Business Cycles, Discretion and Fluctuations in Sovereign Debt to GDP *

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Abstract

What is the relative importance of business cycles vs discretionary policy as drivers of sovereign debt dynamics, and what are the macroeconomic effects of fiscal consolidations? We address these questions through the lens of a structural vector autoregression (SVAR) identified with narrative sign restrictions and estimated on a broad sample of emerging and advanced economies. The VAR includes real GDP growth, debt to GDP, primary balance, effective interest rate, and inflation. We identify three shocks: two business cycle shocks (demand and supply) and a discretionary policy shock identified with narrative sign restrictions. The narrative shocks are borrowed from a literature which precisely aims to capture changes in fiscal policy not driven by business cycle considerations. The estimates reveal that business cycle demand and supply shocks account for about half of the yearly fluctuations in debt to GDP ratios and discretionary policy shocks account for about a fifth. Outside of the business cycle, primary balance consolidations are not harmful to growth on average, and do succeed in reducing debt.

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1 Introduction

The secular rise in sovereign debt levels around the world has been one of the most conspicuous macroeconomic phenomena of the last two decades. To a significant extent the rise can be attributed to countercyclical responses to two major crises- namely the global financial crisis and the Covid-19 pandemic. However, the underlying trend has been on an upward trajectory in most parts of the world even outside of these episodes.

Sovereign borrowing can provide several benefits to countries. It can enable them to conduct countercyclical policy to stabilize economics cycles, as well as allow governments to finance long term projects related to infrastructure and social objectives. But when debt levels surge too high or too quickly, a few concerns and risks come to the fore. For example, high debt levels erode fiscal space and constrain the ability of governments to support economies during downturns. Moreover, the debt level itself may become a source of vulnerability if the outlook for its sustainability turns sour, for instance due to a rise in projected interest rates. Indeed, history is replete with examples where sovereign debt triggered or exacerbated broader macroeconomic and financial crises.

This naturally raises two questions-what fraction of debt fluctuations are driven by business cycle stabilization motives, and what is the role of discretionary fiscal adjustments unrelated to business cycles. Second, to what extent and under what circumstances can primary balance consolidations actually help countries reduce debt, and in doing so, what macroeconomic imprints do they leave on measures such as growth, interest rates and inflation.

This paper addresses these questions through the lens of a Structural Vector Autoregression (SVAR) setup involving debt and its major drivers for 21 advanced economies (AEs) and 33 emerging economies (EMs). The five-variable VAR includes GDP growth, primary balance, debt to GDP, inflation and the effective interest rate on debt. In line with the motivating questions, the model is set up to identify two business cycle shocks and a primary balance shock orthogonal to the business cycle.

This identification is achieved via narrative sign restrictions. In particular, the core SVAR is set up with sign restrictions to identify business cycle and fiscal shocks in the spirit of Mountford and Uhlig (2009). It is then augmented with narrative sign restrictions on the primary balance shock, following the approach of Antolín-Díaz and Rubio-Ramírez (2018). This multi-layered approach preserves the rigour of the sign restricted structural VAR setup while allowing narrative information from the literature on discretionary primary balance consolidations to be easily incorporated. We take the narrative shocks from a strand of the literature that is precisely dedicated to identifying movements in the primary balance unrelated to the business cycle, including Guajardo et al. (2014), Gunter et al. (2021) and

Carrière-Swallow et al. (2021).

Our estimates reveal that business cycle shocks characterized by a counter-cyclical response of the primary balance explain about half of the observed fluctuations in debt to GDP ratios in both AEs and EMs. EMs tend to respond less than AEs, but the response in both groups is front loaded. This means that debt is typically reduced during expansions, and as such, âluck,â as captured by shocks to GDP matters quite a bit for debt dynamics.

We further document that fiscal consolidations orthogonal to the business cycle are also an important driver of debt and explain about a fifth to a quarter of year to year debt fluctuations. Furthermore, these discretionary consolidations are successful in reducing debt with minimal effects on GDP.

While these questions have been considered before, our approach provides new and topical insights to this evolving literature. For instance, studies on debt dynamics so far have primarily considered mechanical decompositions of debt into its proximate drivers based on accounting identities. We take a deeper dive and uncover structural drivers in terms of primitive shocks that shed more light on causality and can help inform policy choices. Moreover, the literature is divided on the qualitative implications of discretionary fiscal consolidations, with recent contributions using narrative approaches arguing that they are sharply contractionary. Our results show that once we control explicitly for business cycle shocks and acknowledge the impact of consolidations of debt levels, this may no longer be the case, and consolidations can actually be benign for growth.

The remainder of this paper is organized as follows. This section ends with a brief overview of the related literature. Section 2 presents the methodology. Section 3 discusses the data and estimation set up. Section 4 presents the main results, which are followed by a few extensions in Section 5. Section 6 concludes with a summary of the main takeaways and highlights avenues for future work.

Literature Review

This paper is linked to three strands of the literature, namely on the drivers of sovereign debt, SVAR approaches to analyzing the effect of macroeconomic shocks, and fiscal multipliers and macroeconomic effects of fiscal consolidations.

The literature on drivers of sovereign debt has focused largely on proximate drivers that emerge from a mechanical decomposition of changes in debt to GDP ratios into various subcomponents such as interest rates, primary balance and GDP growth based on identities. Recent examples of this approach can be found for instance in Cochrane (2019) and Hall and Sargent (2011) for the US and Das and Ghate (2022), for India.

While these estimates provide an accurate accounting of the proximate drivers, they are silent on the fundamental primitive shocks that ultimately drive debt, as well as on causality. For instance, a mechanical decomposition may reveal that debt fluctuations are driven to a large extent by the primary balance, but may fail to capture that the primary balance itself is driven by more fundamental business cycle or commodity price shocks. Our approach is geared towards addressing these issues.

The second point of intersection is with the literature on structural vector auto regressions for identifying and studying the implications of macroeconomic shocks. In this context, our work is most closely related to Mountford and Uhlig (2009) who study the impact of fiscal shocks orthogonal to business cycle and monetary policy shocks using sign restrictions. We build on their framework by combining it with the narrative sign restrictions approach of Antolín-Díaz and Rubio-Ramírez (2018). In particular, we constrain the sign of the primary balance shock in our setup to be consistent with the narrative evidence documented in the literature. As shown by Antolín-Díaz and Rubio-Ramírez (2018), even a small number of narrative restrictions can significantly sharpen the identification relative to a purely sign restricted VAR.

The third strand of the literature linked with this paper deals with the macroeconomic impact of fiscal consolidations and expansion, particularly on economic growth. Contrary to traditional and standard new Keynesian result of fiscal consolidations being contractionary, a sizable literature has documented significant instances of fiscal austerity being expansionary. For instance Alesina and Ardagna (2010) uncover several episodes in which spending cuts adopted to reduce deficits were associated with economic expansions rather than recessions. Giavazzi and Pagano (1990) uncovered similar evidence for expansionary austerity looking at episodes in Denmark and Ireland, and Alesina and Perotti (1997) and Alesina and Ardagna (1998) reach similar conclusions for a broader set of countries.

These findings on expansionary austerity were challenged by Guajardo et al. (2014). They argued that even the cyclically adjusted primary balance and related measures typically used in the literature are not immune from capturing fluctuations in fiscal deficits that can be attributed to responses to macroeconomic conditions. Instead, they build on the seminal work of Romer and Romer (2010) for the US to identify instances of primary balance adjustments that are unrelated to macroeconomic conditions and motivated solely by a desire to reduce the budget deficit and ensure long-term public financial sustainability. They draw on a rich and diverse set of documents to collect this narrative information, including country specific (central bank and fiscal budget records) as well as multilateral sources (including OECD economic surveys and IMF staff reports). They conclude that in contrast to the literature emphasising expansionary austerity, the impact of fiscal austerity is highly contractionary.

Jordà and Taylor (2016) challenged the exogeneity of the narrative shocks used by Guajardo et al. (2014) and propose a propensity score matching approach to isolate the impact of exogenous fiscal consolidations. Upon doing so, they still find fiscal consolidations to be contractionary, but particularly only during downturns.

As evident from these rich and diverse set of results, question of impact of fiscal consolidation in output is still very much unsettled, and our paper provides a novel perspective through the use of narrative sign restrictions.

2 Empirical Approach

This section provides a brief summary of how the narrative sign restriction approach can be used to compute historical decompositions and impulse responses analysed in the subsequent sections. The structural vector autoregression has the general form

$$y_t' A_0 = \sum_{l=1}^{p} y_{t-l}' A_l + c + \epsilon_t', 0 < t < T \tag{2.1}$$

where y_t is an n by 1 vector of variables, ϵ_t is an n by 1 vector of structural shocks, A_l is an nxn matrix of parameters for lags $0 \leq l \leq p$. A_0 is an invertible matrix, c is a $1byn$ vector of parameters, p is the lag length and T is the sample size. The vector ϵ_t, conditional on past information and initial conditions $y_0, ..., y_{1-p}$ is Gaussian with mean zero and covariance matrix I_n, the identity matrix. The model described in equation (2.1) can we written as

$$y_t' A_0 = x_t' A_+ + \epsilon_t', 0 < t < T \tag{2.2}$$

where $A_+' = [A_1', A_2', ..., A_p', c']_{mxn}$ and $x_t' = [y_{t-1}', .., y_{t-p}', 1]_{mx1}$ for $1 \leq t \leq T$, where $m = np + 1$. the reduced for implied by equation (2.2) is given by:

$$y_t' = x_t' B + u_t', 0 < t < T \tag{2.3}$$

where $B = A_+ A_0^{-1}$, and $E[u_t u_t'] = \Sigma = [A_0 A_0']^{-1}$. The matrices B and Σ are reduced form parameters, while A_0 and A_+ are structural parameters. Let $\Theta = (A_0, A_+)$ collect the value of the structural parameters.

Impulse Response Functions

Given a value of Θ of structural parameters, the impulse response function (IRF) of the ith variable to the jth structural shock at horizon k corresponds to the element in row i and

column j of the matrix $L_k(\Theta)$ where the latter is defined recursively by

$$\begin{aligned} L_0(\Theta) &= (A_0^{-1})' \\ L_k(\Theta) &= \sum_{l=1}^{k} (A_l A_0^{-1})' L_{k-1}(\Theta), for 1 \leq k \leq p \\ L_k(\Theta) &= \sum_{l=1}^{p} (A_l A_0^{-1})' L_{k-1}(\Theta), for p \leq k \leq \infty \end{aligned} \tag{2.4}$$

We refer to the entry (i, j) of matrix $L_k(\Theta)$ as $L_k(\Theta)_{i,j}$

Structural Shocks and Historical Decomposition

Given a value Θ of structural parameters and the data, the structural shocks at time t are defined by

$$\epsilon_t'(\Theta) = y_t' A_0 - x_t' A_+, for 1 \leq t \leq T \tag{2.5}$$

The historical decomposition computes the contribution of the structural shocks to the observed unexpected change in the variables between two periods. Formally, the contribution of the jth structural shock to the observed unexpected change in the ith variable between periods t and $t + h$ is given by:

$$H_{i,j,t,t+h}(\Theta) = \sum_{l=0}^{h} e_{i,n}' L_l(\Theta) e_{j,n} e_{j,n}' \epsilon_{t+h-l}(\Theta) \tag{2.6}$$

where $e_{j,n}$ is the jth column of I_n

Identifying Structural Shocks

Following the seminar work of Sims (1980) who introduced SVARs for macroeconomic analysis, an extensive literature has been built to offer different identification approaches. The most common among these remains the recursive Cholesky identification scheme (see for instance Christiano et al. (2005)). While useful in certain contexts, it often involves imposing ad-hoc timing assumptions on the dynamic response of shocks. For instance, to identify more than one shock in a system in this scheme, the contemporaneous impact of at least one of the shocks has to be constrained to zero. Such restrictions are particularly undesirable given the lower (annual) frequency of our data.

Several approached in the literature help overcome this timing assumption embedded in

recursive identification, but each has its own caveats. Pesaran and Shin (1998) for instance propose a "generalized" identification scheme that side-steps the timing issue, but the shocks in this identification scheme are not necessarily orthogonal to one another.

Identification Using Narrative Sign Restrictions

Sign restrictions have emerged as a popular alternative to traditional VAR identification schemes in recent times, since they allow researchers to identify shocks my flexibly imposing minimal restrictions on impulse responses that are grounded in theory. The structural shocks and the historical decompositions are continuous functions of the structural parameters. Formally, consider any continuous function $F(\Theta)$ from the structural parameters to the space of $rbyn$ matrices, where r is a natural number. Sign restrictions will take the form

$$S_j F(\theta) e_{j,n} > 0 \tag{2.7}$$

for $1 \leq j \leq n$ where S_j is an $s_j byn$ matrix of full row rank, with $0 \leq s_j$. The value of s_j indicates a number of sign restrictions being used to identify the j^{th}. the precise nature of the sign restrictions is contained in S_j and $F(\Theta)$. In our analysis, we employ a version of the narrative sign identification that restricts structural parameters so that the structural shocks are of a particular sign for some dates. Other types of restrictions (and basis for identification) are also possible through the use of this narrative approach (Antolín-Díaz and Rubio-Ramírez (2018)).

Sign Restrictions on the Impulse Response Functions

The objective is to identify the j^{th} structural shock by imposing s_j sign restrictions on the IRF at different horizons. It is possible to define $F(\Theta)$ as vertically stacked IRFs at the different horizons over which we want to impose the restrictions and S_j as an $s_j byr$ matrix of zeros and ones that select the horizons and the variables over which these sign restrictions are to be imposed.

For example, if $F(\Theta) = L_0(\Theta)$ and $S_j = e'_{2,n}$ are chosen, this imposes the sign restriction that the IRF at horizon zero of the second variable to the j-th structural shock is positive. If the choices are instead $F(\Theta) = L_0(\Theta)$ and $S_j = -e'_{2,n}$, it imposes the sign restriction that the IRF at horizon zero of the second variable to thej^{th} structural shock is negative.

3 Data and Estimation

The analysis is based on a panel of yearly data covering twenty-one advanced economies from 1966-2020 and thirty-three emerging economies from 1990-2020. Annual frequency maximizes the number of countries and years with available data. For the same reason, the level of aggregation for fiscal variables employed is general government as opposed to central. For years before 2011, the primary source of data is the Historical Public Finance Database (HPFD). For years after 2011where HPFD is not available, we use the Global Debt Database (GDD) and the IMF's World Economic Outlook (WEO) database. Because many of the variables employed have a secular trend, the econometric analysis is based on deviations from HP trend in the first difference of each variable.[1]

3.1 Model Specification

We use the narrative sign restriction approach of (Antolín-Díaz and Rubio-Ramírez (2018)) which allows leveraging valuable narrative information from the literature and in a parsimonious yet rigorous framework of a sign-restricted VAR. The backbone of the identification is a set of sign restrictions that are used to identify three shocks-two business cycle shocks (supply and demand) and a discretionary primary balance shock orthogonal to the business cycle. The identification setup is then sharpened by using narrative restrictions to discipline the third shock for which narrative information is available in the existing literature.

More specifically, we identify two business cycle shocks in the spirit of Mountford and Uhlig (2009) using sign restrictions. A demand shock is specified as one which leads output and inflation to move in the same direction on impact, with the primary balance reacting countercyclically. A supply shock embeds the same counter-cyclical response of the primary balance, but imposes output and inflation to move in opposite direction. Table 1 summarizes the sign restrictions used in the VAR.

While similar in spirit, there are some differences from the sign restriction setup of Mountford and Uhlig (2009). First, while they consider only a single business cycle shock, we focus on identifying two separate shocks (supply and demand) in order to quantify and compare their relative contributions to business cycles and debt fluctuations.

Second, we focus on the primary balance to GDP ratio as the fiscal variable instead of

[1]Detrending is particularly important given our interest in historical decompositions. As noted by Ferroni and Canova (2021), a deterministic trend if present can dominate the historical decomposition of VAR variables by increasing the share attributable to the the initial condition. On the other hand, impulse responses for the 6 year horizon that we focus on primary are not affected much by detrending

exploring the role of taxes vs expenditures separately. This is in line with our emphasis on uncovering the drivers of debt, instead of comparing the relative importance of different fiscal instruments. This approach also allows us to better map the primary balance shock with narrative information from the literature which are specified in terms of aggregate movements in the primary balance rather than its components. Third, while Mountford and Uhlig (2009) work with quarterly data and impose the sign restrictions for four quarters, we impose them for a single period given the annual frequency of our data.

Once the two business cycle shocks are identified, we identify a third shock which moves the primary balance in a manner orthogonal to the business cycle shocks identified above. While this can be done with sign restrictions alone, we augment the identification of this shock by complementing the sign restriction with narrative information from the literature. To do this, we incorporate qualitative information from narrative shocks identified by a series of papers that are precisely aimed at capturing movements in the primary balance unrelated to business cycles. We use these measures from Guajardo et al. (2014) for advanced economies and Gunter et al. (2021) and Carrière-Swallow et al. (2021) for emerging economies.

Tables 1 and 2 illustrate the narrative restrictions used in the VAR estimation. The coverage here is limited by the set of narrative restrictions available in the literature. In particular, we manage to incorporate narrative restrictions for 15 out of 21 AEs and 9 our of 33 EMs in the sample. Moreover, even for countries where we have at least one narrative shock from the literature, we are limited by the sample period in the respective paper. For instance, none of the papers have narrative restrictions for later years in the sample (2017 onward for EMs and 2009 onward for AEs). As shown by Antolín-Díaz and Rubio-Ramírez (2018) even a small number of narrative shocks can make significant improvements to the VAR identification. As such, their incorporation is likely to be a valuable part of out setup, despite the sparse and incomplete coverage. We confirm this in the penultimate section where we compare results with and without the narrative information.

4 Results

This section summarizes the results. To answer the first question on drivers of debt, we focus on historical decompositions, and to answer the second one on the impact of fiscal consolidations unrelated to business cycles, we then turn to impulse responses from the estimated SVAR. All estimations are performed using the Empirical Macro Toolbox developed by Ferroni and Canova (2021).

We estimate the model country-by country and summarize medians across two country groups-EMs and AEs. The natural alternative to this approach would have been to estimate

a panel VAR. We opt for the country-by country approach over a panel VAR for at least three reasons. First, the panel approach imposes dynamic homogeneity across countries, which may not be justifiable given the large heterogeneity in debt dynamics across countries already documented in the literature. Second, given the relatively large T (30 years or more), the average responses estimated unit by unit are likely to be consistent. Third, estimating the model country-by country allows us to use narrative sign restrictions, which is not feasible in a panel setting.

4.1 Drivers of Debt

SVAR-based historical decompositions give the year-by-year contribution of each one of the shocks to the observed changes in each of the variables in the system, with a residual component capturing whatever the specified shocks cannot explain. Figure 3 displays the time series of median historical decomposition of debt to GDP ratios in the AE and EM samples. None of the three shocks stand out as being clearly dominant across the sample period. All three contributed significantly to the surge in debt in 2020, which is consistent with the commonly held view that the pandemic was both a demand and supply shock (Guerrieri et al. (2022)). In contrast, the debt surge around the global financial crisis of 2008 was driven largely by demand shocks, with supply shocks contributing even negatively in the case of EMs.

A succinct summary of the historical decompositions can be obtained by taking the median of absolute contributions of the different shocks across countries and time (Figure 4 and Table 2). As far as the historical decomposition of debt to GDP are concerned, the numbers are remarkably similar for the median AE and EM. Business cycle shocks account for about half of the fluctuations in debt (53% in AEs and 55% in EMs). Within business cycle shocks, the share of demand shocks is somewhat higher by about 5% for both country groups. The discretionary primary balance shock account for about one quarter of debt fluctuations.

Looking beyond the drivers of debt, the results begin to reveal notable differences across the two country groups. For instance, discretionary adjustments account for a much larger share of primary balance fluctuations in EMs (30%) relative to AEs (18%). In other words, it is more likely that primary balance fluctuations in emerging markets are driven by discretionary changes, as opposed to business cycles. Moreover, supply shocks account for a much larger share of primary balance fluctuations in AEs relative to EMs. One reason for this could be that EMs are typically more constrained in responding to supply shocks which are more challenging from an inflation-output trade-off relative to demand shocks

To summarize, business cycle shocks and the corresponding co-movements of key macro

and fiscal aggregates account for about half of the observed fluctuations in debt to GDP (55 percent in EMs, 52 percent in AEs). The role of discretionary fiscal policy (shocks to the primary balance) is also sizable, accounting for about a fourth to a fifth of debt fluctuations (22 percent in EMs, and 24 percent in AEs).

4.2 Dynamic Effects of Structural Shocks

This section summarizes the median impulse response over six years of all five variables to the modelâs one standard deviation orthogonal structural shocks. As before, the results are further divided by country group (AEs vs EMs). The shaded areas represent the (unweighted median of the country-by-country) 68 percent highest posterior density credible sets for the IRFs when the sign restrictions and narrative sign restrictions are satisfied. The use of 68% confidence intervals is more standard in this literatre relative to 90 or 95% ones- see for instanceSims and Zha (1999), Murphy (2015)

The demand shock (Figure 5) illustrates the strength of the counter-cyclical response of the primary balance, and, importantly, shows that the overall effect on debt to GDP is also countercyclical. The latter is a result, since no conditions are imposed on the level of debt. The primary balance response is front loaded (the strongest response is on impact) and is relatively long lasting. Since the SVAR shocks are symmetric, these results indicate that countries reduce their debts while in economic expansions, and that they do so in a front-loaded fashion.

There are important differences across country groups. The magnitude of the shock is much larger (about 60 percent larger) in EMs than in AEs. Interestingly, the magnitude of the response of the primary balance is essentially the same in these two country groups. Given that GDP fluctuations are larger, this indicates that EMs respond less than AEs to stabilize business cycle shocks. This lower fiscal response to business cycle shocks is reminiscent of the literature on the procyclicality of expenditures discussed earlier.

Supply shocks (Figure 6) have qualitatively similar effects on the variables of the model (with a front-loaded primary balance response, a countercyclical debt reaction, and much larger impact on EMs than in AEs). Neither demand nor supply shocks seem to have a statistically relevant effect on the effective interest rate on government debt. This variable has a lot of inertia built in, and this may perhaps not be too surprising.

Shocks to the primary balance that do not happen at the onset of recessions (or expansions), by orthogonality of the sign restrictions, and that are not related to the business cycles (through the narrative information) also tend to be front-loaded and durable (Figure 7). Their magnitude is smaller (about two thirds of the response to business cycle shocks). There

are two notable features of these shocks that are common to both AEs and EMs. First, the results clearly show that discretionary primary balance consolidations that are orthogonal to business cycles are actually successful in reducing debt on average. In this sense, the consolidations are indeed "successful", since as shown in the narrative literature, reducing debt is an important motivation behind undertaking such discretionary consolidations.

This is by no means a foregone conclusion. If for instance fiscal consolidations have a sharp negative effect on GDP and/or positive effect on real interest rates, debt to GDP ratios can actually rise in the aftermath of a consolidation.[2]

Second, primary consolidations de-linked from the business cycle have a minimal effect on GDP. As discussed in the introduction, the growth effects of fiscal consolidations remains and active area of debate in the literature. Important recent contributions by Guajardo et al. (2014) and Jordà and Taylor (2016) have suggested conceptual and methodological improvements that show that contrary to some of the earlier findings in the literature, fiscal consolidations are significantly contractions. Our contribution to this debate is two fold. We analyse a much broader set of countries than these papers, and importantly include a large sample of EMs in our analysis.

More importantly, we provide a methodological contribution that allows us to leverage the narrative shocks from the literature in a novel manner . While both Guajardo et al. (2014) and Jordà and Taylor (2016) aim to capture the impact of fiscal consolidations that are unrelated to macroeconomic conditions, they note that their methodology, while making a significant contribution towards achieving this identification goal, is not immune from potential biases in estimates. For instance, as Guajardo et al. (2014) note, if countries postpone fiscal consolidation until the economy recovers, or strengthen it when growth unexpectedly slows to rkeep deficits in check, then the narrative shocks are confounded by business cycle influences, leading to biased results. Similarly, they note how if policymakers officially motivate fiscal consolidation in terms of ensuring long-term debt sustainability, while in fact being motivated by cyclical considerations, this may again bias the results obtained form the pure narrative approach.

Our method is geared towards addressing concerns of this type. My explicitly identifying two business cycle shocks, it aims to purge the discretionary shocks from macroeconomic influences in a precise manner. For this reason, we restrict attention to the qualitative information contained in the narrative shocks, rather than the precise quantitative magnitudes.

The effects of the discretionary shocks are fairly similar across EMs vs AEs are similar, with a slightly stronger reaction of the primary balance in EMs. There are some interesting

[2]see Bi et al. (2013) for a more formal characterization of conditions under which consolidations can fail to reduce debt.

qualitative differences as well, with less favorable effects on EMs than AEs. Specifically, the region where the effects of the shock are positive on economic growth is smaller in EMs. This also translates into a more modest negative effect on Debt in EMs than AEs (in spite of the stronger primary balance response).

5 Extensions

This section discusses a few departures from the baseline model and evaluates the extent to which they tend to alter the main conclusions.

5.1 Value of Narrative Restrictions

The first exercise evaluates the contribution of narrative restrictions by estimating a VAR with only sign restrictions and comparing the results with the baseline model estimated with narrative sign restrictions. Table 3 summarizes the historical decomposition results for the VAR without narrative restrictions. The contribution of the primary balance shock to debt dynamics is very similar to the baseline model. However, the contribution of the same shock to the primary balance is markedly higher, at 44% for both EMs and AEs, relative to 30% and 18% in the model with narrative restrictions. This shows that narrative information for even a limited set of countries and time can play a major role in disciplining the role attributed to the discretionary primary balance shock.

To investigate this further, we compare the impulse responses to the discretionary primary balance shock with and without sign restrictions for both AEs and EMs (Figures 8 and 9 respectively). Narrative restrictions leads to a much sharper decline in debt to GDP in response to the shock. In fact, with just sign and no narrative restrictions, the response of debt to GDP is actually insignificant based on the conventional 68% confidence band, and would imply that the primary purpose for which primary balance consolidations are undertaken is actually not achieved. This result once again highlights the value of incorporating narrative restrictions into the analysis.

5.2 Imposing Contractionary Austerity

As discussed in the introduction, there is significant interest and lack of agreement on the qualitative impact of fiscal consolidations, with some studies finding them to be expansionary and others contractionary. Guajardo et al. (2014) from whom we borrow the qualitative narrative shocks belong to the latter set and find the impact of consolidations identified via their narrative approach to be highly contractionary. They however mention that their

narrative approach may still suffer from biases, to the extent that what their narrative records reveal as purely discretionary adjustments may still suffer from cyclical influences. Given their focus on the imapct on GDP and its components, they also do not examine the impact of fiscal consoldiation shocks on the level of debt, which according to their narrative guideline is the primary purpose behind the discretionaty adjustments that are included in the narrative shock series.

Our baseline results took a step towards addressing the first concern by attempting to purge the discretionary consolidation shock as orthogonal to two separately identified business cycle shocks. Upon doing so, the results reveal that the impact of consolidation shocks on GDP is insignificant. This is shown again in the top panel of Figure 10. The bottom panel considers a counterfactual scenario in which a consolidation is assumed to be contractionary, and imposes an elasticity of GDP with respect to the primary balance to GDP ratio to be -1% after two years as estimated by Guajardo et al. (2014). As the last panel reveals, the decline in debt is much smaller in this case, with zero firmly within the confidence bank for all horizons. This suggests that if in fact the bulk of the discretionary primary balance consolidations were contractionary, they would not be successful in reducing their debt, which is their primary motivation according to narrative records.

To summarize, our results suggest that the impact of discretionary fiscal consolidations undertaken outside of business cycle concerns is moderately negative, but largely insignificant on GDP. The results further suggest that imposing a large contractionary impact of consolidations is not consistent with their primary motivation of reducing debt.

5.3 Monetary Policy Shocks

Following the approach of Mountford and Uhlig (2009), we add a monetary policy shock to the mix by imposing a set of sign restrictions that imply a simultaneous increase in the effective interest rate on debt and a decline in inflation on impact. Table 4 summarizes the full set of sign restrictions. We keep the narrative restrictions the same as in the baseline model.

Table 5 summarizes the historical decomposition results for the VAR model with monetary policy shocks. The monetary shock accounts for 14 and 15 percent of debt fluctuations in advanced and emerging economies respectively. Importantly though, it makes only a moderate difference to the share of debt fluctuations accounted for by the discretionary primary balance shock, which now accounts for 20 percent compared to 23 on average in the baseline model.

5.4 US Interest Rate Shocks

Next, we estimate a version of the baseline model that includes the US nominal interest rate as an exogenous variable. Table 6 summarizes the historical decomposition results in this case and highlights a sharp contrast between AEs and EMs. While the US interest rate shock accounts for about 14% of debt fluctuations in AEs, the corresponding share in minuscule at just 2% for EMs. At first sight, this may appear contradictory to conventional wisdom given the commonly accepted view of the larger role of US interest rates in EM financial conditions.

However, this pattern needs to be interpreted in conjunction with the other shocks in the VAR setup. In EMs, introduction of the US interest rate shock reduces the contribution of demand shocks sharply from 30% to 18%, and increases significantly the contribution of the residual. This suggests that demand shocks and US interest rate shocks are quite similar for EMs, which prevents the VAR model from cleanly being able to separate them into two orthogonal shocks. This would justify the observed reduction in the shares of both US monetary policy and demand shocks at the expense of a rise in share of the residual.

Despite the differing patterns with respect to the share of demand and US monetary policy shocks, the introduction of the latter has limited effect on the share of debt fluctuations on account of the discretionary shock, particularly for EMs, reducing it from 23% to 20%. The reduction in the share of the discretionary shock is somewhat more pronounced for (24% to 17%). One explanation could be that US interest rates typically lead the global financial cycle, and discretionary adjustments undertaken in AEs are often prudent responses to the global interest rate outlook which is critical for debt dynamics.

6 Conclusion

Sovereign debt has reached unprecedented levels in most parts of the global economy. With several countries either battling debt distress or heading ominously in that direction, policy options to reduce debt are under intense debate. Against this backdrop, this paper quantifies the drivers of sovereign debt to GDP ratios for a broad set of 21 advanced and 33 emerging economies and studies the occurrence and consequences of fiscal consolidations, distinguishing those that occur as part of countercyclical business cycle responses from the more discretionary measures unrelated to the economic cycle.

To address these questions, it uses a structural vector autoregression (SVAR) model involving GDP growth, primary balance, debt to GDP, inflation and the effective interest rate on debt. The SVAR is tailored to identify two business cycle shocks and a primary balance shock orthogonal to the business cycle. This identification is achieved via narrative

sign restrictions. In particular, the VAR is set up with sign restrictions and fiscal policy variables similar to the set up of Mountford and Uhlig (2009), and augmented with narrative sign restrictions on the primary balance shock, following the approach of Antolín-Díaz and Rubio-Ramírez (2018). This approach preserves the rigour of the sign restricted structural VAR setup, while allowing narrative information from the literature on discretionary primary balance consolidations to be easily incorporated. The narrative shocks are borrowed from the literature that is precisely dedicated to identifying movements in the primary balance unrelated to the business cycle.

Our main results can be summarized as follows. First, business cycle shocks characterized by a counter-cyclical response of the primary balance explain about half of the observed fluctuations in debt to GDP in both AEs and EMs. This means that debt is typically reduced during expansions, and as such, âluck,â as captured by shocks to GDP matters quite a bit for debt dynamics. Second, fiscal consolidations orthogonal to the business cycle explain about a fifth to a quarter of year to year debt fluctuations. These discretionary consolidations are successful in reducing debt, with minimal effects on GDP.

The paper presents a first attempt at incorporating narrative sign restrictions to study the dynamic of debt and its drivers. While the results provide novel insights on one of the classical questions in macroeconomics, they also generate several promising open avenues for future research. For instance, the linear nature of the SVAR in this paper prevents an exploration of asymmetries based on the sign of the shock (consolidation vs expansion) as well as non-linearities-such as the heterogeneous impact of a consolidation shock depending on the initial level of debt. Moreover, our analysis focused on median dynamics across broadly defined country groups (emerging and advanced), but this approach is likely to mask significant heterogeneity across countries. Unpacking these differences across countries and understanding factors that could potentially explain when is would shed valuable light on the dynamics of debt and policy alternatives for countries looking to reduce it.

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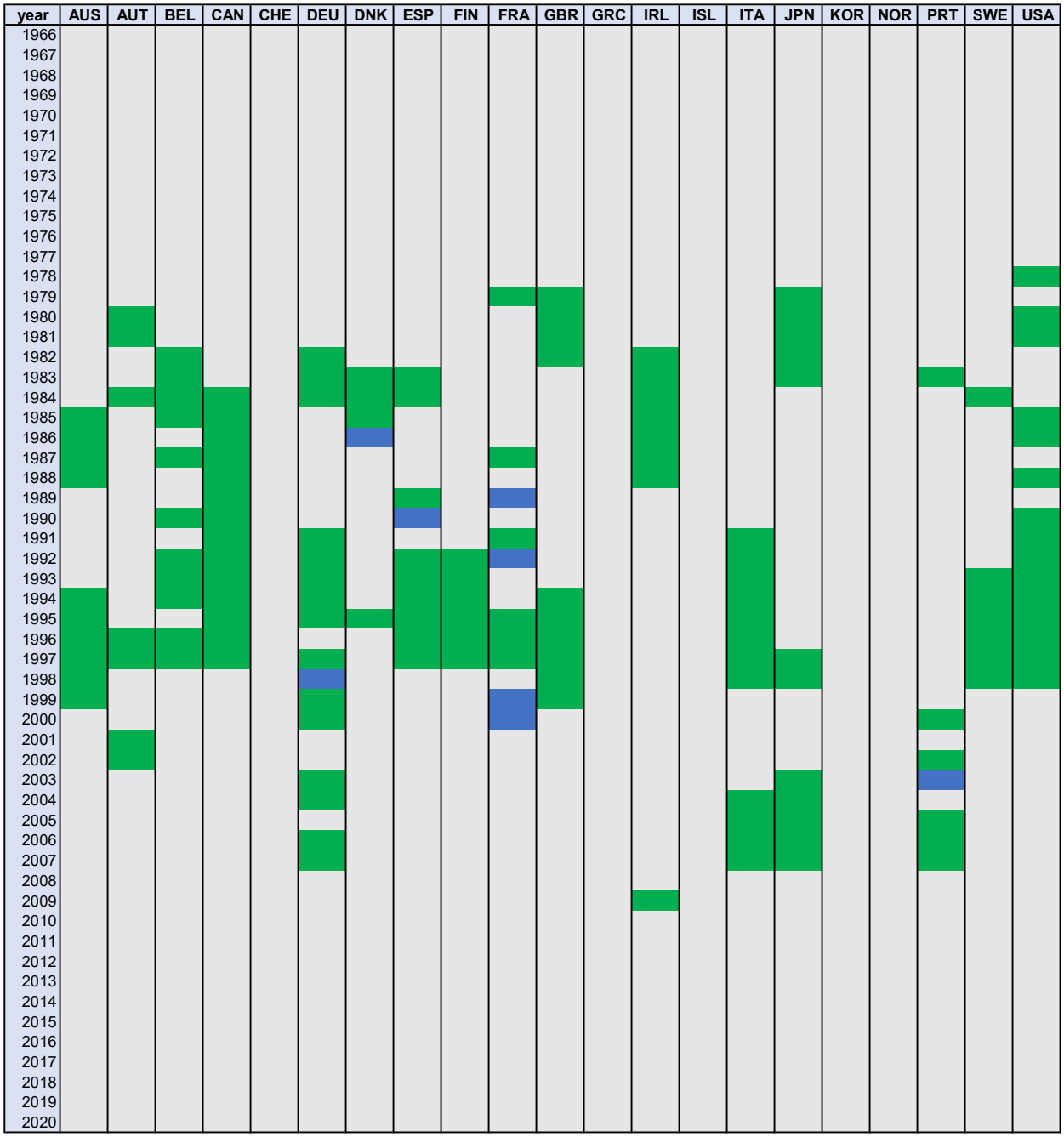
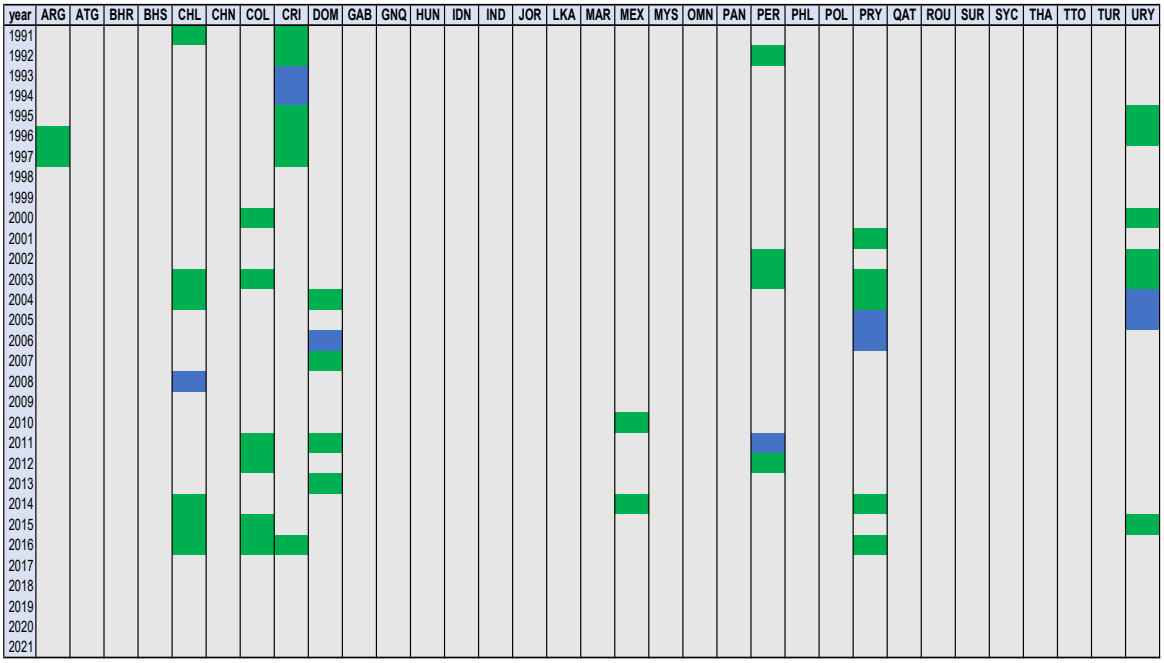
Figure 1 – *Narrative Shocks in Advanced Economies*



Notes: Green and blue denote positive and negative narrative primary balance shocks.
Sources:Guajardo et al. (2014)

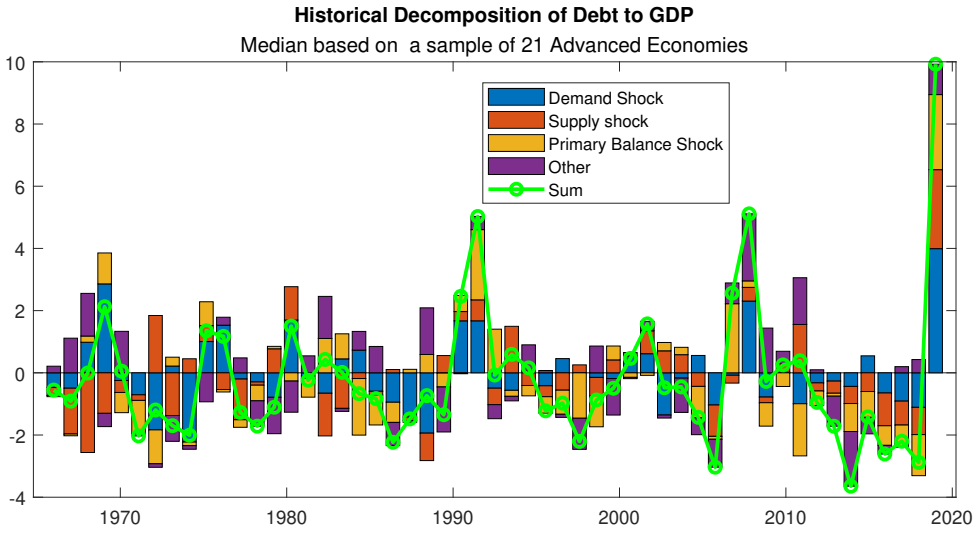
Figure 2 – *Narrative Shocks in Emerging Economies*



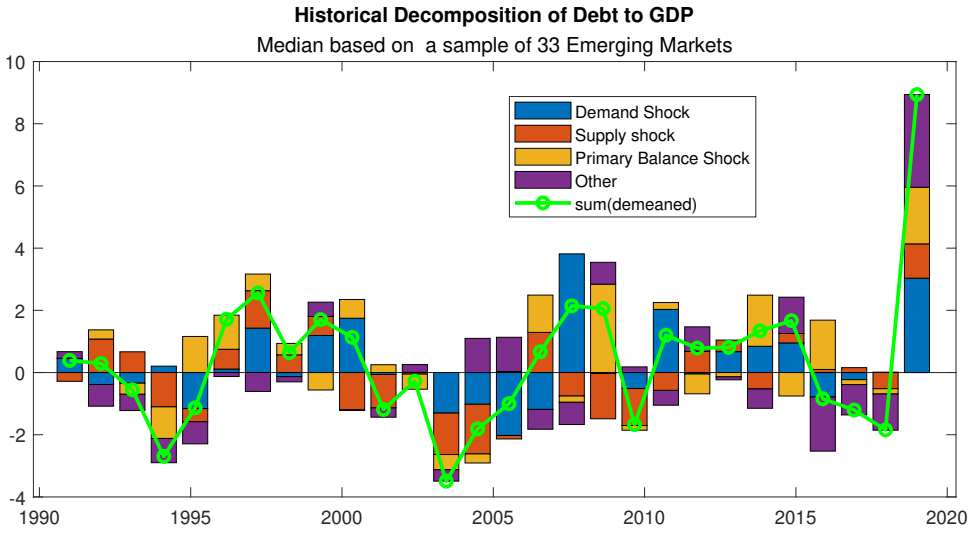
Notes: Green and blue denote positive and negative narrative primary balance shocks. Sources: Gunter et al. (2021) and Carrière-Swallow et al. (2021)

Figure 3 – *Historical Distribution*

(a) Advanced Economies



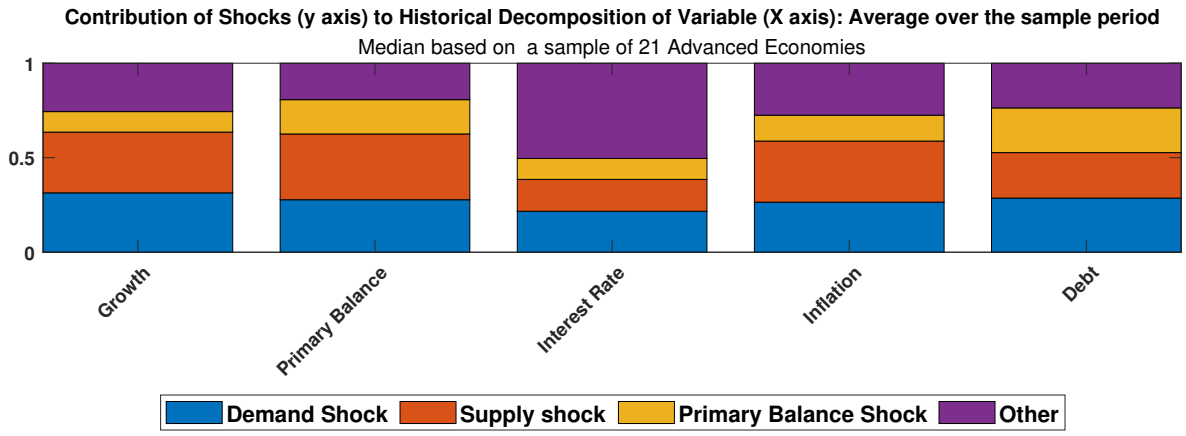
(b) Emerging Economies



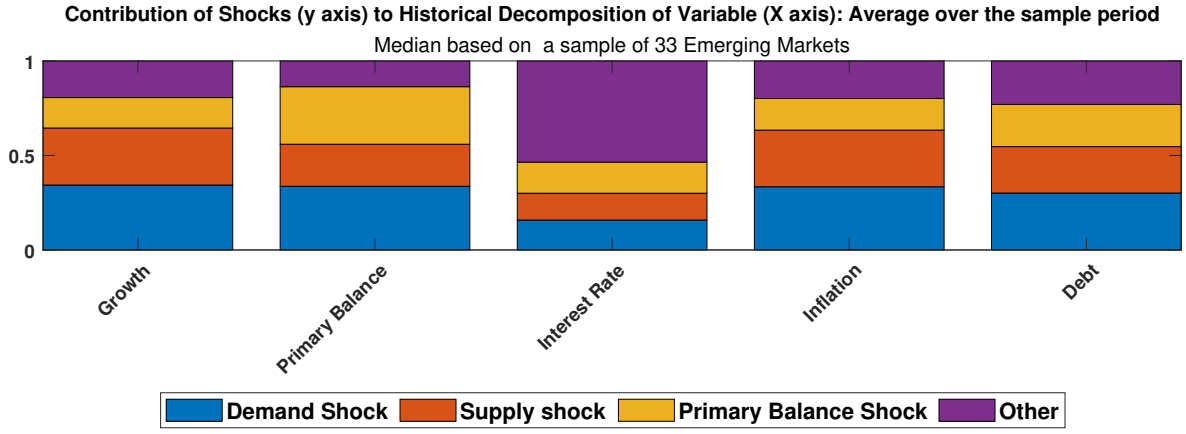
Notes: Median of year to year contributions of the different shocks to the historical decomposition of the variables included in the VAR. EM sample runs from 1990-2002 and AE sample and from 1965-2020.

Figure 4 – *Historical Distribution*

(a) Advanced Economies



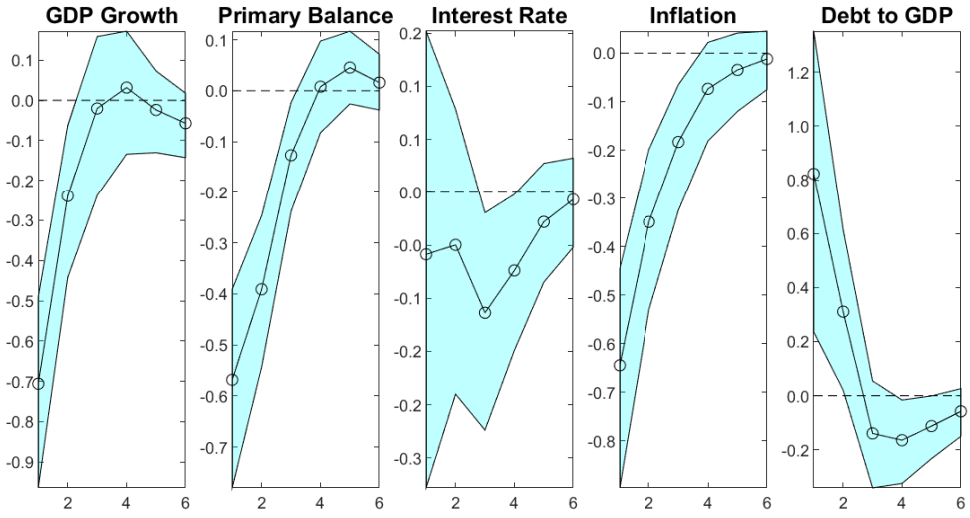
(b) Emerging Economies



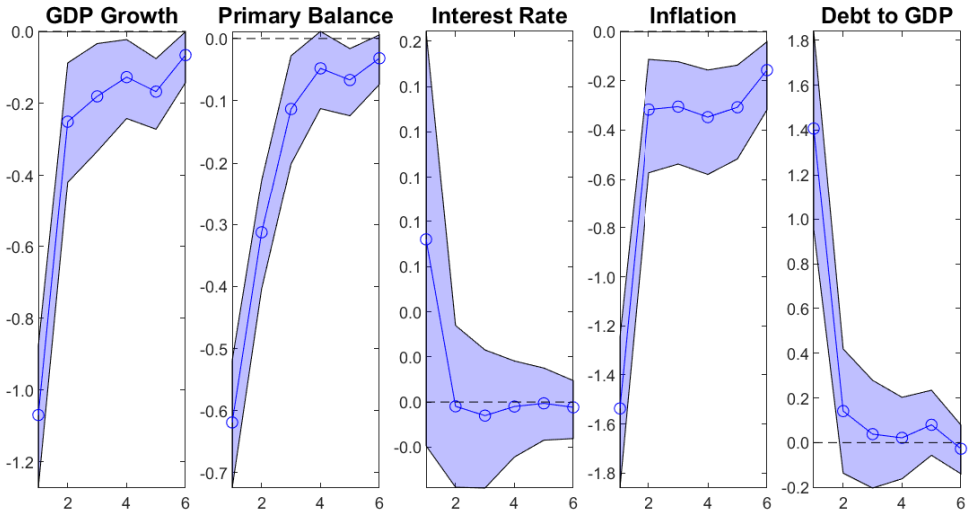
Notes: Median of year to year contributions of the different shocks to the historical decomposition of the variables included in the VAR. EM sample runs from 1990-2002 and AE sample and from 1965-2020.

Figure 5 – *Impulse Response: Demand Shock*

(a) Advanced Economies



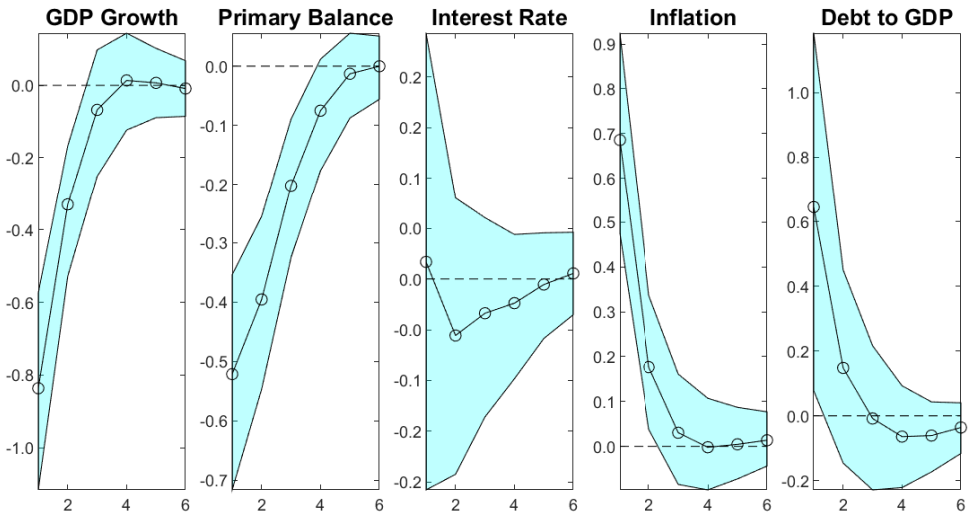
(b) Emerging Economies



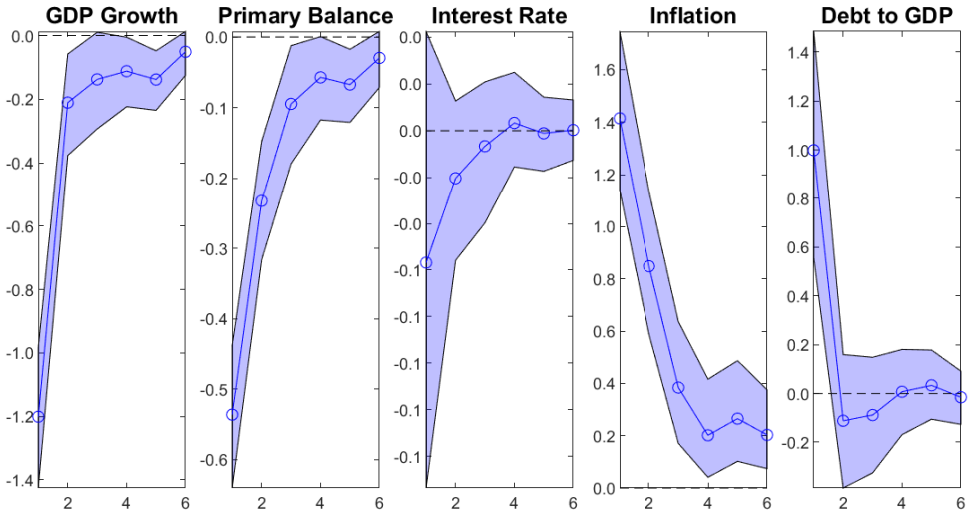
Notes: Medians and 68th percentile confidence intervals

Figure 6 – *Impulse Response: Supply Shock*

(a) Advanced Economies



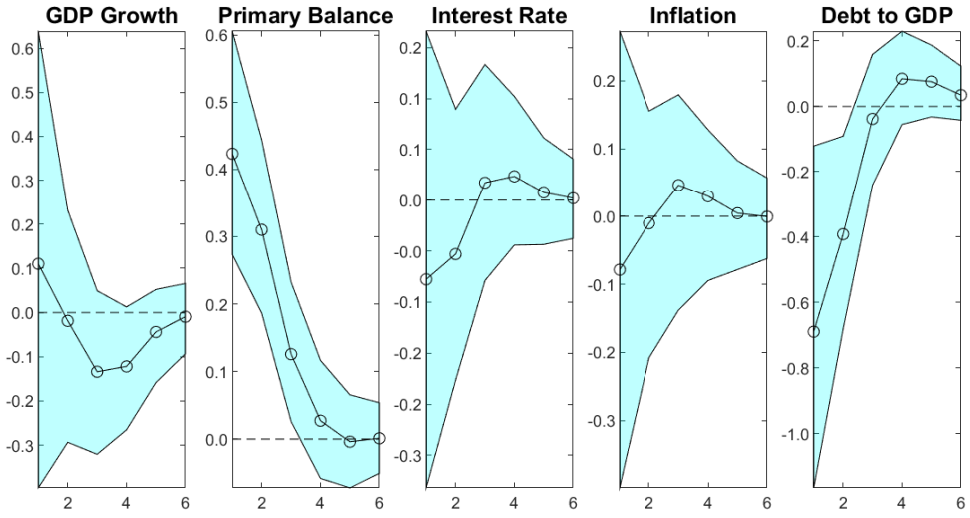
(b) Emerging Economies



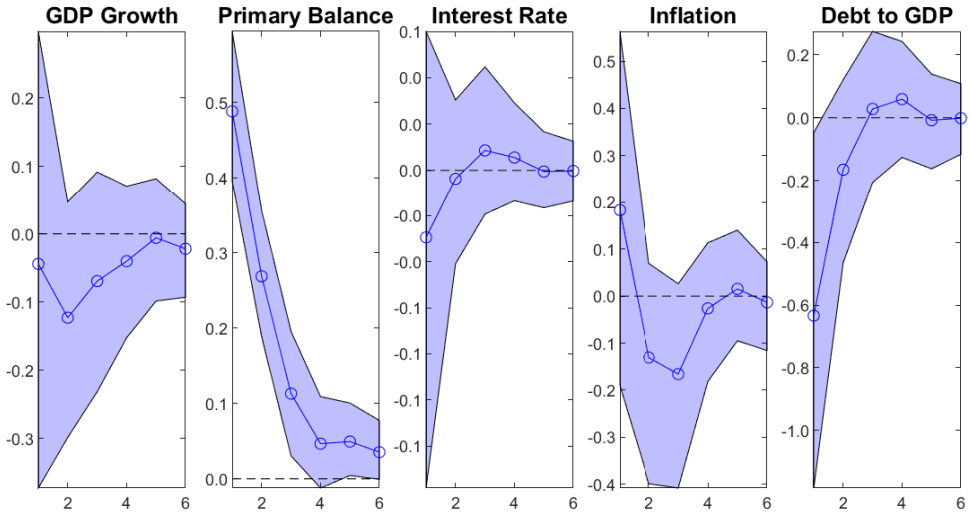
Notes: Medians and 68th percentile confidence intervals

Figure 7 *– Impulse Response: Primary Balance Shock*

(a) Advanced Economies



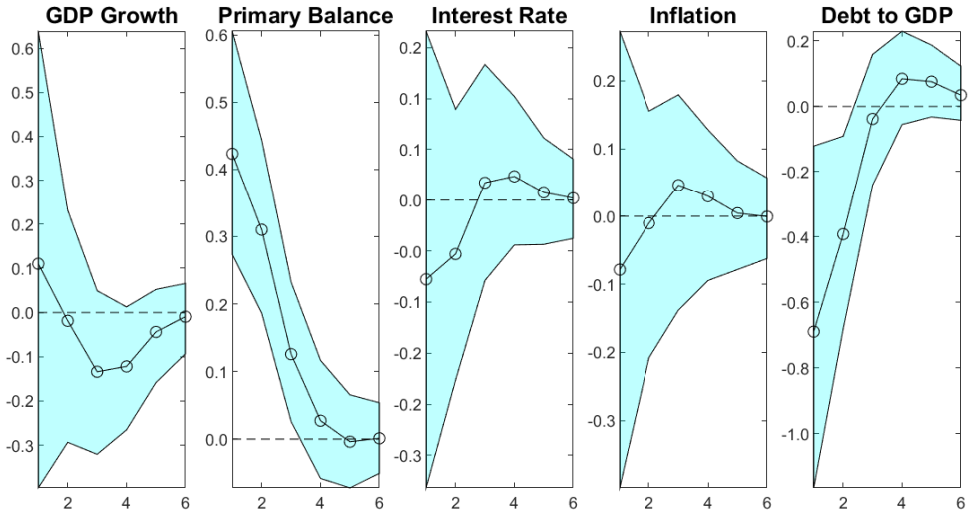
(b) Emerging Economies



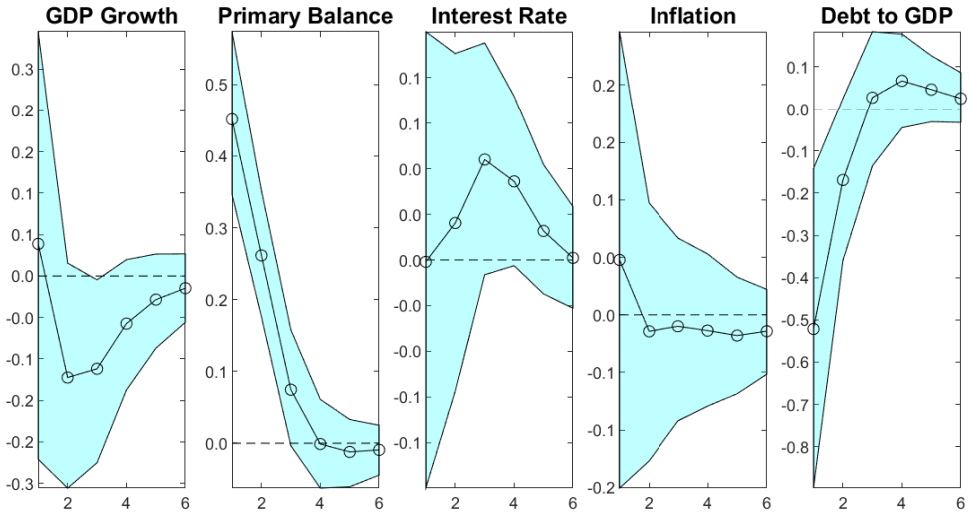
Notes: Medians and 68th percentile confidence intervals

Figure 8 *– Impulse Response: Primary Balance Shock*

(a) Advanced Economies: Sign and Narrative Restrictions



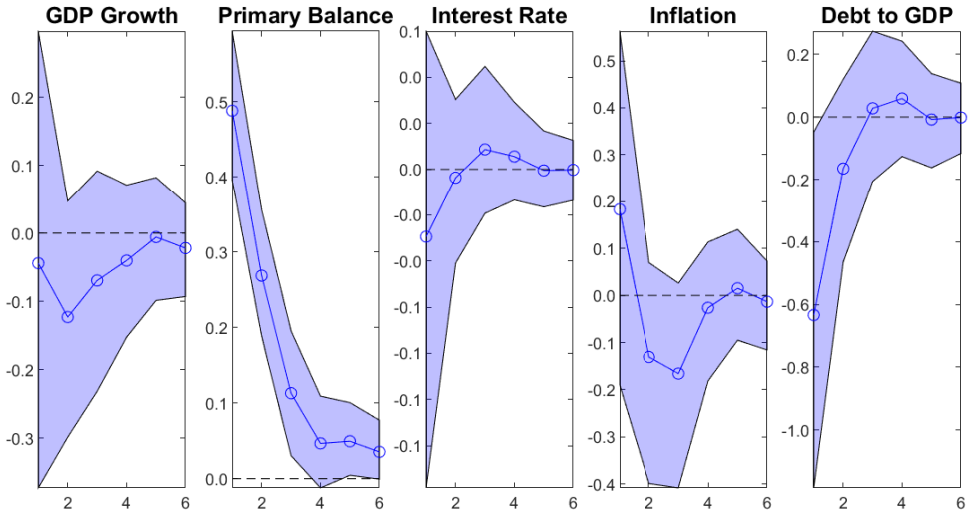
(b) Advanced Economies: Sign Restrictions Only



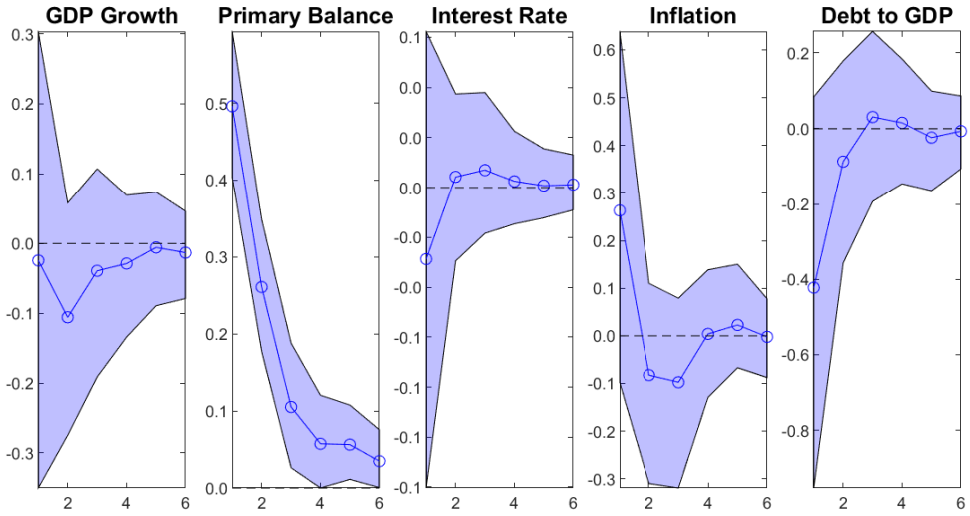
Notes: Medians and 68th percentile confidence intervals

Figure 9 *– Impulse Response: Primary Balance Shock*

(a) Emerging Economies: Sign and Narrative Restrictions



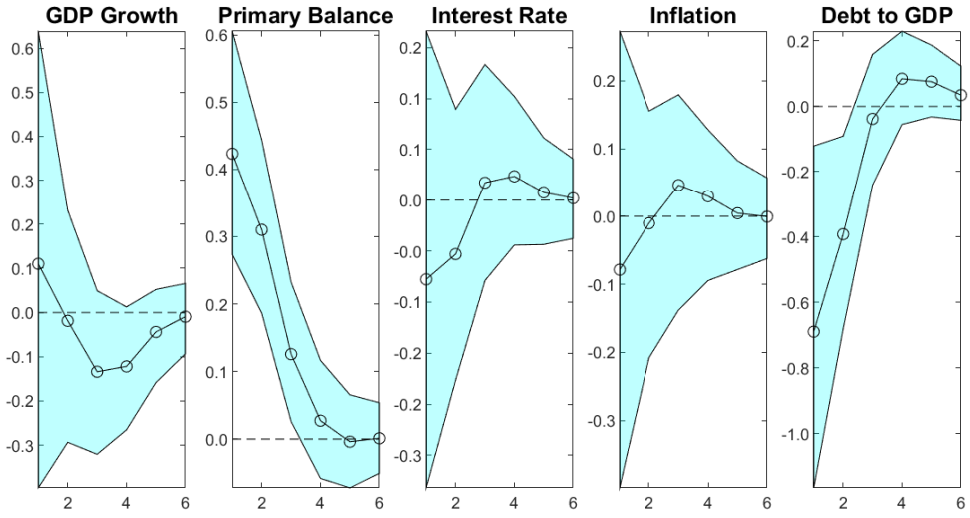
(b) Emerging Economies: Sign Restrictions Only



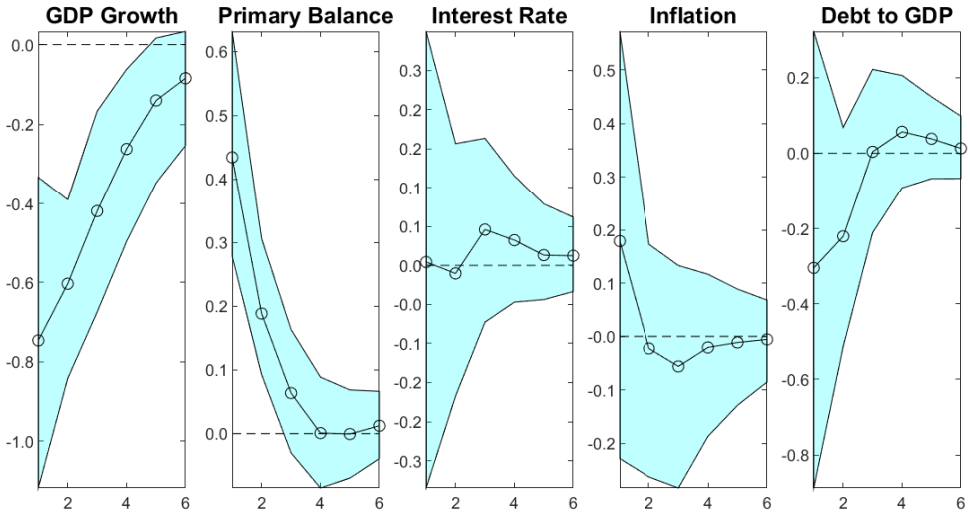
Notes: Medians and 68th percentile confidence intervals

Figure 10 – *Impulse Response: Primary Balance Shock*

(a) Advanced Economies: Baseline



(b) Advanced Economies: Imposing Contractionary Austerity



Notes: Medians and 68th percentile confidence intervals.

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Table 1 *– :Sign-restrictions-imposed*

Sign restrictions imposed on the VAR impulse responses

	GDP Growth	Primary Balance	Interest Rate	Inflation	Debt to GDP
Business Cycle Shocks					
Demand Shock	<0	<0		<0	
Supply Shock	<0	<0		>0	
Discretionary Shock		>0			

Notes: The table denotes the impact sign restrictions imposed on the impulse response of the identifies shocks (along the row) on variables (along the column) in theVAR. Empty cells imply that no sign restrictin is imposed for the specific shock/variable pair.

Table 2 *– Summary of Historical Decomposition*

	GDP Growth	Primary Balance	Interest Rate	Inflation	Debt to GDP
			Advanced Economies		
Business Cycle Shocks					
Demand Shock	0.31	0.28	0.22	0.26	0.29
Supply Shock	0.32	0.35	0.17	0.32	0.24
Primary Balance Shock	0.11	0.18	0.11	0.14	0.24
Residual	0.26	0.19	0.5	0.27	0.24
			Emerging Economies		
Business Cycle Shocks					
Demand Shock	0.34	0.34	0.16	0.33	0.3
Supply Shock	0.3	0.22	0.14	0.3	0.25
Primary Balance Shock	0.16	0.3	0.16	0.17	0.22
Residual	0.19	0.14	0.54	0.2	0.23

Notes: Summary of contributions of different shocks to the VAR variables (median of absolute year to year contribtions)

Table 3 *– Summary of Historical Decomposition: VAR with only sign restrictions*

	GDP Growth	Primary Balance	Interest Rate	Inflation	Debt to GDP
			Advanced Economies		
Business Cycle Shocks					
Demand Shock	0.28	0.21	0.14	0.32	0.24
Supply Shock	0.34	0.23	0.14	0.34	0.22
Primary Balance Shock	0.15	0.44	0.19	0.14	0.24
Residual	0.24	0.12	0.53	0.21	0.3
			Emerging Economies		
Business Cycle Shocks					
Demand Shock	0.38	0.29	0.18	0.35	0.33
Supply Shock	0.27	0.16	0.16	0.29	0.2
Primary Balance Shock	0.19	0.44	0.17	0.15	0.23
Residual	0.16	0.11	0.49	0.22	0.25

Notes: Summary of contributions of different shocks to the VAR variables (median of absolute year to year contribtions)

Table 4 *– Sign restrictions imposed on the VAR impulse responses*

	GDP Growth	Primary Balance	Interest Rate	Inflation	Debt to GDP
Business Cycle Shocks					
Demand Shock	<0	<0		<0	
Supply Shock	<0	<0		>0	
Monetary Policy Shock			>0	<0	
Discretionary Shock		>0			

Notes: The table denotes the impact sign restrictions imposed on the impulse response of the identifies shocks (along the row) on variables (along the column) in theVAR. Empty cells imply that no sign restriction is imposed for the specific shock/variable pair.

Table 5 *– Summary of Historical Decomposition in VAR with Monetary Policy Shock*

	GDP Growth	Primary Balance	Interest Rate	Inflation	Debt to GDP
			Advanced Economies		
Business Cycle Shocks					
Demand Shock	0.23	0.27	0.26	0.27	0.24
Supply Shock	0.38	0.34	0.15	0.31	0.24
Monetary Policy Shock	0.08	0.11	0.29	0.19	0.14
Discretionary Shock	0.12	0.19	0.11	0.11	0.19
Residual	0.2	0.09	0.19	0.13	0.18
			Emerging Economies		
Business Cycle Shocks					
Demand Shock	0.32	0.35	0.1	0.27	0.27
Supply Shock	0.31	0.23	0.11	0.26	0.22
Monetary Policy Shock	0.12	0.08	0.4	0.25	0.15
Discretionary Shock	0.12	0.2	0.08	0.07	0.2
Residual	0.14	0.14	0.3	0.14	0.16

Notes: Summary of contributions of different shocks to the VAR variables (median of absolute year to year contribtions)

Table 6 *– Summary of Historical Decomposition in VAR with US Interest Rate Shock*

	GDP Growth	Primary Balance	Interest Rate	Inflation	Debt to GDP
			Advanced Economies		
Business Cycle Shocks					
Demand Shock	0.24	0.27	0.16	0.27	0.26
Supply Shock	0.31	0.29	0.11	0.3	0.25
Discretionary Shock	0.16	0.14	0.22	0.14	0.17
US Interest Rate Shock	0.09	0.14	0.26	0.11	0.14
Residual	0.2	0.16	0.25	0.19	0.19
			Emerging Economies		
Business Cycle Shocks					
Demand Shock	0.22	0.2	0.19	0.12	0.18
Supply Shock	0.37	0.17	0.2	0.29	0.23
Discretionary Shock	0.2	0.28	0.17	0.18	0.23
US Interest Rate Shock	0.03	0.01	0.01	0.01	0.02
Residual	0.17	0.34	0.42	0.39	0.33

Notes: Summary of contributions of different shocks to the VAR variables (median of absolute year to year contribtions)