INTERNATIONAL MONETARY FUND

# Is High Debt Constraining Monetary Policy? Evidence from Inflation Expectations

WP/23/143



**2023**
JUN


WORKING PAPER

 WP/23/143

**IMF Working Paper**

Monetary and Capital Markets and Western Hemisphere Departments

# Is High Debt Constraining Monetary Policy? Evidence from Inflation Expectations

**Prepared by Luis Brandao-Marques, Marco Casiraghi, Gaston Gelos, Olamide Harrison, and Gunes Kamber***

Authorized for distribution by David Hofman

June 2023



**ABSTRACT:** This paper examines whether high government debt levels pose a challenge to containing inflation. It does so by assessing the impact of government debt surprises on inflation expectations in advanced- and emerging market economies. It finds that debt surprises raise long-term inflation expectations in emerging market economies in a persistent way, but not in advanced economies. The effects are stronger when initial debt levels are already high, when inflation levels are initially high, and when debt dollarization is significant. By contrast, debt surprises have only modest effects in economies with inflation targeting regimes. Increased debt levels may complicate the fight against inflation in emerging market economies with high and dollarized debt levels, and weaker monetary policy frameworks.

**RECOMMENDED CITATION:**



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|---|---|
| JEL Classification Numbers: | E31, E41, E52, E62 |
| Keywords: | Inflation expectations; monetary policy; fiscal dominance; debt |
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WORKING PAPERS

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Prepared by Luis Brandao-Marques, Marco Casiraghi, Gaston Gelos, Olamide Harrison, and Gunes Kamber[1]

[1] The authors would like to thank Gustavo Adler, Bergljot Barkbu, David Hofman, and Erlend Nier for their comments. Zoe Strauss provided excellent research assistance.

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# Introduction

The COVID-19 crisis propelled sovereign debt levels around the world to new heights. Between 2019 and 2022, in advanced economies, debt levels rose from 103.9 to 112.5 percent of GDP, and in emerging market economies, they grew from 55.1 to 64.6 percent of GDP. Sovereign debt levels are expected to remain high in coming years (IMF, 2022), and demands on fiscal policy remain substantial. At the same time, higher levels of interest rates could increase debt services considerably in the coming years.

Could the rise in government debt levels pose a problem for monetary policy? This question is of particular relevance as central banks are struggling with the major challenge posed by inflationary pressures. In principle, various mechanisms by which high sovereign debt levels can complicate monetary policymaking are conceivable. Central banks may be (seen as) hesitant to raise interest rates as much as needed to achieve their inflation objective, out of concern for debt sustainability. They may also be concerned about the impact of rising rates on their own net income if they remunerate excess reserves, and on their balance sheets as they proceed to actively shrink them. In an extreme form of fiscal dominance, people may believe that the central bank could try to inflate away part of the debt or resort to outright monetization of future deficits, which in turn would lead inflation expectations to shoot up. The fiscal theory of the price level has reformulated these notions, arguing that price levels adjust so that the real value of government debt equals the present value of taxes less spending (Cochrane 2023).

Such concerns are, in principle, relevant for both advanced- and emerging market economies. In many emerging market economies, these issues used to be very much at the forefront until the early 2000s. For example, Celasun, Gelos, and Prati (2004) found that fiscal variables were an important determinant of inflation expectations in major emerging market economies. Fiscal consolidation, the adoption of more credible macroeconomic and monetary frameworks, and the granting of autonomy to central banks lessened these concerns in these economies over the following years. However, central bank credibility remains less established in some emerging market economies, which as a group are generally still more vulnerable to external shocks. Although sovereign foreign currency exposures have fallen, currency mismatches in the private sector remain widespread (BIS, 2019), posing vulnerabilities that ultimately can threaten the fiscal position of these economies. Because of this historical background and the structural specificities of emerging market economies, in this study we differentiate between advanced- and emerging market economies.

Several other studies have empirically investigated the relationship between fiscal variables and inflation expectations in s with inflation-targeting central banks (Catão & Terrones, 2003; de Mendonça & Machado, 2013; Celasun, Gelos, and Prati, 2004; Coibion, Gorodnichenko, and Weber, 2021). These papers find generally that tightening fiscal balances are helpful in reducing inflation expectations and observed inflation, with stronger effects in economies with high and persistent inflation. This paper takes a somewhat different approach and covers a much longer and recent period.

Specifically, we investigate how sovereign debt may affect inflation dynamics by examining its impact on inflation expectations. For identification purposes, we focus on debt surprises. We trace out the response of inflation expectations to an unexpected increase in sovereign debt using local projections. Since we are interested in the effects of debt and debt sustainability, to avoid capturing demand-side effects related to unexpected fiscal expansions, we focus on long-run expectations (5 years ahead), under the assumption that any inflationary effects of such demand pressures are shorter-lived. To further minimize demand effects (such as initial price pressures leading to a de-anchoring of inflation expectations unrelated to longer-term debt concerns), we also condition on existing debt levels.

We find that in response to debt surprises, inflation expectations in emerging market economies rise significantly, whereas they do not in advanced economies. Specifically, for emerging market economies, a 10-percentage-point increase in the government-debt-to-GDP ratio triggers a statistically significant 20-basis point increase in long-term inflation expectations within the first year after the shock and reaching a peak of 70-basis point within the second year. The effect is much larger in emerging market economies that do not feature inflation targeting regimes compared to those that do, because these regimes are typically associated with sound monetary frameworks and autonomous central banks that help contain expectations of fiscal dominance. These results are broadly consistent with earlier ones of Catão and Terrones (2005) who find a strong positive association between deficits and inflation among high-inflation and developing countries, but not among low-inflation advanced economies.

However, in line with the notion that debt sustainability concerns are behind our results, the effect on inflation expectations is not present for emerging market economies with low sovereign debt levels. These findings are in line with those by Kwon, McFarlane, and Robinson (2009), who report evidence consistent with the notion that the risk of a debt-inflation trap is significant in highly indebted economies.

# Theoretical Mechanisms

We are primarily interested in the extent to which government debt and concerns regarding solvency of the sovereign might affect monetary policy and the ability of a central bank to achieve its price stability objective. A large theoretical literature establishes direct links between government debt and the price level. The starting point is fiscal dominance: that a central bank tightens its monetary policy stance in response to a rise in inflation by less than it would otherwise because of the level of government debt.

To the extent that the government debt is in local currency, high government debt may lead central banks to limit increases in the policy rate out of concern for the government's solvency. Economic agents, in turn, anticipate this reaction, raising their inflation expectations. In the extreme, firms and households may fear that the central bank may resort to outright debt monetization. Implicit in these mechanisms is that some portion of government debt is not backed by the government's current and

future primary surpluses. These arguments are well established by Sargent and Wallace (1981) and in subsequent forward-looking models of inflation (Aiyagari and Gertler, 1985; Calvo, 1988; Bohn, 1988, among others). Although Sargent and Wallace (1981) never discuss the fiscal stance or debt sustainability, the key point is that the fiscal path is predetermined and needs to generate seigniorage. A corollary of these arguments is that a tighter monetary policy may deliver lower inflation now (and in extreme cases not even that) but surely higher inflation in the future if fiscal policy dominates monetary policy. This is because (sufficiently) forward-looking agents anticipate the need for looser monetary policy later to inflate away the public debt.

A similar mechanism albeit with important theoretical departures is developed in the fiscal theory of the price level or FTPL (Leeper 1991, Sims 1994, Woodford 1994, Cochrane 2005, and Benigno 2020). The central mechanism in the FTPL is that prices adjust so that the real value of government debt equals the present value of taxes less spending (Cochrane, 2023). More recently, Bianchi and Melosi (2022) developed a theoretical framework where monetary-policy fiscal interaction is more acute when fiscal imbalances are large and fiscal credibility wanes, making it harder for the monetary authority to stabilize inflation around its desired target. In their framework, a fiscally-driven rise in trend inflation does not necessarily stem from a lack of credibility of the central bank, but rather from the incompatibility between the objectives of the central bank and the expected behavior of the fiscal authority in credibly stabilizing its debt.

A different, but related mechanism developed more recently in Arellano and others (2020) argues that sovereign default risk on external defaultable government debt affects inflation expectations. In their model, by assumption, inflation is high (and consumption low) whenever the sovereign default because productivity is low. Specifically, they assume that total factor productivity depends on the government's credit standing. Taking expectations, when default risk is high, expected inflation is high. Thus, any shock that increases the sovereign's default risk—for instance, a productivity or a terms of trade shock—raises (near-term) inflation expectations. In this paper, we identify shocks to debt that are plausibly orthogonal to shocks that move inflation and output and find that these shocks are relevant for the conduct of monetary policy as summarized by dislocations of long-term expectations in emerging market economies. Furthermore, we establish the presence of nonlinearities by demonstrating higher sensitivity of inflation expectations to debt surprises in high-debt and high-inflation emerging market economies.

# Data and Empirical Methods

## Econometric Approach

Our goal of assessing how debt sustainability concerns might impinge on monetary policy and its ability to anchor inflation expectations faces various empirical challenges, mostly related to endogeneity. First, in the relationship between debt levels and inflation, causality probably flows both ways. For example, policymakers may tighten fiscal policy in response to a rise in inflation expectations, which could result in a negative correlation of changes in debt and inflation expectations (Celasun, Gelos,and Prati, 2004). On the other hand, fiscal policy actions which affect

debt may also directly influence inflation expectations through aggregate demand effects, which we would like to exclude. Second, the co-movement between debt levels and inflation could be spurious and driven instead by an omitted variable. Particularly in emerging market economies, adverse GDP shocks stemming, say, from a sudden stop of capital flows as a result of changes in global risk aversion often come along with exchange rate depreciations that induce a rise in inflation expectations. In such situations, we would observe a simultaneous increase in the debt-to-GDP ratio and inflation expectations that is not (necessarily) driven by the mechanisms we are trying to capture. Moreover, information shocks that manifest as positive or negative interest rate shocks—reflecting a central bank communicating a surprisingly positive or negative economic outlook—could cause higher/lower nominal debt along with higher or lower inflation expectations (Nunes and others, 2022). Also, other shocks to inflation expectations that have an impact on the nominal interest rate bill (hence, on debt sustainability) could introduce a positive (negative) bias for local (foreign) currency denominated instruments (Celasun and others, 2004).

Moreover, since we are interested in mechanisms related to the government's intertemporal budget constraint, as discussed earlier, to the extent possible, we would like to exclude short-term inflationary demand effects stemming from fiscal expansions.

To address these concerns, we pursue a threefold strategy. First, we use forecast errors from various vintages of International Monetary Fund (IMF) World Economic Outlook (WEO) publications to identify unanticipated exogenous shocks (surprises) to government debt, which both mitigate endogeneity concerns. Moreover, debt surprises may capture changes in debt that do not necessarily move one-for-one with the budget deficit and are less likely to be driven by changes in government expenditures (Singh and others, 2005). For example, such debt surprises may include the recognition of hidden contingent liabilities. Second, we focus on long-term inflation expectations (i.e., 5-year ahead expectations), which are less likely to be affected by short-term aggregate demand effects (assuming reasonable estimates of aggregate price stickiness). Third, to further reduce the influence of aggregate demand effects and simultaneity, we also condition our estimations on existing debt levels; if debt surprises affect long-term inflation expectations more the higher pre-existing debt levels are, this is unlikely to stem from such demand effects or other shocks.

The debt shocks are defined as the difference between the realized annual growth rate of the debt to GDP ratio and the corresponding IMF forecast, which is published in October. In other words, the shock is unanticipated change in the debt-to-GDP ratio that is observed in the last quarter of each year. Specifically, the debt surprise, $\text{debt}_{i,t}^{shock}$, for country $i$ at time $t$ is defined as:

$$\text{debt}_{i,t}^{\text{shock}} = \frac{\text{Debt}_{i,t}^{\text{realized}}}{\text{GDP}_{i,t-1}^{\text{realized}}} - \frac{\text{Debt}_{i,t}^{\text{forecast}}}{\text{GDP}_{i,t-1}^{\text{realized}}}$$

where the lowercase debt variables denote debt-to-GDP ratios.

As argued in the literature that uses this approach (e.g., Blanchard and Perotti, 2002; Auerbach and Gorodnichenko, 2012, 2013; Abiad and others, 2016; Furceri and Li, 2017), debt levels projected in the October WEO publications are likely to reflect all available information at the time of publication.

Any difference between realized nominal debt levels and the October WEO projections thus are more likely to reflect unanticipated policy changes or debt revaluations.

One concern with the government-debt forecast errors is that they may not represent true surprises, because they may be forecastable. To verify the sensitivity of our results to such issues, we consider two approaches from the literature. First, we follow the method used in the October 2017 WEO and Magud and Pienknagura (2022) by regressing the debt forecast errors on forecast errors of inflation and real GDP growth and using the residuals from this regression as our debt shock. The other approach, which follows Auerbach and Gorodnichenko (2013), consists of regressing the debt forecast errors on lagged macroeconomic variables—output gap, debt, and primary balance—with which the forecast errors might be predicted. The residuals from this regression are then used as the debt shock. In both approaches, we include a set of country fixed effects. The results and conclusions discussed below are quantitatively and qualitatively robust to these alternative shocks.

As previously discussed, government debt shocks can affect inflation expectations through multiple channels. The impact of these shocks on long-term expectations will depend on the monetary policy regime, the degree of central bank independence and other institutional features, and the anchoring of inflation expectations. Thus, analyzing the sensitivity of long-term inflation expectations to unexpected shifts in government debt helps shed light on whether non-aggregate demand mechanisms are at work.

We use panel regressions and the local projections method of Jordà (2005) to estimate the responses of long-term inflation expectations to the identified government debt shocks over different horizons. As noted by Auerbach and Gorodnichenko (2012), the local projections approach easily accommodates nonlinearities in impulse response functions and cross-country correlation in the error term.

The baseline specification we estimate is given by:

$$\pi(H)^{e}_{i,t+l} = \alpha^{h}_{i} + \nu^{h}_{t} + \sum_{s=0}^{S} \beta^{h}_{s} u^{d}_{i,t-s} + \sum_{j=1}^{J} \gamma^{h}_{j} \pi(H)^{e}_{i,t-j} + \mathbf{x}'_{it}\Gamma + \varepsilon_{i,t+h},\ l = 4, 10, 16, 22, 26, \text{and } 34, \qquad (1)$$

where $\pi(H)^{e}_{i,t+l}$ denotes the measure of inflation expectations for horizon *H* for country *i* at time *t+l,* $u^{d}_{i,t-s}\, u^{d}_{i}, t-s$ are debt surprises, $\mathbf{x}'_{it}$X is a vector of controls (to be introduced later as robustness), $\alpha^{h}_{i}$ and $\nu^{h}_{t}$ are country and time fixed effects, and $\varepsilon_{i,t+h}$ is a random disturbance. We include lags *j* of the debt shock to reduce concerns that the dynamics of the impact are due to properties of the shock (i.e., that the shock is persistent and to some extent predictable)[2] as opposed to the operating mechanisms. The coefficients, $\beta^{h}_{0}$, of the response of inflation expectations to debt surprises

[2] Several authors have pointed out that analyst forecasts, including WEO forecasts, are to some extent predictable (e.g., Celasun and others 2021 for GDP forecasts). Debt forecasts, in particular, show positive errors that increase with debt-to-GDP ratios, and which are state contingent. As noted above, for robustness we filter the debt surprises on other endogenous variables with which debt surprises might be forecastable and find that our results are qualitatively and quantitatively similar.

specification are estimated using the within estimator for each projection period, with standard errors coming from Driscoll and Kraay's (1998) heteroskedasticity and autocorrelation-consistent estimator.

## Data

The sample includes 41 emerging market and developing economies, 7 low-income and developing countries, and 34 advanced economies between 2000 and 2020.[3] We group together emerging market- and developing economies. Inflation expectations data are captured using survey-based inflation forecasts from professional forecasters reported by Consensus Economics for five years ahead.[4] We use inflation expectations data at a semi-annual frequency because for most of our sample, in the Consensus Economics forecasts, long-term inflation forecasts are only collected at a semi-annual frequency (in April and October). Our choice of expectations from professional forecasters is driven solely by the consistent availability across countries of inflation expectations data.[5] Data on government debt, GDP, output gap, and consumer price inflation are from the IMF's WEO dataset, which covers all economies from 1995 to 2019. In constructing our debt shock, the forecast for government debt and GDP for each country in a given year is taken from the October vintage of WEO forecasts of that year. The realized values of these variables are then taken from the following year's October WEO database.

**Table 1. Summary Statistics**

| | (Emerging) | | (Advanced) | | (Difference) | |
|---|---|---|---|---|---|---|
| | mean | s.d. | mean | s.d. | b | t |
| Inf. Expectations, 5-yr | 3.91 | 1.92 | 2.04 | 0.44 | 1.87*** | (17.92) |
| Debt Surprise | 0.65 | 4.49 | 0.59 | 4.14 | 0.06 | (0.19) |
| Debt to GDP | 37.91 | 18.27 | 57.10 | 44.62 | -19.19*** | (-7.59) |
| CPI, y-o-y | 5.62 | 7.33 | 1.69 | 1.71 | 3.93*** | (9.56) |
| Observations | 352 | | 426 | | 778 | |

We follow Flores and others (2023) in cleaning the data to minimize measurement errors and inconsistencies across data vintages. Figure 1 shows the availability of debt shocks data for advanced- and emerging market economies. The debt forecast data in WEO vintages are available for a small number of advanced economies before 2002, which imposes the starting year of the sample for our empirical analysis. Figure 2 summarizes the debt shocks for advanced and emerging market economies by presenting the interquartile range, the mean, and median forecast errors by group of economies. The mean and median debt to GDP forecast errors are similar across the two groups. The median forecast error is 0.15 for emerging market economies, and 0.05 for advanced

[3] Table A.1 in Annex I contains the list of economies included in our sample.

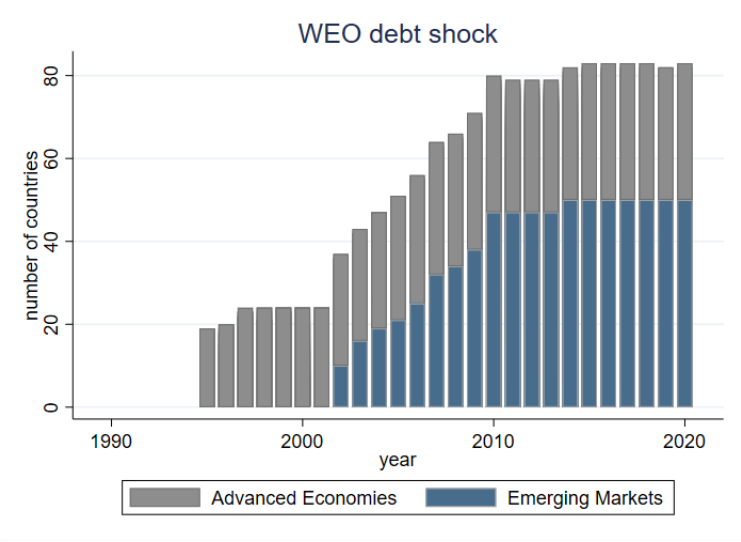
[4] Annex II presents results when we use three-year ahead inflation expectations. Our main conclusions are unaltered when considering a shorter forecast horizon.

[5] Market-based measures and household and firm surveys of inflation expectations are not available for most economies in our sample. Naturally, subsequent results are relevant for the measure used in this study.

economies, and the mean forecast error is 0.65 for emerging market economies and 0.59 for advanced economies; they are not statistically different from each other (Table 1).

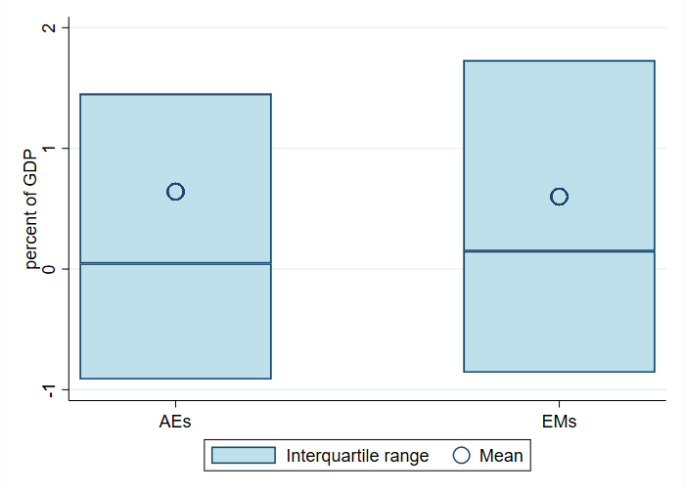
The positively skewed distribution suggests a bias towards optimism in IMF forecasts (IMF, 2021), although this bias is found to be more pronounced, the longer the forecast horizon (Flores and others, 2023). Figure 3 plots the evolution of the size of forecast errors over time. It is notable that forecast errors tend to become large and positive during recessions, as for example during the global financial crisis (GFC).

**Figure 1. Data Availability**



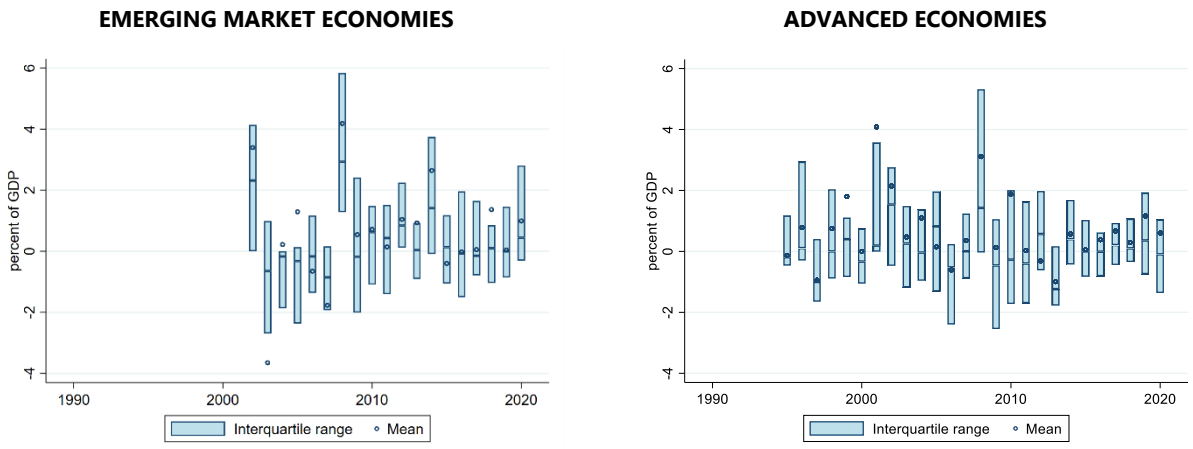

Notes: The chart shows the number of economies for which debt to GDP shocks are available for the second WEO vintage of the year, usually published in October. The grey bars denote the count for advanced economies while the blue bars denote the count for emerging market economies

**Figure 2. Debt-to-GDP Surprises on Impact**




Notes: The Chart shows the interquartile range (shaded region), mean (blue dot), and median (blue line in the shaded box) for the debt-to-GDP shock at the beginning of the projection period for the entire sample.

**Figure 3. Debt Surprises Across WEO Vintages**




Notes: Charts show the interquartile range (shaded region), mean (blue dot), and median (blue line in the shaded box) for the debt-to-GDP shock for emerging market economies (left) and advanced economies (right).

# Results

## Main Results—Emerging Market- vs. Advanced Economies

The results indicate that debt surprises do affect inflation expectations in emerging market economies. Figure 4 and Tables 2, 3 and 4 present the results from our baseline specification. That is, they display the impact of a debt shock on inflation expectations for the following three years. When we use the full sample, our results suggest that a surprise 10 percent increase in government debt to GDP leads to a significant increase in long-term inflation expectations after about two years. However, this result seems to be driven mainly by emerging market economies. When we split our sample to estimate our baseline specification for emerging market economies and advanced economies, the impact of a debt shock on inflation expectations significantly differs. For advanced economies, the response of inflation expectations to a debt shock is zero across all horizons. For emerging market economies, however, an unanticipated increase in the government debt to GDP ratio is associated with a rise in long-term inflation expectations. Specifically, a 10 percent unanticipated increase in the government debt to GDP ratio results in a statistically significant 20-basis point hike in long-term inflation expectations within the first year after the shock, and reaching a peak of 70-basis point within the second year.

Interestingly, our results suggest that the impact of a debt shock on inflation expectations is delayed and builds over time. Several factors may explain this finding. First, data on public finances and national accounts become available with a lag, and given that the first survey on long-term inflation expectations occurs at the end of the first quarter of the year, the full extent of the forecast error on public debt may not be available to forecaster, and forecasters may be slow to incorporate this information fully in their new forecasts. Second, the delayed response of inflation expectations may be related to inflation expectations being more backward looking or adaptive, consistent with the evidence from inflation expectations surveys as in Coibion and Gorodnichenko (2012). For instance,

recent work by Chen and others (2022) also finds that the cross-section average of individual forecasts of expectations in survey data tends to underreact to shocks initially but overreact in the medium-term.

Another possible channel is that debt shocks today may signal future higher deficits, which would then support higher inflation expectations. For example, bad economic news may prompt fiscal policy to turn stimulative for several years. Such an explanation would be consistent with the estimated unconditional and conditional effects. While our study tries to control for contemporaneous demand shocks but does not include at forward-looking effects, examinations suggest that this channel is not important. In our sample, debt surprises do not forecast persistently higher deficits.[6]

These results suggest that inflation expectations in emerging market economies appear more sensitive to the fiscal position than in advanced economies. Furthermore, fiscal shocks increase the risk that long-term inflation expectations de-anchor. The heightened sensitivity of inflation expectations to the fiscal stance could suggest that, on average, fiscal dominance—in which the fiscal authority's solvency constraint determines inflation—is more likely to prevail in emerging market- than in advanced economies, reflecting more limited fiscal capacity for emerging market sovereigns. The result may also capture broader concerns that emerging market central bank independence is less secure than in advanced economies, given weaker institutional frameworks and protections (Unsal and others, 2022).[7] These mechanisms are explored further below, where we examine the role of inflation-targeting regimes and initial debt levels in shaping the impact of the debt surprises on inflation expectations.

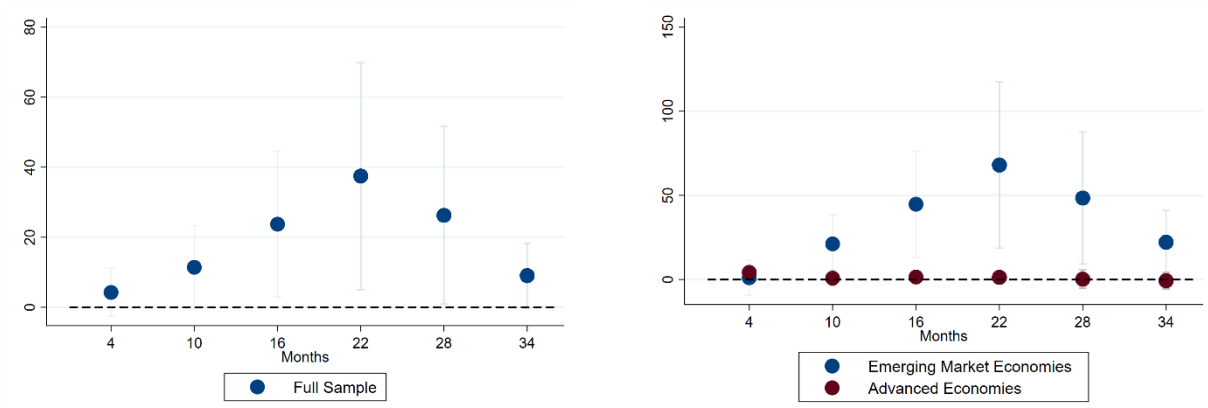
[6] A vector autoregressive (VAR) approach is better suited to investigate these effects in a unified way, but would involve a prohibitively large number of parameters to estimate given our data sample.

[7] For instance, using the central bank transparency index of Dincer et. al (2019), we find that, when using the full sample of countries, the sensitivity of inflation expectations to debt surprises depends on the initial level of central bank transparency. Lower central bank transparency is associated with higher sensitivity of inflation expectations to debt surprises. A simple difference-in-means test confirms that the average central bank transparency is indeed higher for advanced economies than for emerging market economies. However, the pattern does not hold within our subsample of emerging market economies, possibly due to limited variation in the data.

## Figure 4. Response of 5-Year Inflation Expectations to Government Debt Shocks, Baseline

(Basis points, annual rate)

***Full Sample*** ***Emerging Market- vs Advanced Economies***




Notes: t=0 is the quarter of the shock. The figures plot for the relevant horizon the 5-year ahead inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. The blue dots denote the inflation expectations response for emerging market economies in our sample while the red dots denote the corresponding response for advanced economies. The whiskers represent 90 percent confidence intervals. The chart on the left shows the response for the full sample.

## Table 2. Response of 5-Year Inflation Expectations, Baseline (Full Sample)

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0042 | 0.0114 | 0.0237* | 0.0374* | 0.0262* | 0.0090 |
| | (0.0042) | (0.0072) | (0.0126) | (0.0196) | (0.0153) | (0.0056) |
| No. of Obs. | 778 | 672 | 671 | 607 | 606 | 563 |
| Adjusted R sq. | 0.60 | 0.32 | 0.12 | 0.05 | 0.03 | 0.03 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

## Table 3. Response of 5-Year Inflation Expectations, Baseline (Emerging Market Economies)

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0010 | 0.0211** | 0.0447** | 0.0680** | 0.0484** | 0.0221* |
| | (0.0064) | (0.0105) | (0.0192) | (0.0300) | (0.0238) | (0.0114) |
| No. of Obs. | 352 | 280 | 279 | 252 | 251 | 232 |
| Adjusted R sq. | 0.63 | 0.40 | 0.17 | 0.12 | 0.05 | 0.03 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 4. Response of 5-Year Inflation Expectations, Baseline (Advanced Economies)**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0042* | 0.0008 | 0.0015 | 0.0013 | 0.0002 | -0.0008 |
| | (0.0025) | (0.0028) | (0.0021) | (0.0021) | (0.0033) | (0.0030) |
| No. of Obs. | 426 | 392 | 392 | 355 | 355 | 331 |
| Adjusted R sq. | 0.32 | 0.11 | -0.05 | -0.08 | -0.10 | -0.13 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

## State Dependence

Given the focus of this paper on assessing the role of fiscal policy in shaping inflation expectations, we pay particular attention to whether measures of fiscal buffers and sustainability matter for the impact of fiscal shocks. We also explore the extent to which the ex-ante level of inflation matters in shaping the response dynamics to the shock.

### Government Debt Level

Although our empirical strategy so far has sought to minimize the potential impact of short-term demand pressures stemming from changes in the fiscal stance, it is still possible that our estimates may be contaminated by such effects. For example, in environments with weak central bank credibility, a rise in inflation driven by a fiscal expansion may have persistent effects, de-anchoring inflation expectations through mechanisms not directly driven by debt concerns.

Therefore, to go one step further in identifying those effects we are after, we condition our estimation on initial debt levels. If debt surprises affect long-term inflation expectations more, the higher the initial debt stock is, this is a strong indication that the change in inflation expectations is driven by debt concerns. When present, it is likely that such effects are nonlinear.

We focus on the difference in the impact of the debt shock on emerging market economies in the 10th and 90th percentiles of initial government debt levels. We refer to these as low- and high debt groups, respectively. The modified empirical specification now includes an interaction term between the debt shocks and the initial debt level:

$$\pi\left(H\right)^{e}_{i,t+l} = \alpha^{h}_{i} + \nu^{h}_{i} + \sum_{s=0}^{S} \beta^{h}_{s} u^{d}_{i,t-s} + \delta_0 debt_{i,t-1} \times u^{d}_{i,t} + \delta_1 debt_{i,t-1} + \sum_{j=1}^{I} \gamma^{h}_{j} \pi\left(H\right)^{e}_{i,t-j} + \mathbf{x}'_{it}\Gamma + \varepsilon_{i,t+h}, \qquad (1)$$

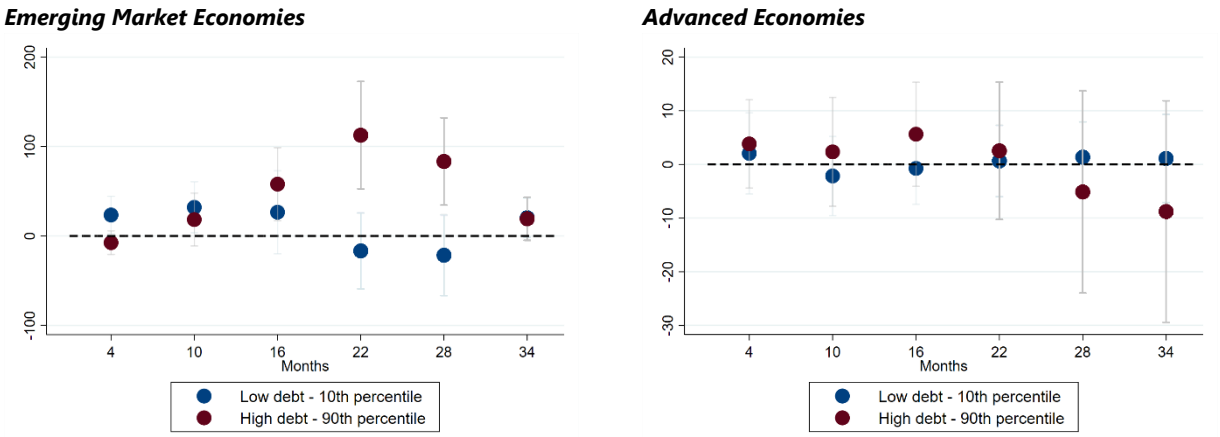
where $debt_{i,t-1}$ is the government debt-to-GDP level at the end of the year before the shock. The coefficient of interest, $\beta^{h}_{0} + \delta^{h}_{0}\, debt_{i,t-1}$, depends on the debt level with a positive value for the marginal effect indicating that inflation expectations are more sensitive to debt shocks in emerging market economies with higher debt levels.[8]

[8] Including a similar lag structure for the interaction terms as those on the debt surprises in equation 2 above yields similar results.

Our results show that the sensitivity of inflation expectations to debt surprises depends on the debt level. Figure 5 illustrates the state dependence by tracing out the response of inflation expectations for economies with government debt-to-GDP levels at the 10th and 90th percentiles of the emerging market economies. The figure shows that for countries in the low debt group, the impact of the unanticipated debt increase on inflation expectations is statistically indistinguishable from zero. By contrast, high debt countries experience as much as a 100-basis point increase in long-term inflation expectations after two years in response to a 10-percent surprise rise in the debt-to-GDP ratio. Our interpretation is that debt sustainability concerns prevail more in emerging market economies with high debt levels, and forecasters anticipate the effect this might have on the central bank's ability to stabilize prices.

**Figure 5. Response of 5-Year Inflation Expectations to Government Debt Shocks, by Initial Debt Level Classification**

(Basis points, annual rate)




Notes: t=0 is the year of the shock. The figures plot for the relevant country groups the inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. The blue dots denote the inflation expectations response for economies with a debt level at the 10th percentile of the relevant country group sample, while the red dots denote the corresponding response for economies with a debt level at the 90th percentile of the relevant country group sample. The whiskers represent 90 percent confidence intervals.

**Table 5. Response of 5-Year Inflation Expectations, by Initial Debt Level Classification (Emerging Market Economies)**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0334* | 0.0364 | 0.0165 | -0.0582 | -0.0552 | 0.0207 |
| | (0.0178) | (0.0267) | (0.0412) | (0.0440) | (0.0425) | (0.0168) |
| Debt to GDP | -0.0034 | 0.0050 | 0.0017 | -0.0097 | -0.0112 | -0.0179*** |
| | (0.0044) | (0.0086) | (0.0093) | (0.0071) | (0.0073) | (0.0067) |
| Debt Surprise # Debt | -0.0006* | -0.0003 | 0.0006 | 0.0027** | 0.0022** | -0.0000 |
| | (0.0004) | (0.0007) | (0.0009) | (0.0012) | (0.0011) | (0.0003) |
| No. of Obs. | 333 | 276 | 275 | 248 | 247 | 228 |
| Adjusted R sq. | 0.65 | 0.40 | 0.19 | 0.24 | 0.11 | 0.04 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table 6. Response of 5-Year Inflation Expectations, by Initial Debt Level (Advanced Economies)**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0018 | -0.0028 | -0.0016 | 0.0004 | 0.0023 | 0.0025 |
| | (0.0052) | (0.0053) | (0.0050) | (0.0052) | (0.0051) | (0.0065) |
| Debt to GDP | 0.0001 | -0.0004 | -0.0007 | 0.0000 | -0.0008 | 0.0003 |
| | (0.0010) | (0.0014) | (0.0019) | (0.0017) | (0.0021) | (0.0019) |
| Debt Surprise # Debt | 0.0000 | 0.0000 | 0.0001 | 0.0000 | -0.0001 | -0.0001 |
| | (0.0001) | (0.0001) | (0.0001) | (0.0001) | (0.0001) | (0.0001) |
| No. of Obs. | 369 | 340 | 340 | 305 | 305 | 284 |
| Adjusted R sq. | 0.29 | 0.07 | -0.09 | -0.12 | -0.13 | -0.15 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

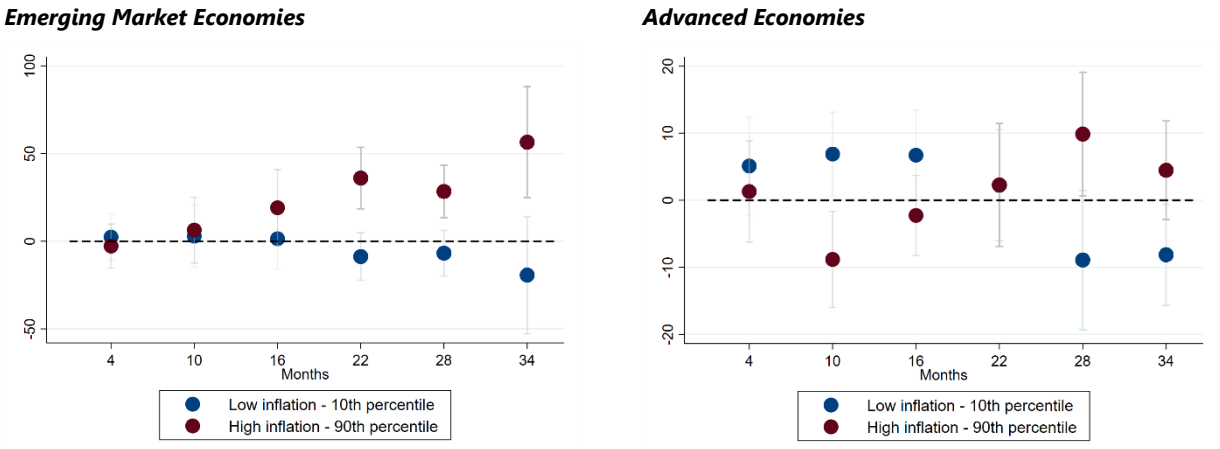
## Inflation Level

We next explore the implications of the level of inflation for the sensitivity of inflation expectations to debt surprises. To this end, we divide the emerging market sample into initial inflation percentiles and condition the debt shock on the pre-shock inflation level. The modified empirical specification is the same as (2) except that it includes the starting level of inflation instead of the previous year's level of debt, both on its own and interacted with the debt shock. The marginal effect of the debt surprise is $\beta_0^h + \delta_0^h \pi_{i,t-1}$ and depends on the inflation level, with a positive value indicating that inflation expectations are more sensitive to debt shocks in economies with higher inflation levels.

Initial inflation levels do indeed matter. We evaluate the effects of debt shocks for low (10th percentile) and high (90th percentile) inflation levels. Long-term inflation expectations increase by about 40 basis points after two years for countries with initial inflation levels at the 90th percentile of the emerging market sample, rising to 50 basis points after three years (Figure 6 and Table 7). By contrast, the impact of the debt shock is statistically indistinguishable from zero for countries with initially low inflation levels. The differences between the responses under low and inflation is statistically significant at the 90 percent confidence level. When inflation is already high, the willingness and the ability of the central bank (or of the fiscal authority) to tighten sufficiently in response to debt surprises might be more limited. Furthermore, higher inflation ceteris paribus reduces the nominal value of government debt thereby increasing the borrowing capacity of the sovereign and raising expected future inflation.

**Figure 6. Response of 5-Year Inflation Expectations to Government Debt Shocks, by Initial Inflation Level Classification**

(Basis points, annual rate)




Notes: t=0 is the year of the shock. The figures plot for the relevant country groups the inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. The blue dots denote the inflation expectations response for economies with an initial inflation at the 10th percentile of the relevant country group sample, while the red dots denote the corresponding response for economies with an initial inflation level at the 90th percentile of the relevant country group sample. The whiskers represent 90 percent confidence intervals.

**Table 7. Response of 5-Year Inflation Expectations, by Initial Inflation Level (Emerging Market Economies)**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0027 | 0.0027 | 0.0003 | -0.0116 | -0.0090 | -0.0240 |
| | (0.0081) | (0.0109) | (0.0104) | (0.0082) | (0.0081) | (0.0224) |
| CPI, y-o-y | 0.0162* | 0.0429** | 0.0580** | 0.0320 | 0.0358 | 0.0151 |
| | (0.0094) | (0.0209) | (0.0277) | (0.0346) | (0.0405) | (0.0349) |
| Debt Surprise # Inflation | -0.0005 | 0.0003 | 0.0018** | 0.0045*** | 0.0035*** | 0.0076** |
| | (0.0004) | (0.0007) | (0.0007) | (0.0006) | (0.0008) | (0.0036) |
| No. of Obs. | 334 | 268 | 267 | 240 | 239 | 220 |
| Adjusted R sq. | 0.68 | 0.50 | 0.39 | 0.46 | 0.31 | 0.13 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The profile of the impulse response for high inflation economies to the debt shock appears to suggest that inflation expectations remain dislodged for at least three years after the debt shock. This stands in contrast to the results for the interaction between the debt shock and the initial debt level—in that case, medium-term inflation expectations return to the pre-shock level after roughly three years. The difference between the two profiles might be related to the persistence of inflation in economies with chronically high inflation (Dornbusch, 1982; Rodriguez, 1982; Buiter & Grafe, 2001). In other words, past inflation might be driving current inflation and inflation expectations for these types of economies. When the debt shock hits, the contemporaneous effect of the shock is compounded on the impact of lagged inflation, and this causes a more persistent dislocation of medium-term expectations.

## Debt Dollarization

So far, we have explored the relationship between inflation expectations and debt surprises irrespective of the currency composition of government debt. How does this composition affect the sensitivity of medium-term expectations to debt surprises? On the one hand, concerns about debt monetization and its inflationary impact are only directly present for the local currency share of government debt (Panizza and Tadei 2020, and Sunder-Plassmann 2020). This direct channel should imply a larger sensitivity of inflation expectations for a smaller foreign currency debt share. On the other hand, a large foreign currency debt share increases the vulnerability of a sovereign to external shocks, reducing debt sustainability. And large adverse shocks are typically accompanied by sizeable depreciations, which increase the real value of the foreign-currency-denominated government debt and cause inflationary pressures. Moreover, when the government is confronting a fiscal crisis, a smaller share of local-currency debt implies that a higher inflation level is needed to achieve the same overall reduction in real debt value.

To explore these mechanisms further, we condition on the initial foreign currency debt share prior to the debt surprise. We also control for the size of debt and its interaction with the debt surprise shock because the size of debt and its currency composition could be correlated: sovereigns that cannot issue much debt due to concerns about price stability might be forced to issue mostly foreign currency debt. If the magnitude of the response to the debt surprise is higher for economies with higher debt, this would introduce a negative bias for the interaction term of debt surprises and the share of foreign currency debt. Accordingly, the regression equation is modified thus:

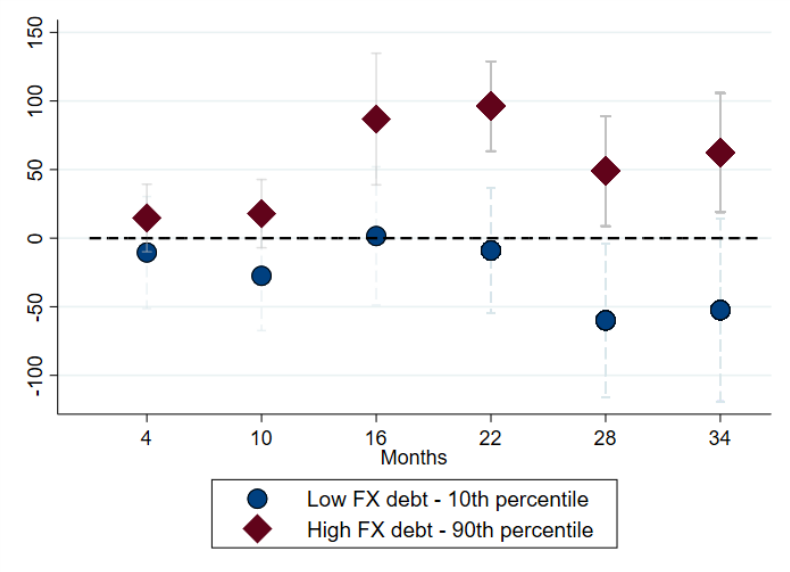
$$\pi(H)^{e}_{i,t+l} = \alpha^{h}_{i} + \nu^{h}_{t} + \sum_{s=0}^{S} \beta^{h}_{s} u^{d}_{i,t-s} + \delta^{h}_{0} debt_{i,t-1} \times u^{d}_{i,t} + \delta^{h}_{1} debt_{i,t-1} + \delta^{h}_{2} fxshare_{i,t-1} \times u^{d}_{i,t} + \delta^{h}_{3} fxshare_{i,t-1} + \delta^{h}_{4} fxshare_{i,t-1} \times debt_{i,t-1} \times u^{d}_{i,t} + \sum_{j=1}^{J} \gamma^{h}_{j} \pi(H)^{e}_{i,t-j} + \mathbf{x}'_{it}\Gamma + \epsilon_{i,t+h}, \quad (3)$$

The marginal effect of the debt surprise—$\beta^{h}_{0} + \delta^{h}_{0} debt_{i,t-1} + \delta^{h}_{2} fxshare_{i,t-1} + \delta^{h}_{4} fxshare_{i,t-1} \times debt_{i,t-1}$—depends not only on the currency composition of government debt, $fxshare_{i,t-1}$, but also on the government debt level.

The results indicate a positive and statistically significant effect of the interaction between foreign currency debt levels, debt levels, and the debt surprises after 22 months. Evaluating the effects at the tail ends of the foreign currency debt share distribution contrasts the sensitivity of medium-term inflation expectations to debt surprises for higher vs lower foreign currency debt share emerging market economies. Figure 7 shows the effects over time of a positive debt surprise shock for economies with low (10th percentile) and high (90th percentile) foreign currency debt shares, with government debt evaluated at its average across economies and periods in the estimation sample. The results suggest that the vulnerability effect—that a large foreign currency debt share increases the vulnerability of a sovereign to external shocks—outweighs the mitigating effects from lower concerns about the ability of the central bank to monetize the debt.

**Figure 7. Response of 5-Year Inflation Expectations to Government Debt Shocks, Emerging Market Economies—Initial FX Share of Government Debt**

(Basis points, annual rate)




Notes: t=0 is the year of the shock. The figures plot for emerging market economies the inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. The blue dots denote the inflation expectations response for economies with an initial FX share of government debt beneath the 10th percentile while the red dots denote the corresponding response for economies with an initial FX share of government debt above the 90th percentile. The whiskers represent 90 percent confidence intervals. The responses are evaluated at the average government debt across economies and periods in the estimation sample.

**Table 8. Response of 5-Year Inflation Expectations, by Initial FX Debt Share Classification (Emerging Market Economies)**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0039 | 0.0136 | 0.0039 | -0.0234 | -0.0208 | -0.0011 |
| | (0.0092) | (0.0150) | (0.0164) | (0.0162) | (0.0128) | (0.0153) |
| FX Debt Share | 0.0078*** | 0.0105*** | 0.0163*** | 0.0168*** | 0.0193*** | 0.0202*** |
| | (0.0023) | (0.0037) | (0.0049) | (0.0056) | (0.0061) | (0.0068) |
| Debt Surprise # FX Debt Share | -0.0002 | 0.0001 | 0.0009 | 0.0021*** | 0.0017*** | 0.0008** |
| | (0.0003) | (0.0004) | (0.0006) | (0.0008) | (0.0005) | (0.0004) |
| No. of Obs. | 321 | 261 | 260 | 236 | 235 | 217 |
| Adjusted R sq. | 0.65 | 0.43 | 0.24 | 0.26 | 0.18 | 0.07 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

## Inflation Targeting

To explore the role of monetary policy frameworks and credibility, we divide the emerging market economy sample based on whether the central bank operates an inflation targeting (IT) regime according to the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions, and re-estimate specification (1) for each subsample.

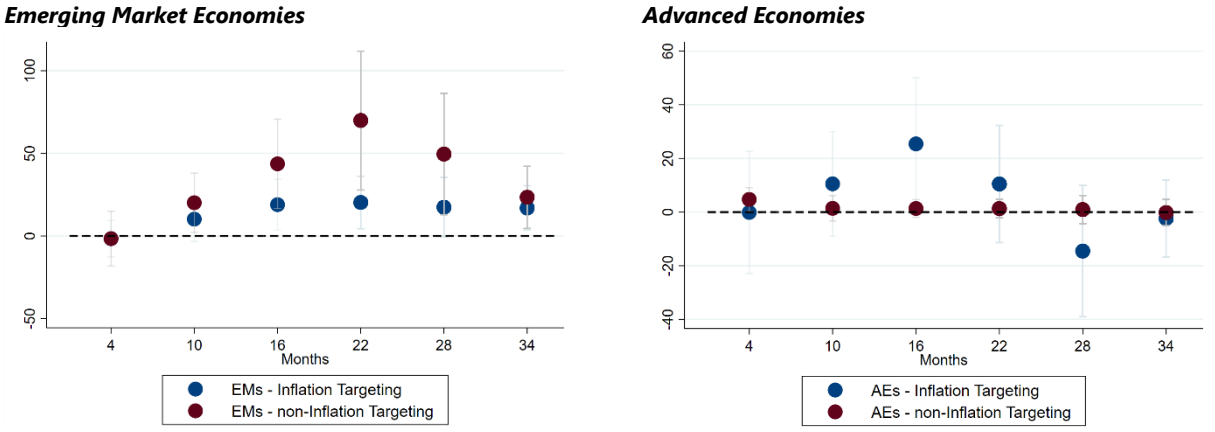
Our results show that economies with non-IT pursuing central banks display relatively higher sensitivity of long-term inflation expectations to a debt surprise—but the difference vis-à-vis IT economies is not significant. Nevertheless, the profile of the impulse response for non-IT emerging market economies matches the delayed onset of de-anchored expectations shown in the baseline results for emerging market economies. These results suggest that inflation-targeting emerging market central banks are better able to anchor medium-term expectations in response to fiscal shocks than their non-IT counterparts, possibly because there is more fiscal-monetary coordination in non-IT regimes.

These results are not directly supportive of the empirical findings by Bianchi and Melosi (2022) who also argue that unfunded debt shocks cause higher expected inflation via fiscal-monetary coordination. One of the restrictions for the identification of unfunded debt shocks in their approach is that the debt-to-GDP ratio declines in the years following the shock because monetary policy accommodates the fiscal expansion. Thus, drops in debt-to-GDP ratios would be associated with higher expected inflation, with greater sensitivity for tighter fiscal-monetary coordination. In contrast, our results above suggest higher debt-to-GDP ratios are associated with higher expected inflation, with greater sensitivity for tighter fiscal-monetary coordination.

Finally, we perform the same exercise for advanced economy economies and find that there is no clear distinction between the two regime classifications. At the end of the projection horizon, the sensitivity of inflation expectations to debt surprises appears to be greater for inflation-targeting advanced economy central banks.

**Figure 8. Response of Inflation Expectations to Government Debt Shocks, by Inflation Targeting Regime Classification**

(Basis points, annual rate)



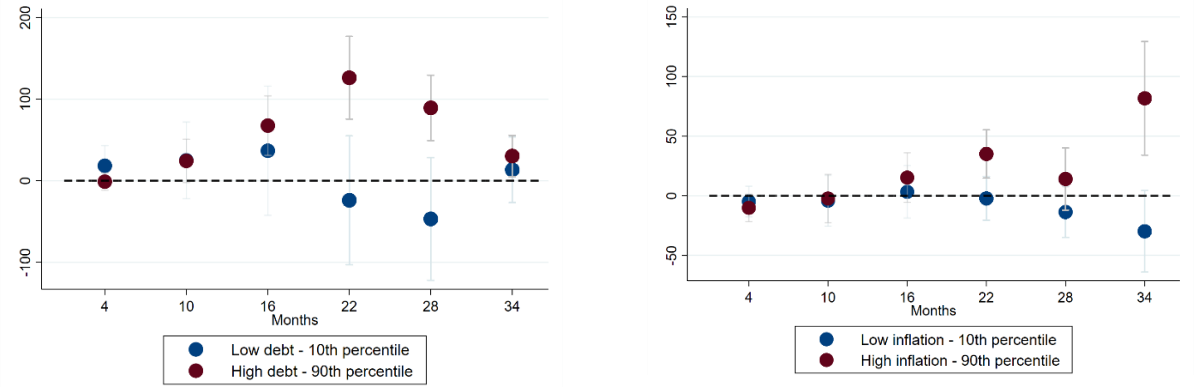

Notes: t=0 is the year of the shock. The figures plot for the relevant country groups the response of 5-year inflation expectations to a 10 percent surprise in the debt-to-GDP ratio. The blue dots denote the inflation expectations response for economies with inflation-targeting central banks in the relevant country group sample while the red dots denote the corresponding response for economies with non-inflation targeting central banks. The shaded region represents 90 percent confidence intervals.

# Robustness

As a robustness check to reduce the possibility that the estimated effects on expectations are driven by fiscal demand stimuli, we control for the fiscal stance. Specifically, we include the change in the primary balance as a percentage of GDP and the change in the output gap as additional controls in the regression specifications that condition on state variables. These are jointly meant to capture the fiscal impulse which might have implications for aggregate demand and thus affect the extent to which debt surprises affect inflation expectations and ultimately monetary policy. Our results remain quantitatively and qualitatively robust to introducing these controls (Figure 9).

**Figure 9. Response of Inflation Expectations to Government Debt Surprises, Emerging Market Economies—Conditional on the Fiscal Stance**

(Basis points, annual rate)




Notes: t=0 is the year of the shock. The figures plot for the relevant state variable the inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. Included as controls are the change in the primary balance to GDP ratio as well as the change in a measure of the output gap. The red (blue) dot corresponds to the estimates evaluated at high (low) debt and inflation levels, with the whiskers representing 90 percent confidence intervals.

The main results of the paper use government debt to GDP levels as a proxy for debt sustainability concerns. While this is a reasonable proxy, the mapping from debt levels to default risk is not one-to-one and other measures of debt sustainability might yield different results. As a robustness exercise, we use the Financial Risk Rating (FRR) of the International Country Risk Guide (ICRG) instead of government debt levels to proxy for debt sustainability concerns. Specifically, we replace $debt_{i,t-1}$ in equation (2) with the inverse of the risk rating for country $i$ at time $t-1$ and higher levels indicate higher risk ($FRR_{i,t-1}$). The FRR is an index that attempts to measure a country's "ability to finance its official, commercial, and trade debt obligations" (ICRG Method, 2022). Its components include foreign debt as a percentage of GDP, foreign debt service as a share of exports, the current account as a share of exports, reserves as a share of imports, and currency depreciation.

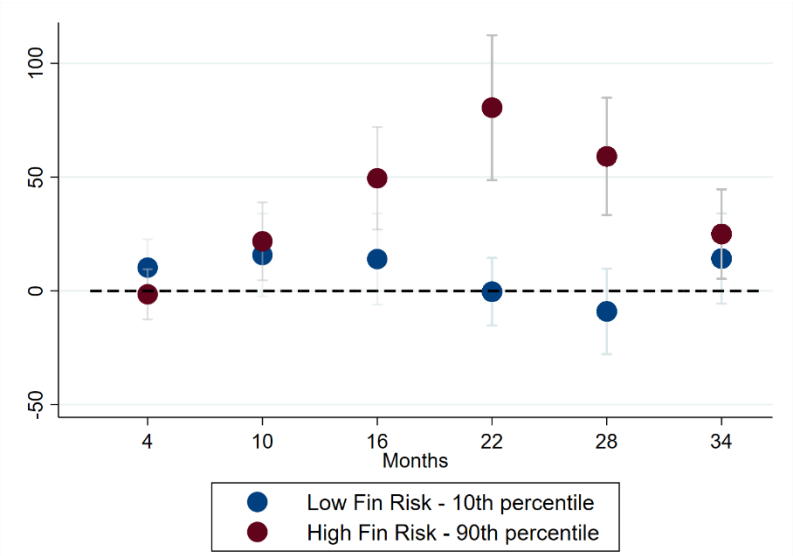
As was the case with government debt, we find that the sensitivity of inflation expectations to government debt surprises increases with the level of the ICRG risk measure. Figure 10 displays the response of 5-year ahead inflation expectations to government debt surprises when the conditioning variable is the ICRG risk measure. To highlight the impact of the conditioning variable, we again display the coefficients of the local projections for the highest risk decile (90th percentile) and the

lowest risk decile (10th percentile). After the first year, the impact of debt shocks on long-term inflation expectations is significantly higher for the highest risk decile.

As noted above, government debt forecast errors may not represent true surprises, because they are forecastable. We follow the method used in IMF (2017) and Magud and Pienknagura (2022) by regressing the debt forecast errors on forecast errors of inflation and real GDP growth and using the residuals from this regression as our debt shock. We find that the results are qualitatively similar and that the peak estimated sensitivities retain statistical significance and are slightly larger in magnitude than in the baseline specification. This might be due to downward biased estimates in the baseline results from the disinflationary effects of adverse GDP growth shocks. That is, a negative GDP growth surprise that would imply a larger debt-to-GDP likely lowers inflation and inflation expectations. We also follow the approach of Auerbach and Gorodnichenko (2013) and project the debt forecast errors on lagged macroeconomic variables with which the forecast errors might be predicted, using the residuals from this regression as the debt shock. The results and conclusions discussed above are also quantitatively and qualitatively robust to this approach.

**Figure 10. Response of Inflation Expectations to Government Debt Surprises, Emerging Market Economies—ICRG Financial Risk Rating**

(Basis points, annual rate)




Notes: t=0 is the year of the shock. The figure plots for the 10th and 90th percentiles of the ICRG Financial Risk Rating, the inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. The red (blue) dot corresponds to estimates evaluated at a high (low) financial risk rating, with the whiskers representing 90 percent confidence intervals.

**Table 9. Regression Results, by ICRG Financial Risk Rating, Emerging Market Economies**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0493 | -0.0043 | -0.1042 | -0.2697*** | -0.2357*** | -0.0217 |
| | (0.0363) | (0.0528) | (0.0634) | (0.0895) | (0.0821) | (0.0440) |
| Financial Risk Rating | 13.1319 | 22.8277 | 23.5666 | 18.5699 | -4.7757 | -39.6436 |
| | (19.8761) | (25.9743) | (25.4310) | (42.7289) | (44.8312) | (27.5824) |
| Debt Surprise # ICRG FRR | -1.7191 | 0.8848 | 5.2006** | 11.8482*** | 9.9753*** | 1.5808 |
| | (1.3463) | (1.9772) | (2.4406) | (3.6415) | (3.2268) | (1.6284) |
| No. of Obs. | 342 | 280 | 279 | 252 | 251 | 232 |
| Adjusted R sq. | 0.63 | 0.40 | 0.20 | 0.28 | 0.15 | 0.03 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

# Conclusion

We have explored a new way to assess the how concerns about government debt levels can affect inflation expectations, based on unanticipated changes in government debt. Our finding that debt surprises raise long-term inflation expectations in emerging market economies, particularly when initial debt levels are already high, when inflation is already elevated, and when monetary policy frameworks are weaker, has important policy implications.

In emerging market economies with high government debt levels, bringing them to a sustainable path is likely to be important for containing inflation. This is particularly relevant at the current juncture, after a sharp rise indebtedness around the COVID-19 shock, and with inflationary pressures around the world having proven strong and persistent. In the medium term, adopting modern, forward-looking monetary policy frameworks such as inflation targeting can reduce inflationary concerns associated with government debt, creating more space for both monetary- and fiscal policy.

Further research could quantify the degree to which debt concerns affect the inflationary process itself through the expectations channel. Moreover, whereas in this study we have focused on professional forecasters' expectations, it may be worth investigating the degree to which households' and firms' expectations are also influenced by government debt levels.

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# Annex I

**Table A.1: Country List**

| Advanced Economies | | Emerging & Developing Economies | | Low Income & Developing Countries |
|---|---|---|---|---|
| Australia | Singapore | Albania | North Macedonia | Bangladesh |
| Austria | Slovak Republic | Argentina | Pakistan | Honduras |
| Belgium | Slovenia | Armenia | Panama | Moldova |
| Canada | Spain | Belarus | Paraguay | Nicaragua |
| Cyprus | Sweden | Bolivia | Peru | Nigeria |
| Czech Republic | Switzerland | Bosnia and Herzegovina | Philippines | Uzbekistan |
| Denmark | Taiwan Province of China | Brazil | Romania | Vietnam |
| Estonia | United Kingdom | Bulgaria | Russia | |
| Finland | United States | Chile | Saudi Arabia | |
| France | | China | Serbia | |
| Germany | | Colombia | South Africa | |
| Greece | | Costa Rica | Sri Lanka | |
| Hong Kong SAR | | Croatia | Thailand | |
| Ireland | | Dominican Republic | Turkey | |
| Israel | | Ecuador | Turkmenistan | |
| Italy | | Egypt | Ukraine | |
| Japan | | El Salvador | | |
| Korea | | Georgia | | |
| Latvia | | Guatemala | | |
| Lithuania | | Hungary | | |
| Netherlands | | India | | |
| New Zealand | | Indonesia | | |
| Norway | | Kazakhstan | | |
| Poland | | Malaysia | | |
| Portugal | | Mexico | | |

**Table A.1: 5-Year Inflation Expectations, by Inflation Level, Advanced Economies**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0050 | 0.0066* | 0.0065 | 0.0022 | -0.0085 | -0.0079* |
| | (0.0043) | (0.0038) | (0.0040) | (0.0049) | (0.0061) | (0.0045) |
| CPI, y-o-y | 0.0217** | 0.0463*** | 0.0640*** | 0.0662*** | 0.0323* | 0.0458*** |
| | (0.0110) | (0.0101) | (0.0123) | (0.0178) | (0.0173) | (0.0145) |
| Debt Surprise # Inflation | -0.0010 | -0.0041*** | -0.0023 | 0.0000 | 0.0049* | 0.0033* |
| | (0.0017) | (0.0010) | (0.0015) | (0.0023) | (0.0027) | (0.0018) |
| No. of Obs. | 381 | 349 | 349 | 314 | 314 | 293 |
| Adjusted R sq. | 0.33 | 0.13 | 0.02 | -0.02 | -0.07 | -0.08 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table A.2: 5-Year Inflation Expectations, by Financial Risk Rating, Advanced Economies**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | -0.0139 | -0.0209 | 0.0020 | -0.0227 | -0.0335** | -0.0120 |
| | (0.0113) | (0.0213) | (0.0201) | (0.0280) | (0.0163) | (0.0248) |
| Financial Risk Rating | 8.8700* | -2.4138 | 6.9317 | -9.0687 | -2.9544 | -14.0266* |
| | (4.6527) | (8.5152) | (6.3806) | (8.9443) | (7.4589) | (8.0936) |
| Debt Surprise # ICRG FRR | 0.7321* | 0.8730 | 0.0575 | 1.0676 | 1.4386** | 0.4676 |
| | (0.4136) | (0.8052) | (0.8014) | (1.1156) | (0.5765) | (0.9031) |
| No. of Obs. | 371 | 340 | 340 | 306 | 306 | 286 |
| Adjusted R sq. | 0.26 | 0.07 | -0.09 | -0.11 | -0.13 | -0.13 |

Notes: All regressions include 2-month and 8-month lags of 5-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

# Annex II

**Table A.3: Regression Results, 3-Year Inflation Expectations, Full Sample**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | -0.0024 | 0.0143* | 0.0246** | 0.0436*** | 0.0328*** | 0.0217*** |
| | (0.0057) | (0.0081) | (0.0114) | (0.0130) | (0.0102) | (0.0081) |
| No. of Obs. | 780 | 673 | 673 | 608 | 608 | 564 |
| Adjusted R sq. | 0.61 | 0.45 | 0.23 | 0.21 | 0.20 | 0.15 |

Notes: All regressions include 2-month and 8-month lags of 3-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table A.4: Regression Results, 3-Year Inflation Expectations, Emerging Market Economies**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | -0.0050 | 0.0280** | 0.0479*** | 0.0800*** | 0.0637*** | 0.0530*** |
| | (0.0111) | (0.0128) | (0.0173) | (0.0189) | (0.0137) | (0.0170) |
| No. of Obs. | 354 | 281 | 281 | 253 | 253 | 233 |
| Adjusted R sq. | 0.61 | 0.47 | 0.25 | 0.26 | 0.23 | 0.17 |

Notes: All regressions include 2-month and 8-month lags of 3-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table A.5: Regression Results, 3-Year Inflation Expectations, Advanced Economies**

| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | -0.0008 | -0.0003 | 0.0006 | 0.0022 | -0.0016 | 0.0005 |
| | (0.0017) | (0.0030) | (0.0036) | (0.0034) | (0.0032) | (0.0037) |
| No. of Obs. | 426 | 392 | 392 | 355 | 355 | 331 |
| Adjusted R sq. | 0.39 | 0.13 | -0.01 | -0.04 | -0.08 | -0.13 |

Notes: All regressions include 2-month and 8-month lags of 3-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Table A.6: Regression Results, 3-Year Inflation Expectations, By Initial Debt Level, Emerging Market Economies**

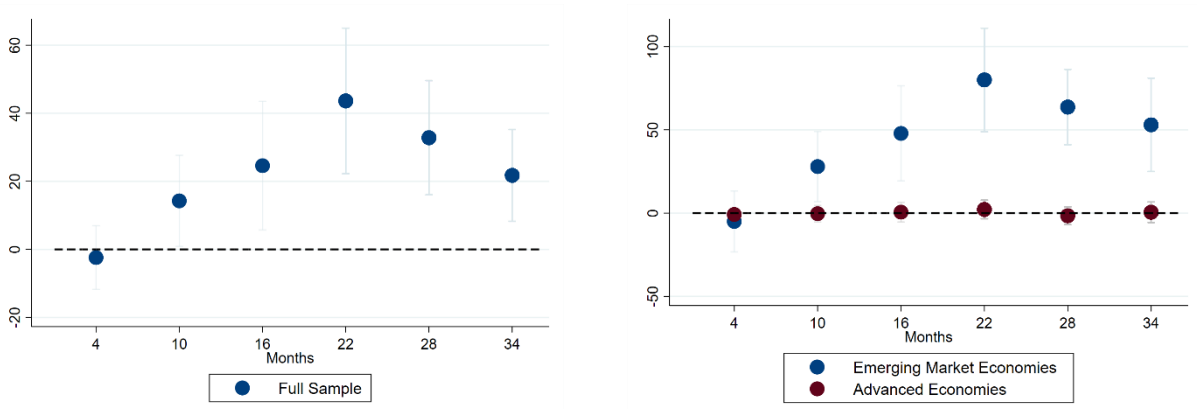
| | (1) h = 4 | (2) h = 10 | (3) h = 16 | (4) h = 22 | (5) h = 28 | (6) h = 34 |
|---|---|---|---|---|---|---|
| Debt Surprise | 0.0411 | 0.0228 | 0.0231 | -0.0341 | -0.0404 | 0.0575* |
| | (0.0323) | (0.0308) | (0.0422) | (0.0518) | (0.0459) | (0.0330) |
| Debt to GDP | -0.0133** | -0.0112 | -0.0239*** | -0.0283** | -0.0299** | -0.0217** |
| | (0.00588) | (0.00794) | (0.00823) | (0.0111) | (0.0128) | (0.0110) |
| Debt Surprise # Debt | -0.000955 | 0.000122 | 0.000506 | 0.00252* | 0.00220* | -0.000198 |
| | (0.000788) | (0.000765) | (0.00107) | (0.00131) | (0.00116) | (0.000674) |
| No. of Obs. | 335 | 277 | 277 | 249 | 249 | 229 |
| Adjusted R sq. | 0.62 | 0.47 | 0.26 | 0.31 | 0.27 | 0.17 |

Notes: All regressions include 2-month and 8-month lags of 3-year ahead inflation expectations, a 12-month lag of the debt shock, and country and time fixed effects. Driscoll-Kraay standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

## Figure A.1: Response of 3-Year Inflation Expectations to Public Debt Shocks, Baseline

(Basis points, annual rate)

***Full Sample*** ***Emerging Market- vs Advanced Economies***

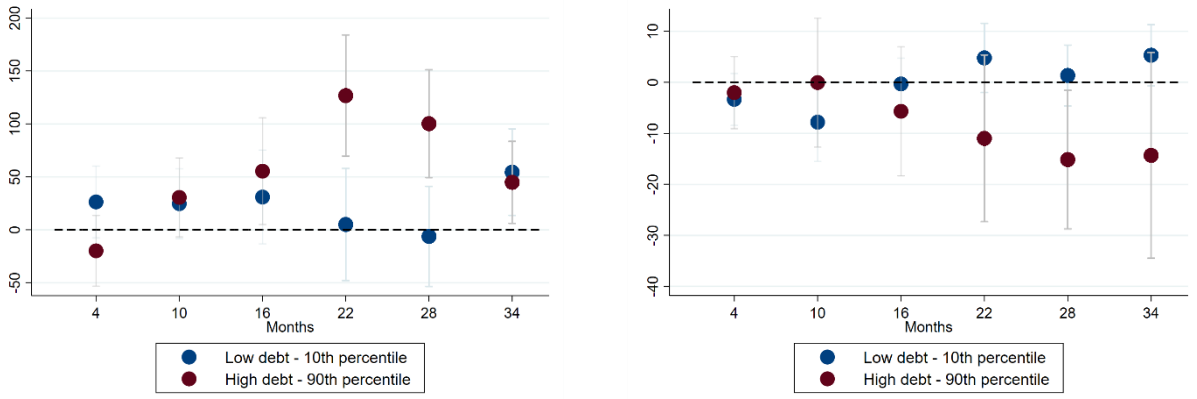



Notes: t=0 is the quarter of the shock. The figures plot for the relevant horizon the 3-year ahead inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. The blue dots denote the inflation expectations response for emerging market economies in our sample while the red dots denote the corresponding response for advanced economies. The whiskers represent 90 percent confidence intervals. The chart on the left shows the response for the full sample.

## Figure A.2: Response of 3-Year Inflation Expectations to Public Debt Shocks, by Initial Debt Level Classification

(Basis points, annual rate)

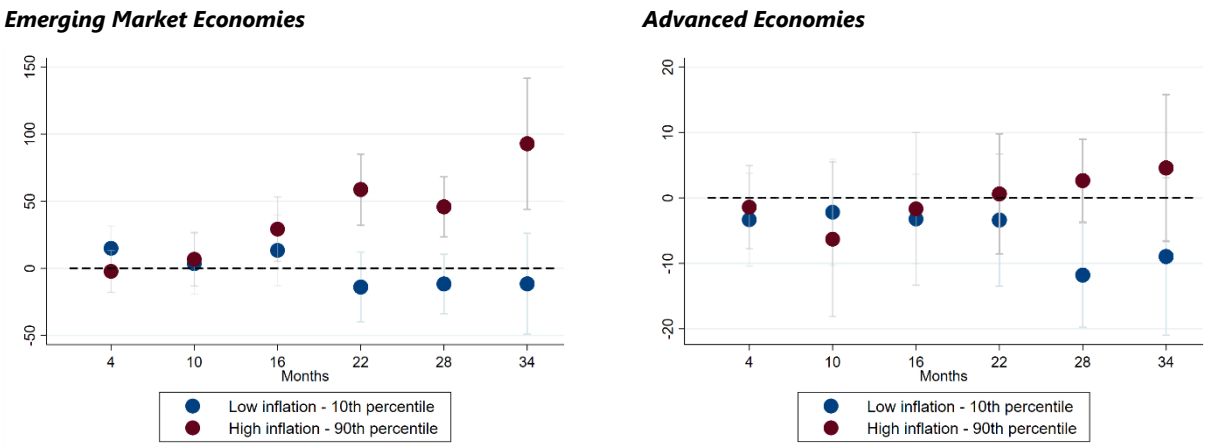
***Emerging Market Economies*** ***Advanced Economies***




Notes: t=0 is the year of the shock. The figures plot for the relevant country groups the 3-year ahead inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. The blue dots denote the inflation expectations response for economies with a debt level at the 10$^{th}$ percentile of the relevant country group sample, while the red dots denote the corresponding response for economies with a debt level at the 90$^{th}$ percentile of the relevant country group sample. The whiskers represent 90 percent confidence intervals.

## Figure A.3: Response of 3-Year Inflation Expectations to Public Debt Shocks, by Initial Inflation Level Classification

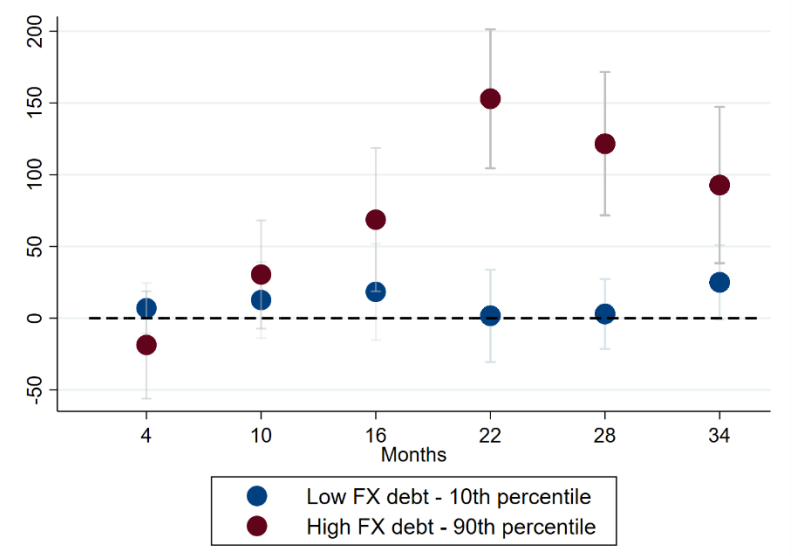
(Basis points, annual rate)




Notes: t=0 is the year of the shock. The figures plot for the relevant country groups the 3-year ahead inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. The blue dots denote the inflation expectations response for economies with an initial inflation at the 10th percentile of the relevant country group sample, while the red dots denote the corresponding response for economies with an initial inflation level at the 90th percentile of the relevant country group sample. The whiskers represent 90 percent confidence intervals.

## Figure A.4: Response of 3-Year Inflation Expectations to Public Debt Shocks, Emerging Market Economies—by Initial FX Share of Government Debt

(Basis points, annual rate)




Notes: t=0 is the year of the shock. The figures plot for the relevant country group the 3-year ahead inflation expectations response to a 10 percent surprise in the debt-to-GDP ratio. The blue dots denote the inflation expectations response for economies with an initial FX share of government debt beneath the 10th percentile, while the red dots denote the corresponding response for economies with an initial FX share of government debt above the 90th percentile. The whiskers represent 90 percent confidence intervals.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