A Closer Look at Fiscal Space in Climate-Vulnerable Developing Countries

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ABSTRACT

We study the availability of fiscal space among a sample of climate-vulnerable developing countries from the Vulnerable Group of 20 (V20) membership who speak of being poised to undertake urgent climate adaptation and transition investments but describe being restricted by "narrow fiscal space." We suspect that many governments are unable to maneuver not because of "narrow fiscal space" but because of a so-called "financial death trap," whereby "developing-country governments are pushed into default, not out of bad faith or because of long-term insolvency, but for lack of cash on hand." We estimate debt limits per country, reflective of a country record of fiscal adjustment consistent with long-term solvency, and find that with few exceptions, fiscal space is fairly ample. We also find that economies may be converging to long-run debt ratios that are in the vicinity of International Monetary Fund

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Debt Sustainability Framework (IMF-DSF) debt thresholds, confirming that IMF-DSF thresholds should not be construed as limits to fiscal space *per se*, and suggesting that the differences between our estimated debt limits and IMF-DSF thresholds—which are substantial—represent an opportunity cost that arises when otherwise solvent governments cannot mobilize funds in the immediate-term for important long-term, climate-related investments. Our findings imply that governments with ample fiscal space should be afforded a second look and perhaps be supported by lenders, particularly if they have well-articulated climate adaptation and resilience investment plans, which promise large multiplier effects, since growing the economy in a sustainable way also contributes to debt sustainability. Findings also suggest that actions to obviate the financial death-trap are warranted, if indeed otherwise solvent, able and ready governments are unable to access required finance for urgent climate investments, since the opportunity costs of letting things be cannot be insignificant to either individual economies or the global community. Findings should also encourage climate-vulnerable governments, who are not quite ready with fitting climate-aligned investment plans, to endeavor to complete these, so that their fiscal space can be leveraged for sustainable development.

MOTIVATION AND OBJECTIVE

Whether or to what degree climate-vulnerable developing countries have fiscal space is a key question confronting the international public finance community today. Fiscal space is understood as the scope for further increases in public debt without undermining sustainability (Ostry et al. 2010) or, more generally, as "the room for undertaking discretionary fiscal policy relative to existing plans without undermining fiscal sustainability" (IMF 2016). Fiscal sustainability, in turn, is (at its core) about government solvency, or the "ability of the public sector to honor all of its current and future financial obligations," a medium-to-long term concept (Debrun 2019).[2] Operationally, however, some sustainability assessments—such as the International Monetary Fund's (IMF) debt sustainability assessments/frameworks (IMF-DSF)—also incorporate concepts of liquidity, a short-term constraint, "without drawing a sharp distinction between the two" (IMF 2002).[3] Thus, the debt (service) thresholds[4]

[2] Tanner (2013) describes a 'sustainable policy' as one that, if continued indefinitely and without modification, would keep the government solvent. Blanchard (1990) defines a fiscal policy as a set of rules and an inherited level of debt, and a *sustainable* fiscal policy as one such that the debt-to-GDP ratio would converge back to its initial level.

[3] An entity is (il)liquid if, regardless of whether it satisfies the solvency condition, its liquid assets and available financing are (in)sufficient to meet or roll-over its maturing liabilities (IMF 2014).

[4] IMF's current DSF for **low-income countries** (IMF 2018) features thresholds for the present value (PV) of public and publicly-guaranteed external debt (PPG) (as a % of GDP or exports), PV of PPG external debt service (as a % of exports or revenue), and PV of total public debt (as a % of GDP). Thresholds depend on whether the country has weak, medium or strong 'debt carrying capacity', e.g., for the last indicator, thresholds are 35% (weak), 55% (medium), 70% (strong). Beyond these thresholds, the probability of fiscal stress is deemed to be 'too high' (IMF 2018 and Debrun et al. 2019). For **market access countries**, the 2013 MAC-DSF tagged a country for "higher" scrutiny, triggering more risk analyses, if any one of three criteria held: current or projected debt-to-GDP ratio above 60 or 50

used in IMF-DSFs, which are largely derived from estimates of the correlates of fiscal stress episodes—such as defaults, restructurings or an IMF-supported program of significant size—should not be confused with limits to fiscal space *per se*.[5]

The question comes up because climate-vulnerable developing economies are the most threatened by the physical impacts of climate change—both recurring weather-related extreme events and slower-onset events—and have little choice but to immediately undertake strategic adaptation, resilience and transition investments at a "pace and scale that climate science requires" to survive and thrive (Bhattacharya et al. 2020). Yet, Vulnerable Group of 20 (V20) members describe how climate investments are restricted because of "extreme resource constraints" and limited or "narrow fiscal space."[6] V20 members report, among others, high and rising levels of public debt, which are in no small part due to recurring climate-related challenges;[7] high debt servicing requirements, which have crowded out both "decisive crisis and recovery responses to COVID-19" and crucial climate investments;[8] and disproportionately high sovereign borrowing costs, which has been independently verified as premiums for national vulnerability to physical risks.[9] An overall dearth of climate finance—whether grants or loans, from official or private sources—suitable for adaptation and transition investments, which typically promise positive net economic benefits (if not positive financial returns) in the long term but require large amounts of capital up-front, has also been reported.[10] Thus, the V20 have called on the international community to provide debt forgiveness and flexibility, dedicated resources and financing mechanisms to address and avert loss and damage, and other forms of targeted support so that member states can invest in climate resilient, low-carbon and sustainable development.

What "narrow fiscal space" may mean has to be clarified, however. Are governments close to a point where long-term solvency would be in doubt? Or are otherwise able and

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percent, for advanced economies (AE) or emerging market economies (EME) respectively; current or projected gross financing needs-to-GDP ratio above 15 or 10 percent, for AE or EM respectively; or have or are seeking exceptional access to IMF resources (IMF 2013).

5 In its assessment of the MAC-DSA framework in 2011, the IMF made this distinction: *"In this approach, the reference to 60 percent of GDP should not be construed as a level beyond which debt distress is likely or inevitable, nor should it be used to judge whether debt is sustainable or not. Rather the reference point should be used as an indication that more analysis is needed."* (IMF 2011, p. 13). Further, a separate framework for the 'assessment of fiscal space' was proposed in 2016 and piloted among select MACs in 2017 and 2018. We describe it in the next section.

6 Formed in 2015 with originally 20 members, the V20 Group of Finance Ministers of the member states of the Climate Vulnerable Forum (CVF) is a dedicated cooperation initiative of economies systematically vulnerable to climate change. Current membership stands at 48 economies. The rest of this paragraph are drawn from the *1st Climate Vulnerable's Finance Summit Communique*, 8 July 2021 (https://www.v-20.org/activities/ministerial/1st-climate-vulnerables-finance-summit-communique) and *Statement on Debt Restructuring Options for Climate-Vulnerable Nations*, 27 October 2021 (https://www.v-20.org/our-voice/statements/group/v20-statement-on-debt-restructuring-option-for-climate-vulnerable-nations).

7 At the same time, high levels of indebtedness are a reason for being "pass[ed] over for access to international financial support" when disasters strike. (https://www.v-20.org/activities/ministerial/1st-climate-vulnerables-finance-summit-communique).

8 External public debt service was larger than health care expenditure in at least 62 countries in 2020, twenty-five of which are in Sub-Saharan Africa (Munevar 2021). ECLAC (2021) discusses Latin America and Caribbean.

9 Buhr et al. (2018) estimate that exposure to climate risks has increased the cost of debt for V20 countries by 117 basis points, on average, amounting to more than USD 40 billion in additional interest payments over the period 2007–2016 on government debt alone. It is possible that premiums may continue to rise as climate change impacts become more acute. Cevik and Jalles (2020) and Bierne et al. (2021) confirm a risk premium on vulnerability.

10 Bhattacharya et al. (2020) provides a comprehensive picture of the climate finance problem.

solvent governments finding themselves without room for fiscal maneuver? The distinction is important because the latter would imply far less pressure on climate-vulnerable developing economies to undertake painful fiscal adjustment now and far more pressure on international public institutions and key central banks to address the market and institutional failures which have impeded the flow of finance to otherwise solvent governments—described as a "financial death trap" where "developing-country governments are pushed into default—not out of bad faith or because of long-term insolvency, but for lack of cash on hand."[11] A new credit-rating system that accounts for each country's growth prospects and long-term debt sustainability, support for a liquid secondary market in developing-country bonds, currency swap lines with low- and low-middle income central banks, are among the actions suggested for the Group of 20 (G20), IMF, Bank for International Settlements (BIS) and key central banks to consider.[12]

In fact, having limited fiscal space doesn't quite square with the fact of negative interest rate-growth differentials (the difference between the average interest rate paid on government debt and the growth rate of the economy, henceforth IRGD) which have prevailed in many V20 countries for decades[13] and which are forecast to persist for at least the next five years. It is quite the opposite. Room for fiscal maneuver should be ample. This follows from the arithmetic of debt dynamics, where it can be shown that changes in debt are driven by the IRGD—which is assumed to be positive and whose impact is directly proportional to the initial debt level—and the primary balance: the larger IRGD is, the larger the fiscal effort necessary to stabilize the public debt-to-gross domestic product (GDP) ratio or put it on a downward path.[14] When IRGDs are negative however, when output growth is greater than interest rates on government debt, the debt-to-GDP ratio can be stabilized or even decline without governments having to generate primary surpluses (Blanchard 1990, Debrun 2019).[15]

With fiscal space *and* a continuing regime of negative IRGDs, the argument for concerted international action to unlock the flow of finance into climate adaptation investments, *particularly* those with large and persistent multiplier effects, becomes even more compelling. Well-chosen climate adaptation investments, by having a positive impact on growth, or by preventing growth from being derailed by climate change, can potentially help an economy

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[11] J. Sachs, "Time to Overhaul the Global Financial System", 3 December 2021, Project Syndicate (https://www.project-syndicate.org/commentary/global-financial-system-death-trap-for-developing-countries-by-jeffrey-d-sachs-2021-12.) Sachs describes how low- and lower-middle-income country borrowers are perceived as high risk, which often becomes a self-fulfilling prophecy. "International lenders (or rating agencies) come to believe, often for an arbitrary reason, that Country X has become uncreditworthy. This perception results in a "sudden stop" of new lending to the government. Without access to refinancing, the government is forced into a default, thus "justifying" the preceding fears. The government then usually turns to the International Monetary Fund for emergency financing. The restoration of the government's global financial reputation typically takes years or even decades."

[12] Ibid. ECLAC 2021 also suggests a new credit rating agency

[13] Escolano et al. (2011) document negative and relatively large IRGDs for 128 non-advanced economies between the years 1966 and 2010. IMF (2011) likewise shows that interest rate-growth differentials have been negative in emerging markets (-4) percent and lower income countries (-8 percent) between 1990 and 2016.

[14] From the standard intertemporal government budget constraint one can derive an expression for a change in debt: $\boldsymbol{\Delta d_t = (r_t - \vartheta_t)d_{t-1} - pb_t}$, where d_t is public debt (as a share of GDP), $(r_t - \vartheta_t)$ is the IRGD, and *pb* is the primary balance (as a percentage of GDP). Thus, the higher the IRGD, the larger the fiscal effort necessary to stabilize the public debt-to-GDP ratio (that is, $\Delta\, d_t = 0$) or put it on a downward path.

[15] This does not mean public debt becomes a 'free lunch'. There continues to be welfare costs associated with high public debt although costs may be "smaller than typically assumed" (Blanchard 2019).

outgrow its debt, advancing not just climate resilience but also debt sustainability in the longer run.

Our objective is to estimate whether and to what extent fiscal space exists for a sample of climate vulnerable countries. Because markets operate with incomplete information, estimates of fiscal space—whether countries are near or far from a point where long-term fiscal solvency fails—may be of use in the efforts to unlock the flow of finance to these countries, particularly for urgent and well-chosen climate adaptation and transition investments. At the very least, a closer look at fiscal space should facilitate a deeper reckoning and assignment of accountabilities—among and between governments of climate-vulnerable economies *and* international public finance agencies and key central banks—for addressing the problem.

To do this, we choose the approach by Ostry et al. (2010) and Ghosh et al. (2013) which permits an analysis of fiscal space that focuses on estimating, based on the historical record of fiscal adjustment of countries, a debt limit (d^{**}) beyond which solvency fails, *abstracting* from liquidity/rollover risks.[16] The choice is deliberate; the IMF-DSF thresholds already incorporate liquidity concerns in a significant way. Any differences between the IMF-DSF thresholds and our estimated debt limits may also be a gauge of the opportunity cost of liquidity constraints (actual fiscal space and fiscal investments foregone) due to a financial death trap.

The approach is also appealing because "implications about the sustainability of public debt positions at the present time" are drawn from governments' track record of "willingness to adjust," i.e. whether the response of fiscal policy to increases in public debt in the past has been consistent with satisfying its intertemporal budget constraint (Ostry et al.) This information may be useful to lenders and markets, less to predict whether countries may or may not default, but to prompt a second look at short-term liquidity issues versus longer-term climate-aligned growth potential among climate-vulnerable countries.

We employ this approach on a sample of 38 economies from the membership of the V20 and Association of Southeastern Asian Nations (ASEAN), examining those classified by the IMF as low-income countries (LIC) and market access countries (MAC) separately, using data from 1990 to 2019. Our estimates suggest that with few exceptions, fiscal space is **ample** for both developing low-income countries (LICs) and market-access countries (MACs). Importantly, we also find that LICs and MACs may be converging to long-run debt ratios that are in the vicinity of, and even below, IMF-DSF thresholds—an indication perhaps of the disciplining effect of these (or other) thresholds,[17] but also a confirmation that IMF-DSF thresholds are **not** to be construed as limits to fiscal space *per se*. The differences between our estimated debt limits and IMF-DSF thresholds are not small, moreover—hinting at significant opportunity costs that arise when otherwise solvent governments are caught in the financial death trap and cannot mobilize funds for important climate adaptation and transition investments. To the extent that foregone or delayed climate investments due to this trap have mitigation co-benefits, or produce substantial merit goods, then opportunity costs are shared by the global community.

[16] IMF (2011) discusses other approaches **to** estimating indicative 'maximum sustainable public debt' levels for advanced and emerging market economies.

[17] A commonly used debt ceiling by some countries (e.g., set by law) is 60 percent of GDP (IMF 2011).

Our findings imply that governments with ample fiscal space, reflective of a track record of fiscal adjustment consistent with long-term solvency, should be afforded a second look and perhaps supported, particularly if they have well-articulated climate adaptation plans, and investments with large multiplier effects, since growing in a sustainable way also contributes to debt sustainability. Findings also suggest that actions to obviate the financial death trap are warranted, if indeed otherwise solvent, able and ready governments are unable to access finance for urgent climate investments, and that climate-vulnerable country governments, who are not quite ready with fitting climate-aligned development and investments plans, should endeavor to complete these, so that their fiscal space can be leveraged to get funding for those plans.

The rest of the paper proceeds as follows. In the next section, we describe the approach of Ostry et al. (2010) and Ghosh et al. (2013) in more detail, followed by our empirical approach, data and variables in the third section. Our estimates are in the fourth section. Implications and closing remarks are in the fifth.

MODEL

A model that permits a fairly intuitive analysis and estimation of fiscal space is derived and demonstrated by Ostry et al. (2010) and Ghosh et al. (2013) (henceforth Ostry/Ghosh).[18] The model posits a relationship between the primary balance and public debt that exhibits *fiscal fatigue*, whereby a government's ability to increase primary balances cannot keep pace with rising debt (say, as it becomes increasingly difficult to cut non-interest expenditures or raise taxes to cover higher interest payments), e.g. coming from low levels of debt, where the primary balance may exhibit little or even decreased sensitivity to rising debt, the primary balance first increases with debt but then slows down, and actually decreases at very high debt levels. In other words, the marginal response of the primary balance to lagged debt is non-linear, deviating from the standard treatment of the fiscal reaction function as a linear function (Bohn 1998), but supported by observations made in Abiad and Ostry (2005) and Mendoza and Ostry (2008). The response of the primary balance to lagged public debt is of the reduced form:

$$pb_{t+1} = \mu + f(d_t) + \varepsilon_{t+1} \tag{1}$$

where pb is the primary balance, μ captures all systematic determinants of the primary balance other than lagged debt, and $f(d_t)$ is the response function of the primary balance to lagged debt that is non-linear in form such that there exists a debt ratio beyond which the response of the primary balance is less than the growth-adjusted interest rate, $r^*–g$ (where r^* is the risk-free interest rate and g, the growth rate of real GDP).[19] Ostry/Ghosh show that fiscal fatigue is a sufficient condition for an endogenous upper bound on debt, or *debt limit*,

[18] Unless otherwise indicated, the description in the next five paragraphs draws heavily from these two papers as well as from Debrun et al. (2019) which surveys public debt sustainability assessments.

[19] $f(d)$ is assumed to be continuously differentiable and have the property that there exists a debt ratio $d^m > \bar{\varepsilon}$ such that $\mu + f(d^m) - \bar{\varepsilon} \geq (r^*-g)\, d^m$ and $f'(d) < (r^*-g)\ \forall\ d > d^m$. As mentioned, r^* is the risk-free interest rate, exogenously given, and g is the growth rate of real GDP.

above which debt would be unsustainable, increasing without bound as the primary balance would never be enough to offset a growing debt service. At this limit, interest rates would become infinite, and government would necessarily default. *Fiscal space* is then defined as the difference between current levels of public debt and the estimated debt limits.

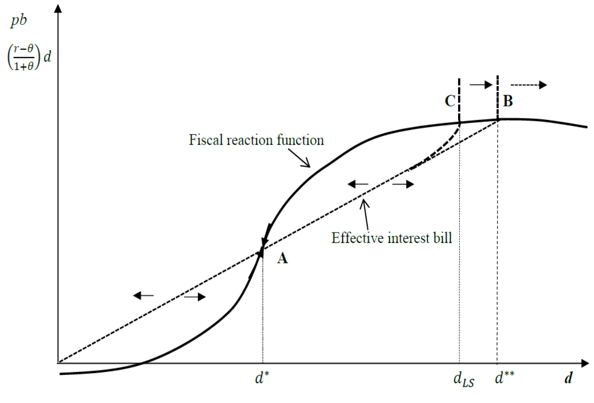
Their derivation of the debt limit is illustrated in Figure 1, where the solid line is a stylized representation of a fiscal reaction function with fiscal fatigue, the dotted line is the effective interest-rate schedule, and three points of intersection are identified. In a simple deterministic case where there are no shocks to the primary balance and no endogenous responses of interest rates to risk, point B is the intersection of the fiscal reaction function with the risk-free interest rate schedule, which yields debt limit ***d*****. [20] That is, d^{**} is the largest root of the equation:

$$\mu + f(d^{**}) = (r^{*}-g)\, d^{**} \qquad (2)$$

Thus, an improvement in a country's economic growth rate pivots the interest rate schedule clockwise, raising the debt limit, while a negative fiscal shock (or, in the general stochastic case mentioned below, the possibility of one) could "push an otherwise sustainable debt level into unsustainable territory."

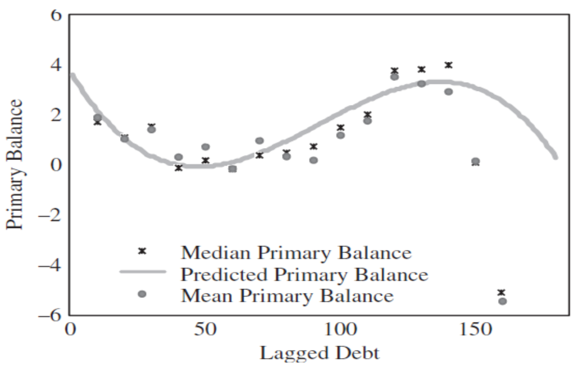
Point A, a lower intersection, yields ***d****, the "conditionally stable" long-run debt ratio to which the economy normally converges.[21] If a shock raises debt above this point (but not beyond d^{**}), the primary balance in later periods will more than offset the higher interest payments, returning the debt ratio to its long-run average.

FIGURE 1 Determination of the debt limit given fiscal fatigue



Source: Debrun et al. 2019

FIGURE 2 Primary Balance and Public Debt for 23 advanced economies, 1970-2007



Source: Ghosh et al. 2013

[20] The deterministic case abstracts from stochastic shocks to the primary balance and the endogeneity of the interest rate and assumes that the interest rate schedule is a straight line with slope given by the growth-adjusted risk-free real interest rate (that was prevailing at low debt levels) and that output growth is independent of the level of public debt or the interest rate.

[21] In general, there will be two stationary equilibria, the lower and higher intersections, ignoring the intersection that would occur at $d < 0$ (Ghosh et al. 2013).

Point C gives the debt limit in the general stochastic case, i.e., when stochastic shocks and increasing risk premiums, as debt approaches its limit, are considered. The latter is depicted by an upward bending, convex interest payment schedule, that becomes vertical as debt exceeds its limit at $\boldsymbol{d_{ls}}$.[22] Since the deterministic case does not necessarily take full account of the sharp rise in interest rates as debt approaches its limit, $\boldsymbol{d_{ls}}$ is necessarily lower than d^{**} (Ghosh et al.). Consequently, the available fiscal space will likely be overstated in the deterministic case.

It is important to note that debt limits here (from either deterministic or stochastic case) abstract entirely from liquidity/rollover risk. In practice, however, liquidity risks are not trivial for some countries. Country-specific policies and events in the near-term could result in significant deviations from past behavior or performance and may cause some countries to default on their debt, which, if not addressed could threaten solvency.[23] Thus, "prudence would dictate that governments target a debt level below their limit." (Ostry et al.).

While a finding of ample fiscal space does not rule out a default outcome nor distill the proximate cause(s) of a default if or when it does occur despite evidently ample fiscal space, it is still important to distinguish among default outcomes. In some cases, poor investments or profligate spending could make such an outcome practically inevitable.[24] However, in other cases, especially among lower-income countries, a country may already be caught in the financial death trap, with no access to financing to roll over debt, or with access at extremely high cost, given market perceptions of outsized liquidity risks as well as coordination failures among creditors, despite a history of fiscal behavior consistent with long-term solvency.[25] It is in such latter cases where more nuanced information may guide lenders in taking a second look at short-term liquidity issues versus longer-term climate-aligned growth potential to make judicious lending decisions.

It is also important to note that a finding that a government has no or little fiscal space is "not a prediction that public debt will explode or that the government will default" but rather

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[22] Ghosh et al 2013. More specifically, it assumes that the risk premium and default probability are jointly endogenous.

[23] We thank one of our referees for emphasizing this point.

[24] For instance, Sri Lanka's recent default on its debt of USD 50B is regarded as "the previous government's own making" rather than a consequence of global economic problems (Hoskins, P. "Sri Lanka defaults on debt for the first time in history." *BBC News*, 20 May 2022. https://www.bbc.com/news/business-61505842). Professor Mick Moore of the University of Sussex was quoted as saying, "This is the most man-made and voluntary economic crisis of which I know." (Ibid.). Among others, the previous government borrowed money for what critics have called "unnecessary infrastructure projects" and spent virtually all of its foreign reserves to pay off debt service without seeking to restructure the debt. (Ibid. Also, https://www.bbc.com/news/world-61028138.)

[25] Countries like Ghana and Ethiopia, although they have not defaulted on their debt, may be examples. Sachs describes Ghana as having a debt-to-GDP ratio that is far lower than Greece and Portugal, yet Ghana's credit ratings are several notches lower and its cost of capital is several percentage points higher (i.e. 9% on ten-year borrowing versus 1.3% and 0.4% for the other two, respectively) (see footnote 11). Ethiopia grew at close to 10 percent annually for the last two decades and was regarded as "one of Africa's most promising economies" yet has been unable to restructure its debt after being hard hit by the pandemic, while already struggling with high interest bills (common to other African countries) and internal armed conflict. Ethiopia was among just three countries that sought debt relief under the Common Framework of the G20, in which private creditors do not participate; "the result is stasis." (Economist, 30 April 2022. https://www.economist.com/middle-east-and-africa/2022/04/30/debt-repayment-costs-are-rising-fast-for-many-african-countries).

that something may need to change, i.e. "fiscal policy may need to react more strongly to debt than past behavior would suggest" (Ostry et al.).

Empirically, Ostry/Ghosh estimate a reduced form fiscal reaction function for 23 advanced economies for the period 1985 to 2007; a cubic function is found to approximate $f\,(d_t)$ well (Figure 2).[26] Debt limits are computed using actual market interest rates—(i) the historical average over 1998 to 2007 of the implied nominal interest rate on government debt (relative to the growth rate of nominal GDP) and (ii) IMF projections of long-term government bond yields and for GDP growth for 2010 to 2014—as well as (iii) endogenous interest rates obtained from the model (based on derived risk premiums). Using market interest rates, debt limits for eighteen countries were between 152.3 and 263.2 percent of GDP; fiscal space was limited or not available for five countries.[27] Using model-projected interest rates, debt limits were lower and fiscal space narrower by an average of 8.5 percent and 4 percent, respectively.[28]

The approach of Ostry/Ghosh has since been adopted by Moody's Analytics in its assessment of fiscal risks in advanced economies.[29] To our knowledge, however, it has not been applied to measure fiscal space in non-advanced MACs or LICs.[30] Instead, for MACs, the IMF has just prepared and piloted a new framework for providing 'bottom line' assessments of fiscal space,[31] which, like the DSF, seems to be heavy on the availability of market funding rather than on long-term solvency. It defines fiscal space as "the room to raise spending or lower taxes relative to a pre-existing baseline, without endangering market access and debt sustainability," and abstracts "from any considerations other than financing availability and fiscal sustainability," which are, in turn, defined as "the extent to which the government can expect to have access to market funding at reasonable rates" and "the extent to which public debt and annual financing needs … of the government remain sustainable," respectively.[32] Operationally, it relies heavily on existing indicators and tools, 'eschewing' a single metric in favor of a multi-faceted approach.

This new 'fiscal space' framework is viewed as not being a good fit for LICs however, reasoning that majority of LICs rely on (concessional) financing whose availability is largely determined by non-quantifiable factors.[33] Instead, it is proposed that LIC DSAs already provide

[26] They control for economic, institutional, and other structural variables such as output gap, government expenditure gap, fuel and non-fuel commodity prices, trade openness, inflation, a political stability index, fiscal rules index, whether the country had an IMF-supported programme, and age-dependency ratios.

[27] Debt limits (and therefore fiscal space) did not exist for Greece, Iceland, Italy, Japan, and Portugal. Fiscal space was ample for Australia, Korea, Denmark, Norway, and Sweden. See Table 3 of Ghosh et al. (2013).

[28] Debt limits in the stochastic case were lower than limits using either projected or historical market rates.

[29] Moody's estimates for a set of thirty advanced economies are featured in Figure 1 of Ostry et al. (2015).

[30] Ostry et al. is used to compute long-run debt ratios (what would be d*) in IMF (2011).

[31] As per IMF (2019), the classification stands at "substantial fiscal space" (no significant constraint to undertaking temporary fiscal measures, if an economic case can be made for them), "some fiscal space" (some concerns about financing, fiscal sustainability, or credibility, but meaningful temporary fiscal measures are possible, if an economic case can be made), "fiscal space at risk" (there are clear, but not imminent, risks to fiscal sustainability and at most marginal fiscal loosening is possible compared to the baseline), and "no fiscal space" (fiscal sustainability and market financing are patently in question, or market financing is already prohibitively expensive).

[32] All quotes are from IMF 2018, pp. 9 and 10.

[33] It could be useful to LICs that can obtain a significant amount of external market or other non-concessional financing (IMF 2018).

important insights into debt vulnerabilities (IMF 2018). Other work on fiscal space in LICs has been by Baum et al. (2017) which explores the notion of a 'safe debt limit' for LICs (due to Debrun et al. 2020), defined as "the level that would accommodate an increase in debt (resulting from a shock) without breaching the debt limit" (ala Ostry/Ghosh); fiscal space is the difference between safe debt limits and current debt ratios. In demonstrating their safe limits, however, Baum and others do not estimate a d^{**} or $\boldsymbol{d}_{ls}$ for their sample of LICs but use LIC-DSF thresholds.

EMPIRICAL APPROACH, DATA AND VARIABLES

Our sample includes 23 LICs and 15 MACs from the V20 and ASEAN, using data for the period 1990 to 2019. The two groups are analyzed separately.[34] Data availability is uneven across the economies, however, and so, in the end, we have two unbalanced panels and a parsimonious set of controls.

Our data include general government gross debt and primary balance (budgetary central government) as a share of GDP and a set of control variables based on the literature (discussed below), as well as IMF projections on public debt, interest expense on public debt and GDP growth for 2021 to 2025. These are sourced or based on data from IMF Government Financial Statistics, the IMF World Economic Outlook database, the World Bank Open Data-World Development Indicators and IMF Staff Reports containing debt sustainability analyses. Data also include country default spreads and 10-year US Treasury rates obtained from the website of Aswath Damodaran and the Federal Reserve Bank of St. Louis' FRED.[35] The full list of variable definitions and data sources are in Annex Table A1.

Procedurally, we first estimate fiscal reaction functions per panel with the following reduced form specification:

$$pb_{i,t} = \beta_0 + \beta_1 {}^* d_{i,t-1} + \beta_2 {}^* d_{i,t-1}^{\;2} + \beta_3 {}^* d_{i,t-1}^{\;3} + \gamma' X_{i,t} + \alpha_i + \varepsilon_{i,t} \tag{3}$$

where $pb_{i,t}$ is the ratio of the primary balance to GDP in country i at time t, $d_{i,t-1}$ is lagged debt (which was suggested by the data, discussed with Figures 1 and 2 below); $X_{i,t}$ is a vector of macroeconomic and other determinants of primary balance, α_i are country fixed effects and $\varepsilon_{i,t}$ are error terms which are corrected for within-country first order autocorrelation to take into account persistence in shocks to the primary balance. Fixed effects were confirmed using a test of overidentifying restrictions.[36]

[34] Our sample initially included the forty-eight member nations of the V20 and seven more from the ASEAN, or a total of fifty-five. Spotty or missing data reduced this to forty-seven outright (Comoros, Gambia, Haiti, Niger, South Sudan, Tuvalu, Yemen, Brunei) then further to forty-one during the modelling (Afghanistan, Grenada, Malawi, Papua New Guinea, Palau, Sta. Lucia). Three more economies were considered outliers (Sudan, Barbados, and Lebanon) leaving thirty-eight.

[35] Damodaran is found at https://people.stern.nyu.edu/adamodar/ New_Home_Page/dataarchived.html, while the FRED is at https://fred.stlouisfed.org/series/GS10

[36] By Schaffer, M.E., Stillman, S. 2010. Available at https://ideas.repec.org/c/boc/bocode/s456779.html

For both LIC and MAC panels, our vector $X_{i,t}$ includes the output gap (actual less potential), to control for the effect of business cycles; the government expenditure gap (actual less potential) to control for temporary fluctuations in government outlays; the (logarithm) of CPI inflation to control for any effects of inflation (such as bracket creep); trade openness (or sum of exports and imports as a percentage to GDP); a two-year moving average of revenue-to-GDP to proxy the capacity of a country's fiscal institutions (to generate primary surpluses); a dummy variable indicating whether the country had an IMF-supported program in a given year as a proxy for the international influence on fiscal behavior and a dummy variable for the year 2008 and onwards.[37] Other institutional variables mentioned in the literature—political stability and fiscal rules[38]—were explored but not included as it would have meant fewer countries and/or shorter time series for countries without any tangible contribution to the estimation (e.g., in terms of statistical or economic significance or goodness of fit). The MAC panel additionally controls for the effect of fuel and non-fuel commodity price movements (which are applied only to fuel and non-fuel commodity exporters).[39]

The fixed effects linear model with AR(1) disturbances that we used could not handle heteroskedasticity and one that could- (panel-corrected standard errors)- could not be applied to our unbalanced panels. Thus, we confirmed robustness using an alternative specification—feasible GLS—which corrects for within panel heteroskedasticity and panel specific autoregression—but proxied country fixed effects using country-specific dummy variables. Slope homogeneity, in turn, was tested following Pesaran and Yamagata (2008) using the algorithm by Bervendsen and Ditzen (2020), although for our sample size the power of these tests is quite low.[40]

Next, we estimate debt limits using three sets of market-based IRGDs, specifically, (i) effective interest rates on government debt and GDP growth rates for the years 2009 to 2019 (ii) IMF-projected interest rates and GDP growth for the period 2021 to 2025; and (iii) IMF-projected interest rates and GDP growth rates for 2021 to 2025 that are 'shocked', i.e., increasing the former by one-standard deviation and decreasing the latter by one-standard deviation. Average IRGDs were combined with the estimated fiscal reaction function to obtain three sets of debt limits using equation (2) above. A fourth set of debt limits was obtained for MACs using estimated sovereign interest rates computed by adding a country default spread to the 10-year US Treasury bond rate for the years 2009 to 2019.

Finally, we compute fiscal space. Fiscal space is the difference between estimated debt limits and the current or projected debt; projected debt for 2025 is used in this paper. Since

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[37] Variables follow Ostry/Ghosh, Abiad and Ostry (2005) and Mendoza and Ostry (2008) to the extent possible.

[38] Ostry/Ghosh use the International Country Risk Guide data set and the IMF fiscal rules database. We also tried indicators from the World Governance Indicators data set.

[39] Commodity prices, fuel and non-fuel, did not contribute anything to the LIC panel regression.

[40] Ghosh et al. (2013) note in their Appendix that testing for slope homogeneity is difficult "because the overlap of debt ratios observed across countries over different debt ranges is limited." Instead, they grouped their data into low-to-moderate debt and moderate-to-high debt categories and ran fixed effects regressions per country, with a different specification depending on whether the country belonged to one or the other category. Their objective was to establish whether countries in the same category behaved similarly to rising debt. Running this test is not feasible for our unbalanced sample.

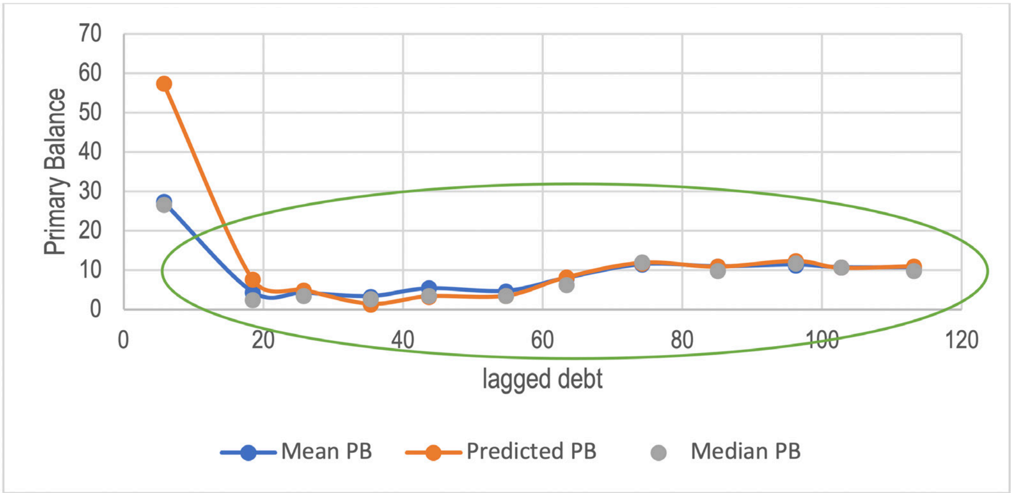
we do not derive model-implied risk premiums and interest rates at this time, we double the decrease in debt limits obtained when model-implied interest rates were applied by Ghosh et al. (2013) and see what happens to fiscal space.

RESULTS

Fiscal reaction function

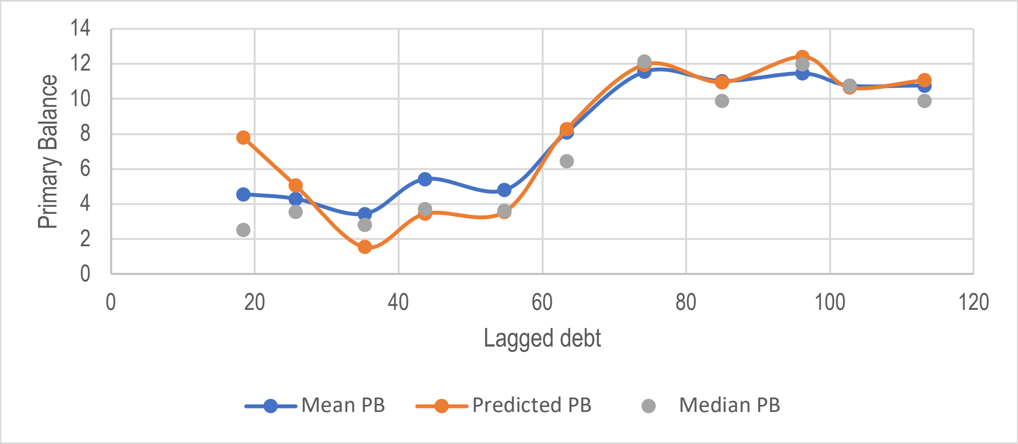
Primary balances and lagged debt for LICs for the period 1990 to 2019 are shown in Figures 3a and 3b. The scatterplots highlight the mean primary balances (blue line) as well as fitted values (orange line) from the estimation results in Table 1 (discussed shortly), computed for a specified debt range (0-10 percent, 11-20 percent and so forth), and indicate that fiscal fatigue may characterize the data i.e., at low levels of debt, the primary balance does not respond positively to debt, which changes as debt increases, becoming positive before eventually weakening again. Figure 4 for MACs also indicates fiscal fatigue.

FIGURE 3A Sample LICs of the V20/ASEAN: Primary balance and Public Debt, 2009-2019



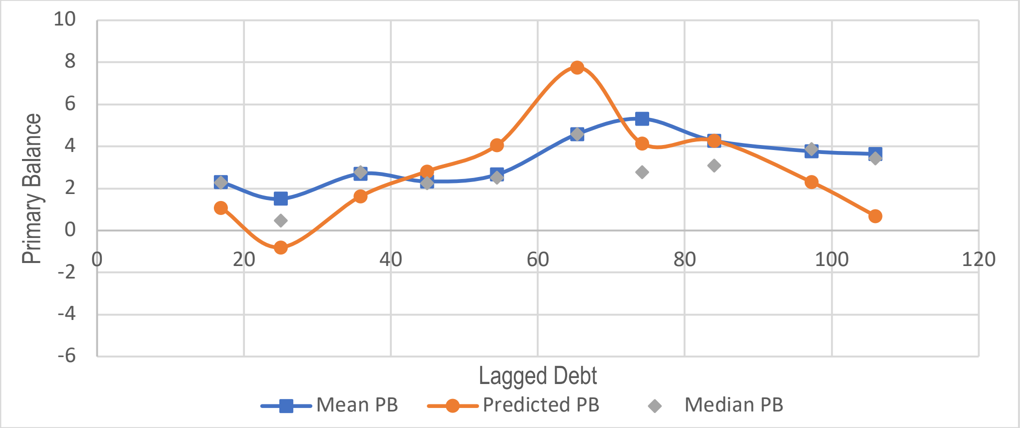
Source: Authors' calculations.
Note: Computed for 23 LICs over a specified debt range. Fitted primary balances are obtained from Table 1, column 1. The encircled portion is detailed in Figure 3B.

FIGURE 3B Detail of Figure 3A



Source: Authors' calculations.
Note: Figure 3A for debt > 10 percent. Fitted primary balances are obtained from Table 1, column 1.

FIGURE 4 15 MACs of the V20/ASEAN: Primary balance and Public Debt, 2009 to 2019



Note: Fitted primary balances are obtained from Table 1, column 2.

The results of our fixed effects panel regressions are presented in Table 1. The coefficients of the cubic functional form are statistically significant, suggesting that fiscal fatigue is a statistically significant and robust feature of the data for both LIC and MAC panels, i.e., the marginal response of the primary balance is first negative and then positive at moderate levels of debt before it starts declining.[41] We find that, for LICs, the response starts declining when debt to GDP is a little above 92 percent. For MACs, the inflection point is at around 87 percent.[42]

[41] Robustness was tested using an alternative specification (feasible GLS) as described in the previous section. Results are available upon request.

[42] For their sample of advanced countries, Ostry/Ghosh observed that the response of primary balances to lagged debt started to decline when debt reached 90 to 100 percent to GDP.

TABLE 1 Estimation results for the fiscal reaction function, 1990-2019

	LIC		MAC	
Lagged debt	-0.750	***	-0.393	***
	0.161		0.111	
Lagged debt2	0.013	***	0.007	***
	0.003		0.002	
Lagged debt3	-0.0001	***	-0.00004	***
	0.00002		0.000011	
Output gap	30.784	**	8.629	**
	15.130		4.079	
Govt expenditure gap	-6.534	***	-12.079	***
	1.954		0.935	
Revenue, 2-year average	0.759	***	0.723	***
	0.071		0.072	
Log(inflation)	0.341		0.181	+
	0.285		0.116	
Trade openness	-0.026		-0.002	
	0.025		0.008	
IMF	0.143		0.210	
	0.607		0.283	
Oil prices			-0.825	
			0.785	
Non-fuel comm prices	-		-0.595	**
			0.302	
GFC	-1.548	*	-1.144	***
	0.833		0.339	
_cons	3.080	*	-2.214	*
	1.858		0.630	
Observations	238		272	
Countries	23		15	
Average size	10.3		18.1	
Min, Max size	4, 25		5,28	
R^2 (within)	0.395		0.575	
AR(1) coefficient	0.402		0.707	

Note: The dependent variable is budgetary central government primary balance to GDP (in percent). Country-specific fixed effects are included in all specifications and the error term is assumed to follow an AR(1) process. ***, **, *, + denote significance at 1 percent, 5 percent, 10 percent and 12 percent levels respectively.

With one exception, signs of the significant coefficients are also as expected: primary balances respond positively to the output gap and negatively to temporary increases in government outlays; stronger fiscal institutions are associated with better surplus generating capacity; and the period after 2008 is associated with lower primary balances. The positive response of primary balances to inflation and to international influence (IMF) is also expected, but the former is only marginally statistically significant in one panel and the latter is not statistically significant in either panel. Contrary to expectations, however, the sign of the coefficient on non-fuel commodity prices is negative, suggesting that among non-fuel commodity exporting-MACs, primary balances respond negatively to changes in non-fuel commodity prices. Perhaps what we are seeing is elastic global demand for these exports.[43]

Our tests for slope homogeneity are found in Annex Table A2. We find some evidence that the null hypothesis of slope homogeneity cannot be rejected.[44]

IRGDs and Debt Limits

Estimating debt limits per country involves combining the estimated fiscal reaction functions with relevant IRGDs. Tables 2 and 3 provide summary statistics of the IRGDs used for estimating the debt limits of LICs and MACs, respectively (figures per economy are in Annex Tables A3 and A4). IRGDs are based on historical, estimated and projected market interest rates, with one case that includes simulated shocks. Debt ratios are also shown for reference.

TABLE 2 Actual and projected debt-to-GDP ratios and average IRGDs for 23 LICs

	Debt/GDP			IRGD (percentage points)		
	2009	2019	2025	Historical 2009-2019	Projected 2021-25	Projected, shocked
Median	34.5	42.0	51.6	−8.0	−7.1	−5.5
Mean	36.5	44.9	54.1	−7.7	−7.3	−4.9
Min	9.3	9.6	20.7	−23.5[a]	−16.9[a]	−10.2[a]
Max	91.3	106.6	87.0	4.1[b]	−0.8	5.8[c]

Source: Annex Table A3. Notes: [a] Ethiopia; [b, c] Kiribati and Samoa, respectively.

[43] When non-fuel commodity prices increase, the decline in quantity demanded is larger than the price increase so that output and income fall. Taxes will tend to fall when income declines, thus, the primary balance will also decline.

[44] Using the test for pure autoregressive models, the null hypothesis cannot be rejected using the unadjusted delta statistic but can be rejected using the adjusted delta statistic. However, the adjusted delta statistics tend to have a larger size; see Bervendsen and Ditzen (2020). Please refer to footnote 37 for other notes on this matter.

TABLE 3 Actual, estimated and projected debt-to-GDP ratios and average IRGDs for 15 MACs

	Debt/GDP			Average IRGDs			
	2009	2019	2025	Historical 2009-2019	Estimated 2009-2019	Projected 2021-25	Projected, shocked'
Median	46.1	53.5	63.1	−2.7	−2.8	−2.1	−0.8
Mean	46.4	58.0	70.1	−4.3	−3.0	−2.7	−1.3
Min	22.8	26.5	34.2	−14.9	−9.8	−10.5	−9.2
Max	101.7	129.0	142.6	−0.1	0.6[a]	2.8[b]	4.1[c]

Source: Annex Table A4. Notes: [a] Morocco; [b] Costa Rica; [c] Costa Rica.

In general, LICs have relatively large and negative IRGDs, with projected IRGDs for 2021 to 2025 that are, on average, less favorable than for 2009 to 2019. A positive average occurs in just two instances, Kiribati (4.1, historical) and Samoa (5.8, projected-shocked), while the largest negative IRGDs are in Ethiopia (refer to Table 4 or A4). The IRGDs for MACs are also negative on average, but less negative than those for LICs by about 3.4 to 4.7 percentage points. Historically, Morocco (0.6) and Fiji (0.2) had positive IRGDs (Table 5 or A5). Three MACs are projected to have average IRGDs that are positive in the period 2021 to 2025 (Costa Rica, Fiji and Guatemala).

Historically, average debt ratios in LICs have been about 9.9 to 13.1 percentage points less than the debt ratios in MACs, consistent with the fact that MACs have better access to debt markets. In 2025, debt ratios in LICs are projected to be about 16.0 percentage points less than the ratios in MACs.

Estimated debt limits (d**) and 'conditionally stable' long-run debt ratios (d*) are presented in Tables 4 and 5, where figures in red ink are the modulus of a complex number.[45] Estimated debt limits for LICs range from a minimum of 123.7 percent (Honduras) to a maximum of 160.3 percent (Ethiopia), with mean at 141.7 percent of GDP in the 'historical' case, and a minimum of 113.9 percent (Samoa) to a maximum of 148.5 percent (Kiribati), with mean at 137.4 percent of GDP in the 'shocked' case. For MACs, debt limits range from 118.8 percent (Fiji) to 162.4 percent (Mongolia), with mean at 132.1 percent of GDP in the historical case, and 79.2 percent (Fiji; a modulus) to 151.7 percent (Mongolia), with mean at 121.4 percent of GDP in the 'shocked' case.

[45] The modulus, also called the absolute value of a complex number, is the square root of the sum of squares of the real and imaginary part of a complex number, or the distance between the origin and the point in the complex plane.

TABLE 4 23 LICs: Estimated debt limits (d**) and long-run debt ratios (d*) under different IRGD assumptions

	Debt	IRGD			Historical		Projected		Projected, shocked	
	2025	Historical 2009-19	Projected 2021-25	Projected, Shocked	d*	d**	d*	d**	d*	d**
Bangladesh	40.3	-8.5	-10.5	-9.3	41.7	**141.2**	41.3	**144.3**	41.5	**142.5**
Bhutan	82.8	-9.3	-7.2	-5.3	51.7	**152.6**	52.2	**149.9**	52.6	**147.4**
Burkina Faso	48.3	-5.2	-6.1	-5.3	44.9	**138.3**	44.7	**139.8**	44.9	**138.5**
Cambodia	38.0	-8.1	-7.5	-5.8	50.1	**149.2**	50.3	**148.4**	50.7	**145.9**
DR Congo	20.7	-20.1	-12.5	-6.9	37.9	**156.4**	38.8	**145.6**	40.1	**136.3**
Ethiopia	40.0	-23.5	-16.9	-10.2	36.9	**160.3**	37.9	**151.9**	39.3	**141.8**
Ghana	87.0	-12.4	-6.9	-4.4	38.9	**145.5**	40.2	**136.4**	41.0	**131.4**
Honduras	39.9	-2.1	-3.7	-3.2	40.1	**123.7**	39.5	**127.5**	39.6	**126.6**
Kenya	64.4	-4.9	-8.8	-8.4	39.7	**131.2**	38.6	**138.5**	38.7	**137.9**
Kiribati	86.5	4.1	-1.9	-1.4	60.6	**141.1**	58.9	**149.2**	59.0	**148.5**
Madagascar	49.3	-8.0	-9.6	-8.4	43.1	**141.7**	42.8	**144.2**	43.1	**142.3**
Maldives	78.1	-6.9	-7.1	-3.6	42.4	**138.8**	42.3	**139.2**	43.4	**132.8**
Marshall Islands	54.2	-2.7	-1.7	0.5	44.1	**131.7**	44.4	**129.6**	45.3	**124.7**
Nepal	41.1	-12.0	-10.3	-9.8	40.1	**145.9**	40.4	**143.2**	40.5	**142.5**
Rwanda	73.1	-9.2	-10.0	-7.0	45.1	**145.7**	44.9	**146.9**	45.6	**142.5**
Samoa	67.7	-1.1	-0.8	5.8	46.2	**130.7**	46.3	**130.1**	49.5	**113.9**
Senegal	61.5	-2.1	-6.0	-3.0	47.2	**134.5**	46.1	**141.2**	46.9	**136.1**
State of Palestine	34.5	-8.0	.	.	37.6	**135.9**	.	**.**	.	**.**
Timor-Leste	23.4	-5.6	-4.2	-2.4	56.4	**152.0**	56.7	**150.1**	57.1	**147.9**
UR of Tanzania	38.8	-11.3	-6.9	-5.6	38.8	**143.4**	39.9	**136.0**	40.2	**133.5**
Vanuatu	55.5	-2.5	-4.3	-2.4	46.2	**134.0**	45.6	**137.3**	46.2	**133.9**
Lao PDR	53.9	-9.1	-7.1	-6.0	43.8	**144.3**	44.3	**141.2**	44.6	**139.4**
Myanmar	46.7	-8.8	-9.7	-6.4	41.0	**141.0**	40.8	**142.4**	41.6	**136.9**
Median	**51.6**	**-8.0**	**-7.1**	**-5.5**	**43.1**	141.2	43.5	141.8	44.0	138.2
Mean	**54.1**	**-7.7**	**-7.3**	**-4.9**	**44.1**	141.7	44.4	141.5	45.1	137.4

Source: Annex Table A5. Note: Figures in red ink are the modulus of a complex number

TABLE 5 15 MACs: Estimated debt limits (d**) and long-run debt ratios (d*) under different IRGD assumptions

	Debt		IRGD				Historical		Estimated		Projected		Projected, shocked	
	2019	2025	Historical 2009-19	Estimated 2009-19	Projected 2021-25	Projected, shocked	d*	d**	d*	d**	d*	d**	d*	d**
Colombia	52.3	59.3	-0.8	-3.1	-1.4	-0.6	38.7	**116.5**	37.3	**125.6**	38.3	**119.0**	38.9	**115.3**
Costa Rica	56.7	74.2	-0.6	-2.7	2.8	4.1	43.9	**113.4**	36.1	**122.5**	22.2	84.9	20.5	88.4
Dom Rep	53.5	63.1	-4.1	-2.8	-1.5	-1.0	40.5	**133.1**	41.1	**129.2**	41.8	**124.9**	42.1	**122.9**
Fiji	48.9	79.3	-0.6	0.2	-1.7	4.0	40.7	**118.8**	41.4	**115.3**	40.0	**123.2**	31.4	79.2
Guatemala	26.5	34.2	-0.2	-1.2	-0.5	0.4	42.9	**111.8**	37.6	**117.3**	38.3	**113.6**	49.9	**108.9**
Mongolia	68.4	77.3	-14.9	-9.8	-10.5	-9.2	44.1	**162.4**	45.5	**152.8**	45.3	**154.3**	45.6	**151.7**
Morocco	65.1	76.6	-0.0	0.6	-1.4	-0.7	44.4	**122.1**	44.8	**119.7**	43.6	**126.8**	43.9	**124.5**
Philippines	37.0	61.1	-2.7	-3.6	-4.0	-3.3	43.4	**131.5**	43.0	**134.0**	42.8	**135.3**	43.1	**133.2**
Sri Lanka	86.8	79.2	-3.6	-3.6	-1.3	-1.0	36.9	**127.3**	36.8	**127.4**	38.2	**118.5**	38.4	**117.0**
Tunisia	74.2	99.7	-2.3	-0.9	-4.0	-3.1	43.2	**129.7**	44.0	**125.4**	42.4	**134.8**	42.8	**132.3**
Viet Nam	43.6	49.3	-13.6	-5.9	-7.0	-5.9	43.9	**159.8**	46.2	**144.1**	45.8	**146.5**	46.2	**144.1**
Indonesia	30.6	41.3	-11.0	-5.5	-2.8	-1.5	42.6	**153.4**	44.4	**141.2**	45.6	**134.3**	46.2	**130.6**
Malaysia	57.1	62.2	-2.2	-2.3	-2.4	-0.8	44.2	**130.5**	44.1	**130.9**	44.1	**131.3**	44.9	**126.2**
Singapore	129.0	142.6	-5.9	-3.4	-2.2	-0.6	48.3	**146.0**	49.3	**140.3**	49.8	**137.3**	50.5	**133.3**
Thailand	41.0	52.7	-2.7	-1.1	-2.1	0.2	38.7	**125.7**	39.6	**119.8**	39.0	**123.6**	40.7	**113.8**
Median	46.1	**63.1**	**-2.7**	**-2.8**	**-2.1**	**-0.8**	43.2	129.7	43.0	127.4	42.4	126.8	43.1	124.5
Mean	46.4	**70.1**	**-4.3**	**-3.0**	**-2.7**	**-1.3**	42.4	132.1	42.1	129.7	41.1	127.2	41.7	121.4

Source: Annex Table A6. Note: Figures in red ink are the modulus of a complex number

Fiji and Costa Rica illustrate how sharp changes in the debt limit accompany large reversals in the sign of the IRGD. The estimated debt limit for Fiji climbs from 118.8 percent to 123.2 percent as average IRGDs improve from -0.6 (historical 2009 to 2019) to -1.7 (projected 2021 to 2025), and then decreases sharply to 79.2 percent as IRGDs deteriorate to 4.0 when stress is simulated. A similar story may be said for Costa Rica, although the sharp change in debt limit from 113.4 percent to 84.9 percent accompanies the sharp change in IRGD from -0.6 (historical) to 2.8 (projected 2021 to 2025), even before the projected IRGD is shocked.

With regards to *d**, we find that LICs are converging to long-run debt ratios that range from 36.9 to 60.6 percent, and 38.7 to 59.0 percent, with means of 44.1 and 45.1 percent of GDP, for the historical and shocked cases respectively (Table 6). These long-run debt ratios are in the vicinity of the IMF-DSA threshold for LICs with 'medium' carrying capacity (55 percent)[46]—which could indicate the disciplining effect of these thresholds but are a

[46] Thresholds for LICs pertain to the PV of total public debt, as a percent of GDP, and not the nominal value of the debt, because the latter may not be a good indicator of the debt burden if rates are concessional (Debrun et al. 2019).

TABLE 6 Estimated long-run debt ratios, d*, for historical and shocked cases and the difference between d** and IMF-DSF thresholds

		Historical IRGDs	Projected, shocked IRGDs	DSF thresholds	Difference: d** and DSF thresholds
LICs	mean	44.1	45.1	55 (medium)	82.9
	min, max	36.9, 60.0	38.7, 59.0		43.9, 112,9
MACs	mean	42.4	41.7	50 (higher scrutiny)	71.4
	min, max	36.9, 48.3	20.5, 50.5		29.2, 101.7

Note: Base data from Annex Tables A5 and A6.

confirmation that IMF-DSF thresholds are not to be construed as debt limits *per se*. In fact, the differences between estimated d** and IMF-DSF thresholds are not small—ranging from about 44 to 112 percentage points, with mean at 83 percentage points—suggesting that opportunity costs (e.g., foregone fiscal space, thus, delayed or foregone adaptation investments) associated with binding liquidity constraints, despite having ample fiscal space, could be substantial. Annex Table A5 provides information on the applicable DSF threshold per LIC.

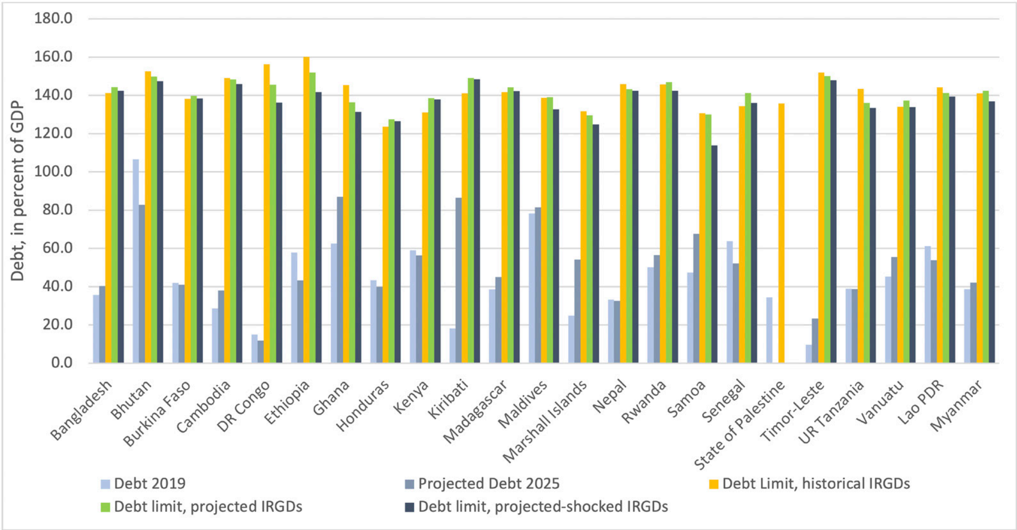
For MACs, indicative long-run debt ratios range from 36.9 to 48.3 percent, and 20.5 to 50.5 percent, with means at 42.4 and 41.7 percent, for the historical and shocked cases respectively. These are below the 2013 DSF threshold (50 percent) which tags a non-advanced MAC for "higher scrutiny," and again confirm that DSF thresholds are distinct from, and should not be construed as, debt limits. The differences between estimated debt limits and the 50 percent threshold also suggest significant opportunity costs when, say, markets react poorly to an actual or anticipated breach of the IMF-prescribed debt threshold, despite governments having more than enough fiscal space. As earlier tables show, the IMF projects that, except for three, all MACs will breach 50 percent debt-to-GDP threshold in 2025.

Fiscal Space

Figures 5 and 6 show the debt ratios in 2019 and projected for 2025, alongside the debt limits estimated under various IRGD for LICs and MACs. One can reckon whether fiscal space may be narrow or ample in 2025 by the difference between estimated debt limits and projected debt in 2025. This is highlighted in Figures 7 and 8 which illustrate the fiscal space associated with debt limits using shocked IRGDs. Complete figures are found in Annex Tables A5 and A6.

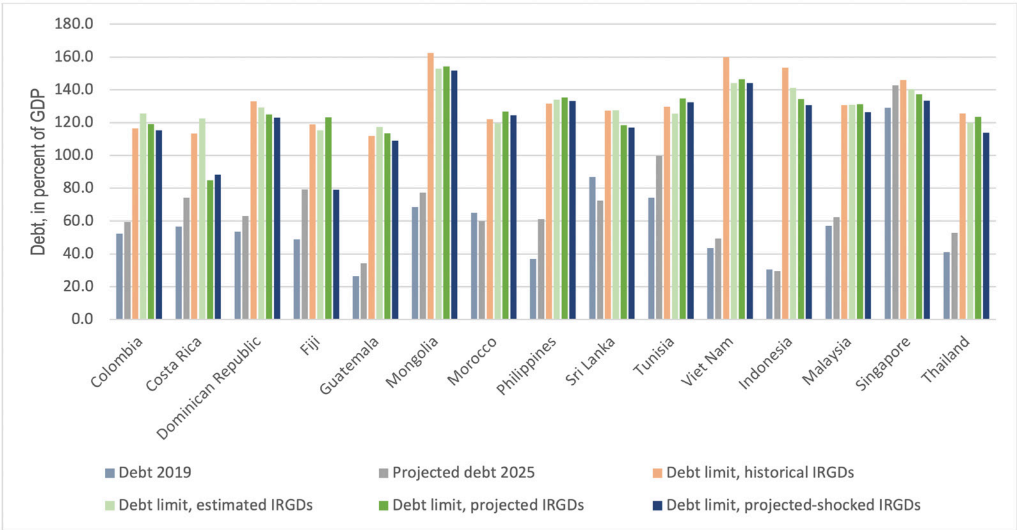
Footnote 3 provides a listing of thresholds.

FIGURE 5 23 LICs: Debt 2019 and 2025 and Estimated Debt limits under various IRGD assumptions



Source: Annex Table A5

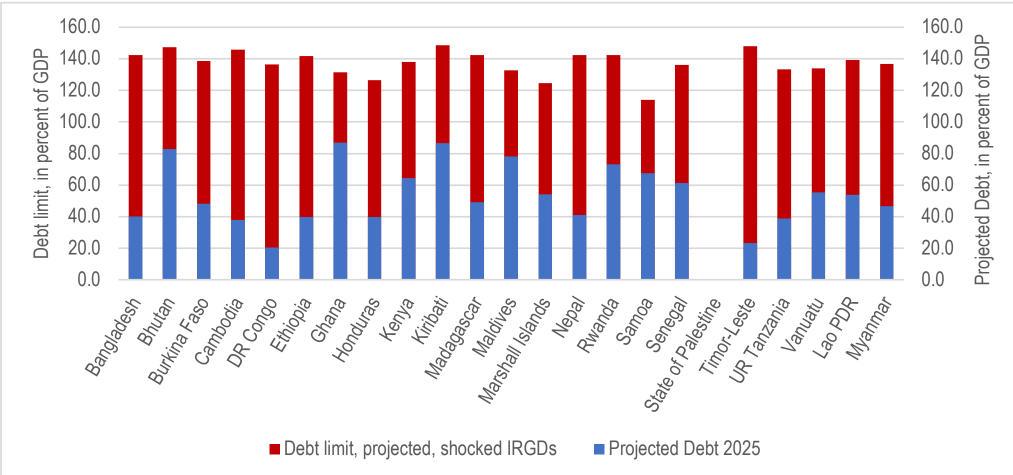
FIGURE 6 15 MACs: Debt 2019 and 2025 and Estimated Debt limits under various IRGD assumptions



Source: Annex Table A6

With few exceptions, fiscal space in 2025 associated with debt limits using shocked IRGDs is estimated to be fairly ample for both LICs and MACs. The average fiscal space is 83.3 percent for LICs and 51.3 percent for MACs, a difference that is consistent with the lower average projected debt in 2025 for LICs (54.1 percent) versus MACs (70.1 percent), as well as with the larger negative 'shocked' IRGDs for LICs (-4.9) than for MACs (-1.3). Among LICs, the smallest fiscal space is 44.4 percent (Ghana) which is associated with a projected debt ratio of 87 percent and a debt limit of 131.4 percent. The largest is 124.5 percent (Timor-Leste) associated with a projected debt ratio of 23.4 percent and a debt limit of 147.9 percent.

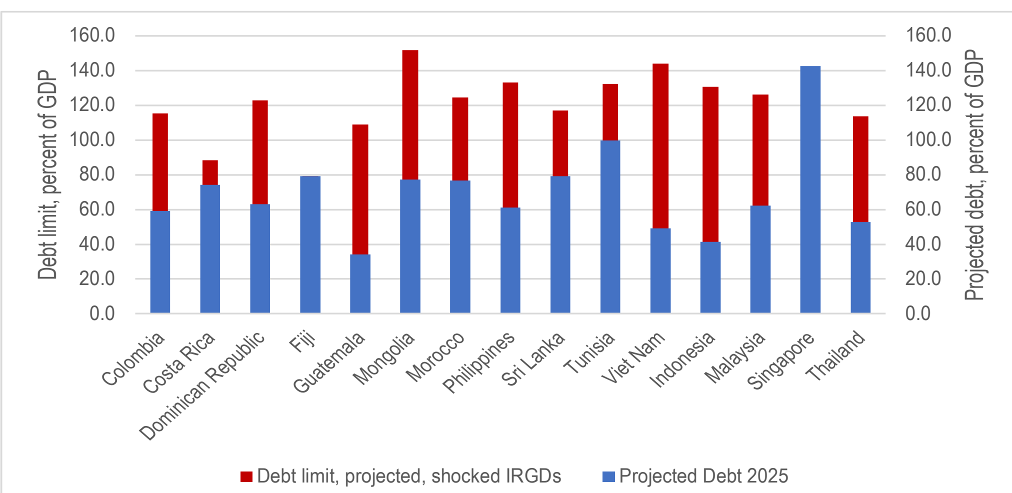
FIGURE 7 23 LICs: Fiscal space associated with debt limits using 'shocked' IRGDs and projected debt in 2025



Source: Annex Table A5. The red area indicates fiscal space.

Among developing MACs, and as expected from their estimated debt limits, Fiji and Costa Rica have the smallest fiscal space, with Costa Rica at 14.2 percent (vis projected debt of 74.2 percent) and Fiji at -0.1 percent (vis projected debt of 79.3 percent.) Assuming future behavior based on past behavior, Fiji would hit its estimated debt limit. The one advanced economy in the sample, Singapore, is likewise predicted to breach its debt limit, which is not unexpected given its high projected debt in 2025 (142.5 percent) and its increasing average IRGDs (from -5.89 in 2009 to 2019, to -0.65 percent for 2021 to 2025). As earlier mentioned, these findings are not a prediction that debt will explode or governments will default, but rather that 'fiscal policy may need to react more strongly to debt than past behavior would suggest' (Ostry et al.).

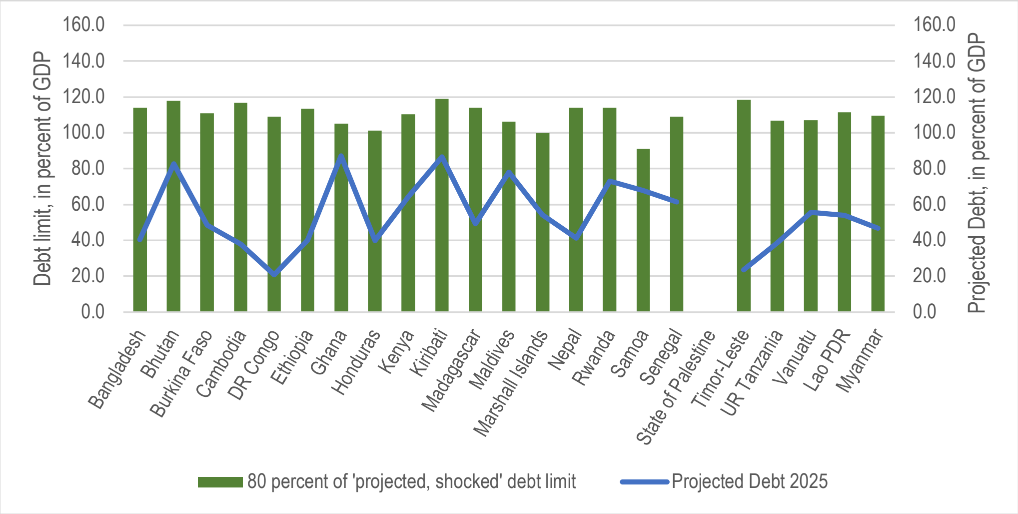
FIGURE 8 15 MACs: Fiscal space associated with debt limits using 'shocked' IRGDs and projected debt in 2025



Source: Annex Table A6.
Note: The red area indicates fiscal space.

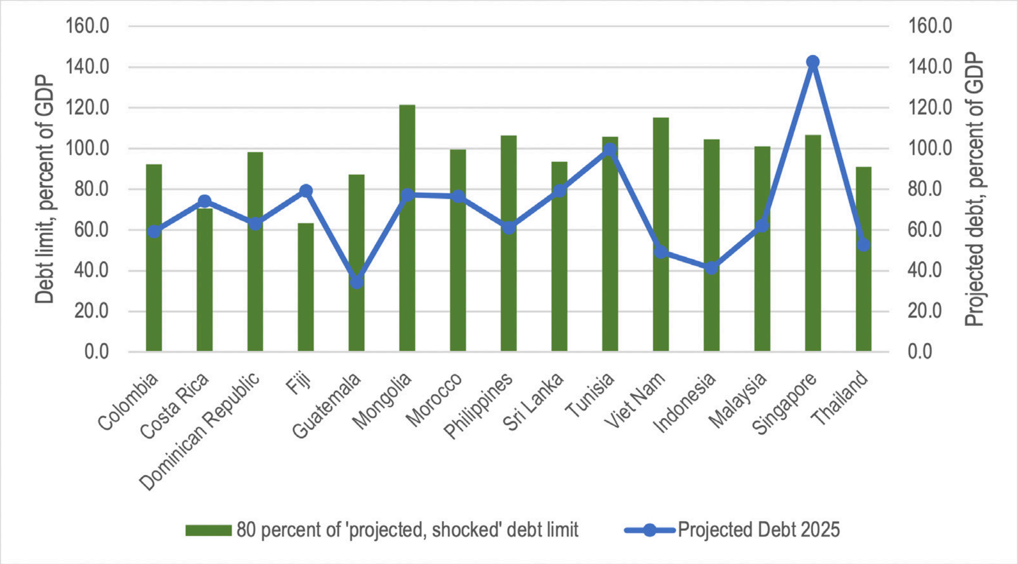
As a final exercise, we reduce debt limits by twenty percent to approximate a 'stochastic' case, i.e., when risk premiums on interest rates are assumed to increase as economies approach their debt limits. Twenty percent is more than double the observed decrease in debt limits (8.5 percent) among advanced economies in the stochastic case of Ghosh et al. (2013). Results are shown in Figures 9 and 10. LICs continue to have room for fiscal maneuver while five MACs appear to have little or no more room for maneuver.

FIGURE 9 LICs: Fiscal space assuming a 20 percent reduction in debt limits (approximating a 'stochastic' case)



Source: Annex Table A5.

FIGURE 10 MACs: Fiscal space assuming a 20 percent reduction in debt limits (approximating a 'stochastic' case)



Source: Annex Table A6

To get around the uncertainty associated with point estimates of the fiscal space, Ghosh et al. (2013) also estimate the probability that fiscal space for a given country is positive. That is, instead of saying that the fiscal space for a given country is 60 percent, one can say the probability that the fiscal space is greater than 50 percent is at 72 percent, for example. Specifically, Ghosh et al. calculate the probability that fiscal space is greater than 0, 50 and 100 percent for each country using bootstrapped coefficient estimates of the fiscal reaction function to calculate the debt limit. We are in the process of doing the same for LICs and MACs.

IMPLICATIONS AND CONCLUDING REMARKS

We study the availability of fiscal space among a sample of climate-vulnerable developing countries from the membership of the V20 who speak of being poised to undertake urgent climate adaptation and transition investments but describe being restricted by narrow fiscal space. We wonder whether 'narrow' fiscal space really means that otherwise able and solvent governments find themselves unable to access funding for their urgent climate needs, a situation that has been described as a "financial death trap." Thus, we estimate debt limits (debt ratios beyond which fiscal solvency fails) using a model that *abstracts* from liquidity risks, allowing us not only to infer the size of available fiscal space (if any) but also, perhaps, gauge the opportunity cost of the so-called financial death trap. The former is given by the difference between estimated debt limits and current or projected debt ratios, and the latter by the difference, if it exists, between estimated debt limits and IMF-DSF thresholds.

We find that with few exceptions fiscal space is fairly ample for both developing LICs and MACs. Importantly, we also find that debt limits are LICs may be converging to long-run debt ratios that are in the vicinity of, or below IMF-DSF debt to GDP thresholds, a confirmation that IMF-DSF thresholds are not to be construed as limits to fiscal space *per se*. The differences between estimated debt limits and IMF-DSF thresholds are not small, moreover—hinting at a significant opportunity cost associated with governments which are ready with *well-chosen* climate adaptation and transition investments—i.e., with large and persistent multiplier effects and positive long-run economic net benefits—but who may be caught in the financial death trap and therefore cannot mobilize funds. To the extent that foregone or delayed climate investments due to this trap have mitigation co-benefits or produce substantial merit goods, then opportunity costs are shared by the global community.

Our findings imply that governments with ample fiscal space, indicating a track record of fiscal adjustment that is consistent with satisfying their intertemporal budget constraint, should be afforded a second look and perhaps supported by lenders, particularly if they have well-articulated climate adaptation and resilience investment plans, which promise large multiplier effects and sustainable development dividends, since growing the economy in a sustainable way also contributes to debt sustainability.

Findings also suggest that actions to obviate the financial death trap are warranted, if indeed otherwise solvent, able and ready governments are unable to access required finance for urgent climate investments. The opportunity costs of letting things be—with "developing-country governments are pushed into default, not out of bad faith or because of long-term insolvency, but for lack of cash on hand"—cannot be insignificant to either individual economies or the global community.

Finally, findings should encourage climate vulnerable developing country governments, who are not quite ready with fitting climate-aligned investments plans, to endeavor to complete these, so that they can leverage their fiscal space for climate-aligned sustainable development.

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ANNEX

TABLE A1 Variable definitions and Data sources

Variable	Description	Source
Dependent variable		
Primary balance to GDP ratio	in percent, budgetary central government	Calculations based on IMF Government Finance Statistics
Explanatory variables		
Lagged debt to GDP ratio	in percent; government gross debt	WEO Database
Output gap	Difference between actual and potential, calculated using Hodrick-Prescott filter, real GDP	Calculations based on WEO database
Government expenditure gap	Difference between actual and potential, calculated using Hodrick-Prescott filter, real government non-interest spending, budgetary central government	Calculations based on WEO database
Trade Openness	sum of exports and imports to GDP (in percent)	Calculations based on World Development Indicators
Inflation	logarithm of CPI inflation	Calculations based on WEO database
Revenue to GDP ratio	two-year moving average	Calculations based on IMF Government Finance Statistics
IMF	dummy variable = 1 if programme exists for given year, 0 otherwise	IMF History of Lending Arrangements
oil prices	Log of oil prices applied to oil exporters (i.e., oil accounts for at least 20% of exports)	Exporters identified from UN COMTRADE. Oil prices from IMF Primary Commodity Price System
non-fuel commodity prices	Log of non-fuel commodity price index, applied to commodity exporters (i.e. a non-fuel commodity comprises at least 20 percent of exports) only	Exporters identified from UN COMTRADE. Non-fuel price index from IMF Primary Commodity Price System
GFC	dummy variable = 1 if year > 2007, 0 otherwise	
Interest rate – Growth Differentials (IRGD)		
Historical 2009–2019	Effective interest rate, computed as interest expense of budgetary central government divided by general government gross debt, less nominal GDP growth. Mean of 2009 to 2019.	IMF Staff Reports containing Debt Sustainability Analysis (e.g., Article IV, Review Under the Extended Credit Facility Arrangement, Review Under the Stand-by Arrangement, Review Under the Staff-Monitored Program, Request for Disbursement Under the Rapid Credit Facility, Request for Purchase Under the Rapid Financing Instrument, Request for Arrangement Under the Extended Credit Facility)
Projected 2021–2025	computed using IMF projections for interest expense, general government debt and GDP growth for 2021 to 2025	same
Estimated sovereign interest rates 2009–2019	Country default spreads added to the 10-year US Treasury rate for each year 2009–2019, applied to market access countries, less nominal GDP growth	Aswath Damodaran (https://people.stern.nyu.edu/adamodar/) and Federal Reserve Bank of St. Louis' FRED (https://fred.stlouisfed.org/series/GS10).
Debt 2025	IMF projection of debt in 2025, or latest year projection is available (2024, 2023 or 2022)	IMF Staff Reports containing Debt Sustainability Analysis (e.g., Article IV, Review Under the Extended Credit Facility Arrangement, Review Under the Stand-by Arrangement, Review Under the Staff-Monitored Program, Request for Disbursement Under the Rapid Credit Facility, Request for Purchase Under the Rapid Financing Instrument, Request for Arrangement Under the Extended Credit Facility)

TABLE A2 Testing for slope heterogeneity, AR models

	Delta	p-value
LIC, non-adj	-1.448	0.148
adj	-8.625	0.000
MAC, non-adj	1.297	0.195
adj.	2.349	0.019

Variables partialled out: constant
Source: Pesaran, Yamagata. 2008. Journal of Econometrics
H0: slope coefficients are homogenous

TABLE A3 Actual and projected debt-to-GDP ratios and GDP growth, and average IRGDs for LICs in sample

	Debt/GDP			GDP Growth		IRGD		
	2009	2019	2025[a]	2009-2019	2021-2025[b]	Historical 2009-19[c]	Projected 2021-25[b]	Projected, shocked 2021-25[d]
Bangladesh	39.5	35.7	40.3	6.6	7.1	-8.5	-10.5	-9.3
Bhutan	65.7	106.6	82.8	6.1	6.9	-9.3	-7.2	-5.3
Burkina Faso	25.9	42.0	48.3	5.7	5.3	-5.2	-6.1	-5.3
Cambodia	28.5	28.6	38.0	6.4	5.1	-8.2	-7.5	-5.8
DR Congo	91.3	15.0	20.7	5.9	6.4	-20.1	-12.5	-6.9
Ethiopia	35.2	57.9	40.0	9.7	7.3	-23.5	-16.9	-10.2
Ghana	26.8	62.6	87.0	6.6	5.3	-12.4	-6.9	-4.4
Honduras	23.4	43.3	39.9	3.1	4.0	-2.1	-3.7	-3.3
Kenya	35.9	59.0	64.4	4.9	5.6	-4.9	-8.8	-8.4
Kiribati	9.3	18.1	86.5	3.1	1.9	4.1	-1.9	-1.4
Madagascar	34.9	38.5	49.3	2.3	4.8	-8.0	-9.6	-8.4
Maldives	48.4	78.3	78.1	5.2	7.3	-6.9	-7.1	-3.6
Marshall Islands	41.6	24.8	54.2	2.3	1.7	-2.7	-1.7	0.5
Nepal	39.4	33.1	41.1	5.0	5.4	-12.0	-10.3	-9.9
Rwanda	18.5	50.2	73.1	7.1	8.1	-9.2	-10.0	-7.0
Samoa	34.1	47.4	67.7	1.5	0.6	-1.1	-0.8	5.8
Senegal	29.9	63.8	61.5	4.6	7.1	-2.1	-6.0	-3.0
State of Palestine	24.0	34.5	.	4.7	0.0	-8.0	.	.
Timor-Leste	.	9.6	23.4	3.7	2.6	-5.6	-4.2	-2.4
UR Tanzania	24.0	39.0	38.8	6.5	5.2	-11.3	-6.9	-5.6
Vanuatu	21.1	45.3	55.5	2.7	2.9	-2.5	-4.3	-2.4
Lao PDR	51.8	61.1	53.9	7.2	6.8	-9.1	-7.1	-6.0
Myanmar	54.4	38.8	46.7	6.4	5.4	-8.8	-9.7	-6.4
Median	**34.5**	**42.0**	**51.6**	**5.2**	**5.3**	**-8.0**	**-7.1**	**-5.5**
Mean	**36.5**	**44.9**	**54.1**	**5.1**	**4.9**	**-7.7**	**-7.3**	**-4.9**

Source: IMF WEO Database.

Notes: [a] Debt projections are from IMF reports and are for 2025 except for Honduras (2024) and Bhutan, Kiribati, and Lao PDR (2023); [b] Projections are from IMF Reports and are for 2021-2025, except for Honduras (2020-2024) and Bhutan, Kiribati and Lao PDR (2021-2023); [c] Effective interest rate, computed as interest expense of budgetary central government divided by general government gross debt, less nominal gdp growth, from IMF Reports, average of 2009 to 2019; [d] "Shocked" is defined as the difference between country-specific mean of real interest rate plus one country-specific standard deviation, and country-specific mean of GDP growth minus one country-specific standard deviation.

TABLE A4 Actual, estimated and projected debt-to-GDP ratios and GDP growth, and average IRGDs for MACs in sample

	Debt/GDP			GDP growth		IRGDs			
	2009	2019	2025[a]	2009-2019	2021-2025[b]	Historical 2009-19[c]	Estimated 2009-19[d]	Projected 2021-25[b]	Projected, shocked[e]
Colombia	35.4	52.3	59.3	3.5	4.1	−0.8	−3.1	−1.4	−0.6
Costa Rica	26.0	56.7	74.2	3.3	3.1	−0.7	−2.7	2.8	4.1
Dominican Republic	36.7	53.5	63.1	5.2	5.1	−4.1	−2.8	−1.5	−1.0
Fiji	51.5	48.9	79.3	2.9	4.3	−0.6	0.2	−1.7	4.0
Guatemala	22.8	26.5	34.2	3.3	3.8	−0.2	−1.3	−0.5	0.4
Mongolia	48.5	68.4	77.3	6.9	5.9	−14.9	−9.8	−10.5	−9.2
Morocco	46.1	65.1	76.6	3.6	3.9	−0.1	0.6	−1.4	−0.7
Philippines	49.8	37.0	61.1	6.0	6.4	−2.7	−3.6	−4.0	−3.3
Sri Lanka	75.2	86.8	79.2	5.1	4.6	−3.6	−3.6	−1.3	−1.0
Tunisia	46.6	74.2	99.7	2.0	2.4	−2.3	−0.9	−4.0	−3.1
Viet Nam	36.3	43.6	49.3	6.4	6.8	−13.6	−5.9	−7.0	−5.9
Indonesia	26.5	30.6	41.3	5.4	5.4	−11.0	−5.5	−2.8	−1.5
Malaysia	50.4	57.1	62.2	4.7	5.7	−2.2	−2.3	−2.4	−0.8
Singapore	101.7	129.0	142.6	4.5	3.4	−5.9	−3.4	−2.2	−0.7
Thailand	42.4	41.0	52.7	3.3	3.4	−2.7	−1.1	−2.1	0.2
Median	**46.1**	**53.5**	**63.1**	**4.5**	**4.3**	**−2.7**	**−2.8**	**−2.1**	**−0.8**
Mean	**46.4**	**58.0**	**70.1**	**4.4**	**4.5**	**−4.3**	**−3.0**	**−2.7**	**−1.3**

Source: IMF WEO Database.

Notes: [a] Debt Projections are from IMF Reports and are for 2025, except for Sri Lanka (2024); [b] Projections are from IMF Reports and are for 2021-2025, except for Sri Lanka which covers 2021-2024; [c] Effective interest rate, computed as interest expense of budgetary central government divided by general government gross debt, less nominal gdp growth, from IMF reports, average of 2009 to 2019, except for Indonesia which covers 2002 to 2007; [d] Estimated sovereign debt interest rate, computed as 10-year US Treasury rate plus country default spread, less nominal gdp growth; average from 2009 to 2019; [e] "Shocked" is defined as the difference between country-specific mean of real interest rate plus one country-specific standard deviation, and country-specific mean of GDP growth minus one country-specific standard deviation.


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