# Fiscal Guardrails against High Debt and Looming Spending Pressures

## Staff Discussion Note No. SDN/2025/004

# Technical Annexes

# Annex 1. Correction Mechanisms and Sovereign Risks[1]

This annex analyzes the impact of fiscal rules with clearly specified automatic correction mechanisms on sovereign spreads. The empirical analysis presents findings from six countries that have adopted this approach: Armenia, Costa Rica, Cyprus, Czech Republic, Poland, and Slovak Republic. The analysis focuses on these countries because their fiscal rules prespecify a gradual tightening of the fiscal stance through concrete measures as the debt-to-GDP ratio increases above prespecified thresholds (Annex Table 1.1).

**Estimation methodology**. By taking a synthetic combination of untreated countries (the donor pool) as in Lang, Mihalyi, and Presbitero (2023), the synthetic controls often match the characteristics of treated countries in the pre-intervention period better than single unaffected countries. The treatment period is set as the date when the country has its fiscal rule with automatic correction mechanisms approved by Congress. The methodology provides more appropriate counterfactuals because it generates a weighted average of the untreated countries in the donor pool, optimizing the weight for each comparable country (often including weights of zero for many countries). Then, the outcomes for the synthetic country are projected into the post-treatment period using the same weights. Following the notation in Abadie (2021), the treated country is the first unit ($c = 1$); the donor pool is the set of potential comparisons, $c = 2,..,C+1$. The outcome variable ($Y_{ct}$) is the sovereign spreads. The SC estimator (that is, the treatment effect on the treated country ($c = 1$) at time $t$) is then estimated by:

$$\hat{\tau}_{1t} = Y_{1t} - \sum_{c=2}^{C+1} w_c Y_{ct}.$$

(2.1)

The weights, $\mathbf{W}=(w_2, \ldots, w_{c+1})$, are restricted to sum to one and to be nonnegative. They are chosen to minimize:

$$\|\mathbf{X}_1 - \mathbf{X}_0\mathbf{W}\| = \left( \sum_{h=1}^{k} v_h (X_{h1} - w_2 X_{h2} - \cdots - w_{C+1} X_{hC+1})^2 \right)^{1/2}.$$

(2.2)

Minimizing this expression ensures that the best resembles the pre-intervention values of the outcome predictors for the treated unit ($\mathbf{X}_1$). The matrix $\mathbf{X}_0 = [\mathbf{X}_2 \ldots \mathbf{X}_{c+1}]$ collects the values of the predictors for the untreated units, which may include pre-intervention values of the outcome. The positive constants, $v_1, ..., v_k$, reflect the relative importance of the k predictors $X_{11}, ..., X_{k1}$ for predicting $Y_{1t}$.

The analysis considers all countries with available data on sovereign bond spreads and excludes countries with spreads greater than 4,000 basis points from the donor pool because those could be countries in debt distress and therefore less relevant for the cases considered here. The baseline treatment is the official legislative approval by parliaments of the fiscal rule with a clearly specified automatic correction mechanism component. The synthetic country is constructed using the sovereign spreads on seven specific dates that correspond to the last weekly spread and the past six-month-end weekly spreads preceding the legislative approval of the fiscal rule. As a robustness check, synthetic controls are constructed using a set of pretreatment characteristics that include standard macroeconomic variables (GDP growth, public debt, fiscal balance, current account balance, and international reserves) in addition to the sovereign spread. This did not change the main results (Annex Figure 1.3).

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[1] Prepared by Julien Acalin, Leonardo Martinez, and Francisco Roch.

**Data**. The sample includes weekly data on sovereign bond spreads from April 27, 2012, to November 3, 2023, for all available countries, sourced from the IMF Sovereign Spread Monitor (SSM) and credit default swap (CDS) spread data from Bloomberg Finance L.P. Data on the sovereign spread monitor are based on the weighted average of sovereign bonds with remaining maturity more than one year. Macroeconomic indicators are based on October 2024 vintage of IMF World Economic Outlook (WEO) database. Given the limitations coming from data availability, the analysis uses the SSM spreads for Armenia, Costa Rica, Cyprus, and Czech Republic. For Poland and Slovakia, for which the SSM spread was not available by the time they approved their fiscal rule with automatic correction mechanisms, the authors use credit default swap spreads.

**Annex Figure 1.1. Sovereign Spreads Differentials – Placebo Tests**
(Difference in spreads in logarithms)
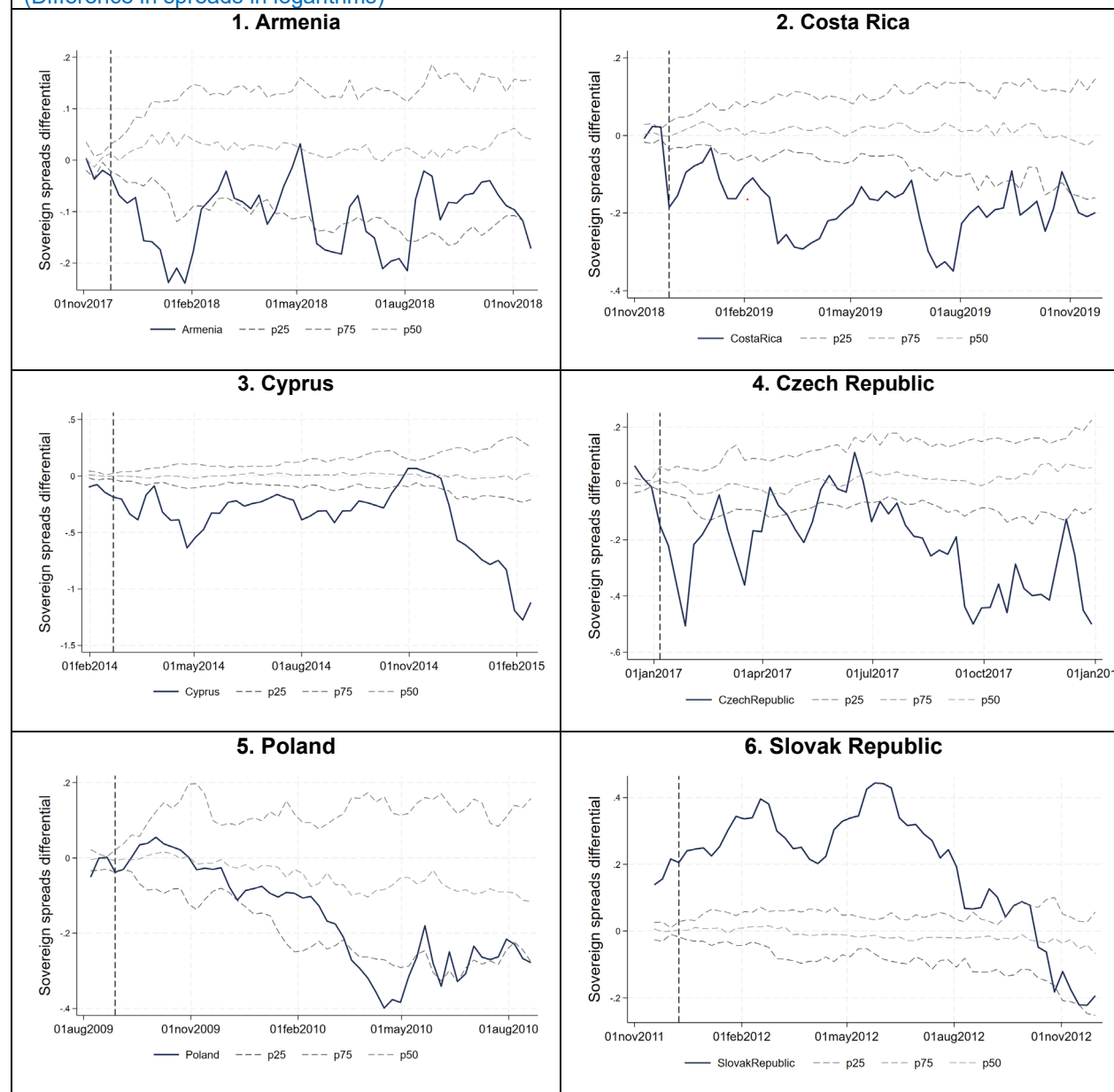


Source: Acalin, Martinez, and Roch 2025.
Note: The panels show the country-specific log spread difference (solid line) and the median and interquartile range of the placebo effect using the donor pool countries as treated units (dotted lines).

**Results**. Main results show that sovereign spreads tend to decline persistently for all six countries with a robust correction mechanism in their fiscal rules relative to the synthetic control groups, suggesting that these types of rules are effective at mitigating sovereign risks. The analysis includes an in-space placebo test to show the robustness of results. The authors assign the treatment to the donor pool countries. If the drop in spreads is the result of events unrelated to fiscal rules with prespecified correction mechanisms, this falsification test should show similar results to the baseline. Annex Figure 1.1 shows the log spread differential against its synthetic control, which dropped in all six countries, relative to country-specific panels with the median and interquartile range for the falsification tests, shortly after the approval of their fiscal rule.[2] In all placebo falsification tests for all six countries, the median gap is very close to zero for the post-treatment period (Annex Figure 1.1). It is evident that the log spread difference estimated lies below the interquartile range for all countries, except for Slovakia prior to the entry into force of the rule, confirming that the effect related to the approval of the fiscal rule with prespecified correction mechanisms is economically meaningful and significant.
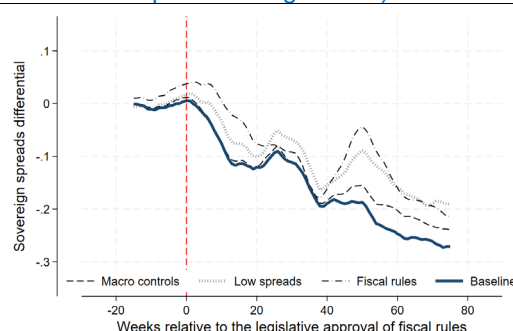
*Sensitivity analysis.* Annex Figure 1.3 reports the median effect in our baseline analysis and compares it to the median effects across scenarios: (1) assuming that countries are matched based on pretreatment characteristics that includes standard macroeconomic variables (GDP growth, public debt, fiscal balance, current account balance, and international reserves) in addition to the sovereign spread (dashed line); (2) excluding countries with spread greater than 1,500 basis points from the donor pool (dotted line); and (3) including only countries with a fiscal rule, but without a robust correction mechanism, in the donor pool (dash-dotted line). The median effect is estimated lower when the sample includes only countries with a fiscal rule in the donor pool, suggesting a spread compressing effect of fiscal rules. In contrast, fiscal rules with a clearly specified automatic correction mechanism further compress the sovereign spread beyond the effect of having a fiscal rule, with a median additional effect at 20 percent after a year.

The section further analyzes the persistence on the empirical relationship between the presence of a fiscal rule with clearly specified automatic correction mechanisms and government bond yield spreads. The empirical strategy builds upon a large literature on the determinants of sovereign spreads (Afonso and Guimarães 2015; Heinemann, Osterloh, and Kalb 2014; Iara and Wolff 2014). A key objective in the analysis is to compare levels of sovereign spreads for countries with a fiscal rule with a robust correction mechanism to other countries with no fiscal rule. The baseline specification takes the following:



**Annex Figure 1.3. Sovereign Spreads Differentials—Sensitivity Analysis**
(Difference in spreads in logarithms)

Source: Acalin, Martinez, and Roch 2025.
Note: The horizontal axis shows the median log spread (12-week moving average) difference between countries under study in the sample and their respective synthetic control group under different assumptions. The figure compares the median effect in our baseline analysis (solid line) to the median effects (1) assuming that countries are matched based on pretreatment characteristics that includes standard macroeconomic variables (GDP growth, public debt, fiscal balance, current account balance, and international reserves) in addition to the sovereign spread (dashed line); (2) excluding countries with spread greater than 1,500 basis points at any point in time from the donor pool (dotted line); and (3) including only countries with a fiscal rule in the donor pool (dash-dotted line).

$$\text{Spread}_{i,t} = \alpha + \beta \text{Spread}_{i,t-1} + \sum \beta_j \, X_{j,i,t} + \beta_{\text{FR}} \, \text{FR}_{i,t} + \beta_{\text{RCM}} \, \text{RCM}_{i,t} + \gamma_i + \mu_t + \epsilon_{i,t} \qquad (2.3)$$

where *Spread(i,t)* denotes the logged sovereign spread for country *i* at time *t*, *FR(i,t),* and *RCM(i,t)* are dummies for, respectively, the presence of a fiscal rule and the presence of a clearly specified explicit automatic correction mechanisms (for Armenia, Costa Rica, Cyprus, Czech Republic, Poland, and

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[2] Specifically, the sovereign spreads were already declining in Cyprus prior to the approval, suggesting some market anticipation at a time of an IMF program. By contrast, the spread differentials increased in Slovak Republic after the approval of the fiscal rule with automatic correction mechanism but then started to drop after its entry into force in March 2012.

Slovakia) in country *i* at time *t*. Note that RCM is a subset of *FR*. Thus, for the six countries under study the two dummies are equal to 1 after the legislative approval of their robust fiscal rule. *X(i,t)* is a set of country-specific macroeconomic controls, γ(t) denotes country fixed effects, and μ(t) denotes time specific controls.

Drawing from the literature on determinants of sovereign spreads, the following macroeconomic variables are included as country-specific controls: GDP growth, debt and primary balance to GDP ratios, reserves and current account as a share of GDP. Given markets react to contemporaneous available information, we use current values for the flow variables (GDP growth, primary balance-GDP ratio, and current account-GDP ratio) and lagged values for the stock variables (debt-GDP ratio and reserves-GDP ratio). Including all variables with their lagged value does not change our results. The regression also includes two global factors, which are common drivers of global rates as controls (Chicago Board Options Exchange Volatility Index [VIX] and US federal funds rate).

The benchmark model is estimated for a panel of 99 countries during 2012–23. The spread variable comes from the IMF Spread Monitor. Information on fiscal rules and correction mechanism is based on IMF Fiscal Rules Database:1985–2024. Other macro-fiscal variables are obtained from the IMF WEO database. The estimation is on an annual basis, which filters the noise from large variations in the financial markets.

In a dynamic specification, the presence of the lag of the dependent variable might introduce an endogeneity bias. A system generalized method of moments (GMM) estimator shows a lower bias and higher efficiency than other typical estimators, including widely used fixed effect and first-differences GMM estimators (Iara and Wolff 2014). Following Kalan, Popescu, and Reynaud (2018), a dynamic panel regression at the annual frequency is estimated using a system generalized GMM estimator. The system GMM is implemented using Roodman's procedure (Roodman 2009).[3]

The results are reported in Annex Table 1.2 for the full sample of countries and Annex Table 1.3 for the restricted sample of countries excluding 10 countries with spreads greater than 4,000 basis points at any point in time.[4] In both tables, the ordinary least squares (OLS) results are presented in columns (1) to (3) and the GMM results in columns (4)–(11). In most regressions, the AR(1) and AR(2) results support the validity to use GMM, as residuals are autocorrelated in the first but not in the second lag. To avoid overspecification in the GMM models, the analysis collapses the matrix of instruments and restricts the set of internal instruments. The Hansen test further supports that the instruments as groups are exogenous in both our parsimonious specifications and in the full specification with time fixed effects. The estimation results are in line with the previous literature using similar models of spread determination. Lower growth rates, higher current account deficits, higher global uncertainty, and higher global interest rates put upward pressure on spreads. The lagged levels of debt and reserves are not significant.

In both the OLS and GMM estimations, the RCM dummy is negative and significant. The results are more nuanced for the fiscal rule dummy, especially when excluding outliers. This is consistent with the fact that fiscal rules with a robust correction mechanism have an economically and statistically significant

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[3] The analyses model the following variables as strictly exogenous covariates: GDP growth, lagged reserves-GDP ratio, current account-GDP ratio, the VIX and the FFR, and the FR and RCM dummies. The authors further treat as predetermined variables the lagged spread and debt-GDP, based on the fact that they are potentially correlated with past errors—so these are instrumented GMM-style using first lag and deeper. The primary balance-GDP ratio is considered as an endogenous variable, as this variable is potentially correlated with present errors—so this is instrumented GMM-style using second lag and deeper. Further specification choices key to system GMM include lag length, applied transformation, and finite-sample correction. With GMM with a T of up to 12, the number of instruments could be very large (quadratic in T), which makes it be necessary to reduce the number of instruments through restricting the number of lags (only the second to forth lags are to be used in constructing the GMM instruments). In terms of transformation, the preferred specification uses the forward orthogonal deviations transformation and makes the finite-sample correction to the two-step covariance matrix proposed by Windmeijer (2005). To avoid the concern of overfitting the instruments, the results report a parsimonious specification that only controls for the growth rate and the current account balance ratio, which are the two statistically significant controls in the full specification.

[4] The outliers are Belarus, Ecuador, Ethiopia, Lebanon, Pakistan, Russia, Sri Lanka, Tunisia, Ukraine, and Zambia.

effect in compressing spreads. Focusing on the parsimonious specification with time-fixed effects in column 10, the authors find that fiscal rules with a robust correction mechanism are associated with a long-term decline of 25 percent in sovereign spread (exp (–0.165–0.165)–1 = ~25 percent). The marginal effect of the presence of a robust correction mechanism is about 15 percent (exp (–0.165)–1 = ~15 percent), consistent with previous findings from the synthetic control analysis. The results are robust to excluding countries that had a spread above 4,000 basis points at any point over the sample period (Annex Table 1.3).

### Annex Table 1.2 – Dynamic Panel Regressions – Full Sample

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dependent variable: ln(spread) | Ordinary Least Squares | | | Generalized Method of Moments - Instrumental Variables | | | | | | | |
| Fiscal Rule Dummy | -0.174*** [0.063] | | -0.181*** [0.063] | -0.062 [0.060] | | -0.147** [0.066] | | -0.045 [0.037] | | -0.165** [0.079] | |
| Robust Correction Mechanism Dummy | | -0.239** [0.094] | -0.248*** [0.094] | -0.184** [0.078] | -0.204*** [0.076] | -0.162** [0.063] | -0.196*** [0.064] | -0.136*** [0.046] | -0.148*** [0.048] | -0.165** [0.064] | -0.193*** [0.067] |
| Growth Rate | -0.022*** | -0.022*** | -0.022*** | -0.025*** | -0.025*** | -0.021*** | -0.019*** | -0.015*** | -0.015*** | -0.023*** | -0.023*** |
| Current Account-GDP | -0.005 | -0.006* | -0.006* | -0.021*** | -0.020*** | -0.015*** | -0.014*** | -0.011*** | -0.011*** | -0.016*** | -0.014*** |
| Lagged Debt-GDP | -0.000 | -0.000 | -0.000 | 0.001 | 0.001 | 0.002 | 0.002 | | | | |
| Primary Balance-GDP | 0.001 | 0.001 | 0.001 | 0.041*** | 0.040*** | 0.001 | -0.001 | | | | |
| Lagged Reserves-GDP | 0.001 | 0.002 | 0.002 | -0.002 | -0.002 | -0.000 | 0.001 | | | | |
| VIX | 0.024*** | 0.024*** | 0.024*** | 0.034*** | 0.034*** | | | 0.028*** | 0.028*** | | |
| Federal Fund Rate | 0.077*** | 0.077*** | 0.077*** | 0.054*** | 0.058*** | | | 0.090*** | 0.091*** | | |
| Lagged ln(spread) | 0.715*** | 0.711*** | 0.706*** | 0.896*** | 0.909*** | 0.817*** | 0.846*** | 0.950*** | 0.955*** | 0.791*** | 0.832*** |
| Constant | 1.164*** | 1.074*** | 1.202*** | 0.054 | -0.056 | 0.791** | 0.489* | -0.250 | -0.305 | 1.073** | 0.740* |
| Observations | 874 | 874 | 874 | 875 | 875 | 875 | 875 | 875 | 875 | 875 | 875 |
| No. of countries | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| R-squared | 0.941 | 0.941 | 0.941 | | | | | | | | |
| R-squared_within | 0.508 | 0.508 | 0.511 | | | | | | | | |
| Country FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year FE | NO | NO | NO | NO | NO | YES | YES | NO | NO | YES | YES |
| No. of instruments | | | | 18 | 17 | 25 | 24 | 10 | 9 | 17 | 16 |
| AR(1) p-value | | | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| AR(2) p-value | | | | 0.142 | 0.150 | 0.311 | 0.304 | 0.078 | 0.081 | 0.322 | 0.340 |
| Hansen p-value | | | | 0.002 | 0.003 | 0.670 | 0.650 | 0.100 | 0.109 | 0.547 | 0.398 |

(1)-(3): Ordinary least squares regressions estimations with robust standard errors.
(4)-(11): System generalized method of moments two-step robust estimations with the Windmeijer finite-sample correction.

Source: Authors' estimates.
Note: VIX = Chicago Board Options Exchange Volatility Index.

### Annex Table 1.3 – Dynamic Panel Regressions - Excluding Outliers

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dependent variable: ln(spread) | Ordinary Least Squares | | | Generalized Method of Moments - Instrumental Variables | | | | | | | |
| Fiscal Rule Dummy | -0.159** [0.069] | | -0.166** [0.068] | -0.111* [0.056] | | -0.069 [0.048] | | -0.077 [0.055] | | -0.103* [0.056] | |
| Robust Correction Mechanism Dummy | | -0.215** [0.099] | -0.224** [0.100] | -0.157** [0.065] | -0.182*** [0.068] | -0.118** [0.050] | -0.138*** [0.049] | -0.142*** [0.050] | -0.157*** [0.052] | -0.120** [0.050] | -0.141*** [0.052] |
| Growth Rate | -0.013*** | -0.013*** | -0.013*** | -0.022*** | -0.022*** | -0.005 | -0.004 | -0.011*** | -0.012*** | -0.008** | -0.008** |
| Current Account-GDP | -0.012*** | -0.012*** | -0.012*** | -0.025*** | -0.024*** | -0.013*** | -0.013*** | -0.014*** | -0.014*** | -0.015*** | -0.014*** |
| Lagged Debt-GDP | -0.002 | -0.002 | -0.002 | 0.000 | 0.000 | 0.002 | 0.002 | | | | |
| Primary Balance-GDP | 0.006 | 0.006 | 0.007 | 0.041** | 0.041** | -0.004 | -0.006 | | | | |
| Lagged Reserves-GDP | -0.003 | -0.002 | -0.002 | -0.001 | -0.001 | 0.002 | 0.002 | | | | |
| VIX | 0.023*** | 0.023*** | 0.023*** | 0.032*** | 0.032*** | | | 0.025*** | 0.025*** | | |
| Federal Fund Rate | 0.052*** | 0.052*** | 0.052*** | 0.050** | 0.053** | | | 0.084*** | 0.086*** | | |
| Lagged ln(spread) | 0.674*** | 0.670*** | 0.665*** | 0.890*** | 0.917*** | 0.884*** | 0.892*** | 0.886*** | 0.902*** | 0.865*** | 0.885*** |
| Constant | 1.487*** | 1.394*** | 1.516*** | 0.107 | -0.106 | 0.127 | 0.017 | 0.122 | -0.007 | 0.493 | 0.320 |
| Observations | 776 | 776 | 776 | 777 | 777 | 777 | 777 | 777 | 777 | 777 | 777 |
| No. of countries | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| R-squared | 0.948 | 0.949 | 0.949 | | | | | | | | |
| R-squared_within | 0.454 | 0.454 | 0.458 | | | | | | | | |
| Country FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year FE | NO | NO | NO | NO | NO | YES | YES | NO | NO | YES | YES |
| No. of instruments | | | | 18 | 17 | 25 | 24 | 10 | 9 | 17 | 16 |
| AR(1) p-value | | | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| AR(2) p-value | | | | 0.195 | 0.212 | 0.460 | 0.456 | 0.145 | 0.151 | 0.480 | 0.490 |
| Hansen p-value | | | | 0.000 | 0.000 | 0.397 | 0.453 | 0.643 | 0.670 | 0.601 | 0.603 |

(1)-(3): Ordinary least squares regressions estimations with robust standard errors.
(4)-(11): System generalized method of moments two-step robust estimations with the Windmeijer finite-sample correction.

Source: Authors' estimates.
Note: Estimation excludes outliers for countries with spread greater than 4,000 basis points. Note: VIX = Chicago Board Options Exchange Volatility Index.

## Annex Table 1.1. Fiscal Rules and Correction Mechanisms in Selected Countries

| | Armenia | Costa Rica | Cyprus | Czech Republic | Slovak Republic | Poland |
|---|---|---|---|---|---|---|
| **Date of legislative approval** for the correction mechanism | November 23, 2017 | December 3, 2018 | February 21, 2014 | January 2017 | December 8, 2011 | August 27, 2009 |
| **Fiscal Anchor** | Debt anchor at 60 percent of GDP | Debt anchor at 60 percent of GDP | Debt anchor at 60 percent of GDP | Debt anchor at 55 percent of GDP | Debt anchor at 60 percent of GDP (starting in 2018, the cap is reduced by one percentage point each year to reach 50 percent of GDP in 2027). | Debt anchor at 60 percent of GDP |
| **Correction Mechanisms** | The Laws on the Budget System and Public Debt Laws consider three thresholds for debt at 40, 50, and 60 percent of GDP. When actual debt exceeds each threshold, the Law requires the government to take correction actions.<br><br>• 40 percent of GDP. The overall deficit should not be greater than capital expenditures.<br>• Between 50 and 60 percent of GDP. In addition to the previous rule, the growth rate of primary current expenditures is capped at the average nominal GDP growth of the previous seven years. The government must introduce a debt reduction program, as part of the MTFF.<br>• Exceeding 60 percent of GDP. In addition to the previous two rules, the primary current expenditures are capped at the average nominal GDP growth of the previous seven years, minus 0.5 percentage points. Current expenditures are capped by the anticipated tax revenues and the government must submit a debt reduction plan to parliament. | The correction mechanism sets a tighter expenditure limit as debt reaches higher levels.<br>• The expenditure limits on the growth of current expenditures are set at 100, 85, and 75 percent of the average GDP growth over the previous four years when debt is below 30, between 30 to 45, and between 45 to 60 percent of GDP, respectively. The ceiling on total spending growth is set at 65 percent of the same benchmark when debt is above 60 percent of GDP.<br>• When debt exceeds 60 percent of GDP, additional measures need to include: (1) no adjustment on pension except for cost of living, and (2) no cost-of-living adjustments to the public sector base salaries or other salary incentives.<br>• If real GDP growth exceeds 6 percent for two consecutive years, the ceilings on current spending growth limit can be set not exceeding 85 percent of average nominal GDP growth of previous four years. | The 2014 Fiscal Responsibility and Budget Systems Law (FRBSL) established an autocorrection mechanism that is triggered when government debt-to-GDP ratio exceeds 60 percent, and when there is a significant deviation from the medium-term budgetary objective or the adjustment path towards it.<br><br>• If there are deviations from the medium-term objective or the adjustment path of more than 0.5 percent of GDP, corrective measures must be implemented immediately, especially on the expenditure side. | The framework contains an expenditure rule that restrains the expenditures to the cyclically adjusted revenues. The law prescribes corrective actions when debt-to-GDP ratio exceeds any of the two thresholds at 55 and 60 percent:<br><br>• If the debt-to-GDP ratio exceeds 55 percent, the government must submit both a new budget proposal and medium-term fiscal outlook to the Parliament; both items shall be intended to achieve long-term sustainability of public finances.<br><br>• If the debt-to-GDP ratio increases beyond 60 percent, the government is required to propose concrete measures to reduce debt. | The fiscal rule introduces an automatic correction mechanism that takes increasing actions with debt thresholds when debt reaches 50 percent of GDP.<br><br>• Level 1: 50–53 percent. The Minister of Finance is required to propose measures to bring debt below this amount.<br>• Level 2: 53–55 percent. The government is required to propose to the National Council a package of measures to bring debt down and to freeze wages of government members.<br>• Level 3: 55–57 percent. In addition to the above, expenditure would be cut automatically by 3 percent and next year's budgetary expenditure would be frozen, except for interest payments.<br>• Level 4: 57–60 percent. In addition to the above, the government should submit a balanced budget.<br>• Level 5: 60 percent. In addition to the above, the cabinet will face a confidence vote in parliament.<br><br>These thresholds were also reduced by 1 percentage point each year starting 2018. | The correction mechanism institutionalized several criteria with an increasing intensity of fiscal adjustments to restore public finances.<br><br>• First, a mandatory correction of 2 percentage points in expenditure per year was required when deficits in the previous period exceeded 3 percent of GDP.<br>• Second, a progressive set of debt brakes were introduced:<br>○ 55–60 percent of GDP: The government shall adopt a budget law that implies a reduction of the debt-to-GDP ratio at the end of the financial year. The remuneration of the employees covered by the State Budget shall not increase. The adjustment to pensions may not exceed the CPI inflation of the previous financial year. The government may review the provision system to increase revenues, including possible changes to tax rates on goods and services.<br>○ Above 60 percent of GDP: All the previous procedures apply. Within a month, the government must present to Parliament a program designed to bring the debt-to-GDP under 60 percent. The expenditure of the local government for the following year shall not be higher than its revenues. |
| **Triggers for activating escape clauses** | • Large-scale disasters, warfare, and negative economic developments owing to economic shocks. | • Triggers include the declaration of National Emergency and when GDP growth expected to be less than 1 percent.<br>• The maximum period is two years. | • None. | • Severe economic slowdown.<br>• War.<br>• Natural disaster or outlays related to international agreements with an estimated cost higher than 3 percent of GDP. | • Major recession.<br>• Banking system bailout.<br>• Natural disaster.<br>• State of war.<br>• Election of a new government. | • Martial law.<br>• State of Emergency.<br>• Natural disaster. |
| **Empirical analysis in synthetic control (weights in percent of total)** | • South and Central America EMDEs (32)<br>• Africa LIDCs (22)<br>• Middle East EMDEs (20)<br>• Other EMDEs (17)<br>• Other advanced economies (9) | • North Africa EMDEs (84)<br>• East Asia EMDEs (10)<br>• Southern Europe EMDEs (6) | • Eastern Europe EMDEs (100) | • Central America EMDEs (36)<br>• Eastern Europe advanced economies (23)<br>• Northern Europe advanced economies (15)<br>• Western Europe advanced economies (13)<br>• North America advanced economies (12)<br>• Southern Europe advanced economies (1) | • Northern Europe advanced economies (77)<br>• Eastern Europe EMDEs (23) | • Southern Europe advanced economies (35)<br>• Eastern Europe advanced economies (27)<br>• South America EMDEs (21)<br>• North Europe advanced economies (6)<br>• Eastern Europe EMDEs (4)<br>• Central America EMDEs (2)<br>• Asia advanced economies (2) |

Source: IMF Fiscal Rules Database 1985-2024. Note: EMDE = Emerging market and developing economy.

# Technical Annex 2. Empirical Analysis on the Role of Fiscal Rules and Fiscal Councils[1]

*This annex presents the details on the data and methodology used to empirically analyze the effects of fiscal rules and fiscal councils on fiscal discourse, fiscal surprises and compliance with debt rules.*

## A.    Data sources

- **Data on fiscal rules and fiscal councils.** Data on fiscal rules and fiscal councils are based on the 2025 update of the IMF Fiscal Rules and Councils Database (Alonso and others, 2025a). The *data set* contains country-specific information on fiscal rules for more than 120 economies from 1985 and 2024. The database also contains detailed characteristics of fiscal rules, such as their statutory basis, coverage, monitoring, enforcement procedures, and key features of escape clause and corrective mechanisms. The data set also covers 54 fiscal councils as of the end of 2024, with information on their remit, budgetary safeguards, organization structure (resources and staffing), accountability, and communication aspects. The data are available online.
- **Data on fiscal discourse.** The data on fiscal discourse are sourced from the Manifesto Project database, kindly tabulated and shared by authors in Cao, Dabla-Norris, and Di Gregorio (2024). The data cover 65 countries for more than 4,500 manifestos and 720 national elections held from 1960 to 2022. Restraint discourse is defined as a share of political parties' manifestos calling for an outright reduction of budget deficits or limit of government spending.
- **Macroeconomic data** are from the IMF WEO database. Annex Table 2.1 lists the sample countries.

### A Measure of the Strength of Fiscal Rules

The empirical analysis uses the "strength" index developed in Davoodi and others (2022a) (updated with latest 2025 update of fiscal rule database in Alonso and others (2025b). The index is constructed to measure how strong fiscal rules are based on the approach in the European Commission's Fiscal Rule Index (2023). The strength index is based on four institutional criteria: (1) the statutory or legal basis of the fiscal rule, (2) the monitoring of fiscal rules, (3) the enforcement and correction mechanisms, and (4) the flexibility of rules and their resilience to shocks.[2] The mapping of variables to these criteria is described in Annex Table 2.2, in which a score is assigned for each type of rule summing the scores across the four institutional criteria. Each indicator score is standardized between 0 and 1, with weights assigned on each rule. For countries with multiple rules, a declining weight is assigned for each additional type of fiscal rules. The highest scoring rule would have a weight of 1, and subsequent rules (in descending scoring) will be assigned weights of one-half, one-third, and one-fourth, respectively. The scoring is then summed to a single index, which measures as a proxy for the strength of fiscal rules. The index is standardized by unconditional mean and standard errors, leading to an index ranging between -0.64 and 3.51.

The estimated "strength" index on fiscal rules is highly correlated (correlation coefficient of 0.80) to that published by European Commission for European Union (EU) countries, suggesting our measure is consistent with that by European Commission. The overall strength of fiscal rules has improved across both advanced and emerging market economies (Annex Figure 2.1). Further details and stylized facts on the fiscal rule strength index are in Alonso and others (2025b).

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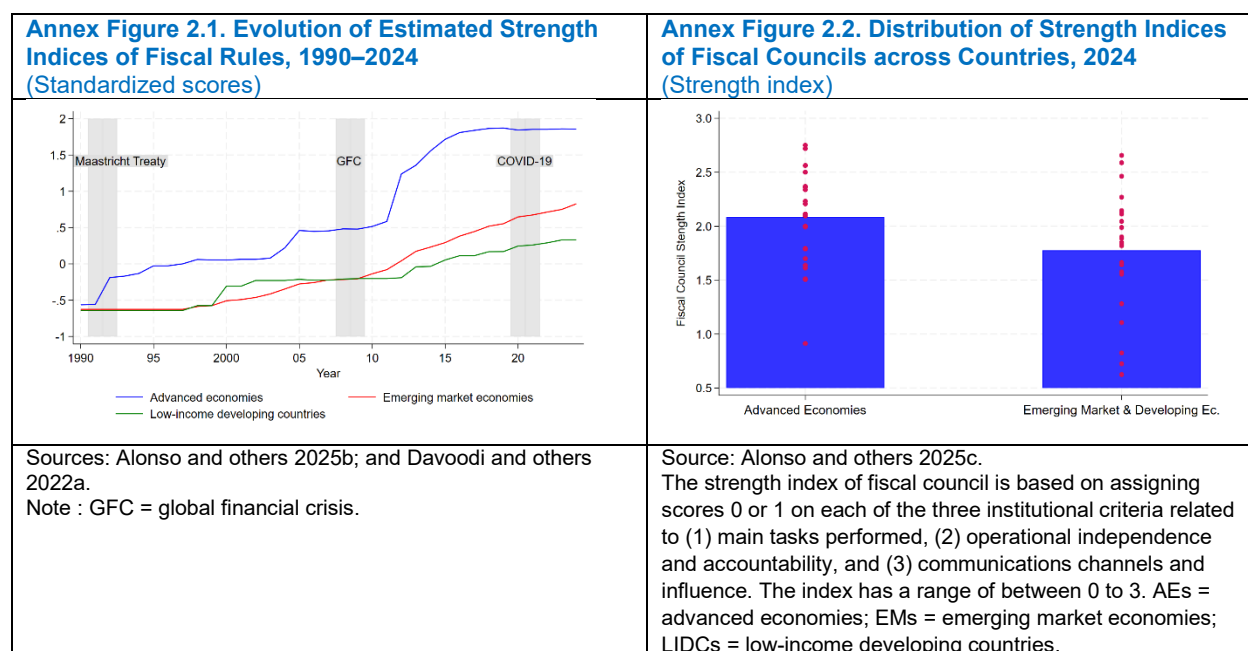
[1] Prepared by Alexandra Solovyeva and Clara Arroyo.

[2] The European Commission approach contains the fifth criterion as to whether there is room for setting or revising fiscal rules, but it is not applicable for many countries outside the EU.

### Annex Table 2.1. Sample Country Coverage

| Country | Fiscal Rules | Fiscal Councils | Fiscal Discourse | Fiscal Surprises | Compliance with Debt Rule Limits |
|---|:---:|:---:|:---:|:---:|:---:|
| Afghanistan | | | | ✓ | |
| Albania | | | | ✓ | |
| Algeria | | | | ✓ | |
| Andorra | ✓ | | | | |
| Angola | ✓ | | | ✓ | |
| Antigua and Barbuda | ✓ | | | | |
| Argentina | ✓ | | ✓ | ✓ | |
| Armenia | ✓ | | ✓ | ✓ | ✓ |
| Aruba | ✓ | ✓ | | | |
| Australia | ✓ | ✓ | ✓ | ✓ | |
| Austria | ✓ | ✓ | ✓ | ✓ | ✓ |
| Azerbaijan | ✓ | | | ✓ | ✓ |
| Bahamas, The | ✓ | ✓ | | | |
| Bangladesh | | | | ✓ | |
| Barbados | ✓ | | | | |
| Belarus | | | | ✓ | |
| Belgium | ✓ | ✓ | ✓ | ✓ | ✓ |
| Benin | ✓ | | | ✓ | ✓ |
| Bolivia | | | ✓ | ✓ | |
| Bosnia and Herzegovina | | | ✓ | ✓ | |
| Botswana | ✓ | | | ✓ | ✓ |
| Brazil | ✓ | ✓ | ✓ | ✓ | |
| Bulgaria | ✓ | ✓ | ✓ | ✓ | ✓ |
| Burkina Faso | ✓ | | | ✓ | ✓ |
| Burundi | ✓ | | | ✓ | ✓ |
| Cambodia | ✓ | | | ✓ | ✓ |
| Cameroon | ✓ | | | ✓ | ✓ |
| Canada | ✓ | ✓ | ✓ | ✓ | |
| Cabo Verde | ✓ | | | | |
| Central African Republic | ✓ | | | ✓ | ✓ |
| Chad | ✓ | | | ✓ | ✓ |
| Chile | ✓ | ✓ | ✓ | ✓ | |
| China | | | | ✓ | ✓ |
| Colombia | ✓ | ✓ | ✓ | ✓ | ✓ |
| Democratic Republic of the Congo | ✓ | | | ✓ | |
| Congo, Republic of | ✓ | | | ✓ | ✓ |
| Costa Rica | ✓ | ✓ | ✓ | ✓ | |
| Côte d'Ivoire | ✓ | | | ✓ | ✓ |
| Croatia | ✓ | ✓ | ✓ | ✓ | ✓ |
| Cyprus | ✓ | ✓ | ✓ | | |
| Czech Republic | ✓ | ✓ | ✓ | ✓ | ✓ |
| Denmark | ✓ | ✓ | ✓ | ✓ | ✓ |
| Dominica | ✓ | | | | |
| Dominican Republic | ✓ | | ✓ | ✓ | |
| Ecuador | ✓ | | ✓ | ✓ | ✓ |
| Egypt | | | | ✓ | |
| El Salvador | ✓ | | | ✓ | ✓ |
| Equatorial Guinea | ✓ | | | | |
| Eritrea | | | | ✓ | |
| Estonia | ✓ | ✓ | ✓ | | |
| Ethiopia | | | | ✓ | |
| Finland | ✓ | ✓ | ✓ | ✓ | ✓ |
| France | ✓ | ✓ | ✓ | ✓ | ✓ |
| Gabon | ✓ | | | ✓ | ✓ |
| Gambia, The | | | | ✓ | |
| Georgia | ✓ | ✓ | ✓ | ✓ | ✓ |
| Germany | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ghana | | | | ✓ | |
| Greece | ✓ | ✓ | ✓ | ✓ | ✓ |
| Grenada | ✓ | ✓ | | | |
| Pakistan | ✓ | | | ✓ | ✓ |
| Panama | ✓ | ✓ | ✓ | ✓ | ✓ |
| Papua New Guinea | ✓ | | | ✓ | ✓ |
| Paraguay | ✓ | | | ✓ | |
| Peru | ✓ | ✓ | ✓ | ✓ | ✓ |
| Philippines | | | | ✓ | |
| Poland | ✓ | | ✓ | ✓ | ✓ |
| Portugal | ✓ | ✓ | ✓ | ✓ | ✓ |
| Qatar | | | | ✓ | |
| Romania | ✓ | ✓ | ✓ | ✓ | ✓ |
| Russia | ✓ | | ✓ | ✓ | |
| Rwanda | ✓ | | | ✓ | ✓ |
| Saudi Arabia | | | | ✓ | |
| Senegal | ✓ | | | ✓ | ✓ |
| Serbia | ✓ | ✓ | ✓ | | |
| Sierra Leone | | | | ✓ | |
| Singapore | ✓ | | | | |
| Slovak Republic | ✓ | ✓ | ✓ | ✓ | ✓ |
| Slovenia | ✓ | ✓ | ✓ | ✓ | ✓ |
| Solomon Islands | ✓ | | | | |
| Somalia | ✓ | | | | |
| South Africa | | ✓ | ✓ | ✓ | |
| South Sudan | ✓ | | | | |
| Spain | ✓ | ✓ | ✓ | ✓ | ✓ |
| Sri Lanka | ✓ | | | ✓ | ✓ |
| St. Kitts and Nevis | ✓ | | | | |
| St. Lucia | ✓ | | | | |
| St. Vincent and the Grenadines | ✓ | | | | |
| Guatemala | | | | ✓ | |
| Guinea | | | | ✓ | |
| Guinea-Bissau | ✓ | | | ✓ | ✓ |
| Haiti | | | | ✓ | |
| Honduras | ✓ | | | ✓ | |
| Hong Kong SAR | ✓ | | | ✓ | |
| Hungary | ✓ | ✓ | ✓ | ✓ | ✓ |
| Iceland | ✓ | ✓ | ✓ | | |
| India | ✓ | | | ✓ | ✓ |
| Indonesia | ✓ | | | ✓ | ✓ |
| Iran | ✓ | ✓ | | ✓ | |
| Iraq | | | | ✓ | |
| Ireland | ✓ | ✓ | ✓ | ✓ | ✓ |
| Israel | ✓ | | ✓ | ✓ | |
| Italy | ✓ | ✓ | ✓ | ✓ | ✓ |
| Jamaica | ✓ | ✓ | | ✓ | ✓ |
| Japan | ✓ | | ✓ | ✓ | |
| Jordan | | | | ✓ | |
| Kazakhstan | ✓ | | | ✓ | ✓ |
| Kenya | ✓ | ✓ | | ✓ | ✓ |
| Kiribati | ✓ | | | | |
| Korea | | ✓ | ✓ | ✓ | |
| Kosovo | ✓ | | | | |
| Kuwait | | | | ✓ | |
| Kyrgyz Republic | | | | ✓ | |
| Lao P.D.R. | | | | ✓ | |
| Latvia | ✓ | ✓ | ✓ | ✓ | ✓ |
| Lebanon | | | | ✓ | |
| Lesotho | | | | ✓ | |
| Liberia | ✓ | | | ✓ | ✓ |
| Libya | | | | ✓ | |
| Lithuania | ✓ | ✓ | ✓ | ✓ | ✓ |
| Luxembourg | ✓ | ✓ | ✓ | | |
| Madagascar | | | | ✓ | |
| Malawi | | | | ✓ | |
| Malaysia | ✓ | | | ✓ | ✓ |
| Maldives | ✓ | | | | |
| Mali | ✓ | | | ✓ | ✓ |
| Malta | ✓ | ✓ | | | |
| Marshall Islands | ✓ | | | | |
| Mauritania | | | | ✓ | |
| Mauritius | ✓ | | | | |
| Mexico | ✓ | ✓ | ✓ | ✓ | |
| Moldova | | | ✓ | ✓ | |
| Mongolia | ✓ | ✓ | | ✓ | ✓ |
| Montenegro, Rep. of | ✓ | | ✓ | | |
| Morocco | ✓ | | | ✓ | |
| Mozambique | | | | ✓ | |
| Myanmar | | | | ✓ | |
| Namibia | ✓ | | | ✓ | ✓ |
| Nauru | ✓ | | | | |
| Nepal | | | | ✓ | |
| Netherlands, The | ✓ | ✓ | ✓ | ✓ | ✓ |
| New Zealand | ✓ | | ✓ | ✓ | |
| Nicaragua | | | | ✓ | |
| Niger | ✓ | | | ✓ | ✓ |
| Nigeria | | | | ✓ | |
| North Macedonia | | ✓ | ✓ | ✓ | |
| Norway | ✓ | | ✓ | ✓ | |
| Oman | | | | ✓ | |
| Sudan | | | | ✓ | |
| Sweden | ✓ | ✓ | ✓ | ✓ | ✓ |
| Switzerland | ✓ | | ✓ | ✓ | |
| Tajikistan | | | | ✓ | |
| Tanzania | ✓ | | | ✓ | ✓ |
| Thailand | ✓ | | | ✓ | ✓ |
| Timor-Leste, Dem. Rep. | ✓ | | | | |
| Togo | ✓ | | | ✓ | ✓ |
| Tonga | ✓ | | | | |
| Tunisia | | | | ✓ | |
| Türkiye | | | ✓ | ✓ | |
| Turkmenistan | ✓ | | | | |
| Tuvalu | | | | | |
| Uganda | ✓ | ✓ | | ✓ | ✓ |
| Ukraine | | | ✓ | ✓ | |
| United Arab Emirates | | | | ✓ | |
| United Kingdom | ✓ | ✓ | ✓ | ✓ | ✓ |
| United States | ✓ | ✓ | ✓ | ✓ | |
| Uruguay | ✓ | ✓ | | ✓ | |
| Uzbekistan | | | | ✓ | |
| Vanuatu | ✓ | | | | |
| Venezuela | | | | ✓ | |
| Vietnam | ✓ | | | ✓ | |
| West Bank and Gaza | | | | | |
| Yemen | | | | ✓ | |
| Zambia | ✓ | | | ✓ | |
| Zimbabwe | | | | ✓ | |

Source: Alonso and others (2025a), IMF Fiscal Rules Database: 1985-2024.
Note: The table lists the countries included in the empirical analysis. "Fiscal Rules" and "Fiscal Councils" indicate the presence of fiscal rules and fiscal councils in each country, respectively. "Fiscal Discourse," "Fiscal Surprises," and "Compliance with Debt Rule Limits" indicate whether there is an entry in the corresponding empirical exercise.

**Annex Figure 2.1. Evolution of Estimated Strength Indices of Fiscal Rules, 1990–2024**
(Standardized scores)



**Annex Figure 2.2. Distribution of Strength Indices of Fiscal Councils across Countries, 2024**
(Strength index)



Sources: Alonso and others 2025b; and Davoodi and others 2022a.
Note : GFC = global financial crisis.

Source: Alonso and others 2025c.
The strength index of fiscal council is based on assigning scores 0 or 1 on each of the three institutional criteria related to (1) main tasks performed, (2) operational independence and accountability, and (3) communications channels and influence. The index has a range of between 0 to 3. AEs = advanced economies; EMs = emerging market economies; LIDCs = low-income developing countries.

**Annex Table 2.2. Mapping Variables to Criteria to Measure the Strength of Fiscal Rules**

| Criteria | Variables (This paper) | | Variables (European Commission) | Score |
|---|---|---|---|---|
| **Legal Basis (C1)** | Legal basis (C1) | = | Statutory or legal basis of the rule (EC Criterion 1) | [0,1] |
| Room to set or revise the rules (C2) | Not applicable | | Adjustment margin (EC Criterion 2) | - |
| **Monitoring of Fiscal Rules (C3)** | Monitoring mechanism outside the government (C3a) | = | Nature of the body in charge of rule monitoring and the correction mechanism (EC Criterion C3a) | [0,1] |
| | Monitoring of Fiscal Rules (Fiscal Council dataset) (C3b) | = | Real Time Monitoring (EC Criterion 3b) | [0,1] |
| | Independence – Legal & Operational (IMF Fiscal Council dataset: 2021) (C3c) | = | Nature of the body in charge of monitoring the correction mechanism in case of deviation (EC Criterion 3c) | [0,1] |
| | Independent body setting budget assumptions and monitoring budget implementation (C3d) | = | Independent body providing/endorsing macro budgetary forecast (EC Criterion 3d) | [0,1] |
| **Enforcement and Correction Mechanism (C4)** | Formal enforcement procedure; fiscal responsibility law (C4a) | | Correction Mechanisms in case of deviation from the Rule (EC Criterion 4) | [0,1] [0,1] |
| | Presence of correction mechanism in case of deviation from the rule (C4b) Type of correction (C4c) | = | | [0,1] |
| **Flexibility and Resilience against shocks (C5)** | Presence of escape clauses (C5a) Characteristics of escape clauses (activation procedures; conditions for invoking the clause; accountability mechanism) (C5b) | = | Does the rule contain clearly defined escape clauses which are in line with the Stability Growth Pact? (EC Criterion 5a) | [0,1] [0,1] |
| | Not applicable | = | Is there a budgetary margin defined in relation to the rule? (EC Criterion 5b) | - |
| | Budget balance rule defined in cyclically adjusted terms (adds to C5a for BBR) | = | Are targets defined in cyclically adjusted terms or do they account for the cycle in any way? (EC Criterion 5c) | - |
| | Not applicable[3] | = | Are there exclusions from the rule in the form of items that fall outside authorities' control at least in the short-term (for example, interest payments, unemployment benefits)? (EC Criterion 5d) | - |

[3] The IMF Fiscal Rule dataset has information as to whether the fiscal rules exclude public investment. It is not included here because the decision is largely within government control.

### A Measure of the Desirable Properties of Fiscal Councils

Similarly, a strength index is constructed to measure the desirable properties of fiscal councils. The index is based on three institutional criteria: (1) main tasks performed and available instruments, (2) operational independence and accountability, and (3) communication channels and influence. Selected variables in the IMF Fiscal Council database are mapped to these criteria (Annex Table 2.3). An overall strength index is calculated by summing up the scores for each of the four criteria, resulting an overall index with a theoretical maximum of three. The index covers more than 50 countries that have fiscal councils by the end of 2024. For countries with more than one fiscal council (for example, Belgium, Chile, and The Netherlands), a combined index is calculated by selecting the highest value for each variable across fiscal councils in the same country.

The estimated index points to a large variation on the strength of fiscal councils across countries, with advanced economies having higher scores, particularly among European countries (Annex Figure 2.2). Moreover, countries that have stronger fiscal councils tend to be associated with higher scores on the strength of fiscal rule, with a positive and statistically significant correlation of 0.55. The correlation is higher for emerging market and developing economies (EMDEs) at 0.62.

### Annex Table 2.3. Mapping Variables to Criteria to Measure the Strength of Fiscal Councils

| Criteria | Variables | Score |
|---|---|---|
| **Task and Instruments (I1)** | **Public relations (I1a):** equals 1 if the council prepares public reports on its activities; equals 2 if reports have high media impact; 0 otherwise.<br>**Budget process (I1b):** equals 1 if the council produces a forecast that is adopted in the budget process; equals 2 if either the forecasts are binding, there is a comply or explain mechanism, there are formal consultation or hearings, or the council can stall the budget process; equals 0 if the council does not produce a forecast. | [0,1] |
| **Independence and Accountability (I2)** | **Legal Independence (I2a):** council's independence from political interference is guaranteed by law or treaty (0/1).<br>**Operational Independence – management (I2b):** equals 1 if there are safeguards on the council's budget or multi-annual funding commitments; equals 2 if both are true; equals 0 otherwise.<br>**Operational Independence – personnel (I2c):** equals 1 if the council can select its own staff or if staff is commensurate to tasks; equals 2 if both are true; equals 0 otherwise.<br>**Operational Independence – Access to information (I2d):** council is guaranteed full access to information in timely manner by legislation (0/1).<br>**Operational Independence – Forecasts (I2e):** council prepares or assesses macro forecasts used for budget (0/1). | [0,1] |
| **Communications (I3)** | **Communication policy/strategy (I3a):** equals 2 if the strategy is published; equals 1 if the strategy is internal; equals 0 if there is no strategy.<br>**Publications (I3b):** council or its staff publishes reports or press releases (0/1).<br>**Media coverage (I3c):** council leadership holds media events or present at parliamentary hearings (0/1).<br>**Elements of reports (I3d):** reports contain forecasts, assessment of rule compliance, debt sustainability analysis, costing of fiscal policies (each adds 1). | [0,1] |

Source: Alonso and others, 2025a.

## B.    Empirical Analysis

**Fiscal discourse.** To examine the relationship between political discourse on fiscal restraint and the strength of fiscal rules and fiscal councils, the following cross-section regressions are estimated for 33 advanced economies and 26 EMDEs:

$$\Delta Restraint\ Discourse_i = \alpha + \beta\ F_i^j + \gamma\ Strength\ Index_i^j + \epsilon_i \quad (3.1)$$

where $\Delta Restraint\ Discourse_i$ is the dependent variable that denotes changes in average restraint discourse—defined as a share of a share of political parties' manifestos calling for an outright reduction of budget deficits or limit of government spending—in country $i$ from 1990 to 2009 and 2010 to 2022. Explanatory variables include the binary variable indicating the presence of fiscal rule or fiscal council ($F_i^j$), and the average value of strength index of fiscal rules and effectiveness index on fiscal councils calculated over the sample period, $Strength\ Index_i^j$, where $j = \{rule, council\}$.[4]

### Annex Table 2.4. Fiscal Discourse

| Dependent Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Change in Restraint Discourse | | | |
| Fiscal Rule | 0.622 | -0.166 | | |
| Fiscal Rule Strength | | 0.129** | | |
| Fiscal Council | | | 0.596* | -1.179 |
| Fiscal Council Strength | | | | 2.677** |
| Constant | -0.551* | -0.551* | -0.647*** | -0.647*** |
| Observations | 52 | 52 | 59 | 59 |
| $R$-squared | 0.022 | 0.086 | 0.029 | 0.095 |

Sources: Alonso and others 2025a, 2025b; Cao, Dabla-Norris, and Di Gregorio 2024; Manifesto Project database, and IMF staff calculations.
Note: The table reports coefficient estimates from cross-country regressions estimated using ordinary least squares for 33 advanced economies and 26 emerging market and developing economies with robust standard errors. The dependent variable is the change in average restraint fiscal discourse 1990–2009 and 2010–22. Explanatory variables include the binary variable indicating the presence of fiscal rule (council) and the strength index of fiscal rules (councils). Restraint discourse captures the share of party's manifesto's content calling for an outright reduction of budget deficit or the limitation of public spending. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Results indicate that, in countries that have no fiscal rules or independent fiscal councils, restraint discourse declined by 0.55–0.65 percentage points, which means that political parties' manifesto advocating a higher government spending or deficits (Annex Table 2.4). The mere adoption of fiscal rules or presence of a fiscal council does not have a significant association with political discourse, with estimated coefficients close to 0. Stronger fiscal rule frameworks—as measured by higher scoring in the strength index—is associated with a greater fiscal restraint in political discourse.

**Fiscal Surprises**

The following panel regression is estimated to examine if fiscal surprises are related to the presence and the strength of fiscal rules and fiscal councils:

$$surprise_{i,t} = \beta_1 surprise_{i,t-1} + \Upsilon'F_{it} + \beta_2(g_{i,t} - g_{i,t|t-1}) + \beta_3(\pi_{i,t} - \pi_{i,t|t-1})$$
$$+ \Lambda'X_{it} + \alpha_i + \eta_t + \epsilon_{it} \quad (3.2)$$

where $surprise_{i,t}$ is the dependent variable that denotes a fiscal surprise, namely a primary deficit or a debt surprise. Primary deficit surprise ($pdef_{i,t} - pdef_{i,t|t-1}$) is defined as the difference between the actual primary deficit in percent of GDP in year $t$ ($pdef_{i,t}$) and its one-year ahead projection ($pdef_{i,t|t-1}$) taken in the last year ($t–1$). Debt surprise ($d_{i,t} - d_{i,t|t-1}$) is defined as the difference between the actual public debt to GDP ratio in year $t$ ($d_{i,t}$) and its one-year ahead projection ($d_{i,t|t-1}$) from last year ($t-1$). ($g_{i,t} - g_{i,t|t-1}$) and ($\pi_{i,t} - \pi_{i,t|t-1}$) denote real GDP growth and inflation surprises, respectively. One-year ahead

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[4] For empirical analysis in this section, strength indices for fiscal rules and councils are standardized to range from 0 and 1.

projections are from the IMF World Economic Outlook database. Other control variables $X_{it}$ include the lags of actual primary deficit (in the primary deficit surprises regression) and the lags of changes in public debt to GDP ratio (in the debt surprise regression), and the World Uncertainty Index (Ahir, Bloom, and Furceri 2022). Fiscal rules and fiscal council variables, $F_{it}$, include binary variables indicating the presence of fiscal rules and/or fiscal councils, as well as strength indices of fiscal rules and/or fiscal councils. The panel regressions also include country- and year-fixed effects.

Surprises equations are estimated using the weighted-average least squares estimator during 2000-23 for 30 advanced economies and 110 EMDEs. The results indicate that primary deficit surprises are positively correlated with inflation surprises and tend to be lower in the aftermath of fiscal policy loosening (Annex Table 2.5). Debt surprises are persistent, negatively correlated with real growth surprises and positively correlated with inflation surprises (Annex Table 2.6). Both primary deficit and debt surprises tend to be smaller on average in countries with stronger fiscal rules and fiscal councils.

### Compliance with Debt Rules

Credible fiscal rules and strong independence fiscal oversight from councils could contribute to greater compliance and limit the excess deviations of debt from the rule limits. To examine the key determinants that could limit the excess deviations of debt from the fiscal rule limits, the following panel regression is estimate for a sample of 64 economies (19 advanced economies and 45 EMDEs) during 2000–23):

$$debtdev_{i,t} = \beta_1 debtdev_{i,t-1} + \Upsilon' F_{it} + \beta_2 \left( g_{i,t} - g_{i,t|t-1} \right) + \beta_3 (\pi_{i,t} - \pi_{i,t|t-1}) + \Lambda' X_{it} + \alpha_i + \eta_t + \epsilon_{it} \quad (3.3)$$

where the dependent variable, $debtdev_{i,t}$, is the deviation of the debt-to-GDP ratio ($d_{i,t}$) from the debt rule limit ($debt\ limit_{it}$) normalized by the country's $i$ average debt-to-GDP ratio. ($g_{i,t} - g_{i,t|t-1}$) and ($\pi_{i,t} - \pi_{i,t|t-1}$) denote real GDP growth and inflation surprises. The one-year ahead projections on growth and inflation ($g_{i,t|t-1}$ and $\pi_{i,t|t-1}$) from last year ($t$–1) are taken from the IMF World Economic Outlook database. Other control variables $X_{it}$ include the lags of changes in public debt to GDP ratio, and the World Uncertainty Index (Ahir, Bloom, and Furceri 2022). Fiscal rules and fiscal council variables, $F_{it}$, include binary variables indicating the presence of fiscal rules and/or fiscal councils, as well as strength indices of fiscal rules and/or fiscal councils. The regression also includes country- and year-fixed effects.

The analysis uses the weighted-average least squares estimator to estimate the regression across countries (64 in total of which 19 advanced economies and 45 EMDEs) that have adopted debt rules. The results indicate that deviations from debt rule limits are persistent with a high autocorrelation coefficient and are negatively correlated with real growth and inflation surprises (Annex Table 2.7). Deviations tend to be smaller on average in countries with stronger fiscal (and debt) rules and stronger fiscal councils, especially those that are operationally independent with budget safeguards and multi-annual funding commitments.

## Annex Table 2.5. Primary Deficit Surprises

| Dependent Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Primary Deficit Surprise | | | | | | | |
| Lag Dependent Variable | 0.00 | 0.00 | 0.00 | -0.00 | 0.00 | -0.00 | 0.00 | 0.00 |
| World Uncertainty Index | 0.34 | 0.33 | 0.33 | 0.35 | 0.32 | 0.34 | 0.35 | 0.34 |
| Real Growth Surprise | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 |
| Inflation Surprise | 0.34*** | 0.34*** | 0.31*** | 0.31*** | 0.32*** | 0.32*** | 0.31*** | 0.31*** |
| Lag Primary Deficit | -0.03*** | -0.03*** | -0.03*** | -0.03*** | -0.03*** | -0.03*** | -0.03*** | -0.03*** |
| Fiscal Council | -0.51*** | | | | | | | |
| Fiscal Council Strength | | -0.70*** | | | | | | |
| Fiscal Rule | | | -0.35*** | | | | | |
| Fiscal Rule Strength | | | | -1.38*** | | | | |
| Debt Rule | | | | | -0.38*** | | | |
| Debt Rule Strength | | | | | | -1.09*** | | |
| Budget Balance Rule | | | | | | | -0.40*** | |
| Budget balance Rule Strength | | | | | | | | -1.11*** |
| Observations | 2,547 | 2,547 | 2,547 | 2,547 | 2,547 | 2,547 | 2,547 | 2,547 |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Source: Authors' estimates.

Note: The table reports coefficient estimates from regressions estimated using the weighted-average least squares method during 2000–23. The dependent variables is "primary deficit surprise" measured as the difference between the actual primary deficit to GDP ratio and its one-year-ahead projection.

*** indicates regressors that are considered to be robust drivers, with the associated *t*-statistics larger than 1 in absolute value.

### Annex Table 2.6. Debt Surprises

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable | | | | Debt Surprise | | | | |
| | | | | | | | | |
| Lag Dependent Variable | 0.51*** | 0.51*** | 0.51*** | 0.51*** | 0.51*** | 0.51*** | 0.51*** | 0.51*** |
| World Uncertainty Index | -0.68 | -0.60 | -2.45*** | -0.71 | -1.74 | -0.42 | -2.35*** | -0.67 |
| Real Growth Surprise | -0.94*** | -0.94*** | -0.96*** | -0.90*** | -0.93*** | -0.92*** | -0.95*** | -0.90*** |
| Inflation Surprise | 2.10*** | 2.17*** | 2.50*** | 2.31*** | 2.02 | 2.26*** | 2.28*** | 2.23*** |
| Lag $\Delta$ Debt | -0.04 | -0.04 | -0.03 | -0.04*** | -0.04 | -0.04*** | -0.03 | -0.04*** |
| Fiscal Council | -1.42*** | | | | | | | |
| Fiscal Council Strength | | -2.02*** | | | | | | |
| Fiscal Rule | | | -1.58*** | | | | | |
| Fiscal Rule Strength | | | | -6.08*** | | | | |
| Debt Rule | | | | | -2.20*** | | | |
| Debt Rule Strength | | | | | | -5.76*** | | |
| Budget Balance Rule | | | | | | | -2.15*** | |
| Budget Balance Rule Strength | | | | | | | | -5.37*** |
| | | | | | | | | |
| Observations | 2,106 | 2,106 | 2,106 | 2,106 | 2,106 | 2,106 | 2,106 | 2,106 |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Source: Authors' estimate.

Note: The table reports coefficient estimates from regressions estimated using the weighted-average least squares method during 2000–23. The dependent variable is "debt surprise" measured as the difference between the actual government debt to GDP ratio and its one-year-ahead projection.

 *** indicates regressors that are considered to be robust drivers, with the associated *t*-statistics larger than 1 in absolute value.

**Annex Table 2.7. Deviations for Debt Rule Limits**

| Dependent Variable | Deviation from Debt Rule Limit | | |
| --- | --- | --- | --- |
| | (1) | (2) | (3) |
| | | | |
| Lag Dependent Variable | 0.85*** | 0.85*** | 0.84*** |
| World Uncertainty Index | -0.02 | -0.02 | -0.02 |
| Real Growth Surprise | -0.01*** | -0.01*** | -0.01*** |
| Inflation Surprise | -0.26*** | -0.23*** | -0.25*** |
| Lag Δ Debt | 0.002*** | 0.002*** | 0.002*** |
| Fiscal Rule Strength | -0.19*** | | |
| Debt Rule Strength | | -0.17*** | |
| Fiscal Council Strength | | | -0.06*** |
| | | | |
| Observations | | | |
| Year fixed effect | Yes | Yes | Yes |
| Country fixed effect | Yes | Yes | Yes |

Source: Authors' estimates.
Note: The table reports coefficient estimates from regressions estimated using the weighted-average least squares method during 2000–23. The dependent variable is the difference between the actual public debt to GDP ratio and the debt rule limit normalized by the country-specific average debt to GDP ratio over the sample period.
*** indicates regressors that are considered to be robust drivers, with the associated $t$-statistics larger than 1 in absolute value.

# Technical Annex 3. Fiscal Rules and Growth-Enhancing Investment[9]

*This annex presents a dynamic general equilibrium model framework to illustrate whether and how fiscal rules can be adjusted to accommodate public investment.*

The dynamic general equilibrium framework bridges several elements in the literature:

1.  The model framework builds on the literature on public investment and output multipliers, as in Traum and Yang (2015) and Drautzburg and Uhlig (2015).

2.  The model allows an endogenous relationship between government debt and its borrowing costs, which is in line with Mian, Straub, and Sufi (2022). The endogeneity can be interpreted from both demand and supply perspectives of government bonds (asset). From the asset demand side, household savers require higher yields to hold increasing government debt. From the supply perspective of government bond, the bond provides certain convenience benefits (for example, Krishnamurthy and Vissing-Jorgensen 2012)—due to its safety and regulatory advantages. As government incurs higher debt, these benefits diminish and lead to higher borrowing costs.

3.  The model allows for nonlinear and time-varying elasticity of interest rates to debt levels, which depends on the probability of debt distress. This reflects the case that high-debt countries, the rise in debt could lead to a disproportionate surge in sovereign risk premiums, with higher probability of debt distress in the spirit of Bi and Traum (2012).

4.  The model incorporates the pass-through of sovereign borrowing costs to private sector funding costs, following Corsetti and others (2013) and Bevilaqua, Hale, and Tallman (2020).

The model features a closed economy with three groups of standard agents: households, firms, and the government.

*   *Households*: A representative household provides labor services and uses the labor income to consume, invest in private capital, or save in one-period government bond. Government bonds are included in the household's utility function, consistent with Mian, Straub, and Sufi (2022), to reflect their convenience yield (that is, the liquidity and safety premium), which is diminishing with government debt.

*   *Firms* operate under a standard Cobb-Douglas production function that uses labor and private capital. Public capital provides positive externalities to production. Firms maximize profits and take input prices as given, in line with Traum and Yang (2015) and Drautzburg and Uhlig (2011). The model assumes price flexibility.

*   *Government*: Fiscal policy consists of a set of revenue and expenditure instruments. On the revenue side, the government levies consumption and direct income taxes. On the expenditure side, it allocates resources to government final consumption, public investment, and lump-sum transfers to households.

To illustrate how debt sustainability and fiscal space matter, the model considers three economies with varying initial debt level.

*   An advanced economy with low debt with initial debt at 60 percent of GDP

*   Countries with high initial debt at 110 percent of GDP with limited fiscal space

*   Countries with very high debt and no fiscal space, with initial debt at 140 percent of GDP. The risk of debt distress is high and sensitive to the changes in risk premium.

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[9] Prepared by Anh Dinh Minh Nguyen, W. Raphael Lam, and Galen Sher.

The authors acknowledge that whether debt level is considered low or high and the extent of available fiscal space varies across countries. For example, EMDEs often have a lower debt-carrying capacity, such that the probability of debt distress rises sooner at lower level of debt (Annex Figure 3.1). This finding would suggest the initial debt levels for low or high debt for EMDEs are likely to be smaller than illustrated here.

**Key equations of the dynamic general equilibrium model:**

The Euler equation of the representative household is described that:

$$\lambda_t - CY_t = \beta E_t \frac{\lambda_{t+1}R_t}{z_{t+1}} \tag{4.1}$$

where $\beta$ is the discount factor, $\lambda_t$ is the marginal utility, $CY_t$ the convenience yield, $R_t$ the gross interest rate on one-period government bond, and $z_\{t\} = Z_t/Z_{t-1}$ where $Z_t$ captures the trend along the balanced growth path.

The convenience yield is linked to debt as in Mian, Straub, and Sufi (2022):

$$CY_t = \bar{\lambda}\left(\overline{CY} - \varphi_t\left(\frac{B_t - \bar{B}}{\bar{B}}\right)\right) \tag{4.2}$$

in which $B_t$ is the level of debt, $\varphi_t$ is the elasticity of debt on convenience yield, and variables denoted with a bar correspond to the steady state of the variable. A deviation from Mian, Straub, and Sufi (2022) is that the elasticity $\varphi_t$ is allowed to be time varying, reflecting different probability of debt distress $\rho_t$:

$$\rho_t = \frac{\exp(a_1 + a_2 b_{t-1})}{1 + \exp(a_1 + a_2 b_{t-1})} \tag{4.3}$$

where $b_t$ is the debt-to-GDP ratio. This specification is similar to that proposed in Bi and Traum (2012), indicating that the probability of debt distress rises with the debt-to-GDP ratio in the previous year. The logistic function guarantees that $\rho_t$ lies between 0 and 1. The parameters $a_1$ and $a_2$ are the intercept and slope parameter decide the shape of the curve. In case of debt distress $\rho_t = 1$, it is assumed that the premium goes up by 1 percentage points for each 10 percentage points increase in debt, that is, $\Delta = 0.1$, which aligns with the increase of spread in Greece during the sovereign debt crisis. As a result, $\varphi_t$ can be expressed as:

$$\varphi_t = \rho_t \Delta + (1 - \rho_t)0 = \rho_t \Delta \tag{4.4}$$

To capture the spillover and the passthrough from stress in sovereign yields to the borrowing cost of the private sector, the model adopts the approach in Burriel and others (2020) on the financial sector. The return on investment is described as:

$$1 + \psi_t = \beta E_t \lambda_{t+1} \frac{(1-\delta)q_{t+1} + r^k_{t+1}}{z_{t+1}q_t\lambda_t} \tag{4.5}$$

where $q_t$ is the de-trended Tobin's Q and $\psi_t$ is the wedge associated with the sovereign risks

$$\psi_t = \frac{\varphi_t}{2}\left(\frac{B_t - \bar{B}}{\bar{B}}\right) \qquad\qquad (4.6)$$

It is based on the empirical evidence in Bevilaqua, Hale, and Tallman (2020) that shows the sensitivity of corporate yields to sovereign yields is about 0.5 for advanced economies in a cross-country panel regression.

**Calibration.** The model is calibrated to advanced economies at the annual frequency, considering three different initial public debt to GDP ratios, which have different probabilities of debt distress as discussed above. The parameters relating to the probability of debt distress $a_1$ and $a_2$ are calibrated at about −5.2 and 3.5, respectively (blue line in Annex Figure 3.1). These parameters are obtained based on two anchor points, as discussed in Bi and Traum (2012), assuming that low probability of debt distress at the level of 50 percent of GDP, while it approaches one when debt is close to 250 percent of GDP.

- Countries with high debt and limited fiscal space (initial debt at 110 percent of GDP), the probability of debt distress is $\rho_t = 0.2$, implying an elasticity $\varphi_t$ of 0.02 (that is, $\rho_t\, \Delta = 0.2 \times 0.1$). If debt increases by 10 percent, premium would increase by 20 basis points, consistent with the empirical evidence in Mian, Straub, and Sufi (2022) (with elasticity of 0.017) or Laubach (2009) (values at 0.015−0.022).

- At high initial debt levels, the calibrated probability is set at $\rho_t = 0.4$, mapping into an elasticity $\varphi_t$ of 0.04, which is close to the upper bound estimates in Mian, Straub, and Sufi (2022). Empirical evidence also finds a stronger response of interest-growth differential to debt would double at high debt level (Lian, Presbitero, and Wiriadinata 2020). The results remain robust with the elasticity 0.035 or 0.055.
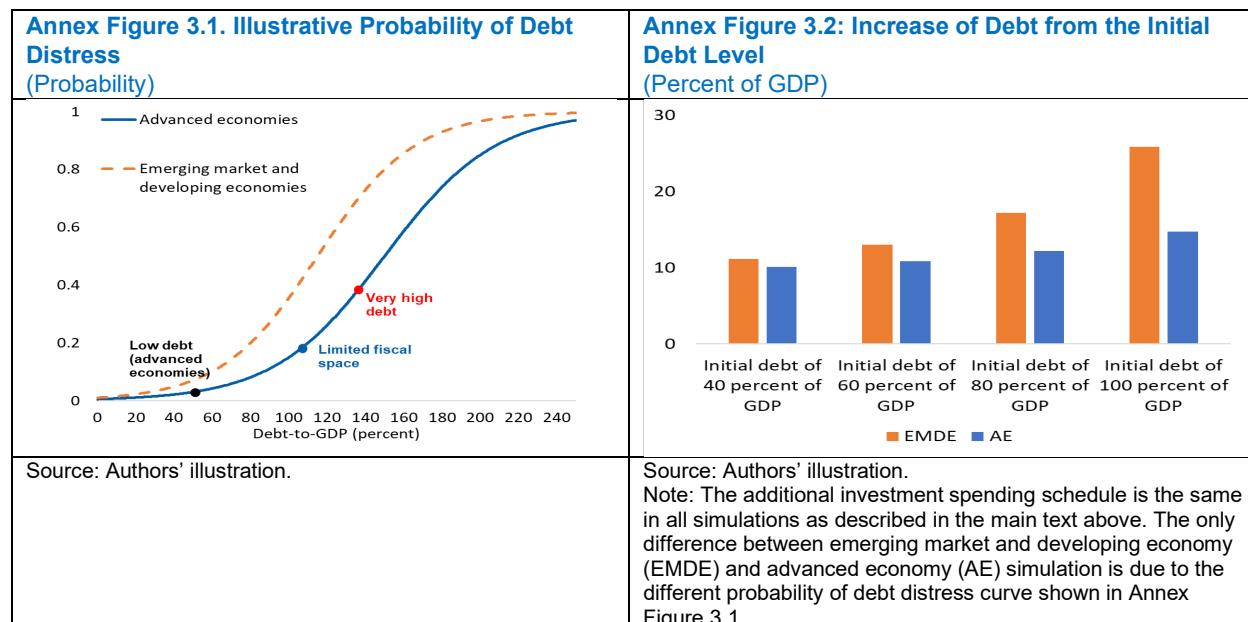
Other parameters are standard in the literature, summarized in Annex Table 3.1.

**Annex Table 3.1: Parameters of the Model**

| Parameters | Value | Parameters | Value |
|---|---|---|---|
| Discount factor | 0.99 | Probability of debt distress: Slope parameter | 3.5 |
| Inverse of Frisch labor supply elasticity | 1.2 | Consumption tax rate (SS) | 19% |
| Capital depreciation rate | 8% | Interest rate (SS) | 1.5% |
| Elasticity of substitution | 4 | Public investment efficiency (SS) | 0.7 |
| Steady state growth | 2% | Labor income tax rate (SS) | 25% |
| Capital income share | 30% | Government investment as percent of GDP (SS) | 4% |
| Output elasticity to public capital | 2.5% | Government consumption as percent of GDP (SS) | 20% |
| Probability of debt distress: Intercept parameter | −5.2 | | |
| Source: Authors' compilation. Note: SS = steady state. | | | |

**Fiscal rules.** Countries are assumed to have *binding* fiscal rules in the form of a primary deficit ceiling, which is assumed to be the same over time in the baseline. For example, if a country has a primary deficit ceiling of 3 percent of GDP, the model assumes countries will stay at 3 percent of GDP from year 0 to outer years in the horizon. Although the illustration shows only primary deficit ceilings, the framework is applicable to (1) different types of fiscal rules, including expenditure ceilings or budget balance rule because one could convert expenditure limits to a primary deficit ceiling and (2) multiyear fiscal rules in the form of a net expenditure path because the primary deficit path can be prespecified over the years. In

that context, the analysis illustrates results as a deviation from the baseline in terms of deficits, such that fiscal rule limits will be at 0 percent of GDP.

| **Annex Figure 3.1. Illustrative Probability of Debt Distress** (Probability) | **Annex Figure 3.2: Increase of Debt from the Initial Debt Level** (Percent of GDP) |
|---|---|
|  |  |
| Source: Authors' illustration. | Source: Authors' illustration. Note: The additional investment spending schedule is the same in all simulations as described in the main text above. The only difference between emerging market and developing economy (EMDE) and advanced economy (AE) simulation is due to the different probability of debt distress curve shown in Annex Figure 3.1. |

**Additional investment spending.** The model simulates an investment program of a 1 percent of GDP per year for 10 years. After 10 years, the investment program winds down gradually over next few years. The cumulative cost of the investment program is thus assumed to be about 12 percent of GDP.

**Alternative probability of debt distress**: The analysis also considers an alternative scenario in which the probability of distress rises sooner at lower levels of debt, reflecting emerging markets and developing countries that have lower debt-carrying capacity relative to advanced economies. A higher probability of debt distress at lower debt level (leftward shift of the curve in Annex Figure 3.1) would lead to a larger increase in debt for the same investment path, particularly at higher level of debts given nonlinear effects of higher debt to interest rates (Annex Figure 3.2).

**Endogenous fiscal multipliers from additional investment.** The analysis in the main text focuses on two cases: (1) initial fiscal rules are kept such that additional investment is financed by reprioritizing investment and (2) easing the fiscal rule such that additional public investment is financed by a rise in public debt. To illustrate the endogenous impact of different financing (for the same additional increase in public investment), the simulation results show that fiscal multipliers vary depending on the initial debt-to-GDP levels and means of financing the same investment. The higher extent additional investment is financed by debt (easing the rules to allow for higher deficits and debt), the fiscal multipliers would be decreasing if debt levels are large owing to the rise in interest rates. The inverse relationship will be more pronounced at very high debt levels. At low debt

**Annex Figure 3.3. Endogenous Fiscal Multipliers Depending on Financing Means of Public Investment**
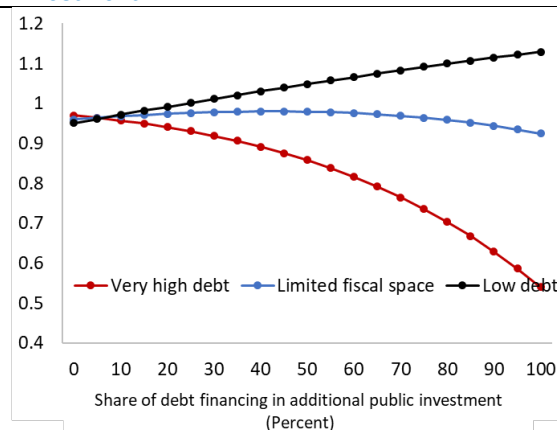


Source: Authors' illustration.
Note: The vertical axis shows the fiscal multipliers for three different cases with different initial debt-to-GDP ratios across advanced economies. The horizontal axis shows the extent of debt financing in scaling up the same level of public investment (0: no easing of initial fiscal rule limits; 100 means the additional investment is financed entirely by debt by relaxing the rules). An $\alpha$ value between 0 and 1 indicates the proportion $1-\alpha$ of additional public investment is financed by revenue measures or other spending cuts.

levels, fiscal multipliers tend to rise as additional investment is enhancing growth without much adverse impact on borrowing cost.

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**PUBLICATIONS**

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