Center for Sustainable Development at BROOKINGS

DECEMBER 2022

WORKING PAPER #180

DEBT, CREDITWORTHINESS, AND CLIMATE

A NEW DEVELOPMENT DILEMMA

HOMI KHARAS
CHARLOTTE RIVARD

Debt, creditworthiness, and climate: A new development dilemma

DECEMBER 2022

Working paper #180

About Global Economy and Development
Founded in 2006, the Global Economy and Development program at the Brookings Institution aims to play its part to ensure that the future of globalization is one of inclusive growth and shared prosperity. With an interdisciplinary team of experts, Global provides thought-leadership, cutting edge research, and innovative policy solutions to achieve a more equitable global economic system for sustainable prosperity, drawing on the core strengths of Brookings—authoritativeness, independence, depth of practical expertise, and unparalleled convening power. For more, visit www.brookings.edu/Global.

About the Center for Sustainable Development
Launched in 2020, the Center for Sustainable Development at Brookings generates leading research and insights to advance global sustainable development and implement the Sustainable Development Goals within and across all countries. To learn more visit: www.brookings.edu/SustainableDevelopment.

Authors

Homi Kharas is a senior fellow at the Center for Sustainable Development, Global Economy and Development program at the Brookings Institution.

Charlotte Rivard is a research analyst at the Center for Sustainable Development, Global Economy and Development program at the Brookings Institution.

Acknowledgments

This working paper was prepared as an input to the High-Level Advisory Group (HLAG) on Sustainable and Inclusive Recovery and Growth, co-chaired by Mari Pangestu (World Bank), Ceyla Pazarbasioglu (IMF), and Lord Nicholas Stern (London School of Economics).

It was presented to the High-Level Expert Group on Climate Finance, commissioned by the COP26 and COP27 presidencies, co-chaired by Vera Songwe (Liquidity and Sustainability Facility) and Lord Nicholas Stern (London School of Economics).

The Brookings Institution is a nonprofit organization devoted to independent research and policy solutions. Its mission is to conduct high-quality, independent research and, based on that research, to provide innovative, practical recommendations for policymakers and the public. The conclusions and recommendations of any Brookings publication are solely those of its author(s) and do not reflect the views or policies of the Institution, its management, its other scholars, or the funders acknowledged below.

Brookings is grateful to the robust network of funders that made this important work possible. We gratefully acknowledge the support of the London School of Economics and Political Science and the Children's Investment Fund Foundation. This report was also supported by the Embassy of Denmark in Washington, D.C., the Bill & Melinda Gates Foundation, and the UK Department for Business, Energy, and Industrial Strategy. Additionally, this work was supported in part by a grant from the Open Society Foundations.

Brookings recognizes that the value it provides is in its absolute commitment to quality, independence, and impact. Activities supported by its donors reflect this commitment.

I. The development dilemma

Developing countries face a dilemma. Most have run up public indebtedness in a sensible response to the global recession induced by COVID-19 lockdowns. This has led to a deterioration in creditworthiness but saved their economies and protected their most vulnerable citizens. Some 49 developing countries have been downgraded by one or more of the major credit rating agencies since the end of 2019. In normal times, developing countries should be slowly restoring fiscal discipline and retrenching public spending as the recovery phase ends, helping to restore their credit scores. But times are not normal. The global economy is slowing. Developing countries have yet to return to pre-pandemic income levels, and many face growing setbacks from food, energy, flood, drought, and conflicts. They face an urgent need to scale up efforts to transition to a low-carbon economy. Yet, for the most part, governments in developing countries are being encouraged by international agencies to reduce fiscal deficits to pre-empt emerging debt service difficulties.[1]

An alternative approach has been put forward by academic economists, most notably Professor Nicholas Lord Stern at the London School of Economics.[2] He argues that climate change is so urgent an issue as to warrant a rapid scale-up of public and private investments in most developing countries. This spending would propel a "just transition" toward a more sustainable and inclusive pattern of economic growth. His approach requires higher investments by about four percentage points of GDP in many developing countries, sustained over decades. This approach would focus on climate mitigation and adaptation, strengthened health and education systems, resilience, nature-based solutions, and agriculture, forestry, and land use.[3] Financing investments on such a scale would inevitably entail a major buildup in external public debt.

Hence the dilemma: Should developing countries retrench to preserve macroeconomic stability, as they would in normal times, and face the risk of stagnating or even backsliding growth and welfare in the face of global shocks; or should they invest to adjust to the economic realities of the 21st century, even at the risk of running up more debt? Which strategy best preserves creditworthiness?

Of course, there is no single answer to these questions that would apply to all countries, given the fact that developing countries start from vastly different initial conditions, and have large differences in their historical track records of growth, fiscal discipline, politics, and default events. Yet there is a common set of conceptual considerations that all policymakers should carefully take into account.

This paper seeks to inform the debate on the fiscal response to current development challenges. Our first contribution is to develop scenarios of growth, investment, fiscal deficits, and debt corresponding to the contrasting pathways described above. In one business-as-usual (BAU) or "normal" scenario, the primary surplus displays moderate fiscal consolidation, as is now recommended by leading international financial institutions, while growth follows the medium-term trend forecast by the IMF in its "October 2022 World Economic Outlook."[4] In the other scenario, there is a "big investment push," generating larger primary deficits but also faster growth. The deficits are assumed to be partly financed by a large scaling-up of official non-concessional lending.

Our second contribution is to assess the impact of these different scenarios on a country's creditworthiness. We take the values of macroeconomic variables from our scenarios and apply coefficients that have been generated in academic studies of creditworthiness to assess the net impact.

We find that both scenarios improve creditworthiness, but the "big push" improves it more. The key assumption behind this finding is the micro-level relationship between investment and growth. The growing body of literature on project returns from mitigation, adaptation, resilience, human capital, and biodiversity conservation suggests considerable scope for high economic-return investments in most countries. Of course, there may still be cases where public investment does not generate good returns, especially where governance is poor. But diagnostic reports such as the World Bank's "Country Climate and Development Reports" document how new investments would help most countries contribute to global net-zero targets and avoid or offset the damage caused by increasing natural disasters in a cost-effective way where returns or avoided future costs far outweigh investment outlays.

Section 2 turns to a description of where countries stand today on their macroeconomic balances and reviews the deteriorating creditworthiness, higher interest rates, fiscal deficits, and growth prospects on a country-by-country basis. These are the key variables to answering questions such as which countries have fiscal space to expand their public investments. One simple but powerful conclusion is that considerable fiscal space can be freed up by reducing the interest cost on external debt, potentially by an expansion of official multilateral lending.

Section 3 develops two forward-looking scenarios. The first uses BAU growth, investment, and fiscal balance trends for a median developing country, drawing these variables from the outlook for developing countries forecast by the IMF.[i] We look at the implications for indebtedness and creditworthiness along this path.

The second scenario repeats the exercise with a "big push" in which the government implements needed investments on the scale required for a just transition. This second scenario follows Bhattacharya et al. (2022) in proposing a four percentage points of GDP increase in fiscal deficits and investment rates, half of which is externally financed on terms similar to those provided by a non-concessional official lender, proxied as the International Bank for Reconstruction and Development (IBRD).

We find that the BAU scenario does lead to a stabilization of the burden of debt and fiscal deficits compared to GDP, but the alternative "big push" scenario leads to higher growth and a 32 percent increase in income levels by 2050, albeit with 20 percentage points higher levels of indebtedness.[ii]

Using coefficients from the literature on the determinants of creditworthiness, we further conclude that creditworthiness is actually improved in the "big push" scenario. This finding is robust across the various coefficient estimates in the models we review.

Additionally, while each developing country should make the choice of investment or retrenchment based on its national interest, the growth benefits of a coordinated big investment push across many developing countries will be higher thanks to the spillover effects of the contribution to a stronger global economy. Needless to say, climate mitigation also depends on a concerted "big push" to decarbonize in all countries, developed and developing. Developing countries without an investment-grade credit rating account for one-quarter of total greenhouse gas (GHG) emissions. They will not find it economically attractive to adopt aggressive programs

[i] Data is drawn from the IMF "World Economic Outlook, October 2022" database that gives values through 2027. Beyond this date, values are fixed at the average for the previous five years for each variable.
[ii] The reported results are for a developing country with average levels of initial debt, fiscal deficits, growth and cost of finance for an IBRD 10-year loan as of October 2022.

of decarbonization without access to cheaper capital, and if they do not decarbonize, the global target of keeping emissions below a level that keeps 1.5 degrees within reach will become simply unattainable. This provides the rationale for global programs to accelerate decarbonization in developing countries, typically implemented through the major official international financial institutions in the world. Such programs are desirable to change incentives faced by individual developing country finance ministers. They can be complemented by plurilateral or bilateral initiatives such as the G7's newly announced $600 billion Partnership for Global infrastructure and Investment (PGII), the Global Climate Shield, the Just Energy Transition Partnerships (JETPs), as well as China's Belt and Road Initiative. Each of these shares a common characteristic—they expand access to financing at reasonably low-interest rates and at far longer maturities than is common in commercial sovereign capital markets—and so are necessary to incentivize and implement "big push" programs.

A concluding section makes some suggestions for policy actions in support of the "big push" scenario.

II. Where do developing countries stand today?

Developing countries' creditworthiness has been deteriorating since the onset of the COVID-19 pandemic, driven by higher interest rates, slower growth, and burgeoning fiscal deficits.

a. Deteriorating creditworthiness

Developing countries face a multitude of overlapping crises: the COVID-19 pandemic, the Ukraine-Russia war and consequent food and energy shortages, and more frequent and severe natural disasters. Government finances have been strained and policymakers complain about the lack of fiscal space to meet the demands of their populace. Relative to pre-pandemic levels, 49 countries have been downgraded by one of the three major rating agencies, an additional 16 have had their outlooks downgraded, and only a very few have been upgraded. Eight countries are formally in default as of November 2022. An additional four have defaulted since 2019 but have worked out agreements with creditors. Three are working to restructure debt under "The Common Framework for Debt Treatment beyond the DSSI" and four have been classified by the IMF to be currently in debt distress.

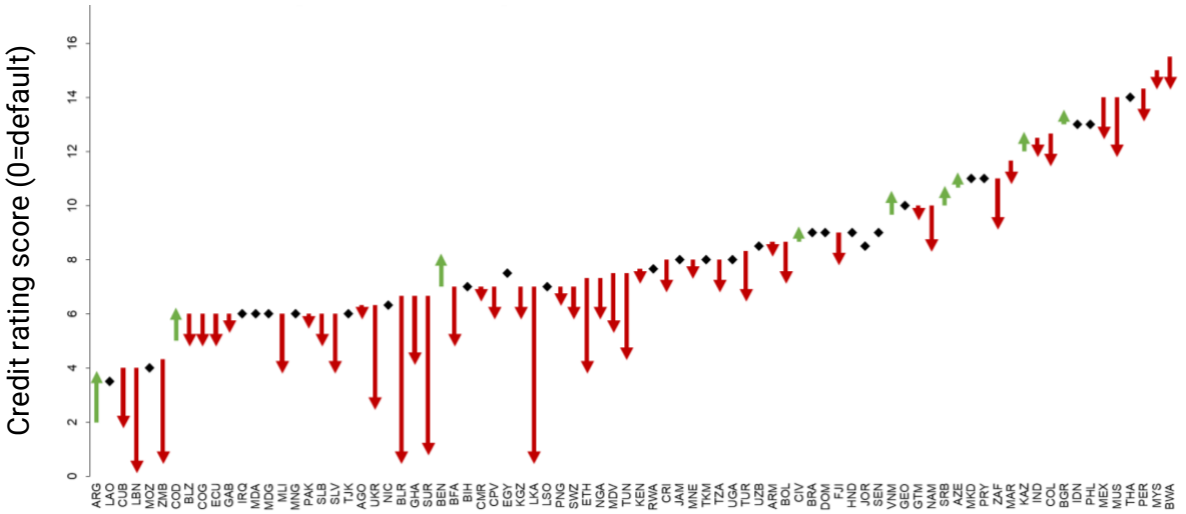
Figure 1. Developing countries face debt distress and default

Currently in default	Defaulted since 2019 but agreement reached with creditors	Common Framework	Additional countries in debt distress
Belarus Grenada Lebanon Sri Lanka Suriname Venezuela Zambia Russia	Argentina Belize Ecuador Ukraine	Chad Zambia Ethiopia	Congo, Rep. Mozambique Sao Tome and Principe Somalia

Note: Russia defaulted on a portion of its foreign currency debt in June of 2022 but is currently not rated by any major rating agency.
Source: Trading Economics for columns 1 and 2, IMF[5] for column 3, and IMF Debt Sustainability Assessments for column 4.

Figure 2 below shows the deterioration in creditworthiness across most emerging markets and developing economies (EMDEs). It also shows that few countries now enjoy an investment grade (a score of 12 or above on the scale below) for sovereign bonds. Sub-sovereigns (such as the utility companies that are the implementing agencies for many mitigation projects and sustainable infrastructure investments) likely face even worse creditworthiness scores, although in rare cases the sovereign ceiling may be "pierced" by such entities.

Figure 2. Sovereign credit ratings December 2019 versus November 2022



Note: Vertical axis measures average credit rating of three major agencies: S&P, Fitch, Moody's, with ratings converted to a 0 (default) to 21 (best rating) scale.
Source: Author estimates from scraping of Trading Economics (November 18, 2022).

b. Higher bond yields

A combination of monetary policy tightening and a flight to quality has meant that nominal bond yields in sovereign debt markets have risen considerably in 2022. This rise in interest rates has had an immediate negative impact on creditworthiness by raising debt service payments on loans with variable interest rates, and a further indirect effect of reducing the number of efficient projects that can fuel growth.

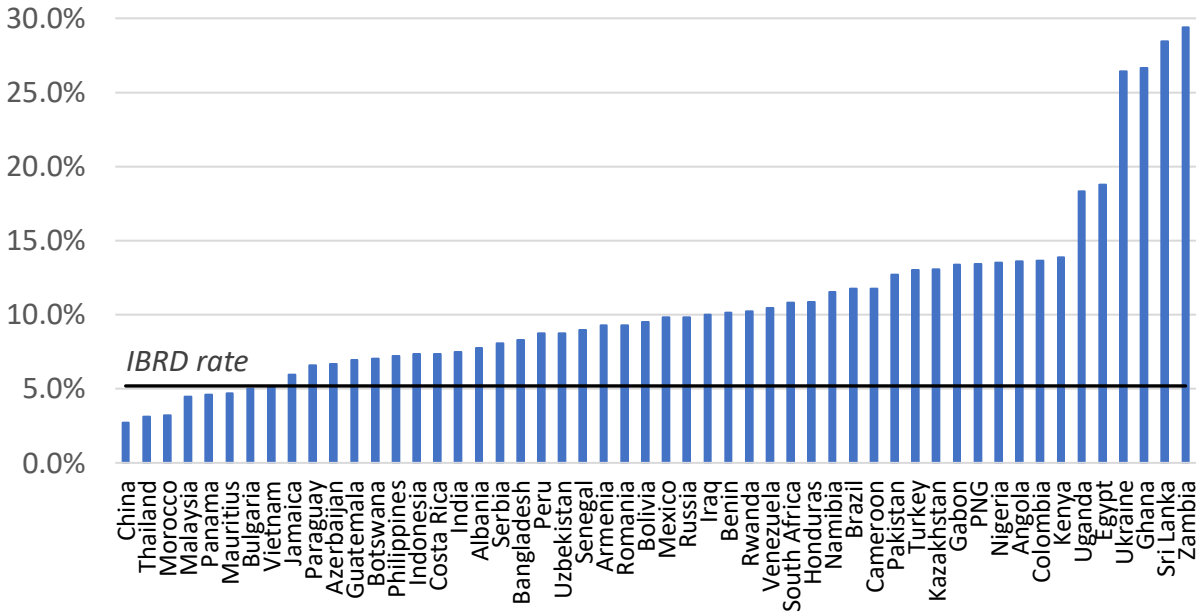
In standard debt dynamics, a rise in interest rates is associated with an increase in the level at which the debt-to-GDP ratio stabilizes. In **Figure 3** below, we show the market interest rate for those developing countries that have access to bond markets (proxied by the yield on a bond maturing in roughly 10 years' time). The horizontal line provides a comparison with the approximate interest rate of an IBRD 10-year loan; a fixed spread of roughly 1 percentage point above six-month secured overnight financing rates in U.S. dollars.[iii]

Almost all advanced economies borrow from global capital markets at rates below 5 percent for a 10-year maturity bond. Only six EMDEs can borrow at less than 5 percent, another 23 pay between 5-10 percent, and 23 pay more than 10 percent. The remaining EMDEs are choosing to avoid bond markets entirely, but, based on a model of their creditworthiness, the rates they face would be prohibitive. Sub-national entities and state-owned utilities, the entities responsible for much climate-related investment, will be paying even higher rates. For these countries, and indeed for all but a handful of investment-grade countries, borrowing from an MDB like IBRD is far cheaper than borrowing from capital markets. In the case of countries like Egypt or Uganda, for example, the difference in the cost of capital between market and official non-concessional lending rates is over 10 percentage points. The fact that so many countries have continued to

[iii] Other MDBs with AAA ratings have similar lending terms as IBRD. IBRD lending terms depend on maturity and have commitment and frontend fees. For convenience we approximate all these into an effective interest rate of 5.2 percent for a 10-year flexible loan. As a comparison, the nominal U.S. 10-year treasury bond was 3.82 percent on November 21st, 2022.

borrow from the markets rather than from MDBs suggests either that they are rationed by MDBs (a supply effect) or that they willingly choose to pay higher interest in exchange for the greater flexibility, speed, and lack of conditionality afforded by market borrowing (a demand effect).

Figure 3. Developing country 10Y bond yield



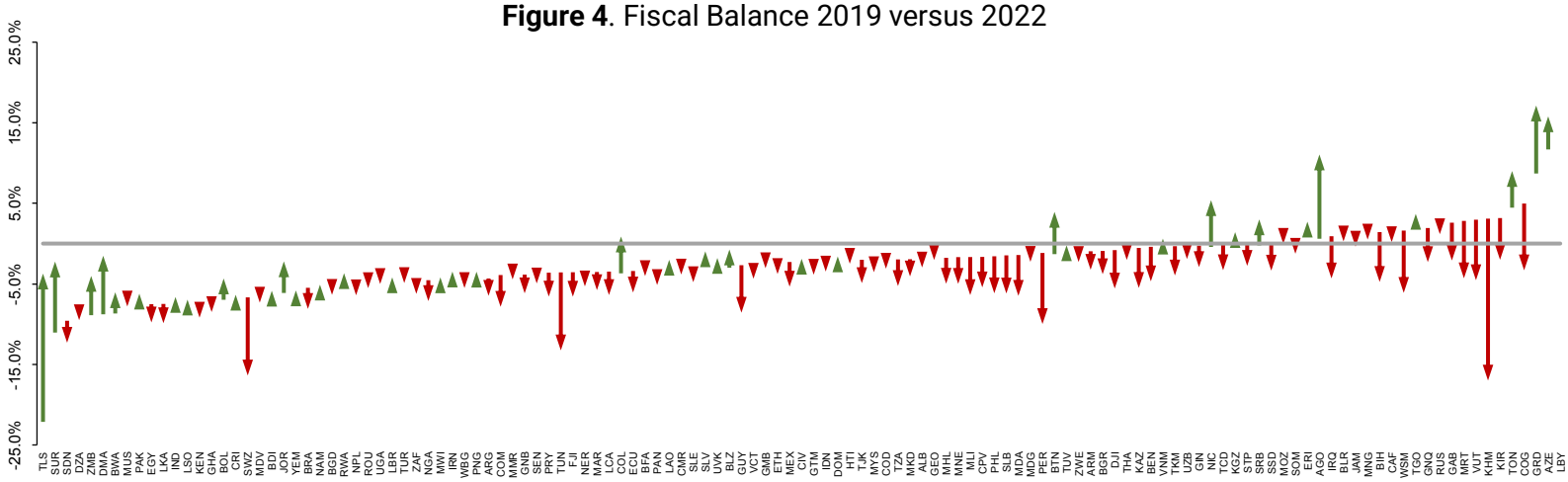
Source: Trading Economics, World Government Bonds, and Market Insider, extracted October 14, 2022.

A recurring theme of this paper is that the deterioration in the creditworthiness of many developing countries is due to their reliance on international capital markets where they pay a significant interest rate premium that reflects a lack of liquidity when global capital markets tighten or when economic conditions deteriorate. For example, both Zambia and Sri Lanka, two countries with the highest interest payments as a share of GDP, had larger debt service payments due to private creditors than to official creditors, and have subsequently been forced to seek a rescheduling. They would have been better off had they sought greater access to official financing earlier.[6] Official lenders can and should be less concerned with liquidity—they have better access to capital markets and can afford to reschedule or implicitly roll over payments that are due to them as long as countries are solvent. Indeed, this is the standard practice of multilateral development banks. These organizations do not participate in debt restructurings as a matter of principle, but typically informally agree to provide new money that at least covers the principal repayments that are due to them during the consolidation period. A shift of borrowing from market sources to official sources would improve creditworthiness substantially.

c. Fiscal deficits

Figure 4 below shows countries' fiscal deficits (general government revenue minus general government expenditure) projected by the IMF in the "World Economic Outlook, October 2022". The figure shows the widening deficits associated with managing the impact of the pandemic and other shocks. In a few cases (Cambodia, Swaziland, Tunisia, Peru, and Bhutan) the fiscal deficit widened substantially. In most cases, the change has been small (less than ±2 percentage points of GDP) relative to the size of the shock suffered by the country. The median fiscal deficit in 2022 was -4.3 percent. In 2022, oil-exporting countries witnessed a substantial windfall gain in their fiscal balances while oil-importing countries saw deficits widen, especially in those countries that subsidize energy consumption. Some large economies had high fiscal

Figure 4. Fiscal Balance 2019 versus 2022



Source: WEO October 2022 general government revenues - general government total expenditures.
Note: FSM was removed for scaling purposes.

deficits as a share of GDP, such as India (-9.9 percent) and Brazil (-7.6 percent), while others, such as Mexico (-3.2 percent) and Indonesia (-4 percent) were more prudent. Several small island states, such as Jamaica (0.3 percent), ran surpluses to respect the conditions of a program negotiated with the IMF.

Detailed comparative data on primary fiscal balances (the fiscal surplus excluding the interest payments on debt) are not readily available but can be approximated using data on interest payments taken from the IMF's "Government Financial Statistics" database. As the primary balance is the main tool of current fiscal policy, it is the variable most closely related to the concept of fiscal space. Its importance lies in the fact that it is the primary balance, along with GDP growth and interest rates, that together determine the level at which debt/GDP ratios will stabilize. Returning to the example of Jamaica, its small overall surplus is due to a policy of running a primary surplus of over 7 percent of GDP—one of the highest surplus levels in the world.

d. Growth rates

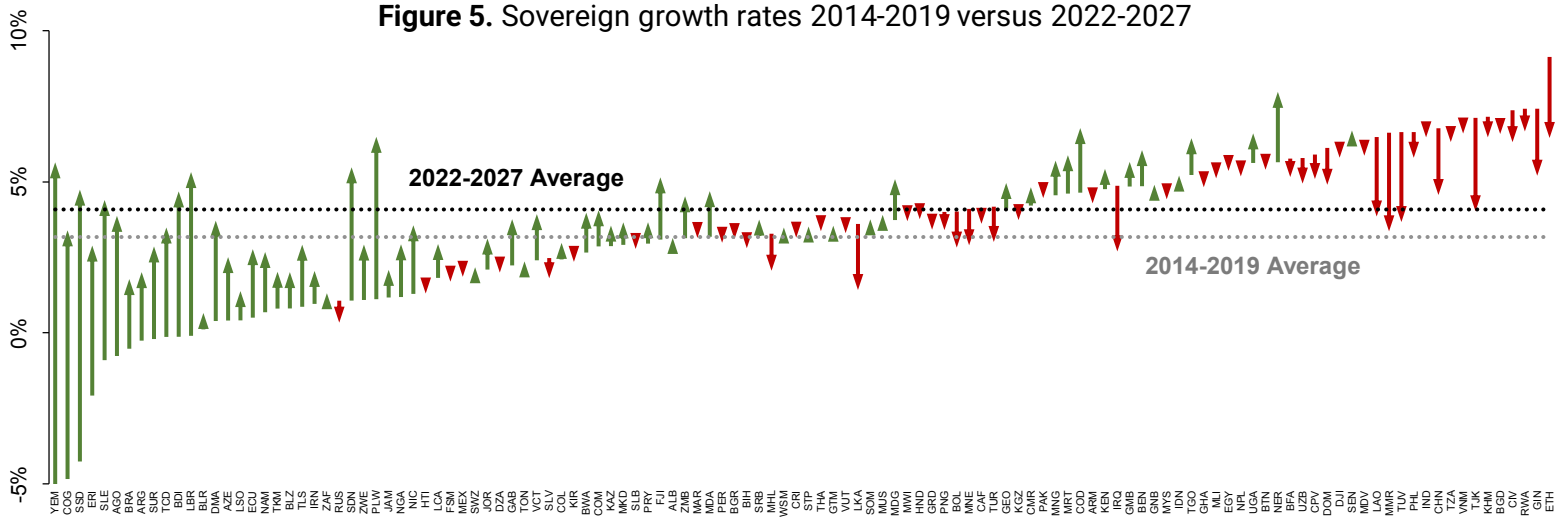
A further driver of fiscal space is economic growth. The IMF has recently revised down its economic growth projections on average for EMDEs (and for the world as a whole) and this has received considerable attention. But what is important for debt solvency analysis is the level of growth, not its change. The IMF still projects growth in EMDEs to average 4.1 percent for the five years between 2022 and 2027, a considerably faster pace than the actual five-year pre-

pandemic growth of 3.2 percent. Also, this higher level of growth is more evenly distributed across countries.

Figure 5 shows that the pattern of EMDE growth follows a mean-reversion. Countries that grew most slowly between 2014 to 2019 are now projected to grow faster in 2022-2027, while the rapid growth countries of the first period are expected to slow.

A small degree of comfort can be drawn from these projections: The hardest cases of debt crises to resolve, those where growth is so low that primary balances must adjust significantly and immediately to avoid an explosive rise in debt ratios, become less acute when the growth rate rises, something now forecasted by the IMF.

Figure 5. Sovereign growth rates 2014-2019 versus 2022-2027



Source: WEO October 2022
Note: GUY, MOZ, and GNQ were removed for scaling purposes

e. Assessment of debt dynamics

Based on the above drivers of debt dynamics, in most countries, debt levels are expected to stabilize, or at least not increase very rapidly, even if fiscal deficits remain at current levels. Appendix A provides a distribution of countries by current indebtedness, growth, deficits, and average interest rates. It shows the considerable diversity of developing country contexts.

Broadly speaking, countries can be classified into four groups in terms of the debt management issues they face. We look at growth rates and primary surplus estimates for developing countries and divide countries into groupings with values above and below the mean for each variable (4.07 percent for growth and -1.08 percent for the primary surplus). This gives us four categories: high growth, high surplus; high growth, low surplus; low growth, high surplus; and low growth, low surplus. We get data on 98 developing countries (see Appendix B).

For each of these four groups, we then take the mean value of the group and project out the path of debt-to-GDP accumulation under BAU, a “big push” scenario financed evenly with domestic resources and with official financing, and a “big push” scenario financed evenly with domestic resources and market financing at current rates.

The “big push” scenario assumes country investment rates rise by 4 percentage points of GDP and that GDP growth rises by 1 percentage point relative to the BAU scenario. This implies that GDP per capita levels are 32 percent above baseline in the “big push” scenarios, but debt levels are also much higher than in the baseline.

Figure 6 below shows the evolution of the debt-to-GDP ratio under each of the scenarios. The first observation is that there is a group of countries with low surpluses (in reality, high deficits) and low growth rates (lower left quadrant) that will face difficulties in stabilizing their debt-to-GDP ratio. This group is comprised of countries like Sri Lanka, which has already had to reschedule its debts after sharply cutting tax rates and revenues and then seeing a fall-off in its important tourism sector. In any scenario, these countries should prioritize policies to improve fiscal balances and reinvigorate growth.

Moving diagonally to the group of countries with high growth and strong fiscal surpluses (upper right quadrant), we see that current policies will quickly bring down debt ratios. A “big push” will also bring down debt ratios, albeit at a slower pace, if financed on official lender terms. With market rate financing, the debt/GDP ratio steadily rises.

Moving to the upper left quadrant, there is a group of countries with high surpluses and low growth. This group includes countries such as Jamaica, which, as noted above, has one of the largest primary surpluses in the world. On average, the fiscal surplus in this group is the highest of any group.[iv] These countries are also able to bring down their debt-to-GDP ratios quickly in a BAU scenario, despite the lack of growth. In the alternative “big push and official lending terms” scenario, debt levels stabilize, but incomes rise significantly as growth goes up by one percentage point. Even under market-rate financing, this group of countries would not see a significant rise in the debt-to-GDP ratio.

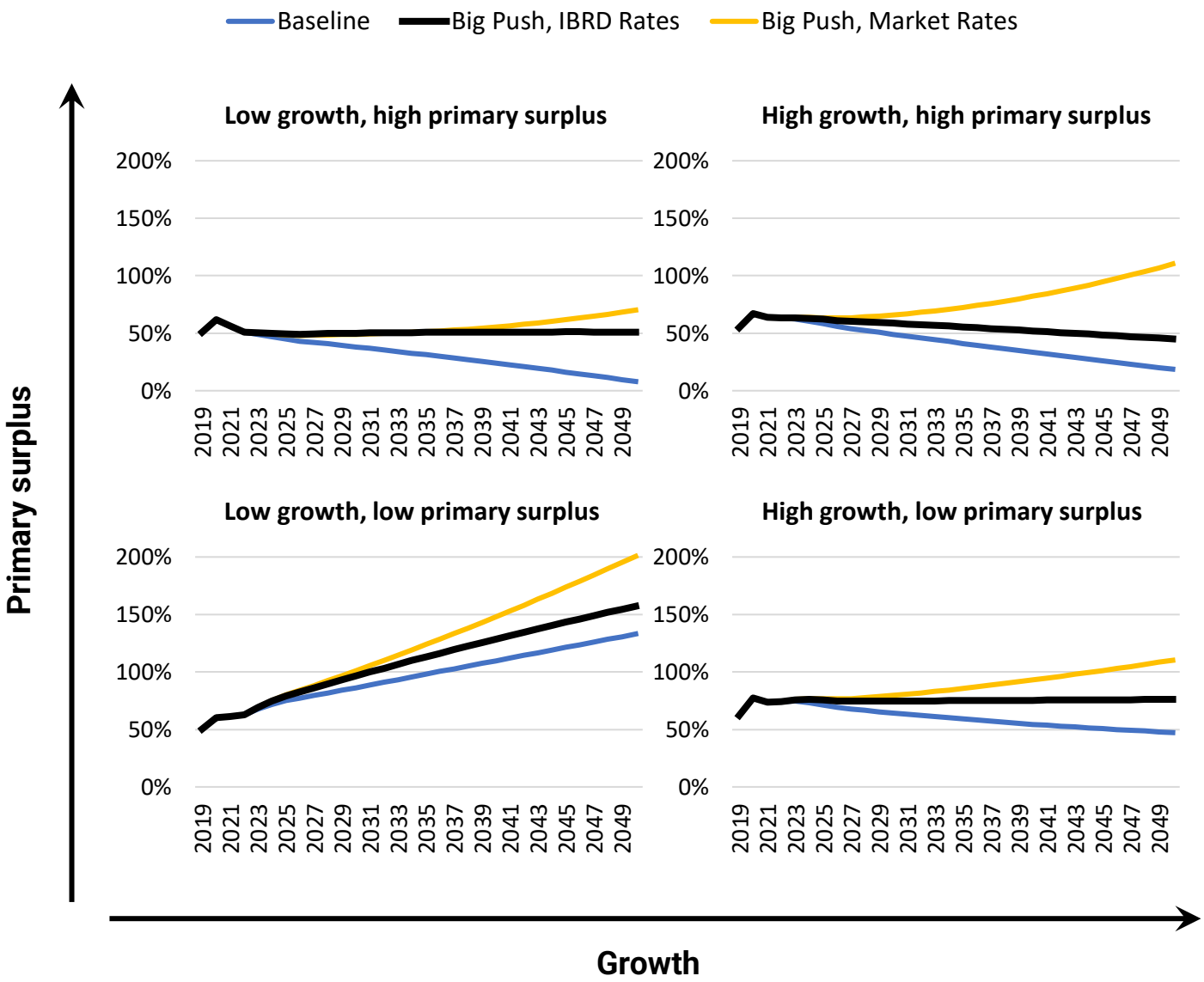
The fourth country grouping, represented in the lower right quadrant, features low fiscal balances but high growth. This group of countries is trying to grow out of any debt difficulties. It includes countries such as India where despite large fiscal deficits, the burden of debt is contained by high levels of growth and hence tax revenues. The big push does not create a material change in debt-to-GDP ratios compared to current levels as long as it is financed on official terms.

There are three inferences we draw from this overview:

- Most countries have the fiscal space to implement a “big push” if official financing is available.
- Undertaking a “big push” through market financing is a far riskier proposition, as debt levels would quickly start to rise.
- For selected countries (about one-quarter of the total), which already have high fiscal deficits combined with low growth, a “big push” could lead to an accumulation of debt that could be risky.

[iv] In some countries, there is an active debate as to whether there is a causal relationship between high fiscal surpluses and low growth. We are not taking views on that debate but simply reproducing data drawn from the IMF.

Figure 6. Developing country debt scenarios under business as usual and a "Big Push" (% GDP)



Note: Growth is a five-year average from 2022-2027 with a mean of 4.07 percent across developing countries. Primary surplus is general government revenues—(expenditures – interest payments) with a mean of -1.08 percent in 2022 for developing countries. "Low" and "High" are defined as countries below and above the mean, respectively. Average (mean) interest rates for each group exclude countries in default (columns 1, 3, and 4 in **Figure 1**). See Appendix B for the 98 developing countries classified by growth and primary surplus.

Source: Author's calculations using the October 2022 IMF WEO for growth, general government revenues and expenditures, and the IMF GFS for interest expenses.

III. Country creditworthiness—a forward look

The previous section outlined how macroeconomic parameters would evolve under alternative scenarios and different country characteristics. In this section, we ask what impact these scenarios have on a country's creditworthiness. Ultimately, it is the desire to preserve creditworthiness that drives countries' policy positions on the size of fiscal deficits and public investments.

There is a large academic literature on whether debt crises are driven by unsustainable fiscal policy, or by a loss of confidence by investors that drives up interest rates and turns into a self-fulfilling prophecy of default. But as Rogoff notes: "whereas the theory may be ambiguous, the empirical evidence is abundantly clear."[7]

This empirical evidence establishes what drives a sovereign's credit rating in practice. The main credit rating agencies (CRAs)—S&P, Moody's, and Fitch—have unique methodologies for assigning and updating credit ratings for sovereigns. In general, the CRAs use both quantitative modeling of macroeconomic variables, as well as qualitative criteria and judgments. S&P gives a 1-to-6-point score across five different assessments: Institutional, Economic, External, Fiscal, and Monetary. Fitch uses an OLS model with macroeconomic and financial variables and then adjusts the ratings. Moody's methodology is less transparent but involves similar principles.

Economists have modeled the driving factors behind sovereign credit ratings. An early example is Cantor and Packer (1996), who developed one of the first models to explicitly mirror the factors CRAs claim to incorporate in their assessments: a mixture of current fiscal and monetary indicators as well as projections for the future.[8] Over time, other models have incorporated additional variables such as political stability and corruption, regional effects across the continents, and climate vulnerability and resilience. While the exact selection of variables differs, the same key elements are consistent across the literature (Appendix C):

- **Wealth and income** variables, proxied by GDP, GNI, or GNP per capita measures.
- **Monetary and debt** variables, particularly inflation and the public debt-to-GDP ratio.
- **Real economy** variables, such as GDP growth, fiscal balances, trade variables, and labor market variables.
- **Institutional** variables, including membership in an economic union, default history, and government capacity, measured by corruption, democracy, rule of aw, and government effectiveness.

The empirical findings are quite robust across models. Higher wealth is linked to improved creditworthiness. Higher inflation and public indebtedness (as a share of GDP) worsen creditworthiness. A stronger real economy and stronger institutions improve creditworthiness.

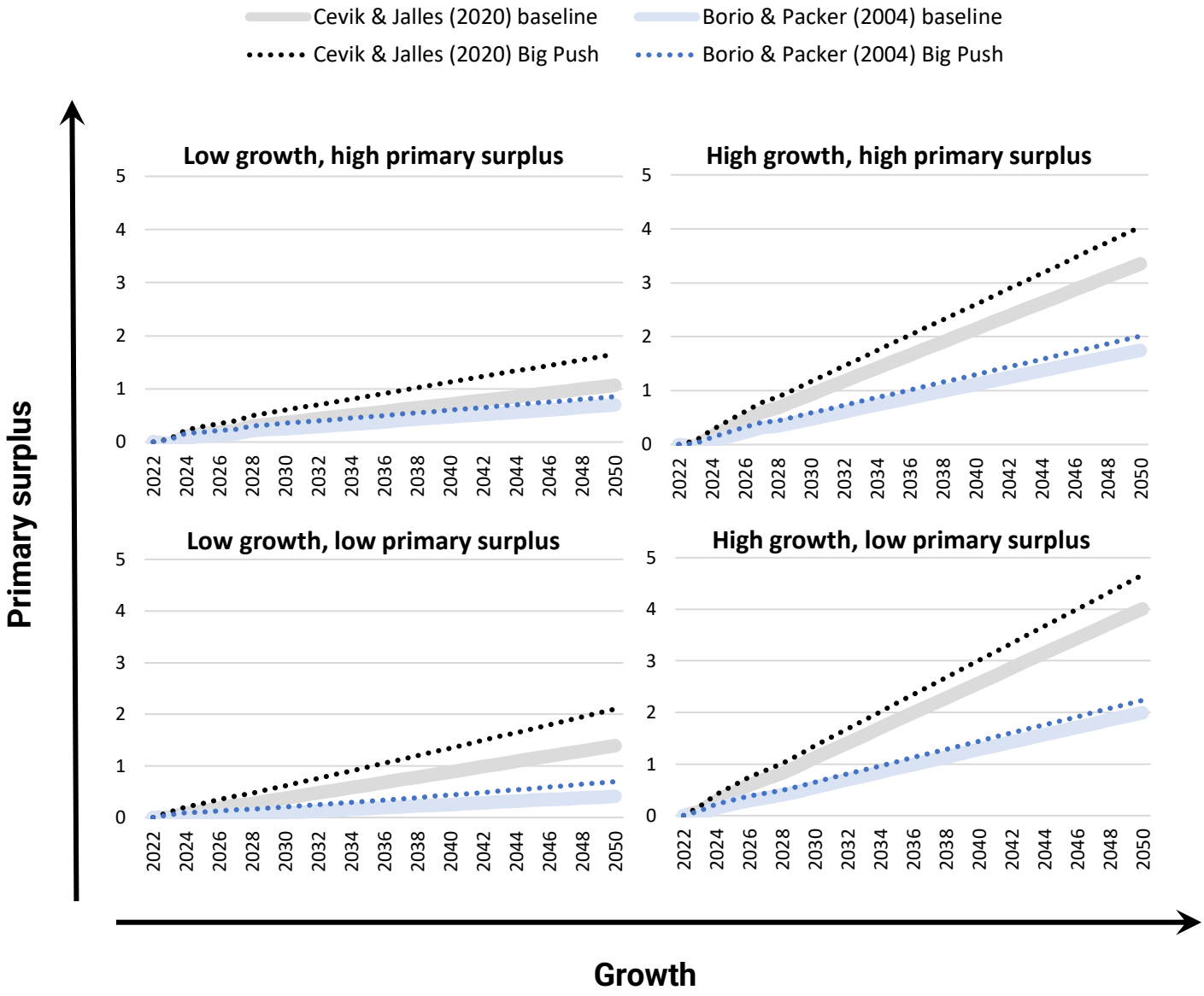
Given these findings, the question of whether the "big push" scenario improves creditworthiness relative to a BAU counterfactual is ambiguous. On the one hand, the big push results in higher income levels over time and a stronger real economy–factors tending to improve creditworthiness–but it also results in higher public indebtedness, a factor leading to a deterioration in creditworthiness. The net result depends on which of these factors dominates—it becomes an empirical matter rather than a theoretically-derived result.

We take two studies that include the variables that we project over time—indebtedness, income levels, and growth—to assess the net effect on creditworthiness. The process is simply to use the coefficients from the academic studies, insert the scenario-based values of the variables, and get changes from the base year based on the changes in these values. **Figure 7** below shows the results of this exercise. In each of the four country groupings, the BAU trajectory shows a strong upward trend in the level of creditworthiness. This is as expected; BAU policies have been set in such a way as to generate an improvement in creditworthiness. What is more interesting is that in all four quadrants, the impact of the big push, official lending scenario is unambiguous in improving creditworthiness even more.

The intuition is simple. In the models, the size of the coefficients is such that the income variable is far more important than the debt-to-GDP variable. Because the "big push" raises growth, over time it results in far higher levels of income. And while indebtedness is also higher, there is less impact on creditworthiness because the coefficient is so small.

These comparative results would hold even if baseline growth is subject to uncertainty. We do not account for the potential rises in debt due to climate damage.[9] According to Kahn et al., the current trajectory of temperature increase will reduce world real GDP per capita by more than 7 percent by 2100.[10] These considerations would equally affect both the baseline and "big push" scenarios but would not change the comparative result—the "big push" would still lead to an improvement in creditworthiness compared to the BAU scenario.

Figure 7. Developing country credit rating scenarios under business as usual and a "Big Push"



Note: Growth is a five-year average from 2022-2027 with a mean of 4.07 percent across developing countries. Primary surplus is general government revenues – (expenditures – interest payments) with a mean of -1.08 percent in 2022 for developing countries. "Low" and "High" are defined as countries below and above the mean, respectively. Average (mean) inputs are used for each group. See Appendix B for the 98 developing countries classified by growth and primary surplus.

Source: Author's calculations using the October 2022 IMF WEO for growth, general government revenues and expenditures, and the IMF GFS for interest expenses.

To examine this further, we developed our own model of credit ratings, using similar variables to those found in the literature. The results are presented in Appendix D. By using our own model, we can decompose the coefficient of determination into its components. The resulting Shapley values indicate how much each explanatory variable contributes to the total explained variance of the model.

We present results for models estimated over the full sample of countries and a sub-sample with developing countries only. We find that over the whole sample, almost all the variance in creditworthiness is explained by the variance in two variables—income levels and the rule of law. The coefficient on the indebtedness variable is small and the degree of variance that this variable explains is also small.

The results are somewhat different in the model that is estimated based on the sub-sample of developing countries. There, the debt ratios explain more of the variance, but the coefficient is still small. Income levels and the rule of law continue to explain a large share of the variance in creditworthiness.

One takeaway from this overview of empirical evidence is that the prominence given to public indebtedness as a key criterion for creditworthiness is perhaps misplaced. Public indebtedness is undoubtedly one important variable, and indeed it rises in each of the country groupings we consider (**Figure 8**). But it is not the dominant variable nor even perhaps the most important one for creditworthiness assessments. Despite this, much of the policy discussion revolves around the level of public indebtedness. This is at the core of the Maastricht criteria in the EU; debt thresholds also feature prominently in IMF-World Bank's "Debt Sustainability Assessments," and debt ceilings are a popular feature in many fiscal rules that legislatures have used to constrain the tendency of executive branches of government to overborrow.

Our findings suggest that far more attention should be given to the trajectory of income levels which show a substantial rise in the "big push" scenario. Our empirical results support the idea that the real problem with high indebtedness is the debt overhang problem—private lenders become unwilling to lend even for high-return activities as part of the proceeds are shared with existing creditors. This stunts growth and reduces future income levels. A debt overhang causes either underlending or excessively high interest rates, both of which serve to worsen creditworthiness. The policy inference is that the solution is to devise ways to increase the level of new debt accumulation (and investment), not to decrease these.

A second finding is that institutional factors should be prioritized. Regardless of the proxy variable used (e.g., corruption, rule of law, government effectiveness, or a combination), institutional factors play a very important role in the empirical determinants of creditworthiness. This corroborates the importance assigned by rating agencies such as Fitch to structural variables.[11] Part-and-parcel of a big push on investment must be an accompanying push to improve the investment climate through better sectoral and macro policies and stronger regulations.

As one example of the power of institutional improvements, we looked at the history of Rwanda, a country that has made significant headway in combating the civil unrest and genocide that had plagued it through the early 2000s[12]. From 2006 to 2021, Rwanda's Rule of Law score improved by 0.88 points (on a scale from -2.5 to 2.5).[13]

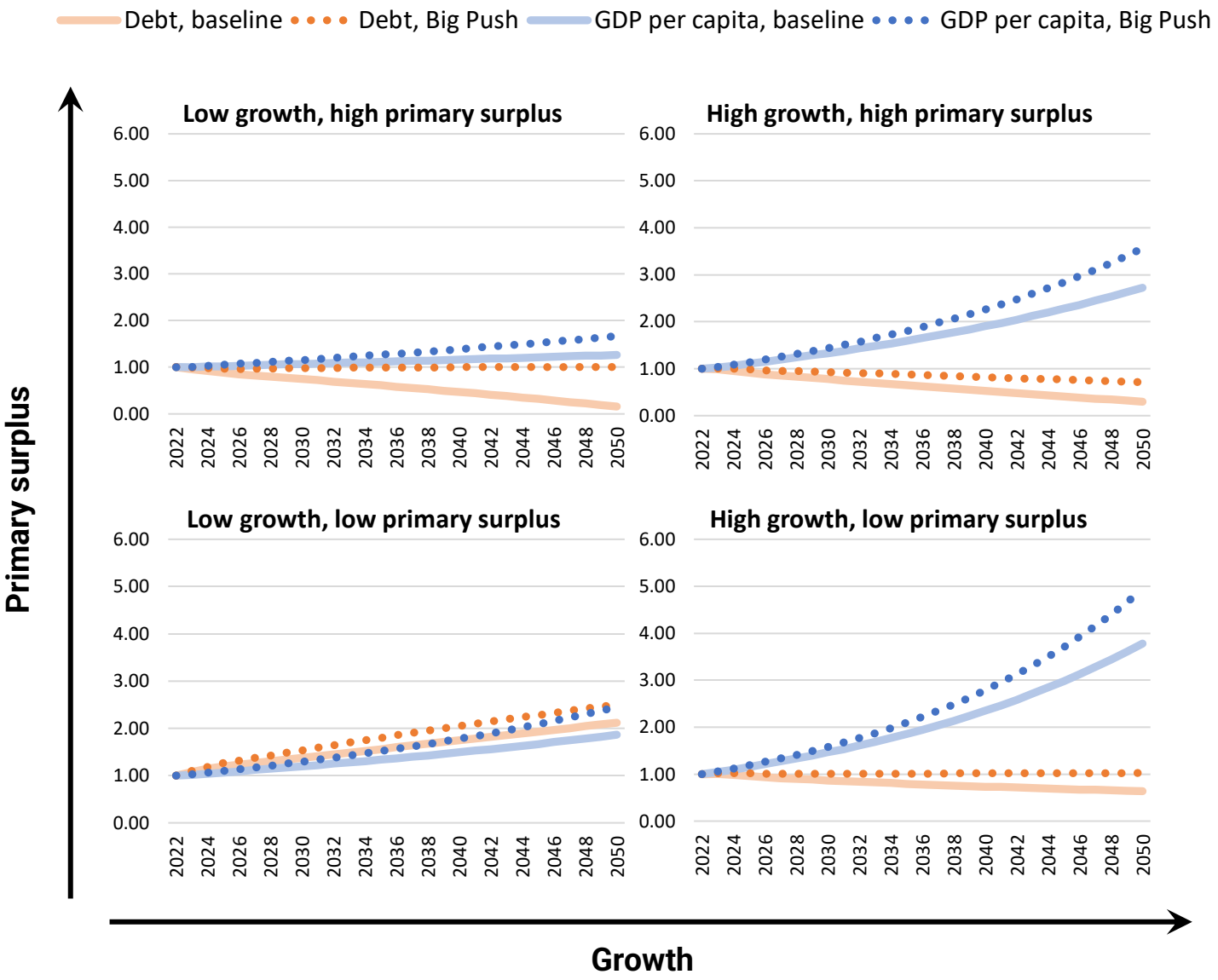
Rwanda first went to capital markets in 2006, when it was assigned a B- rating by Fitch. This rating has been systematically upgraded to B+ in 2014, where it remains today even while Rwanda's indebtedness has risen from 20 percent of GDP in 2006 to 67 percent in 2021.[14] The

improvement from B- to B+ is more than explained by the improvement in the rule of law variable. Stronger institutions are also linked to more effective public spending and broad-based societal benefits. Rwanda now has a lower murder rate than the United States.[15] Rwanda is the third most-competitive place to do business in Africa.[16]

In our simulations, the improvement in the rule of law that Rwanda displayed over a 15-year period has had over four times the impact on creditworthiness compared to the average fiscal adjustments and debt consolidation expected by the IMF in the BAU scenario, extrapolated out to 15 years.

The Rwanda example is a reminder that institutions can be improved in the medium term, a time span relevant for creditworthiness analysis and one that is of foremost concern for climate-related activities. Another indication of the importance of institutions comes from the evidence that climate vulnerability and resilience play a big role in creditworthiness analysis. Cevik and Jalles find that, across all countries, an increase in climate vulnerability by 1 percentage point is associated with a 0.2 decrease in creditworthiness (0-21 scale), but this penalty is over three times more when their sample is restricted to developing countries alone.[17] On the flip side, they find that a 1 percentage point increase in climate resilience is associated with a 0.09 improvement in creditworthiness, with developing countries benefiting at a higher rate of 0.202. As many of the investments supported by the “big push” would improve resilience by investing in adaptation (irrigation, for example), there would be an additional benefit for creditworthiness over and above the rise in income levels that such investments would bring.

Figure 8. Debt and GDP per capita relative to 2022 under business as usual and a "Big Push"



Note: Growth is a five-year average from 2022-2027 with a mean of 4.07 percent across developing countries. Primary surplus is general government revenue—(expenditures–interest payments) with a mean of -1.08 percent in 2022 for developing countries. "Low" and "High" are defined as countries below and above the mean, respectively. Average (mean) inputs are used for each group. See Appendix B for the 98 developing countries classified by growth and primary surplus.

Source: Authors' calculations using the October 2022 IMF WEO for growth, general government revenues and expenditures, and the IMF GFS for interest expenses.

IV. Summary and policy implications

Global climate policy requires developing countries to mitigate their carbon emissions. This will require new investments. Developing countries also have to adapt to strengthen their resilience to climate events. The scale of the needed new spending is, on average, around 4 percentage points of GDP.

Is it feasible to finance this, given the already heavy indebtedness of many developing economies?

Our answer is a resounding yes, with a few qualifications.

We base this claim on a country-by-country assessment of the evolution of macroeconomic variables in a "big push" scenario compared to a BAU scenario. The "big push" results in higher growth and per capita income levels, but also higher indebtedness. In our "big push" scenario, half the added spending is financed through additional public debt. Using empirical models of the determinants of creditworthiness, we conclude that creditworthiness would be better under the "big push" scenario.

The qualification stems from the fact that there are a handful of countries where both the BAU and "big push" scenarios result in public indebtedness levels moving into uncharted territory. These are countries with currently high fiscal deficits and low growth rates. We cannot be confident that the empirical results will carry over to these cases. However, there are no large developing countries in this group and only a few mid-sized countries.

What would be needed to encourage a "big push"?

First and foremost, a change in the methodology of the major IFIs in how they undertake creditworthiness assessments, with an acknowledgment that the lack of investment in high-return mitigation and adaptation activities is a significant risk. In the BAU, the lack of fiscal space is causing a debt overhang and underinvestment in desirable climate-related activities. This is the principal risk, both to individual countries facing more frequent natural disasters and to the global community that needs accelerated carbon mitigation by developing countries.

Second, international financial institutions need to scale up their provision of financing at affordable, albeit non-concessional, rates. Without such financing, the debt overhang problem becomes far harder to tackle. This is the economic basis for new initiatives such as the G7 Partnership for Global Infrastructure and Investment, which we applaud.

Third, developing countries, too, must do more. The "big push" scenarios used here are conditional on half of the financing coming from domestic resources. The exact proportion of DRM will depend heavily on individual country contexts, but DRM is needed to bring down the rate at which debt accumulates and at the same time to generate the revenues to service the debt.

Fourth, developing countries should focus on the investment climate within their countries. Stronger institutions would raise the impact of public spending and give confidence to investors. Strengthening institutions can go a long way toward offsetting higher indebtedness and improving creditworthiness scores. In particular, developing country governments must be able to credibly and transparently plan and execute the climate-related investments they wish to undertake. Involving neutral partners, such as the multilateral development banks in "just transition" economic partnerships is a good starting point.

There are many details that are not addressed in this paper: the role of SDRs, non-debt-creating resources such as participation in voluntary carbon offset markets, aid, support for loss and damage, debt-for-climate swaps, and more. All these would make the “big push” even easier to undertake and contribute to climate justice. But they remain contentious issues with no clarity on financing amounts and allocation mechanisms.

Where there is greater consensus is the scalability of official non-concessional financing from multilateral development banks. One concern that has been raised is that developing countries are not in a position to absorb these funds because of existing high levels of indebtedness and the recent deterioration in their creditworthiness. Our core finding is that a big investment push financed partly by multilateral development bank lending is feasible and desirable from a macroeconomic perspective if the investment project microeconomics are sound. Concerns about creditworthiness should not be the major factor when assessing fiscal space for climate-related investments. We find that a big-investment-push scenario would improve creditworthiness, climate action, and economic development simultaneously.

Appendix A. Initial conditions on developing country debt

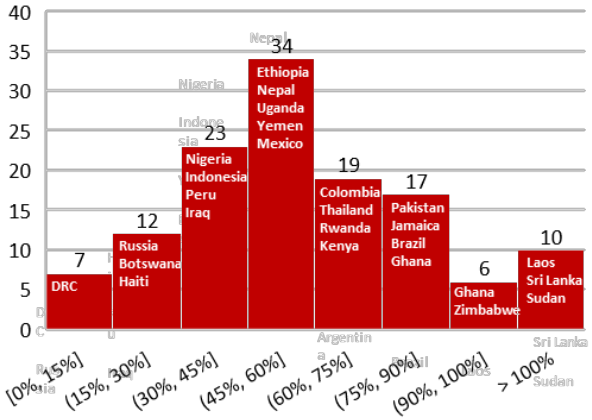
Developing countries have widely different initial conditions on debt and its drivers. In comparison to Advanced Economies, general government debt is far lower, growth is higher, and fiscal balances are comparable. The largest distinguishing feature is the interest rates they face.

If developing countries are asked to finance a big-push-investment approach by accessing sovereign bonds, they will have unacceptable debt dynamics.

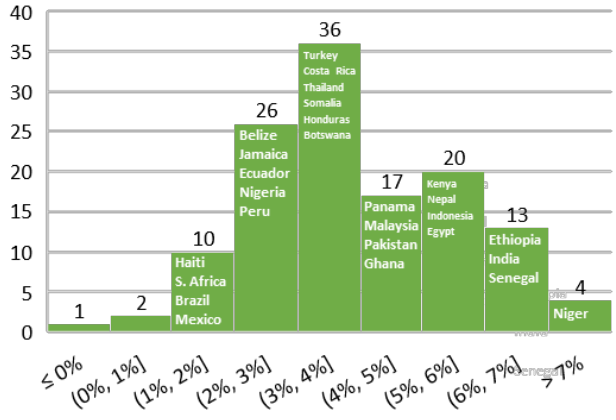
While general government debt is the accepted metric of public indebtedness, the composition of debt between domestic and foreign sources can also be important. External debt levels are substantially lower than general government debt levels.

Debt models are incomplete in understanding the positive impact of public investment on growth and can underestimate the risks to trend growth in the long term if climate adaptation investments are not undertaken.

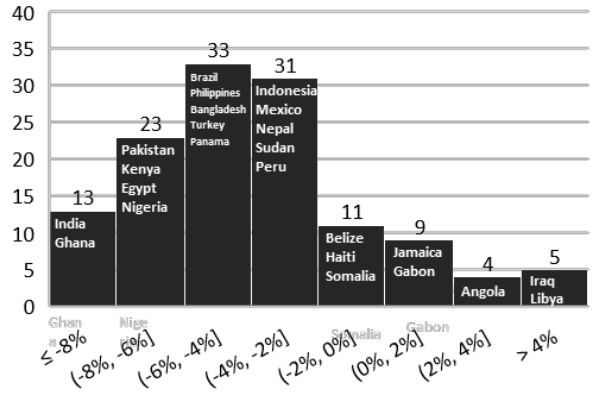
General government gross debt, 2022[1]



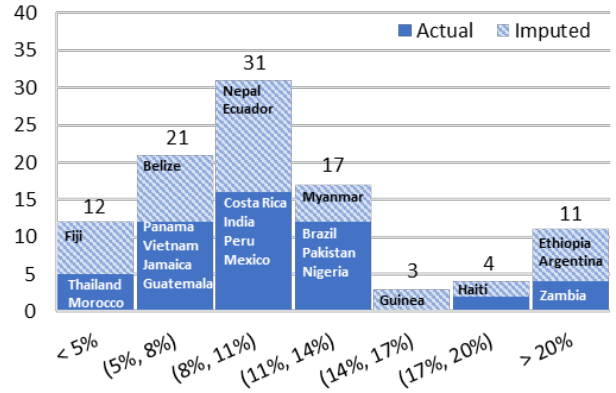
Real growth rate, 5 year average 2022-2027[2]



General government surplus, 2022[3]



Nominal interest rate, TE 10Y Bonds[4]



Note: Selected country examples are named in each category for illustrative purposes.
Sources: (1) IMF WEO, October 2022, (2) Authors' calculations using GDP constant national currency from IMF WEO, October 2022, (3) IMF WEO, October 2022 general government revenues – general government expenditures, (4) Trading Economics, World Government Bonds, and Market Insider 10Y Bond yields extracted October 14, 2022, and authors' calculations for imputed yields. Imputed yields are derived from the all-country-credit-rating model described in Appendix D.

Appendix B. Country classifications

The countries below are classified by growth and primary surplus. Growth is a five-year average from 2022-2027 with a mean of 4.07 percent across developing countries. Primary surplus is general government revenues – (expenditures – interest expenses) with a mean of -1.08 percent in 2022 for developing countries. “Low” and “High” are defined as countries below and above the mean, respectively. Average (mean) inputs are used for each group.

Low growth, High primary surplus	**Low growth, Low primary surplus**	**High growth, High primary surplus**	**High growth, Low primary surplus**
Albania	Belarus	Armenia	Bhutan
Angola	Central African Republic	Bangladesh	Burkina Faso
Argentina	Colombia	Cameroon	Cabo Verde
Azerbaijan	Dominica	Dominican Republic	Cambodia
Belize	El Salvador	Egypt	Côte d'Ivoire
Bosnia and Herzegovina	Eswatini	Georgia	Congo
Botswana	Jordan	Ghana	Ethiopia
Brazil	Kiribati	Mongolia	Fiji
Costa Rica	Kyrgyz Republic	Mozambique	Guinea-Bissau
Equatorial Guinea	Laos	Pakistan	India
Gabon	Lesotho	Panama	Kenya
Grenada	Malawi	Philippines	Madagascar
Guatemala	Mauritius	Tanzania	Malaysia
Iraq	Montenegro	Uganda	Maldives
Jamaica	Myanmar		Mali
Kazakhstan	Namibia		Moldova
Marshall Islands	North Macedonia		Nepal
Mexico	Paraguay		Rwanda
Micronesia	Romania		Senegal
Morocco	Solomon Islands		Sierra Leone
Nicaragua	Sri Lanka		Sudan
Papua New Guinea	VCT		The Gambia
Peru	Thailand		Togo
Republic of Congo	Timor-Leste		Uzbekistan
Russia	Vanuatu		Vietnam
Samoa	West Bank and Gaza		Zambia
São Tomé and Príncipe			
Serbia			
South Africa			
St. Lucia			
Tonga			
Turkey			
32	**26**	**14**	**26**

Source: October 2022 IMF WEO for growth, general government revenues and expenditures, and the IMF GFS for interest expenses.

Appendix C. Credit ratings models in the literature

The chart below summarizes the independent variables used across the literature in creditworthiness models. An X indicates inclusion of the variable in the model; a bold **X** denotes the variable coefficient is significantly different from 0 at the 5 percent level of significance.[8, 17-26]

		Cantor and Packer (1996)	Afonso (2003)	Borio and Packer (2004)	Bissoondoyal Bheenick (2005)	Mellios and Paget Blanc (2006)	Afonso, Gomes, and Rother (2007)	Canuto, Dos Santos, and de Sa Porto (2012)	Bozic and Magazzino (2013)	Teixeira et al (2018)	Cevik and Jalles (2020)	Wüste (2022)
Wealth/Income	GDP size			**X**								
	GDP per capita		**X**	**X**			**X**	**X**		**X**	**X**	**X**
	GNP per capita	**X**			**X**							
	GNI per capita					**X**			**X**			
Monetary and debt	Inflation	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	X	**X**
	Inflation > 40%			**X**								
	Gross government debt, % GDP			X	X		**X**		**X**	**X**	**X**	**X**
	Central government debt-to-central government receipts							**X**				
	Pensions and social security liabilities							X				
	External debt to exports ratio	**X**	**X**	X			X					
	External debt, % GDP				X					**X**		
	External debt, % of Current External Receipt					**X**						
	Net external debt							**X**				
	Original sin indices			**X**								
	Aggregate effective currency mismatches			**X**								
	Currency derivatives and spot market turnover			**X**								
	Foreign reserves				X		**X**		**X**		**X**	
	Real interest rate								**X**			
Real economy	GDP growth	X	**X**	**X**			**X**	X		**X**	**X**	X
	GNI growth								**X**			
	Investment									**X**		
	Savings, % GDP					**X**						
	Government revenue					**X**						
	Fiscal balance	X	X		X		**X**		**X**			X
	Current account balance	X	X		X		**X**		**X**	**X**		
	Liquidity risk									**X**		
	Real exchange rate				X	**X**						
	Trade dependence					**X**						
	Trade openness							**X**				
	Trade											**X**
	Terms-of-Trade										**X**	
	Climate Vulnerability										**X**	
	Unemployment rate						X		**X**	**X**	**X**	X
	Age dependency ratio											**X**
	Industrialized country status	**X**										
	Developing country status		**X**					**X**				**X**
	Corruption			**X**		**X**				**X**		
	Political risk			**X**						**X**		
	Degree of democracy											X
	National Fiscal Rule Index											X
	Government effectiveness						X					
	Law and order											
	European Union membership						**X**					
	Tenure of chief executive											X
	Election year											**X**
	Natural resource rents, % GDP											X
	Default history	**X**	**X**			**X**	**X**	**X**	**X**	**X**		
	Time since last foreign currency default			**X**			X					
	Debt in default, % of GDP											**X**

Appendix D. Credit rating models

We implement two OLS regression models– one for all countries and one with developing only –predicting 2022 Trading Economics credit rating scores[27] (0-100 scale) from 2020 data of the following independent variables:

Variable	Units	Description
gdp_g_5yr	%	GDP growth, five-year average (2014-2019) calculated from GDP in constant 2015 USS, World Development Indicators (NY.GDP.MKTP.KD)
ln_gdppc_con	-	The natural log of GDP per capita (current USD), World Development Indicators (NY.GDP.PCAP.CD)
gdp_vol	%	The GDP volatility is a five-year average (2018-2022) standard deviation of GDP growth (annual %) based on constant local currency, from the World Development Indicators (NY.GDP.MKTP.KD.ZG)
resratio_wdi	%	Reserves over (imports + short-term external debt). Reserves (FI.RES.TOTL.CD) and imports (NE.IMP.GNFS.CD) come from the World Development Indicators. Short-term external debt (DT.DOD.DSTC.CD) comes from World Development Indicators as well as the Bank for International Settlements if the country is high income or missing data. For select countries, short-term external debt data is missing from both sources so a simple reserve over imports ratio is used.
extdebtratio	%	External debt / (exports + remittances) or if remittances are not available External debt / exports. For developing countries, external debt is from the World Development Indicators, External debt stocks, total (DOD, current USD) (DT.DOD.DECT.CD). For high-income countries, an annual average is calculated from Joint External Debt Hub (JEDH) data. Exports are taken from the World Development Indicators, Exports of goods and services (current USD). Remittances are from the World Bank.[28]
debttogdp	% GDP	General government gross debt, IMF WEO October 2022
fiscbal	% GDP	General government revenue - general government total expenditure, IMF WEO October 2022
rulelaw	Index, -2.5 to 2.5	Rule of Law, World Governance Indicators (RL.EST). Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
inflation	%	Inflation, consumer prices (annual %), World Development Indicators (FP.CPI.TOTL.ZG)
island	1 or 0	1 if Small Island Developing State, 0 otherwise

All-country OLS model

The regression model below uses data from 120 countries for which we have data to predict the Trading Economics credit rating score. From the Shapley values (farthest right column), we can see the relative variance explained by each of the variables. Notably, the natural log of GDP per capita and the rule of law collectively explain just over 80 percent of the R^2 (0.83507) or roughly 68 percent of the total variance. Both have a positive association; Countries with higher GDP per capita and rule of law tend to have higher credit ratings, all else constant. Inflation and Island explain around 12 percent of the R^2 or 10 percent of the total variance, and both have negative associations with credit ratings. Next comes the debt to GDP ratio which explains about 2.3 percent of the R^2 (2 percent of the total variance) and GDP growth which explains about 1.2 percent of the R^2 (1 percent of the total variance). The remaining variables—reserves, GDP volatility, external debt ratio, and fiscal balance—each explain 1 percent or less of the R^2.

```
. rego TE gdp_g_5yr ln_gdppc_con gdp_vol resratio_wdi extdebtratio debttogdp fiscbal rulelaw
> inflation island if year==2020 & iso3c!="RUS" & iso3c!="UKR"
```

Gr	Regressor	Coef.		Std.Err.	P>|t|	Std.Coef.	Shapley %R2
1	gdp_g_5yr	.7787147		.5879401	0.188	0.0594	1.2101
2	ln_gdppc_con	9.189361	***	1.850012	0.000	0.4015	39.7293
3	gdp_vol	.0166103		.380973	0.965	0.0022	0.9769
4	resratio_wdi	.0772531	***	.0256684	0.003	0.1262	1.0012
5	extdebtratio	-.0039811		.0042531	0.351	-0.0398	0.4231
6	debttogdp	-.0652062	**	.0297326	0.030	-0.0984	2.2827
7	fiscbal	.2643274		.328117	0.422	0.0394	0.4015
8	rulelaw	14.86127	***	2.370979	0.000	0.4912	41.8946
9	inflation	-.2996477	**	.1255879	0.019	-0.1057	6.4170
10	island	-16.97401	***	3.4877	0.000	-0.2162	5.6635
-	Intercept	-30.23174	*	17.29463	0.083		
	Observations	120					
	Overall R2	0.83507					
	Root MSE	11.66612					
	F-stat. Model	55.18896	***		0.000		
	Log Likelihood	-459.3067					

Developing country OLS model

This regression model is the same as above, but only uses the subset of 67 developing countries from the total 120 countries above. We see that about 22 percent of the R^2 is explained by reserves (13 percent of the total variance), 14 percent by rule of law (8.3 percent of the total variance), 14 percent by GDP per capita (7.9 percent of the total variance), and 13 percent by debt to GDP (7.5 percent of the total variance). The external debt ratio, inflation, and island each explain between 8-11 percent of the R^2. GDP growth explains 4 percent, GDP volatility, 2 percent, and fiscal balance, 1 percent, of the R^2.

```
. rego TE gdp_g_5yr ln_gdppc_con gdp_vol resratio_wdi extdebtratio debttogdp fiscbal rulelaw
> inflation island if year==2020 & iso3c!="RUS" & iso3c!="UKR" & highinc==0
```

Gr	Regressor	Coef.		Std.Err.	P>|t|	Std.Coef.	Shapley %R2
1	gdp_g_5yr	1.305519		.7989307	0.108	0.1747	4.4835
2	ln_gdppc_con	6.138345	**	2.701522	0.027	0.2592	13.5854
3	gdp_vol	-.3133043		.6094674	0.609	-0.0615	2.2110
4	resratio_wdi	.204922	***	.0492684	0.000	0.3874	21.9931
5	extdebtratio	-.0289021	*	.0150583	0.060	-0.2108	11.3413
6	debttogdp	-.0159197		.07145	0.824	-0.0327	12.8561
7	fiscbal	.097782		.5536574	0.860	0.0221	1.0188
8	rulelaw	10.21949	***	3.491212	0.005	0.3075	14.2752
9	inflation	-.2936923	*	.1495717	0.055	-0.2197	9.8159
10	island	-13.7223	**	5.287792	0.012	-0.2860	8.4198
-	Intercept	-15.39182		24.63445	0.535		
	Observations	67					
	Overall R2	0.58334					
	Root MSE	11.55009					
	F-stat. Model	7.840326	***		0.000		
	Log Likelihood	-252.9894					

Endnotes

[1] Georgieva, Kristalina. "The IMF's Role in a More Shock-Prone World: Plenary Meeting of the 2022 IMF-Work Bank Annual Meetings." International Monetary Fund. October 14, 2022. https://www.imf.org/en/News/Articles/2022/10/14/sp101422-imf-managing-director-speech-to-the-plenary-meeting

[2] Princeton Economics. "Lord Nicholas Stern: New Approaches to the Economics of Climate Change: Urgency, Scale, Opportunity." YouTube, October 11, 2022, https://www.youtube.com/watch?v=zDbOh-Lnx5M

[3] Bhattacharya, Amar, Meagan Dooley, Homi Kharas, Charlotte Taylor, and Nicholas Stern. "Financing a big investment push in emerging markets and developing economies for sustainable, resilient and inclusive recovery and growth." (2022). https://www.lse.ac.uk/granthaminstitute/publication/financing-a-big-investment-push-in-emerging-markets-and-developing-economies/

[4] International Monetary Fund. "World Economic Outlook Report October 2022: Countering the Cost-of-Living Crisis." International Monetary Fund. October 2022. https://www.imf.org/en/Publications/WEO/Issues/2022/10/11/world-economic-outlook-october-2022

[5] International Monetary Fund. "The G20 Common Framework for Debt Treatments Must Be Stepped Up." International Monetary Fund. December 2, 2022. https://www.imf.org/en/Blogs/Articles/2021/12/02/blog120221the-g20-common-framework-for-debt-treatments-must-be-stepped-up

[6] Shantayanan, Devarajan, and Homi Kharas. "Is the Sri Lankan Debt Crisis a Harbinger?" Foreign Affairs. August 4, 2022. https://www.foreignaffairs.com/sri-lanka/sri-lankan-debt-crisis-harbinger

[7] Rogoff, Kenneth. "Emerging Market Sovereign Debt in the Aftermath of the Pandemic." Journal of Economic Perspectives 36, no. 4 (2022): 147-66. https://www.aeaweb.org/full_issue.php?doi=10.1257/jep.36.4#page=149

[8] Cantor, Richard, and Frank Packer. "Determinants and impact of sovereign credit ratings." Economic policy review 2, no. 2 (1996). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1028774

[9] Kling, Gerhard, Yuen C. Lo, Victor Murinde, and Ulrich Volz. "Climate vulnerability and the cost of debt." Available at SSRN 3198093 (2018). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3198093

[10] Kahn, Matthew E., Kamiar Mohaddes, Ryan NC Ng, M. Hashem Pesaran, Mehdi Raissi, and Jui-Chung Yang. Long-term macroeconomic effects of climate change: A cross-country

analysis. No. w26167. National Bureau of Economic Research, 2019. https://www.nber.org/papers/w26167

[11] McCormack, James, Ed Parker, Carlos Masip, and Rob Shearman. “Sovereign Rating Criteria” Fitch Ratings. July 11, 2022. https://www.fitchratings.com/research/sovereigns/sovereign-rating-criteria-11-07-2022

[12] Lemarchand, René. “Rwanda Genocide and Aftermath” Britannica. Accessed November 15, 2022. https://www.britannica.com/place/Rwanda/Moving-forward

[13] Kaufmann, Daniel, and Aart Kraay. “World Governance Indicators.” World Bank. August 25, 2022. Accessed October 5, 2022. https://info.worldbank.org/governance/wgi/

[14] Trading Economics. “Rwanda - Credit Rating.” Trading Economics. Accessed October 24, 2022. https://tradingeconomics.com/rwanda/rating

[15] Country Economy. “Country comparisons Rwanda vs United States: Homicides rate per 100,000 population Rwanda vs United States comparison.” Country Economy. 2015. https://countryeconomy.com/countries/compare/rwanda/usa?sector=Homicides+rate+per+100%2C000+population&sc=XE29

[16] Kimenyi, Mwangi S. “Is Rwanda Exportable?” The Brookings Institution. October 31, 2012. https://www.brookings.edu/blog/up-front/2012/10/31/is-rwanda-exportable/

[17] Cevik, Serhan, and João Tovar Jalles. “Feeling the heat: Climate shocks and credit ratings.” Available at SSRN 3772492 (2020). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3772492

[18] Afonso, Antonio. "Understanding the determinants of sovereign debt ratings: Evidence for the two leading agencies." *Journal of Economics and Finance* 27, no. 1 (2003): 56-74. https://link.springer.com/article/10.1007/BF02751590

[19] Borio, Claudio EV, and Frank Packer. “Assessing new perspectives on country risk.” BIS Quarterly Review, December (2004). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1967457

[20] Bissoondoyal-Bheenick, Emawtee. “An analysis of the determinants of sovereign ratings.” Global Finance Journal 15, no. 3 (2005): 251-280. https://www.sciencedirect.com/science/article/pii/S1044028304000705

[21] Mellios, Constantin, and Eric Paget-Blanc. “Which factors determine sovereign credit ratings?.” The European Journal of Finance 12, no. 4 (2006): 361-377. https://www.tandfonline.com/doi/abs/10.1080/13518470500377406

[22] Afonso, António, Pedro Gomes, and Philipp Rother. “What 'hides' behind sovereign debt ratings?.” (2007). https://papers.ssrn.com/Sol3/papers.cfm?abstract_id=954705

[23] Canuto, Otaviano, Pablo F. Pereira Dos Santos, and Paulo C. de Sá Porto. “Macroeconomics and sovereign risk ratings.” Journal of International Commerce, Economics and Policy 3, no. 02 (2012): 1250011. https://www.worldscientific.com/doi/abs/10.1142/S1793993312500111

[24] Bozic, Vanja, and Cosimo Magazzino. “Credit rating agencies: The importance of fundamentals in the assessment of sovereign ratings.” Economic Analysis and Policy 43, no. 2 (2013): 157-176. https://www.sciencedirect.com/science/article/pii/S0313592613500166

[25] Teixeira, João CA, Francisco JF Silva, Manuel BS Ferreira, and José AC Vieira. “Sovereign credit rating determinants under financial crises.” Global Finance Journal 36 (2018): 1-13. https://www.sciencedirect.com/science/article/pii/S1044028317301990

[26] Wüste, Sebastian. “The logics of sovereign credit ratings in developed and developing countries.” Research in International Business and Finance 62 (2022): 101717. https://www.sciencedirect.com/science/article/pii/S0275531922001052

[27] Trading Economics. “Credit Ratings by Country.” Trading Economics. Accessed November 18, 2022. https://tradingeconomics.com/country-list/rating

[28] World Bank. “Migration and Remittances Data: Annual Remittances Data.” World Bank. May 2021. https://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data

BROOKINGS

1775 Massachusetts Ave NW
Washington, DC 20036
(202) 797-6000
www.brookings.edu