

Living with High Public Debt

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August 2023

1. Introduction

Public debts have soared to unprecedented peacetime heights. These high debts pose economic, financial and political problems.² Multilateral financial institutions and others have consequently laid out scenarios for bringing them back down.

Our thesis in this paper is that high public debts are not going to decline significantly for the foreseeable future. Countries are going to have to live with this new reality as a semi-permanent state. These are not normative statements of what is desirable; they are positive statements of what is likely.

First, large, persistent primary budget surpluses are not in the political cards. Over the last half century, episodes where countries have run primary surpluses of, say, 3 to 5 percent of GDP for extended periods are very much the exception to the rule. Maintaining large primary surpluses requires favorable economic conditions and a degree of political solidarity that currently do not exist. Divided government and slow growth make this route to debt consolidation even more challenging than in the past.

Second, it is difficult to imagine more favorable interest-rate-growth-rate differentials (favorable interest-rate-growth-rate differentials reducing debt ratios in an accounting sense). Real interest rates have trended downward to very low levels. It is hard to foresee them falling still lower. Faster global growth is pleasant to imagine but difficult to engineer.³ History suggests that the reorganization required of firms to capitalize on Generative Artificial Intelligence and other new general-purpose technologies, in ways that translate into faster aggregate growth, will take a decade and more.

Third, inflation is not a sustainable route to reducing high public debts. Only unanticipated inflation has this effect. Although an anticipated increase in inflation may reduce debt ratios in the short run by raising the denominator of the debt-to-GDP ratio, in the long run it is apt to raise interest rates and shorten maturities. At both horizons, these effects are unlikely to be economically important.

Fourth, statutory ceilings on interest rates and related measures of financial repression are less feasible than in the past. Investors opposed to the widespread application of repressive policies are a more powerful lobby. Financial liberalization, internal and external, is an economic fact of life. The genie is out of the bottle.

All of which is to say that, for better or worse, high public debts are here to stay.

¹ International Monetary Fund and University of California, Berkeley, respectively. We thank numerous colleagues for helpful comments and Qin Xie for excellent research assistance. The views expressed are the authors' and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

² The same could be said of private debts. These, however, are not the subject of our already long paper.

³ Institutions such as the World Bank anticipate slower, not faster, growth over the next decade.

These high debts are more of a problem for emerging market and developing economies (EMDEs) than for most major advanced economies. There exists robust demand for the high-quality public-label securities of advanced-country governments by economies around the world, and by emerging markets in particular. Demand comes not only from emerging-market central banks, which hold AAA-rated bonds of the United States and other advanced-countries as reserves, but also from the private sector. We highlight this private sector demand, which is on the same order of magnitude as foreign official demand. Private financial institutions hold safe assets as capital and reserves. Investors hold them because they are free of adverse selection. Individuals hold them as insurance against idiosyncratic shocks. Since emerging market governments have limited capacity to produce safe assets, this demand is satisfied by the governments of advanced countries like the United States. This structural source of demand suggests that the high public debts of advanced-country governments, if not optimal, are in most cases at least manageable.⁴

The public debts of emerging markets and developing economies do not benefit from this additional demand. Their debt ratios may be lower, but they are more difficult to sustain for this reason and for reasons of debt maturity and composition. Given high inherited debts, there is an argument for debt restructuring in a range of developing economies. Unfortunately, history shows that an extended period, marked by serious difficulties in heavily-indebted developing economies, must pass before stakeholders acknowledge this reality and organize themselves accordingly. Indeed, recent changes in the structure of global financial markets make that acknowledgment and organization even more difficult. Not surprisingly, a lengthy period of little to no progress is precisely what we have seen. Developing economies continue to be saddled with heavy debts and limited capital-market access.

2. Global Stock of Public Debt

Figure 1 summarizes in one page the evolution of public debt since the turn of the century. The data cover government debt in the form of both securities and loans in domestic and foreign currencies. This is in contrast to data sets that consider only debt securities, long-term debt securities or external debts, and which cover fewer countries. We consider a total of 182 countries: 67 developing economies, 81 emerging markets, and 34 advanced economies.⁵

The figure shows gross government debt on a consolidated basis (i.e., excluding intergovernmental holdings but including debt in the hands of the central bank), scaled by GDP and aggregated as an unweighted average across countries.⁶ Globally (top left panel), debt ratios trace out a u-shaped pattern, falling prior to the Global Financial Crisis (GFC) and rising thereafter, followed by a jump with the onset of COVID-19. There is then a decline in debt ratios in 2020-21, reflecting the impact of unexpected inflation and the resumption of growth. Most of this is well known, although progress in reducing debt ratios prior to the GFC, when debt ratios fell on average from roughly 60 to 40 percent, is relatively little remarked upon.

⁴ As we emphasize, this is not a blanket statement applying to all advanced countries. In addition, this conclusion is contingent on how advanced-country governments *respond* to the existence of this additional demand.

⁵ We follow the country groupings in the IMF's *World Economic Outlook*, including all countries for which data are available (though not economies such as Hong Kong, SAR that are not also countries). We use general government where data are available and central government otherwise.

⁶ Weighted averages would provide another perspective, one dominated by a small handful of large countries, however, and one that would raise thorny issues of choice of exchange rates etc.

These patterns are pronounced among developing economies. On average, indebtedness fell by half before the GFC (again, relative to GDP). This reflected debt relief under the Heavily Indebted Poor Countries (HIPC) Initiative between 2001 and 2005, when annual debt service payments by 36 eligible countries declined by about 1.5 percentage points of GDP, together with fiscal reforms put in place to qualify for the initiative. This was followed in 2005 by the Multilateral Debt Relief Initiative (MDRI) under which countries completing the HIPC process received 100 percent relief on debts to the IMF, World Bank and African Development Bank. 31 of 36 eligible countries saw their debt loads reduced substantially. Some such as Ghana had 70 percent of their debts cancelled, while others such as Liberia and Malawi had 90 percent written off. The contrast between the sharp debt relief achieved under these programs and lack of progress to date under the G20's Common Framework for Debt Treatments is evident and painful. This contrast reflects the rise of non-Paris Club creditors and of market finance relative official lending (more on which below).

Debt ratios in developing economies then rose sharply in the most recent decade, facilitated by accommodative global credit conditions. Debts averaging 40 percent of GDP a decade ago are now half again as high at 60 percent. 40 developing economies (according to Chuku et al. 2023) are in debt distress, their capacity to repay having been damaged by shocks to global food and fuel prices, depressed tourism revenues, and fallout from climate events and natural disasters. These include a number of countries that received debt relief in the early 2000s, which is a reminder that debt restructuring alone is not sufficient to ensure sustainability.

Emerging markets similarly show sharply increasing debt ratios, again rising from the range of 40 to 60 percent of GDP on average over the last decade. Half of this increase is concentrated in recent years, despite the favorable impact of inflation on debt ratios in 2021-2. The optimistic take is that deficits have persisted and debts have risen because government revenues respond with a lag to reopening and recovery from the COVID crisis; as these revenues materialize, fiscal balances will strengthen. The pessimistic take is that economic growth in emerging markets, and growth of the associated revenues, will slow with higher inflation and interest rates and due to disruptions associated with Russia's invasion of Ukraine (Kose and Ohnsorge 2023). Such disagreements are what make markets (and vigorous conference discussions).

In the advanced country world, as seen at the bottom of Figure 1, debt ratios remained essentially flat in the run-up to the GFC, reflecting success at growing the denominator of the debt-to-GDP ratio – success that, in the event, was not sustained.⁷ Debt ratios then rose sharply between 2008 and 2014, reflecting bank bailouts, budget deficits, and sluggish economic recovery. This was followed by modest fiscal consolidation until the COVID crisis, when debt ratios shot up.

The final panel of Figure 1 focuses on the United States. There is no visible tendency for the U.S. debt-to-GDP ratio to fall at any point since the turn of the century, in contrast to elsewhere.⁸ The debt ratio then jumps up with the onset of the GFC and again with COVID-19.

⁷ Those who point to the outsized role of the financial sector in the rapid growth of the pre-financial-crisis period would argue that this earlier growth was intrinsically unsustainable.

⁸ This is also in contrast to behavior in the U.S. itself in the 1990s.

These cross-country averages impart a sense of gradual change and thus disguise the extent to which exceptional events alter the debt landscape. Figure 2 brings out this aspect by highlighting debt spikes, defined as episodes when the increase in the debt ratio in a period of five or fewer years is in the 80th percentile of such increases.⁹ Episodes then end in the first year in which the debt ratio falls. If the debt ratio rises strongly in 2007-11 but then falls in 2012, for example, the spike is dated as occurring in 2012.

This is what we see for the advanced economies, more than 70 percent of which experienced debt spikes in the Global Financial Crisis. In contrast, the share of advanced countries experiencing sharp increases in debt ratios in the COVID-19 crisis is less. The opposite is true of emerging market and developing economies, a larger share of which saw their debts spike in response to COVID than the GFC. COVID was a global shock, whereas the GFC was centered in the advanced economies. In addition, there was a stark difference in the magnitude of fiscal stimulus provided by advanced economies versus that provided by emerging market and developing economies during COVID.¹⁰ The contrasting implications for public finances in different parts of the world are direct.

3. Structure of Global Debt

Globally, the most notable shift in terms of who holds public debt is the rising share of foreign nonbank investors – mutual funds, pension funds, insurance companies and hedge funds, among others – and the declining share of the foreign official sector. This is the tendency for financial markets to supplant official bilateral and multilateral lenders as more countries tap domestic and international capital markets.

The retreat of foreign official finance is especially evident in developing economies.¹¹ But the retreat of official lending is also visible in emerging markets, matched in this case by the rising share of debt held by foreign nonbank investors. The contrast with developing economies, where the rise of foreign nonbank investors is not equally apparent, is a reminder that institutional investors looking to emerging and frontier markets continue to focus mainly on the former. The growing footprint of foreign nonbank investors in emerging markets has implications for volatility: Fang, Hardy and Lewis (2022) show that demand for emerging market debt by private nonbank foreign investors, and investment funds in particular, is highly reactive to yields. Their results suggest that this change in investor composition can accentuate capital-flow reversals when rates rise in advanced countries. These observations also speak to the literature on the global financial cycle (Miranda-Agrippino and Rey 2021) and its growing importance over time (Potjagailo and Wolters 2023).

There is also some tendency in emerging markets and developing economies for domestic banks (and in developing economies also nonbanks, meaning local pension funds and insurance

⁹ This definition follows Powell and Valencia (2023). We apply the 80th percentile separately for each of the three country groupings. Defining a single 80th percentile threshold for all countries would not change the results much, since the increase in the debt ratio at the 80th percentile is in fact quite similar across groups (16 percentage points for advanced and developing economies and 15 percentage points for emerging markets).

¹⁰ Not to mention the stark difference between the US and other advanced economies and between China and other emerging markets.

¹¹ Chinese bank lending is counted here as foreign bank lending rather than official lending, which is arguable. While important in certain individual cases, the share of foreign bank lending to emerging market and developing economies is sufficiently small on average that this doesn't alter the essence of the story.

companies) to hold a larger share of government debt. This rising share of banks will not reassure those wary of the diabolic loop (the tendency for sovereign debt problems and banking problems to compound one another). Large bank holdings also create problems for debt restructuring, since forcing losses on banks can create recapitalization costs for taxpayers that more than offset any interest savings, whereas exempting the banks may require severe haircuts of other investors, jeopardizing their cooperation.

Two compositional changes dominate the picture for advanced countries. One is the reduction in the share of government debt held by domestic banks. This reflects developments in Europe, where the Euro Crisis drove home the riskiness of bank holdings of government bonds, causing banks to pare them down and authorities to toughen provisions regulating bank portfolios.¹² The other is the rise in the share of government debt held by central banks. In the case of central banks holding their own governments' bonds, this reflects unconventional monetary policies, the balance-sheet effects of which have been unwound only slowly (if at all). In some cases, Italy for example, the vast majority of net public debt issuance since the end of 2014 has been purchased by the national central bank (see Figure 3). This renders us wary about the impact on spreads and debt sustainability of quantitative tightening (Arnold et al. 2023).

The increase in central bank holdings of advanced-country bonds also reflects the accumulation of reserves by developing countries. This accumulation centered on 2002-15, after which reserve growth slowed or moved into reverse. The share of U.S. Treasury securities held by foreign central banks rose through 2013, after which some de-accumulation took place as central banks expended dollar reserves to support their currencies.¹³ In particular, China's foreign exchange reserves peaked in 2013-14 but then declined with financial-market volatility and capital outflows in 2015. The PBoC remains the single largest holder of foreign exchange reserves, although it has been trimming the share held in U.S. Treasuries.¹⁴ More generally, there has been gradual diversification by central banks away from the dollar, again most visibly since 2015 (Arslanalp, Eichengreen and Simpson-Bell 2022). The run-down of foreign reserves, and growing geopolitical tensions prompting some central banks to contemplate diversification away from dollar reserves, raise questions about whether foreigners will remain an equally important source of demand for U.S. public debt going forward.

There was a push following the Asian financial crisis to develop bond markets in order to diversify the population of investors (and insulate the government's finances from flighty foreigners), while limiting dependence on foreign-currency debt (the Asian crisis having pointed up currency-mismatch problems). Figure 1 confirms some progress in developing domestic bond markets as gauged by the share of debt held by domestic nonbank investors.¹⁵

¹² The recent experience of Silicon Valley Bank is a reminder that this tendency is not universal.

¹³ Tabova and Warnock (2022), using Treasury International Capital (TIC) data, show the share of long-term Treasuries held by the foreign official sector already peaking several years earlier.

¹⁴ China publishes the U.S. dollar share of its reserves with a five-year lag, but independent estimates are that it reduced its holdings of U.S. Treasuries by \$250 billion over the last two years, with the decline accelerating recently and the level now its lowest since 2010 (Slok 2023).

¹⁵ Debt held by nonbank domestic investors (such as domestic bondholders) is different from marketable debt issued under domestic legislation, which can be held by foreign investors. Arslanalp and Tsuda (2014a) show that foreign investors held some 20 percent of countries' local currency bonds (unweighted average), where location of issue and currency of denomination are closely but not perfectly correlated. Powell and Valencia (2023) show that there has not been much change since this article was written.

Figure 4, in contrast, shows the breakdown of government debt (both securities and loans) by currency denomination. Contrary to what is sometimes asserted, little movement is evident in the shares of domestic- and foreign-currency debt, looking across all countries on average. Much has been made of the success of large emerging markets, such as China and India, that issue the entirety of their sovereign debt in their own currencies. The figure confirms that the share of debt in local currency is relatively high for these major emerging markets. But it also confirms that these cases remain exceptions to the rule.

Policymakers have paid special attention to the currency denomination of sovereign debt held by foreign investors. Historically, foreign investors have preferred foreign-currency debt, something that created currency mismatches and financial fragilities for emerging-market sovereigns. Considerable effort has been devoted to solving this problem of “original sin,” as the failure of sovereigns to sell local-currency debt to foreigners is known. Figure 5 shows a measure of original sin, computed as $[1 - (\text{Securities held externally and external loans taken by country } i \text{ in currency } i / \text{Securities held externally and external loans taken by country } i)]$. (To be clear, securities held externally *include* debt issued domestically but held by foreign investors.) Figure 5 suggests that assertions of redemption from original sin are exaggerated.¹⁶ Some readers will find this surprising, but the fact is that significant progress has been limited mainly to larger emerging markets and not shared by the many smaller countries in our global sample.

Two interpretations suggest themselves. First, even if a substantial share of new issues purchased by foreigners are in the local currency, it takes time to transform the outstanding stock. Figure 6 looks at the currency composition of new debt issuance, both domestic and foreign, by year. In major emerging markets, this has risen strongly over the last two decades, from roughly 40 to nearly 80 percent of new issuance. For other emerging markets and low-income countries, however, domestic-currency-denominated securities are typically half or less of new issuance, something that works only slowly to transform the outstanding stock.

The other interpretation focuses on country size and foreign investor appetite.¹⁷ For small countries, the costs of placing domestic-currency bonds with foreign investors (underwriting fees and interest premia, for example) exceed the risk-reduction and other benefits. Foreign investors are slow to add bonds denominated in exotic currencies, given modest diversification benefits and significant information costs. These constraints bind less tightly for large countries. Many emerging markets that have made substantial progress on this front (China, India, Brazil, Indonesia) are notably larger than the median emerging market or developing country.

Ho (2019), Bertaut, Bruno and Shin (2022) and Shin, Onen and von Peter (2023) provide two further reasons for not getting too excited about the trend toward issuing local currency debt. First, that trend has not been continuous. There were sudden stops and reversals in 2015 and 2018-19. These episodes were mainly associated with exchange rate depreciations, which inflict

¹⁶ These estimates of local currency shares are higher than in Eichengreen, Hausmann and Panizza (2022), where the focus is on bonds placed in international markets. Shin, Onen and von Peter (2023) also consider securities held externally regardless of whether issued on local or international markets but do not include other forms of credit to sovereigns. Du and Schreger (2022) focus on a subsample of disproportionately larger emerging markets and find a larger shift toward domestic-currency issuance. Our findings thus highlight the importance of considering the universe of emerging markets before generalizing.

¹⁷ This was the argument in Eichengreen and Hausmann (1999).

capital losses on foreign investors in local-currency bonds. Second, and relatedly, these episodes are a reminder that local currency issuance doesn't eliminate the currency mismatch; it only shifts it from the balance sheet of the sovereign to the balance sheet of foreign investors. In troubled times, foreign investors now suffer the double whammy of losses in local currency (due to higher interest rates) and further losses in dollars (due to local currency depreciation). The result may be more capital flow volatility, not less, given foreign investors' wish to liquidate their positions in advance of such events.

In sum, this global perspective suggests a combination of continuity and change. The most glaring change is the rise in debt ratios since the mid-2000s. The largest absolute and proportional increase is in the advanced economies, where debts have risen from 50 to 85 percent of GDP on average, these countries having made extensive use of their fiscal capacity in response to crises. In emerging markets and developing economies, the absolute and proportional increase is less, from 40 to 60 percent of GDP on average. This should not reassure, however, given these countries' more limited revenue-raising capacity. Meanwhile, private finance has increasingly supplanted official lending.

In terms of continuity, there has been less change in the currency denomination of the debt of the vast majority of sovereigns than popular commentary suggests; in the median country, the foreign-currency share remains on the order of 50 percent. The share of debt held by foreign investors that is denominated in foreign currency is still higher: only a limited number of emerging markets have succeeded in significantly increasing the share of the stock of debt held by external investors that is denominated in their own currency. This suggests that, along with new potential fragilities created by higher debt ratios, preexisting fragilities remain.

4. $r - g$

By now, analysts are used to thinking about " $r - g$," the real-interest-rate-real-growth-rate differential, as a factor in public debt sustainability. The importance of $r - g$ can be gleaned from the familiar equation summarizing the dynamics of the debt-to-GDP ratio:

$$\Delta b = d + (r - g)b_{t-1} + sfa \quad (1)$$

where b is debt as a share of GDP and Δb is its change. The right-hand side is made up of the primary budget deficit (deficit net of interest payments) relative to GDP, denoted d ; $r - g$ interacted here with the inherited debt ratio; and defaults, restructurings, conversions, assumptions by the public sector of private debt, other off-budget spending, and exchange rate effects, denoted sfa for stock-flow adjustment.

The $r - g$ differential is especially convenient for back-of-the-envelope calculations for a country such as the United States with debt in the hands of the public of roughly 100 percent of GDP: in this case it equals the primary budget deficit-to-GDP ratio consistent with a stable debt ratio. At the time of writing, the U.S. 10 year Treasury yield is 4.0 percent, while the CBO's inflation forecast for that horizon is 2.4 percent. If one adopts the CBO's GDP growth forecast of 1.7 percent per annum, then the primary deficit consistent with a stable debt ratio is 0.1 percent of GDP. If one instead assumes that r returns to 0.5 percent, its level before the

pandemic, then the primary deficit consistent with a stable debt ratio is 1.2 percent. For comparison, the primary deficit for calendar year 2023 is projected at 2.9 percent.¹⁸

In projecting a path for r , analysts typically focus on the determinants saving and investment, where the real rate rises and falls to equate the two aggregates. So what should we expect of their determinants going forward?

Studies typically start with the demographic determinants of aggregate savings rates. They generally find that the negative impact of a larger old-age population, whose low savings rates are a prediction of the life-cycle model, is more than offset by the positive impact of increased longevity, which encourages more saving while of working age in order to support more years in retirement (Bloom, Canning and Graham 2003, IMF 2023a). A key point, however, is that these demographic variables are slowly moving. They are unlikely to deliver sharp changes in real interest rates in a short period.

Working in the other direction is the supply of saving from China and other emerging markets (Bernanke's 2005 global savings glut). Since growth in China is slowing, this source of saving should decline.¹⁹ Insofar as China now seeks to rebalance from saving to consumption as part of its "dual circulation" strategy, this movement will be reinforced.²⁰ Although we have seen notable growth collapses (see Hausmann, Rodriguez and Wagner 2006), changes in growth rates in heavily controlled economies such as China's tend to be gradual rather than precipitous. Again, the implication is that such factors are unlikely to produce sharp changes in real interest rates over short horizons.²¹

A guess, then, is that changes in these determinants of global and U.S. savings supply will be gradual, not abrupt. Insofar as they work in opposite directions, they will tend to cancel out.

If forecasting r is hard, then forecasting g is harder. The World Bank projects that global growth will slow to a three-decade low by 2030, reflecting protectionist pressures that limit the growth of international trade, weather-related disasters, and the spread of labor-force ageing to emerging market and developing economies (Kose and Ohnsorge 2023). It posits a slowdown in total factor productivity growth, reflecting a decline in investment rates and the traditional view that TFP growth in developing countries comes packaged with fixed investment (DeLong and

¹⁸ CBO projection for fiscal year 2023. For calendar year 2023 the figure is slightly higher.

¹⁹ This is because China's share of global GDP will not be growing as rapidly as in the past, and because of life-cycle implications for China itself. The life-cycle model predicts high savings rates in fast-growing economies insofar as those currently of working age have higher incomes out of which to save compared to the incomes previously earned by the currently retired, out of which the latter now dissave.

²⁰ Similarly, if energy exporters in the Middle East and elsewhere face less favorable terms of trade as the world shifts toward renewables (as assumed by Kose and Ohnsorge), and if they boost their investment in non-energy-related infrastructure, the other main source of this so-called savings glut will move in the same direction. Saudi Arabia's "Vision 2030" plan, which aims to boost investment in chemicals, information technology, healthcare, life sciences, transportation, logistics, tourism and real estate, is an example of this infrastructure push.

²¹ Global savings will be further affected by the evolution of U.S. household saving. This shot up as a share of personal income during the pandemic, when spending opportunities were in cold storage and households received relief checks. Some observers speculated that, as a result of the economic uncertainties highlighted by COVID, households would permanently increase their precautionary saving. By the end of 2022, however, savings rates had fallen back to below pre-pandemic levels. How much of this reflects a venting of pandemic-era demands as opposed to a return to the pre-pandemic status quo is uncertain.

Summers 1991). As for why investment growth has slowed, the authors point to slower output growth (less investment means less growth, but less growth also means less investment), declining net capital flows (a corollary of slowbalization), and deteriorating terms of trade for traditional energy exporters as other countries shift to renewables.

This view suggests that evolution of the g component of $r-g$, and therefore debt sustainability, will be problematic in countries that depend heavily on trade, that are vulnerable to climate-related shocks, and that have experienced demographic transitions such that the labor force is now expanding more slowly. These factors are likely to weigh on growth, and hence on debt sustainability, in a wide range of countries, in other words.

Those of more optimist bent will point to technical change with the potential of delivering faster productivity growth. Most widely commented upon recently is Generative Artificial Intelligence that uses deep learning and adversarial neural networks to create text, video, computer code and 3D renderings.²² Generative AI has the potential to relieve those in word-intensive occupations of routine tasks, freeing them for more productive work.²³ In the past, such general-purpose technologies have provided a powerful boost to growth. But these growth and productivity effects materialize only with delay, after firms learn how to capitalize on new technologies and reorganize, and as workers acquire new skills. The decade and a half delay between introduction of the first practical office desktop computer, the IBM PC, in 1981 and advent of the “New Economy” (the acceleration of TFP growth starting around 1995) is a familiar example, but there are many precedents (Eichengreen 2015).

This perspective suggests caution before concluding that we will see a boost to productivity growth from this new wave of general-purpose technologies in the time frame relevant to meeting debt-management challenges (over the next decade or so). Even if faster growth materializes more quickly than in the case of earlier GPTs, it will then prompt additional investment, putting upward pressure on real interest rates (following logic in Hamilton et al. 2015), offsetting the positive impact of growth on debt ratios. Another caution is that the impact of these GPTs may be least positive for developing economies whose traditional entry point into sustained economic growth is labor-intensive manufacturing and services. Economies specializing in labor-intensive manufacturing may find it difficult to compete with advanced economies utilizing AI-enabled robotics (Rodrik 2015). Anyone who has had a “conversation” with a chatbot instead of the expected call-center operative in India or the Philippines will know that internationally-traded services are not immune from this pressure.

A high degree of uncertainty thus attaches to any forecast of $r-g$. Our own view is that $r-g$ is likely to move up modestly over the next decade.²⁴ Up because of smaller glut of global savings and the limited immediate productivity impact of new technologies. Modestly because many of the underlying drivers, such as demographics, Chinese growth and the impact of new technology, evolve slowly.

²² One might point also to other developments, such as new materials, genetic editing, and advances in robotics, with the potential to significantly boost economic growth, but Generative AI has attracted particular attention.

²³ See Felten, Raj and Seamans (2023) and Briggs, Kodnani and Pierdomenico (2023), who highlight the impact on the legal profession. Dare one include professors under this “word-intensive” heading?

²⁴ This renders us more pessimistic than the IMF in its April 2023 *World Economic Outlook*, where it projects r as falling back to pre-pandemic levels.

If $r-g$ remains negative, as it has in many countries now for more than a decade, economic growth will erode debt burdens, other things equal. But other things are not equal. They were not equal in the last decade, when budget deficits more than offset the impact of growth. It is to this issue that we now turn.

5. Primary Surpluses

The conventional way of bringing down high public-debt ratios, in addition to hoping for a favorable $r-g$, is by running primary budget surpluses. IMF (2023b) relies on this observation when projecting a consolidation path for heavily-indebted advanced economies.

There are instances in history where governments have succeeded in doing just this. But while the logic is impeccable in an accounting sense, it may be problematic in a political sense, in that the political conditions allowing heavily-indebted governments to run primary budget surpluses for extended periods are not present today.

Eichengreen, El-Ganainy, Esteves and Mitchener (2021) apply eq. 1 above to three 19th century instances of sharp debt reduction: Britain after the French and Napoleonic Wars, the United States after the Civil War, and France after the Franco-Prussian War. In all three cases, wartime exigencies bequeathed heavy debt burdens: Britain's debt ratio approached 200 percent of GDP in the early 1820s; France's approached 100 percent of GDP in the 1870s. U.S. federal government debt was lighter, at some 30 percent of GDP, but this case is still notable for the country having essentially extinguished that debt over the subsequent half-century.

The corresponding decompositions are shown in Table 1.²⁵ Notably, the primary balance *more* than fully accounts for decline in the debt/GDP ratio in all three cases. Britain ran primary surpluses for over nine decades. Those primary surpluses were continuous (though they declined gradually over time, from 6 percent of GDP in the 1820s to 1-2 percent on the eve of World War I), interrupted solely by a modest deficit at the time of the Boer War. The extent of debt reduction is all the more remarkable given how the interest-rate-growth-rate-differential was pushing in the other direction. While assertions of Victorian Britain's economic "failure" are contested (McCloskey 1970), the relevant fact here is that a GDP growth rate of 2 percent fell short of a consol rate of 3 to 4 percent, together with a price level that was virtually the same at the start and end of the period.²⁶

This string of surpluses was made possible by ideology and politics. Ideology refers to the Victorian philosophy of "Sound Finance," which saw a limited role for government in normal times while acknowledging the need to ramp up spending in emergencies. As Campbell (2004, p.9) describes, "'Sound Finance' as a fiscal system was simple but strict: it entailed balanced budgets, increased taxation to help finance exceptional expenditures, reduction of existing debt, and accurate and transparent annual budget statements." It was integral to the fiscal philosophy of both Peel and Gladstone, who emphasized budget surpluses and limited government. Conveniently, there were no costly conflicts between the Napoleonic Wars and the end of the 19th century to strain the fiscal position. Britain's limited wars in South Africa,

²⁵ We calculate the nominal interest rate as debt service relative to debt outstanding.

²⁶ There was also a positive contribution to debt reduction from Chancellor Goschen's 1888 debt conversion, which shows up as the stock-flow adjustment. This was not a restructuring; it was a debt exchange permitted by the bond covenant. It allowed the Chancellor to buy back at par securities trading above that level owing to a fall in interest rates, subject to a year's advance notice and that the transaction was at least £500,000 (Ellison and Scott 2020).

Afghanistan, Egypt and Sudan in the 1880s could be met entirely with increased taxation. Additional spending on the Navy, in preparation for a military conflict closer to home, was financed by increasing taxes on income, beer and spirits. “The taxation response to these shocks and developments provides a telling endorsement of ‘Sound Finance,’ for these revenue requirements were accommodated within the framework of the existing revenue system...” as Campbell puts it.²⁷

Politics refers to the dominance of creditors in Parliament. Property owners – and bondholders – had the vote, whereas the franchise and influence of the working class, whose members might have favored more extensive social spending even if it jeopardized debt reduction, were still limited.²⁸

In the case of the United States, debt reduction was again more than fully achieved by running primary surpluses. It is often assumed that the United States, as a country of immigration with a westward-moving frontier, grew out from under its Civil War-era debt. But while growth was high, interest rates were higher: here too the interest-rate-growth-rate differential contributed negatively to debt reduction.

Even more than in Britain, debt reduction rested on limited government, belief in which flowed from the country’s culture of rugged individualism (Bazzi, Fiszbein and Gebreslisse 2020). Representatives of Southern states, in particular, opposed expansive federal spending, given that the social priorities of the federal government were not their own. Real wages that were high by international standards meant that the median voter’s income was close to that of the wealthy, lessening the pressure for redistributive taxes and transfers (Lindert 1994). Federal government spending remained less than 5 percent of GDP prior to U.S. entry into World War I. The budget provided for a sinking fund to finance retirement of 1 percent of the debt each year. After 1887, the debt was so small that the Treasury found it impossible to put these funds to work without having to go into the market and buy bonds at a premium (Ratchford 1947).

In France, yet again, primary surpluses entirely accounted for the halving of the debt ratio in the decades leading up to World War I. French politicians saw debt retirement as a prudential policy enhancing the country’s capacity to borrow in the event of another German war. They blamed the country’s serial defeats, from the Seven Years War to the Franco-Prussian War, on the weakness of the state’s finances and on its consequent limited ability to borrow, which they now sought to remedy. Although new taxes on income from real estate and securities were imposed in the 1870s, the majority of revenues continued to derive from sales and consumption taxes, whose incidence was regressive (Morgan and Prasad 2009), something that did not deter wealthy French legislators. Meanwhile, spending was restrained until the Moroccan crisis in 1905, which created pressure for additional military outlays. The central government ran primary surpluses in every year from 1896 through 1913. Those surpluses exceeded even British levels in the 1890s, after which they declined, though remaining sufficient for continued debt retirement.

History thus shows that heavy debts can be reduced and even retired by running persistent primary surpluses over long periods of time, as IMF (2023b) imagines today’s

²⁷ Campbell (2004), p.13.

²⁸ This remained the case despite the reform acts of 1832, 1867 and 1884. Even after 1884, 40 percent of men, those not owning land or a home or paying at least £10 of annual rent, were still denied the vote (as were all women).

advanced countries might do. Unfortunately, the economic and political conditions making this possible in the past are no longer present. Nineteenth century debt retirement preceded the rise of social spending and its competing claims on the government's resources. The franchise today is no longer limited to creditors, so those claims are more intense. The need to devote revenues to defense spending rather than debt retirement is back with a vengeance. Governments will have to devote yet additional revenues to meeting the existential crisis of climate change.

Eichengreen and Panizza (2016) enumerated large and persistent primary surplus episodes, of the sort foreseen by IMF (2023b). Their finding, for 54 advanced and emerging-market economies between 1973 and 2013, was of few such episodes. Of 235 nonoverlapping five-year periods in the dataset, there were just 36 five-year nonoverlapping episodes with an average primary surplus of at least 3 percent of GDP (15 percent of the sample), 18 five-year episodes with an average primary surplus of at least 4 percent of GDP (8 percent of the sample) and 12 five-year episodes with an average primary surplus of at least 5 percent of GDP (5 percent of the sample).²⁹ Ten-year episodes are still rarer: there were 5 episodes with an average primary surplus of at least 4 percent of GDP (5 percent of the sample) and 3 episodes with an average primary surplus of at least 5 percent of GDP (about 2.5 percent of the sample).

We updated these tabulations using an additional decade of data (through 2021). Table 2 shows the result for 5-year episodes.³⁰ The only additions are Norway, which regularly runs surpluses in order to put aside for future generations revenues from oil and gas extraction; Greece after 2015, which just qualifies at the 3 percent level and whose exceptional fiscal crisis is well known; and Iceland starting in 2014, where debt exploded with the 2008-9 banking crisis and whose new government committed to debt reduction once that crisis was finally under control. The role of exceptional circumstances is clear.

In that earlier work, we similarly found just three episodes of nonoverlapping 10-year periods of 5 percent primary surpluses: Norway after 1999 (when it was salting away oil and gas revenues in its sovereign wealth fund), Singapore after 1990 (with its strong technocratic government and exposed geopolitical position), and Belgium after 1995 (which despite high inherited debt was desperate to qualify as a founding member of the Euro Area). Extending the dataset yields only one additional case: Norway after 2010. The previous conclusion again applies.

Eichengreen and Panizza reported regressions analyzing the economic and political determinants of the likelihood of observing a five-year episode with a primary surplus of at least 3 percent of GDP. We re-estimated those regressions using our updated data set, winnowing down those long lists of independent variables using the general-to-specific methodology described by Clarke (2014).

The results are similar to those in this earlier study. The most economically important and statistically significant political variable is divided government, which reduces the likelihood of observing a sustained primary surplus, and the rate of GDP growth, which increases that likelihood. Intuitively, divided government makes agreement on sustained policy adjustments

²⁹ The categorization allows for one-year deviations from the surplus threshold specified.

³⁰ There are a few slight differences from the earlier tabulation owing to subsequent revisions of the WEO database.

more difficult, while fast growth facilitates such adjustments.³¹ Given the outlook for these variables, we are skeptical about the scope for large sustained primary surpluses.

6. Financial Repression

Another option is financial repression – using interest-rate caps and related policies to lower the r component of $r-g$.

The third quarter of the 20th century is widely cited as illustrating the power of such policies. Advanced economies emerged from World War II heavily burdened by debt. In the subsequent period, central banks, many of which were not independent of governments, pursued policies capping Treasury bill and bond prices. Other authorities placed regulatory limits on interest rates on alternative financial vehicles, such as bank accounts, driving savings toward bonds. Together, these policies prevented interest rates on public debt securities from rising to levels commensurate with inflation. This turned r negative, allowing inflation to erode the real value of debt.

Table 3, again from Eichengreen, El-Ganainy, Esteves and Mitchener (2021), shows that the full story is more complicated. It focuses large debt reductions in the advanced countries, where large debt reductions are defined as episodes when the debt/GDP ratio fell by at least 10 percentage points. In fact, a quarter to a third of the debt reduction achieved in this period was attributable to primary surpluses, not to financial repression. Contrary to popular presumption, the gospel of Keynesian was not widespread; there was only limited resort to countercyclical deficit spending.³² Recessions were few and mild relative to the preceding and succeeding periods, limiting the tendency for revenues to fall in recessions and for deficits to emerge.

To be sure, a negative $r-g$ accounts for the lion's share of debt reduction. But real interest rates were sharply negative only in 1951, when inflation rose briefly to an average of 15 percent in this sample of countries, reflecting the monetary and fiscal imperatives of the Korean War.³³ Otherwise, real interest rates on public debt were at or only slightly below zero. The interest-rate-growth rate differential contributed importantly to debt reduction not simply because real rates were sharply negative but because economic growth was fast, averaging 4 ½ percent (real) across the advanced-country world.³⁴ Fast growth is the painless way of solving debt problems. Unfortunately, such high growth rates in the advanced countries are not in the cards today.

³¹ Other significant political variables are the magnitude of electoral districts (which affects the likelihood of observing a surplus episode negatively), democracy and proportional representation (both of which affect it positively). Intuitively, policymakers are more accountable in democracies but less accountable when district magnitudes are large. Proportional representation electoral systems make for encompassing coalitions in which the burden of adjustment is shared. Other significant economic variables are high debt/GDP ratios and current account surpluses, which affect the likelihood of sustained consolidation positively. Intuitively, current account surpluses (high savings) makes the maintenance of surpluses easier, while heavy debts make consolidation more urgent.

³² Since countercyclical fiscal policy was used most actively in the United States, that the literature on macroeconomic policy in this period is disproportionately a literature on the United States may have skewed views (Eichengreen 2007, p.28 and passim).

³³ This refers to the same set of countries as in Table 2.

³⁴ Explanations for this rapid growth are not lacking, though authors vary in the weights attached to, inter alia, the backlog of high-return investment opportunities left over from the Great Depression and world wars, favorable demographics, and a social compact to go for growth. See Crafts (1995), Eichengreen (1996), and Temin (2002).

A repeat of the other factors making for a strongly negative real interest rate similarly strikes us as unlikely. In the U.S., the authorities imposed Regulation Q interest rate ceilings on bank deposits, redirecting savings toward bonds.³⁵ Regulation Q ceilings, it is safe to say, are not coming back. Financial deregulation and development, and more recently the rise of crypto and fintech, have made available a much wider range of financial instruments than existed in the 1950s and 1960s. Forcing funds out of bank accounts will no longer automatically force them into bonds.

Through March 1951 the Fed capped interest rates on Treasury bills at 3/8 percent and on Treasury bonds at 2 ½ percent, responding to wartime requests of the Treasury. But the central bank could not simultaneously control both interest rates on Treasury securities and inflation once wartime price controls were lifted. Consumer price inflation consequently ran at 17.6 percent between mid-1946 and mid-1947 and then at 9.5 percent between mid-1947 and mid-1948. It turned negative with the onset of recession in 1949, but then soared to 21 percent annualized in February 1951. These violent price-level oscillations led the Fed to campaign for abandonment of its commitment to cap interest rates, culminating in the Treasury-Fed Accord of 1951 (Eichengreen and Garber 1991).

In sum, the policy of capping interest rates on Treasury securities after World War II reflected a constellation of factors that is highly unlikely for the foreseeable future. Central bank independence is less than absolute, but it greater today than during the war and its aftermath. The Fed, Treasury, and broader investing public would not accept policies that caused inflation to oscillate from +17 percent to -2 percent to +21 percent.³⁶ These conclusions apply not just to the U.S. but to the advanced countries as a group.³⁷

7. Inflation

Alternatively, central banks could engineer higher rates of inflation with the goal of reducing the real value of the debt. As shown in Figure 1, the inflation and growth rebound of 2020-21 reduced the debt/GDP ratio in the U.S. and worldwide by roughly 5 percentage points. When r in eq. 1 above is decomposed into the difference between the nominal interest rate and inflation, the arithmetic impact of the latter on the debt ratio in the U.S. and worldwide “accounts” for the entirety of the decline in the debt ratio in these two years.³⁸

Has this strategy also worked in the past? How long before interest rates respond to inflation, eliminating any favorable impact on the debt ratio? The literature on the impact of inflation on debt reaches a consensus on several points. Moderate inflation has only a modest impact on the debt ratio; any favorable impact via the increase in seigniorage revenues and the

³⁵ Regulation Q was adopted in 1933 in response to the belief that competition for deposits contributed to Depression-era banking problems. It was phased out in 1981-86, although the creation of NOW Accounts in the 1960s had already eroded its effectiveness.

³⁶ Among other things, such policies would not be supportive of the dollar’s international-currency role.

³⁷ There may be more scope for such policies in emerging markets and developing countries, where interest rate regulation and capital controls are more prevalent. The fact that emerging markets and developing countries have on average reduced their foreign currency exposures (as noted above) may make it easier to implement such policies. But other factors eroding their effectiveness, such as the proliferation of alternative assets, apply in these countries as well.

³⁸ Meaning that the impact of the rebound in growth is almost exactly offset by the increase in debt issuance. “Arithmetic impact” and “accounts” indicate that we have not yet provided for changes in interest rates and maturities.

GDP deflator tends to be offset by higher interest rates and the negative impact of inflation on economic growth. While the first (favorable) effects dominate on impact, the second (unfavorable) effects take over after two or three years. On balance, these effects are small and by most measures statistically insignificant. Only unanticipated inflation is significant. An inflation surprise has to be large to make a serious dent in the debt ratio.

Thus, Bernardini et al. (2022) examine 30 episodes of large reductions in debt-to-GDP ratios in the advanced countries since World War II. They identify six episodes in which inflation played an important role in debt reduction (four Western European countries and Japan immediately after the war, and Israel after 1984). In all of these cases inflation averaged in the mid-double digits or even triple-digits. They also identify 10 cases in the 1950s and 1960s where inflation played a subsidiary role.³⁹ But in all of these episodes, interest rate caps, capital controls and other measures of financial repression were also in place, accentuating the effect of inflation.

Eichengreen and Esteves (2022) assemble an unbalanced panel of countries for which fiscal data are available back to 1800, tabulating the frequency of major debt consolidations. They do not find a uniformly positive association of inflation with debt consolidation. Countries undergoing consolidations did not experience higher inflation than their peers. In periods when inflation was relatively high and persistent, interest payments rose sufficiently to offset any positive contribution of inflation to debt reduction.

Garcia-Macia (2022) estimates the effect of inflation on the debt ratio using fixed-effects OLS regressions, local projections, and annual data for 85 advanced and emerging market economies and quarterly data for 28 advanced countries (starting in 1962 and 1992 respectively). Focusing on the post-1992 period permits the author to distinguish expected from surprise inflation, where the inflation surprise is measured as the difference between the *World Economic Outlook* inflation forecast and the actual outturn. Only surprise inflation has a significant impact on the debt ratio. A one percent surprise increase in the GDP deflator lowers the debt ratio by one percent of GDP after one year in high-debt countries (where the initial debt ratio exceeds 50 percent), and by roughly a quarter of a percent of GDP in low debt countries (where the ratio is below 50 percent). Fukunaga, Komatsuzaki and Matsuoka (2022) similarly use data from 1997 through 2017 for 19 advanced economies to estimate impulse-responses to inflation shocks. Their results suggest that a temporary one percentage point inflation shock reduces the debt-to-GDP ratio by one percentage point on impact and that this effect persists. Again, this is the effect of unanticipated inflation, measured as the residual from an estimated Phillips Curve equation and alternatively (as in Garcia-Macia) as the difference between realized inflation and *World Economic Outlook* inflation forecasts. Effects are larger for the subset of countries with relatively long debt maturities. (The analysis makes no provision for maturities to respond.)

Other studies focus on specific countries. For example, Cherif and Hasanov (2018) use time-series methods to analyze the response of the debt ratio to inflation in the post-World War II United States. They find that an inflation shock reduces the debt-to-GDP ratio on impact but that the debt ratio begins rising again after 4 quarters, as interest rates and other variables adjust. After 10 quarters the debt impulse becomes statistically insignificant, and the debt ratio returns to its pre-shock path.

³⁹ Most of these are the same as those in Table 3 above.

A key determinant of the impact of inflation on the debt ratio is the maturity structure of the debt. The greater the short-term share, the smaller the impact of an inflation shock. We can see this by rewriting eq. 1 above expressing the interest rate and growth rate in nominal terms:

$$\Delta b = d + ([r + \pi] - [g + \pi])b_{t-1} + sfa \quad (2)$$

where π denotes inflation and separating b_{t-1} into short-term debt, preexisting long-term debt and newly-issued long-term debt. The interest rate on short-term and newly-issued long-term debt will incorporate the inflation shock, but the cost of servicing preexisting long-term debt will not. Following Fukunaga, Komatsuzaki and Matsuoka (2022), we initially assume no changes in the term structure of the debt, the primary balance or growth rate as a result of the inflation shock. These assumptions allow us to simulate the impact of the shock on the debt ratio.

Figure 7 shows the result for the United States when we adopt *World Economic Outlook* forecasts for d , r and g . A one-time 1 percentage point inflation shock has a less than 1 percentage point impact on the debt ratio, given that short-term and newly issued debt are roughly a quarter of total debt. A permanent inflation shock has larger effects that cumulate over time, given the assumption of no changes in maturity composition. Again, however, these effects are small.⁴⁰ Table 4 summarizes analogous calculations for the G20 countries. Magnitudes vary with initial debt ratios and differences in maturity composition but tend to be small across the board.

These estimates are also upper bounds on the effect of inflation (especially those for the permanent increase inflation), since in practice higher inflation will induce a shortening of maturities.⁴¹ We can allow for the endogenous response of maturities and other variables by estimating vector autogressions on the Eichengreen-Esteves data set and using local projections to simulate the impact on the debt ratio of a one standard deviation shock to the GDP deflator.⁴² The result is a decline in the debt ratio on impact but then a rise (relative to baseline), where this rise becomes evident after three years. But these responses are insignificantly different from zero, consistent with the bulk of the literature just reviewed.⁴³

This analysis thus points to limited scope for reducing today's high debt ratios via inflation, given the absence of restrictions on interest rates and capital flows. To exert a significant impact, inflation must be substantial. But in most countries there would be strong political opposition to substantial inflation. It would also have to be a surprise (as it was, to

⁴⁰ Hilscher, Raviv and Reis (2022) emphasize a related point working in the same direction, namely that the private sector holds a disproportionate share of short-term debt and few long maturities. Consequently, inflation would have to be very high to significantly erode the real value of debt held by the private sector. Using options-market data for the U.S., the authors conclude that a decline in the debt-to-GDP ratio of more than 4 percent due to surprise inflation is perceived by investors as having a probability of less than 1 percent.

⁴¹ Insofar as higher inflation widens the budget deficit owing to the Tanzi effect and worsens growth performance, endogenizing these other variables works in the same direction.

⁴² Control variables are the primary balance, effective interest rate (interest expense/previous year's debt), and real growth. Lags of three periods are used in estimation. The sample includes 134 economies and, where available, a time horizon spanning 1800 to 2019.

⁴³ This (non)result is robust: the overall response and its insignificance are unchanged when we drop small states with a population of less than 1 million, restrict the time period to post-1962, and focus on the subset of country observations with debt-to-GDP ratios above 50 percent.

most, in 2020-21).⁴⁴ But once the tactic was tried, surprises would become increasingly difficult to engineer.⁴⁵

A final point. Relying on surprise inflation to bring down public debts may have adverse financial stability implications. We saw an example in the case of Silicon Valley Bank, which was caught by surprise by inflation and associated interest rate increases and suffered large losses (some unrealized) on its Treasury bond portfolio.⁴⁶ In addition, inflation can impose losses on central banks that have engaged in quantitative easing and acquired large government bond portfolios (again, see e.g. Hilscher, Raviv and Reis 2022). If the fiscal authority is forced to recapitalize such banks, any favorable impact of inflation on public debt will be correspondingly reduced.⁴⁷

8. Safety in Numbers

A silver lining of the additional stock of government debt in the hands of the public may be to relieve the global safe-asset shortage that has contributed to high prices and low yields on advanced-country sovereign bonds in recent years (Ferreira and Shousha 2020). Additional debt issuance may attenuate this problem and also address its negative consequences, including low interest rates on safe assets, limited scope for active use of conventional monetary policy in downturns, and the danger of becoming stuck at the zero lower bound.

Safe assets are simple debt instruments that preserve their value during negative events (Caballero, Farhi and Gourinchas 2017). The ability of a country to serve as a source of safe assets depends on the fiscal capacity of its sovereign, which determines its ability to service its obligations, but also on the commitment of the government and central bank to the maintenance of price and exchange rate stability. There has been some discussion of the capacity of the private sector to produce safe assets, mainly in the 1990s when observers had reason to contemplate the possible disappearance of U.S. Treasury securities. Most observers concluded then that private-label securities lack the simplicity and value-preserving qualities of public debt (see the discussion in Gorton and Ordonez 2022).⁴⁸

There is no consensus on exactly which government debt securities are regarded as safe by central bank reserve managers and other investors. Eichengreen and Gros (2020) focus on AAA-rated government bonds, subtracting from total issuance that portion held by the issuing country's central bank. Figure 8 reports updated calculations following this convention. It shows that safe assets so defined rose following the Global Financial Crisis and again with the

⁴⁴ This point is implicit in our eq. 2, where expected inflation affects the nominal interest rate paid on debt (the first π) but realized inflation (whether expected or not) that determines nominal GDP growth and thus the denominator of the debt ratio (the second π).

⁴⁵ Garcia-Murcia (2022) compares periods before and after the Great Moderation, finding that the response of debt to inflation was smaller and less persistent in the earlier period, when inflation surges were more common and investors were presumably less surprised.

⁴⁶ This is another manifestation of the “diabolic loop” linking debt problems and banking-sector problems, as referred to above.

⁴⁷ There is less than full agreement on the costs of low or negative central bank capital. One view is that these costs are negligible, as demonstrated by the experience of central banks that have successfully operated with negative capital. Another is that central banks without adequate capital may hesitate to raise interest rates for fearing of incurring additional losses, or be reluctant to engage in last-resort lending for fear of not being paid back.

⁴⁸ The Subprime Crisis, in which AAA-rated securitized instruments supplied by the financial industry were abruptly downgraded, then drove a stake through the heart of this private-label safe-asset story.

onset of COVID; the positive effect of additional issuance more than offset any negative effect of associated rating-agency downgrades.⁴⁹ In 2022, this ratio then fell, reflecting declining bond valuations due to higher interest rates.

We know from theory (Caballero and Farhi 2017) and history (Reinhart 2002) that the relationship between issuance and downgrades (for present purposes, between additional issuance and loss of safe-asset status) is nonlinear: high-quality issuers can continue to issue safe assets until their safe-asset status is abruptly lost. The fact that additional public debt issuance has been a positive in relieving the global safe-asset shortage up until now is no guarantee that the same will be true in the future, especially if we are entering a higher interest rate environment that poses greater challenges for prompt and reliable debt-service payments.

A complication is that some central banks also hold bonds of governments not enjoying AAA ratings. Cases in point are bonds of the UK and Japan, countries that are issuers of the third and fourth most important reserve currencies by value, which once enjoyed AAA ratings but no more.⁵⁰ Central banks are also diversifying away from traditional reserve currencies and in favor of new alternatives (Arslanalp, Eichengreen and Simpson-Bell 2022). The leading alternative, the renminbi (China currently being rated A+ by S&P and Fitch and A1 by Moody's), accounts for 2.7 percent of allocated foreign exchange reserves worldwide as of end-2022. But several other nontraditional reserve currencies, such as the Australian dollar, Canadian dollar, and Korean won, also increasingly feature in central bank portfolios. When we include as safe assets these additional currencies that are increasingly prominent in central bank reserve portfolios, the supply of the former increases even more sharply following the global financial crisis and again with the onset of COVID-19.

Whether central bank reserve managers, along with corporate treasurers and others, holding the bonds of these governments with sub-AAA ratings regard them as safe is of course an open question. It could be that they have a more positive assessment than the rating agencies of the issuers' financial prospects. Alternatively, it may be that because the investment tranche of central reserve portfolios has grown relative to the liquidity tranche, reserve managers are more comfortable allocating a portion of that investment tranche to riskier, higher-yielding securities.⁵¹ In addition, some central banks may have been shifting the composition of their reserve portfolios toward currencies such as the renminbi in response to pressure from Beijing to appear supportive of China's renminbi-internationalization drive, or in response to the risk of financial sanctions such as those imposed by the G7+ countries on Russia. In the Russian case, there is no question that sanctions have dramatically changed the definition of what assets are

⁴⁹ We classify governments as AAA when they receive this rating from at least one Big 3 rating agency. 12 countries have AAA ratings from at least one of the three major rating agencies: Australia, Canada, Denmark, Germany, Luxembourg, Netherlands, New Zealand, Norway, Singapore, Sweden, Switzerland and United States. For these purposes we follow convention by adding U.S. GSE debt obligations. Though one can ask whether the extension of Federal Deposit Insurance Corporation insurance to all deposits of Silicon Valley Bank sets a precedent that renders all U.S. bank liabilities safe assets, we do not pursue this avenue here.

⁵⁰ Sterling and the yen each account for roughly 5 percent of allocated reserves.

⁵¹ Yet another qualification to the standard view that central banks hold their reserves *in the form* of safe assets questions whether central banks hold reserves because they *demand* safe assets (for intervention and related self-insurance purposes). Reserve accumulation may instead reflect the desire to keep exchange rates down and current account surpluses up (Aizenman and Lee 2007). In this view, real interest rates are low not because of an excess demand for safe assets but because of the "global savings glut" that manifests itself in those surpluses.

regarded as safe, and that this has been accompanied by a sharp shift in the composition of the Bank of Russia’s portfolio from dollars to renminbi.

By how much will the increase in the supply of safe assets affect safe real interest rates? Using data for a sample of 11 advanced economies, Ferreira and Shousha (2021) find that changes in the net supply of safe assets account for a third of the variance of neutral real rates since the 1960s. According to their estimates, larger net safe asset supply between the 2008 financial crisis and the first half of 2020 (that is, before the full impact of the COVID crisis on debt issuance was felt) raised neutral real rates by nearly 1.5 percentage points. Extrapolating to COVID-era experience, their model suggests that the rise in safe asset supply between 2019Q4 and 2022Q4 raised neutral real rates by an additional 80 basis points, holding other factors constant.⁵²

Whether this increase in the supply of safe assets ends up raising equilibrium interest rates on such securities depends also, of course, on the evolution of demand. Previous analyses of the demand for safe assets focuses on demand from central banks and governments. While not neglecting this aspect, we highlight also demand from the private sector, which is equally important quantitatively.

IMF (2021) estimates that global foreign exchange reserves will have to increase by \$1.1 trillion to \$1.9 trillion over the next five years to remain adequate for intervention and other precautions.⁵³ \$1.1 trillion to \$1.9 trillion was 1.1 percent to 2.0 percent of world GDP in current U.S. dollars at the time of the Fund’s analysis. Figure 8 shows that additional safe asset issuance since the outbreak of COVID-19 meets this five-year need several times over.⁵⁴ The conclusion that recent events in the public-debt sphere are likely to at least help to address the problem of safe asset scarcity remains intact even given that the demand for foreign exchange reserves may continue to grow.

But the price of safe assets such as U.S. Treasury bonds also depends on private demand, as noted. Financial institutions demand Treasuries as collateral for loans. Investors trade them in preference to private-label securities because they create less fear of adverse selection. They regard them as liquid because they are eligible for central banks’ repo operations. Individuals hold them because they provide insurance – because they are readily sold in the event of a negative idiosyncratic shock. These are among the reasons why the quintessential safe asset, the U.S. Treasury bond, bears a convenience yield as captured by the yield differential between actual and synthetic Treasuries.⁵⁵

Our calculations of the global private demand for safe assets (the broad definition in Figure 8) in 100 countries (countries other than those issuing the safe assets in question) puts this at \$6 trillion in 2021. Regressing this private demand at the country level on country GDP and its volatility and on global policy uncertainty, we estimate that one can expect to see another \$2 trillion of demand from this source by 2026 (assuming that the explanatory variables continue to

⁵² These calculations (by the present authors) are based on the narrower of the two definitions of safe assets above.

⁵³ This figures rise to \$2.1 trillion and \$3.1 trillion, respectively, when one looks 10 years out.

⁵⁴ These are the Fund’s “lower bound” and “upper bound” estimates, respectively.

⁵⁵ This is true regardless of whether the synthetic analog is measured as a basket of foreign treasury bonds of comparable duration with currency risk hedged out (Krisnamuthy and Lustig 2019), or by a basket of high-grade dollar-denominated corporate bonds (del Negro et al. 2017).

behave as in recent years).⁵⁶ Notice that this roughly matches the IMF's estimates of the increase in public-sector demand over the period. This puts the total increase in safe assets at 3.2 percent to 4.0 percent of world GDP in current U.S. dollars. On our broad definition of global safe assets in Figure 8, the increase in supply more than satisfies this demand.

Working in the other direction, Del Negro et al. (2017) argue, is the fact that the convenience yield on safe assets has risen by as much as 100 basis points since the turn of the century, given how the world has become a riskier economic, financial and political place. One can imagine the world becoming riskier still, causing investors to attach even greater importance to the insurance services of U.S. Treasuries and other safe assets, further enhancing their convenience yield. This would put downward pressure on the associated interest rate, moderating the upward pressure associated with increased public-debt supply.

This assumes of course that safe assets continue to be regarded as safe – that the factors underlying prevailing convenience yields remain intact. As Brunnermeier, Merkel and Sannikov (2022) observe, this status is not assured. The insurance value of U.S. Treasuries derives from the fact that the market is liquid – that Treasuries can be sold to other investors who value the service flows they provide in the event of an idiosyncratic shock. If some investors shun these assets, reducing the liquidity of the market, others will have incentive to do likewise. This equilibrium is fragile, in other words.

Relatedly, there is the possibility that safe assets could be re-rated as unsafe owing to the issuer's recourse to financial sanctions. This topic has been much discussed in connection with so-called weaponization of the dollar, although it is not the subject of our paper. Elsewhere we have examined the impact of financial sanctions on the composition of central bank reserve portfolios.⁵⁷ There is no evidence in the data of a significant decline in the share of foreign exchange reserves held in dollars by countries targeted by U.S. sanctions, partly because of a dearth of attractive alternatives, and partly because when imposing sanctions the U.S. has coordinated with other reserve-issuing countries. There is some evidence of countries targeted by sanctions increasing the share of their reserves held in gold, though this effect is small. Given the shock of sanctions on the Bank of Russia (specifically, the fact that the U.S. and cooperating countries chose to disregard the 2004 United Nations Convention on Jurisdictional Immunities of States and their Property), central banks and governments could reevaluate the safety of holding their reserves in the form of, inter alia, U.S. Treasuries. Given coordination across countries and the lack of alternatives, we think that any movement away from the dollar will be minor, leaving aside countries such as Russia in extreme circumstances. Countries in Russia's circumstances are not large and important enough, relative to the international financial system, to change our conclusions.

9. Debt Restructuring

⁵⁶ The dependent variable and the global policy uncertainty index are both entered in logs. A representative regression is $\ln(\text{Privately Held Safe Assets}) = -3.69 + 1.08 \cdot \ln \text{GDP} + 0.02 \cdot (\text{volatility of GDP}) + 0.20 \cdot \ln(\text{Global Economic Policy Uncertainty})$, where all coefficients are significantly different from zero at the 99 percent confidence level. Thus, 1 percent growth in GDP translates into a 1.08 percent increase in private demand for safe assets. The sample is annual data for 96 countries during 2000-21.

⁵⁷ See Arslanalp, Eichengreen and Simpson-Bell (2022, 2023).

A final approach to consolidation is debt restructuring. Multiple countries with burdens of questionable sustainability have brought down their debts in this way.⁵⁸ Currently, the debts of scores of financially troubled countries are unsustainable. The economic and financial fallout from the COVID crisis was severe, and there is a long history of global shocks giving rise to debt crises affecting multiple countries simultaneously (Eichengreen 1991, Mitchener and Trebesch 2021).

Reducing those burdens, together with appropriate policy reforms, is necessary to remove debt overhangs that limit capital-market access and act as a tax on growth. The question is how to facilitate their removal. One wants to avoid making restructuring too easy, since doing so would render investors reluctant to lend and deny developing economies external finance. Equally, however, one wants to avoid making restructuring too hard, since doing so delays the restoration of market access and growth.

There is reason to think that recent changes on balance have moved the process further in the “too hard” direction. Restructuring involves a coordination problem: no creditor is prepared to offer concessions without assurance that other creditors are prepared to follow suit. The move from bilateral to market-based lending, together with the shift from bank to securitized finance, has made such coordination more difficult. Debt of developing economies to private creditors, principally bondholders, has grown by factor of seven in the last ten years. Those creditors are more numerous and diverse. Some may be tempted to rush to the courthouse rather than the bargaining table, particularly when they hold bonds without collective action or aggregation clauses. The share of the external obligations of developing economies owed to members of the Paris Club, where intergovernmental debts are discussed and restructured, has fallen from 28 percent in 2006 to 10 percent today. China’s emergence as a major bilateral creditor that is not a Paris Club member has made renegotiation of even these bilateral loans more complex.⁵⁹ Not being a member exempts China from the obligation of accepting Paris Club principles, such as information sharing and comparable treatment of creditors.⁶⁰ Lack of transparency and full accounting of outstanding public debt obligations to China and other creditors has made it more difficult for the parties to know that they are getting a square deal. Finally, the seniority and effective exemption of multilaterals from restructuring agreements has been challenged by some countries.

The G20 Common Framework for Debt Treatments agreed in November 2020 was intended to address these issues. Developing economies would be eligible for restructuring, and new official creditors would participate in a process akin to the Paris Club organized under G20 aegis. The framework stipulated further that private creditors should provide relief on terms comparable to that provided by official creditors, albeit without offering specifics on how this

⁵⁸ Critics will caution, rightly, that not all debts brought down in this way have stayed down. For low-income countries in this position, restructuring may be necessary but not sufficient for restoring debt sustainability (Arslanalp and Henry 2006).

⁵⁹ While China is the leading such country (holding 52 percent of the total official claims of all Common-Framework-eligible countries), there are also other new bilateral lenders, such as India, South Africa and Saudi Arabia, that are not members of the Paris Club. Collectively such countries hold some 60 percent of developing economies’ bilateral external debt.

⁶⁰ To address this issue, the IMF, World Bank and Indian G20 Presidency organized a Global Sovereign Debt Roundtable as a more encompassing venue for discussing restructuring standards and processes.

might be achieved. Private creditors have not exactly rushed, however, to volunteer their cooperation.

Going on three years since the Common Framework was agreed, only four countries, Chad, Zambia, Ghana and Ethiopia, have applied for relief, and only the first three have reached agreements.⁶¹ Evidently, many candidates are deterred by fear of sending a negative signal to the markets while receiving little if anything in return.

The Common Framework thus needs to be strengthened and supplemented by other measures to facilitate restructuring. The framework applies only to developing economies; it could be extended to emerging markets in debt distress.⁶² Countries applying for relief could be expected to impose an immediate freeze on debt-service payments so that they benefit upfront and focus the minds of private creditors.⁶³ This is in contrast to current practice, under which applicants are expected to continue making interest payments until final agreement is reached. For a freeze to be feasible, however, governments applying for relief through the framework would have to have statutory protection from asset seizures by national courts.⁶⁴ Since a freeze would presumably also lead to a determination that the country was in default and trigger acceleration of its bonds, such legislation would also have to override those contractual provisions.

Ahmed and Brown (2022) suggest that the IMF should proactively assess the amount of relief appropriate for each country eligible under the Common Framework and present the findings to its members. Its assessments need not wait on application from the governments of the eligible countries, and their availability would apply additional pressure for creditors to come to the bargaining table. The assumptions underlying these assessments as well as the bottom line haircut should be shared with the creditors so they know not only what is being asked of them but why.⁶⁵ Some will object that blunt assessments risk precipitating the kind of crisis and loss of capital market access that the IMF seeks to avert. But the IMF already publishes debt sustainability analyses in connection with its regular Article IV reviews (for low-income countries, these are conducted jointly with the World Bank). In any case, the majority of eligible countries have already lost market access in advance of negotiations, so interrupting existing access is a non-issue.

Adequate debt sustainability and relief assessments require adequate data. External bank loans containing confidentiality clauses impeding its provision are pervasive in the foreign loans of Chinese policy banks (Horn, Reinhart and Trebesch 2021, Gelpern et al. 2022); these should be discouraged by the international community. Collateralized loans are often not reported in debt statistics when contracted by state-owned enterprises and special purpose vehicles (Di Marchi 2022). In 2021, the OECD launched a Debt Transparency Initiative to assemble more complete information on private sector loans and investments in low-income countries (OECD

⁶¹ Ethiopia is the remaining case. In Ghana and Zambia, negotiations with private creditors have not been finalized at the time of writing, which again points up the lengthy nature of the process.

⁶² Sri Lanka springs to mind as an example.

⁶³ Ramos et al. (2023) suggest a coordinated freeze on a portion of the payments of the 60-some countries in debt distress, up to prescribed limits. A more modest approach would apply such a freeze on a country-by-country basis as individual governments apply to the Common Framework.

⁶⁴ Suggestions to this effect have been made by the IMF and World Bank, but no action has been taken.

⁶⁵ In response to requests by creditors, the Fund and Bank have moved to share the underlying information and assumptions of their debt sustainability analyses more widely.

2022). Few private creditors have participated to date. Creditor-country governments could therefore make this a regulatory requirement for financial institutions. China has insisted in the past that its Big 4 banks, which are major lenders to foreign sovereigns, are commercial institutions rather than arms of government. If so, they should be subject to this transparency requirement.

To discourage free riding and a rush to the courthouse, the vast majority of newly-issued debt securities of emerging markets and developing countries include collective action clauses (CACs), which prevent minority creditors from holding up restructuring agreements in the effort to be bought out on more favorable terms.⁶⁶ Some bonds also include aggregation clauses, where voting is aggregated across bond issues. But other instruments such as syndicated loans and foreign-law-governed sub-sovereign bonds typically do not include CACs; these should be added where they are absent.⁶⁷ Additional creditor countries can adopt anti-vulture-fund legislation along the lines implemented by the United Kingdom, Belgium and France.⁶⁸ At the multilateral level, it would be possible to immunize foreign assets of eligible countries from creditor attachment by adopting a United Nations resolution, as was done for Iraq in 2003.⁶⁹ But international agreement on a UN resolution, including both terms and eligibility, would be a heavy lift. National legislation is more practical, although it leaves the danger that creditors will attempt to attach assets outside the jurisdiction of the borrower.

As an incentive for investors, Lazard (2023) proposes a “Value Recovery Instrument,” under which payments on restructured debt would be indexed to economic performance. Zambia’s agreement under the Common Framework appears to include provisions to this effect. Ramos et al. (2023) suggest credit enhancements along the lines of the Brady Plan debt exchange. Brady Plan haircuts averaged 35 percent, but the principal of the new bonds was fully collateralized by a guarantee fund of U.S. zero-coupon Treasury bonds. Looking at a broader range of restructurings, Meyer, Reinhart and Trebesch (2022) find that historical haircuts average 39 percent. Ramos et al. (2023) estimate that, after applying a 39 percent haircut to the debt of 61 distressed countries, an equivalent guarantee fund would require \$62 billion of assets, which could be funded using Special Drawing Rights or other means.⁷⁰

Debts to multilaterals, such as the IMF and World Bank, are de facto senior, meaning that they are exempt from restructuring. This is justified on the grounds that their loans are already extended at concessional (low) interest rates and that multilaterals lend where other lenders are fear to tread. The share of external debt owed to multilaterals is roughly half the developing economy total; for some 20 developing economies it is as much as two thirds (Zettlemeyer 2023). Exempting the multilaterals means that the same debt relief would require more drastic

⁶⁶ There is, however, a stock of older sovereign bonds still in the market that lack such contractual provisions. IMF (2020) reported that this legacy share amounted to roughly 50 percent of the outstanding stock as of three years ago.

⁶⁷ More ambitiously, one can also imagine clauses that aggregate bonds, bank loans and other instruments.

⁶⁸ See Iversen (2019). Bills to this effect have been submitted to the Assembly and Senate of New York State, under whose governing law most dollar bonds are issued. One can further imagine contractual clauses requiring creditors to acknowledge comparability of treatment, or court decisions to this effect (Buchheit and Gulati 2023).

⁶⁹ The U.S. and UK operationalized this resolution by adopting domestic measures implementing it.

⁷⁰ This calculation assumes that the facility would guarantee 80 percent of principal, that \$1 of capital could guarantee \$4 of principal, and that the multilaterals would take equivalent haircuts, limiting the haircuts required of private creditors to achieve 39 percent debt reduction.

haircuts for other creditors.⁷¹ China has challenged the multilaterals' preferred creditor status, asking why they should receive more favorable treatment than its policy banks. In agreements reached to date under the Common Framework, this issue has been finessed rather than addressed. Chad's agreement does not include any bilateral debt relief from China or other countries. In Zambia's case, China extended loan terms and adjusted financing costs rather than accepting haircuts on principal. In Ghana's, the World Bank contributed by extending more grants in aid.

Abolishing the preferred creditor status of the World Bank and other multilateral development banks is problematic, since losses would leave their shareholders reluctant to fund their risky loans in the future. One response is that multilaterals focusing on economic development should move further in the direction of grants rather than loans; but the same level of development finance would then require additional donor resources.⁷² Another response is that the IMF already takes haircuts through its Catastrophe Containment and Relief Trust, under which interest payments by low-income countries hit by a natural or public-health disaster are effectively forgiven by a grant in aid. The trust is funded by contributions separate from the IMF's general resources, donated by advanced economies and the European Union. Hence the trust is not subject to provisions in the IMF's Articles of Agreement requiring the Fund to safeguard its resources (to lend only when it is assured of being paid back). Again, going further down this road would require more resources from shareholders, something that is easier to suggest than to secure.

10. Conclusion

Public debts have risen for reasons both good and bad, good in that governments have financed needed responses to macroeconomic, financial and public-health emergencies, bad in that they have borrowed imprudently and failed to retire debt in good times. The result has been increases in debt ratios worldwide, on average from 40 to 60 percent of GDP since the Global Financial Crisis.⁷³ In advanced countries, debt ratios have risen still higher, to nearly 85 percent of GDP on average. In the United States, federal government debt in the hands of the public is approaching 100 percent of GDP. In other advanced economies, debt ratios are even higher.

These trends have led anxious observers, such as Bank for International Settlements (2023) and IMF (2023b), to sound a clarion call for debt reduction. Our message is that debt reduction, while desirable in principle, is unlikely in practice. Primary budget surpluses achieved through a combination of tax increases and spending economies will be difficult to sustain on a scale and for the duration needed to significantly reduce debt ratios – to bring them back down to pre-GFC levels, for example. Historically, countries have been able to sustain large primary surpluses only when there exists political solidarity at the national level and when economic growth is strong. The World Bank and others project slower global growth. Meanwhile, political divisions are pervasive. Given the troubled outlook for these variables, we are skeptical about the scope for large sustained primary surpluses.

⁷¹ Recall however that much of this debt is on concessional terms, so the interest burden associated with excluding it is less than proportional.

⁷² There is precedent: additional resources provided through special trust funds endowed by bilateral contributions from advanced economies helped to finance their contributions to the HIPC Initiative and MDRI.

⁷³ To remind, the statistics in this paragraph are unweighted cross-country averages, as in our Figure 1.

Real interest rates, having trended downward for an extended period, now show signs of ticking back up, if for no other reason than that more public debt must now be placed with investors. One can imagine a scenario in which significantly higher interest rates shock governments out of their complacency, driving home the urgency of consolidation and prompting ambitious adjustments. That two of the three very large, sustained fiscal adjustments in the last decade (Greece and Iceland) were in countries experiencing fiscal crises is consistent with this view. But while a large adverse $r-g$ shock may require – and may prompt – additional fiscal adjustment to prevent debt ratios from exploding, we are skeptical, based on our analysis of historical experience, that such adjustment will be of a magnitude sufficient to also bring debt ratios significantly below current levels, given the political barriers to a more vigorous response. In any case, our analysis points to the likelihood of only limited increases in real interest rates.

History and recent experience show that inflation at rates acceptable in most 21st-century countries has at most a temporary negative impact on debt ratios. Caps on nominal interest rates and policies of financial repression that render the debt-reducing effects of inflation more durable are less feasible in our financial liberalized world. Debt restructuring in developing countries has become more challenging with the emergence of official creditors not party to Paris Club norms, and with the growing importance of market finance, meaning that there are more creditors and competing interests than in the once-upon-a-time world of official finance.⁷⁴

Like it or not, then, governments are going to have to live with high inherited debts. Advanced countries such as the United States whose government securities are regarded as safe assets benefit from a robust demand for their liabilities, not just from central banks that hold them as international reserves but also from the foreign private sector. This gives their governments more financial room to run. This is not necessarily true of all advanced countries, including some whose bonds currently trade at narrow spreads relative to U.S. Treasuries. Countries where the central bank has purchased the entirety of net new debt issuance over the last decade may have considerably less room to run; in particular, conditions may change abruptly when quantitative easing gives way to quantitative tightening. Even in the case of the U.S. and other countries in its enviable position, governments must take care to avoid actions that cause their safe assets to be re-rated as unsafe.

Looking forward, the challenges are daunting. Given ageing populations, governments will have to find additional finance for healthcare and pensions. They will have to finance spending on defense, climate change abatement and adaptation, and the digital transition. A growing number of low-income countries are already in debt distress. Living with high public debt therefore means avoiding steps that make a bad situation worse. This means minimizing unproductive public spending. It means targeting social transfers as a way of limiting pressures on the expenditure side. It means limiting contingent liabilities by, inter alia, adequately regulating banks and avoiding recapitalization costs. It means contemplating tax increases where revenues are low by international standards. It means further developing financial markets where markets are underdeveloped and where a diverse population of local investors in debt securities is absent. It means embracing legal and procedural changes that streamline and speed

⁷⁴ In advanced countries, where substantial sums of public debt are held by institutional investors (banks, insurance companies etc.), restructuring would be financially destabilizing, and any such thoughts would be quickly walked back. Hence our discussion of restructuring in the preceding section focused on developing countries. Greece's restructuring is the exception that proves the rule: it was extensively supported by deep-pocketed external actors.

restructuring for countries whose debts are unsustainable. This modest medicine does not make for a happy diagnosis. But it makes for a realistic one.

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Table 1. Composition of Large Pre-1914 Debt Reductions

Country	Period	Debt/ GDP ratio		Decomposition (in %)					Average real GDP growth	Average real interest rate
		Start	End	Primary Balance	Interest rate growth rate differential	g	r	SFA		
UK	1822-1913	194.1	28.3	180.5	-95.6	88.4	-184	15.1	1.9	3.5
USA	1867-1913	30.1	3.2	151.1	-46.3	48.2	-94.5	-4.8	4.2	4.3
France	1896-1913	95.6	51.1	100.4	-1.9	96.3	-98.2	1.6	2.6	2.9

Source: Eichengreen, El-Ganainy, Esteves and Mitchener (2021).

Table 2. Nonoverlapping Primary Surplus Episodes, 5-year periods

3% of GDP		4% of GDP		5% of GDP	
BEL1998	6.0	BEL1998	6.0	BEL1998	6.0
BRA2004	3.6	CAN1997	5.0	CAN1997	5.0
CAN1997	5.0	CHL2004	5.3	CHL2004	5.3
CHL1991	3.5	DNK1985	5.5	DNK1985	5.5
CHL2004	5.3	DNK2004	4.8	IRL1996	5.3
DNK1985	5.5	FIN1998	4.8	ISL2014	5.9
DNK1997	3.5	IRL1988	4.8	NOR1981	5.4
DNK2004	4.8	IRL1996	5.3	NOR2004	13.7
FIN1976	3.4	ISL2014	5.9	NOR2010	9.6
FIN1998	4.8	ITA1996	4.8	NOR2018	6.9
GRC1996	3.9	NOR1981	5.4	NZL1993	5.7
GRC2015	3.1	NOR2004	13.7	PAN1994	6.8
HKG2007	3.2	NOR2010	9.6	SGP1991	12.3
IRL1988	4.8	NOR2018	6.9	SGP2004	6.5
IRL1996	5.3	NZL1993	5.7	SWE1986	5.4
ISL2003	3.7	NZL2002	4.2		
ISL2014	5.9	PAN1994	6.8		
ISR1986	3.1	SGP1991	12.3		
ITA1996	4.8	SGP2004	6.5		
KOR1988	3.2	SWE1986	5.4		
KOR1999	3.8	TUR2002	4.5		
LUX1997	3.4				
MEX1991	3.8				
NLD1996	3.5				
NOR1981	5.4				
NOR2004	13.7				
NOR2010	9.6				
NOR2018	6.9				
NZL1993	5.7				
NZL2002	4.2				
PAN1994	6.8				
PAN2005	3.3				
PER2004	3.0				
PHL2004	3.5				
SGP1991	12.3				
SGP2004	6.5				
SWE1986	5.4				
SWE1997	3.4				
THA1991	3.7				
TUR2002	4.5				
Average	5.0		6.3		7.0
N. Episodes	40		21		15

Source: Eichengreen and Panizza (2016, updated).

Notes: Cases in bold are additions from extending the data to cover 2014-21.

Table 3. Decomposition of Post-WWII Large (at least 10 pp) Debt Reductions in Advanced Economies, (1945-75)

	<u>Debt/GDP ratio</u>			<u>Decomposition</u>		
	Starting	Ending	Decrease	Primary Balance	Growth-interest differential (r-g)	SFA
Simple Average	95.5	22.4	73.1	22.6	82.6	-32.2
Weighted average	112.0	26.2	85.8	33.3	80.2	-27.7
Weighted average (contribution to debt reduction, percent of total debt reduction)				38.8	93.6	-32.4

Source: Eichengreen et al. (2021).

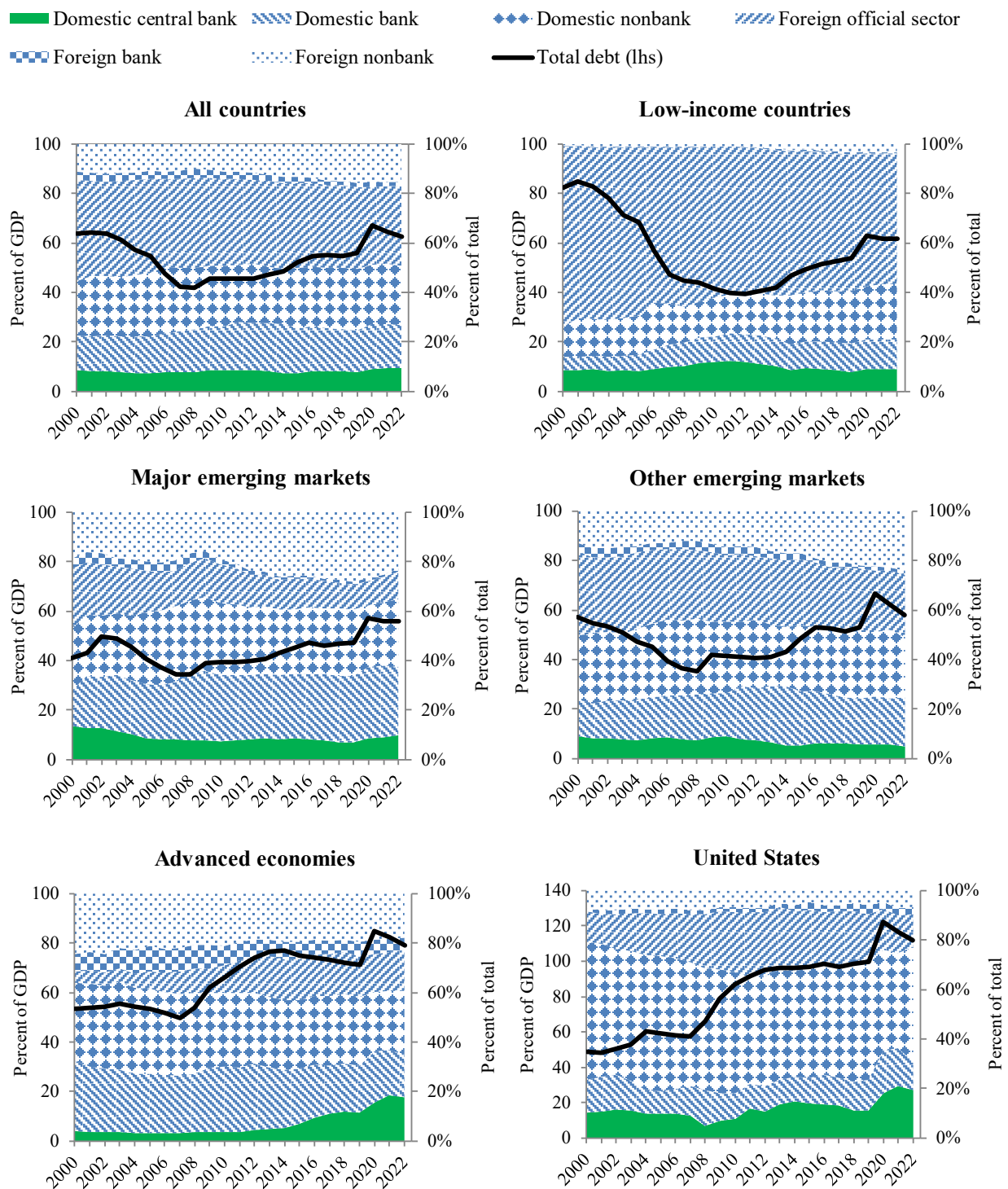
Notes: Sample includes 19 advanced economies. Precise period covered varies by country as peak-to trough years vary by country.

Table 4. G20 Economies: Projected General Government Debt/GDP Ratio in 2028

	Baseline	With 1 ppt inflation shock	
		Temporary	Permanent
Australia	62.2	61.7	59.6
Canada	91.1	90.4	87.5
France	115.0	114.2	110.6
Germany	59.6	59.2	57.3
Italy	131.9	130.8	126.5
Japan	264.0	262.2	254.6
South Korea	58.2	57.8	56.0
United Kingdom	113.1	112.3	108.7
United States	136.2	135.4	132.0
Argentina	65.4	65.4	64.8
Brazil	96.2	95.5	92.9
China	104.9	104.3	101.4
India	83.6	83.0	80.6
Indonesia	37.3	37.0	35.8
Mexico	57.9	57.5	55.7
Russia	21.5	21.4	20.9
Saudi Arabia	19.9	19.8	19.4
South Africa	84.9	84.3	81.8
Turkey	42.3	42.2	41.8

Sources: IMF, World Economic Outlook (April 2023) and authors' estimates.

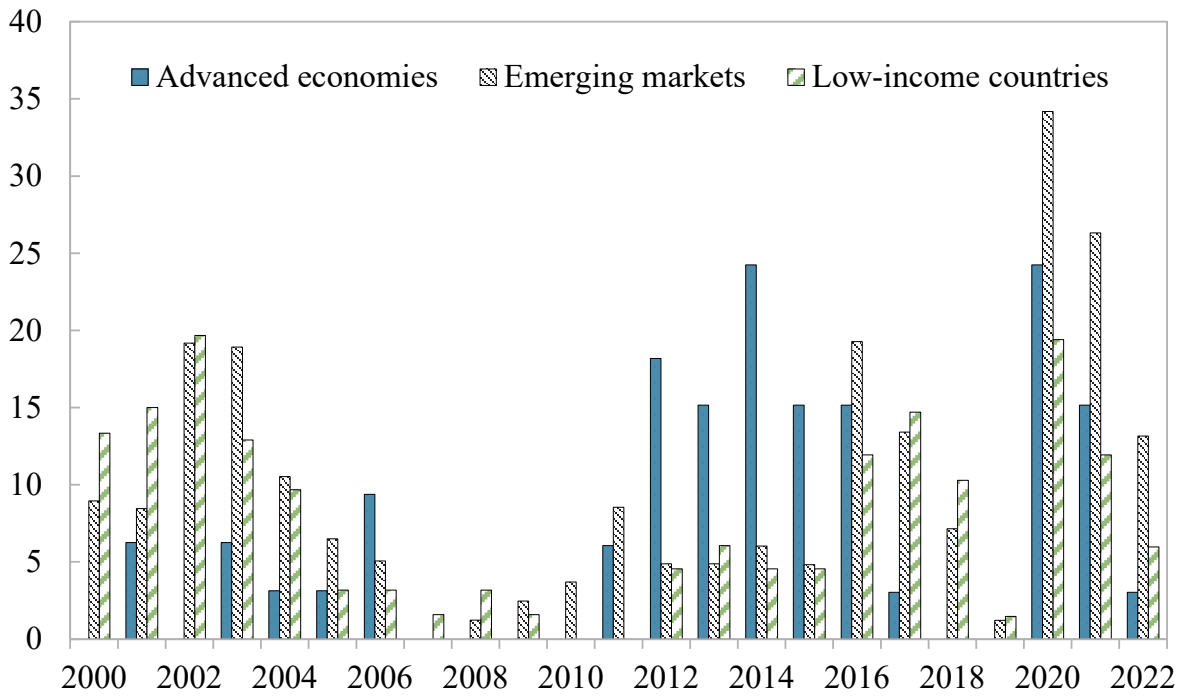
Figure 1. Holders of Government Debt, 2000-22
(Total in percent of GDP; Components in percent)



Source: Arslanalp and Tsuda (2014, updated).

Note: Government debt indicates general government gross debt on a consolidated basis, which excludes intergovernmental holdings. Domestic banks are depository corporations residing in the country (IFS definition). Foreign banks are BIS reporting banks residing outside the country. Foreign official includes foreign central bank holdings and foreign official loans. Foreign nonbanks and domestic nonbanks are imputed from external and total debt.

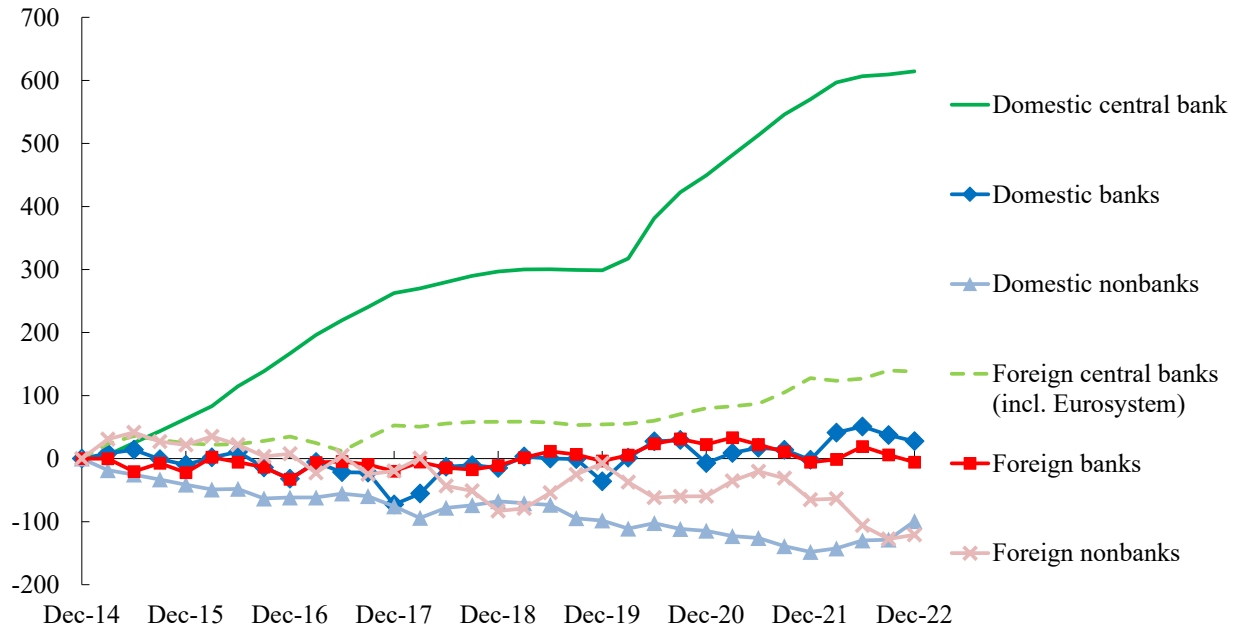
Figure 2. Percent of Countries with Debt Spikes, 2000-22
(Percent of total)



Source: Arslanalp and Tsuda (2014, updated)

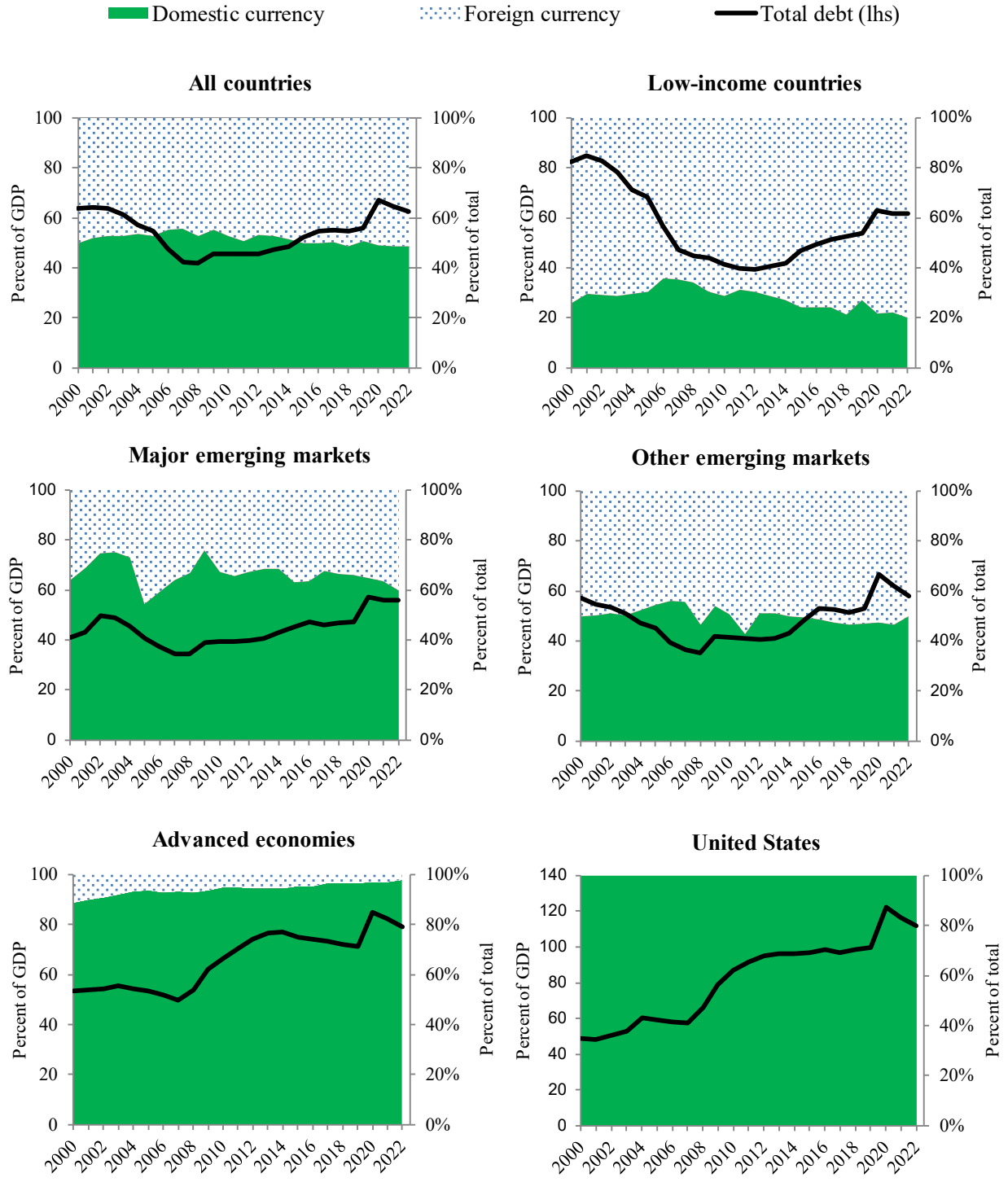
Note: A debt spike episode begins with an increase in debt (as a percent of GDP) in five years above the 80th percentile and ends with a decrease in debt in the following year.

Figure 3. Italy: Cumulative Net Purchases of General Government Debt by Investor Type, since end-2014 (in billion euros)



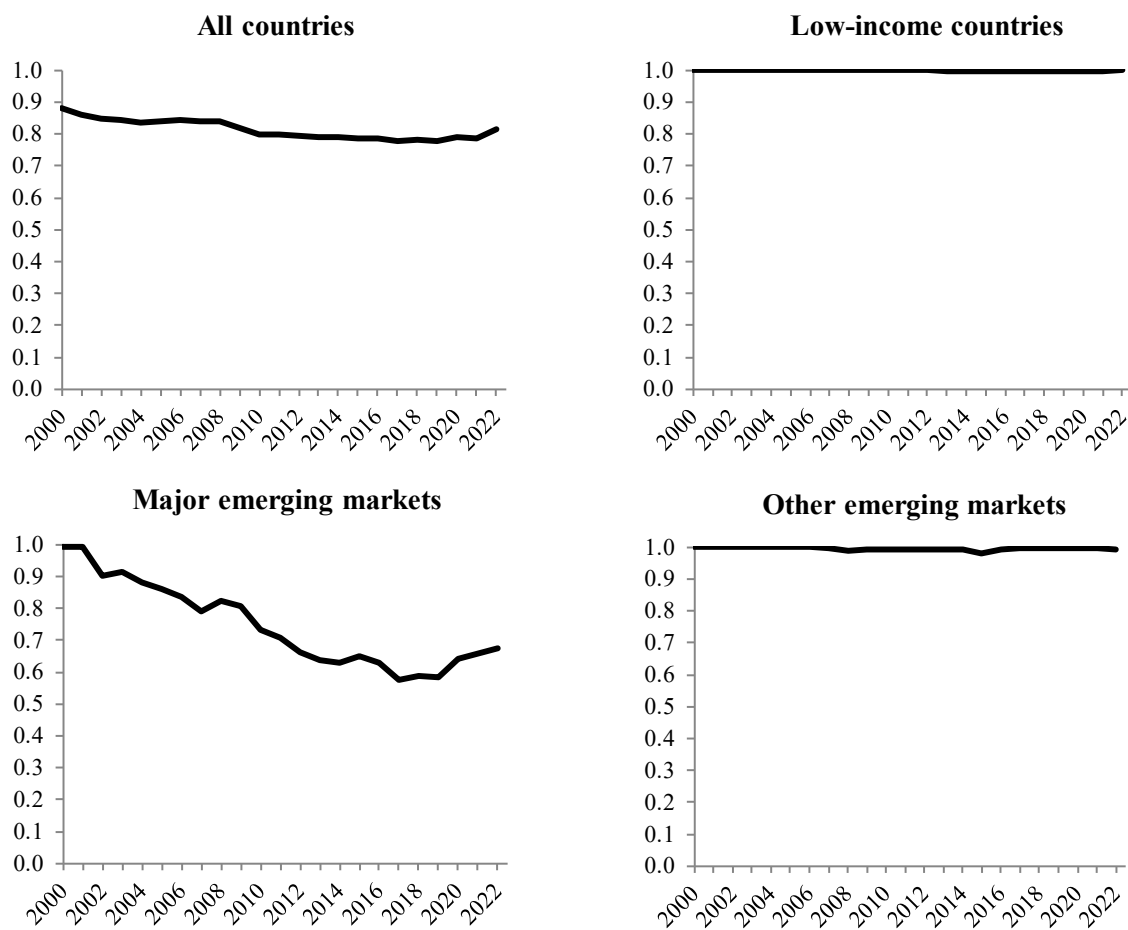
Source: Arslanalp and Tsuda (2014, updated).

Figure 4. Currency Composition of Government Debt, 2000-22
(Total in percent of GDP; Components in percent)



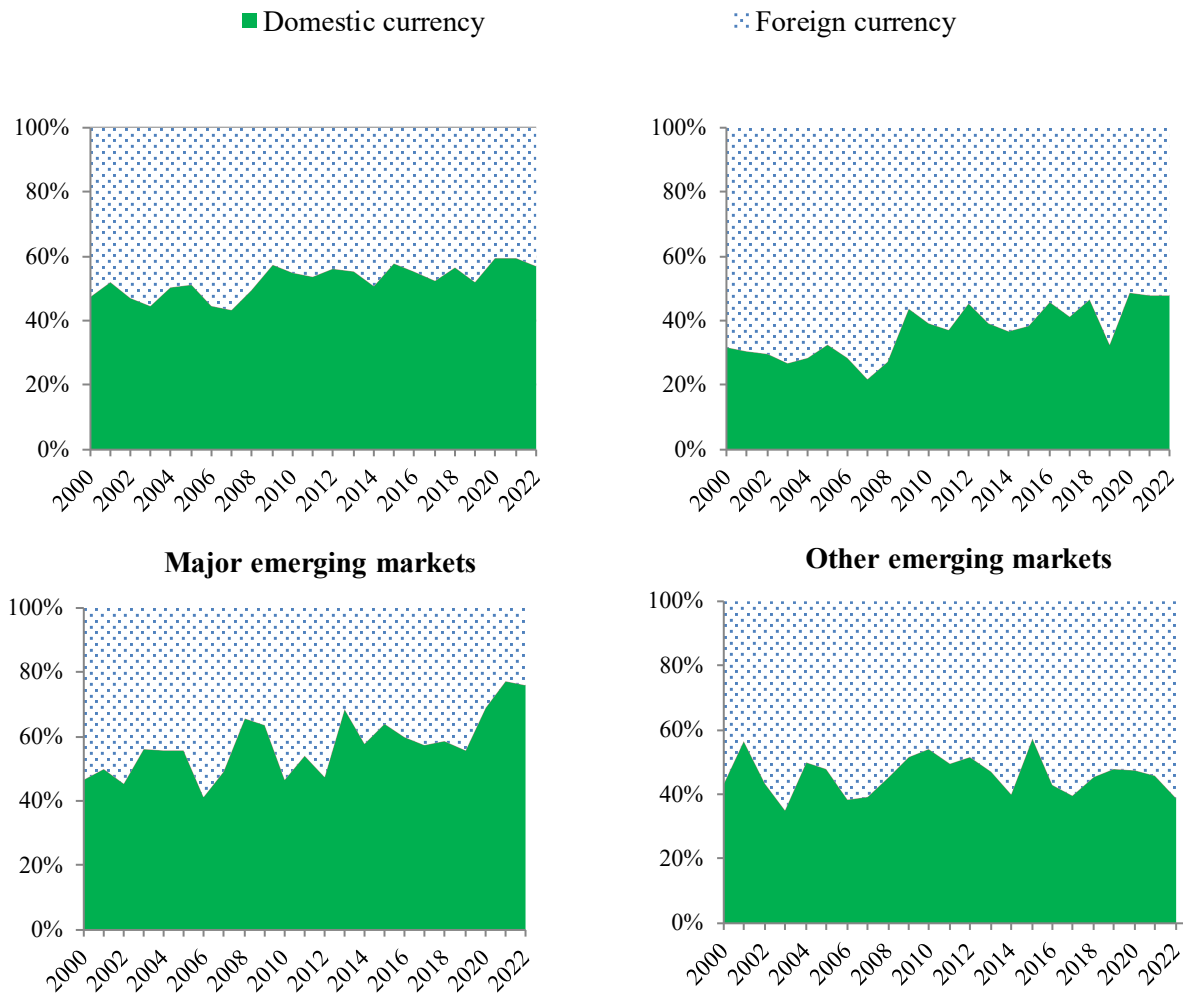
Source: Estimates based on Arslanalp and Tsuda (2014, updated).

Figure 5. Original Sin Index, 2000-22



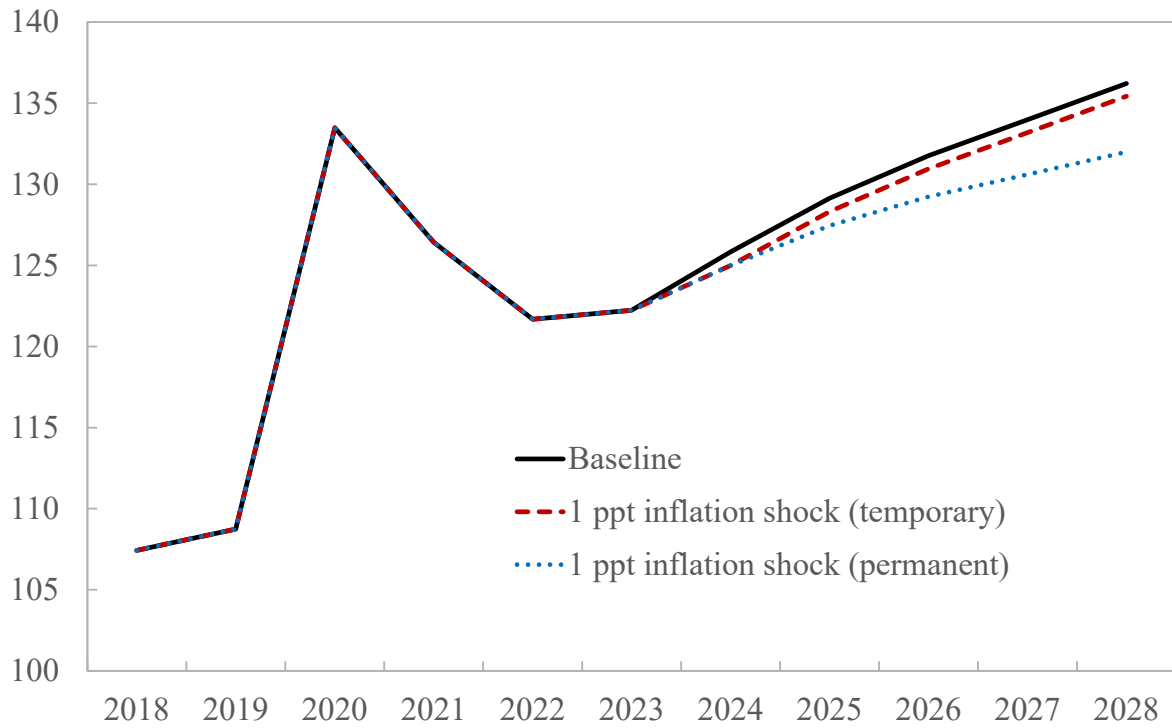
Source: Estimates based on Arslanalp and Tsuda (2014, updated).

Figure 6. Currency Composition of Government Debt Issuance, 2000-22
(Components in percent)



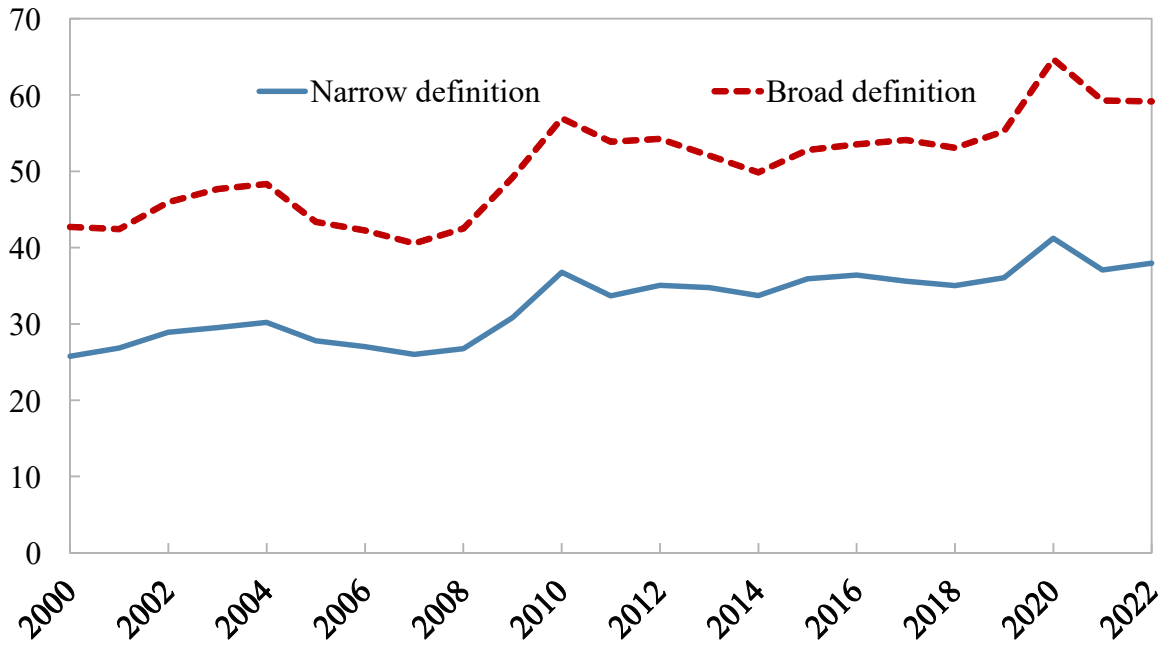
Source: Estimates based on Arslanalp and Tsuda (2014, updated).

Figure 7. United States: General Government Debt
(Percent of GDP)



Sources: IMF World Economic Outlook (April 2023) and authors' estimates.

Figure 8. Global Supply of Safe Assets, 2000-22
(Percent of global GDP)



Sources: Arslanalp and Tsuda (2014, updated); Federal Reserve Flow of Funds; IMF World Economic Outlook.
Notes: The narrow definition includes government debt of 12 countries with a AAA rating from at least one of the three major rating agencies. The broad definition also includes China, Japan, Korea, and the UK. Domestic central bank holdings of government debt are excluded. For the US, GSE debt securities and loans are included.

Country Groupings

Advanced economies:

Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States

Major emerging markets:

Argentina, Brazil, Bulgaria, Chile, China, Colombia, Egypt, Hungary, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand, Turkey, Ukraine, Uruguay

Other emerging markets:

Albania, Algeria, Angola, Antigua and Barbuda, Armenia, Azerbaijan, Bahamas, Bahrain, Barbados, Belarus, Belize, Bolivia, Bosnia and Herzegovina, Botswana, Costa Rica, Croatia, Dominican Republic, Ecuador, El Salvador, Eswatini, Fiji, Gabon, Georgia, Guatemala, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kosovo, Kuwait, Lebanon, Mauritius, Mongolia, Montenegro, Morocco, Namibia, Nauru, Nigeria, North Macedonia, Oman, Pakistan, Palau, Panama, Paraguay, Qatar, Saudi Arabia, Serbia, Seychelles, Sri Lanka, St. Kitts and Nevis, St. Lucia, Suriname, Syria, Trinidad and Tobago, Tunisia, Turkmenistan, United Arab Emirates, Vietnam

Developing economies:

Afghanistan, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Cameroon, Cabo Verde, Central African Republic, Chad, Comoros, Congo Rep., Congo Dem. Rep., Côte d'Ivoire, Djibouti, Dominica, Eritrea, Ethiopia, Gambia, Ghana, Grenada, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Kenya, Kiribati, Kyrgyz Republic, Lao PDR, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Marshall Islands, Mauritania, Micronesia, Moldova, Mozambique, Myanmar, Nepal, Nicaragua, Niger, Papua New Guinea, Rwanda, Samoa, São Tomé and Príncipe, Senegal, Sierra Leone, Solomon Islands, Somalia, St. Vincent and the Grenadines, Sudan, Tajikistan, Tanzania, Timor-Leste, Togo, Tonga, Tuvalu, Uganda, Uzbekistan, Vanuatu, Yemen, Zambia