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Sustainability of Debt Management in the Post-Pandemic Era

Debt Sustainability after the Pandemic: a Rift between Advanced and Developing Economies?

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Abstract

The aftermath of the Covid-19 health crisis poses major fiscal challenges to many countries, both advanced and developing. A key issue facing policymakers is the amount of available fiscal space given the recent surge in public debt. Exceptional shocks like the pandemic can push countries beyond their debt sustainability limit,-inevitably constraining countries' fiscal space. Against this backdrop this paper estimates the development of public debt limits and ensuing fiscal space for a panel of G20 economies - developed and developing - since the 1990s. This analysis suggests that advanced and developing economies face entirely different conditions for the conduct of independent fiscal policies to address major shocks, with the former generally much better placed.

Keywords: Fiscal policy, debt sustainability, fiscal space

JEL Classification: E32, E63, F33

1. Introduction

The (aftermath of the) Covid-19 health crisis poses significant fiscal challenges to many countries, both advanced as well as developing economies. A key issue being faced by policymakers is the degree of fiscal space given the recent surge in public debt. The experience during the outbreak of the Covid-19 pandemic has shown the importance of having fiscal space to implement exceptional measures of fiscal policy that are necessary to support people and the economy - "lives and livelihood" – during an emergency, thus keeping societies and economies resilient.

However, exceptional shocks like the one triggered by the pandemic can push countries beyond their limit vis-à-vis debt sustainability. This will inevitably constrain these countries' fiscal space until the level of debt regains sustainability. The trade-off that politicians and policy makers' face is between fiscal stimulus to respond to the emergency and fiscal restraint to manage debt sustainability. For a variety of reasons, the terms of this trade-off appear to be more challenging for developing than for developed

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economies, which gives rise to a fundamental inequality. This is particularly concerning in view of the global climate challenge, which is likely to make a strong call on the available fiscal space across the globe, putting additional strain on many economies and widening the gap between developed and developing countries.

In this paper we aim to estimate the public debt limit and ensuing fiscal space for a panel of developed and developing economies for the period 1990-2022. Drawing on Bohn (1998, 2008) we explore how the primary fiscal balance responds to increases in the level of debt as an indicator of whether public debt can be repaid in the long run. Importantly, the relationship between a country's primary balance and debt dynamics is non-linear. Our research question is to what extent this relationship is fundamentally different for advanced economies and developing countries.

This discrepancy stems from the fact that advanced economies have favourable access to capital markets, have credible institutions, can issue their debt in their own currency, rely on money financing, benefit from zero-bound nominal interest rates below the nominal output growth rates so that "public debt may have no cost" (Blanchard, 2019). Developing countries, in contrast, have limited access to capital markets, often have poor institutional governance, are constrained vis-a-vis issuing debt in their own currency, cannot rely on money financing; therefor they are facing tighter credit conditions and higher costs of servicing the debt. As a result, they are often under pressure to implement extraordinary fiscal efforts to restore debt sustainability, especially if they face an increase in risk premium that may make the case for fiscal consolidation more urgent (Andres et al, 2020).

The paper is organised as follows. Section 2 reviews the existing literature on debt sustainability and fiscal space and the relevance of our contribution in the context of the current debate. Section 3 discusses the operational definitions, methodology and analytical framework that we employ to estimate the public debt limit and the fiscal space. In Section 4 we present the results for the countries in the Group of 20 (G20) and we discuss three cases – the US, Argentina and Turkey – where the results show that the notion of debt limit, whereas debt has become or is near to become explosive, is less binding for the former than for Argentina and Turkey. Section 5 concludes.

2. Literature review

Within the existing literature there is a broad consensus to consider public debt as being sustainable when the government can manage current and future financial obligations without having to resort to unfeasible or undesirable policies. Debrun et al (2020, 153-4) observes that solvency is a prediction about future budget balances over an infinite horizon. On the other hand, concrete approaches to assess debt sustainability have focused on sufficient (but by no means necessary) conditions for solvency, but this has resulted in an "eclectic" approach rather than a single operational definition of debt sustainability.

The existing literature is also ambiguous about the definition of fiscal space. It is often considered as equivalent to and sometimes synonymous with debt sustainability. Kose et all (2017) broadly define fiscal space as the availability of budgetary resources for a government to service its financial obligations. Through a comprehensive cross-country database of fiscal space, they show the multiple dimensions of debt service capacity, including financing needs that are related to budget positions, access to liquid markets, resilience to valuation changes, and contingent liabilities (Kose et al., 2017:2). Similarly, Bi (2012) and Bi et al. (2016) define a country's fiscal space or fiscal limit as the maximum amount of public debt relative to GDP that a country can sustain without defaulting on its financial

commitments. For Ghosh et al. (2013) fiscal space is room for fiscal manoeuvre. However, both fiscal space and debt sustainability imply the ability of a government to service its debt. Unless debt service capacity is maintained, a government cannot indefinitely finance its operations in a sound manner.

Drawing on Alvarado et al. (2004), Hausmann (2004) and Reinhart et al. (2003), Bi et al. (2016) demonstrate the constraints that are faced by developing countries and their relatively low fiscal limits compared with the developed countries. Their analysis shows that low fiscal limits are largely based on expected future revenue; developing countries have much lower effective tax rates than developed countries due to inefficient tax collection systems, tax evasion and large informal sectors. In addition, these countries are more vulnerable to temporary disturbances in exchange rate due to currency holders' perceptions of fiscal sustainability. Developing countries that rely heavily on external borrowing are exposed to real exchange rate fluctuations. Thus, a large real depreciation lowers a country's fiscal limits, constraints the government's ability to service its debt and suddenly raise default probabilities of ~~an~~ economies with large external debt. Bi et al. (2016: 126) conclude that perception about the fiscal solvency can change suddenly even without changes to economic policies or structures.

Developed economies have high fiscal limits; nonetheless they too need to assess their 'debt limit' (Ghosh et al., 2013: F4) beyond which fiscal solvency is in doubt. Following Bohn (1998, 2008) who looks at how the primary fiscal balance responds to increases in the level of debt as an indicator of whether public debt can be repaid in the long run, Ghosh et al. (2013) develop a framework to assess debt sustainability in developed economies. Their analysis shows that Bohn's sustainability criterion, that the primary balance always reacts positively to lagged debt, is a weak one. Instead, they adopt a stricter sustainability criterion that public debt should converge to some finite proportion of GDP.

In their analysis Ghosh et al. (2013) also introduce the concept of "fiscal fatigue", as a slower policy-induced improvement of the primary balance to rising debt relative to the interest rate-growth rate differential. In their approach, "fiscal fatigue" means that fiscal consolidation is stopped in its tracks beyond a certain debt threshold. As debt approached the debt limit, the cost of financing will depart from the risk-free rate within a very narrow range of debt ratios (Ghosh et al., 2013: F6).[1] The model developed by Ghosh et al. is helpful to identify cases where fiscal consolidation is needed to keep debt on a sustainable path and avoid that shocks derail sustainability (Ghosh et al., 2013: F23). The model also highlights the fact that the relationship between a country's primary balance and debt dynamics is non-linear and that debt limits and the corresponding fiscal space vary considerably across countries.

In a controversial paper Reinhart and Rogoff (2010) use a multi-country historical dataset on public debt and estimate the debt limit above which growth rates are lower than otherwise. They empirically determine this debt threshold at around 90% of GDP for both advanced economies and emerging markets. They conclude that debt/GDP levels at or above 90% are associated with lower growth outcomes due to the nonlinear response of growth to debt as vulnerabilities associated with debt build up. Reinhart and Rogoff's paper sparked a strand of literature broadly vindicating their findings despite criticism regarding their methodology (De Rugy and Salmon, 2020). According to Kassouri et al (2021), however, this debt threshold in developing economies is found to be at 35% of GDP, significantly lower than 90% of GDP in developed economies.

Pappas and Kostakis (2020) identify an increase in debt limits when interest rates are beyond a certain debt threshold surging due to market perceptions of growing insolvency risk. This literature so far has

[1] Ghosh et al. (2013) use the model to analyse the effects of unanticipated fiscal shocks that lower the debt limit. The model also shows the results of "fiscal shocks" with Greece as a case study.

focused mostly on the eurozone in the wake of the sovereign debt crisis of 2010-2013, but it is also relevant for developing economies that rely on foreign currency debt (Poghosyan, 2012).

Blanchard's contribution raises the question of what debt policy a government should embrace when interest rates are historically low (Blanchard, 2019; Blanchard, 2022). Using the concept of neutral interest rate r*, that is the risk-free rate needed to maintain output at potential, he observes the steady decline in the neutral rate over the last thirty years. This decline has resulted in r* becoming lower than GDP growth and occasionally running into the effective lower bound constraint. This in turn results in lower fiscal costs of debt and so the welfare costs of debt. If nominal interest rates are lower than nominal GDP growth rates – and that has been the case in the United States, for instance, on average since 1950 - then the intertemporal budget constraint no longer binds. Thus, fiscal policy can be used to support demand.

Blanchard argues that the 'right' fiscal policy is calibrated around relative weights that depend on the strength of private demand. If the latter is strong while debt is deemed too high, then fiscal policy can focus on debt reduction and monetary policy on keeping output at potential. But if private demand is weak and monetary policy is constrained, then fiscal policy needs to provide macro stabilisation. Blanchard concludes that there is no serious risk for debt sustainability currently in the advanced economies. However, he reckons that each case presents specific features that affect the safe level of debt – including different conditions in developed countries and emerging markets.

3. Analytical framework

Drawing on the existing literature, our analysis offers a contribution based on the following points. First, combining the findings from Reinhart and Rogoff (2010), Pappas and Kostakis (2020) and Gosh et al. (2013), we develop a model that considers features that are country and time specific. For instance, "fiscal fatigue" (Gosh et al., 2013) may imply slower fiscal consolidation. Similarly, an increase in a country's risk premium on the back of market perceptions of growing insolvency risk could push debt above its limit. Thus, our model identifies a single debt threshold, that is country and time specific, above which the debt dynamics become explosive.

Second, drawing on the existing empirical literature, our model considers the (non-linear) feedback effects of debt on each of the following variables – economic growth, the real interest rate and primary balance. Unlike other contributions in this field, our model does not take these variables as exogenous. The core of the model is the dynamic relationship between the interest-growth differential and the primary balance on the one hand and the change of the ratio of debt to GDP on the other.

Third, taking the interest rate as a measure of the cost of borrowing our model estimates the feedback effects of debt and determines the debt threshold. Thus, while compared to Blanchard (2019, 2022) our approach is rather crude, it is appropriate to address our research question. We reach conclusions similar to Blanchard's when we introduce mitigating factors, such as, for instance, the issuance of reserve currency by advanced countries that expand their fiscal space, notably of the United States.

We refer to a widely accepted definition of debt sustainability (IMF, 2020) that considers not only the impact of economic and financial shocks on public debt dynamics, but also to its impact on the economic outlook and the ability of governments to take corrective action.[2] Building on the Debt Sustainability

[2] 'Public debt can be regarded as sustainable when the primary balance needed to at least stabilize debt under both the baseline and realistic shock scenarios is economically and politically feasible such that the level of debt is consistent with an acceptably low rollover risk with preserving potential growth at a satisfactory level' (IMF, 2020).

Analysis (DSA) – a helpful signalling device to detect if at prevailing (or projected) rates of economic growth, real interest rates and the primary balance public debt over time converges towards a stable equilibrium - we include the feedback effects of public debt on growth, yields and fiscal policy should be considered. Specifically, increases in public debt tend to exacerbate adverse growth or interest rate shocks, while, in contrast, a tightening of fiscal policy induced by an increase in public debt may serve to mitigate the impact of these shocks. It is the balance between these forces that ultimately determines the path of public debt. The method applied throughout this section incorporates these feedback mechanisms.

Figure 1 illustrates how these mechanisms jointly determine the sustainability of debt (see the Appendix for a more detailed discussion). Specifically,

- The curve marked '*Growth of real GDP* (g)' depicts how economic growth g is affected by the debt ratio to GDP. At low levels, the debt ratio is likely to have a positive impact on growth, reflecting the vital role of public debt in the functioning of the financial system and the economy at large. However, at high levels, public debt tends to exert a negative impact on economic growth, for instance by squeezing private credit or lowering profit expectations as taxes are likely to be raised.

- The curve marked '*Growth of real debt* (δ)' indicates how the debt ratio to GDP affects the growth rate of real debt δ. This relationship is based on the dynamic budget constraint, which implies that for a given primary balance position, the growth rate of real debt mechanically gets smaller as the debt ratio increases.[3] Additionally, two feedback channels are at play with an increase in the debt ratio affecting the growth of real debt through:

    - an increase in the primary balance due to sustainability concerns (fiscal policy reaction function) slowing down the growth of real debt, and

    - an initial fall and then increase in the real bond yield and an associated acceleration and slowdown of the growth or real debt. This mechanism assumes that at low levels, increases of debt push the real yield down via lower liquidity risk, while above a certain debt threshold growing insolvency risk outweighs the further declines in liquidity risk.

- The two curves intersect twice[4], and at these intersections the debt ratio is constant since the growth rate of real debt and the rate of economic growth are the same. However, these intersections have distinct characteristics. Specifically, the first (left) intersection corresponds to the *steady-state equilibrium* for the debt ratio, whereas the second (right) intersection corresponds to the *threshold* above which the debt ratio becomes explosive. The corollary is that, to keep debt sustainable, it would need to be below that threshold. Moreover, if that is the case the debt ratio automatically tends towards its equilibrium level over time. However, as will be discussed below, these conditions are not (always) satisfied.

For a proper understanding of the model three important additional observations are in order:

[3] See Appendix. For a given primary balance as a per cent of GDP p, the growth rate of real debt δ converges to the real interest rate r for higher levels of the debt ratio as a per cent of GDP d. This can be derived from the familiar dynamic budget constraint $\dot{D} = (r/100)D - P$, where $\dot{D}$ is the absolute change in real debt, D is the absolute level of real debt and P is the absolute level of the primary balance. Dividing the left-hand and right-hand sides by the level of debt D and rearranging yields $100 \cdot \dot{D}/D \equiv \delta = r - 100 \cdot p/d$, where p and d are the ratios to GDP of the primary balance and public debt, respectively.

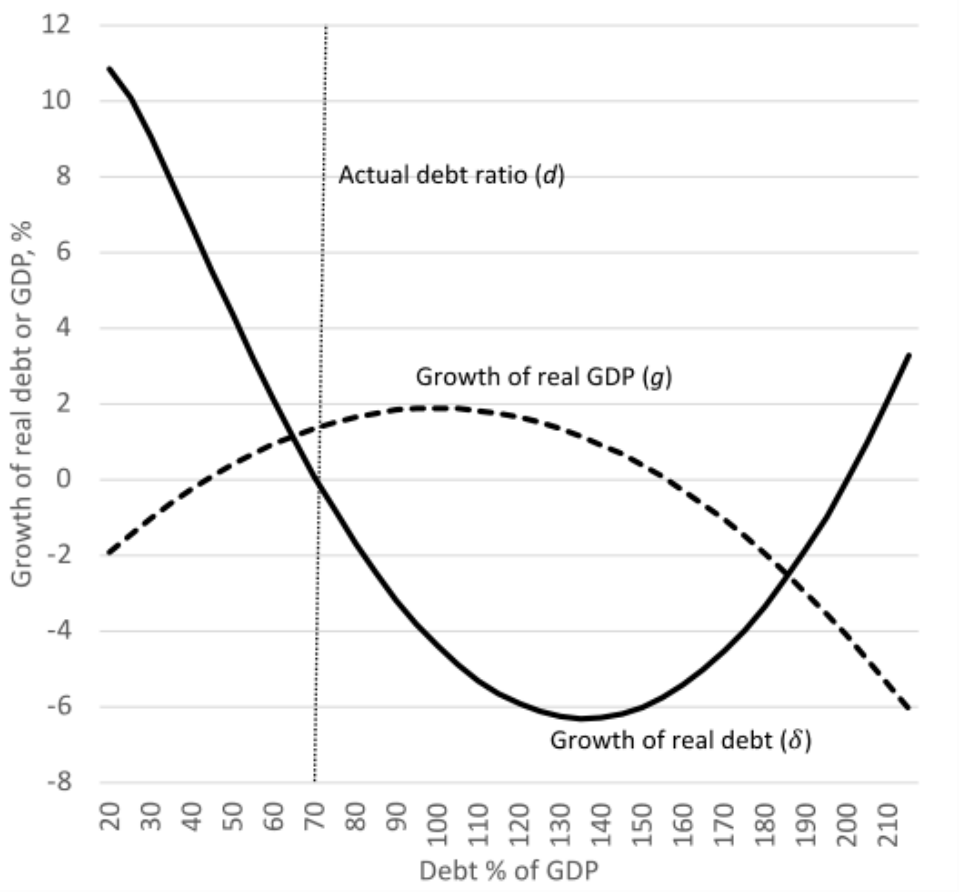
[4] There may be a third intersection located in the second quadrant, which has, however, no economic meaning since the debt ratio can never be negative.

- First, in principle it is possible that the two curves fail to intersect, which means that debt growth δ always exceeds economic growth g, regardless of the actual debt ratio. This means that debt is explosive regardless of its initial level. As will become clear below this may well be the case in several countries. It may also be that the curves intersect only once, which means that the steady state debt ratio is nil.

- The assessment of debt sustainability is *invariant to inflation* because it is the *differential* between the real bond yield and real economic growth $r - g$ (alongside the initial debt ratio and the primary balance) that matters for public debt dynamics, with the inflation rate canceling out (see Appendix).[5]

- If part of public debt is issued in a foreign currency, the yield on the latter may be lower than on domestic currency due to exchange rate risk. However, assuming uncovered interest rate parity holds, the *effective* foreign currency interest rate -- corrected for expected exchange rate depreciation -- is taken to be the same as the domestic currency rate.

Figure 1: Stylized debt dynamics



Source: authors' computations, see Appendix

[5] That is, unless inflation affects the real bond yield r. This may well be the case if inflation is more volatile at higher rates of inflation, entailing an inflation risk premium on bonds. Note that higher inflation would make debt therefore *less* sustainable, *not more* sustainable (except in the short run when inflation has yet to feed through into nominal yields and interest expenditure).

4. Numerical results

This section applies the model developed in the previous section to the (G20) member states for the period from 1990 to 2022. The G20 provides a sample that covers approximately 85 per cent of the world economy, included the largest advanced economies – the G7 – as well as mid-sized advanced economies such as Australia and South Korea. It also includes the BRICS – Brazil, Russia, India, China and South Africa – and some large developing countries such as Turkey and Indonesia. Argentina, a country that repeatedly defaulted on its debt, is also a member of the G20.

To estimate debt sustainability and assess fiscal space for the G20 countries over the period 1990-2022 we use the following indicators: real GDP growth (to calculate 10-year geometric mean of potential growth), debt to GDP ratio, cyclical primary balance, inflation, and long-term interest rates (Table 1). These data series come from the IMF and World Bank public databases. For more coverage on data points for long term interest rates, we use OECD and Trading Economics databases. To model an exchange rate shock, we rely on BIS estimates of debt held in foreign currency.

As series on real yields data are patchy, we use instead long-term interest rates minus inflation. Some long-term interest rate data has been pulled from separate databases rather than a cohesive set. Pre-2011 long-term interest rates come from the IMF while those post-2011 come from the OECD and Trading Economics. Inflation rates and long-term interest rates for Argentina are not publicly available, so we use estimates published by Trading Economics.

Table 1: Indicators and sources

Indicator	Source
Debt to GDP ratio	IMF, World Bank
Cyclically Adjusted Primary Balance	IMF, World Bank
Potential Growth	IMF, authors' own calculations
Inflation (CPI)	IMF, World Bank
Long term interest rates (10 years)	IMF, OECD, Trading Economics
General government debt held in foreign currency (except China: central government debt)	BIS

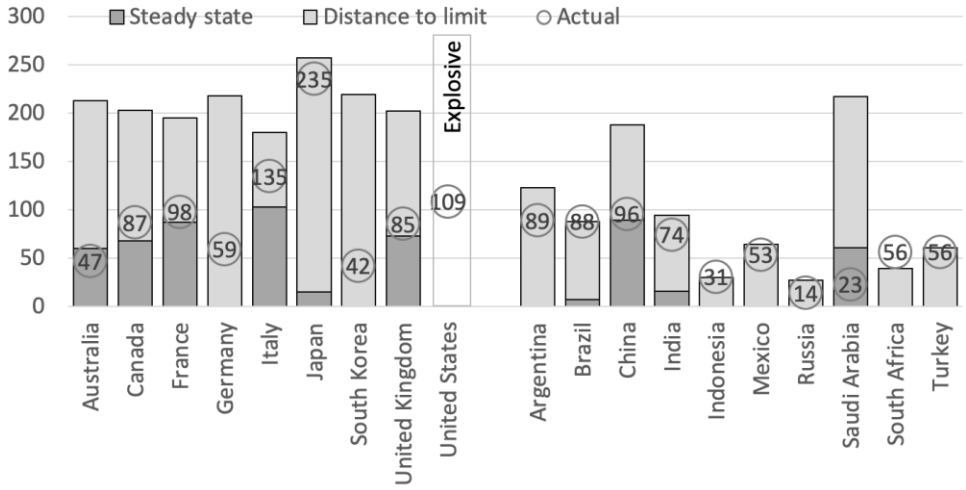
Sources: see right column

4.1 Snapshot of the G20 economies

Figure 2 depicts the situation regarding debt sustainability in the G20 just prior to the pandemic in 2019, based on estimates for the actual debt to GDP ratio, potential economic growth, real bond yields and the cyclically adjusted primary balance as a per cent of GDP. One take-away is that in all but one advanced G20 country (the United States being the exception) debt looked comfortably sustainable, although in Japan the situation could be characterised as 'border line' in the sense that the debt ratio was relatively close to the limit above which debt becomes explosive. By contrast, in all but two

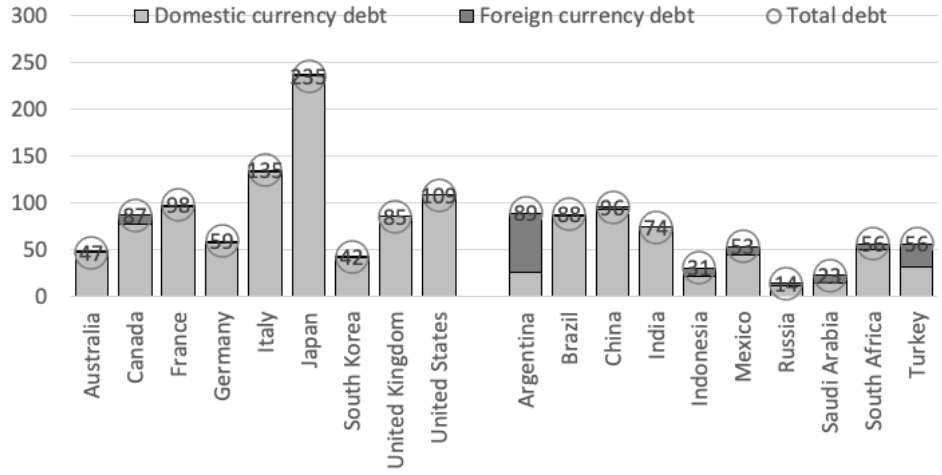
emerging G20 countries – China and Saudi Arabia being the exceptions -- debt sustainability was borderline, meaning that it was close to the debt limit. The situation looked at that stage particularly risky in Argentina and Turkey given their large share of foreign currency debt in total public debt (Figure 3). The amount of fiscal space available to the advanced G20 economies according to our metric was considerably larger than that in the emerging G20 economies – again with the exceptions of China and Saudi Arabia (Figure 4).

Figure 2: Debt sustainability analysis – situation in 2019 (% of GDP)



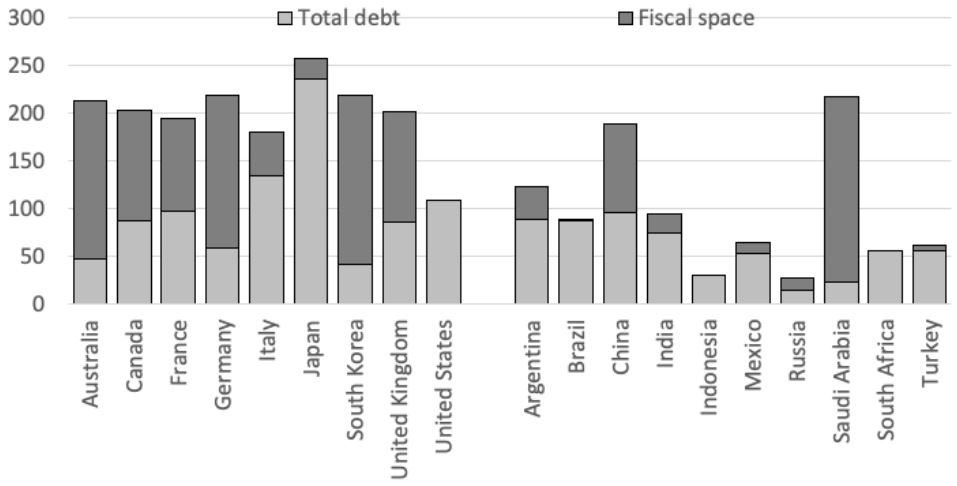
Sources: IMF, OECD, World Bank, Trading Economics, authors' computations

Figure 3: Home versus foreign currency public debt – situation in 2019 (% of GDP)



Sources: IMF, OECD, World Bank, BIS

Figure 4: Public debt and fiscal space – situation in 2019 (% of GDP)



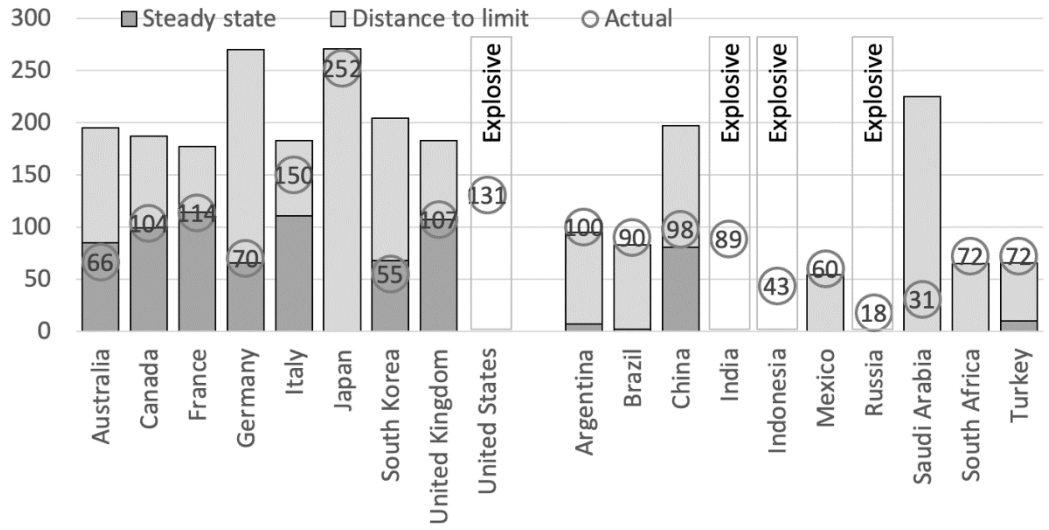
Sources: IMF, OECD, World Bank, BIS, Trading Economics, authors' computations

Figure 5 depicts the current situation regarding debt sustainability in the G20 in 2022, based on estimates or projections for the debt to GDP ratio, potential economic growth, real bond yields and the cyclically adjusted primary balance as a per cent of GDP. The following features emerge:

- The United States is still the only advanced G20 country where debt is on an explosive path, meaning that the debt threshold is effectively nil and the debt ratio bound to rise at an accelerating pace if the primary balance is not raised (or the primary deficit cut) by the required amount.
- Moreover, among the advanced G20 countries, debt sustainability in Japan can still be characterized as 'border line', in the sense that the current debt to GDP ratio is very close to the debt limit above which it becomes explosive. This implies that a minor (permanent) shock to real interest rates, economic growth or the primary balance position would suffice to result in debt becoming explosive.
- Among the emerging G20 economies debt is comfortably sustainable only in China and Saudi Arabia. Not surprisingly, these are also the only emerging G20 economies that dispose of fiscal space according to our metric (Figure 6). In Brazil and Turkey debt is on an explosive path and in the other emerging G20 economies debt is borderline unsustainable or slightly worse in the sense that the debt ratio is at ore just above the limit. In Argentina the underlying situation would likely have been much worse than depicted if not for the ongoing efforts to qualify for (yet another) IMF program, as discussed in more detail below. Indeed, Argentina, and to a lesser extent Turkey, is particularly vulnerable given their large call on foreign currency debt, as noted. Moreover, the situation in Russia is in fact worse than depicted if the expected collapse of GDP this year materializes as the sanctions work their way through.

The bottom line is that in the majority of emerging G20 countries public debt is either explosive or borderline, hence without any fiscal space left. Those with significant fiscal space left are the usual suspects China and Saudi Arabia. Among the advanced economies fiscal space would still be available, although to a lesser extent in Japan while according to out metric no fiscal space is left in the United States. The situation in the United States is special, however, as we will explain below.

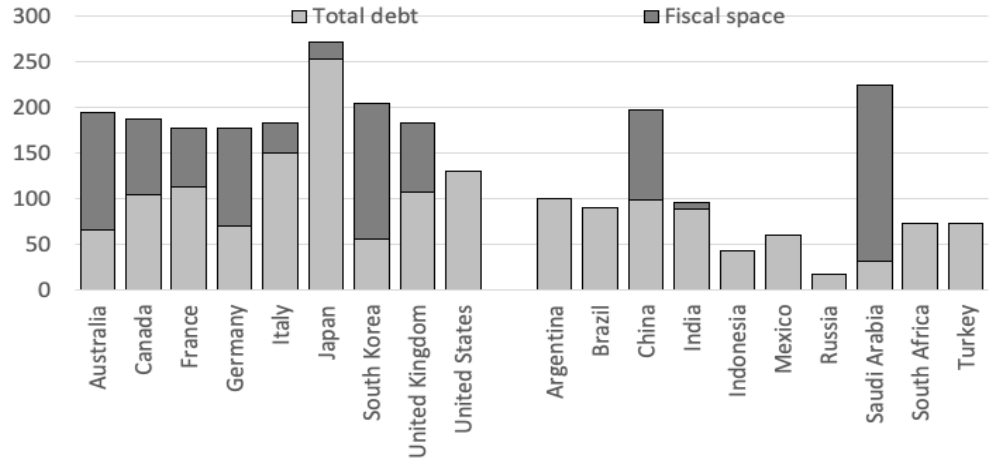
Figure 5: Debt sustainability analysis – situation in 2022 (% of GDP)



Sources: IMF, OECD, World Bank, Trading Economics, authors' computations

These results are consistent with Ghosh et al. (2013) insofar that more open economies and countries with strong institutions exhibit, on balance, more fiscal space. South Korea, Australia, Germany and Canada are part of this group (Figure 6). Oil and commodities exporters, when oil and commodities prices rise, also exhibit good fiscal performance. In our example, Saudi Arabia belongs to this group. These results are also consistent with the 'original sin' that forces developing countries to borrow in dollars or (to less extent) euros rather than in their own currencies. However, it is important to note that the sources of domestic financing have increased in many developing countries, reducing the need to issue debt denominated in foreign currencies (World Bank, 2022: 18-19).

Figure 6: Public debt and fiscal space – situation in 2022 (% of GDP)



Sources: IMF, OECD, World Bank, BIS, Trading Economics, authors' computations

4.2 Some specific cases

The central tenet of our paper is that advanced and developing economies face entirely different conditions concerning the possibility to conduct independent fiscal and monetary policies to address

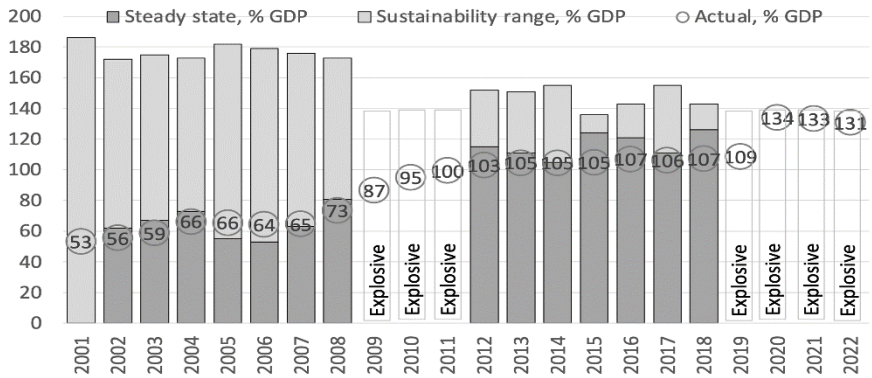
major shocks. Among the G20 economies, the United States – as the issuer of the main global reserve currency (the US dollar) and the main global safe financial asset (Treasury bonds) – enjoys full independence in both policy domains. It can therefore pursue full employment and price stability with relative ease (though if the zero-lower bound on interest rates is binding the emphasis necessarily shifts towards fiscal policy as argued by Blanchard 2022). At the other extreme, Argentina and Turkey stand out as G20 economies where the terms of the trade-off between fiscal and monetary policy sovereignty are particularly harsh, in part due to their reliance on foreign currency debt. We illustrate this empirically using our debt sustainability metric presented in section 3.

Figure 7 depicts the development of relevant variables over the last two decades or so for *the United States*. It shows that up to the financial crisis in 2009, the US public debt ratio to GDP was comfortably below a comparatively high estimated limit of roughly 180% of GDP. As a matter of fact, at around 60% of GDP, the debt ratio stayed close to its estimated steady state equilibrium, reflecting the favourable differential between interest and growth rates and the modest primary deficit. Not surprisingly, this changed in the immediate aftermath of the financial crisis because of a soaring primary deficit and an increase in real interest rates as inflation stalled. However, the previous favourable situation of debt comfortably below the limit was quickly restored thereafter – albeit at a higher level of the debt ratio at around the new steady state equilibrium of 100% of GDP.[6]

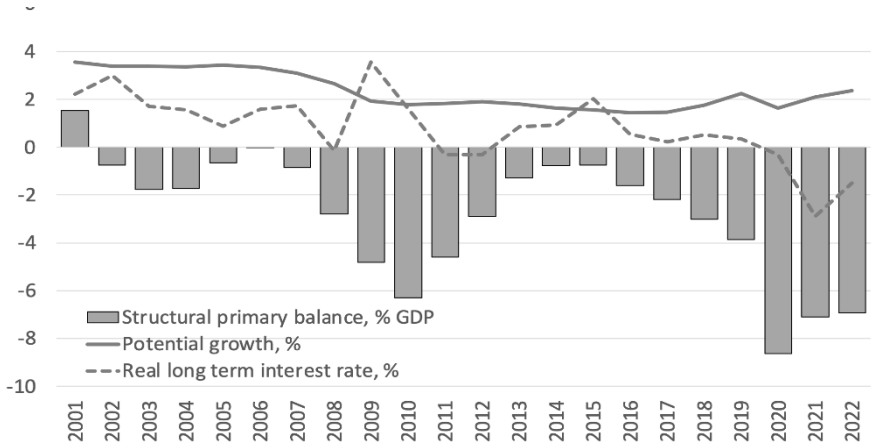
[6] With the exception of 2015, due to a sudden drop in inflation and an associated surge in the real interest rate – which proved transitory.

Figure 7: Debt sustainability analysis – United States

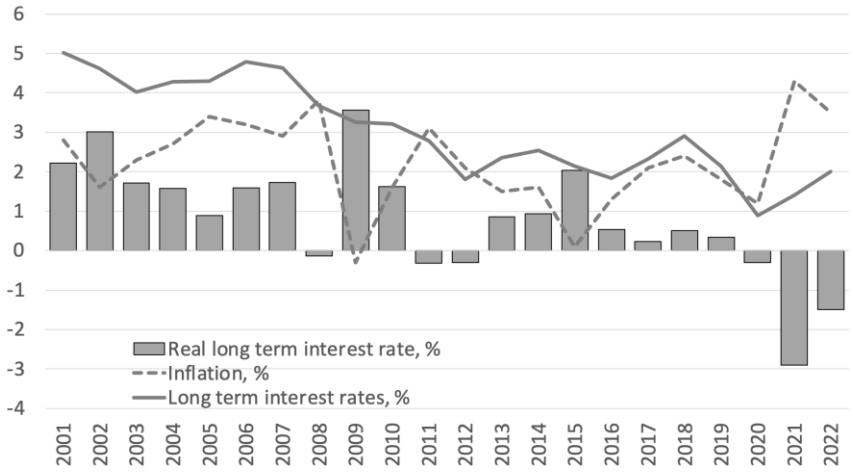
A. Public debt



B. Primary balance, potential growth, real interest rate



C. Interest rate and inflation



Sources: IMF, OECD, World Bank, BIS, Trading Economics, authors' computations

This all changed again when the pandemic hit in 2020 and beyond, due to a massive increase in the primary deficit. And although this deficit is officially projected to fall in 2022 and 2023, the debt ratio at around 130% of GDP remains explosive. Yet real interest rates have remained relatively low, indicating that market confidence in the solvency of the US public sector has remained intact. This clearly illustrates our point that – while in a mechanical sense the United States has used up all its fiscal space during the pandemic – it seems poised to rebuild it in the years ahead. More fundamentally, in a longer-term sense the United States disposes of more fiscal space than our metric suggests owing to the international demand for risk-free dollar-denominated assets.

The situation in *Argentina* could not be more contrasting. In the period 2014-2017 the fiscal situation looked still relatively comfortable, with the actual debt ratio well below the debt threshold, as shown in Figure 8 below. However, things went sour from 2018 onwards when debt rose towards the debt threshold and in 2020 became explosive.

This can be explained by the following (see panels B-D of Figure 8 below). In the period 2014-2018 Argentina enjoyed a hugely favourable *r-g* differential, mostly because the real yield plummeted to negative two-digit territory (Panel B). However, this was almost entirely driven by massive inflation (Panel D). That, in turn, was the result of a steep depreciation of the exchange rate. This also explains the upward trend in the debt ratio in this period, given that more than half of debt is foreign currency (mostly USD) denominated.

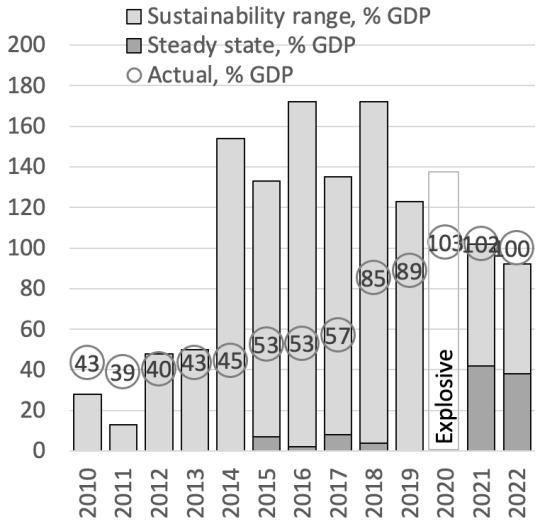
So, this was a crisis in the making, and it came. In 2018 Argentina got a bail-out from the IMF, but this failed as capital stampeded out of the country. In 2019 bond yields caught up with inflation and the favourable *r-g* differential disappeared. In June 2022 Argentina received US$ 4bn as the first step of a larger IMF programme.

In *Turkey,* the fiscal situation looked manageable until 2017. Turkey was hard hit by the financial crisis in 2008-2009, but this was quickly corrected in 2010, with the primary balance in comfortable surplus and the interest-growth differential very favourable (Figure 9). However, in 2017 Turkey started to adopt a looser fiscal policy stance as the primary balance turned negative and deteriorated over time. In its wake, the real interest rate versus growth differential deteriorated significantly while the debt ratio drifted up and in 2022 debt was outright explosive according to our metric. Meanwhile also large contingent liabilities were built up related to COVID-19 support (credit guarantees).

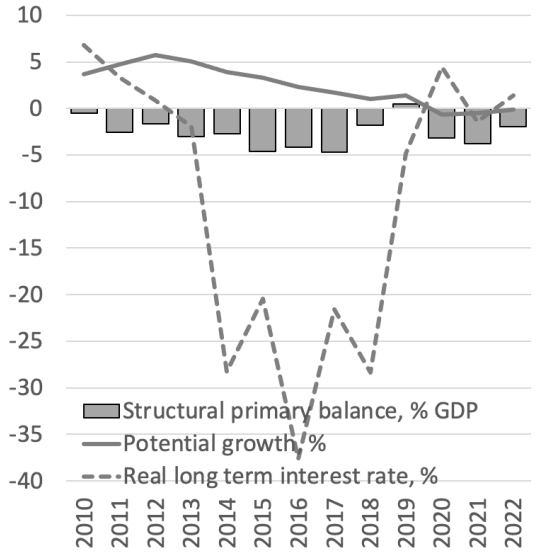
Both the cases of Argentina and Turkey show the adverse impact of inflation on the debt dynamics. In both cases, it is inflation that makes the differential *r-g* favourable, keeping debt manageable, at least initially. Our debt sustainability analysis shows debt to be close to or over the limit before it feeds into real interest rates. This is mainly due to the lagged response of monetary policy to inflation, providing temporary breathing space of fiscal policy. But sooner or later interest rates catch up with inflation. This points to another feature that gives the United States an extended fiscal space, that is historical low inflation in the last decades. Low inflation has consistently helped to keep real interest rates below the GDP growth rate, by allowing monetary to stay supportive without any risk of capital outflows adversely affecting financial conditions (Figure 7).

Figure 8: Debt sustainability analysis – Argentina

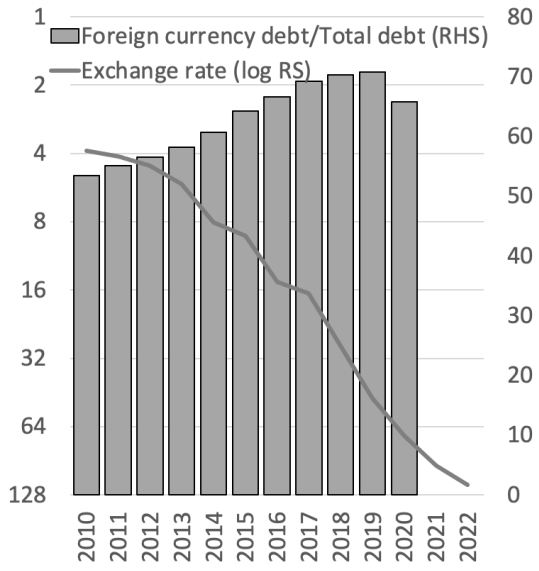
A. Public debt



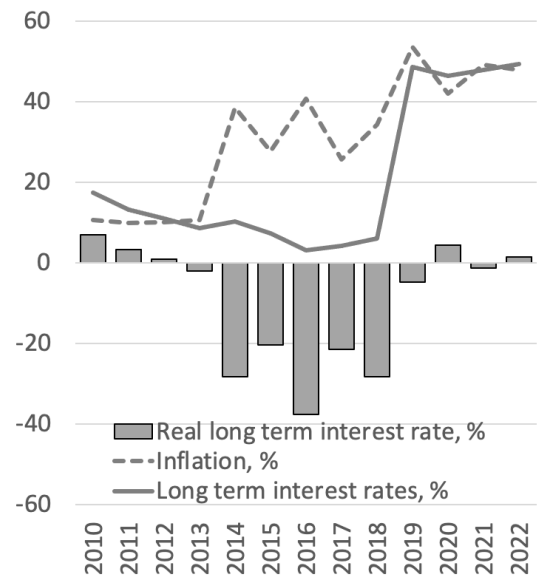
B. Primary balance, potential growth, real interest rate



C. Foreign currency debt and exchange rate



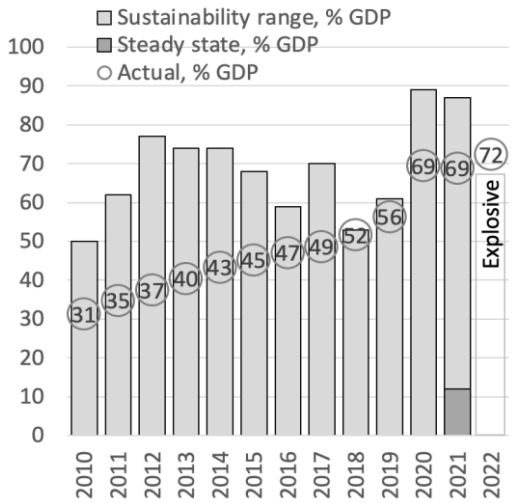
D. Interest rate and inflation



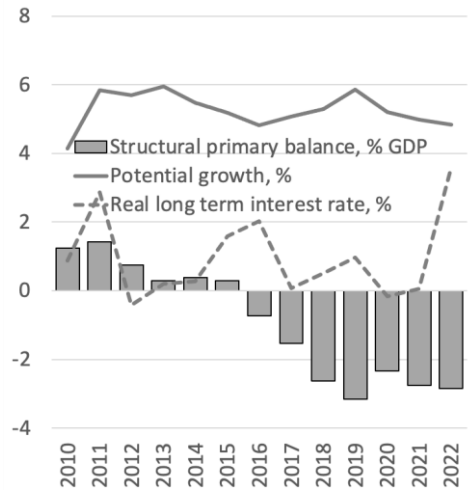
Sources: authors' computations, IMF WEO, BIS, Trading Economics

Figure 9: Debt sustainability analysis – Turkey

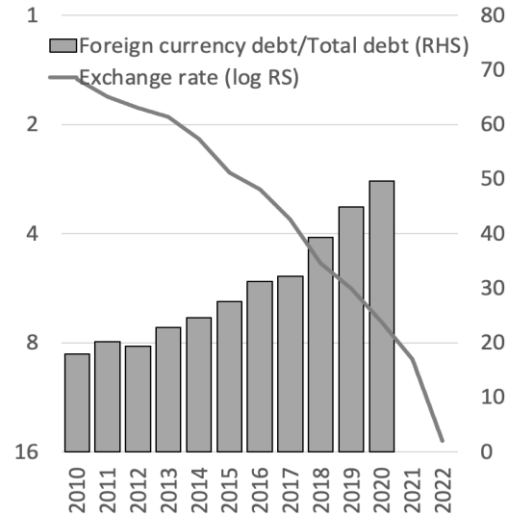
A. Public debt



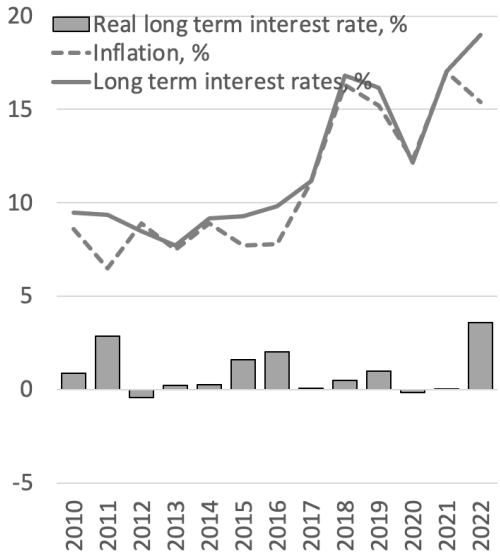
B. Primary balance, potential growth, real interest rate



C. Foreign currency debt and exchange rate



D. Interest rate and inflation



Sources: Authors' computations, IMF WEO, BIS, Trading Economics

5. Conclusions

In this paper we estimate the public debt limit and ensuing fiscal space for a panel of developed and developing economies for the period 1990-2022. For this we devise an analytical framework that expands the methodology of DSA to detect whether a country's debt is on an unsustainable path at prevailing (or projected) rates of economic growth, real interest rates and the primary balance. Our analytical framework includes the *feedback effects* of public debt on growth, yields and fiscal policy.

Using this methodology, we assess whether increases in public debt tend to exacerbate adverse growth or interest rate shocks, while, in contrast, a tightening of fiscal policy induced by an increase in public debt may serve to mitigate the impact of these shocks. It is the balance between these forces that ultimately determines the path of public debt.

The application of our model to the G20 shows three groups of results that we describe as following: 1. countries with explosive debt; 2. countries with borderline debt; 3. countries with balanced debt. However, a more detailed analysis of three countries – the United States, Argentina and Turkey – shows that the debt limit is less binding for the United States than it is for the other two. Being the issuer of the main global reserve currency and the main global safe financial asset means that the US can enjoy full sovereignty in both fiscal policy and monetary policy. It can therefore pursue full employment and price stability with relative ease. Argentina and Turkey, on the other hand, stand out as G20 economies where the terms of the trade-off between fiscal and monetary policy sovereignty are particularly harsh.

These results from our analysis are consistent with the central tenet of our paper, i.e. advanced and developing economies face entirely different conditions concerning the possibility to conduct independent fiscal and monetary policies to address major shocks. Developing countries have limited instruments to expand their fiscal space at the time of shocks such as the Covid-19 pandemic, especially if they are already close to the limit of debt sustainability, exacerbating the risk of falling into a 'debt trap'. These countries are often pushed to tackle the debt before it gets to the point where it may be difficult to generate a primary balance that is sufficient to ensure sustainability, even if fiscal consolidation may run against the need to provide macro stabilisation when private demand is weak and monetary policy is constrained.

Appendix

This Appendix discusses the formal model that underpins the results presented in the main text. Starting point is the government's long-run dynamic budget constraint, formulated as:

$$\frac{\dot{D}}{D} = \frac{r}{100} - \frac{P}{Y}\Big/\frac{D}{Y} \qquad (1)$$

where a dot indicates a change in the variable over time, $\dot{D}/D$ is the growth rate of real public debt, r is the real bond yield, P/Y is the primary balance as a share of GDP and D/Y is the ratio of debt to GDP. This indicates that as the debt ratio to GDP D/Y increases, for a given primary balance as a share of GDP P/Y, the growth rate of real debt will fall asymptotically towards the real bond yield r.

By equating the growth rate of real debt in equation (1) to the growth rate of real output $\dot{Y}/Y \equiv g/100$ – a necessary condition for a sustainable debt ratio – one obtains the familiar condition:

$$p = \frac{r-g}{100}\, d \qquad (2)$$

where lower-case characters are used to denote ratios to GDP in per cent – hence $d \equiv 100 \cdot D/Y$ and $p \equiv 100 \cdot P/Y$. From equation (2) the primary balance required to maintain a stable long-run debt ratio at a given level d can be solved for a given interest rate/growth differential $r - g$.

A crucial shortcoming of this formula, however, is that it is not obvious what target for the debt ratio d should be adopted and whether it represents a stable equilibrium (the formula describes a *necessary* condition for debt sustainability but not a *sufficient* condition). Moreover, as stated, the formula ignores that the variables g, r and p may all in turn depend on the debt ratio d. This is what is meant by the feedback mechanisms discussed in the main text.

The three feedback mechanisms of debt via g, r and p are incorporated as follows.

First, the following stylized relationship between long-run economic growth g and the debt ratio d is adopted:

$$g = g^* + a_1\, d - a_2\, d^2 \qquad (3)$$

where g^* is the component of long-run economic growth unrelated to public debt. The remainder of the equation therefore describes the feedback of public debt on economic growth. This feedback is conventionally formulated as a quadratic relationship, with growth rising with debt up to a certain threshold after which the relationship turns negative. The debt threshold where the negative impact of debt on growth overtakes the positive one is equal to $\frac{1}{2}a_1/a_2$.

The numerical values for the parameters are derived as follows:

- *High-income countries*. We use as our source Checherita -Westphal and Rother (2011), who find $a_1 = 0.1198$ and -$a_2 = -0.0006$ for their baseline model to $\frac{1}{2}a_1/a_2 = 100\%$. Although their estimate is for the 19 countries of the Euro Area, we use this estimate for all high-income countries given that the implied debt threshold is in the ballpark of the consensus.
- *Middle-income countries*. We use as our source Kassouri et al (2021)[7], who find $a_1 = 0.0867$ and -$a_2 = -0.00125$. They present three estimates for each, but we pick the version for which the

[7] We use the results from their Table 1. There seems to be a typo in their tables, however, as the values of a_2 they report all appear to be a factor 10 too high. Fortunately, they also report the debt thresholds which seems to be consistent with our interpretation of the numerical values of the parameters.

coefficients are significant at the 1% level and ignore results for larger samples but with less significant results. This yields a debt threshold of $\frac{1}{2}a_1/a_2 = 35\%$.

- *Low-income countries*. We use again Kassouri et al (2021), who find $a_1 = 0.0059$ and -$a_2 = -0.00008$.[8] This yields a debt threshold of $\frac{1}{2}a_1/a_2 = 37\%$.

Note that for each point in time g^* can be computed as $g^* = g - a_1\, d + a_2\, d^2$.

Second, in a similar fashion the real bond yield r is assumed to depend on the debt ratio d, as follows:

$$r = r^* - b_1\, d + b_2\, d^2 \qquad (4a)$$

or

$$r = r^* + b_1\, d \qquad (4b)$$

Hence according to specification (4a) at low levels of the debt ratio d increases thereof push the real yield down (owing to a lower liquidity risk premium), while above the debt threshold $\frac{1}{2}b_1/b_2$ the impact of debt on real yields turns positive (when solvency risk outweighs liquidity risk). Alternatively, a linear specification as in (4b) can be adopted, depending on the country in question. As to the numerical parameters:

- *United States.* We use the linear specification (4b) based on findings by Laubach (2009), with in his baseline model $b_1 = 0.039$, so roughly four bps per percentage point of public debt.
- *Other high-income countries*. We use as our source Pappas and Kostakis (2020), who find for their baseline model $-b_1 = -0.108$ and $b_2 = 0.000555$. This yields a debt threshold of $\frac{1}{2}b_1/b_2 = 97\%$. Their results are based on data for the euro area, but we assume this result to apply to all advanced economies other than the United States.
- *Other countries*. Studies for developing economies do not generally estimate a non-linear yield equation but assume a positive relationship between the yield and the level of the debt to GDP ratio in equation (2b). A good study is Naidu et al (2016) who find $b_1 = 0.24$.

Again, r^* is computed as $r^* = r + b_1\, d - b_2\, d^2$ if specification (4a) is used and as $r^* = r - b_1\, d$ for the other cases.

Third, the primary balance position p is assumed to depend on the debt ratio d via a fiscal policy reaction function of the flowing stylised form see Ghosh et al (2013):

$$p = p^* - c_1 d + c_2 d^2 - c_3 d^3 \qquad (5)$$

The idea is that as debt increases its impact on the primary balance wanes as a result of 'consolidation fatigue'. The baseline estimates in Ghosh et al (2013) are $-c_1 = -0.208$, $c_2 = 0.0032$ and $-c_3 = -0.00001$. However, to keep things simple for now

Finally, incorporating equations (4) and (5) in the debt-growth equation (1) yields:

$$\delta = r^* - b_1\, d + b_2\, d^2 - 100\, p^*/d + 100c_1 - 100c_2 d + 100c_3 d^2 \qquad (6)$$

[8] See previous footnote.

where $\delta \equiv 100 \cdot \dot{D}/D$.[9] In equilibrium the growth rate of debt and output must be equal, so $\delta = g$. Making use of the growth equation (1) and the real debt growth equation (6) this condition can be reformulated as a cubic equation of the following form:

$$-(a_2 + b_2 + 100c_3)\, d^3 + (a_1 + b_1 + 100c_2)d^2 + (g^* - r^* - 100c_1)d + 100p^* = 0 \qquad (7)$$

This equation potentially has three roots. However, one root is effectively meaningless because, at the above assumptions of the parameters, it would imply negative gross debt. As discussed in the main text, there are therefore two feasible roots, here labelled $\bar{d}$ and $\bar{\bar{d}}$, which have distinct characteristics. Specifically, $\bar{d}$ corresponds to the *steady-state equilibrium* for the debt ratio, whereas $\bar{\bar{d}}$ is the *threshold* above which the debt ratio becomes explosive. If the cubic equation has no roots, it means that debt is always explosive, regardless of its in initial level. As discussed in the main text this means that the debt threshold $\bar{\bar{d}}$ is effectively nil. In some cases, a root for the debt threshold $\bar{\bar{d}}$ exists, but no root is found for the steady state equilibrium $\bar{d}$. This means that if the debt ratio is smaller than the threshold $\bar{\bar{d}}$, debt will shrink until it is nil, which would then be the effective steady state equilibrium as again debt cannot be negative.

[9] This is the curve marked 'δ' in Figure 1. By way of example, the curves depicted in Figure 1 are based on the numerical values thus derived for the euro area as a whole, with $g^* = -1.4$, $r^* = -0.1$ and $p^* = -6.5$.

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