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Debt-for-Climate Swaps: Analysis, Design, and Implementation

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ABSTRACT: This paper compares debt-for-climate swaps—partial debt relief operations conditional on debtor commitments to undertake climate-related investments—to alternative fiscal support instruments. Because some of the benefits of debt-climate swaps accrue to non-participating creditors, they are generally less efficient forms of support than conditional grants and/or broad debt restructuring (which could be linked to climate adaptation when the latter significantly reduces credit risk). This said, debt-climate swaps could be superior to conditional grants when they can be structured in a way that makes the climate commitment de facto senior to debt service; and they could be superior to comprehensive debt restructuring in narrow settings, when the latter is expected to produce large economic dislocations and the debt-climate swap is expected to materially reduce debt risks (and achieve debt sustainability). Furthermore, debt-climate swaps could be useful to expand fiscal space for climate investment when grants or more comprehensive debt relief are just not on the table. The paper explores policy actions that would benefit both debt-climate swaps and other forms of climate finance, including developing markets for debt instruments linked to climate performance.

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WORKING PAPERS

Debt-for-Climate Swaps: Analysis, Design, and Implementation

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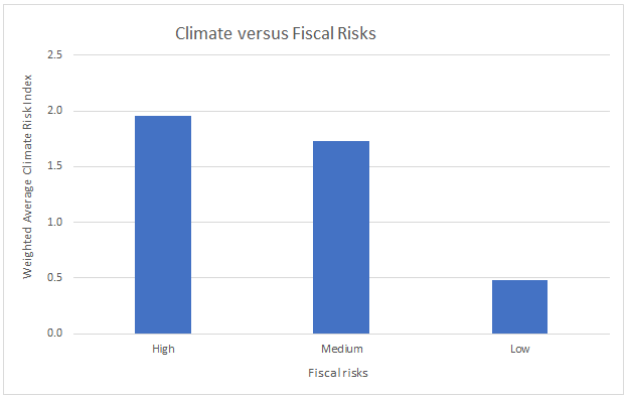
Introduction

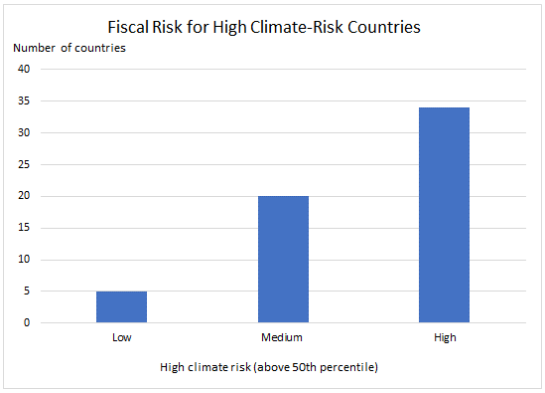
Climate and debt problems are closely linked. Climate vulnerabilities and fiscal risks are correlated. Countries that are more vulnerable to climate change face higher fiscal crisis risks (Figure 1); indeed, a large majority of countries with climate risks above the median are also at high risk of a fiscal crisis (Figure 2). This correlation does not always reflect causation; in part, it simply picks up the fact that many developing countries with histories of debt vulnerabilities are also vulnerable to climate change. In addition, however, there is likely causation in both directions. On the one hand, climate change can exacerbate debt vulnerabilities by adversely impacting countries' productive capacity and their tax base, creating fiscal costs (including for reconstruction after natural disasters) and making external borrowing more expensive. On the other hand, debt problems reduce fiscal space for climate mitigation and adaptation investments and hence exacerbate climate change and/or the adverse implications of climate change.

Figure 1. Countries' Fiscal Risk Categorization and Climate Vulnerability



Source: Authors.

Figure 2. Number of Countries with Above-Median Climate Risk, by Probability of Fiscal Crisis Risk



Source: Authors.

Note: Based on an overall sample of 128 low-and middle-income countries. Climate risk is measured using the IMF Climate-driven INFORM Risk Composite Index (IMF, 2021a). Fiscal risk is assessed using a machine learning model (see Hellwig 2021) supplemented by IMF desk economist judgment. Figure 2 focuses on 59 low- and middle-income countries that have climate threats at or above the median and divides those countries into three groups based on their risk of fiscal crisis in the next two years.

In light of these links, debt-for-climate swaps have been proposed as an instrument that can help countries deal with both climate and debt problems at the same time. Picolotti and others (2020) call for the scaling-up of debt swaps as a means to support countries in building climate resilience and support their post-pandemic recovery. Steele and Patel (2020) argue for debt swaps benefiting spending programs rather than projects, that is, spending on climate resilience, adaptation and biodiversity protection, which give recipients governments flexibility in the use of funds. Volz and others (2021) propose swapping existing debt for "recovery bonds" linking payment terms to the attainment of both policy and spending commitments laid out in a Green and Inclusive Recovery Strategy developed by debtor governments in consultation with civil society, creditors, international financial institutions (IFIs), and UN agencies. To maximize debt relief, the debt exchange would be supported by both "carrots" (Brady-bond type collateral financed by MDBs—multilateral development banks) and "sticks" (regulatory incentives and moral suasion).

However, the coincidence of debt and climate problems does not generate a self-evident case for debt-climate swaps. Debt and climate problems could in principle be tackled separately through a combination of

debt relief and fiscal adjustment on the one hand, and climate finance (loans, conditional grants, or grant/loan combinations) on the other hand. Using several instruments has the advantage of providing extra degrees of freedom. For example, debt relief can be used to restore debt sustainability where it is lacking, while subsidized finance can be calibrated to address climate externalities (when such finance supports emission mitigation) or to a moral argument (namely, that countries that historically generated, or are currently generating, most emissions should support adaptation investments in developing countries suffering from those emissions).

The purpose of this paper is to establish whether there is an economic case for debt-climate swaps along other instruments, and if so, whether and how they should be promoted. The answer to the first question is a qualified yes. But as explained below, getting to this answer is less straightforward than might be expected, and understanding why this is the case helps avoid some pitfalls. The answer to the second question is that debt-climate swaps should be promoted ("scaled") so long as this strengthens climate finance more generally. Many actions that can be undertaken to support debt-climate swaps arguably meet this requirement because (1) policies that support debt swaps involving commercial debt involve much of the same monitoring and verification structures that also support climate-conditional lending instruments, and (2) the link to climate actions is likely to incentivize both bilateral official and commercial creditors to provide debt relief.

The economic case for debt-climate swaps turns out to be sensitive to how such swaps are defined. If they are understood as *any* form of climate-conditional debt relief—including comprehensive debt restructurings in which the debtor commits to specific climate actions—then debt-climate swaps have an efficiency advantage over the "unbundled" alternatives (i.e., separately providing debt relief and subsidizing climate action) when climate actions have a significant impact on the solvency of the borrower. However, debt-climate swaps are generally understood more narrowly, as a type of conditional debt relief involving just one creditor or creditor class. Historically, debt-nature swaps—the predecessor of debt-climate swaps—have aimed to promote both specific investments and policy actions on the one hand and to provide some debt relief on the other, but not to provide comprehensive debt relief or restore debt sustainability in unsustainable debt cases.

As shown in this paper, the economic case for debt-climate swaps defined as a conditional debt relief operation involving a limited set of creditors is narrow. When debt is sustainable, debt-climate swaps are generally a less efficient form of supporting climate action than conditional grants, because some of the debt relief generated by debt swaps will end up subsidizing non-participating creditors. When debt is unsustainable, debt swaps will generally be dominated by comprehensive debt restructuring operations (which could include climate conditionality). However, debt-climate swaps could make economic sense when (1) climate adaptation is efficient; and (2) fiscal risks are high, but debt is not necessarily unsustainable. In such cases, debtors could be better off with debt-climate swaps than with climate conditional grants because the former, but not the latter, can create fiscal space beyond what is needed to finance the climate investment. At the same time, debt swaps might be preferable to a comprehensive debt restructuring if the latter involves reputational costs or economic dislocations that debt swaps can avoid.

In addition, there could be a pragmatic case for debt-climate swaps. Even when debtor countries are in principle be better off with concessional climate finance, deep debt relief, or some combination of both, these alternatives might not be available (or not in sufficient amounts). If debt-climate swaps can expand fiscal support for needed climate actions in such cases, they would be worth pursuing.

The paper proceeds as follows. In the section that follows, we describe the basic structure of bilateral and tripartite debt-for-nature swaps and summarize their history. While well over 100 transactions of this type have occurred since the late 1980s, their average size and total volume has been relatively small. This is followed by an analysis of the economics of debt-climate swaps. The two final sections explain why debt/nature swaps have historically remained small and discuss policy options to meaningfully increase their scale.

Debt-For-Climate Swaps: A Primer

Debt-for-climate swaps take their inspiration from "debt-for-nature" or "debt-for-development" swaps, in which debt is reduced in exchange for spending or policy commitments on the side of a debtor country, at fiscal cost no higher than the debt reduction. They could involve both official bilateral and commercial debt: Under *bilateral* debt swaps, previously committed debt service to official bilateral creditors is redirected to the financing of mutually agreed projects in areas such as nature conservation and climate. *Tripartite* swaps involve buybacks of privately held debt financed by donors and/or new lenders, usually intermediated by an international nongovernmental organization (NGO), conditional on nature- or climate-related policy actions and/or investments. In the most common type of operation the NGO lends the funds to the debtor country at below-market interest rates, on condition that (1) the debtor uses the funds to buyback commercial debt at a discount, and (2) a portion of the resulting debt relief (the difference between the cost of the retired commercial debt and the new debt to the NGO) is used to fund climate-related actions or investments (see Figure 3).

Figure 3. Illustrative Structure of a Tripartite Debt Swap

Source: Authors.

Notes: Figure 3 illustrates a tripartite swap among a nongovernmental organization (NGO), commercial creditors, and a government, involving the following steps: (1) NGO raises funding from environmental, social, and governance (ESG) investors (loans and/or grants); (2) Funding is on-lent to a special purpose vehicle (SPV); (3) The SPV funds agreed-on projects, and (4) provides a loan to the government, which (5, 6) the government uses to buy back debt from commercial creditors. Finally, (7) debt service from the government flows back to the SPV, (8) the NGO, and (9) the investors providing the original funding.

Some debt swaps have involved combinations of public and private support. In Belize (2001) and Panama (2003), the US government and The Nature Conservancy (TNC) shared the costs of debt swaps involving the reduction of US bilateral debt, with TNC providing a grant that matched a portion of the US government's debt reduction. In the case Belize (2021), the US Development Finance Corporation provided political risks insurance for a "blue loan" extended by a TNC subsidiary to Belize, which significantly reduced the credit risk of a "blue bond" used to finance the loan.

Debt swaps have been part of the debt restructuring landscape since the Latin American debt crisis. Early debt-nature swaps include a 1987 tripartite swap with Bolivia led by Conservation International and a 1989 bilateral swap between The Netherlands and Costa Rica. Since then, well over 100 debt swap operations have been conducted: at least 50 trilateral swaps and approximately 90 bilateral debt swaps involving about 15

official creditors (in some cases, more than one at a time) and benefiting about 30 creditors (CRS 2018). These include 10 transactions between the United States and Latin American debtor countries under the 1990 Enterprise of Americas Initiative, and about 20 transactions under the 1998 US Tropical Forest Conservation Act. While “debt-for-nature" swaps lost some of their popularity in the 2000s, perhaps because of the shift toward more comprehensive debt relief under the HIPC/MDRI initiatives, they have since enjoyed a comeback. Recent examples include bilateral swaps conducted by the French development agency under its *contrat de désendettement et de développement* (C2D), most recently with Democratic Republic of Congo (2019) and tripartite swaps led by TNC with Seychelles (2015) and Belize (2021) (Box 1).

Box 1. Recent Debt Swaps in Seychelles (2015) and Belize (2021)

The 2015 Seychelles transaction involved the government of Seychelles and TNC to buy back $21.6 million of public bilateral debt, primarily to Paris Club creditors, for $20.2 million (a discount of 6.5 percent). The Seychelles government used private philanthropic funding and loan capital raised by TNC’s NatureVest conservation investment unit to buy the debt through a newly established Seychelles Conservation and Climate Adaptation Trust (SeyCCAT). In return, the government issued two promissory notes amounting to the same $21.6 million, to pay off the TNC loan as well as to endow SeyCCAT. SeyCCAT became the new owner of the debt, to which the government pays back over a longer tenure, providing a cash-flow relief on repayments. The government committed to protect 30 percent of its waters, protect 15 percent of its high-biodiversity areas, and adopt a marine spatial plan to guide the update of coastal zone management, fisheries, and marine policies. Since 2015, in line with its commitment under the debt swap, Seychelles has progressed from protecting 0.04 percent to 30 percent of its national waters (See CSSCOE, 2018).

The Belize 2021 restructuring was a “tripartite plus” transaction involving the government of Belize, TNC, the US Development Finance Corporation (USDFC), commercial creditors holding a sovereign bond with face value of $553 million (about 30 percent of GDP), and providers of new market finance. Using the proceeds of a “blue bond” issued to the market, a subsidiary of TNC arranged a “blue loan” to the Belize government to finance a bond-for-cash exchange at 55 cents per dollar of face value. About 85 percent of the bondholders accepted the offer, but thanks to a collective action clause, the bond was exchanged in full. On its part, Belize agreed to use part of the debt relief to pre-fund a $23.4 million endowment supporting marine conservation. It also committed to spending $4.2 million per year on marine conservation and to expand its protected ocean area from about 16 percent to 30 percent by 2026. As a result of the transaction, Standard & Poor’s upgraded Belize’s sovereign credit rating to B–.

A critical element of the transaction was a USDFC-provided “political risk insurance” that substantially lowers the credit risk taken by the TNC subsidiary and consequently the cost of the blue bond. Although Belize’s credit rating remains below investment grade, and the IMF continues to assess Belize’s debt as unsustainable “in the absence of additional measures,” this risk insurance earned TNC’s blue bond an investment grade rating, see Landers and Lee (2021), Bolton and others (2022), and IMF (2022).

Despite the frequency of debt swaps, the total volume of debt relief they have generated has remained modest. The main reason has been the small size of the transactions: most debt swaps have been in the two-digit US million-dollar range; the largest swap to date occurred in 1992 between Poland and a group of creditors, for a total value of $580 million. Another reason: debt swaps typically replace old debt with new debt, albeit of lower volume and often denominated in local currency. According to UNDP (2017), the total value of debt treated by debt swaps amounts to $2.6 billion and has funded development or nature-related spending of about 1.2 billion. In contrast, the Brady Plan provided an aggregate debt reduction of $65 billion (Bowe and Dean 1997), while climate grants to developing countries in 2019 amounted to $17 billion (OECD 2021).

Their modest size notwithstanding, some evidence exists that debt-for-nature swaps had the desired conservation effects. Some studies suggest countries that have implemented debt-for-nature transactions tend to have lower deforestation (Shandra and others 2011, Sommer, Restivo, and Shandra 2020). As part of its commitment under the 2015 debt swap, Seychelles increased the share of its protected marine area to 30

percent. However, Cassimon and others (2021) question the extent to which debt-nature swaps provide "additionality" over investments that governments might have already budgeted for and call for increased emphasis on improving the design of debt-for-nature swaps.

When Do Debt-for-Climate Swaps Make Sense?

The remainder of this paper adopts a narrow definition of debt-climate swaps, in line with the way in which debt-nature swaps have historically been understood. That is, we distinguish between four types of climate-conditional financial operations: (1) loans (including on concessional terms); (2) grants; (3) debt swaps; and (4) comprehensive debt restructurings. The difference between (3) and (4) is two-fold. First, to the extent that debt is unsustainable, comprehensive debt restructurings will seek to restore sustainability. This is not generally the case with debt swaps. Second, and related to the first point, comprehensive debt restructurings involve a broad restructuring perimeter, including most categories of creditors. In contrast, debt swaps typically involve debt relief by one creditor or possibly (as in the case of Belize 2021) one class of creditors.[1]

Whether debt-climate swaps make sense compared to alternative instruments to fund climate investment, lower debt, or both, depends on the economic problem that is to be solved. For this analysis, it is useful to distinguish among four potential problems, all of which could cause underinvestment in climate. First, a climate externality (as would be the case for mitigation-related investments). This implies that the benefits of the investment disproportionately fall on parties/countries who do not pay for it. Second, underinvestment because of a borrowing constraint, which can exist even if the borrower could repay if it were able to obtain a loan at affordable interest rates. The cause for such a borrowing constraint is typically credit risk, which pushes up borrowing cost. Third, lack of fiscal space in settings in which debt would be sustainable without the climate investment. This describes a situation in which a country could repay its debts without the climate investment. But it would not be able to repay if it needs to borrow to undertake the investment, even if it obtained a loan at a concessional interest rate, because the required lending would push debt to unsustainable levels.[2] Fourth, debt that is unsustainable regardless of whether the climate investment is undertaken or not.

When the cause of underinvestment is a climate externality or a borrowing constraint, the problem can be solved through concessional loans (possibly conditional on undertaking the investment). *Concessionality*—lending at a lower cost to the borrower than would be justified by the credit risk taken by private lenders—can both offset the climate externality and overcome the borrowing constraint. Concessionality requires some form of public support, whether in the form of public lending or through public guarantees or insurance that lowers the cost of borrowing from private sources. *Conditionality*—linking lending to climate

[1] Note that this way of defining debt-climate swaps does not involve any loss of generality, as the analysis also compares debt swaps in the definition adopted here to climate-conditional comprehensive debt restructurings. Hence, readers that prefer the broad definition (where debt swaps are equated with any form of conditional debt relief) will find all the results they need; but these results will depend on whether the conditional debt relief is of the partial type (i.e., swaps as defined here) or the comprehensive type.

[2] In general, one would expect economically efficient adaptation investments (that is, investments that generate economic returns beyond their costs to the public purse) to improve debt sustainability, as they should either raise revenue directly via higher growth, or because the government should have instruments to tax the returns to such investments. However, there may be cases where such returns raise welfare but are hard to tax over the relevant horizon. Furthermore, except for very large emitters, the benefits to climate mitigation investment are mainly external to the country undertaking the investment. For these reasons, it is possible to imagine a situation where debt is sustainable without the climate investment, but large climate investments render debt unsustainable, even when they are efficient.

projects or climate-related performance indicators—can be justified as a quid-pro-quo for concessionality (as the public entity providing a loan or guarantee/insurance may not be willing to do so except for a specific purpose).

However, many developing countries may lack the fiscal space to pay for needed climate investment, even when it is financed on concessional terms. This challenge is most obvious for countries whose debts may be unsustainable as a result of climate change, such as some of the climate-vulnerable island economies covered in the IMF-World Bank's Climate Change Policy Assessments[3]. However, even developing countries with sustainable debt may lack the fiscal space needed to conduct economically efficient adaptation investments (Aligishiev, Bellon and Massetti 2022). Figure 4 makes this point by plotting a back-of-the-envelope measure for fiscal space in low-income countries, namely, the difference between the present value of debt as a share of GDP at end-2021 and the threshold level of the present value as a share of GDP that would put countries at high risk of debt distress, according to the IMF-World Bank's debt sustainability framework for low-income countries (LIC-DSF).[4] Each bar represents the fiscal space of one country, as proxied by this measure. Of the 64 countries shown, 43 have fiscal space of less than 20 percent of GDP and 33 below 10 percent of GDP; in 28 cases, fiscal space is negative. Among 29 low-income countries (LICs) that have submitted estimates of adaptation needs in the context of their nationally determined contributions to the Paris climate agreement (NDCs), only 7 have sufficient fiscal space, by the measure shown in Figure 4, to meet these needs.

While debt-climate swaps offer one way to support climate investment in countries with insufficient fiscal space, alternative investment instruments may also be available. As long as the spending commitment that accompanies the swap does not exceed the debt service commitment that it replaces and is paid for by resources that would otherwise have been used to service debt, debt-climate swaps can create the needed fiscal space (see Annex 1, first result). However, debt-climate swaps are clearly not the only instrument that can achieve this goal. Alternative instruments include grants (or some combination of grants and concessional lending) and comprehensive debt restructuring, both possibly conditional on climate actions

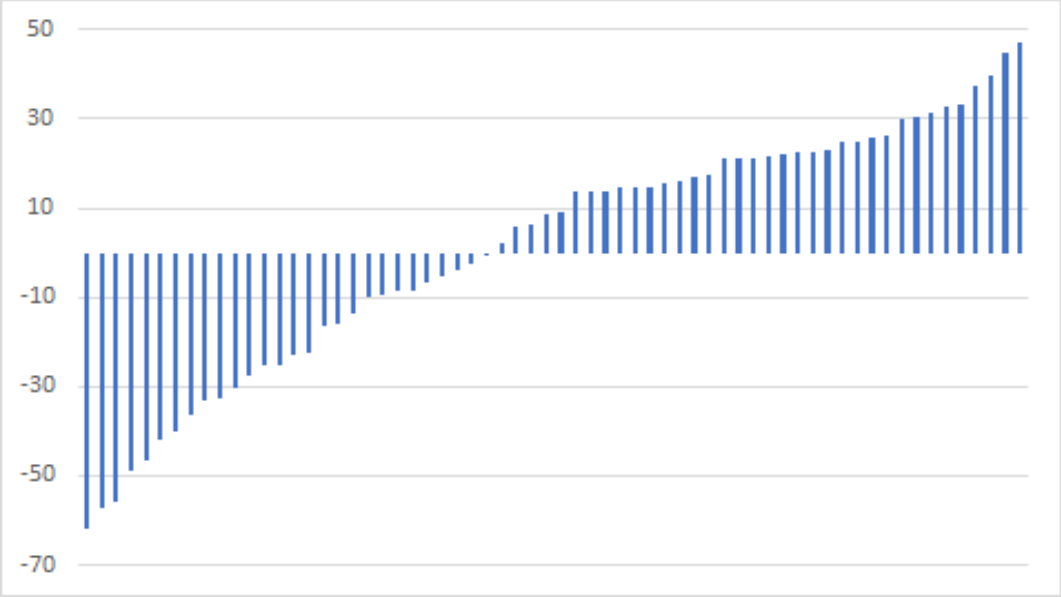
The remainder of this section compares debt-climate swaps to these alternative instruments. It begins with a comparison between debt-climate swaps and climate-conditional grants (or grant/loan combinations). This comparison can be thought of as most relevant to a setting in which a developing country lacks the fiscal space to undertake important climate investments but has sustainable debt. The second comparison is between debt-climate swaps and comprehensive debt restructuring operations, where the latter might be either combined with climate-conditional grants/loans or be itself conditional on climate actions. This comparison might be thought of as relevant to countries with unsustainable debt, or in distressed debt settings in which some form of debt restructuring is part of the solution.

[3] See www.imf.org/en/topics/climate-change for the CCPA reports.

[4] Namely, 35, 55, or 70 percent of GDP for countries with weak-, medium-, or high-debt carrying capacity, respectively. See IMF Guidance Note on the Bank-Fund Debt Sustainability Framework for Low-Income Countries, Tables 11 and 17.

Figure 4. Sovereign Borrowing Space Measure for 64 Low-Income Countries

(Percent of 2021 GDP)



Source: Authors' calculations based on the IMF-World Bank Debt Sustainability Framework for Low-Income Countries (LIC-DSF).
Note: The bars indicate the difference between the present value of debt as a ratio of GDP at end-2021 and the country-specific present value debt ratio that would put the country at high risk of debt distress, according to the IMF-World Bank LIC-DSF. Sovereign borrowing space may be limited by other LIC-DSF sustainability thresholds such as external debt (service) to export and revenues ratios.

Debt-Climate Swaps Compared to Climate-Conditional Grants

Climate-conditional grants (or grant/loan combinations) are generally a more efficient way of supporting public investment in a recipient country than debt-climate swaps. The reason is that climate-conditional grants—assumed to be designed in a way that makes them impossible to be diverted to debt service or other spending purposes—are targeted to only one purpose, namely, the climate investment. Unless the climate investment happens, they are not disbursed. Debt-climate swaps, however, support climate investments by committing a country to redirect spending from debt service to an agreed public investment. This implies that, *unless the swap is structured to ensure that the expenditure commitments are de facto senior to the remaining debt service*,[5] a donor/creditor who wants to fund a climate investment faces greater (sovereign) risk if the support takes the form of a debt-climate swap than if it takes the form of a conditional grant. To reduce that sovereign risk, the donor/creditor could decide to provide additional debt relief. But unless the expenditure commitment is senior, this reduces risk to the investment only to the extent that the risk of the remaining debt repayment is also reduced. In short: a conditional grant only benefits the investment while the benefit of a debt-climate swap is normally shared between the investment and the non-participating creditors.

[5] The Belize (2021) transaction may achieve this, through (1) an insurance by the US Development Finance Corporation to the "blue loan" holders in the event that they obtain an arbitral award against Belize and (2) "cross default provisions with the Belize payment obligations under the marine conservation funding agreement *to ensure the overall alignment with the purpose of this transaction*" (Moody's 2021). Hence, a failure of Belize to live up to the conservation agreement may eventually force the US government to make a payment. If this is more costly (reputationally, politically, or economically) for Belize than a failure to live up to its remaining debt service commitments, it would make the conservation commitment de facto senior.

For this reason, a debt-climate swap is normally a less efficient form of fiscal support than a conditional grant (see Box 2 and Annex 1).

Debt-climate swaps could be a *more* efficient form of fiscal support than conditional grants if the expenditure commitment is de facto senior to debt service. In this case, the swap can support a given climate expenditure at lower cost to the creditor/donor, since at least part of the climate expenditures will be indirectly financed by other creditors (who would suffer greater losses in a crisis, see Box 2 and Annex 1).[6]

In addition, debtors may prefer debt-climate swaps over climate-conditional grants when the former offer debt relief in excess of what is needed to finance the climate investments.[7] While grants are normally set to at most cover the cost of an investment, debt-climate swaps typically produce some net debt relief (that is, debt relief is set to somewhat exceed the cost of the investment). Hence, they lead to a higher net fiscal transfer. This said, for the reasons discussed above, it would generally be more cost efficient (from the perspective of a creditor or donor funding the debt-climate swap) to achieve the same net fiscal transfer by combining a climate-conditional grant which exactly pays for the climate investment with some additional, unconditional debt relief.

Box 2. Comparing Climate-Conditional Grants and Debt-Climate Swaps: An Example

Suppose a country owes 100 units of real resources to creditors. At the time of repayment, the country has resources of 115 available for repayment with probability 0.5; but with probability 0.5, resources are only 90. Hence, with probability 0.5 the country will need to renegotiate its debts to a level no higher than it can repay. The expect payment to creditors (the market value of debt) is hence $0.5 * 100 + 0.5 * 90 = 95$.

Now assume that climate investment costs 20, so it is unaffordable without external support (loan financing would push debt above the maximum that the country could repay). Consider two forms of conditional fiscal support: a grant of 20—all of which must be spent on the climate investment—or debt relief of 20.

Suppose there is no crisis, so the country has 115 units to repay. In that case, grant and debt relief lead to the same outcome. If support took the form of a grant, this pays for the climate investment, creditors are repaid 100, and the country keeps 15. If it took the form of debt relief, debtors are repaid 80, the country uses 20 to implement the climate investment, and keeps 15.

Now suppose there is a crisis, so real resources are 90. In this case, the grant and debt relief will generally lead to different outcomes. If support takes the form of a grant, this is spent on the climate investment, debt is unchanged, and the creditors lose 10. The debt-climate swap, on the other hand, lowers debt to 80. This means that if resources end up at 90, the country will have more than what is needed to repay the debt, but less than the sum of debt and the investment commitment (100).

What happens in this case depends on whether the climate investment commitment ranks above, equal with, or below the debt service commitment (legally or de facto):

- If the climate investment ranks above debt service, the consequences are the same as for a conditional grant. The climate investment is undertaken, and creditors receive 70, losing 10.
- If it does not, then the climate investment will not happen, or only partially. For example, if debt service has precedence, creditors will be repaid 80, leaving only 10 for the climate investment. Alternatively, if resources are allocated pro rata, creditors receive $0.8 * 90 = 72$, losing just 8 rather than 10, while resources for climate investment are $0.2 * 90 = 18$.

[6] This comparison abstracts from considerations related to administration and timing/phasing. For example, debt swaps may provide flexibility to match the cashflow of the climate expenditure commitments (Lazard 2021).

[7] Swaps typically provide an additional benefit by replacing debt repayments in hard currency with local expenditures, strengthening the balance of payments and benefiting the debtor beyond what this simple comparison of debt relief vs additional expenditure commitments would suggest. But similar benefits would result from a grant in foreign currency that is spent in local currency.

Three implications of this example are worth pointing out.

First, expected debt relief is less than the face value debt relief (20) unless the climate expenditure is senior. If climate expenditure ranks *below* debt service, then expected payments to creditors are $0.5 * 80 + 0.5 * 80 = 80$, and expected debt relief $95 - 80 = 15$. If debt service ranks *pro rata* with the climate expenditure, then expected payments to creditors are $0.5 * 80 + 0.5 * 72 = 76$ and the expected debt relief debt swap of face value 20 is $95 - 76 = 19$ If the climate expenditure ranks *above* debt service, however, then expected payments to creditors are $0.5 * 80 + 0.5 * 70 = 75$ and expected debt relief is $95 - 75 = 20$.

Second, if the creditor or donor providing the debt relief cannot structure the relief in a way that guarantees that the 20 units of climate investment happen even in a crisis (as they would if fiscal support takes the form of a climate-conditional grant), then it would need to provide 30 units of debt relief rather than just 20, lowering debt to 70. This would ensure that even in the crisis state, resources are high enough to repay both creditors and undertake the full investment ($90 = 20 + 70$). Hence, if the climate expenditure commitment cannot be made senior, providing fiscal support through a debt-climate swap to achieve a desired level of climate expenditure is more costly than providing it through a conditional grant. The extra cost reflects a subsidy to the non-participating creditors, whose debt service is now made safe, along with the climate expenditure.

Third, if the climate expenditure commitment can indeed be made senior, then supporting the climate investment through a debt swap may in fact have a cost *advantage* over a conditional grant. In the example above, the climate investment of 20 is financed by a swap that writes down the face-value of debt by the same amount, but only costs the participating creditor the market value of that debt, namely, 19 (=20*0.95). The residual amount is indirectly financed by the other (non-participating) creditors, who end up receiving less in the crisis state compared to a situation when losses are distributed pro rata (in the example, 70 rather than 72).

In Annex I, this example is extended in several ways: (1) Resources are described by a continuous probability distribution. These resources must be used to both service debt and pay for any investment commitment resulting from a debt swap. (2) Debtors may suffer a “deadweight cost” of default (a cost that does not benefit the creditor). (3) Debt relief and grants may exceed the climate spending that they are meant to support. (4) To study the implications of debt buybacks and tripartite debt swaps we assume that debt can be traded in the secondary market. Using this setup, it is possible to show the following results:

- A debt-climate swap in which nominal debt relief is at least as large as the climate spending requirement always leads to a non-negative fiscal transfer to the debtor (equal to the expected change in external payment commitments). However, this transfer is always less than the nominal decline in external payment commitments.
- From the perspective of a donor/creditor, a grant is generally a better way of supporting investment spending in a country with risky sovereign debt than debt relief. This is because a grant can be structured to ensure that the investment will happen regardless of debtor country resources. In contrast, if fiscal support takes the form of debt relief, the investment may not happen if the country has insufficient funds to both service its debt and undertake the investment. For the same reasons, a debtor should generally also prefer the grant (unless the debt swap is more generous, in the sense that it leads to debt relief in excess of what is needed to finance the climate investment).
- When the climate investment has priority over debt service, a debt-climate swap is a cheaper way of financing the investment than a grant, because the swap would be partly financed by curtailing spending on debt service when resources are too low to both invest and service all debt.
- A debtor-conducted debt buyback can be efficient if cost of default and/or the share of the cash that goes toward repaying creditors in the event of restructuring is sufficiently high (buybacks are more likely to be a good idea if in the event of default most cash goes to the creditors anyway).
- Finally, a donor-conducted buyback (in which a donor buys back debt in the secondary market and subsequently swaps it against a loan to the debtor country of equal or smaller face value than the cash used in the buyback) is better from the perspective of the donor and debtor than a debtor-conducted debt buyback (in which the donor gives a debtor cash for a buyback in exchange for a claim of equal or lower face value, and the country uses this cash to buy back debt in the market). This is because the donor-conducted buyback happens at a lower secondary price.

Debt-Climate Swaps Compared to Comprehensive Debt Restructuring

Debt swaps are generally not the right tool to address unsustainable debt situations. As defined in this paper, debt swaps involve partial debt relief, while unsustainable debt typically requires a restructuring that includes a broad perimeter of the outstanding debt. This leads to two questions. First, what is the optimal approach to address a situation in which debt is both unsustainable and there are large climate investment needs? Second, is there *any* economic setting in which debt-climate swaps are not dominated by deep debt restructuring (climate-conditional or not), conditional grants, or a combination of the two?

The optimal approach to address both unsustainable debt and large climate investment needs depends on whether climate actions have a strong impact on sovereign risk.

- When this is **not** the case, it generally makes sense to first restore debt sustainability through a comprehensive debt restructuring and then support climate investment through climate-conditional grants/loans. This follows from the arguments of the previous subjection. Debt-climate swaps subsidize the creditors that do not participate in the operation. In contrast, deep debt restructurings generally come with frameworks that seek to ensure wide participation (such as debt exchange offers to all bondholders, or Paris Club comparability of treatment provisions). For this reason, it is generally efficient to de-link the restoration of debt sustainability from fiscal support of climate action, which should be additional to the debt relief required to restore sustainability, and ideally come in the form of conditional grants (or a combination of grants and loans) rather than debt-climate swaps.
- When climate actions **do** materially lower sovereign risk, however, there is an economic case for climate-conditional debt restructuring.[8] In some countries, such as some small island states, both climate-induced catastrophes and significant climate financing needs may exacerbate debt vulnerabilities (see, for example, the IMF-World Bank Climate Change Policy Assessments for Micronesia, St. Lucia, and Tonga). In such cases, providing debt relief without mandating climate adaptation action could give rise to a moral hazard problem (as the costs of debt distress are shared by debtors and creditors, but only the debtor decides how to use the fiscal space gained through debt relief).

Debt-climate swaps could be efficient in narrow settings involving both high risk of debt distress and large costs associated with a comprehensive debt restructuring. In such settings, the disadvantages of debt swaps compared to conditional grants could be more than offset by the benefits of the debt relief associated with debt swaps. At the same time, the main disadvantage of debt swaps compared to comprehensive debt restructuring—lower debt relief, with no guarantee that debt sustainability will be restored—may be outweighed by the possibility of avoiding a traumatic restructuring. Importantly, the second condition is only plausible in narrow cases, as it relies on the assumption that the partial debt relief produced by a debt swap can substantially reduce debt risks.[9] If the probability of debt distress remains high even after the debt swap operation, a comprehensive restructuring would have been preferable. While the reputational and economy costs of a preemptive debt restructuring may be higher than those of a debt swap, they are significantly lower than those of a disorderly default or a post-default restructuring (Asonuma and Trebesch 2016, Asonuma et al 2020).

[8] As with all forms of conditionality, it is important to ensure that the beneficiary country has sufficient ownership over the climate conditions. Conditionality may not be needed at all if the recipient of support—whether through debt relief, grants, or conditional loans) already fully "owns" the conditions. At the same time, conditionality is rarely successful if the conditions are resented by the recipient. To forestall this, the receiving country's priorities and concerns should be taken into account when designing climate conditionalities.

[9] These conditions are similar to the conditions under which a market-based debt buyback might make sense, namely, that impact of the buyback in reducing the risk of debt distress is high relative to the dislocations associated with the non-market restructuring alternative. See Annex I and IMF (2021b).

Beyond these efficiency arguments, there could be a pragmatic case for debt-climate swaps, and more generally for linking debt relief and climate action. Even when the best way to help developing countries with debt and/or climate problems is a combination of plain debt relief with climate-conditional grants or grant-loan combinations, unconditional debt relief may not readily be on offer, and climate-conditional grants will rarely be so generous as to create fiscal space beyond what is needed to fund the climate action. Furthermore, there may be cases when the willingness of creditors to provide debt relief is enhanced by climate conditionality. This pragmatic case for debt swaps may be particularly relevant for middle-income countries that are less likely to receive grants.

To the extent that debt-climate swaps take the form of tripartite swaps involving donor-financed purchases of commercial debt, it makes sense to have the donor undertake the purchases. If the donor can conduct purchases before the debt market realizes that the purchased debt will be forgiven, it may be able to purchase the debt at a lower price than if the debtor had conducted a buyback (Annex I). In a second step, the purchased debt can then be swapped against a loan of equal or lower face value than the cash that that the donor used to buy back the debt.

To conclude, it is important to distinguish between the general case for linking debt relief to climate conditionality and the specific case for debt-climate swaps. When climate adaptation has a significant impact on sovereign risk—most plausibly, when climate change is a contributing cause of unsustainable debt—linking debt relief to adaptation actions is essential to address a source of moral hazard and obtain creditor buy-in. However, this link should generally occur in the context of comprehensive debt restructurings rather than debt swaps involving one creditor or a group of creditors. An exception may arise in settings in which debt swaps are expected to have a material impact on debt risks and the economic cost of a more comprehensive debt restructuring is high. Beyond such settings, debt-climate swap could be a pragmatic way of expanding fiscal space for climate action when the alternatives—conditional grants or comprehensive debt restructuring—are not on the table.

Why Have Debt Swaps Remained a Niche Instrument?

The use of debt swaps has been constrained from both the "demand" (use of funds) and "supply" (availability of funds) sides. First, debt-for-climate and debt-for-nature swaps have historically been linked to specific projects that needed to be identified, structured, and monitored. Creating those projects and the associated governance structures has been costly. Second, the pool of debt held by creditors that could potentially be interested in debt swaps has remained relatively small. These factors are mutually reinforcing: high transactions and monitoring costs shrink the pool of investors/creditors that might be interested in debt-climate swaps, while the small-scale of the swaps stands in the way of achieving economies of scale.

Use of Funds: The Costs of Finding, Structuring, and Monitoring Projects

Debt-climate swaps have mostly remained uncoordinated, small-scale project-based operations by single creditors. Factors constraining the scaling-up of debt swaps have included:

- **High transaction costs**. Debt swaps require identifying a suitable project, coordination across multiple parties, and time-consuming negotiations (2-4 years according to the OECD). Performance monitoring indicators attached to swaps impose high administrative burdens, particularly in environments with weak capacity, due to the need to set-up parallel structures for project implementation and monitoring, bypassing

the debtor government's own systems and procedures (see also Cassimon, Prowse, Essers, 2011). This problem is compounded if the *creditor* countries potentially interested in swaps are not the ones better placed to incur these transaction costs (for example, small, advanced economies without an extensive set of agencies and state apparatus to implement the swap).

- **High monitoring costs**. The fragmented nature of transactions has resulted in project-specific performance measures. This creates an obstacle to scale since prospective investors would need to become familiar with each specific project. It also creates a constraint to the participation of financial institutions that could potentially mobilize significant financing for debt swaps if there were uniform performance indicators and monitoring standards (across a spectrum of projects) and a liquid secondary market.
- **Commitment problems**. Debtor commitment problems arise when the swap requires actions or policies that stretch into the future, creating an incentive to renege once debt relief has been granted or an inability to meet the obligations because of fiscal shocks over time. The debtor may also be reluctant to undertake regulatory policies that lead to permanent and costly reallocations if it perceives a risk that the creditor will not provide the relief initially envisioned.

Supply of Funds: Debt Volume and Composition

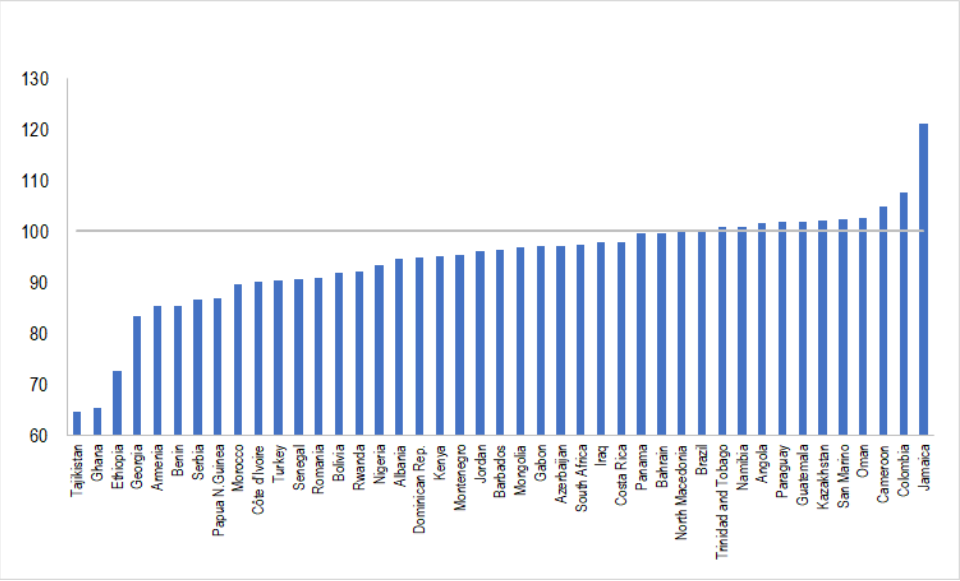
The most common form of debt swaps with LICs has been official bilateral swaps with Paris Club members, using official development assistance-eligible debt. Total external public debt in LICs with medium or high debt sustainability risks according to the LIC-DSF—which is one way to approximate the group of countries with sustainable debt but lack of fiscal space which may be best suited to debt swaps—equaled $245 billion end-2021. Debt held by Paris Club creditors has been significantly reduced since to heavily indebted poor countries, to $18 billion (7 percent of total external debt), compared to $55 billion among non-Paris Club bilateral creditors (23 percent of total external debt).[10] In addition, privately held bonded debt could in principle be suitable for tripartite debt-for-climate swaps. This is $34 billion among those LICs, concentrated in a handful of countries (Table 1), although less so if debt is measured in terms of GDP (Annex Figure 1).

Emerging market economies have issued far higher volumes of bonded and Paris Club debt but generally not on terms that might be suitable for trilateral debt swaps involving debt buybacks. Table 2 shows all countries with bond spreads between 200 and 1,000 basis points as of March 17, 2022. The 1,000 basis point cutoff is chosen to exclude countries in high debt distress, many of whom require a negotiated debt restructuring. The total sovereign debt of these was about $798 billion at end-2021, including $36.5 billion in Paris Club debt and $376 billion in bonds. Only a small set of Paris Club creditors has engaged in debt-for-climate swaps in the past. Tripartite swaps involving debt buybacks debt, on the other hand, have typically focused on debt trading at a large discount. This is a far smaller set, with 153 out of 583 outstanding bonds trading at less than 85 face value. As Figure 5 shows, this set becomes even smaller when considering weighted-average bond price (bid price weighted by amount outstanding per bond): bonds traded below 85 on average in only four countries. That said, to the extent that "demand side" obstacles to debt swaps are reduced, debt swaps could become attractive even for bonded debt that does not trade at a discount, based

[10] Lazard (2021) argues that the Paris Club's comparability of treatment and solidarity principles may further constrain the scope for debt swaps. However, this has not been tested in practice. Comparability of treatment and solidarity principles are designed to prevent free riding by one creditor on Paris Club creditors. However, if an official creditor were to provide debt relief to a debtor using debt-climate swaps, this should benefit rather than hurt the remaining creditors (provided the relief is larger than the additional climate expenditure).

only on the cost advantage associated with sustainability-indexed debt (see below).[11] Furthermore, it may be possible to combine climate conditionality with negotiated debt restructuring (rather than debt buybacks) in some of the debt distress countries that are not shown in the chart (as was done in Belize, 2021).

Figure 5. Distribution of Weighted-Average Bond Bid Prices for a Sample of PRGT and MAC Countries



Source: Authors' calculations based on Bloomberg data as of March 17, 2022.
Notes: MAC = Market-access countries; PRGT = Poverty Reduction and Growth Trust.

Should Debt Swaps be Scaled Up, and if so, How?

Since conditional grants are generally a more cost-effective way to support climate investment than debt-climate swaps, it is not immediately obvious that "scaling" debt swaps should be a policy objective at all. If the main argument for debt swaps is pragmatic—namely, that other forms of fiscal support, including plain debt relief and climate-conditional grants, are in short supply—then policy should focus on expanding any form of fiscal support to developing countries whose climate needs exceed their fiscal space, rather than necessarily on "scaling" debt swaps.

There are nonetheless two arguments for measures that could lead to greater use of debt swaps—and more generally, for linking debt relief with climate commitments. First, most of these measures would not just benefit debt swaps but climate finance more broadly, including climate-conditional grants, climate-conditional official lending, and the sustainability-linked bond issuance. Second, the willingness of some creditors to provide debt relief could be greater if the latter is linked to climate action.

[11] The financial benefit of the buyback depends not only on the face value at which the bond is trading but also on the coupon payments associated with it. This exercise was meant to illustrate that relatively few bonds trade at a significant discount relative to their par value.

This section presents five set of measures—not mutually exclusive—that could contribute to meaningfully scaling up both debt-climate swaps and related climate financing instruments. First, the expansion of project-based swaps to support climate-vulnerable countries accelerates climate investment. Second, a programmatic approach that focuses on budgetary use of funds. Third, developing standardized KPIs as well as a market for debt instruments whose financial terms are linked to these KPIs. Fourth, by using carbon credits to incentivize debt swaps from both private and official sources. Finally, through a multilateral initiative, encompassing a broad set of donor countries and official bilateral creditors, to identify countries with the greatest gaps between climate-related investment needs and fiscal space and support these countries through a combination of bilateral debt swaps and trilateral debt swaps of conditional grants.

Bundling Projects and Policy Reforms

Project-based swaps could be scaled by packaging related projects and combining them with relevant policy reforms. Projects could be organized around a country's mitigation and adaptation plans, for example, decommissioning coal plants, building renewable power plants, and building more resilient infrastructure and agricultural systems. Project bundles could be complemented with policy-based reforms (such as energy sector reform and carbon pricing) that support the overall climate transition. One benefit of linking such reforms to projects involving physical investment is that the latter are harder to reverse; hence they help solve the commitment problem described in the previous section.

Another way to solve the commitment problem is through conditionality agreed with international financial institutions. The IMF's Resilience and Sustainability Trust, approved in April 2022, is designed to support climate-related reforms, among other priorities. IMF or MDB conditionality (for example, with respect to energy sector reform) could serve as a commitment device to undertake reforms that are essential to deliver on NDCs under the Paris Agreement. These could allow countries to attract private and donor financing, including in the form of debt swaps.

Budgetary Expenditures Supporting Adaptation and/or Mitigation

Debt swaps could be used to finance budgetary expenditures in climate-related spending categories. The benefits of this approach are twofold. First, it does not require identifying, structuring, and monitoring individual projects and hence involves much lower transaction costs. Second, funding could come from sources other than debt swaps; thus, it is not linked to previous debt ownership. "Programmatic approaches" of this type could be linked to country development strategies, increasing ownership (Steele and Patel 2020).

A programmatic approach could be used to support a country's decarbonization strategy. Rather than one reform (for example, decommissioning a plant), it can focus on broader energy sector reforms with a climate focus. For instance, if coal is the main source of energy and the country is seeking financing to reduce its carbon footprint, a comprehensive transition strategy could be used to mobilize climate financing, including by using debt swaps. Such a transaction could entail the government undertaking specific commitments (decommissioning of coal plants, increasing renewables, providing support to communities) as part of the transition strategy. Such an approach is akin to the Just Energy Transition Partnership between the G7 and South Africa.

For such an approach to succeed, the debtor country must have a strong institutional set-up to mitigate concerns over use of proceeds. A strong policy commitment from debtor countries would be to implement green budgeting and climate public investment management assessments as part of their public financial management practices. International institutions, including the IMF, can support the development of such practices. Such an approach will allow for a better integration of climate in policy frameworks—and

promote greater transparency, oversight, and accountability over government climate spending. This may also be an attractive approach for private creditors that are looking to green their existing budget-oriented sovereign claims and are more inclined to finance government budgets compared to individual projects. More generally, debtor countries would benefit from having ambitious climate strategies with financing needs and gaps. Such documents would enhance their credibility with creditors when negotiating debt swaps.

Developing KPIs and Creating KPI-Linked Bond Markets

Debt swaps could be linked to KPIs measuring climate *outcomes*, rather than to expenditures or projects. Such an exercise could be integrated to ongoing work on the design and standardization of climate-related KPIs related to environmental, social, and governance (ESG)-linked bonds. Standardized KPIs could be used to reduce monitoring costs for debt swaps while also supporting the issuance of ESG-linked bonds for such operations (thereby reducing the overall cost relative to a plain vanilla bond issued for such purposes). While the "greenium" associated with ES-linked bonds is currently low—up to 50 basis points in the best case—the margin could widen as the credibility of these instruments and overall demand increases. Most ESG issuances have been made by advanced economies. The improved monitoring and commitment from implementing KPIs could allow countries access climate finance at a cheaper cost than under plain vanilla instruments. By the same token, they could lower the costs of designing and monitoring debt-climate swaps. Conversely, debt swaps linked to climate outcomes could address the first mover problem and pave the way for KPI standardization and the development of the ESG market.

Several proposals aim to link the financial terms of bonds to climate-related KPIs. The World Bank has proposed "sustainability-linked bonds" (SLBs), in which KPIs are based on national climate and biodiversity commitments such as NDCs to the Paris Agreement (see Flugge and others 2021, Silva and Stewart 2021). Failure to meet the KPIs would lead to a step-up in the cost of financing (or alternatively, a portion of debt service could be initially placed into an escrow account and returned to countries meeting KPIs). Ferreira and others (2021) point to a role for IFIs in promoting international coordination to address gaps in the climate information architecture and allow for a globally harmonized and consistent set of climate disclosure standards. MDBs and NGOs can contribute by designing and monitoring KPIs in collaboration with national authorities, and by providing intermediary services that help with enforcement. For example, the Finance for Biodiversity Initiative (F4B) proposes the development of a Nature and Climate Sovereign Bond Facility, hosted by one or a collaboration of international institutions, which would establish guidelines and protocols for issuers and investors to design nature and climate indicators and function as a platform for monitoring and verification of performance outcomes (F4B 2021). Scaling up the sovereign SLB market will likely require coordination between debt management offices, industry groups, as well as market participants (Doran and Tanner 2019, Giraldez and Fontana 2021).

Aside from developing and monitoring KPIs, MDBs could consider boosting the attractiveness of KPI-linked bonds by providing enhancements, such as partial guarantees, that reduce credit risk. Such guarantees have already been used to lower the cost of issuing use-of-proceeds bonds (for example, a Blue Bond issued by Seychelles in 2018 with a partial guarantee from the World Bank (see, World Bank, 2018)). Alternatively, MDBs could finance the purchase of Brady-bond style collateral (such as AAA-rated zero-coupon bonds) by the KPI-linked bond issuers themselves. Such enhancements can be justified in two ways: as a temporary measure, to help develop the KPI-linked bond market until the use of KPIs is entrenched, or as a permanent measure, reflecting international externalities that are not fully internalized through either regulation favoring KPI-linked bonds or public pressure on institutional investors. Hence, the purpose of such enhancements is not to eliminate credit risk but to compensate the investor for externalities that cannot be

internalized through other means (Volz and others 2021). MDBs could also be involved in cases where bespoke KPIs are needed, and credit enhancements could be used to manage risks with such projects.

The development of a KPI-linked bond market could spur interest in debt swaps during the transition to net zero and help align financial flows with the Paris Agreement. Commercial creditors, whose portfolios are increasingly screened against environmental criteria, might be offered to voluntarily swap their claims into new green instruments—without necessarily requiring the intermediation of an NGO or complex SPV structures, which have so far been critical for the success of these types of swaps (Figure 3, Box 2). Regulatory convergence and contractual standardization are likely to accelerate such efforts and increase the marketability of such swapped instruments.

Using Carbon Credits to Incentivize Debt-Climate Swaps

As KPIs are standardized, public or private creditors undertaking debt swaps could be given credits to offset their carbon footprint. While this could allow higher levels of carbon emissions elsewhere, it allows for a broader choice of projects, including some that are much more cost effective in reducing emissions than the alternatives that would be pursued in the absence of such trading. Those efficiency gains can make green investments more attractive, allow more projects to be financed and thereby help reduce aggregate emissions. To the extent that the credits are generated through climate mitigation that would have not been feasible absent the debt-for-climate swap, the gains are additional—the debtor country has a lower debt and the creditor benefits from carbon credits in support of their mitigation objectives. One successful example is a 2005-2007 debt-for-wind-power swap between Spain and Uruguay through the now defunct Clean Development Mechanism (CDM) earned Spain certified emission reduction credits (Cassimon, Prowse, and Essers, 2014, 2021). A new facility like the CDM could facilitate the uptake of debt-for-climate swaps.

Carbon credits would need to be designed to avoid risks of greenwashing and align climate actions underpinning debt swaps with global mitigation efforts. This means focusing on cases where the climate action would not have been undertaken without the debt swap and any mitigation gains are additional to the baseline. Such opportunities are more likely to exist in fiscally constrained emerging market and developing economies where the lack of financing inhibits the ability of the government to finance their climate-reform agenda—and global mitigation remains lower as a result. Furthermore, by increasing the discount on the buyback or reducing the cost of financing the new debt, carbon credits could increase the fiscal space gained by the country undertaking the climate investment, particularly while the “greenium” on ESG debt remains small. Hence, even partial carbon credits can lower the cost of the operation for the debtor and incentivize the creditor to make a deal.

Mobilizing Official Funding for Debt Swaps or Grants Linked to Climate Action

Many developing countries will not be able to implement their NDCs without fiscal support in the form of either grants or debt relief. As argued above, given current debt levels, many developing countries are likely to have insufficient fiscal space to implement their NDCs. These countries will not be able to attract private finance to fund climate investments, even with fully developed KPI indexed bond markets. However, the KPIs required for the development of this market could be an essential ingredient for more ambitious forms of fiscal support involving donor countries. The announced $8.5 billion support for South African during COP26 involved both commitments to reforms and KPIs for monitoring reforms in the energy sector.

The most effective vehicle to fund climate investments in countries lacking fiscal space would be a coordinated, multiyear initiative funded by the major official bilateral creditors and a broad set of high-income donor countries. This would require identifying:

- First, a set of potential beneficiary countries. This could be based on climate-related public investment needs relative to fiscal space (the climate-related fiscal gap) and the magnitude of climate risk faced by the debtor country.
- Second, a group of advanced and/or creditor economies that are willing to make a fiscal commitment to help these beneficiaries. This could be set as a share of GDP of the donor countries, which could in turn depend on the per capita income level of the donor/creditor. These commitments should aim to fill the aggregate climate-related fiscal gap of the beneficiaries.
- Third, an agreement among the donor countries on support forms that would be acceptable as a way of discharging the commitments of donors. Central to this agreement would be (1) a minimum climate impact per dollar of financial support, as measured by agreed beneficiary countries' KPIs and (2) a maximum support level for each beneficiary country—namely, the identified climate-related fiscal gap.

Subject to meeting these agreed conditions, donors and creditors would negotiate climate actions and the modality of support. The latter could include bilateral debt-climate swaps (for donor countries that are creditors of countries in the beneficiary group); conditional grants (for donor countries that are not major official bilateral creditors); and tripartite debt-climate swaps (for donor countries that are not major official bilateral creditors but prefer to support beneficiaries via conditional debt relief). The scope for the latter could be broadened by establishing a secondary market for loans, so as to give donor countries the opportunity to sponsor a debt-for-climate swap involving claims held by another creditor country. Multilateral institutions and/or NGOs could serve as intermediaries.

To minimize free riding, share the fiscal costs, and achieve political feasibility, the set of participating donor countries would need to be as large as possible. At a minimum, it would need to include the union or the main official bilateral creditors, both Paris Club and non-Paris Club, and advanced economies. This approach is needed to address two forms of free riding: first, with respect to the climate-change mitigation benefits of the initiative and, second, with respect to its impact on credit risk. Unless all major official creditors participate, non-creditor donors will not have an incentive to participate (since a significant portion of their fiscal support would benefit those creditors, in the form of improved solvency of the borrowers). Conversely, unless all advanced economies participate, the major official creditors—some of which are developing countries—will not be willing to participate since they would be shouldering a disproportionate burden of the fiscal cost of an initiative that, by diffusing the economic and climate crises of the beneficiary group, as global benefits.[12]

Conclusion

Debt-climate swaps can be useful instruments when the main constraint to climate investment is lack of fiscal space. In such cases, standard climate finance (green loans or bonds) will not solve the problem, because they would raise debt to unsustainable levels. Instead, promoting climate investments will require fiscal transfers. These could take the form of climate-conditional grants, debt-climate swaps (defined as climate-conditional debt relief by one creditor or a strict subset of creditors), or comprehensive debt restructuring. The latter could be combined with climate conditionality.

Debt-climate swaps are generally a less efficient form of fiscal support than its close cousins, conditional grants and/or broad debt restructuring. Conditional grants and plain debt restructuring are

[12] The use of carbon credits could also help attenuate the free rider problem by providing a benefit to participating creditors even when other creditors do not participate.

usually better at ensuring that the resources transferred reach their intended target—financing a climate investment and/or reducing the debt burden rather than benefitting other creditors. While climate-conditional grants can be structured so that they only disburse if the climate action is implemented, this is more difficult for debt-climate swaps, which operate by lowering the debt service to participating creditors conditional on a public investment commitment that typically remains subject to sovereign risk. And comprehensive debt restructuring, by definition, seeks to involve a broad set of creditors. As a result, debt-climate swaps are generally dominated by climate-conditional grants, coupled with a comprehensive debt restructuring in unsustainable debt cases.

However, there are two settings in which debt-climate swaps are at least as good as conditional grants, comprehensive debt restructuring, or a combination of both:

- When a debt-climate swap can be structured in a way that ensures that climate investment commitment of the recipient country de facto ranks above its commitment to service debt. In this case, a debt-climate swap may even have an advantage over a conditional grant.
- When a comprehensive debt restructuring is expected to produce large economic dislocations and the debt relief associated with a debt-climate swap—while partial—is expected to materially reduce the probability of debt distress (including by restoring debt sustainability in unsustainable debt cases). These conditions were rarely if ever met by debt-nature swaps in the past. But they could perhaps be met in the future, if debt swaps are "scaled".

While the case of debt-climate swaps is narrow, there is a broader case for including climate conditionality in comprehensive debt restructurings. When climate risks are a contributing cause of debt risk, it makes sense to condition debt relief on debtor actions that will lower the economy's exposure to this risk (such as adaptation investment). While most present-day debt problems in developing countries are not caused by climate change, this argument is relevant for a set of economies that suffer from unsustainable debt and high climate risks and is likely gain further relevance in the future, as additional economies feel the impacts of climate change. In recognition of this fact, the IMF's new Sovereign Risk and Debt Sustainability Framework (IMF 2022b) includes modules that analyze the impact of climate adaptation and mitigation on debt sustainability and requires IMF staff to apply the adaptation module in all debt restructuring contexts.

In addition, there is a pragmatic case for debt-climate swaps. In the real world, climate finance falls short—particularly climate-conditional grants. Furthermore, the willingness of creditors to provide debt relief may be enhanced if the debtor commits not only to standard macroeconomic conditionality, but also to climate conditionality (even when there is no direct impact of climate conditionality on credit risk).

Hence, debt-climate swaps are worth promoting, so long they (1) expand the fiscal resources of debtor countries that cannot shoulder climate investments based on loans alone, and (2) are designed to maximize the benefits to the debtor. Specifically, they should be structured to ensure that they funds generated by the reduction in debt service are spent on the desired investment rather than general debt service (the recent debt swap targeted to marine conservation in Belize offers an example for how to do this). Furthermore, to the extent that the debt swap involves a buyback of commercial debt in the secondary market, the buyback should be conducted by a donor/creditor rather than the debtor, as a third party may be able to purchase the debt at a lower price than the debtor country.

These arguments call for policies that would encourage and raise the scale of debt-climate swaps, particularly when such policies also benefit other forms of climate finance. Such policies could include packaging climate projects and related policy reforms, linking debt-climate swaps to the budgetary use of funds (and climate-related policy reforms), developing of standardized climate performance indicators and markets for debt instruments whose financial terms are linked to these KPIs, and the use of carbon credits to incentivize debt swaps from both private and official sources. Policies of this type would reduce the transactions and

monitoring costs that currently stands in the way of debt-climate swaps, encourage the use of scarce resources to reduce emissions in the most cost-effective way, and increase the fiscal benefits of debt-climate swaps and others forms of climate finance (the “greenium”) for developing countries.

Beyond policies that reduce the transactions and agency costs, debt-climate swaps and related climate finance instruments deserve official financial support. One form that such support could take is credit enhancements, such as partial guarantees or Brady-bond style collateral. The purpose of such enhancements (in effect, a public subsidy) should not be to eliminate credit risk, but address climate externalities that cannot be internalized through other means, such as regulation favoring KPI-linked bonds or the response of institutional investors to public opinion.

Most ambitiously, official creditors and high-income countries could agree to alleviate fiscal constraints to climate investments in developing countries. This would require identifying a set of potential beneficiary countries, negotiating a set of commitments on the side of participating creditors/donors, and agreeing on acceptable forms of support to discharge these commitments, including a minimum climate impact per dollar of financial support, as measured by agreed KPIs in beneficiary countries, and a maximum support level for each beneficiary country. Subject to these agreed conditions, donors would be free to choose which countries to support and the modality of support. The latter could include climate conditional grants, bilateral debt-climate swaps, and the purchase of commercial debt and its swap with climate-conditional loans or KPI-linked bonds.

Annex I. Fiscal Transfers Associated with a Debt Swap

This annex studies the fiscal transfers associated with three types of debt swaps.

1. A bilateral debt swap, in which an official bilateral creditor swaps a debt claim D_0 for a debt claim D_1 plus an incremental spending commitment S. D_0 and D_1 can be thought of as either a face value or a net present value evaluated at an official interest rate. S is the excess of SDG/climate spending over the spending that would have been carried out without the swap. $D_s \equiv D_1 + S$ denotes the total external expenditure commitments of the country after the debt swap (debt service plus climate spending). We assume that $D_s \leq D_0$

2. A "type A" tripartite debt swap in which a third party—a donor, such as a civil society organization or a government seeking to support climate action—raises cash C, uses this to purchase government bonds from commercial creditors at a price $p_A < 1$, and subsequently swaps them for a debt claim $l_A \leq C$ (a loan from the donor to the country), conditional on an incremental spending commitment $S > 0$. As before, D_1 denotes the debt outstanding after the swap operation: $D_1 = D_A \equiv D_0 - C/p_A + l_A$. Since $p_A < 1$ and $l_A \leq C$, $D_1 < D_0$.

3. A "type B" tripartite debt swap which works exactly like the previous operation, except that the debt buyback is conducted by the debtor country rather than the donor. That is, the donor provides cash C to the debtor in exchange for (1) a new debt claim $l_B \leq C$, (2) a commitment to use the cash to buy back debt in the secondary market at a price $p_B < 1$, and (3) an incremental spending commitment $S > 0$. Debt outstanding after the swap operation is $D_1 = D_B \equiv D_0 - C/p_B + l_B < D_0$

We answer four questions:

- First, under what conditions on D_0, D_1, and S do these operations provide a fiscal benefit (net transfer) to the debtor? We show that if S is serviced from the same pool of resources as debt (and hence the country may not deliver the full expenditure in bad states), then $D_0 - D_1 > S$ guarantees a fiscal transfer. However, the level of this transfer—that is, the expected reduction in external payment commitments—is always smaller than the nominal reduction in payment commitment (that is, the nominal debt relief net of the spending commitment).

- Second, from the perspective of a donor/creditor, is it better to support climate investment through a conditional grant or a debt-climate swap? The answer is that the grant is generally preferable unless the expenditure commitments are senior to the remaining debt claims—in which case a swap may be preferable.

- Third, in operation 3, does it make sense to force the debtor to use the cash C to buy back debt, or would it be better to just let the debtor keep the cash? The answer is "it depends." In particular, the buyback may make sense when it helps reduce the chances of a default that is costly for the debtor.

- Finally, from the perspective of a donor (NGO) with a given cash budget C, which version of the tripartite swap is better: type A or type B? The answer is that if the donor can conduct purchases before the debt market realizes that the purchases debt will be forgiven, the type A swap is better.

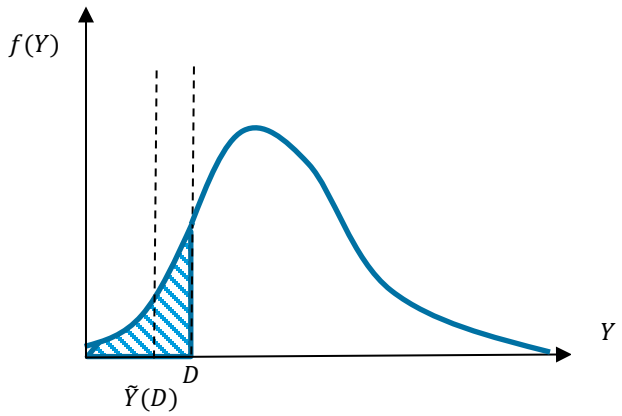
When do Debt Swaps Expand the Fiscal Space of the Debtor?

To understand the conditions under which debt swap benefit the debtor fiscally, it is important to take into account the riskiness of the debt—that is, it is important to take into account that some of the debt might not have been repaid in the first place.

To put some minimal structure on the problem, assume that defaults are determined by ability to pay (that is, ignore the possibility of opportunistic defaults). Debtor resources to repay debt (understood broadly to include not just debt service, but all external expenditure commitments, including a possible incremental spending commitment S) are denoted Y, are distributed with density function $f(Y)$ and cumulative distribution function $F(Y)$. Note that $f(Y)$ and $F(Y)$ are assumed to be independent of S; that is, we ignore potential benefits of climate investment on output—a reasonable assumption if S is interpreted as mitigation spending and the country is small, but a potentially significant omission if S is interpreted as adaptation spending.

If $Y \geq D$, debt D is repaid in full, else the debtor defaults. The probability of default is hence $F(D)$, indicated by the blue shaded area in the Figure 1.

Annex Figure 1.1



Source: Authors.

If $Y < D$, there is a debt renegotiation. We assume that creditors have all the bargaining power, that is, the country pays Y. Let $\tilde{Y}(D) \equiv E(Y|Y < D) = F(D)^{-1} \int_0^D Y f(Y) dY$ denote the expected value of Y conditional on ending up in the default state. Using the Leibniz rule for the differentiation of an integral, it is straightforward to show that $\tilde{Y}'(D) = \frac{f(D)}{F(D)}\left(D - \tilde{Y}(D)\right)$.[13] By definition, $\tilde{Y}(D) < D$. Hence, $\tilde{Y}'(D) > 0$.

Expected fiscal payments to creditors associated with debt D are hence $[1 - F(D)]D + F(D)\tilde{Y}(D)$, or equivalently $D - F(D)[D - \tilde{Y}(D)]$. This says that expected payments to creditors are smaller than the promised debt repayment, and that the difference depends on the probability of default $F(D)$, and the debtor's ability to

[13] The authors thank Tim Willems for pointing this out.

pay in the default state, $\tilde{Y}(D)$. Using the fact that $\tilde{Y}'(D) = \frac{f(D)}{F(D)}\left(D - \tilde{Y}(D)\right) > 0$, one can show that both $F(D)[D - \tilde{Y}(D)]$ and $D - F(D)[D - \tilde{Y}(D)]$ are increasing in D.[14]

To avoid clutter, simplify the notation, such that $F(D_0) \equiv F_0$, $F(D_s) \equiv F_s$, $\tilde{Y}(D_s) \equiv \tilde{Y}_s$. $\tilde{Y}_s$ is the level of payments that is expected to be available to service both debt and the climate spending commitment in the event that it is impossible to repay both in full (without making any assumption on how this is distributed between these two types of spending—we will return to this point below).

The expected fiscal transfer associated with a debt swap is the difference between the expected payment obligations of the debtor before and after the swap:

$$T_r \equiv [1 - F_0]D_0 + F_0\tilde{Y}_0 - [1 - F_s]D_s - F_s\tilde{Y}_s \quad (2)$$

which can be rewritten as $T_r \equiv D_0 - D_s - \{F_0[D_0 - \tilde{Y}_0] - F_s[D_s - \tilde{Y}_s]\}$. If $D_0 - D_s \geq 0$, then $F_0[D_0 - \tilde{Y}_0] - F_s[D_s - \tilde{Y}_s] \geq 0$ (since and $F(D)[D - \tilde{Y}(D)]$ is increasing in D). It follows that $D_0 - D_s \geq T_r \geq 0$. That is:

- As long as the swap (weakly) lowers the country's total spending commitment ($D_0 \geq D_s \equiv D_1 + S$), it will lead to a positive (non-negative) fiscal transfer.
- However, this transfer is always (weakly) less than the nominal decline in external payment commitments ($T_r \leq D_0 - D_s$). The interpretation for this is that part of the nominal debt relief does not benefit the debtor to the extent that it would have defaulted (and not fully repaid that debt) in some states. Hence, the expected transfer to the debtor is lower than the nominal transfer.

Debt Swaps versus Conditional Grants

This section focuses on comparing debt swaps with conditional grants when the purpose is to provide fiscal space for an investment project of a given size, rather than to provide debt relief over and above what it costs to fund this project. That is, we consider two alternative forms of climate finance:

- a conditional grant $G = S$ that exactly covers the cost of a climate investment S; or
- conditional debt relief $D_0 - D_1 \equiv S$ in the same nominal amount.

Since both the grant and conditional debt relief are assumed to cover exactly the cost of the climate investment, external obligations remain unchanged at D_0 regardless of how the fiscal support is delivered. Hence, the probability of defaulting on external obligations is also equal and unchanged at $F(D_0)$, and there is no (net) fiscal transfer in either case ($D_S \equiv D_1 + S = D_0$ implies $T_r = 0$; see equation 2).

What form of fiscal support is better? As we show in this section, the answer may be different depending on whether (1) one takes the perspective of a creditor/donor or that of the debtor; (2) what is assumed about the priority of the spending commitment relative to the commitment to repay debt; (3) whether or not debt restructurings involve an inefficiency (deadweight loss) or not.

We assume grant support can be structured to pay *only* for the expenditure commitment (for example, by putting the money into an escrow account that disburses only when the relevant receipts are presented).

[14] Using the product rule, $\frac{d\{F(D)[D-\tilde{Y}(D)]\}}{dD} = \frac{d\{F(D)D-F(D)\tilde{Y}(D)\}}{dD} = f(D)D + F(D) - [f(D)\tilde{Y}(D) + F(D)\tilde{Y}'(D)]$. Using $\tilde{Y}'(D) = \frac{f(D)}{F(D)}\left(D - \tilde{Y}(D)\right)$, this becomes $f(D)D + F(D) - f(D)\tilde{Y}(D) - f(D)\left(D - \tilde{Y}(D)\right) = F(D) > 0$. It follows that $\frac{d\{D-F(D)[D-\tilde{Y}(D)]\}}{dD} = 1 - F(D) > 0$.

Hence, if fiscal support takes the form of a conditional grant, the spending happens regardless of the level of Y. Using s to denote realized climate spending, we have $s = S$. Debt service to creditors is D_0 if $Y \geq D_0$ and Y if $Y < D_0$.

What if climate spending is "financed" via debt relief? If there are sufficient resources to pay for both the expenditure commitment S and debt D_1 ($Y \geq D_1 + S = D_0$), then $s = S$. But if there are not ($Y < D_0$), then climate spending may be lower. Specifically, consider three possibilities.

a. Debt service enjoys priority. Creditors receive Y and $s = \max\{Y - D_1, 0\}$.
b. Y is shared pro-rata. Creditors receive $\frac{D_1}{D_1+S}\ Y$, and $s = \frac{S}{D_1+S}\ Y$.
c. Climate spending enjoys priority. Creditors receive $\max\{Y - S, 0\}$, and $s = \min\{S, Y\}$.

If follows that:

Unless conditional debt relief is structured such that climate spending enjoys priority, realized climate spending s will be higher when supported through a conditional grant than *when it is supported through debt relief*.

In cases (a) and (b) above, $Y < D_1 + S$ implies that $s < S$. In case (c), it depends. If $Y \geq S$, then the priority of the climate investment guarantees that $s = S$. But if $Y < S$ (which is possible, since we have so far made no ex-ante restrictions on S and the distribution of Y), then less climate spending would happen than in the case of grant financing, even when the climate spending has priority.

Non-participating creditors are unaffected when climate spending is supported through a conditional grant, whereas they may do either better or worse when it is supported through a debt-climate swap. Specifically, they will do better (worse) under a debt swap when debt service (climate spending) enjoys priority, while they will do the same if debt service and climate spending commitments rank equally and any shortfall is distributed pro rata.[15]

To show this, it is enough to focus on the recovery value per unit of debt in the default state, i.e. when $Y < D_0$ (since in the non-default state, all creditors are repaid in full, and the probability of default is the same regardless how the climate spending financed). With grant financing, this is $\frac{Y}{D_0}$. In the case of conditional debt relief, it is as follows

a. If debt service enjoys priority, $\frac{Y}{D_1}$.
b. If Y is shared pro-rata, $\frac{D_1}{D_1+S}\ Y/D_1 = \frac{Y}{D_1+S} = \frac{Y}{D_0}$
c. If climate spending enjoys priority, either $\frac{Y-S}{D_1} = \frac{Y-S}{D_0-S}$ (if $Y \geq S$), or 0 (if $Y < S$)

In case (a), creditors will recover strictly more than they would recover in the case of grant financing: $D_1 < D_0$ implies that $\frac{Y}{D_1} > \frac{Y}{D_0}$. In case (b). they recover exactly the same (namely, $\frac{Y}{D_0}$). Finally, in case (c), when climate spending enjoys priority, the remaining creditors do worse in a debt climate-swap than under conditional grants, since they will receive at most $\frac{Y-S}{D_0-S}$ if $Y \geq S$. But $Y < D_0$ and if $Y \geq S$ imply that $\frac{Y}{D_0} > \frac{Y-S}{D_0-S}$.

[15] The pro rata case is unlikely to hold exactly, as it seems unlikely that climate commitments and debt service would be honored in exactly the same proportion. But it is still useful as an approximation of what might happen if both type of commitments rank equally.

Donor/participating creditor perspective

A donor/creditor seeking to support climate investment should normally prefer the grant financing route, since this ensures that the climate investment will happen, in the desired amount, regardless of the state of debtor country resources. An exception is a case where the climate commitment has priority over debt service, that is, case (c) above.

If this is the case, however (that is, climate spending enjoys priority and $Y > S$ for any realization of Y), *and if the donor/creditor is not the only creditor*, then the donor/creditor should prefer a debt-climate swap over a climate conditional grant, because if $Y < D_1 + S$, the climate spending is partly financed by the remaining creditors. As a result, the debt-climate swap is a cheaper way of financing S than the grant.

To see this most simply, imagine a donor/creditor holding cash $C \geq S$ and debt that is exactly equal to the desired climate spending $S < D_0$. This means that in the event of a debt-climate swap, the remaining debt, $D_1 = D_0 - S$ is held entirely by other creditors. Then:

- If the creditor grant-finances the climate expenditure, it will spend cash S (a grant), but keep a debt claim worth S in nominal terms. Debt remains at D_0. Assuming that the donor/creditor ranks equally with the other creditors, the expected repayment to the donor/creditor is $[1 - F(D_0)]S + F(D_0)\frac{S}{D_0}\tilde{Y}(D_0)$.
- If the creditor finances the climate expenditure via a debt-climate swap, it keeps its cash C, but reduces its debt claim to zero. The expected debt repayment is zero.

Hence, the debt climate swap is better for the donor/creditor if $C > C - S + [1 - F(D_0)]S + F(D_0)\frac{S}{D_0}\tilde{Y}(D_0)$, or equivalently if $S > [1 - F(D_0)]S + F(D_0)\frac{S}{D_0}\tilde{Y}(D_0)$. By definition, $\tilde{Y}(D_0) < D_0$, hence, the inequality holds.

This example easily generalizes to the case when the desired climate spending is less than the donor/creditor's initial debt position and the remaining debt is partly held by the donor/creditor and by others.

Debtor perspective

Suppose that the debtor cares about the climate investment. Then, in the setting described in this section—where net transfers are zero, and the probability of default is $F(D_0)$ regardless of whether fiscal support comes through grants or debt relief—the debtor should prefer grants over debt relief for much the same reason why a donor/creditor should prefer conditional grants: they represent the safer form of climate finance.

In general, this conclusion will continue to hold if the debtor is additionally worried about default costs, such as output costs of default, or reputational or political costs for the debtor government (Martinez and others, 2022).[16] This said, in the presence of default costs that increase with the extent of creditor losses, the debtor and the donor may disagree on whether swaps with de facto senior expenditure commitments are a good idea. Such swaps would lead to higher creditor losses and hence impose an additional cost on the debtor (even if they make the financing cheaper for the donor). This said, they may still be preferable to the debtor than the

[16] Maintaining the assumption that debt swaps do not provide debt relief beyond what is needed to finance the climate expenditure, this would always be true if the default cost is fixed, since the choice between grants and debt swaps does not influence the probability of default. But it would generally also be true if higher investor losses (haircuts) lead to higher default costs, since the latter are generally no higher in the grant case than in the swap case (unless debt service enjoys priority over the climate expenditure in the latter, see above). For example, when debt service and climate expenditure rank equally, non-participating investors would be indifferent between the grant and the swap, but the climate investment is still safer in the grant case.

case where expenditure commitments are de facto junior, depending on how much the debtor values the benefits from those expenditures.

The main reason why a debtor may prefer a debt swap over a conditional grant is that contrary to the assumption made at the beginning of this section, the debt swap is in fact somewhat more generous than the grant. While a grant can be expected to cover no more than the cost of the investment that it is supposed to fund, the reduction in debt service commitments engineered by debt-nature swaps has historically exceeded the investment requirements of the swap. Hence, debt swaps, unlike conditional grants, can be expected to imply a net fiscal transfer. For the same reason—a decline in total external commitments—debt swaps may lead to a decline in the probability of default, and hence to lower expected default costs.

Importantly, however, the same result—financing of the climate investment combined with a certain amount of debt relief—could generally be reached more cost-effectively, from the perspective of the donor/creditor funding the debt-climate swap, by combining a conditional grant covering the costs of the investment with some further debt relief. This would ensure that the portion of support dedicated to funding the climate investment is not diluted by subsidizing non-participating creditors.

Would the Debtor be Better Off Keeping the Donor-Provided Cash Rather Buying Back Debt?

In a seminal paper, Bulow and Rogoff (1988) argued that market-based buybacks may not benefit debtors when they are financed using the debtor's own cash, and that money donated for buybacks would be better spent supporting the debtor country directly. A literature sparked by the paper identified conditions under which market-based debt buybacks might benefit the debtor after all (see IMF 2021 for a survey and further references). One of those conditions, first pointed out by Dornbusch (1988) in his discussion of Bulow and Rogoff, is that buybacks may help to avert default, which is costly for the debtor. In the remainder of this paper, we illustrate both Bulow and Rogoff's original point and Dornbusch's objection within the framework used so far.

Suppose default involves an inefficiency (deadweight loss) $L \geq 0$. As in the previous section, we assume that this default cost falls on the debtor and is non-pecuniary (so it does not affect the resources available for debt repayment in that default state). Allowing for additional pecuniary costs (that reduce the resources available to repay the debtor in the default state) would not change the results, while complicating the exposition. Also for simplicity, we assume that $l_B = 0$, that is, we focus on the case where the cash C provided to the country is not repayable (a grant). Allowing $l_B > 0$ would not change the result but complicate the notation (as there would be one more parameter to carry around in the inequalities below).

With these assumptions, consider the benefits and costs of a buyback:

- Without the buyback, country keeps the cash C, of which γC (becomes available for debt repayment. Hence, the expected payment to creditors is $[1 - F(D_0 - \gamma C)]D_0 + F(D_0 - \gamma C)[\tilde{Y}(D_0 - \gamma C) + \gamma C]$. In addition, the debtor expects the loss L with probability $F(D_0 - \gamma C)$.
- In the buyback case, the government pays C to buy back debt. In addition, it will pay debt service $D_B \equiv D_0 - C/p_B$ if there is no default, or $\tilde{Y}(D_B)$ in the event of default. The expected payment is $[1 - F(D_B)]D_B + F(D_B)\tilde{Y}(D_B) + C$. In addition, the debtor expects to lose L with probability $F(D_B)$

The buyback benefits the debtor if and only if:

$$[1 - F(D_B)]D_B + F(D_B)[\tilde{Y}(D_B) + L] + C < [1 - F(D_0 - \gamma C)]D_0 + F(D_0 - \gamma C)[\tilde{Y}(D_0 - \gamma C) + \gamma C + L] \quad (8)$$

which can be rewritten as:

$$D_B - F(D_B)[D_B - \tilde{Y}(D_B)] + C < D_0 - F(D_0 - \gamma C)[(D_0 - \gamma C) - \tilde{Y}(D_0 - \gamma C)] + [F(D_0 - \gamma C) - F(D_B)]L \quad (9)$$

Using the fact that $p_B D_B = D_B - F(D_B)[D_B - \tilde{Y}(D_B)]$ and $D_B \equiv D_0 - C/p_B$, this becomes:

$$p_B D_0 < D_0 - F(D_0 - \gamma C)[(D_0 - \gamma C) - \tilde{Y}(D_0 - \gamma C)] + [F(D_0 - \gamma C) - F(D_B)]L \quad (10)$$

Now consider the following special cases:

(i) $\gamma = 1, L \geq 0$. In this case, a buyback always makes sense (even if $L = 0$). To see, substitute $\gamma = 1$ and $D_B \equiv D_0 - C/p_B$ into (9), to obtain:

$$D_B - F(D_B)[D_B - \tilde{Y}(D_B)] < \{D_0 - C - F(D_0 - C)[(D_0 - C) - \tilde{Y}(D_0 - C)]\} + [F(D_0 - C) - F(D_0 - \tfrac{C}{p_B})]L \quad (11)$$

Recall that $D - F(D)[D - \tilde{Y}(D)]$ is increasing in D and $D_B \equiv D_0 - C/p_B < D_0 - C$ (since $p_B < 1$). Hence, the left-hand side must be smaller than the first term (in curly brackets) on the right hand side, while $[F(D_0 - C) - F\left(D_0 - \frac{C}{p_B}\right)] < 0$. It follows that (11) holds, regardless of the level of L.

(ii) $\gamma = 0, L = 0$. This is the case that is friendliest to the Bulow-Rogoff critique. Using $p_A D_0 = D_0 - F(D_0)[D_0 - \tilde{Y}(D_0)]$, (10) can be written as:

$$p_B D_0 < D_0 - F(D_0)[(D_0) - \tilde{Y}(D_0)] = p_A D_0 \quad (11)$$

From the previous section, we know that since $D_0 > D_B$, $p_B > p_A$, So, (11) never holds, and a debtor-financed buyback will make the debtor worse off.

(iii) $\gamma = 0, L > 0$. Using $p_A D_0 = D_0 - F(D_0)[D_0 - \tilde{Y}(D_0)]$, (10) can be written as:

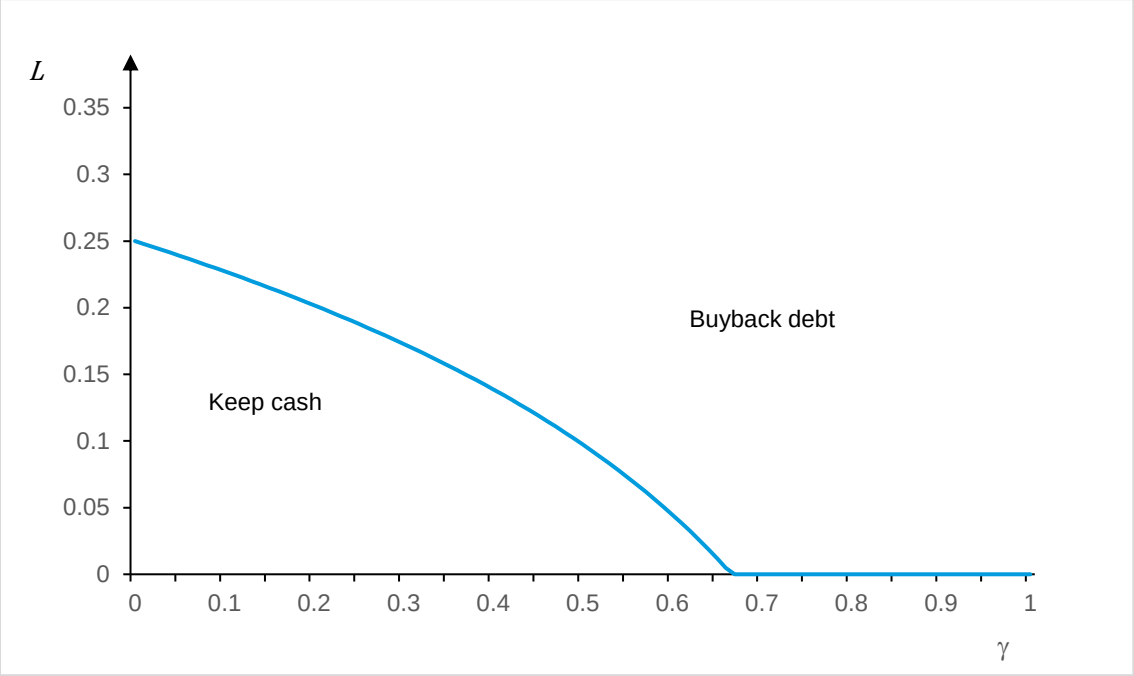
$$p_B D_0 < p_A D_0 + [F(D_0) - F(D_B)]L \quad (12)$$

Since $D_0 > D_B$, $p_B > p_A$ and $F(D_0) > F(D_B)$. Hence, for a given D_0, C and distribution $F(.)$ (which in turn determine p_A, p_B and D_B) (12) could hold—that is, the buyback could benefit the debtor—if L is sufficiently large, even though creditors benefit also (since $p_B > p_A$)

When $0 \leq \gamma < 1$ and $L \geq 0$, then there is a trade-off between γ and L. For a given L (even $L = 0$) buybacks could be a good idea if γ is sufficiently high, so that in the event of default most cash goes to the creditors anyway. And for any given $\gamma < 1$ (even $\gamma = 0$) buybacks could be a good idea if L is sufficiently high (so that the buyback price is sufficiently low, and the buyback avoids a large inefficiency).

Annex Figure 1.2 illustrates the trade-off between L and γ for a specific example, namely, the case in which Y is uniformly distributed between 0 and 1, $D_0 = 0.5$ and $C = 0.2$. When $\gamma = 0$, then buybacks make sense for $L \geq 0.25$. As γ increases, the threshold value of L for which buybacks make sense declines. For $\gamma > 0.66$, buybacks make sense even if $L = 0$.

Annex Figure 1.2



Source: Authors' calculations.

Note: γ represents the share of debtor country cash that a creditor can seize in the event of default, while L represents the non-pecuniary costs of default for the debtor. The blue line in Annex Figure 1.2 represents the parameter set $L(\gamma)$ for which the debtor is indifferent between using its cash to buy back the debt and keeping it, assuming Y is uniformly distributed between 0 and 1. The set is derived by requiring the left-hand side and right-hand sides of (10) to be equal, using the distributional assumption to solve for L as a function of γ and p_B in the resulting equation, using $p_B = 1 - F(D_B)\left[1 - \frac{\tilde{Y}(D_B)}{D_B}\right]$ to solve for the buyback price p_B as a function of D_0 and C, and using $D_0 = 0.5$ and $C = 0.2$ to generate the plot.

Donor-Conducted versus Debtor-Conducted Buybacks

Donor-conducted buybacks (and hence type A tripartite debt swaps) will achieve greater debt relief than debtor-conducted buybacks (and hence type B tripartite debt swaps) to the extent that the donor can buy back debt at a lower price. Assuming risk-neutral investors, the buyback price must satisfy an interest parity condition: the expected return of buying a unit of debt at must be equal to the safe interest rate. For simplicity, the latter is assumed to be zero. Then, interest parity requires

$$p(D) = [1 - F(D)] * 1 + F(D) * \frac{\tilde{Y}(D)}{D} = 1 - F(D)\left[1 - \frac{\tilde{Y}(D)}{D}\right] \quad (7)$$

where D is the level of debt after the buyback. Using the fact that $\widetilde{Y}'(D) = \frac{f(D)}{F(D)}\left(D - \tilde{Y}(D)\right)$ (see footnote 8), it is straightforward to show that $p(D)$ is decreasing in D, that is, $p'(D) < 0$.

If the donor buys back the debt (and the market does not realize that the bought back debt will be forgiven) then the market price will be based on an outstanding debt level that is unchanged, so $D = D_0$. Let $p_A = 1 - F(D_0)\left[1 - \frac{\tilde{Y}(D_0)}{D_0}\right]$ denote the buyback price in this operation.

In contrast, when the debtor buys back the debt, it is retired from the market, so that $D = D_B \equiv D_0 - \frac{C}{p_B} + l_B < D_0$ and the buyback price $p_B = 1 - F(D_B)\left[1 - \frac{\tilde{Y}(D_B)}{D_B}\right]$.

Since $D_B < D_0,\ p_B > p_A$, implying that type A debt swaps are superior to type B swaps (so long as in the type A swaps, the market does not realize that the purpose of the buyback is to forgive the debt). The remaining creditors will still benefit from the greater reduction in credit risk that results from the debt reduction achieved by the type A swap. But the benefit that would have accrued to the creditors selling the debt is captured by the debtor in the type A swap, which is not the case in the type B swap.

Annex Table 1.1 External Debt of Low-Income Countries by Creditor Type

(End-2020 or latest available; billions of US dollars, unless otherwise noted)

	Risk Indicators			Public External Debt					
Country	LIC-DSF Risk of debt distress*	Sovereign spread**	Debt to GDP	Total external debt	Multilateral excl. IMF	Paris Club	Non-Paris Club	Private creditors	Bonds
Afghanistan	H			2.0	1.0	0.9	0.1	0.0	0.0
Benin	M	680	50.6	4.4	2.7	0.1	0.4	1.2	0.6
Burkina Faso	M		46.9	4.0	3.5	0.2	0.3	0.0	0.0
Burundi	H		69.6	0.5	0.4	0.0	0.1	0.0	0.0
Cameroon	L	541	47.2	11.5	4.4	1.7	3.9	1.4	0.8
Cabo Verde****	H		158.6	2.0	1.0	0.2	0.2	0.6	0.0
Central African Republic	H		46.5	0.4	0.2	0.0	0.2	0.0	0.0
Comoros****	H		25.2	0.3	0.1	0.0	0.2	0.0	0.0
Democratic Republic of the Congo	M		12.4	4.5	2.3	0.1	2.0	0.1	0.0
Côte d'Ivoire	M	679	51.6	20.0	4.0	0.7	3.2	12.1	8.5
Djibouti****	H		43.2	2.4	0.7	0.1	1.6	0.0	0.0
Dominica****	H		100.9	0.3	0.2	0.0	0.0	0.1	0.0
Ethiopia	H	1,807	53.0	29.0	14.0	1.1	7.4	6.5	1.0
Gambia, The	H		84.1	0.6	0.5	0.0	0.2	0.0	0.0
Ghana	H	1,404	81.7	23.3	6.0	0.9	2.2	14.1	10.2
Guinea	M		36.7	3.4	1.3	0.1	1.8	0.2	0.0
Guinea-Bissau	H		80.4	0.7	0.4	0.0	0.1	0.2	0.2
Haiti	H		24.2	2.0	0.1	0.0	1.9	0.0	0.0
Kenya	H	573	69.8	33.7	15.2	3.6	7.5	7.4	6.1
Kiribati****	H		17.6						
Kyrgyz Republic	M		60.0	3.8	1.6	0.4	1.9	0.0	0.0
Lesotho	M		50.7	0.9	0.8	0.0	0.2	0.0	0.0
Liberia	M		52.9	1.0	0.8	0.0	0.1	0.0	0.0
Madagascar	M		53.1	3.5	2.8	0.3	0.3	0.1	0.0
Malawi	H		59.3	2.2	1.8	0.0	0.4	0.0	0.0
Maldives****	H		124.0	2.8	0.4	0.1	1.5	0.9	0.4
Mali	M		52.7	5.3	4.0	0.2	1.0	0.0	0.0
Marshall Islands****	H		14.8						
Mauritania	H		53.0	4.2	2.5	0.2	1.5	0.0	0.0
Micronesia, Fed. States of****	H		15.0						
Nicaragua	M		48.9	5.9	4.7	0.5	0.7	0.0	0.0
Niger	M		52.6	4.0	3.1	0.2	0.6	0.2	0.0
Papua New Guinea	H	908	49.3	5.1	2.6	0.7	0.9	0.9	0.5
Rwanda	M	447	70.3	5.1	3.7	0.2	0.5	0.7	0.5
Samoa****	H		49.6	0.4	0.2	0.0	0.2	0.0	0.0
Senegal	M	513	74.7	15.9	5.7	3.0	2.0	5.2	4.2
Sierra Leone	H		75.0	1.3	0.9	0.0	0.2	0.2	0.0
Solomon Islands****	M		16.6	0.1	0.1	0.0	0.0	0.0	0.0
South Sudan	H		64.4						
St. Lucia****	H		94.6	0.6	0.3	0.0	0.1	0.3	0.3
St. Vincent and the Grenadines****	H		87.5	0.4	0.3	0.0	0.1	0.0	0.0
Tajikistan	H	1,788	49.3	3.1	1.3	0.0	1.3	0.5	0.5
Tanzania	M		39.7	17.6	11.2	1.3	2.8	2.3	0.0
Timor-Leste, Dem. Rep. of****	M		9.8	0.2	0.2	0.0	0.0	0.0	0.0
Togo	M		63.8	1.8	0.8	0.0	0.6	0.3	0.0
Tonga****	H		44.7	0.2	0.1	0.0	0.1	0.0	0.0
Tuvalu****	H		6.0						
Uganda	M		49.7	11.3	7.2	0.9	2.7	0.5	0.0
Vanuatu****	M		46.1	0.4	0.1	0.1	0.2	0.0	0.0
Total				**245.0**	**115.6**	**17.8**	**55.3**	**56.2**	**33.7**

Sources: Bloomberg Finance L.P.; World Bank, International Debt Statistics 2021; and IMF staff.
*H = high, M = medium.
**Weighted-average spread" is the par-value-weighted spread across all of a country's bonds with more than one-year remaining maturity.
***Non-Paris club debt end-2020 is approximated by using non-Paris club share of total external official debt in 2019, multiplied by total official external debt in 2020.
****Small developing state.

Annex Table 1.2. External Debt of Market-Access Countries by Creditor Type

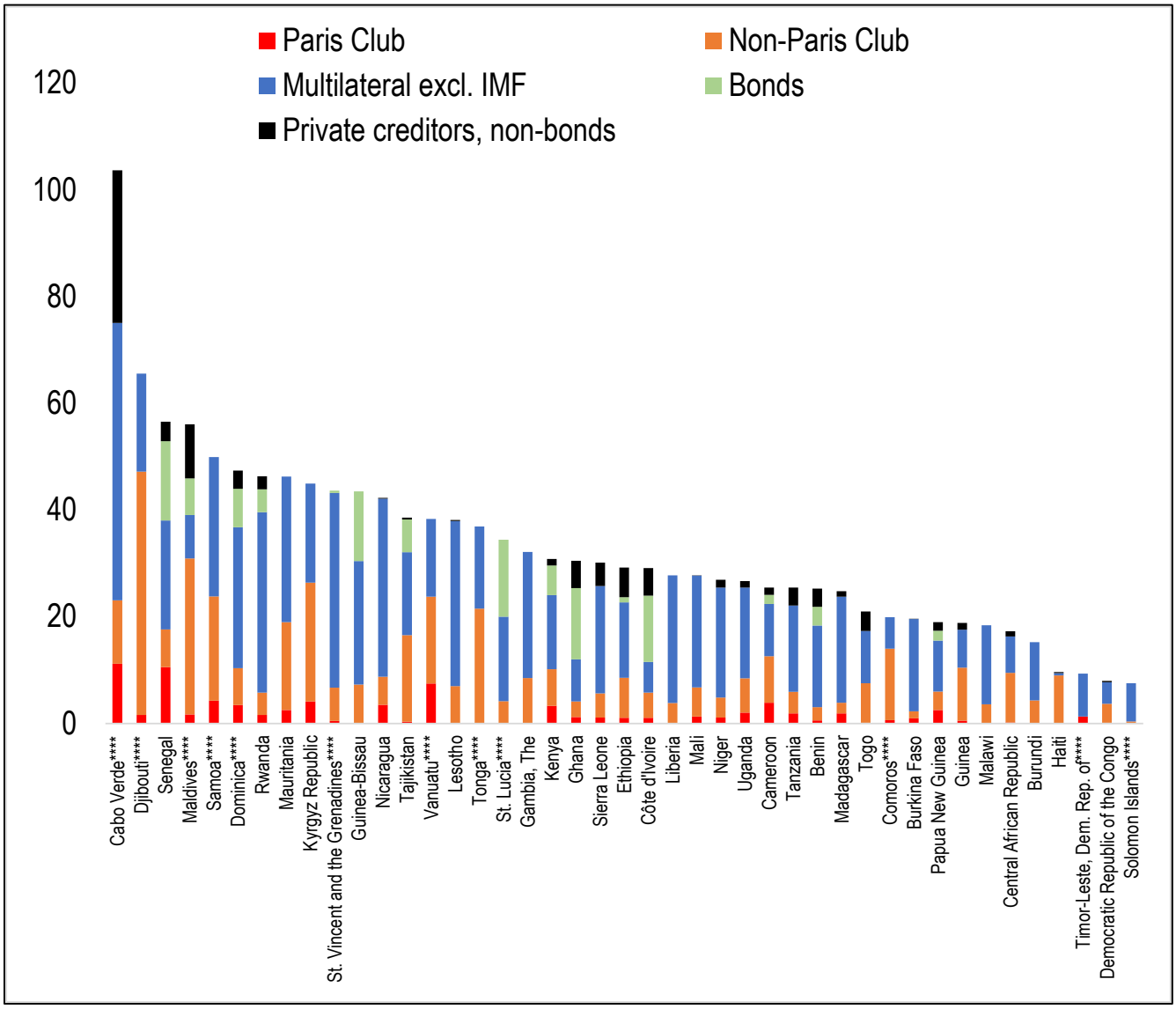
(End-2020 or latest available; billions of US dollars, unless otherwise noted)

	Risk Indicators		Public External debt					
Country	Sovereign spread**	Debt to GDP	Total external debt	Multilateral excl. IMF	Paris Club	Non-Paris Club	Private creditors	Bonds
Albania	417	79.4	5.3	2.5	0.6	0.1	2.0	1.5
Angola	592	86.5	47.1	3.1	1.4	17.8	24.9	8.0
Armenia	497	60.3	5.6	3.4	1.1	0.0	1.1	1.0
Azerbaijan	251	26.3	14.0	5.9	1.2	0.1	6.8	3.8
Bahrain	364	126.2						
Barbados****	522	142.1						
Bolivia	567	82.1	11.9	8.2	0.5	1.1	2.1	2.0
Brazil	246	92.9	194.2	33.7	5.2	5.0	150.3	47.9
Colombia	335	64.6	84.8	25.5	5.6	0.0	53.7	48.3
Costa Rica	414	68.8	12.6	4.5	0.4	0.1	7.7	7.0
Dominican Republic	389	61.0	34.1	5.9	1.1	0.1	27.0	26.4
Gabon	511	71.2	6.5	2.1	0.4	1.1	2.9	2.4
Georgia	540	49.8	8.0	4.8	1.5	0.1	1.6	0.8
Guatemala	266	30.9	11.2	4.8	0.5	0.1	5.9	5.8
Iraq	501	60.0						
Jamaica	284	91.6	9.2	2.9	0.0	0.6	5.6	5.6
Jordan	432	91.7	18.8	5.5	3.2	0.7	9.3	9.2
Kazakhstan	245	25.1	25.4	6.3	0.4	1.4	17.3	17.3
Mongolia	374	95.9	9.7	2.7	1.8	1.4	3.9	3.8
Montenegro, Rep. of****	522	88.6	4.9	0.7	0.2	0.8	3.2	2.4
Morocco	287	76.3	43.7	19.7	6.1	1.3	16.5	10.9
Namibia	284	70.3						
Nigeria	607	35.3	29.7	14.3	0.8	3.5	11.2	11.2
North Macedonia	381	54.7	5.1	1.7	0.1	0.5	2.7	2.6
Oman	322	65.5						
Panama	213	60.4	29.7	7.3	0.1	0.0	22.2	21.7
Paraguay	233	35.5	10.3	4.7	0.2	0.0	5.4	5.4
Romania	346	50.4	58.7	13.3	0.4	0.0	44.9	44.7
San Marino	235	96.6						
Serbia	372	57.5	18.3	6.0	2.3	3.7	6.3	6.3
South Africa	290	70.6	99.4	5.9	1.4	2.9	89.2	79.7
Trinidad and Tobago****	205	65.6						
Türkiye	553	41.3	132.4	27.7	4.9	2.2	97.7	88.3
Total			**798.0**	**195.5**	**36.5**	**42.5**	**523.5**	**375.6**

Sources: Bloomberg Finance L.P.; World Bank, International Debt Statistics 2021; and IMF staff.

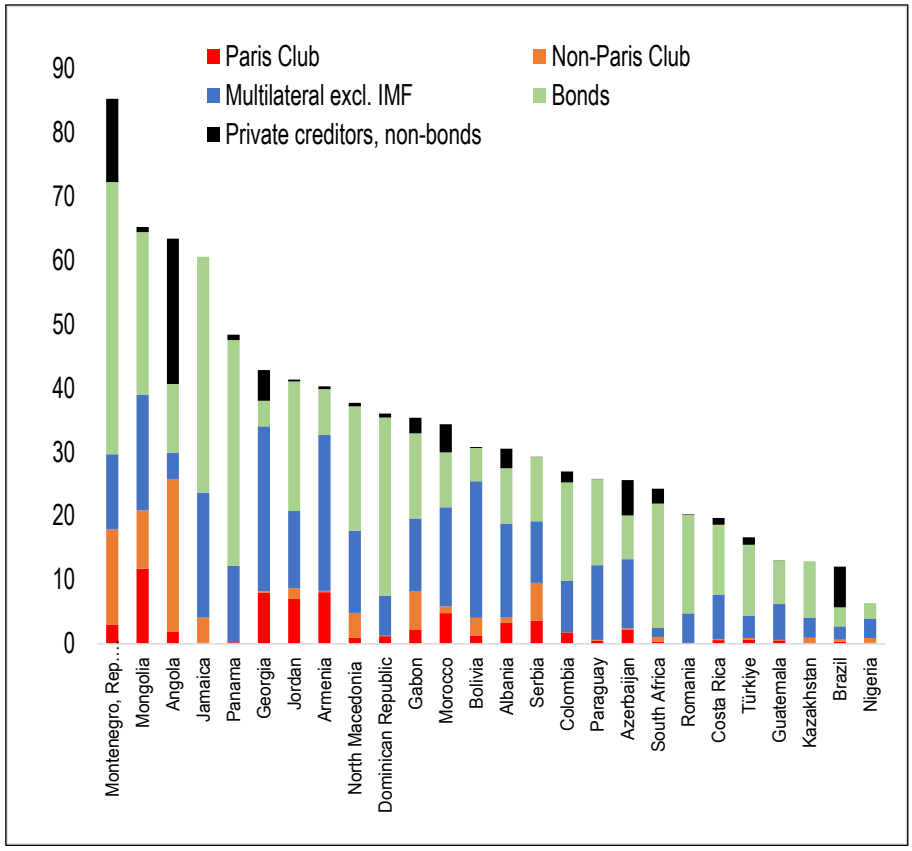
*H = high, M = medium
**Weighted-average spread" is the par-value-weighted spread across all of a country's bonds with more than one-year remaining maturity.
***Non-Paris club debt end-2020 is approximated by using non-Paris club share of total external official debt in 2019, multiplied by total official external debt in 2020.
****Small developing state.

Annex Figure 1.3. External Public Debt of LICs by Creditor Composition (Percentage of GDP)



Source: Authors' calculations.

Annex Figure 1.4. External Public Debt of MACs by Creditor Composition (Percentage of GDP)



Source: Authors' calculations.

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