Fiscal Consolidation and Public Debt

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Abstract

High public debt is urging policy makers to consider strategies to rebuild buffers and preserve debt sustainability. We focus on discretionary fiscal consolidation, defined as an increase in the ratio of primary balance (the difference between government revenues and non-interest expenditures) to GDP not driven by business cycle considerations, and evaluate whether—and under which conditions—it is likely to be associated with a durable reduction in public debt to GDP ratios. Our findings, based on a large sample of advanced and emerging countries, indicate that, on average, discretionary fiscal consolidation has a minimal impact on debt ratios. However, discretionary consolidations implemented during economic upturns or in scenarios where they can "crowd in" private investment, are more likely to be associated with sustained reductions in debt ratios.

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1. Introduction

Public debt as a ratio to GDP ("debt ratios" henceforth) soared across the world during the COVID-19 pandemic. As shown in Figure 1, the global average of this ratio approached 100 percent in 2020. Despite a reduction in the last two years due to the sharp post-pandemic rebound in growth and high unexpected inflation, public debt ratios remain stubbornly high. Based on IMF forecasts, global public debt is now substantially higher, and it is projected to grow considerably faster than in pre-pandemic projections, urging scholars and policy makers to think about how countries could live with high public debt and how they could stabilize debt ratios and preserve debt sustainability (Rogoff 2022; Arslanalp and Eichengreen 2023; BIS 2023).

High public debt ratios pose a significant concern for policymakers, as they make countries vulnerable to debt crises, constrain policy space, and can act as a drag to capital accumulation and economic growth through several channels—see Fatas and others (2021) and Kose and others (2021) for extensive reviews. This is particularly true in light of tight global financial conditions, weak global growth prospects, and a stronger US dollar. That high public debt ratios are at the center of the public policy debate is evident as the issue is a key focus of the ongoing reform of the European fiscal architecture.[1] The recent rise in sovereign debt holdings of domestic financial institutions, particularly in emerging markets (EMs), has further exacerbated the costs of high public debt, including by limiting resources available for domestic institutions to lend to the private sector and by aggravating the risk of adverse sovereign-bank feedback loops (Broner and others 2014; Farhi and Tirole 2018; IMF 2022a). High debt ratios coupled with rising borrowing costs are also translating into debt service payments absorbing an increasing share of government revenues, potentially crowding out public investment and social spending, particularly in developing economies. Finally, high public debt ratios, along with higher public investment needs, have made debt sustainability a growing concern—especially as high real interest rates and weak economic growth prospects are already reversing the favorable dynamics that characterized interest-growth differential (r-g) in recent years (Blanchard 2019; Mauro and Zhou 2021; Mian

[1] See, for example, the April 2023 press release of the European Commission, Arnold and others (2022), and Ando and others (2023).

and others 2022; Presbitero and Wiriadinata 2022; Zettelmeyer and others 2023)—and call for fiscal adjustments to stabilize debt ratios and preserve debt sustainability.

This paper examines the relationship between discretionary fiscal consolidation (henceforth "fiscal consolidation"), defined as an increase in the ratio of primary balance (the difference between government revenues and non-interest expenditures) to GDP not driven by business cycle considerations, and debt-to-GDP ratios. The absolute value of debt, whether expressed in real terms or as a nominal amount in local currency, does not provide a meaningful assessment of economic burden or repayment capacity. This is because the significance of a given debt level is relative to the size of the economy; a mere local currency or dollar figure lacks context without considering the economic scale or other indicators of a country's ability to repay. We focus on debt to GDP ratios, a standard metric used by policymakers, and applied extensively in the literature for evaluating a nation's repayment capacity and as a core element in debt sustainability analyses (see e.g. IMF (2022b)). These ratios are also commonly used in empirical research assessing the impact of public debt on growth and other macroeconomic factors, as discussed in Romer and Romer's NBER (2019) study on 'Fiscal Space in the Aftermath of Financial Crises' and in a decade of research papers surveyed by Rugy and Salmon (2020).[2]

Our analysis is descriptive, not prescriptive; it does not address the optimal level of debt-to-GDP for a country or the advisability of fiscal consolidation at any particular time. Instead, it focuses on understanding how fiscal consolidation influences debt ratios. While extensive research has been conducted on the effects of fiscal consolidation on GDP, the specific impact of such policies on debt ratios has not been as thoroughly explored. This paper aims to address this gap by focusing on the dynamics of debt ratios following fiscal consolidation, contributing a new dimension to the existing body of literature.

Since fiscal consolidation can be expected to reduce both debt (the numerator) and GDP (the denominator), the net effect of fiscal policies on debt ratios is far from obvious. Indeed, and perhaps surprisingly, basic summary statistics reveal that periods of primary balance to GDP increases are roughly equally likely to be accompanied by debt ratios increasing or decreasing.

[2] See https://www.mercatus.org/research/policy-briefs/debt-and-growth-decade-studies. Interest payments to revenues is another indicator used in policy, though far less common that Debt-to-GDP ratios.

This is also consistent with the findings of Balasundharam and others (2023), who review the literature and find the probability that fiscal consolidation achieves its *ex-ante* objectives in terms of improving the primary balance and/or reducing debt ratios in a durable manner (see Mauro 2011; Mauro and Villafuerte 2013) ranges from 38 to 50 percent. More importantly, our analysis reveals that movements in the debt ratio are not simply due to a denominator effect but are instead driven primarily by changes in debt.

The paper considers the following questions: i) How effective is fiscal consolidation in durably reducing public debt ratios? and ii) Under which conditions is fiscal consolidation more likely to durably reduce debt ratios? In doing so, our analysis contributes to two main strands of literature. First, we add to the studies on the macroeconomic effects of fiscal consolidation (Alesina and Perotti 1997; Alesina and others 2015; Guajardo and others 2014; Beetsma and others 2015; Jorda and Taylor 2016) by providing novel evidence on the dynamics of debt ratios following a fiscal consolidation. Second, we build on the literature discussing different strategies to reduce public debt (Reinhart and others 2015; Eichengreen and others 2020; Kose and others 2022)—from standard ones such as growth and consolidation, to more heterodox approaches such as debt default or restructuring, unexpected inflation, and financial repression—providing direct evidence of the role played by fiscal consolidation and of the conditions under which it is more likely to be successful in reducing debt ratios.

Alesina and others (2019) look at the macroeconomic effects of fiscal consolidation plans in 16 advanced economies (AEs) and find that while tax-based plans do not reduce debt ratios, expenditure-based consolidations have a stabilizing effect on debt dynamics. Baldacci and others (2012) study debt reduction episodes and use debt decompositions to conclude that increases in the primary balance play an important role; this does not, however, necessarily imply that fiscal consolidations lead to lower debt ratios. Our question is different and complements these analyses by looking directly at fiscal consolidations in a large sample of AEs and EMs to show if and under which conditions consolidations are more likely to be associated with a durable reduction in public debt ratios. For instance, Germany and Italy in the 2010s are good examples that macroeconomic conditions at the time of consolidation matter for its success. Germany successfully reduced the debt to GDP ratio from 69 percent in 2016 to 59 percent in 2019, by running a primary balance above 2.3 percent of GDP while the economy was above potential. Rietzler and Truger (2019)

argue that the political commitment to strictly adhere to the debt brake contributed partly to the good performance of Germany's public finance, but favorable macroeconomic environment played a bigger role. Italy implemented fiscal consolidations from 2011 to 2014 in response to the sovereign debt crisis, with the primary balance ranging from 1.0 to 2.2 percent of GDP. However, with the economy below potential throughout the years and lacking pro-growth measures, the debt to GDP ratio increased from 120 percent in 2011 to 135 percent in 2014 (Figari and Fiorio 2015; Andrle and others 2021).

We start by presenting in Section II a simple analytical framework to understand how fiscal consolidations could affect the ratio of public debt to GDP.

Turning to the empirical analysis, we employ an up-to-date dataset of fiscal aggregates for AEs and EMs over the past two decades, discussed in Section III. Our analysis includes debt and its primary drivers for 22 AEs and 37 EMs. We start by looking at the effect of fiscal consolidation on debt ratios using a Structural Vector Autoregression (SVAR) with six well known drivers of debt: GDP growth, government revenues, primary balance, debt to GDP, inflation, and the effective interest rate on debt. The framework uses a sign-restriction-based identification following the method in Mountford and Uhlig (2009), and accounts for three distinct shocks: a demand-driven GDP growth shock, a supply-driven GDP growth shock, and primary balance shocks. The latter encapsulates "discretionary" primary balance consolidations, defined as a change in the primary-balance to GDP ratio outside of a business cycle. Further, we exploit the flexibility of the sign restricted SVARs, and characterize consolidations that end up reducing debt ratios and those that do not.

The empirical analysis is conducted in two steps. First, we estimate the effects of fiscal consolidation on debt ratios using the SVAR model with sign restrictions, which allows us to look separately at the effects of consolidations which were successful or unsuccessful in reducing debt ratios. Second, to understand which macroeconomic conditions are more likely to be associated with debt ratio reductions (we refer to these as successful consolidations), we build a dataset of successful and unsuccessful consolidations from the output of the SVAR, and estimate the main drivers of successful fiscal consolidations.

The main findings from the SVAR are discussed in Section IV. First, we find that the average fiscal consolidation has a negligible effect on debt ratios. This result is consistent with a negative effect of fiscal consolidation on GDP growth found in several empirical studies (see Blanchard and Leigh (2013), Guajardo and others (2014), and Fatas and Summers (2018), among others), which could offset its effect on public debt. But lower GDP is not the only factor explaining the negligible effect of consolidations on debt ratios. Unanticipated transfers to state-owned enterprises (SOEs) and other contingent liabilities that get realized on government balance sheets, as well as unexpected exchange rate depreciations that can increase the domestic value of foreign exchange denominated debt, have historically played a role in offsetting debt reduction efforts (Abbas and others 2011). Second, adequately timed and appropriately designed fiscal consolidations are likely to be associated with a durable reduction in debt ratios. The average size of primary balance consolidations that happened together with debt reductions in the past is about 0.4 percentage points of GDP, lowering the average debt ratio by 0.7 percentage points in the first year and up to 2.1 percentage points after five years. About half of the observed decreases in debt ratios are associated with suitably tailored consolidations.

Next, in Section V, we turn to the analysis of the potential factors which could make consolidations more likely to end up in lower debt ratios. Analyzing all the episodes of fiscal consolidations identified in the SVAR, we document that the probability of fiscal consolidation being associated with lower debt ratios improves from the baseline (average) of about 50 percent to more than 75 percent when: (1) there is a domestic or global expansion, and global risk aversion and financial volatility are low; (2) in scenarios where fiscal consolidation is more likely to encourage ("crowd in") private investment (cases with initial high public debt, and low private credit, such that the benefits of reducing public debt can outweigh its costs); and (3) the consolidation is driven more by expenditure reductions rather than revenue increases (in AEs). Additionally, consolidations are more likely to be associated with debt ratio reductions in EMs, when they are accompanied by an appreciation of the nominal exchange rate, suggesting the importance of foreign currency-denominated debt in these economies.

Finally, in Section VI, we discuss the main policy implications of our analysis on the backdrop of the current debate about the need to rebuild fiscal buffers and bring debt back to more manageable levels.

2. Analytical Framework

This section aims to provide a framing device for understanding the impact of fiscal consolidations on debt to GDP ratios. To keep the expressions manageable, it makes several simplifying assumptions, including fixing the maturity of the entire stock of debt to one year and assuming that the debt dynamics are governed only by interest rate and primary balance. The results are therefore best suited to learn qualitative features rather than a precise quantification.

Starting from the standard debt dynamics equation:

$$D_t = (1 + i_t)D_{t-1} - PB_t + O_t, \tag{1}$$

where D_t denotes the nominal stock of debt, PB_t denotes the nominal primary balance, O_t is a residual (accounting, e.g., for below-the-line operations and valuation effects due to exchange rate fluctuations), Y_t is nominal GDP and i_t the nominal effective interest rate, we can get the following expression for the growth of public debt:

$$\Delta \ln D_t \approx i_t - \frac{PB_t}{D_{t-1}}. \tag{2}$$

Then, from the definition of the fiscal multiplier ($m_y > 0$), we can get the following expression for GDP growth as a function of the change in the primary balance:

$$\Delta \ln Y_t = -m_y \frac{\Delta PB_t}{Y_{t-1}}. \tag{3}$$

Combining the above two expressions yields:

$$\Delta \ln \left(\frac{D_t}{Y_t}\right) = \Delta \ln D_t - \Delta \ln Y_t = i_t - \frac{PB_{t-1}}{D_{t-1}} + \frac{\Delta PB_t}{Y_{t-1}}\left(m_y - \frac{Y_{t-1}}{D_{t-1}}\right). \tag{4}$$

The above expression highlights that a consolidation ($\frac{\Delta PB_t}{Y_{t-1}}$) reduces the debt ratio when the following inequality holds:

$$m_y \frac{D_{t-1}}{Y_{t-1}} < 1. \tag{5}$$

Two takeaways follow from this condition. First, the size of the multiplier is a key determinant of whether consolidations reduce debt ratios. The larger the multiplier is, the less likely a consolidation is to reduce debt ratios (denominator effect). Second, all else equal, higher debt ratios tend to mitigate the impact of consolidations in reducing debt ratios. This is because the direct effect of a proportional fiscal consolidation on the value of debt is smaller (the numerator effect), higher the debt ratio. In the empirical section, we will take these predictions to the data.

3. Data and Stylized Facts

Sources and Description

We employ a dataset that includes information on public debt, GDP, inflation, the primary balance and interest expenses for a balanced sample of 28 AEs (from 1979 to 2021), 83 EMs (from 1991 to 2021), and 55 low-income countries (LICs, from 1985 to 2021). We use this dataset to identify episodes of public debt reductions and look at the main factors behind those episodes.

For the SVAR analysis, we rely on a smaller sample of 22 AEs (1981-2019) and 37 EMs (1994-2019) for data availability reasons. A key requirement to estimate the SVAR model is a fully balanced dataset with the following six variables: (1) the growth rate of real GDP (percent), (2) the growth rate of real government revenues (percent), (3) the change in primary balance to GDP ratio (percentage points), (4) the change in the public debt to GDP ratio (percentage points), (5) the change in effective interest rate (percentage points) and (6) the change in inflation (percentage points).

The fiscal indicators refer to general government coverage and are obtained from the World Economic Outlook (WEO) database for 2002-2021, and from the Historical Public Finance Dataset (HPFD) compiled by Mauro and others (2015) for 1981-2011. Since small differences exist across the two databases for overlapping years, a smooth linear interpolation was applied to link the WEO with the HPFD series over a 10-year period from 2002 to 2011 for all countries (except for Spain, Sweden and Norway, for which the WEO data are available since 1981). The remaining variables are taken from the WEO database.

A First Look at the Data

This section employs a standard debt decomposition technique to a large sample of 166 countries to quantify the contributions of real GDP growth, nominal interest expenses, primary balance, and inflation, to historical debt reduction episodes. Debt reduction episodes are identified in two steps. The first one involves identifying turning points in the debt to GDP time series for each country based on the business cycle dating methodology of Harding and Pagan (2002). A minimum of 2 years between successive peaks and troughs, and a minimum length of 4 years for a complete cycle are imposed. This step decomposes the entire time series into non-overlapping periods of surges and reductions. Second, to better characterize episodes with meaningful upside and downside changes in debt ratios, we also identify stable periods with minimum length of 3 years within these episodes if the cumulative change in the debt to GDP ratio is either less than 5 percentage points in levels or less than 10 percentage points of the country specific standard deviation. The categorization of stable episodes, although new in the literature, is in line with observed movements in the data. The method identifies 328 reduction episodes over 1970 to 2021, and, on average, a debt ratio reduction episode lasts five years.[3]

Moving from the debt dynamics illustrated in equation (1) and expressing the variables as share of GDP, the change in the debt to GDP ratio can be decomposed into the contributions from interest expense, inflation, real growth, primary balance, and the residual:

$$d_t - d_{t-1} = \frac{i_t}{1+\gamma_t} d_{t-1} - \frac{\pi_t}{1+\gamma_t} d_{t-1} - \frac{g_t}{1+g_t} d_{t-1} - pb_t + o_t, \quad (6)$$

where d_t is general government gross debt over GDP, i_t is the effective nominal interest rate defined as the interest expense over the previous period's debt stock, γ_t is the nominal growth rate, π_t is the inflation rate based on GDP deflator, g_t is the real GDP growth rate, pb_t is the primary balance over GDP, and o_t is the residual.

Figure 2 (panel a) reports a simple average of the decomposition of changes in debt ratios at the country-year level, during reduction episodes. The magnitude of the decline in the debt ratio is, on

[3] Appendix Figure A1 provides examples of the time series decomposition of debt to GDP ratios into episodes of surges, reductions, and stable periods for two countries—Germany and Italy.

average, 3, 5, and 10 percentage points a year in AEs, EMs, and LICs, respectively. The main insights from this analysis are two-fold. First, consistent with the evidence discussed by Baldacci and others (2012), primary balance surpluses are an important driver of debt ratio reductions both in AEs—where they are the most important factor—and in EMs, while they do not play a meaningful role in LICs. Second, real GDP growth and inflation matter in all country groups, with inflation playing a relatively bigger role in reducing debt ratios in EMs and LICs.[4] The same takeaways are confirmed if we restrict the sample to the countries used to run the SVAR in the remainder of the paper (Figure 2, panel b), with primary balance surpluses playing a dominant role in AEs, while inflation and growth playing a somehow similar role in EMs.

4. The Effects of Fiscal Consolidations: A SVAR model with Sign Restrictions

Methodology

We evaluate the effects of fiscal consolidation on debt using a Structural Vector Autoregression (SVAR) model, which considers jointly the standard drivers of debt ratios—namely real GDP growth, interest rates, inflation, government revenues, and the primary balance. The model uses a sign-restriction based identification, following the method of Mountford and Uhlig (2009).

We consider three structural shocks. The first two are demand and supply GDP shocks. These are identified by their impulse on GDP and government revenues, and their distinct impact on inflation. A positive demand shock, for example, would raise prices, while a positive supply shock would lower them. The third is a shock to the primary balance, which we assume to be negatively associated with GDP growth (e.g., we assume a negative multiplier $m_y > 0$). Notably, the primary balance shock is distinct from the demand shock: while a primary balance shock entails a negative correlation between the primary balance and GDP (i.e., a fiscal consolidation shock, or an increase in primary balance, reduces GDP), the demand and supply shocks instead entail a positive correlation with GDP.

The core of the analysis lies in studying the features of consolidations that are likely to be associated with lower debt ratios. To do so, the primary balance consolidation shock (defined as a

[4] While Figure 2 focuses on debt reduction episodes, high inflation could also lead to higher debt, including through unexpected devaluations.

positive change in primary balance to GDP, outside of a business cycle) is split into two different (orthogonal) components: i) a *successful* shock, which is identified by the additional condition of debt ratio declining, and ii) an *unsuccessful* one, which is identified by the additional condition of debt ratio increasing (Table 1). Note that the method imposes restrictions on the sign of the co-movement between the variables, but does not impose any other constraint, such as on the magnitude or duration of the responses.

All sign restrictions are imposed on impact, except for the sign restrictions on GDP and the debt to GDP ratio in the case of the primary balance consolidation shocks, which are imposed one period ahead (e.g., we assume fiscal consolidations to affect GDP and debt dynamics with a lag).

We estimate the VAR for each country, with two lags, using Bayesian techniques with Minnesota priors, where hyperparameters are chosen to maximize marginal data density (see, for instance, Canova 2007). The estimation is conducted using the Empirical macro toolbox of Canova and Ferroni (2022). Impulse responses are computed using inverse variance weights, as in Di Pace and others (2020).

Results

Does the Average Consolidation Reduce Debt/GDP?

A stylized fact that emerges from the data is that simultaneous consolidations and debt ratio reductions are infrequent. Figure 3 shows that only 54 percent of country-years with annual increases in primary balance to GDP are also accompanied by a decrease in debt ratios. This aligns with a recent survey by the Balasundharam and others (2023), which documents that at best only half of fiscal consolidations achieve their fiscal targets, including a durable debt reduction.

Consistent with from the SVAR approach with sign restrictions also suggest that consolidations do not reduce debt ratios on average the stylized fact presented in Figure 3, results (Figure 4). The impulse responses show that the point estimate of the effect of consolidations on debt ratios is very close to zero over the entire 5-year horizon, for both AEs and EMs. This result is robust to estimation through narrative sign restrictions based on narrative data, as shown by Patel and Peralta-Alva (2023).

Which fiscal consolidations could reduce debt ratios?

Given that we have shown that, on average, fiscal consolidations do not reduce public debt ratios, we turn to the relevant question: what features characterize fiscal consolidations that are more or less likely to be associated with a durable reduction of debt ratios? As discussed above, the flexibility of the SVAR approach is used to study the features of consolidations that coincide with reductions in debt ratios. The impulse responses are reported in Figure 5, separately for advanced economies (panel A) and emerging markets (panel B).

In both samples, two characteristics distinguish consolidations that are associated with a reduction in debt ratios—successful consolidations—versus those that do not—the unsuccessful one. First, as expected, consolidations, in which debt ratios decline, happen when the negative effects on output are mitigated, consistent with the framework presented in Equation (5) above. When considering the sample of AEs (Figure 5, panel A), the fall in GDP growth is smaller (0.5 percent reduction on impact) for consolidations in which debt ratios decline, compared to those in which they do not, where GDP growth declines sharply by 1.3 percent. For EMs (panel B), the magnitudes are larger, with growth decelerating by 1.7 percent in unsuccessful episodes and by about half of that value (0.9 percent) in successful ones.

At the same time, it is important to note that the results we find are not mechanical, or by construction. While it is true that in the case of successful consolidations, debt to GDP falls, and GDP contracts by less, in fact, movements in GDP alone are *not* the most important factor to explain the difference between successful and unsuccessful consolidations. This point is evident in a comparison of the magnitudes of the response of GDP and debt to GDP (panels 1 and 4). In successful cases (blue lines), GDP falls, yet the debt to GDP ratio also *falls*; in unsuccessful cases (red lines), GDP falls, but the debt ratio almost doubles. That is, the difference between successful and unsuccessful consolidations is thus driven primarily by movements in public debt. We confirm these findings by estimating the SVAR with the real stock of public debt, rather than with debt/GDP ratios (see Appendix Figure A2 for the impulse responses). While in the successful cases, a fiscal consolidation induces a permanent decrease in the debt level, in unsuccessful ones, we find that debt levels eventually do not decrease (it could be that fiscal consolidation is so contractionary that revenues drop in the following period, see more on this below).

Second, inflation also tends to increase more in cases where consolidation and debt reductions coincide (panel 6). (for both AEs and EMs, the median response of inflation in unsuccessful consolidations is below and outside the confidence interval of the response to successful consolidations for two years after impact). Several factors could rationalize this empirical regularity. For instance, the typical consolidation entails a revenue (tax increase) component which could push prices up. Moreover, any exchange rate depreciation concomitant with the consolidation could also increase import prices and contribute to inflation.[5] The differential response of effective interest rates on impact in successful versus unsuccessful consolidations (panel 5) suggests that monetary policy remains more accommodative on impact, and hence allows higher inflation in the case of successful consolidations.[6] This mitigates the decline in nominal GDP and thereby contributes to the decline in the debt ratio. Debt decomposition identities suggest that inflation contributes significantly—about half a percentage point—to the reduction in debt ratio for successful fiscal consolidations.

An important question to ask is why fiscal consolidation may fail to reduce debt ratios, over and above the effect on GDP. This can happen if countries conduct “below-the-line" operations that can offset the impact of fiscal consolidation on debt. Examples include transfers to state-owned enterprises in Mexico (2016), clearance of arrears in Greece (2016), and contingent liabilities in Italy (2013).[7]

To get a better sense of the long-term effects on GDP and debt ratios, Figure 6 reports the implied impulse response in terms of *levels* of GDP, primary balance to GDP and debt to GDP, based on the first difference estimates shown in Figure 5. The estimates from Figure 6 suggest that during the average successful consolidation (0.4 and 0.3 percentage points of GDP in AEs and EMs respectively) debt/GDP declines by 0.6 percentage point in 1 year, and 1.8 percentage point over

[5] The exchange rate implications are particularly vital for low-income countries where foreign currency-denominated debt forms a significant share of public debt. Exchange rate depreciation has been a major contributor to the increase in debt ratios in Sub-Saharan Africa (IMF (2023b)). Consolidations may, however, also boost the economic outlook and investor sentiment and lead to an appreciation of exchange rates (see e.g. Corsetti, Meier, and Mueller (2012), and Kim (2015)), but overall evidence for such effects is weak (Beetsma and others 2015).

[6] IMF (2010) also finds that policy interest rate cuts can support output during fiscal consolidations, which would also be consistent with a positive inflation response.

[7] See IMF (2016), IMF (2017) and IMF (2013), respectively. The phenomenon is not limited to advanced and emerging market economies. The contribution of such below the line operations to rising debt ratios has been persistently high in recent times in Sub Saharan Africa (IMF2023a).

a 5-year horizon for AEs, and 0.6 and 1.7 percentage points for EMs, respectively. During successful consolidations debt ratios go down durably, even beyond a 5-year horizon, as illustrated in Figure 6. The average consolidation shock in the data implies a sustained improvement in the primary balance, mostly on impact, of 0.4 percentage point of GDP. It reduces debt ratios persistently, starting with 0.7 percentage points the first year and stabilizing at a 2.1 percentage point reduction by year five and beyond.

Expenditure- vs Revenue-Based Consolidations

Fiscal consolidations can be implemented via either spending cuts or revenue (tax) increases, or some combination of the two. To see if the relative importance of spending vs revenues has a bearing on the success of consolidations in reducing debt ratios, Figure 7 reports the contributions of revenues and expenditures to both successful and unsuccessful consolidation shocks. The relative height of the bars shows the degree to which successful and unsuccessful consolidations are revenue vs expenditure based. For instance, in panel 1, for unsuccessful consolidations, the height of the green bar is larger than that of the blue bar, indicating that unsuccessful consolidations are more revenue based on average. These contributions are based on results from a VAR where we replace primary balance to GDP with its two components—revenue to GDP and expenditure to GDP.[8]

In advanced economies, successful consolidations tend to be balanced between spending cuts and tax or revenue increases, whereas those that are unsuccessful are biased toward revenue and involve fewer spending cuts.[9] These results do not hold in emerging market economies, consistent with studies that find tax increases to hurt growth and debt ratios more than equivalent spending cuts in advanced economies but not necessarily in emerging market economies (see, for instance, Guajardo and others (2014), Carrière-Swallow and others (2021), Pappa and others (2015), and

[8] The shock is identified in a manner similar to the original SVAR, by putting a sign restriction on primary balance to GDP (which here means the difference between revenues to GDP and expenditures to GDP has to be positive). Impulse responses are then scaled so that their impact on GDP is the same as in the baseline SVAR.

[9] This pattern is consistent with both expenditure-based and revenue-based fiscal adjustments being successful in reducing the duration of debt consolidation in advanced economies (Baldacci and others 2012).

Alesina and others (2019)). Indeed, for low-income countries, where the tax revenue to GDP ratio is particularly low, revenue mobilizing consolidations may be more desirable (IMF 2022c).

5. The Drivers of Successful Consolidations: A Panel Approach

Given the evidence that some consolidations can successfully bring down public debt ratios, the key question—especially from a policy standpoint—is to understand under which conditions it is more likely to observe fiscal consolidation associated with debt ratio reductions.

To answer this question, we build a panel with the historical debt decompositions from the SVAR of the previous section and isolate periods in which the fiscal consolidation shocks played a significant role in driving debt ratios. We identify successful periods as ones in which the debt ratio declines, and the successful fiscal consolidation shock contributes significantly by accounting for at least 10% (in the historical decomposition) of the debt ratio decline. Conversely, we identify failure periods as those for which the debt ratio increases, and the unsuccessful shock contributes to at least 10% of the increase in the debt ratio.[10] For example, if the debt to GDP ratio declines in a country by 5 percentage points in a given year and the successful shock contributes 1 percentage point to this decline, whereas the unsuccessful shock contributes zero, this is counted as a successful country-period.

Using this approach, we end up classifying about a third of all country-year observations as either successful or unsuccessful episodes, suggesting that 70 percent of the time, growth and other unidentified shocks are the main drivers of debt. We restrict our analysis to the 30 percent of observations in which fiscal consolidations are a key driver of debt dynamics, as they are likely to provide more information on the factors that are associated with success or failure of consolidation in reducing debt ratios. We assess the role of different macroeconomic variables in affecting the likelihood that fiscal consolidations are associated with lower debt ratios, we estimate the following logit model:

$$y_{it} = \alpha + \beta . X_{it} + \epsilon_{it}, \qquad (7)$$

[10] The results are qualitatively robust to different values of this threshold, for example, similar results would emerge if the value is 30%.

where y_{it} is a dummy variable which takes the value 1 if the respective country-year is classified as a successful consolidation, and zero if it is classified as an unsuccessful one. We explore two broad sets of conditioning variables in the vector (X_{it}), related to: i) state of the economy, including both global and local factors, and ii) the likelihood of relatively large crowding in effects from fiscal consolidation. As proxies for state of the economy, we use domestic and global output gaps, the Chicago Board Options Exchange Volatility Index (VIX), and nominal exchange rate movements during a consolidation episode. To capture scenarios where crowding in can be large, we use the initial levels of public debt and private credit, both expressed as ratio to GDP.

Table 2 reports the regression results, using bootstrapped standard errors to allow for uncertainty in the dependent variable which is a generated regressor. The first column shows the pooled estimates, whereas the second one shows estimates obtained including country fixed effects. The estimates reveal that consolidations and debt ratio reductions are more likely to happen during good times, as the likelihood of a successful consolidation is higher during domestic and global booms as well as during periods of lower volatility as measured by the VIX. This result is consistent with prior literature on multipliers, which establishes that fiscal multipliers are likely smaller during good times (Jorda and Taylor 2016).

Our results also suggest that consolidations and debt ratio reductions are also more likely to happen when the initial public debt to GDP is high and private credit to GDP is low. This points to the importance of the crowding in effect of fiscal consolidation. In particular, crowding in effects are likely to be high when public debt levels are high, and when private credit is low. Consolidations undertaken under such circumstances are likely to have a lower negative impact on output and are hence more likely to be successful in decreasing debt ratios.

Note that, in theory, the direction of the effect of initial debt levels on the likelihood of successful consolidations could go either way. When initial debt is high, the direct effect of fiscal consolidation on the value of debt is small (or the numerator), as shown in Equation (3) above; at the same time, consolidations hurt output less when initial debt is high, likely because of greater crowding in of private investment (Ilzetzki and others 2013; Kirchner and others 2010). Our results suggest that the latter effect dominates.

Finally, we also find that consolidations and debt ratio reductions are more likely to happen when they are accompanied by an appreciation of the nominal exchange rate. This effect, which is primarily evident only for EMs, points to the importance of foreign currency-denominated debt, the value of which can decrease more sharply during consolidations if the exchange rate appreciates. Relatedly, appreciations can also have a positive effect on growth in EMs, but not in AEs (IMF 2023a).

In terms of magnitudes, the estimates reported in Table 3 are outcomes of a logit regression and denote the partial impact of a unit change in the variable on the log odds ratio of a consolidation being successful in reducing the debt ratio. To understand their significance in terms of probabilities, Figure 8 transforms the coefficients from column 1 in Table 2 into the marginal impact of a one standard deviation change in the variable on the probability of achieving success when consolidating. The baseline probability based on the identified episodes mentioned above is 54%. These probabilities go up to 75% if consolidation is undertaken during global and domestic booms, and a further 12% if financial conditions are loose or crowding in effects are high.[11]

6. Conclusions

We started our analysis motivated by the constraints and risks that high (and increasing) public debt pose to fiscal space, economic outcomes, and debt sustainability. Within that context, it becomes critical to identify policies which could help reverse the increasing trend of public debt ratios, or at least stabilize them. The paper focuses on fiscal policies and asks whether and under which conditions fiscal consolidations can raise the likelihood of a durable reduction in debt ratios.

What are the characteristics of a successful fiscal consolation (or a consolidation that succeeds in reducing debt ratios)? Our results show that adequately timed (for example, during economic expansions) and appropriately designed (for example, growth friendly—which in advanced economies includes more expenditure- than revenue-based measures) fiscal consolidations have a high probability of being associated with durable debt ratio reductions.

[11] The numbers are computed by adding the coefficients from a multivariate standardized logit regression plotted in Figure 7. For instance, when global and domestic output gaps are one standard deviation above mean, and the VIX is one standard deviation below, the probability increases from a baseline of 54% to 75% (~=54+12+8.6), based on the numbers in the first two green bars in Figure 8.

How large are the estimated effects of a successful fiscal consolation? The average successful fiscal consolidation in the data (equal to 0.4 percentage points of GDP) coincides with a reduction in the debt ratio of 0.7 percentage points during its first year and, cumulatively, by up to 2.1 percentage points after 5 years.

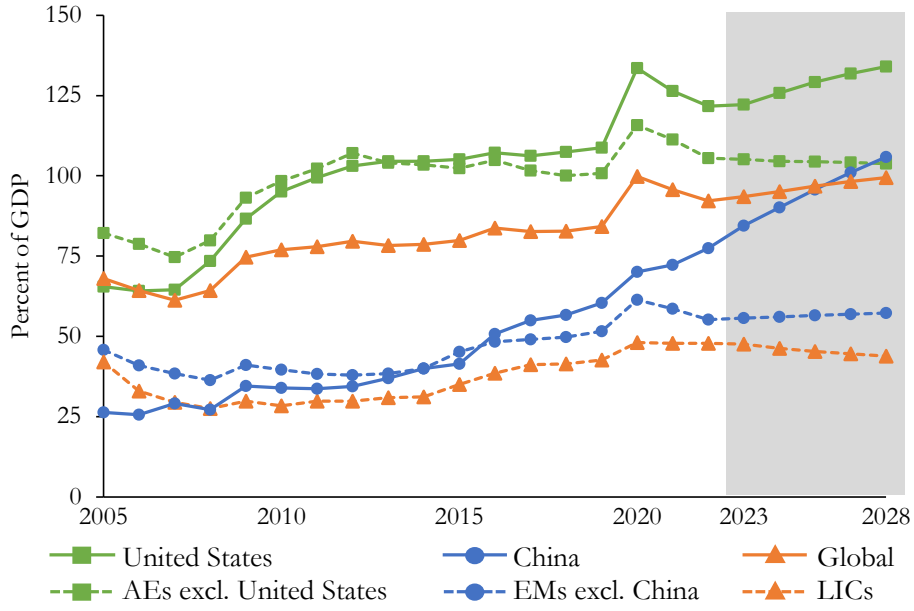
Historical episodes suggest growth and inflation play a meaningful role too in debt reductions. In fact, existing evidence suggests that the debt-reducing effects of fiscal adjustments can be reinforced when accompanied with growth enhancing structural reforms and strong institutional frameworks (Aligishiev and others 2023). At the same time, because these conditions and accompanying policies are not always present, and because fiscal consolidation tends to slow GDP growth, our results show that, on average, fiscal consolidations have a negligible effect on debt ratios. It is therefore important to design fiscal consolidation plans in ways to maximize their potential effect on debt ratios.

The analysis in this paper suggests that well designed fiscal consolidations, beyond automatic stabilizers or what would be implemented during economic cycles, along with growth-friendly structural reforms, could be effective to gradually reduce debt ratios. Such fiscal consolidation should ideally coincide with domestic recovery and/or favorable external conditions. Ultimately, strong institutions are crucial to durable debt reduction. Robust fiscal and monetary frameworks can prevent operations that undermine the success of consolidations to reduce debt ratios (Gaspar and others 2016; Caselli and others 2022).

Finally, a caveat to note is that while our analysis focuses on determining the effects of fiscal consolidation on debt ratios, it does not consider the desirability of fiscal consolidation from a welfare perspective. The results have nevertheless to be contextualized within the broader scope of economic literature. Notably, research on optimal policy, such as the works in optimal sovereign default literature (e.g., Cuadra and others 2010), suggests that fiscal consolidation may still be optimal even if it results in a short-term output contraction.

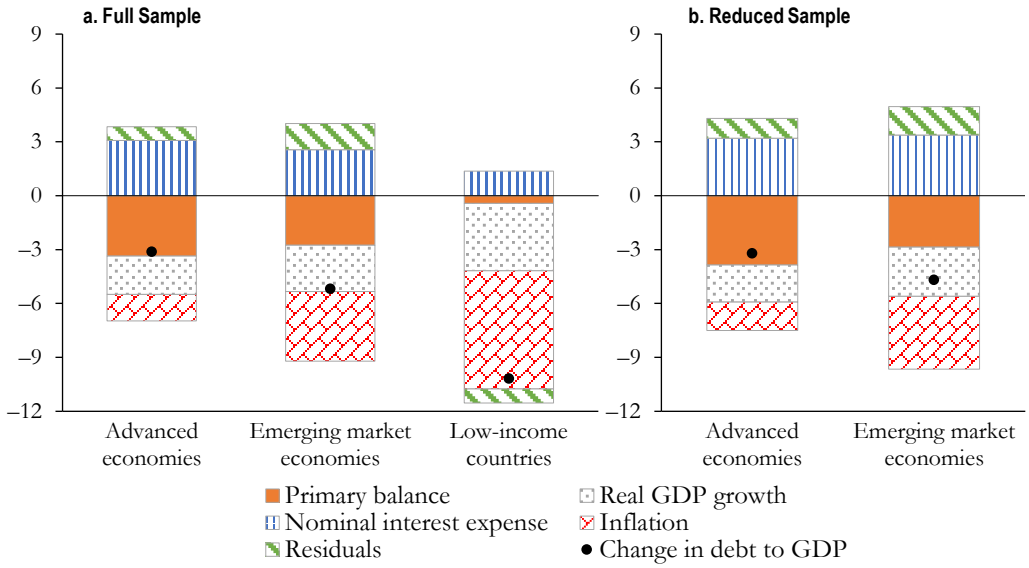
Figures and Tables

Figure 1. Public debt to GDP, 2005-2028



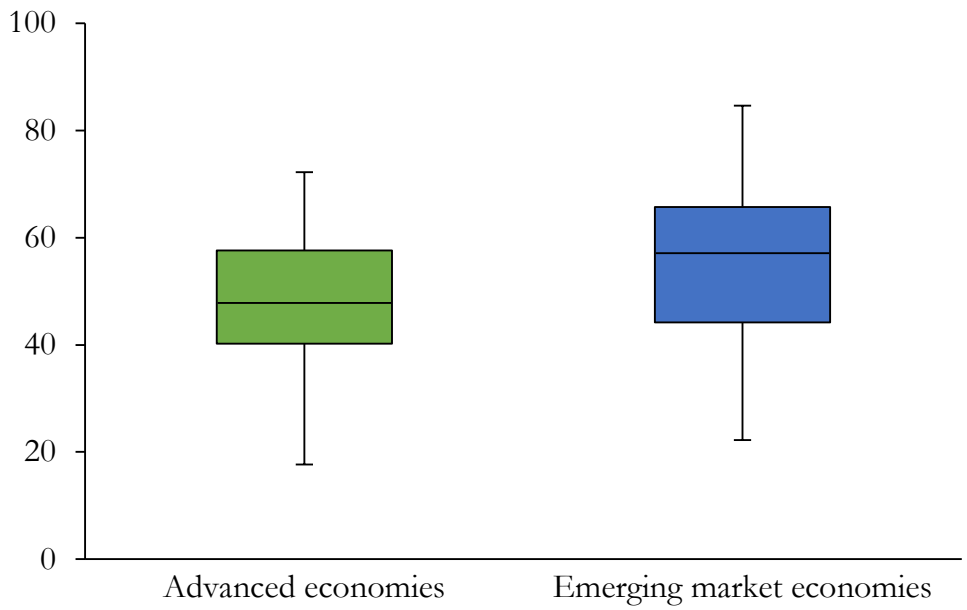
Source: IMF World Economic Outlook 2023 April and IMF staff calculations.
Note: Averages are weighted by nominal GDP. Shaded area denotes forecast period. Sample comprises a balanced panel of 32 advanced economies, 45 emerging markets, and 12 low-income countries. AEs = advanced economies; EMs = emerging markets; LICs = low-income countries.

Figure 2. Public debt to GDP decomposition



Sources: IMF World Economic Outlook 2023 April, Global Debt Database (Mbaye and others 2018); Mauro and others (2015); and IMF staff calculations.
Note: Contribution of real exchange rate to debt to GDP is reflected in the residual because the share of foreign currency-denominated debt is not available for all countries. Sample covers 28 advanced economies from 1979 to 2021, 83 emerging market economies from 1991 to 2021, and 55 low-income countries from 1985 to 2021.

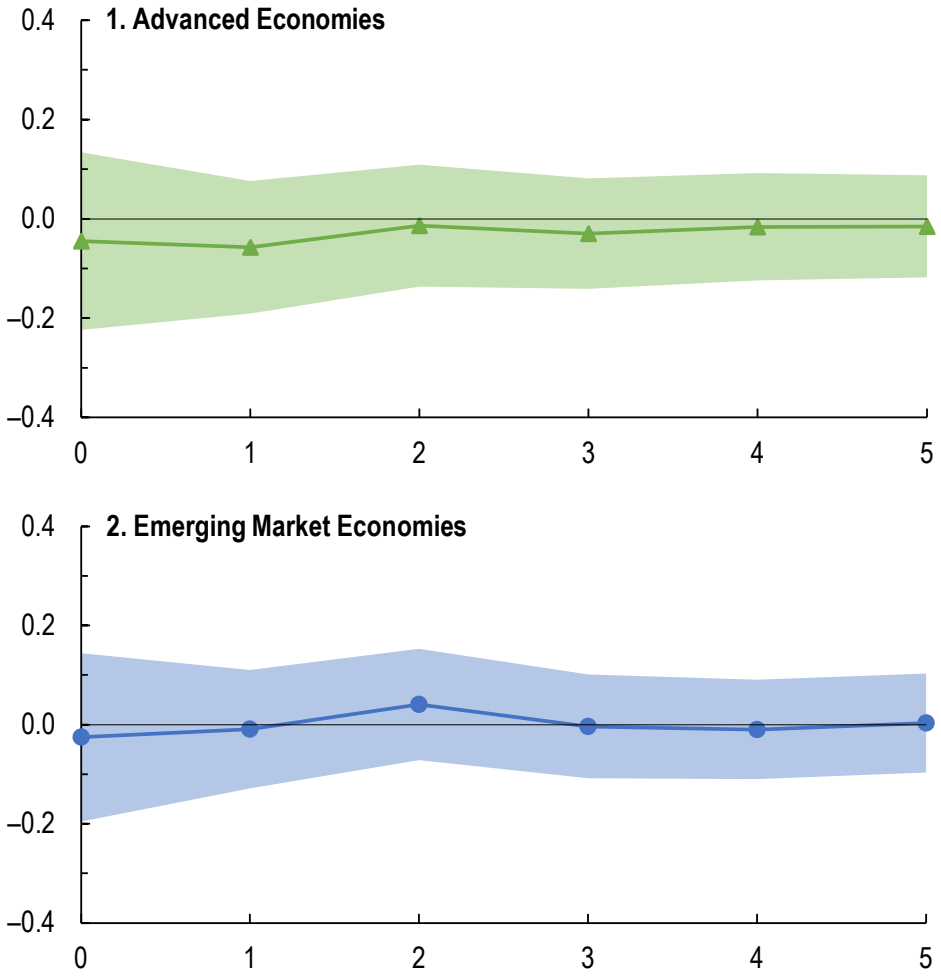
Figure 3. Unconditional probability of observing fiscal consolidations with reduction in debt to GDP



Sources: IMF World Economic Outlook; IMF, Historical Public Finance Dataset (Mauro and others 2013); and IMF staff calculations.

Note: The figure reports stylized facts based on the sample of 22 advanced economies from 1980 to 2020 and 36 emerging market economies from 1991 to 2020. It shows the distribution of the probability of observing consolidations (defined as defined as a period of positive change in the primary-balance to GDP ratio at annual frequency) with a contemporaneous reduction in debt to GDP ratio. The probabilities are calculated by taking simple ratios of the number of country-years with an increase in the primary balance to GDP ratio and a decline in debt to GDP ratio to the total number of country-years with an increase in the primary balance to GDP ratio. The horizontal line stands for the median, the box represents the 25th and the 75th percentiles, and the whiskers represent the extremes, excluding the outliers.

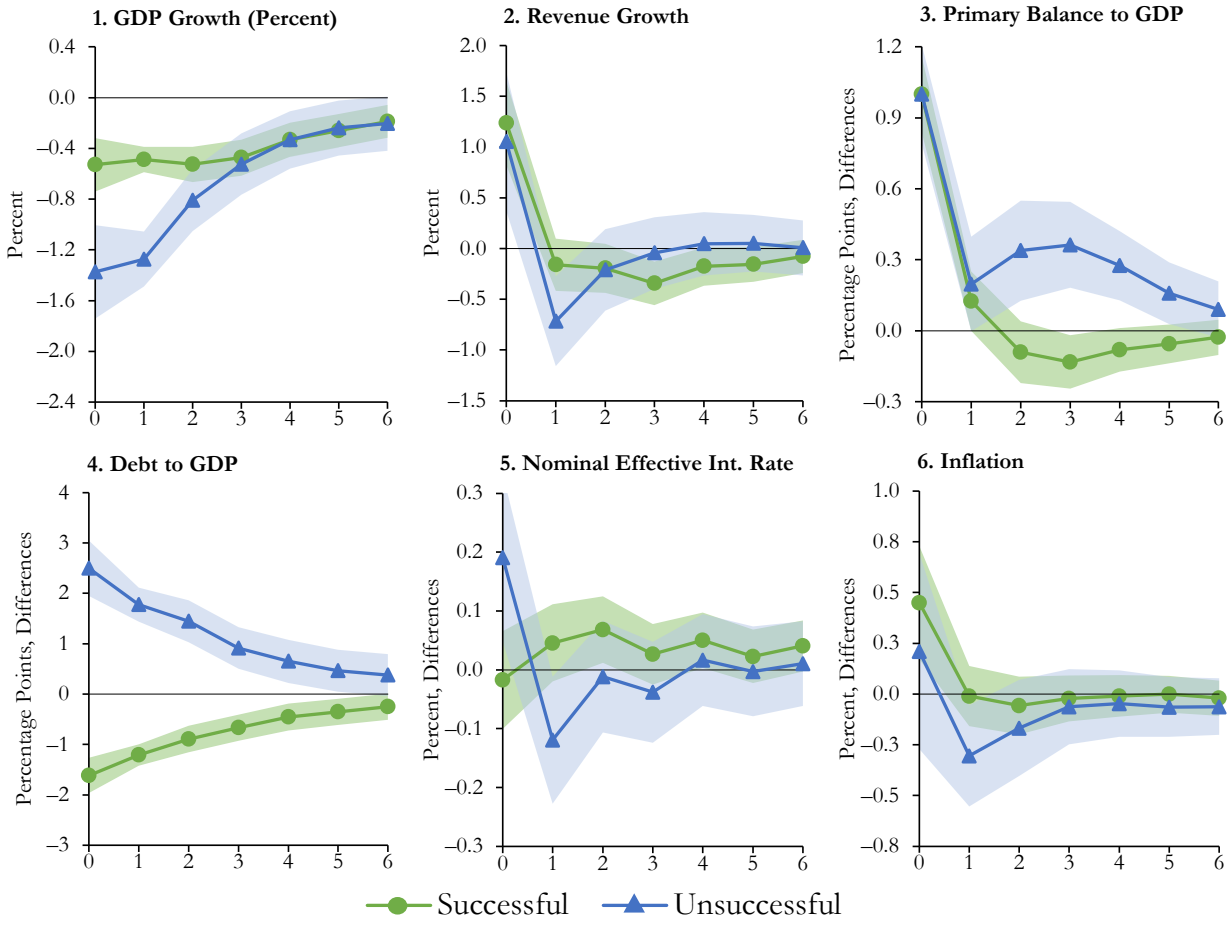
Figure 4: Impulse responses of debt to GDP to a primary balance shock, average fiscal consolidations



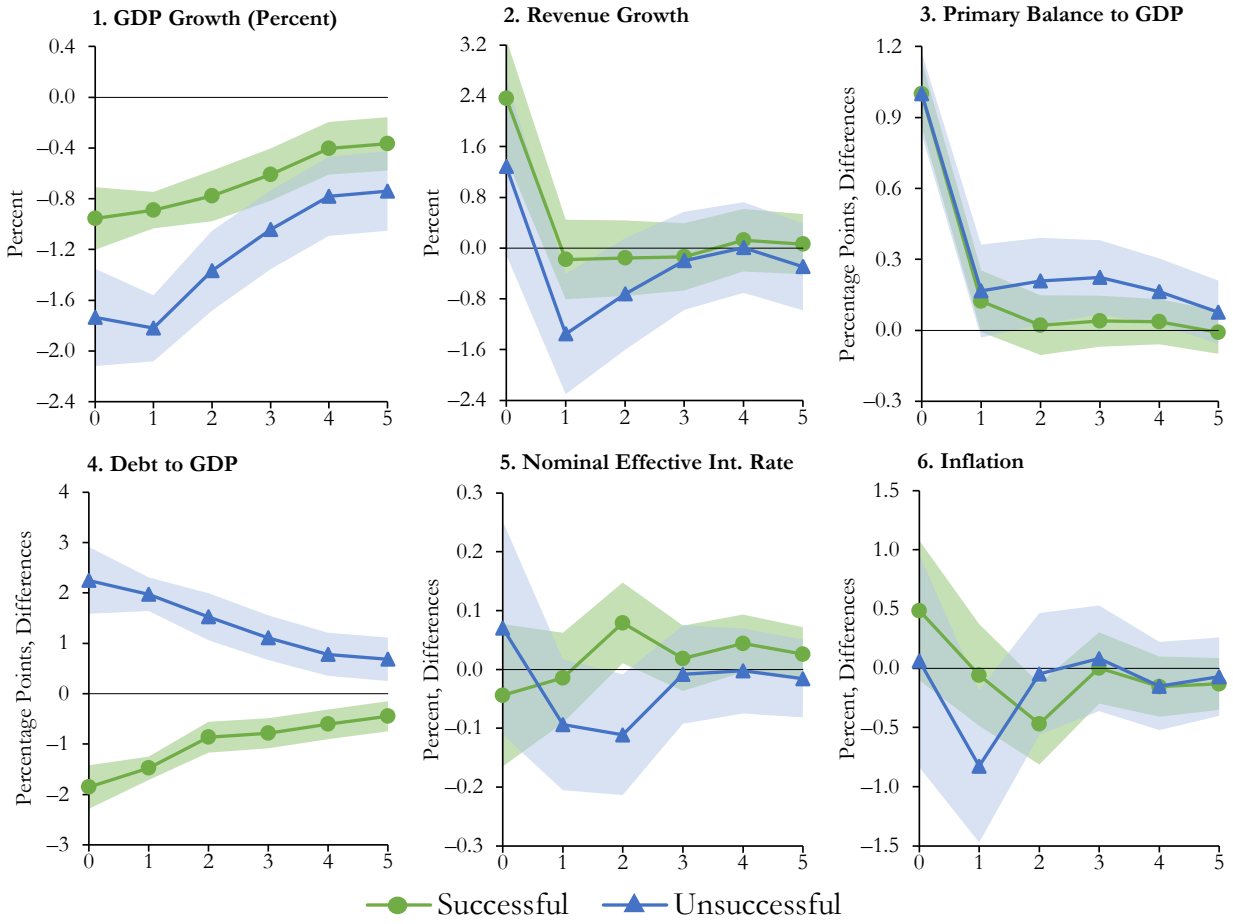
Sources: Canova and Ferroni (2022); IMF World Economic Outlook; IMF, Historical Public Finance Dataset (Mauro and others 2013); and IMF staff calculations.
Note: Primary balance shock is scaled to one percentage point of GDP on impact on average. Displayed impulse responses are inverse variance weighted means across countries from a Bayesian vector autoregression estimated country by country at annual frequency. Shaded areas represent the 16th–84th percentile range of the posterior distribution. The sample includes 21 advanced economies (top panel) and 37 emerging economies (bottom panel) from 1981 to 2019.

Figure 5: Impulse responses of debt to GDP to a primary balance shock, successful and unsuccessful fiscal consolidations

Panel A: Advanced Economies



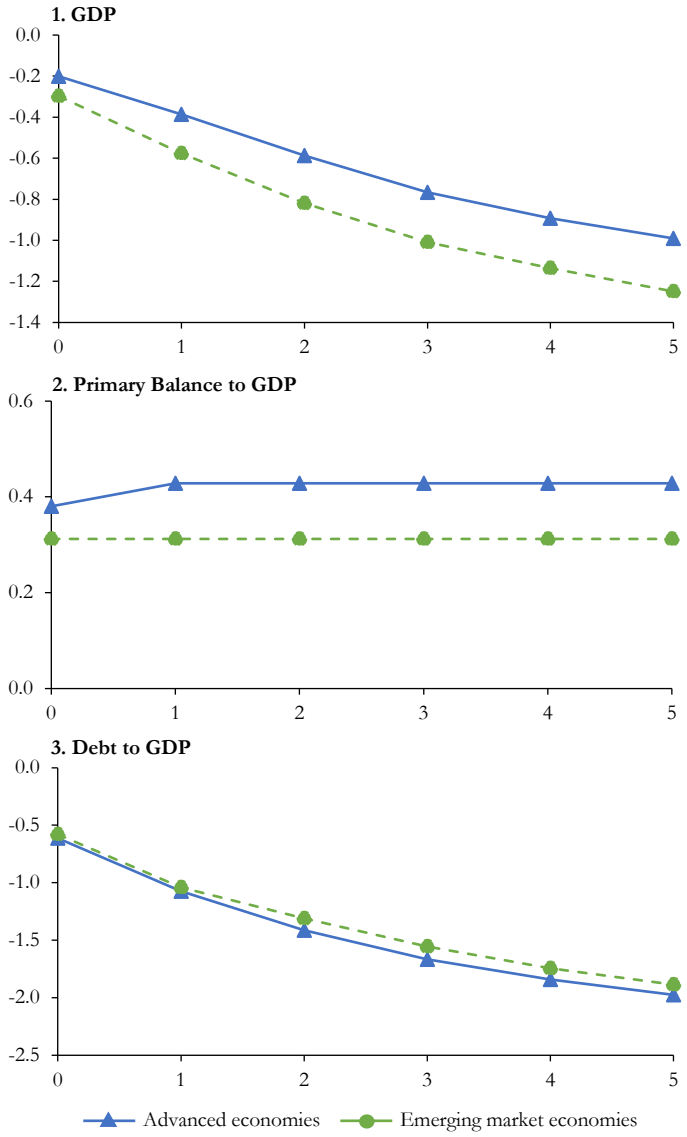
Panel B: Emerging Markets



Sources: Canova and Ferroni (2022); IMF World Economic Outlook; IMF, Historical Public Finance Dataset (Mauro and others 2013); and IMF staff calculations.

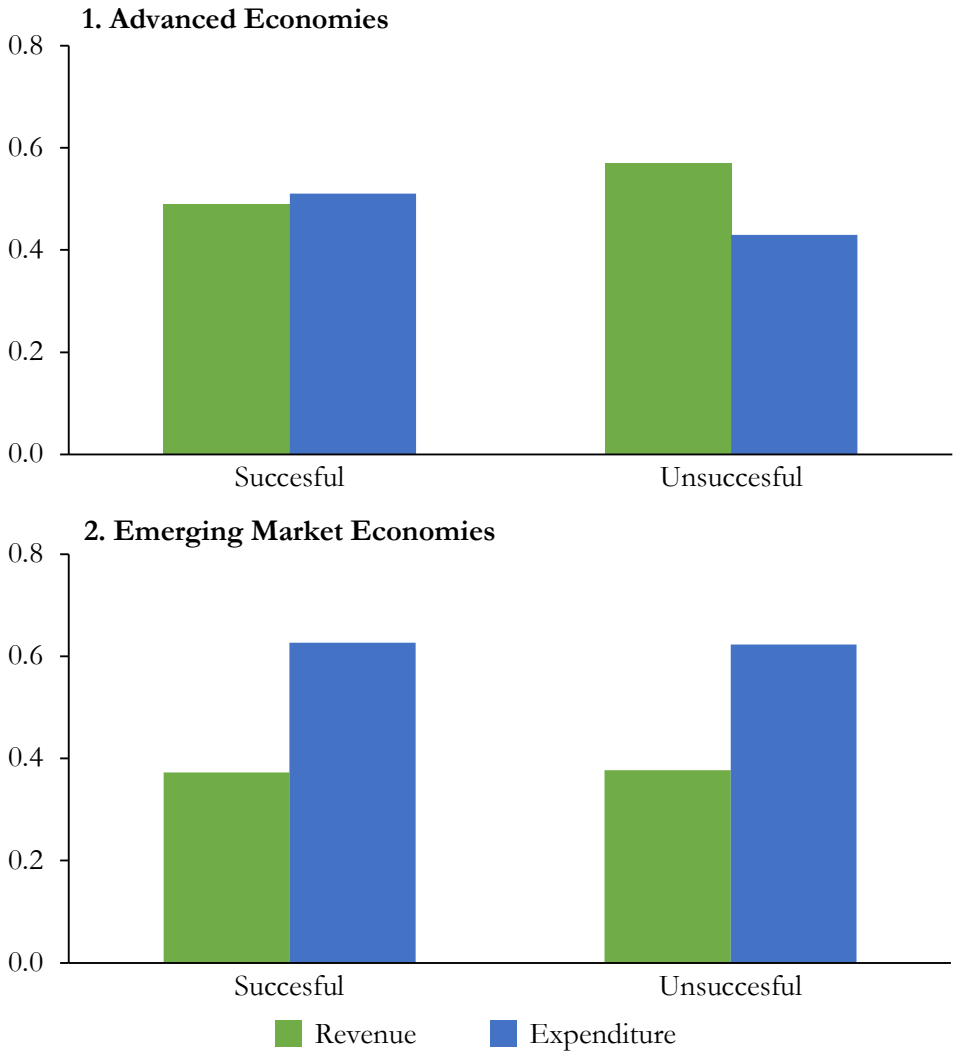
Note: Primary balance shock is scaled to one percentage point of GDP on impact on average. Displayed impulse responses are inverse variance weighted means across countries from a Bayesian vector autoregression estimated country by country with 2 lags at annual frequency. Variables in panels 3-6 are in first differences to ensure stationarity. Shaded areas represent the 16th–84th percentile range of the posterior distribution. The sample includes 21 advanced economies (panel A) and 37 emerging economies (panel B) from 1981 to 2019.

Figure 6. Impulse response levels to an average successful consolidation shock



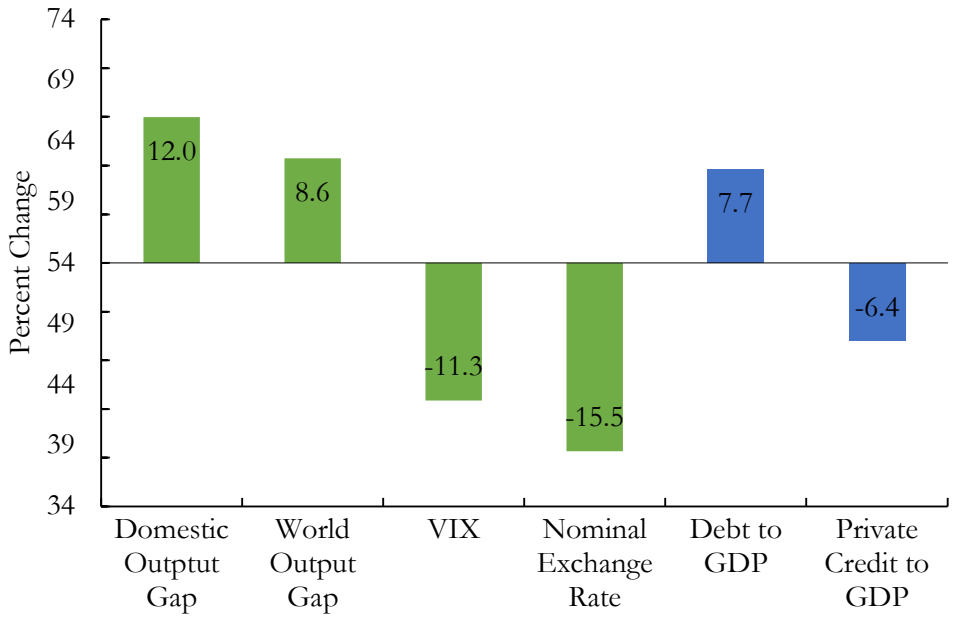
Sources: Canova and Ferroni (2022); IMF World Economic Outlook; IMF, Historical Public Finance Dataset (Mauro and others 2013); and IMF staff calculations.
Note: The figure shows median values implied by the vector autoregression estimates at annual frequency. The y-axis is in percentage points. The sample includes 21 advanced economies (solid line) and 37 emerging economies (dashed line) from 1981 to 2019.

Figure 7. Contribution to primary balance shock on impact, revenue- versus expenditures-based fiscal consolidations



Sources: Canova and Ferroni (2022); IMF World Economic Outlook; IMF, Historical Public Finance Dataset (Mauro and others 2013); and IMF staff calculations.
Note: The sample includes 21 advanced economies (panel A) and 37 emerging economies (panel B) from 1981 to 2019. The figure reports the contributions of revenues and expenditures to the response of primary balance/GDP on impact. These are based on estimates from a VAR where we replace primary balance to GDP with its two components—revenue to GDP and expenditure to GDP. The shock is identified in a manner similar to the original SVAR, by putting a sign restriction on primary balance to GDP (which here means the difference between revenues to GDP and expenditures to GDP has to be positive). Impulse responses are then scaled so that their impact on GDP is the same as in the baseline SVAR

Figure 8. Factors affecting the probability of consolidations reducing debt ratios



Sources: Canova and Ferroni (2022); IMF World Economic Outlook; IMF, Historical Public Finance Dataset (Mauro and others 2013); and IMF staff calculations.
Note: The figure shows estimates of multivariate standardized logit regression with the dependent being a dummy variable equal to one for a successful consolidation, in which the debt to GDP declines and the successful shock from the VAR contributes at least 10 percent to the decline, and equal to zero for an unsuccessful one (for example, debt to GDP increases and the unsuccessful consolidation shock from the VAR contributes at least 10 percent to the increase). All coefficients are significant at the 10 percent level based on bootstrap standard errors. The world output gap variable is orthogonalized with respect to domestic output gap to recover the exogenous component. The sample consists of 21 advanced economies from 1981 to 2019 and 37 emerging market economies from 1994 to 2019. The bars indicate the marginal impact of a one standard deviation increase in the variable on the probability of a consolidation being successful in reducing the debt ratio. For the nominal exchange rate, the impact of half instead of one standard deviation (which is close to a 5% depreciation) is shown since the overall standard deviation is high due to a thick right tail in the distribution. VAR = vector autoregression; VIX = Chicago Board Options Exchange Volatility Index.

Table 1. Structural Vector Autoregression sign restrictions

	GDP	Real Revenue	Primary Balance to GDP	Debt to GDP	Interest Rate	Inflation
Demand Shock	+	+				+
Supply Shock	+	+				–
Successful Primary Balance Shock	–		+	–		
Unsuccessful Primary Balance Shock	–		+	+		

Source: IMF staff calculations.
Note: Sign restrictions on debt to GDP and GDP growth for consolidation shocks are imposed one period ahead, i.e., a consolidation shock is assumed to affect debt to GDP, and GDP in the following year. All other sign restrictions are imposed on impact.

Table 2. Drivers of successful consolidations: Probit results

	(1) Pr(Success)	(2) Pr(Success)
Domestic Output Gap	16.1***	17.6***
	(4.62)	(6.10)
World Output Gap	33.8***	29.0*
	(10.4)	(17.6)
Lagged Debt/GDP	0.0084***	0.026*
	(0.0030)	(0.013)
Lagged Private Credit/GDP	-0.0054*	-0.016
	(0.0031)	(0.011)
VIX (log)	-1.50***	-1.29**
	(0.38)	(0.50)
Nominal Depreciation (EMs)	-0.12***	-0.12***
	(0.028)	(0.039)
Nominal Depreciation (AEs)	-0.033*	-0.046
	(0.020)	(0.032)
Constant	4.75***	
	(1.19)	
Observations	406	356
Country Fes	No	Yes

Notes: The table shows the estimates of multivariate logit regression with the dependent being a dummy variable equal to one for a successful consolidation, in which the debt to GDP declines and the successful shock from the VAR contributes at least 10 percent to the decline, and equal to zero for an unsuccessful one (for example, if debt to GDP increases and the unsuccessful consolidation shock from the VAR contributes at least 10 percent to the increase). The world output gap variable is orthogonalized with respect to domestic output gap to recover the exogenous component. The sample consists of 21 advanced economies from 1981 to 2019 and 37 emerging market economies from 1994 to 2019. VIX = Chicago Board Options Exchange Volatility Index. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

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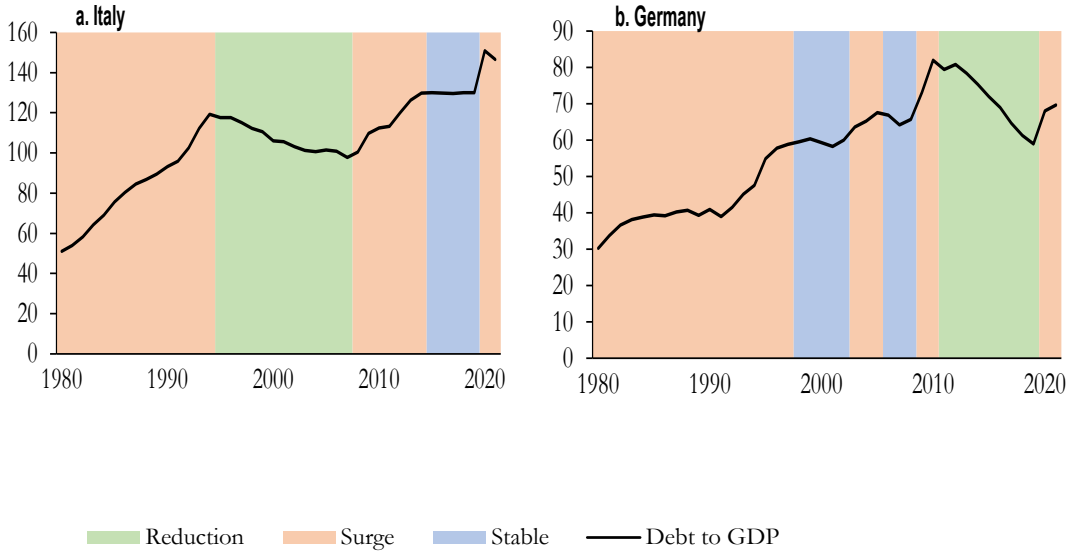
Appendix

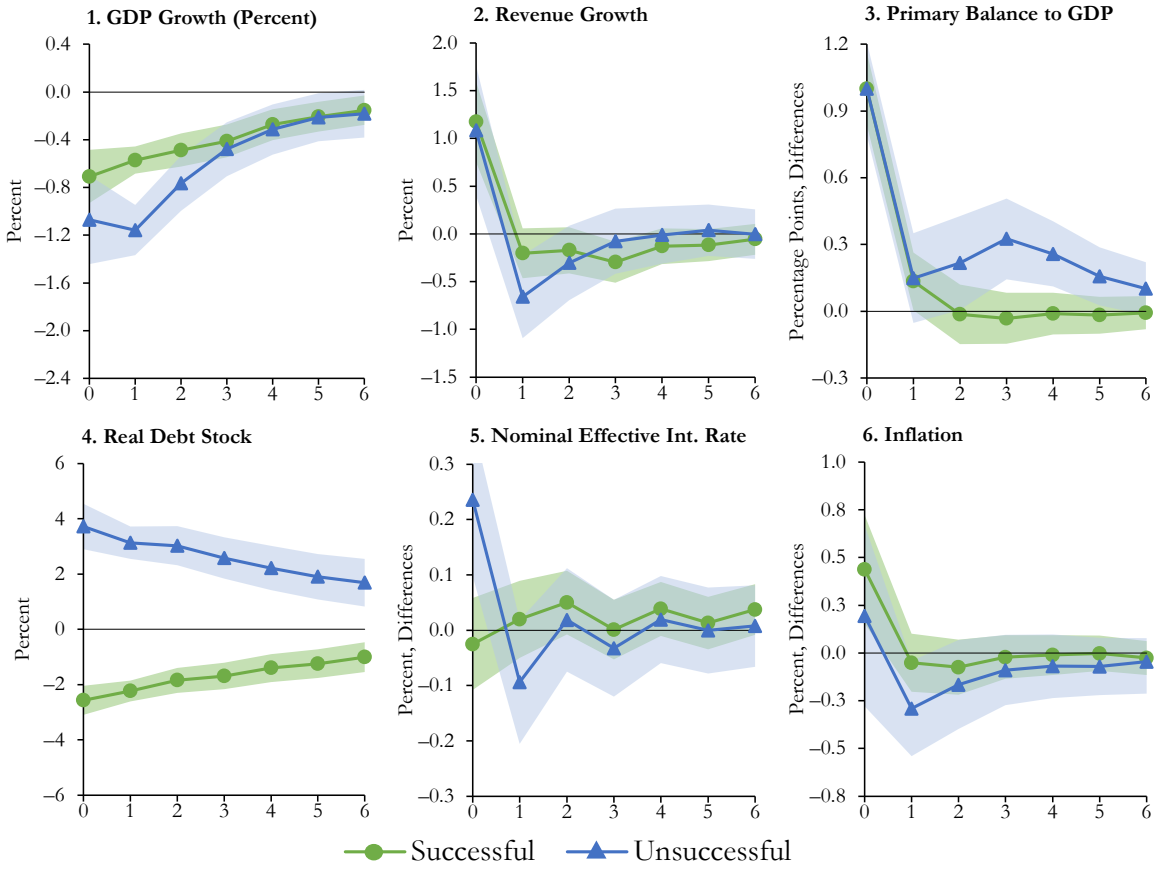
Figure A1: Debt Episodes



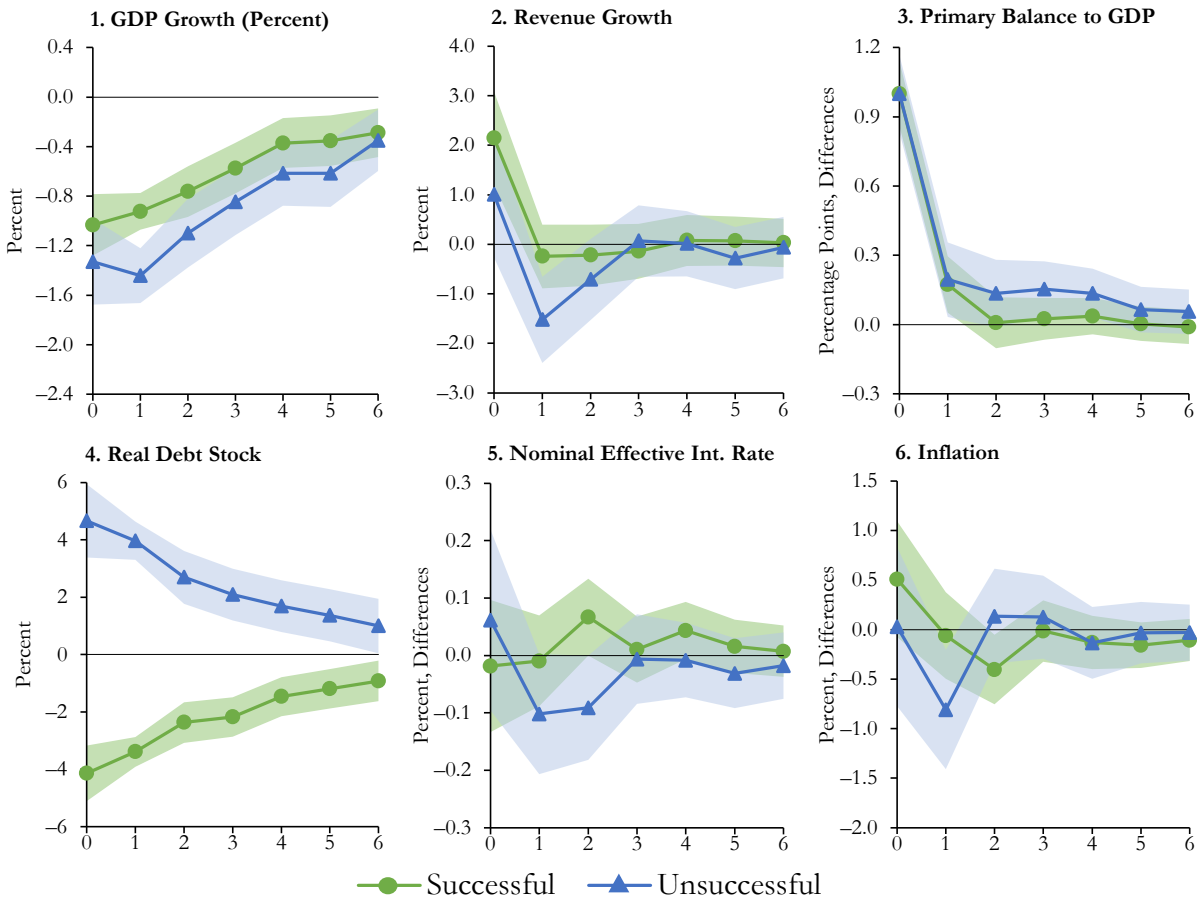
Sources: IMF, Global Debt Database, Historical Public Finance Dataset (Mauro and others 2013); and IMF staff calculations.

Figure 2 Impulse responses of debt to GDP to a primary balance shock, successful and unsuccessful fiscal consolidations (real debt stock)

Advanced Economies



Emerging Markets



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Note: Primary balance shock is scaled to one percentage point of GDP on impact on average. Displayed impulse responses are inverse variance weighted means across countries from a Bayesian vector autoregression estimated country by country with 2 lags at annual frequency. Variables in panels 3-6 are in first differences to ensure stationarity. Shaded areas represent the 16th–84th percentile range of the posterior distribution. The sample includes 21 advanced economies (panel A) and 37 emerging economies (panel B) from 1981 to 2019.