Although multilateral creditors such as the IMF and World Bank, as well as other bilateral public creditors, continue to constitute the primary financing sources, there has been an increase in cross-border capital provision from the private sector driven by global excess liquidity (Figure 1). Traditionally, private sector funding has been dominated by commercial bank loans and international bonds; however, an increasing number of developing countries now rely more on issuing international bonds than on bank loans.

International sovereign bonds[1] are government-issued bonds denominated in foreign currencies and sold in international bond markets, sometimes referred to as Eurobonds. Before 2000, developing countries generally faced significant challenges in issuing bonds in global markets to secure foreign currency financing (Gelos, Sahay & Sandleris, 2011), as most of them lacked formal sovereign credit ratings and therefore did not meet the prerequisites for market borrowing. Many developing countries are assigned non-investment-grade ratings of BB or lower, which limits investor demand and often necessitates offering bonds at higher interest rates. Nonetheless, recent prolonged periods of excess global liquidity have made it relatively easier for these countries to raise foreign currency. Thus, even non-investment-grade developing countries with no prior issuance history have begun issuing international bonds (Das, Papaioannou & Polan, 2008).[2]

2.3. International Bond Issuance Risks

Issuing international sovereign bonds provides developing countries with an additional avenue for securing funding. However, it also exposes them to potential downsides, including market, exchange rate, and capital outflow risks. Unlike borrowing from official creditors, international bonds can be issued relatively easily and without programmatic conditions. While this accessibility is appealing, it requires constant attention to market conditions and investor sentiment, which can significantly affect borrowing costs and debt sustainability.

This market-driven nature means that external shocks—such as U.S. interest rate hikes, global financial uncertainty, or country-specific political instability—can cause borrowing costs to rise sharply (Mu, Phelps & Stotsky, 2013). A prominent example is Ghana, which experienced a rapid buildup of external debt after repeated international bond issuances in the 2010s. While these bonds initially allowed the country to access large volumes of capital, they also increased its exposure to refinancing and currency risks. In 2022, Ghana defaulted on most of its external debt following a steep rise in yields and a de facto loss of access to international markets. This case underscores the importance of prudent debt management and the potential dangers of overreliance on market-based borrowing.

In essence, while international bonds offer flexibility and speed, they can compromise debt sustainability in the absence of strong institutional frameworks and macroeconomic stability, especially for countries with limited reserves and high fiscal needs. Recent empirical analyses further underscore these concerns. For example, synthetic control experiments conducted by the African Development Bank found that several African countries experienced deteriorating debt indicators after their first Eurobond issuance, suggesting that international bond issuance can have long-term implications for macroeconomic stability (African Development Bank, 2021).

2.4. The Opaque Relationship Between the Diversification of Financing Methods and External Debt

This study examines the macro-level relationship between developing countries' diversified financing methods—exemplified by international bond issuance—and the rise in external debt levels, drawing on quantitative analyses of country-level microdata. Initially, it may appear that the former has driven the latter—that is, diversified financing channels increase external debt of developing countries' governments. However, this relationship is not necessarily established. In principle, the debt volume of a developing country's government depends on its financing needs and debt sustainability (i.e., repayment capacity). Thus, diversifying financing methods does not necessarily increase debt.

To assess whether international bond issuance results in additional borrowing or merely replaces existing sources, it is useful to consider two possible scenarios. The first scenario

involves a developing country with access to the necessary capital to meet its borrowing needs before diversifying financing methods. In this case, the level of external borrowing corresponds to the government's borrowing needs, and diversifying financing methods would not substantially impact debt levels. Thus, issuing debt in international markets would be offset by a decrease in other borrowing sources (a substitution effect). Previous studies have suggested that developing countries face narrowing financing options when experiencing income growth, causing them to gradually lose access to concessional loans from official creditors or experience declining loan amounts. In such contexts, international bond issuance has been identified as an alternative financing tool for filling the gap caused by reduced access to official lending (Grigorian, 2003; Guscina et al., 2014). Under this scenario, international bonds function as substitutes for borrowing from official creditors.

The second scenario involves a developing country unable to meet its borrowing needs before diversifying financing options. Here, access to new market-based funding sources may lead to additional borrowing. Two factors can explain this outcome. First, when governments gain access to a broader pool of international investors, the overall market capacity to absorb credit risk expands, lowering the effective barrier imposed by concerns about creditworthiness.[3] Second, the ability to borrow at lower interest rates may lead governments to consider a larger debt stock sustainable. Developing countries consider repayment burdens when determining an appropriate debt level; however, if lower-cost financing becomes available, the average interest rate declines, allowing for more external borrowing and overcoming the interest burden barrier. While in most cases market-based borrowing entails higher interest rates than concessional lending from multilateral creditors, exceptionally favorable international liquidity conditions or strong investor demand can occasionally allow sovereigns to issue at comparable or even lower rates. In such circumstances, the incentive to expand borrowing could be reinforced. This study, therefore, investigates whether the issuance of international bonds leads to an overall increase in external borrowing rather than merely substituting for other funding sources. Accordingly, the empirical analyses in subsequent sections are designed to determine which of these scenarios more accurately reflects actual debt dynamics in developing countries.

3. Purpose of Analyses and Literature Review

3.1. Purpose of Analyses

This study examines how the initiation of international bond issuance—an important example of financing diversification—affects the overall level and creditor composition of external debt in developing countries. Rather than simply comparing types of borrowing, it aims to clarify whether new access to international bond markets leads to a net increase in total external debt

and changes in its structure. Given that approximately half of developing countries have not issued international bonds, the study compares these two groups to identify statistically significant differences in external debt levels and composition. In doing so, it sheds light on the relationship between financing diversification and external debt dynamics,[4] with implications for effective debt management and creditor risk assessment.

3.2. Literature Review

Institutions such as the IMF and World Bank, supported by extensive data, have long conducted and published research on developing countries' external government debt. In recent years, the World Bank has increasingly emphasized improving government debt transparency by publishing detailed data on developing countries' external debt through its International Debt Statistics (IDS) report, which features more granular breakdowns and has gained considerable attention for its utility in international finance.

Existing studies have documented increased international bond issuance, coinciding with rising external debt among developing countries (World Bank, 2023). In the mid-2010s, developing countries issued a wave of first-time international bonds, prompting several studies to highlight the graduation from concessional loans as a key factor behind this trend. These papers also examined how issuing countries should adjust their financing strategies to maintain debt sustainability (Guscina et al., 2014; Presbitero et al., 2016). However, since then, there has been limited research on the medium- to long-term evolution of external debt among governments issuing international bonds, and no studies have explicitly examined the relationship between international bond issuance and external debt increases.

Building on insights from previous literature, this study revisits the implications of international market financing for the governments of developing countries. In particular, it provides three key contributions relative to earlier studies. (1) It examines a larger and more diverse sample, as developing countries' international bond issuance has continued beyond the mid-2010s. (2) The analysis yields new insights by analyzing medium- to long-term outcomes. (3) Given the notable increase in external debt among developing countries since the mid-2010s (Figure 1), it investigates a period of particular relevance for understanding current debt dynamics.

4. Analyses (1): International Bond Issuance and External Debt Levels

A robust analytical framework is essential to better understand the potential impact of international bond issuance on external debt levels. This section outlines the data and methodology and then presents, interprets, and discusses the results.

4.1. Data and Analytical Framework

This study examines 77 of the 122 LMICs included in the IDS that had not issued international bonds before 2000. The analysis period spans from 2000 to 2022. To minimize the influence of the Heavily Indebted Poor Countries initiative on external debt dynamics, the starting year is set at 2000. While the reasons why individual countries did not issue international bonds before 2000 may differ (e.g., prior debt history, restructuring processes, or policy decisions), the analysis focuses on the causal impact of initiating international bond issuance. Therefore, the sample is defined uniformly based on the absence of issuance prior to 2000. Potential differences across countries (sample bias) are addressed through a pre-analysis in the DiD framework.

This study employs a DiD approach to estimate the impact of international bond issuance on the external debt-to-GDP ratio. A DiD estimation identifies the effect of a specific policy or event—in this case, the initiation of international bond issuance—by comparing changes between treatment (30 issuing countries) and control (47 non-issuing countries) groups over time (Table 1) (Bertrand, Duflo & Mullainathan, 2004).

To address potential concerns regarding sample bias, a pre-analysis group comparison between the treatment and control groups is presented in Table 2. The standardized mean differences (SMDs) are all well below the commonly used threshold of 0.5, indicating that differences across the treatment and control groups are small to moderate in magnitude. Overall, the results suggest that the two groups are broadly comparable prior to the initiation of international bond issuance and that potential sample bias is limited.

Changes in the external debt-to-GDP ratio are calculated over two specific points within the study period for each country. The analysis then estimates if there is a statistically significant difference between the treatment and control groups based on whether a country issued international bonds. For countries issuing international bonds, the change is calculated from the year before issuance, while the same timeframe is applied to non-issuing countries. The estimation equation is as follows:

$$\Delta Y_{it} = \alpha + \beta \cdot treat_{it} + \gamma_t \cdot time_t + \epsilon_{it}.$$

Where ΔY_{it} is the change in the external debt-to-GDP ratio (percentage) for country i over the period (difference); α is the intercept term; $treat_{it}$ is the treatment dummy variable for international bond issuance, where 1 indicates issuing countries, and 0 is non-issuing countries; β represents the treatment effect, indicating the causal impact of international bond issuance on the external debt-to-GDP ratio; time_t is the time dummy variable representing each observation period; γ_t captures the effect of the time dummy in each period; and ϵ_{it} is the error term, including unobserved factors.

Table 1. Treatment and Control Group Countries

Treatment Group*

Albania (2010)	Angola (2015)	Armenia (2013)
Azerbaijan (2014)	Belarus (2010)	Benin (2019)
Bolivia (2012)	Cameroon (2015)	Egypt (2001)
Ethiopia (2014)	Gabon (2007)	Georgia (2008)
Ghana (2007)	Honduras (2013)	Kenya (2014)
Lao PDR (2015)	Maldives (2017)	Mongolia (2012)
Montenegro (2010)	Mozambique (2016)	North Macedonia (2005)**
Papua New Guinea (2018)	Paraguay (2013)	Rwanda (2013)
Senegal (2009)	Sri Lanka (2007)	Suriname (2016)
Tajikistan (2017)	Uzbekistan (2019)	Zambia (2012)

Control Group***

Algeria	Bangladesh	Bhutan
Herzegovina	Botswana	Burkina Faso
Burundi	Cabo Verde	Cambodia
Central African	Chad	Comoros
Congo	Djibouti	Eswatini
Fiji	Gambia	Guinea
Guinea-Bissau	Haiti	Iran
Kyrgyz	Lesotho	Liberia
Madagascar	Malawi	Mali
Mauritania	Mauritius	Myanmar
Nepal	Nicaragua	Niger
Samoa	São Tomé and Príncipe	Sierra Leone
Solomon Islands	Somalia	St. Vincent
Sudan	Tanzania****	Togo
Tonga	Turkmenistan	Uganda
Vanuatu	Zimbabwe	

*) The year in parentheses denotes the initial year of issuance.

**) Although North Macedonia issued an international bond in 1997, there was a significant gap before subsequent issuances. Therefore, 2005 is treated as the first issuance year.

***) All issuances in the treatment group refer to international bonds issued through public offerings.

****) Tanzania issued international bonds via private placement in 2013. As this study focuses on bonds issued through public offerings, and Tanzania has not rolled over its debt since the bond matured in 2000, the country is included in the control group.

The interval T between the baseline and observation years ranges from one to ten years. For example, if $T = 5$, this implies a five-year interval between two observation points. In this scenario, the treatment group includes countries that issued international bonds in the second year of the interval. The analysis then evaluates whether external debt changes differ significantly between these countries and those that did not issue international bonds over the five-year period (four years post-issuance). This approach is referred to as the "standard DiD."

The DML approach is used alongside the standard DiD analysis, as it enables more precise

Table 2. Pre-Analysis Group Comparison Between Treatment and Control Groups (Averages and Standardized Mean Differences)

Indicator	Treatment Group	Control Group	SMD
External Debt			
External debt (% of GDP)	23.0	30.9	0.282
from multilateral creditors	11.8	16.5	0.283
from bilateral creditors	8.3	12.4	0.276
from commercial banks	1.6	1.2	0.114
from other private creditors	0.6	0.8	0.087
External debt (% of exports)	81.8	139.1	0.316
External Balance and Resilience			
Current account (% of GDP)	−6.6	−7.8	0.124
Foreign reserves (months of imports)	4.4	5.1	0.119
Export dependency (% of GDP)	34.3	30.4	0.195
Growth, Income, and Prices			
GDP per capita (USD)	6,579.6	4,555.7	0.467
GDP growth rate (%)	11.1	8.2	0.334
Inflation (CPI, %)	6.5	6.2	0.042
Fiscal Indicators			
Fiscal balance (% of GDP)	−1.5	−0.8	0.139
Fiscal balance (% of average tax revenues)	−10.8	−11.7	0.024
Government Effectiveness (World Bank WGI)	−0.5	−0.8	0.400
Concessional external debt stocks (% of external public debt)	50.9	56.5	0.205

Data: World Bank, World Development Indicators, and A Cross-Country Database of Fiscal Space published in March 2025
Note: All figures are calculated as averages over the three years prior to the bond issuance year (t-1 to t-3). SMDs are reported in absolute values. An SMD below 0.5 is commonly interpreted as indicating no substantial imbalance (Austin, 2009).

estimations by rigorously controlling for non-linearity and confounding in covariates (Sant'Anna & Zhao, 2020). Specifically, DML based on Neyman orthogonality minimizes the influence of estimation errors in covariates on causal inference, resulting in more reliable estimates (Chernozhukov et al., 2017; Chernozhukov et al., 2018).

Compared to other extensions of the traditional DiD framework—such as DiD combined with propensity score matching (PSM), synthetic control methods, or interactive fixed effects (Bai, 2009) —DML offers several unique advantages. First, it does not require strict model assumptions regarding the functional form of covariates and allows for high-dimensional, flexible control of confounders using machine learning techniques such as random forest or gradient boosting. Second, unlike PSM-based DiD, which often depends on correctly specifying a low-dimensional propensity score model, DML can capture complex, nonlinear relationships between treatment assignment and covariates without the risk of model misspecification. Third, in contrast to synthetic control or panel factor models, DML accommodates heterogeneous treatment settings and relatively short panels, making it well-suited to this study's structure of

varying treatment timing across countries.

While alternative DiD extensions have been applied in related literature, they are not ideally suited to account for the multiple confounders and potential nonlinearities present in external debt accumulation. By contrast, DML is particularly appropriate for this analysis, as it enables flexible, data-driven adjustment for unobserved heterogeneity and nonlinear temporal effects. This is especially suitable given the complexity of macroeconomic dynamics involved in sovereign borrowing decisions and debt accumulation.

In this study, two ensemble learning methods—random forest and gradient boosting—are used to estimate the non-parametric function $g(time_i)$. This approach allows the analysis to address potential violations of the parallel trends assumption and obtain more robust estimates of the treatment effect β.

The estimation equation is as follows:

$$\Delta Y_{it} = \beta \cdot treat_{it} + g(time_i) + \epsilon_{it}.$$

Where ΔY_{it} denotes the change in the external debt-to-GDP ratio (percentage) for country i over the period (difference); $treat_{it}$ is the treatment dummy variable for international bond issuance, where 1 represents issuing countries and 0 non-issuing countries; β indicates the treatment effect, representing the causal impact of international bond issuance on the external debt-to-GDP ratio; $g(time_i)$ is the non-linear term dependent on the time covariate time, estimated by machine learning models and capturing complex temporal effects; and ϵ_{it} is the error term, including unobserved factors.

This methodological choice aligns with recent developments in causal inference in applied econometrics, where machine learning tools are increasingly integrated to strengthen identification under high-dimensional confounding.

4.2. Analyses Results

Table 3 shows that both the standard DiD and the DML analyses yield statistically significant values for the coefficient β. Moreover, β remains consistent across the three methods employed, underscoring the robustness of the findings. These results indicate that developing countries that began issuing international bonds exhibit higher levels of external debt than those that did not, reaching 19 percentage points after ten years.

4.3. Interpretation and Discussion of Results

There is a significant difference in external debt levels between the two groups, especially considering that the average external debt-to-GDP ratio for all sample countries was approximately 32% at the end of 2022. This highlights the need to examine how international

Table 3. Results of the DiD Analyses of External Debt

	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
(i) Standard	6.174***	8.804***	9.597***	12.270***	13.916***	15.710***	14.564**	15.165**	17.504**	19.401**
	(1.651)	(2.488)	(3.164)	(3.769)	(4.535)	(5.213)	(5.923)	(6.479)	(7.227)	(8.173)
(ii) DML using Random forest	6.023***	8.761***	9.530***	11.994***	13.506***	16.427***	14.356***	15.315***	16.589***	19.498***
	(1.102)	(2.009)	(1.541)	(2.223)	(2.514)	(3.240)	(2.820)	(2.609)	(4.402)	(4.179)
(iii) DML using Gradient Boosting	6.220***	8.988***	9.501***	12.722***	13.782***	15.849***	14.415***	14.728***	18.847***	19.807***
	(1.091)	(2.019)	(1.541)	(2.288)	(2.464)	(3.115)	(2.814)	(2.851)	(4.095)	(4.065)
Treated group	30	30	30	30	28	27	25	23	20	17
Control group	1435	1382	1329	1276	1223	1168	1112	1054	995	933
Adjusted R-squared in (i)	0.139	0.202	0.242	0.271	0.283	0.290	0.289	0.294	0.290	0.281
RMSE in (ii)	6.788	13.806	11.115	16.177	18.140	20.085	19.203	17.171	22.965	19.896
RMSE in (iii)	7.461	14.945	14.551	19.450	21.061	25.504	22.060	23.513	27.246	24.222

Note: Standard errors are reported in parentheses. *p < .1; **p < .05; ***p < .01.

bond issuance contributes to the rise in external debt. The analysis reveals a trend in which countries that begin issuing international bonds accumulate more debt. However, the underlying mechanism driving this increase remains unclear.

Examining the relationship between international bonds and other forms of external debt suggests three possible scenarios. The first involves an increase in external debt directly attributable to international bond issuance. In this case, an expanded lending base increases the capacity for risk absorption, thereby increasing debt for countries issuing international bonds. Assuming the levels of other external debt remain unchanged, the total external debt rises by the volume of international bonds issued.

In the second scenario, the increase in debt due to international bonds exceeds any reduction in other external debt forms. For instance, international bonds may offer lower borrowing costs (e.g., reduced interest rates), decreasing the debt repayment burden while increasing the absolute debt level. In this case, a substitution effect would likely lead to a relative decline in other external financing.

The third scenario involves an increase in other forms of external debt following international bond issuance, which could occur if bond issuance encourages additional indirect external borrowing through other channels.

These three scenarios suggest distinct movements in external debt beyond international bonds. Thus, changes in the composition of external debt could provide insights to help distinguish between them.

5. Analyses (2): International Bond Issuance and the Structure of External Debt

Building on the interpretation and discussion in Analyses (1), Analyses (2) focuses on changes in the composition of creditors following international bond issuance, aiming for a more detailed understanding of the factors driving changes in external debt.

5.1. Data and Analytical Framework

For the dependent variable in Analyses (1), the IDS dataset categorizes creditors into multilateral creditors, bilateral creditors, commercial banks, international bonds, and other private creditors. Each category, expressed as a percentage of GDP, is also used as a dependent variable in Analyses (2). All other conditions remain consistent with those described in Analyses (1).[5]

5.2. Analyses Results

The results of the analyses, presented in Table 4, yield similar values for coefficient β across the standard DiD and DML methods. Statistical significance was consistently observed across all three methods for international bonds. For multilateral creditors, the robust DML analyses confirmed statistical significance, indicating reliable results for this category. Overall, these findings indicate that developing countries issuing international bonds also exhibit higher levels of external borrowing from multilateral creditors, with this increase growing over time to approximately 7.5 percentage points after ten years. The statistically significant differences in international bonds and multilateral creditors revealed in Analyses (2) account for approximately 80% of the results in Analyses (1), as shown in Figure 2. In contrast, the coefficients for bilateral creditors, commercial banks, and other private creditors were not statistically significant, suggesting no notable changes in these categories following international bond issuance.[6]

5.3. Interpretation and Discussion of Results

The results from the creditor-level analysis yield two key insights into how international bond issuance affects external debt dynamics.

First, issuing international bonds does not lead to a corresponding decrease in other debt types, contributing to a net increase in external debt. The lack of statistical significance in the other debt components, except for multilateral creditors, suggests international bond issuance does not influence changes in these categories. Therefore, international bonds do not produce a substitution effect, resulting in an overall increase in external debt.

Governments issuing international bonds assume additional foreign currency-denominated market debt, exposing themselves to heightened market, exchange rate, and capital outflow risks. Market risk arises as countries with international bonds are subject to continuous market scrutiny (Olabisi & Stein, 2015), with bond yields fluctuating widely depending on global economic and political conditions. If yields rise at maturity, refinancing—or rolling over—these bonds may require higher yields or, in extreme cases, may become infeasible. Moreover, this forced transparency in international bond markets can lead to capital outflows or deficits in the financial account of the balance of payments during periods of widening credit spreads, increasing capital flight risk. Exchange rate risk arises because governments operating fiscal accounts in a domestic currency face inevitable currency mismatches when repaying foreign debt.

Table 4. Results of DiD Analyses on External Debts for Various Creditor Categories

Bilateral creditors

	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
(i) Standard	0.376	0.410	0.491	1.742	1.604	1.627	1.134	1.170	1.546	2.006
	(0.804)	(1.192)	(1.504)	(1.784)	(2.091)	(2.339)	(2.621)	(2.873)	(3.192)	(3.612)
(ii) DML using Random forest	0.329	0.531	0.502	1.876	1.472	1.588	1.184	1.281	1.184	1.856
	(0.435)	(0.967)	(1.035)	(1.442)	(1.316)	(1.369)	(1.356)	(1.589)	(2.147)	(2.361)
(iii) DML using Gradient Boosting	0.289	0.435	0.553	1.837	1.704	1.505	1.174	1.492	1.759	1.768
	(0.420)	(0.975)	(1.053)	(1.469)	(1.372)	(1.436)	(1.424)	(1.631)	(2.044)	(2.266)
Treated group	31	31	31	31	29	28	26	24	21	18
Control group	1,512	1,459	1,406	1,353	1,300	1,245	1, 189	1,131	1,071	1,008
Adjusted R-squared in (i)	0.082	0.120	0.149	0.173	0.189	0.196	0.198	0.201	0.195	0.188
RMSE in (ii)	2.711	6.544	6.119	9.159	8.596	8.159	8.453	8.667	10.723	11.291
RMSE in (iii)	3.063	8.155	7.183	9.846	9.132	9.620	10.413	11.138	12.811	13.500

Multilateral creditors

	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
(i) Standard	1.554	2.670*	3.384*	4.115*	4.888*	5.160	5.745	6.596	7.378	7.728
	(1.085)	(1.611)	(2.043)	(2.415)	(2.916)	(3.354)	(3.805)	(4.145)	(4.627)	(5.194)
(ii) DML using Random forest	1.580***	2.787***	3.451***	4.144***	4.919***	5.007***	5.770***	6.505***	6.760***	7.476***
	(0.461)	(0.599)	(0.722)	(0.794)	(0.908)	(1.049)	(1.246)	(1.386)	(1.505)	(1.620)
(iii) DML using Gradient Boosting	1.551***	2.680***	3.200***	3.935***	4.906***	5.817***	5.845***	6.254***	7.296***	7.670***
	(0.467)	(0.660)	(0.764)	(0.748)	(0.871)	(1.111)	(1.259)	(1.361)	(1.554)	(1.664)
Treated group	31	31	31	31	29	28	26	24	21	18
Control group	1,512	1,459	1,406	1,353	1,300	1,245	1, 189	1,131	1,071	1,008
Adjusted R-squared in (i)	0.092	0.144	0.167	0.174	0.167	0.163	0.161	0.165	0.161	0.153
RMSE in (ii)	2.578	2.862	3.025	4.237	5.263	5.684	6.275	7.026	7.330	7.414
RMSE in (iii)	2.732	2.986	3.932	7.066	6.454	5.979	7.557	8.667	8.422	8.666

Commercial banks

	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
(i) Standard	0.166	1.212***	1.048**	1.130**	1.203*	2.103***	1.363	1.287	1.165	1.165
	(0.242)	(0.377)	(0.480)	(0.564)	(0.649)	(0.752)	(0.849)	(0.942)	(1.068)	(1.215)
(ii) DML using Random forest	0.152	1.221	1.042	1.106	1.258	2.088	1.253	1.250	1.106	1.117
	(0.230)	(1.069)	(0.770)	(0.832)	(0.930)	(1.489)	(1.132)	(0.807)	(1.098)	(1.069)
(iii) DML using Gradient Boosting	0.155	1.181	1.130	1.028	1.158	2.085	1.321	1.158	1.142	1.200
	(0.230)	(1.075)	(0.773)	(0.837)	(0.940)	(1.500)	(1.137)	(0.806)	(1.086)	(1.060)
Treated group	31	31	31	31	29	28	26	24	21	18
Control group	1,512	1,459	1,406	1,353	1,300	1,245	1, 189	1,131	1,071	1,008
Adjusted R-squared in (i)	0.001	0.015	0.014	0.018	0.023	0.031	0.029	0.028	0.026	0.022
RMSE in (ii)	1.275	6.213	4.359	4.784	5.170	8.164	5.848	3.784	5.234	4.521
RMSE in (iii)	1.268	6.278	4.578	4.956	5.165	8.264	5.714	4.113	5.056	4.533

International bonds

	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
(i) Standard	2.378***	4.239***	4.729***	5.206***	6.039***	6.654***	6.206***	5.957***	6.887***	8.113***
	(0.085)	(0.138)	(0.204)	(0.272)	(0.361)	(0.462)	(0.564)	(0.660)	(0.780)	(0.931)
(ii) DML using Random forest	2.382***	4.252***	4.738***	5.162***	6.111***	6.660***	6.202***	6.104***	6.854***	8.181***
	(0.588)	(0.597)	(0.646)	(0.774)	(1.066)	(1.358)	(1.313)	(1.304)	(1.543)	(1.893)
(iii) DML using Gradient Boosting	2.382***	4.265***	4.738***	5.230***	6.111***	6.724***	6.234***	5.921***	6.821***	8.185***
	(0.588)	(0.598)	(0.649)	(0.775)	(1.067)	(1.363)	(1.319)	(1.309)	(1.545)	(1.877)
Treated group	31	31	31	31	29	28	26	24	21	18
Control group	1,512	1,459	1,406	1,353	1,300	1,245	1, 189	1,131	1,071	1,008
Adjusted R-squared in (i)	0.345	0.399	0.286	0.229	0.197	0.165	0.117	0.093	0.094	0.094
RMSE in (ii)	3.539	3.756	4.160	4.817	6.207	7.609	6.991	6.711	7.638	8.356
RMSE in (iii)	3.593	3.988	4.385	5.408	7.016	8.481	7.385	7.303	7.496	8.765

Table 4. Continued

Other private creditors

	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
(i) Standard	1.828***	0.337	0.101	0.101	0.135	0.144	0.046	0.001	0.253	0.319
	(0.210)	(0.338)	(0.412)	(0.469)	(0.539)	(0.600)	(0.664)	(0.724)	(0.813)	(0.917)
(ii) DML using Random forest	1.812***	0.296	0.123	0.081	0.106	0.101	0.020	0.086	0.243	0.360
	(0.420)	(0.362)	(0.211)	(0.227)	(0.355)	(0.381)	(0.425)	(0.487)	(0.613)	(0.603)
(iii) DML using Gradient Boosting	1.831***	0.369	0.051	0.075	0.185	0.068	0.049	0.155	0.286	0.394
	(0.424)	(0.365)	(0.208)	(0.225)	(0.359)	(0.379)	(0.424)	(0.475)	(0.610)	(0.591)
Treated group	30	30	30	30	28	27	25	23	20	17
Control group	1,435	1,382	1,329	1,276	1,223	1,168	1,112	1,054	995	933
Adjusted R-squared in (i)	0.058	0.016	0.023	0.031	0.035	0.035	0.036	0.038	0.036	0.034
RMSE in (ii)	2.484	1.961	1.122	1.149	1.810	1.866	1.961	2.321	2.677	2.565
RMSE in (iii)	2.277	2.096	1.082	1.119	1.888	1.928	2.412	2.323	2.831	2.628

Note: Standard errors are reported in parentheses. *p < .1; **p < .05; ***p < .01.

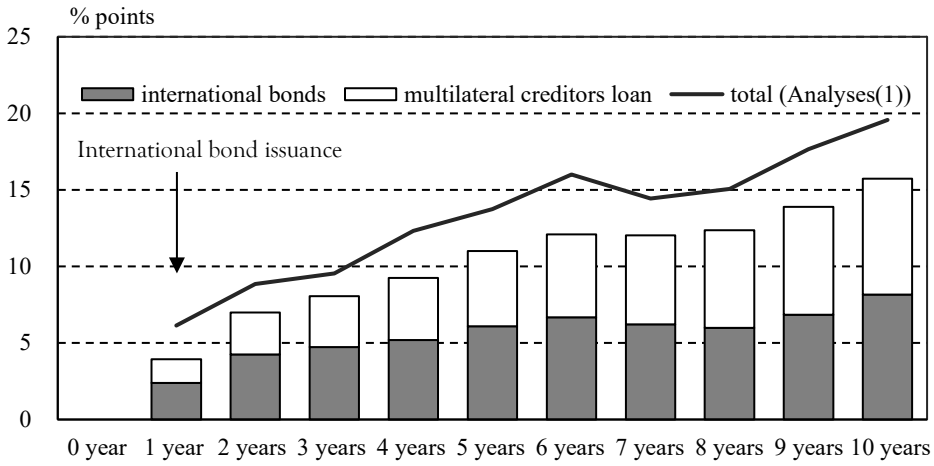

Fig. 2 External Debt Increase After International Bond Issuance

The second insight is that governments that begin issuing international bonds show a statistically significant increase in borrowing from multilateral creditors compared to non-issuing governments after the issuance. Multilateral creditors generally provide concessional financial support at the request of developing countries. This result implies that countries issuing international bonds will likely seek additional financial assistance from international institutions. However, it is difficult to identify the direct factors behind this dynamism, particularly as this finding contradicts assumptions in previous studies. Earlier literature has suggested that international bond issuance is an attractive option for countries anticipating reduced concessional financing—such as from expected changes in income classification—and is intended to compensate for such financing gaps (Guscina, 2014). Multilateral creditors may also evaluate the track record of international bond issuance when deciding whether to lend and act in a way that positively considers this decision.

As noted, developing countries initiating international bond issuance have experienced increased external debt levels through the net increase attributable to international bonds and additional borrowing from multilateral creditors. In this process, these countries are likely to experience greater risks associated with international bonds when considering risks stemming from external debt. Like other forms of debt, government external debt secures current funds based on anticipated future cash flows. When future repayment prospects are assured, borrowing can promote economic growth and is therefore beneficial. Conversely, the inability to secure necessary external debt may hinder the growth of a country and is considered undesirable. This raises the question of whether the external debt of developing countries that have begun issuing international bonds can be considered sustainable and appropriate borrowing.

To assess this, the GDP growth rates of the treatment and control groups were compared to determine whether any statistically significant differences exist. If higher external debts were associated with greater economic growth, such borrowing should not necessarily be viewed negatively. However, DiD analyses reveal no statistically significant differences in growth outcomes (Table 5). In statistical terms, there is no evidence that countries initiating international bond issuance have achieved better economic growth. This conclusion is further supported by the similar distributions of per capita GDP across the two groups (Figure 3).

Figure 4 compares the results of the Debt Sustainability Analysis conducted by the World Bank and the IMF for the treatment group (countries issuing international bonds) and the control group (countries not issuing international bonds). Examining the risk of external debt distress reveals that the treatment group is more likely to be categorized as “high risk” or “in distress” compared to the control group. Additionally, when considering overall debt, which includes domestic debt, the treatment group has a higher proportion of cases categorized as “in distress.”

Taken together, these results provide stronger support for the second scenario outlined in

Table 5. Results of DiD Analyses on Real GDP Growth Rates

	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
(i) Standard	−9.584	−25.904*	−24.647	−25.219	−16.969	−19.539	−10.448	6.405	48.500	23.661
	(8.584)	(14.092)	(18.500)	(22.452)	(26.717)	(30.875)	(36.139)	(40.905)	(47.337)	(54.341)
(ii) DML using Random forest	−10.316	−23.679	−26.581	−24.024	−16.542	−18.733	−11.868	0.199	48.926	17.896
	(19.064)	(35.436)	(36.485)	(36.974)	(42.217)	(53.830)	(61.283)	(49.874)	(51.697)	(45.394)
(iii) DML using Gradient Boosting	−10.974	−26.838	−23.528	−29.986	−20.859	−16.323	−10.868	4.622	48.917	32.457
	(18.883)	(35.375)	(36.804)	(36.854)	(42.511)	(53.803)	(61.142)	(51.641)	(52.048)	(44.850)
Treated group	30	30	30	30	28	27	25	23	20	17
Control group	1392	1340	1288	1236	1184	1130	1075	1018	959	897
Adjusted R-squared in (i)	0.163	0.151	0.130	0.127	0.127	0.123	0.119	0.113	0.095	0.070
RMSE in (ii)	112.212	212.952	211.056	218.204	252.298	298.703	331.542	266.356	224.113	187.068
RMSE in (iii)	117.124	212.822	211.862	233.418	266.115	317.394	381.068	281.182	232.188	200.270

Data: World Bank, World Development Indicators

Note: Standard errors are reported in parentheses. *p < .1; **p < .05; ***p < .01.

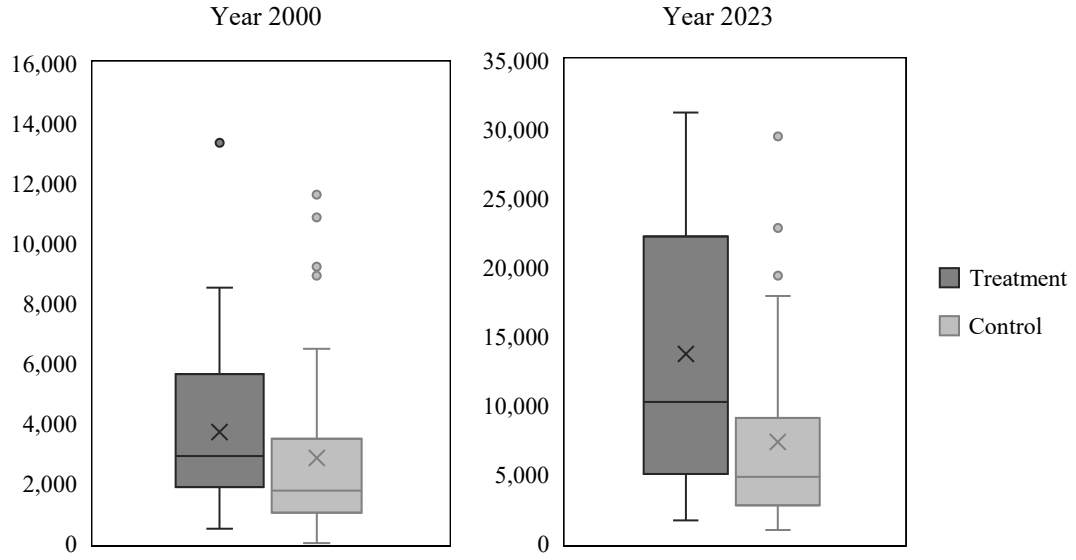

Fig. 3 GDP Per Capita Distributions
Data: World Bank, World Development Indicators

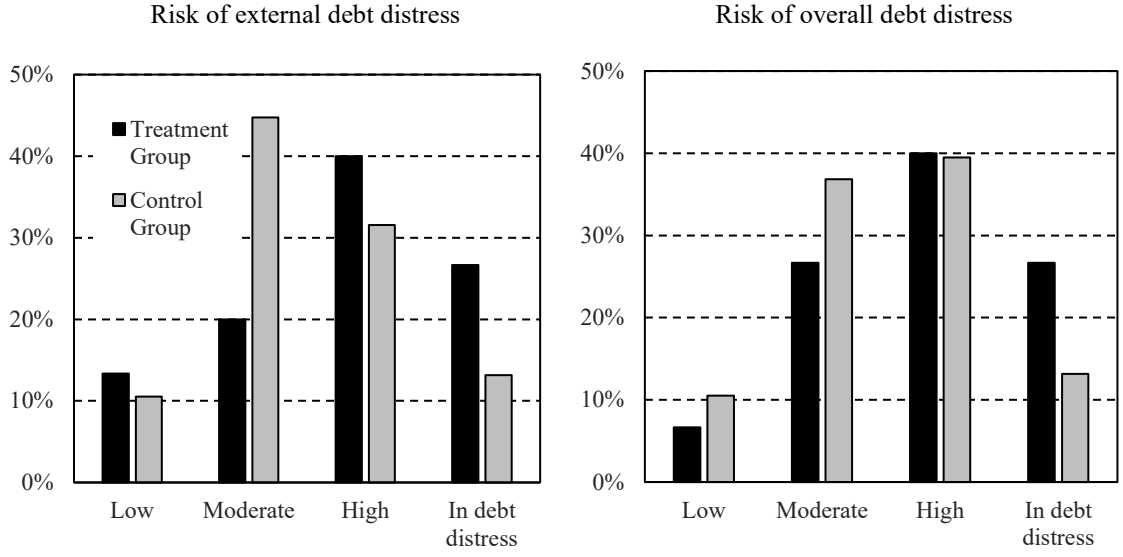

Fig. 4 Debt Sustainability Analysis Results
Data: International Monetary Fund
Note: The World Bank Group and the IMF work with low-income countries to produce regular debt sustainability analyses, which are structured examinations of developing countries' debt based on the Debt Sustainability Framework (Wyplosz, 2007). The data is as of the end of July 2024.

Section 2.4—namely, that unmet financing needs, rather than the substitution of other debt sources, have driven the observed net increase in external debt following the initiation of international bond issuance.

6. Conclusion

This study finds that developing countries initiating international bond issuance tend to exhibit significantly higher external debt levels than those that do not, with debt increasing by

approximately 19 percentage points over a ten-year period. This rise is attributable not only to the newly issued international bonds but also to increased borrowing from multilateral creditors. This finding implies that countries issuing international bonds are likelier to bear higher external debt—a reality that differs somewhat from the assumptions in earlier literature, which often framed international bond issuance as a substitute for concessional financing from official creditors. Instead, these observed trends align with the latter pattern identified in Section 2.4—namely, that the governments of developing countries still have unmet financing needs and have been able to fulfill them through diversifying funding sources, driving the net increase in external debt. Furthermore, as market-based financing generally entails higher costs than other funding options, even under the most favorable market conditions, it can be inferred that expanding the funding pool has enabled lenders to take on greater risk, facilitating increased borrowing.

No statistically significant differences in GDP growth rates or per capita GDP were observed between issuing and non-issuing countries when examining whether this expansion in external borrowing positively contributes to economic outcomes. Additionally, the debt sustainability analyses conducted by the IMF and the World Bank for these countries indicate that higher levels of external debt are associated with elevated risks of debt distress, with implications for external liabilities and the overall government debt portfolio.

These findings offer valuable insights for debt and credit management in the context of international bond issuance, with policy implications for both developing countries and their creditors. The suitability of increased external borrowing through diversified financing channels ultimately hinges on a country's fiscal discipline, debt transparency, and institutional capacity for risk management. While issuing international bonds can be an effective means to mobilize capital for development, infrastructure, or countercyclical needs, these benefits can quickly be outweighed if borrowing exceeds sustainable levels or if market sentiment shifts abruptly.

The case of Ghana illustrates this point vividly. Despite a series of successful international bond issuances throughout the 2010s, Ghana's growing reliance on market-based financing left it increasingly vulnerable to shifts in global financial conditions. When interest rates rose and investor confidence weakened, the country lost access to markets and defaulted in 2022. This real-world episode is consistent with the empirical finding of this study that international bond issuance tends to heighten debt vulnerabilities when not accompanied by sufficient risk management.

More generally, the results suggest that developing countries' issuance of international bonds is best understood as part of a broader debt management strategy, in which refinancing and exchange rate risks require particular attention. The observed association between issuance and

higher external debt levels highlights the need for careful calibration of borrowing decisions to fiscal capacity and institutional strength.

For creditors and investors, the findings imply that the mere presence of international bonds should not be taken as a direct signal of sovereign creditworthiness. Instead, a more comprehensive evaluation that considers macroeconomic fundamentals, debt sustainability indicators, and institutional robustness is necessary. At the same time, it is recognized that actual policy responses and market behavior depend on country-specific circumstances and prevailing financial conditions, which may limit the applicability of these implications uniformly across all cases.

NOTES

1. International bonds are issued by various entities; however, this study focuses on those issued by governments in developing countries. Such bonds are often simply referred to as *sovereign bonds* in the literature.
2. A significant factor behind this trend is the increase in emerging market index funds, such as JP Morgan's Emerging Market Bond Index, which are accessible to individual investors.
3. However, this does not necessarily translate into greater debt stability for the borrowing government. Broader market access may ease short-term financing constraints, but it also increases exposure to exchange rate and market volatility risks, particularly when macroeconomic fundamentals and foreign-currency-earning capacities remain unchanged.
4. A prominent feature of recent debt developments in many developing countries is the growing role of lending from China. In the IDS dataset used in this study, Chinese debt is not separately identified but is partly classified under Private Creditors and partly under Bilateral Creditors. While Chinese debt is therefore implicitly included within the aggregated creditor categories analyzed in this study, its effects cannot be explicitly disentangled in the present framework.
5. Due to the availability of IDS data, the sample size slightly differs from that of Analyses (1).
6. Statistical significance is observed for commercial banks in the standard analysis; however, the DML analysis does not show statistical significance. Thus, the results from the latter were adopted.

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