TECHNICAL NOTE IDB-TN-03430

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When Debt Heals and When It Hurts: Policy Insights from a Global Growth-at-Risk Analysis

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Abstract

The relationship between public debt and economic growth has long been debated in the literature, with empirical evidence yielding negative, negligible, or even positive estimates. We argue that these contradictory findings partly reflect overlooked distributional asymmetries in the debt–growth nexus. Using panel quantile regressions with fixed effects for 192 countries within a Growth-at-Risk (GaR) framework, we examine how debt shapes the conditional distribution of growth. Our results show that debt reductions are typically followed by non-Keynesian expansionary effects at the lower end of the expected growth distribution and by traditional Keynesian effects at the upper end, while having a mostly neutral impact around the center. These findings are particularly robust for emerging and low-income countries, even after controlling for structural covariates known to influence GaR. Motivated by these findings, we further analyze the implications of fiscal consolidation for subsequent growth performance. Using both statistical measures based on the cyclically adjusted primary balance (CAPB) and, for a smaller sample, a narrative action-based indicator, we document a positive role for fiscal consolidation during periods of economic vulnerability. Overall, our findings underscore the importance of fiscal prudence during episodes of weak economic activity in emerging and low-income economies and highlight the risks associated with excessive debt accumulation under adverse economic conditions.

Key words: Debt-to-GDP, Real Growth, GaR, Vulnerable Growth, Growth-Debt nexus, Fiscal Consolidation

JEL: E63, H63, H87, E32

1. Introduction

The relationship between public debt and economic growth has long been at the center of heated policy debates. This issue is particularly relevant for emerging and low-income economies, where public debt has escalated to unprecedented levels (Kose et al., 2022), and inflationary pressures have been amplified by trade tensions, ongoing conflicts, and the accommodative monetary policies adopted in response to the COVID-19 pandemic, the lingering effects of which remain evident to this day. The prospect of rising or even stable interest rates may further destabilize emerging and low-income market economies, as higher debt-servicing costs can render public debt unsustainable. Consequently, understanding the optimal level of public debt relative to national output and, in particular, its relationship with growth prospects, has become increasingly important and has attracted substantial academic and policy attention in recent years.

Early contributions, most notably Reinhart and Rogoff (2010), argued that once government debt exceeds a threshold of around 90 percent of GDP, economic growth is significantly impaired. However, subsequent critiques highlighted methodological issues in this work, suggesting that the debt–growth link is more complex and context-dependent than initially thought (Herndon et al., 2013). Building on these insights, a growing body of empirical and theoretical literature has examined the channels through which debt may influence growth, as well as the evidence for a systematic relationship between the two—an issue that remains disputed in the literature (see Heimberger, 2023, for a recent overview).

This debate is reflected in a substantial body of research. Numerous studies document a negative relationship between public debt and economic growth (e.g., Afonso and Jalles, 2013; Chudik et al., 2017; Woo and Kumar, 2015), particularly when debt exceeds certain thresholds (e.g., Baum et al., 2013; Caner et al., 2010; Reinhart and Rogoff, 2010). In case the debt-to-GDP ratio increases via larger government expenditure (the numerator) findings in this branch of the literature imply the presence of a non-Keynesian mechanism of "expansionary austerity", whereby reductions in public debt are followed by improved growth performance as documented for instance by Alesina and Ardagna (2010).

Conversely, other research shows that fiscal consolidations, especially those aimed at reducing debt, can have persistent adverse effects on output (Guajardo et al., 2014; Fatás and Summers, 2018; Jordá and Taylor, 2016). Some authors even question the usefulness of the debt-to-GDP ratio as a reliable indicator for monitoring fiscal sustainability and economic performance

(Furman and Summers, 2020; Mehrotra and Sergeyev, 2021). Additionally, a number of studies argue that, even when a negative relationship exists, it is often small and may not be causal (e.g., Ahe et al., 2020; Panizza and Presbitero, 2014), particularly after accounting for publication bias (Heimberger, 2023).

We contribute to the literature by proposing that an important and neglected reason behind the contradictory findings on the debt–growth relationship is that the effect of debt varies across the conditional distribution of growth. We test this hypothesis using panel quantile regressions with fixed effects (Koenker, 2004) covering a broad sample of 192 countries and adopt the Growth-at-Risk framework proposed by Adrian et al. (2019), which focuses on predictive rather than causal relationships—in our case, between debt and expected growth.

Our results confirm this hypothesis. We find that increases in current public debt are associated with lower growth during recessions (i.e., at the lower quantiles of the GDP growth distribution) but with higher growth during strong expansions (i.e., at the upper quantiles), while the relationship is largely non-significant at the median. These findings reconcile conflicting results in the literature and highlight the importance of debt management and fiscal prudence during periods of vulnerable growth, particularly for emerging markets and low-income economies, which are the main drivers of our results. Our findings are robust to the inclusion of structural covariates previously identified in the literature as significant determinants of Growth-at-Risk, such as institutional quality, the size of the banking sector, and trade openness.

Our results suggest that at the lower end of the GDP growth distribution, non-Keynesian mechanisms appear to be at work, whereby debt reductions are followed by higher, rather than lower, economic growth. Because the debt-to-GDP ratio—our main variable of interest—can vary due to changes in either public debt or output, it is inherently difficult to attribute its movements exclusively to one of these sources. To further investigate this paradoxical non-Keynesian effect, we explicitly test the role of fiscal consolidation episodes and their interaction with the debt-to-GDP ratio.

Identifying fiscal consolidations is challenging as well, as they are often intertwined with broader macroeconomic conditions. To address this, we employ two complementary approaches: (i) a statistical definition of fiscal consolidation based on changes in the cyclically adjusted primary balance (CAPB), following the tradition started by Alesina and Ardagna (1998); and (ii) a narrative, action-based indicator recently made available by Adler et al. (2024) at the IMF,

following the methodological approach advanced by Romer and Romer (2010) and Guajardo et al. (2014). The first measure covers our full country sample, allowing for a precise estimation of effects at the lower tail of the growth distribution. The second, while conceptually more appealing, differs in that it examines policymakers stated intentions and actions as documented in contemporaneous policy records, thereby identifying fiscal shocks primarily motivated by deficit reduction. Unlike CAPB-based indicators, these action-based measures are less likely to be systematically correlated with other developments affecting output that could bias estimates of the impact of fiscal consolidation on growth. Unfortunately, data for these indicators are available only for a smaller subsample of 31 countries, most of which are advanced economies.

With these limitations in mind, our results generally confirm that part of the effect observed at the lowest quantiles of growth is attributable to fiscal consolidations—that is, debt reductions—producing non-Keynesian effects when growth prospects are severely constrained, often referred to in the Growth-at-Risk literature as episodes of "vulnerable growth". For advanced economies, the evidence is less pronounced and not robust across all specifications, although fiscal consolidation continues to exhibit a consistently positive association with growth at the lower end of the distribution (unlike the debt-to-GDP ratio itself).

The remainder of this paper is organized as follows. Section 2 reviews the literature, covering both the Growth-at-Risk framework and adjacent studies on the debt–growth nexus. Section 3 outlines our methodology, which is based on panel quantile regressions, while Section 4 describes the data used in our analysis. The results of our empirical models, along with robustness checks, are presented in Section 5. Finally, Section 6 concludes and offers policy recommendations.

2. From Growth at Risk to the Growth-Debt Nexus

In this section, we review two strands of literature relevant to our contribution. The first is the Growth-at-Risk (GaR) framework, originally developed by Adrian et al. (2019), which links downside risks to economic activity with financial conditions and other variables. The second examines the relationship between debt and growth, with a focus on the non-linearities arising from debt risk—namely, thresholds beyond which debt may hinder economic performance. In this section we also include a brief review of recent debates in the literature that measures the effect of fiscal consolidation on growth, and which motivate non-linearities in the debt-growth relationship.

2.1. The Growth at Risk Framework.

An influential body of recent research has shown that financial conditions possess strong predictive power for real economic activity, particularly during periods of macroeconomic stress. That is, in the lower (negative) tail of the GDP growth distribution. This line of work, initiated by Giglio et al. (2016) and further developed by Adrian et al. (2019), introduced the concept of Growth-at-Risk, inspired by the widely adopted notion of Value-at-Risk, long familiar to regulators and market practitioners. The GaR framework has since gained substantial traction among international policymakers, becoming a standard tool for central banks and supervisory authorities in assessing financial stability risks.

In practice, the methodology involves estimating and reporting the lower quantiles of the GDP growth distribution—predicted from financial conditions—over one or several quarters ahead (Prasad et al., 2019). Originally designed as a country-level exercise, where U.S. GDP growth was forecast using the National Financial Conditions Index (NFCI), the approach rapidly expanded to a global setting. Consequently, the capacity of financial conditions to anticipate downside risks to growth has been tested across a broad range of economies (e.g., Brownlees and Souza, 2020; Arrigoni et al., 2020; Gächter et al., 2023; Chuliá et al., 2024).

The core branch of the GaR literature has therefore investigated the impact of financial conditions, monetary policy, and global financial cycles on growth risks. Adrian et al. (2022) demonstrate that looser financial conditions reduce downside risks in the near term but increase them over longer horizons, highlighting an intertemporal risk tradeoff. Consistent with this, Beutel et al. (2021) show that contractionary U.S. financial and monetary shocks elevate downside risks globally, especially in countries with rigid exchange rate regimes, high foreign currency exposures, or elevated leverage. Similarly, Arbatli-Saxegaard et al. (2020) find that U.S. monetary policy spillovers disproportionately affect the left tail of the GDP growth distribution in both advanced and emerging economies.

At a domestic level, Falconio and Manganelli (2020) show that both financial conditions and economic risk have asymmetric effects on the distribution of growth, intensifying tail risks during turbulent periods but exerting limited influence on the upside. Szendrei and Varga (2023) extend this focus to the euro area, applying variable selection methods to identify the most relevant predictors of different parts of the GDP distribution, highlighting the role of banking sector variables on top of the Composite Indicator of Systemic Stress-CISS in the case of Europe

(Hollo et al., 2012). Plagborg-Moller et al. (2020), however, cast doubt on the robustness of financial predictors, concluding that financial indicators contribute relatively little to distributional forecasts of GDP growth beyond information already contained in real variables.

The literature has also expanded beyond financial conditions to examine alternative determinants. These include institutional quality, trade openness, debt, and financial market depth—analyzed in a cross-country framework for the European Union (Gächter et al., 2023)—as well as climate-related risks, captured through different moments of the temperature variation distribution, in the context of Latin American and Caribbean economies (Giraldo et al., 2025).

Several studies have enriched the GaR methodology by integrating higher-frequency data, belief shocks, and scenario analysis. Ferrara et al. (2021) and Chulia et al. (2023) propose high-frequency GaR models using mixed-data sampling and machine learning techniques, demonstrating their usefulness in real-time monitoring, particularly during crises such as COVID-19. Boeck and Pfarrhofer (2023) highlight the role of belief shocks (i.e., misjudgments in expectations) showing that although effects on GaR are not statistically strong, downside risk misperceptions can exacerbate business cycle fluctuations.

Beyond traditional quantile regressions, González-Rivera et al. (2020) develop the concept of growth-in-stress (GiS), which constructs conditional growth densities under stressed scenarios. GiS complements GaR by enabling multidimensional stress-testing, particularly relevant during systemic crises such as the pandemic. Brownlees and Souza (2020) further assess the predictive validity of GaR, finding that quantile regression forecasts perform comparably to standard GARCH models, with volatility models sometimes providing superior out-of-sample accuracy.

An important dimension of GaR research concerns the role of policy in mitigating downside risks. Galán (2020) documents that macroprudential policies, particularly borrower-based measures, reduce risks at the lower tail of the GDP distribution, though their effectiveness varies with the phase of the financial cycle. Franta and Gambacorta (2020) similarly find that macroprudential tightening, such as stricter loan-to-value limits, narrows the GDP distribution and reduces crisis intensity. Karmakar and Lima (2021) show that countercyclical capital buffers could have substantially mitigated the global recession following the Lehman collapse, reducing the severity of downside risks by thickening the left tail of the GDP distribution. Chuliá et al. (2024) highlight the central role of the banking sector and the credit channel, introducing the concept of Vulnerable Funding, analogous to Vulnerable Growth in the GaR literature. Their

findings underscore the importance of financial-sector policies, as vulnerable funding appears to anticipate and predict vulnerable growth.

From a theoretical perspective, Suarez (2020) develops a welfare-based framework linking GaR to macroprudential policy design, showing how optimal policy balances expected growth with downside risks. Gai and Haworth (2023) further highlight that policymakers' cautious expectations shape the growth–risk tradeoff, leading to historically dependent policy stances that evolve with crisis experience.

2.2. Relationship Between Debt and Growth.

One of the most debated contributions to the debt–growth nexus is Reinhart and Rogoff's (2010) influential study, which argued that once government debt exceeds a threshold of 90 percent of GDP, economic growth slows considerably. Their claim that high public debt systematically undermines long-term growth prospects quickly shaped both academic and policy debates, especially in the aftermath of the Global Financial Crisis. However, the study became infamous after coding and methodological errors were identified, raising doubts about the robustness of the 90 percent threshold. Critics highlighted that the original results were highly sensitive to country selection, time periods, and econometric methods, suggesting that the relationship between debt and growth is less straightforward than initially thought.

Subsequent research has refined our understanding of this relationship. Checherita-Westphal and Rother (2012) examine twelve Euro Area countries over four decades and provide evidence of a non-linear relationship between debt and growth. They find a turning point between 90 and 100 percent of GDP, though their confidence intervals suggest that negative effects may begin as low as 70–80 percent. Importantly, they identify three key channels through which high debt reduces growth: lower public investment, weaker productivity, and shifts in private saving.

A related but parallel literature has explored the consequences of fiscal consolidations as a response to high debt. Ardagna (2004) shows that the success of fiscal adjustments in lowering debt ratios depends mainly on the size of the adjustment and less on composition, but whether an adjustment is expansionary hinges importantly on composition: spending-based consolidations are more likely to be expansionary than tax-based ones, working largely through labor-market channels. Building on this tradition, empirical and theoretical work argues that attempts to reduce debt via austerity can produce persistent output losses. Fatás and Summers

(2018) document strong hysteresis effects: large fiscal consolidations in advanced economies have often reduced the long-run path of GDP, sometimes increasing rather than decreasing the debt-to-GDP ratio through their negative impact on growth. Other recent research also indicates that fiscal austerity measures have contributed to sluggish economic growth and widening inequality (Ostry et al., 2016) while further question the capacity of fiscal consolidation strategies to promote growth, highlighting their limited effectiveness (e.g., Deleidi et al., 2020).

In a related study of research Ferraro and Peretto (2020) provide a theoretical model of endogenous technological change showing that tax-financed consolidations can depress firm entry, innovative investment, productivity and ultimately per-capita output along a permanently lower path. In their calibrated exercises, tax-based consolidations generate output losses roughly twice as large as spending-based ones, and fiscal tightening can therefore have long-lived anti-growth effects by undermining the innovation process. Croce et al. (2021) obtain related results as well: persistent high government debt raises long-run consumption risk and downside uncertainty, implying welfare costs and higher risk premia that can further suppress growth.

On the empirical literature, a recent branch of the literature, with notable examples in Guajardo et al., (2014) and Jordá and Taylor (2016), argue that statistical methods traditionally used to measure fiscal consolidation, for example, rules based on CAPB, are inherently biased towards finding expansionary effects of fiscal consolidation, potentially understating contractionary impacts. These authors detail two main issues: first, non-policy changes such as a stock market boom can mechanically improve the CAPB through higher capital gains revenue, and since this boom is also correlated with economic growth (like private consumption and investment), the method incorrectly attributes the resulting expansion to the fiscal action itself. Second, the method suffers from reverse causality, as governments often proactively tighten fiscal policy to mitigate the risk of an overheating economy; CAPB-based estimates would mistakenly interpret this policy response to expected economic strength as the cause of that strength.

Furthermore, Guajardo et al. (2014) point out that even more sophisticated techniques, such as Structural Vector Autoregressions (SVAR), often fail to fully resolve these issues, as they typically assume that after accounting for lagged output, changes in fiscal variables are uncorrelated with other short-term economic developments. This assumption ignores both the non-policy changes in cyclically-adjusted data and the crucial element of forward-looking policy

responses to prospective economic conditions, a problem that is particularly acute in multi-country, annual-frequency studies.

To address these limitations, several authors—particularly at the IMF (Guajardo et al., 2014; see also David et al., 2018, 2025; Adler et al., 2024)—have proposed indicators of discretionary fiscal policy that are unrelated to the short-term economic outlook. To construct these indicators, these authors rely on a wide range of contemporaneous policy documents to identify episodes of fiscal consolidation driven not by efforts to counteract abnormal growth, but by the objective of reducing budget deficits and ensuring long-term fiscal sustainability. This method is similar to the narrative approach pioneered by Romer and Romer (2010) to identify fiscal shocks. As these authors note, fiscal measures identified in this way respond to past policy decisions and economic conditions rather than to anticipated developments. Consequently, they are unlikely to be systematically correlated with other factors affecting short-term output, making them well-suited for estimating the immediate effects of fiscal consolidation.

Taken together, the literature has moved beyond the simplistic threshold hypothesis of earlier works. Indeed, while high debt can indeed weigh on growth, the evidence points to context-dependent, non-linear, and channel-specific effects. The design of fiscal policy—whether debt reduction relies on spending cuts or tax increases, and whether it accounts for long-term growth channels such as innovation and productivity—matters greatly in shaping the final growth outcomes. The emerging consensus is that debt sustainability and growth cannot be assessed in isolation: both depend critically on the structure of fiscal adjustments, the macroeconomic environment, and the interplay between policy and long-term development dynamics.

2.3. Linking Vulnerable Growth Episodes and Debt.

From a GaR perspective, the findings that relate debt and growth invite to shift the focus from a single mean-effect threshold to how indebtedness shapes the entire conditional distribution of future growth, particularly the left tail. High and persistent debt—especially when reduced through tax-heavy consolidations or when it undermines public investment and innovation—raises the likelihood and severity of downside outcomes, increasing GaR and related tail-risk measures, including fiscal crisis (Gomez-Gozalez et al., 2023). Conversely, well-timed, spending-focused consolidations or the use of lump-sum financing mitigate long-run damage to the growth distribution. The heterogeneity emphasized by Checherita-Westphal and Rother (2012), the hysteresis documented by Fatás and Summers (2018), and the innovation channel formalized

by Ferraro and Peretto (2020) all imply that GaR models should include indebtedness as a crucial determinant of growth, but also point out to a non-linear association in good and bad times between the two variables.

A number of recent studies are, indeed, related to our work, as they investigate the link between debt—or broader fiscal factors, including sovereign risk—and downside risks to growth. Kladakis and Skouralis (2023) find that sovereign credit rating downgrades substantially increase GDP downside risk, particularly in speculative-grade economies, with bond spreads serving as the primary transmission channel. Croce et al. (2021) show that persistent public debt accumulation magnifies long-term downside risks to consumption growth, highlighting the role of fiscal policy in shaping the distribution of macroeconomic outcomes. Similarly, Gächter et al. (2023) emphasize the importance of structural determinants of GaR, demonstrating that trade openness, government effectiveness, and financial sector size affect both baseline vulnerability and countries' sensitivity to financial shocks.

We build on this literature by adopting a global perspective that covers a large set of both advanced and emerging economies, examining the impact of debt on future growth while highlighting asymmetries across economic cycles—between expansions and recessions—and across levels of development. This approach allows us to uncover novel patterns in the debt–growth relationship, such as the positive association observed at higher quantiles of growth. These findings shed light on the challenges faced by fiscal authorities applying uniform policies across different phases of the cycle, where outcomes may diverge markedly, especially for emerging market economies.

Finally, other results also complement other such as those of Fotiou (2022), who document a clear non-linear relationship between fiscal policy instruments and macroeconomy outcomes, and extend this evidence by showing that the debt–growth nexus is not only state-dependent (expansions versus recessions) but also conditioned on the level of debt itself. Unlike Fotiou (2022), we shift the focus to an international setting, with particular attention to emerging and low-income developing economies, drawing on a sample of 192 countries—of which roughly 73% are non-advanced. This broader scope allows us to provide new evidence on debt as a determinant of growth, revealing opposite effects in recessions and expansions across the globe. Moreover, also in contrast to previous studies on state-dependent fiscal multipliers that condition on fiscal variables such as the debt-to-GDP ratio (e.g., Auerbach and Gorodnichenko,

2012; Nickel and Tudyka, 2014; Fotiou 2022), we examine the entire conditional distribution of growth. This approach highlights that in normal times (around the median), the debt-to-GDP ratio is largely insignificant, whereas in periods of acute recession or strong expansion, higher debt exerts significant effects.

3. Methodology

We follow the panel quantile approach developed by Koenker (2004) and Abrevaya et al. (2008), which extends quantile regression models to panel data settings. This enables us to adapt the Growth-at-Risk (GaR) framework developed by Adrian et al. (2019) to our research question. In the GaR framework, the τ-quantile of the dependent variable—the annual real growth rate—is modeled as a function of past growth outcomes and financial conditions, with particular attention to the lower tail of the distribution. Building on this specification, we define the τ-quantile of growth as follows:

$$Q_\tau(growth_{it}|a_i, \beta, growth_{it-}, debt_{it-}) = a_i^\tau + \beta_\tau^g growth_{it-1} + \beta_\tau^d debt_{it-1}, \quad (1)$$

where, for a given quantile $\tau \in (0,1)$, the coefficients β_τ^k, $k \in \{g, d\}$, capture the relationship between the explanatory variables: namely, the lagged growth rate and the lagged debt-to-GDP ratio and, the τ-th quantile of the growth distribution. The baseline growth level is captured by the coefficient a_i^τ, which is also estimated, thereby allowing our quantile regressions to effectively control for country fixed effects.

While the inclusion of the lagged growth rate is standard in the Growth-at-Risk literature, we adjust the specification in equation (1) by incorporating the debt-to-GDP ratio, as discussed in the introduction. The model in equation (1) is therefore closely related to traditional panel data models of economic activity and can be equivalently expressed as follows:

$$growth_{it} = a_i + x_{it}'\beta_\tau + \varepsilon_{it}, \quad (2)$$

where, $Q_\tau(\varepsilon_{it} \mid b_i, \beta, x_{it}) = 0$. In what follows, our focus extends beyond the lower quantiles of the growth distribution. Instead, we analyze the entire conditional distribution of growth as a function of government debt. This broader perspective is necessary to reconcile the seemingly contradictory conclusions in the previous literature regarding the predictive power of debt for economic growth.

In the second part of our results, we extend equation (1) by adding a variable of fiscal consolidation(fc) and the interaction term of this new variable with the debt-to-GDP ratio, in the following way:

$$Q_\tau(growth_{it} | a_i, \beta, growth_{it-1}, debt_{it-1}) = a_i^\tau + \beta_\tau^g growth_{it-1} + \beta_\tau^d debt_{it-1} + \beta_\tau^c fc_{it-1} + \beta_\tau^{dc} debt_{it-} \ * fc_{it-1}, \quad (3)$$

In the robustness section, in addition to exploring alternative definitions of fiscal consolidation in equation (3), we also extend equation (2) by incorporating additional variables highlighted by Gächter et al. (2023) —such as trade openness, financial market size, and government effectiveness—into the vector x, as a robustness check for our findings. Although our approach, consistent with the original framework, focuses on the predictive power of the right-hand-side variables for growth, this extension nevertheless helps to substantiate our main conclusions.

4. Data

Table 1, Panel A, provides descriptive statistics for economic growth and the government debt-to-GDP ratios across the full sample of countries, as well as separately for emerging and advanced economies. Our data runs from 1996 to 2024, with information for 192 countries. For the full sample (N=5,052 observations— see Table A1 in the Appendix detailing the sampled countries), average GDP growth is 3.55 percent, with a standard deviation of 5.85, reflecting considerable volatility in the sample. The range spans from sharp contractions (-54.34 percent) to exceptional episodes of high growth (147.97 percent), likely linked to crisis rebounds or extraordinary one-off events. Government debt-to-GDP averages 55.05 percent, also with a wide variation (standard deviation 42.55), ranging from zero to an extreme maximum of 658.22

percent, highlighting the presence of countries with extraordinarily high debt burdens in our sample.

For emerging markets (N=3,957, observations, equivalent to 152 countries), average growth is slightly higher at 3.82 percent, with greater volatility (standard deviation 6.07). The minimum and maximum values show sharp recessions (-36.39 percent in Central African Republic, 2013) and unusual high growth (147.97 percent, Equatorial Guinea in 1997), consistent with the higher macroeconomic volatility that characterizes these economies. Average debt is somewhat lower than in the full sample at 53.35 percent of GDP, though the distribution is similarly wide (standard deviation 42.36), and the maximum value is again very high (658.22 percent, Liberia, 2003).

For advanced economies (N=1,095, 40 countries), the growth average is lower at 2.56 percent, with less volatility (standard deviation 4.84). The range still includes severe downturns (-54.34 percent, Macau, 2020) and large positive spikes (75.06 percent, again in Macau but this time in 2023), but extremes are less notable than in emerging markets. Debt levels are notably higher on average (61.20 percent of GDP), with a similar spread (standard deviation 42.67) and a maximum value of 258.37 percent for Japan in 2020, but far below the most extreme debt cases found in emerging markets.

Panel B of Table 1 provides an overview of the fiscal consolidation indicators used in this study. The first measure identifies years in which the cyclically adjusted primary balance (CAPB) is positive, capturing instances of fiscal tightening. In advanced economies, 926 observations correspond to years without a positive CAPB, while 169 observations indicate years with a positive CAPB, representing 15.4% of the sample. In the remaining emerging and low-income countries (non-advanced), on 3,740 ocassions we document no positive CAPB, and in 217 years the opposite, which accounts for 5.48% of the observations.

The second measure follows the methodology of Alesina and Ardagna (1998), classifying fiscal consolidations based on more stringent CAPB thresholds. Using this approach, 820 observations in advanced economies are not classified as consolidations, compared to 108 that are, corresponding to 9.86% of the sample. For other countries, 1,093 observations are non-consolidations and 205 are consolidations, representing 5.18% of the sample. These figures highlight that fiscal consolidation episodes are relatively rare, particularly outside advanced

economies, and provide the basis for the analysis of growth responses to fiscal adjustments in the subsequent sections.

Table 1. Summary Statistics

Panel A. Growth and debt-to-GDP

Indicator	*N*	*Mean*	*St. Dev.*	*Min*	*Max*
growth	5052	3.55	5.85	-54.34	147.97
debt	5052	55.05	42.55	0.00	658.22
growth_emerging	3957	3.82	6.07	-36.39	147.97
debt_emerging	3957	53.35	42.36	0.00	658.22
growth_advanced	1095	2.56	4.84	-54.34	75.06
debt_advanced	1095	61.20	42.67	0.00	258.37

Panel B. Fiscal Consolidation

Variable	*Economy*	*Count d=0*	*Count d=1*	*% d=0*	*% d=1*
CAPB>0	Advanced	926.00	169.00	84.60	15.40
CAPB>0	Other	3740.00	217.00	94.50	5.48
Alesina and Ardargna (1998)	Advanced	820.00	108.00	74.90	9.86
Alesina and Ardargna (1998)	Other	1093.00	205.00	27.60	5.18

Note: Table 1 presents summary statistics. Panel A reports statistics for the annual real GDP growth rate and the debt-to-GDP ratio. These statistics are shown for the full sample of 192 countries (1996–2024) and separately for emerging market economies (152 countries) and advanced economies (40 countries). Panel B summarizes the two main fiscal consolidation variables used in this study. The first variable identifies years in which the cyclically adjusted primary balance (CAPB) is positive, while the second follows Alesina and Ardagna (1998), identifying fiscal consolidations as years in which the CAPB is at least 2%, or at least 1.5% in two consecutive years. The number of events for each variable is reported. Data on GDP growth and debt were obtained from the World Bank and the World Economic Forum. Fiscal consolidation dummy variables in Panel B were constructed by the authors using CAPB data from the IMF's World Economic Outlook.

We also collected data on trade openness, measured as the ratio of exports and imports to GDP, as well as on government effectiveness and credit-to-GDP, using sources from the World Economic Forum and the World Bank. These variables are included in the final section of our results as complementary analyses. Similarly, we compiled data on fiscal consolidation using a narrative approach provided by Adler et al. (2024) from the IMF website for a subsample of 31 countries. This subsample includes 17 advanced economies—Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, and the United States—and 14 non-advanced economies, all from Latin America and the Caribbean: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Paraguay, Peru, and Uruguay.

5. Results

This section is divided into three subsections. In the first, we present our main GaR specification, which examines the predictive effect of the debt-to-GDP ratio on future real growth, controlling—as in the original GaR framework—for a one-year lag of GDP growth. The second subsection expands the specification to include episodes of fiscal consolidation. At this stage, we define consolidation in broad terms, simply as a positive CAPB. This approach allows us to disentangle what drives our results at the negative tail of the conditional growth distribution—whether it is debt accumulation during periods of fiscal loosening or debt reductions during episodes of austerity or restructuring. It is both.

In the third subsection, we present several robustness checks. Specifically, we extend our baseline model by incorporating variables previously identified in the literature as significant determinants of GaR. We also revisit the fiscal-consolidation-augmented model from the second subsection, applying more conventional definitions of fiscal consolidation —such as episodes where the CAPB improvement exceeds 1.5% of GDP over two consecutive years or 2% in a single year— and a narrative, or "action-based", approach that identifies consolidation episodes based on intended policy actions. This latter exercise relies on a sub-sample of 31 countries, as the narrative data on fiscal consolidations are only available for this group.

Across all specifications, we find that for non-advanced economies, vulnerable growth is significantly and positively related to the debt-to-GDP ratio, and that fiscal consolidation at the far-left tail of the growth distribution improves future growth prospects. For advanced economies, however, the results are more heterogeneous.

5.1. Main Growth-at-Risk Specification

Results for the full sample of countries are presented in Table 2, Panel A. As expected, the intercept is always significant across all quantiles, capturing shifts in the conditional distribution of growth across countries and over the time. The lag of GDP growth is consistently positive and significant, housing an effect pronounced around the median (τ=0.5) and also at the tails (τ=0.01, τ=0.9, τ=0.95).

On its side, the debt to GDP ratio, represented by the variable debt, shows a more complex pattern: at the extreme lower quantile (τ=0.01), lagged debt has a significantly negative effect (-0.05, $p<0.01$), suggesting that for countries with high vulnerability in terms of growth, higher

past debt burdens worsen future prospects of growth outcomes. In the middle quantiles (τ=0.05–0.5), the debt effect becomes statistically non-significant. At higher quantiles (τ=0.9 and τ=0.95), debt flips sign and its effects become positive and significant (p=0.02 and p=0.06), implying that at higher levels of growth, increases in past debt may support or at least coincide with stronger growth outcomes. Thus, for the full sample, the main finding is that debt is harmful in recessions but appears to have beneficial predictive power in expansions.

Table 2. Results Panel Quantile with Fixed Effects

Panel A: Full Sample

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.01	Intercept	-9.25	1.59	-5.81	<0.01
	Lag of Growth	0.22	0.09	2.41	0.02
	Lag of Debt	**-0.05**	0.02	-3.23	<0.01
tau=0.05	Intercept	-3.34	0.47	-7.05	<0.01
	Lag of Growth	0.21	0.08	2.77	0.01
	Lag of Debt	-0.02	0.01	-1.57	0.12
tau=0.1	Intercept	-1.79	0.35	-5.05	<0.01
	Lag of Growth	0.25	0.07	3.79	<0.01
	Lag of Debt	0.00	0.01	-0.29	0.77
tau=0.5	Intercept	2.50	0.16	16.14	<0.01
	Lag of Growth	0.29	0.03	9.80	<0.01
	Lag of Debt	0.00	0.00	0.42	0.68
tau=0.9	Intercept	6.13	0.36	17.14	<0.01
	Lag of Growth	0.18	0.05	3.28	<0.01
	Lag of Debt	**0.01**	0.00	2.27	0.02
tau=0.95	Intercept	7.75	0.50	15.57	<0.01
	Lag of Growth	0.17	0.08	2.26	0.02
	Lag of Debt	**0.01**	0.01	1.90	0.06
tau=0.99	Intercept	12.44	1.61	7.71	<0.01
	Lag of Growth	0.29	0.17	1.71	0.09
	Lag of Debt	0.05	0.03	1.59	0.11

Note: Table 2, Panel A reports the results of panel quantile regressions with country fixed effects for the full sample of economies. Across quantiles, lagged GDP growth is consistently positive and statistically significant, confirming growth persistence. The lag of government debt-to-GDP shows strong heterogeneity: it is significantly negative at the lower tail (τ=0.01, p<0.01), indicating that debt exacerbates downturns, but becomes positive and significant in the upper quantiles (τ=0.9 and τ=0.95), suggesting that debt may support stronger expansions.

The results for emerging market economies are presented in Panel B of Table 2. The overall pattern is more pronounced compared to the full sample. The lag of GDP growth is again strongly positive and significant across almost all quantiles. On its, side, debt shows a very pronounced negative effect at the lower tail (τ=0.01: -0.08, p<0.01; τ=0.05: -0.04, p=0.02), confirming that in downturns, for emerging markets, debt burdens deepen the possibilities of poor performance, as they increase vulnerability of future growth scenarios.

Table 2. Results Panel Quantile with Fixed Effects

Panel B: Emerging and Low-Income Market Economies

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.01	Intercept	-8.41	1.41	-5.96	<0.01
	Lag of Growth	0.24	0.08	3.16	<0.01
	Lag of Debt	**-0.08**	0.02	-4.57	<0.01
tau=0.05	Intercept	-3.15	0.61	-5.19	<0.01
	Lag of Growth	0.32	0.08	3.77	<0.01
	Lag of Debt	**-0.04**	0.01	-2.43	0.02
tau=0.1	Intercept	-1.63	0.43	-3.80	<0.01
	Lag of Growth	0.29	0.05	5.28	<0.01
	Lag of Debt	-0.01	0.01	-0.99	0.32
tau=0.5	Intercept	2.57	0.17	15.44	<0.01
	Lag of Growth	0.30	0.03	10.21	<0.01
	Lag of Debt	0.00	0.00	1.08	0.28
tau=0.9	Intercept	6.14	0.31	19.72	<0.01
	Lag of Growth	0.19	0.05	3.74	<0.01
	Lag of Debt	**0.02**	0.01	2.77	0.01
tau=0.95	Intercept	7.72	0.43	17.89	<0.01
	Lag of Growth	0.19	0.07	2.59	0.01
	Lag of Debt	**0.02**	0.01	2.11	0.03
tau=0.99	Intercept	11.78	1.23	9.59	<0.01
	Lag of Growth	0.31	0.18	1.71	0.09
	Lag of Debt	**0.08**	0.03	2.42	0.02

Note: Panel B presents results for emerging market economies. Lagged GDP growth is highly significant and positive across most quantiles, with larger coefficients in the lower and middle quantiles. Debt effects are asymmetric: significantly negative in recessions (τ=0.01, p<0.01; τ=0.05, p=0.02) but turning significantly positive at the top of the growth distribution (τ=0.9, p=0.01; τ=0.95, p=0.03; τ=0.99, p=0.02). These findings suggest that debt deepens crises but can be growth-enhancing in periods of strong economic performance for emerging economies.

At the median (τ=0.5), debt is insignificant, but at higher quantiles (τ=0.9, τ=0.95, τ=0.99) the coefficient turns positive and significant (p-values between 0.01 and 0.03). This suggests an interesting asymmetry: for emerging markets, debt is detrimental during crises but becomes a growth-supporting factor during booms. The effect is larger at the extreme upper tail (τ=0.99, coefficient 0.08, p=0.02), meaning that in periods of exceptionally high growth, emerging markets may leverage debt more effectively to spur growth, while the opposite is true during recessions.

In advanced economies, which results are presented in Table 2, Panel C, the pattern diverges substantially from the previous samples. While the intercept remains significant across quantiles, the lag of GDP growth is weaker, significant mainly at τ=0.5 (p<0.01) but often non-significant in the tails. The debt variable shows little evidence of being beneficial: it is indeed non-significant at the lower quantiles (τ=0.01–0.1) and becomes negative and significant around the median and upper tail (τ=0.5, coefficient -0.01, p=0.05; τ=0.9, -0.02, p<0.01; τ=0.95, -0.02, p=0.03).

At the extreme upper quantile (τ=0.99), it is again negative but not statistically significant. This indicates that, unlike emerging markets, advanced economies do not derive growth benefits from higher debt; rather, debt accumulation tends to be a drag, particularly during periods of strong performance. The asymmetry seen in Panel B is reversed: debt in advanced economies undermines growth in expansions instead of supporting it with not real benefits during recessions.

All on all, the debt to GDP ratio, is mostly harmful in recessions (τ=0.01–0.05), when growth is vulnerable, particularly for emerging and low-income economies. There are, nonetheless, some important differences between emerging and advanced economies, and in recessions versus expansions. Emerging markets show a positive and significant debt effect in high-growth periods, suggesting debt can be leveraged to sustain expansions. Advanced economies, by contrast, show the opposite: debt is detrimental at higher quantiles, highlighting the idea that debt weighs down growth in booms rather than supporting it.

Table 2. Results Panel Quantile with Fixed Effects

Panel C: Advanced Economies

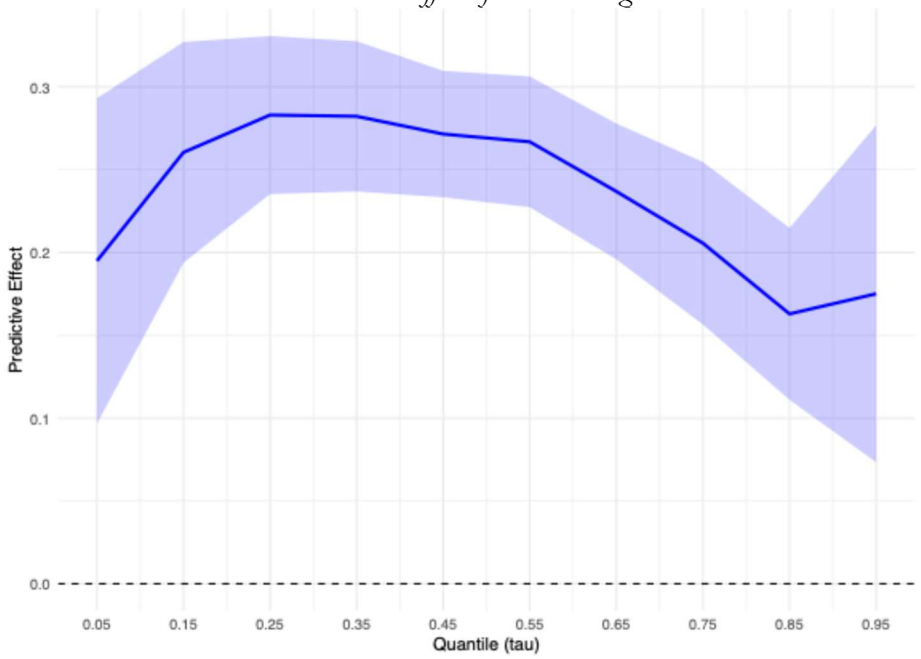
		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.01	Intercept	-14.30	4.32	-3.31	<0.01
	Lag of Growth	0.27	0.16	1.64	0.10
	Lag of Debt	0.04	0.03	1.43	0.15
tau=0.05	Intercept	-4.65	0.91	-5.10	<0.01
	Lag of Growth	0.14	0.10	1.44	0.15
	Lag of Debt	0.00	0.01	0.26	0.79
tau=0.1	Intercept	-2.41	0.64	-3.76	<0.01
	Lag of Growth	0.18	0.11	1.68	0.09
	Lag of Debt	0.01	0.01	1.27	0.20
tau=0.5	Intercept	2.20	0.29	7.70	<0.01
	Lag of Growth	0.20	0.07	2.91	<0.01
	Lag of Debt	**-0.01**	0.00	-1.93	0.05
tau=0.9	Intercept	6.76	0.52	12.93	<0.01
	Lag of Growth	0.05	0.06	0.83	0.41
	Lag of Debt	**-0.02**	0.01	-3.13	<0.01
tau=0.95	Intercept	8.90	1.04	8.54	<0.01
	Lag of Growth	-0.03	0.06	-0.58	0.56
	Lag of Debt	**-0.02**	0.01	-2.23	0.03
tau=0.99	Intercept	14.19	3.81	3.73	<0.01
	Lag of Growth	-0.11	0.11	-1.06	0.29
	Lag of Debt	-0.04	0.03	-1.47	0.14

Note: Panel C shows the results for advanced economies. While lagged GDP growth is positive, it is less consistently significant than in emerging markets. The role of debt contrasts sharply with Panel B: coefficients are insignificant in the lower quantiles but turn negative and statistically significant around the median and upper quantiles (τ=0.5, p=0.05; τ=0.9, p<0.01; τ=0.95, p=0.03). Thus, in advanced economies, debt is not growth-enhancing; rather, it tends to weigh on growth during expansions.

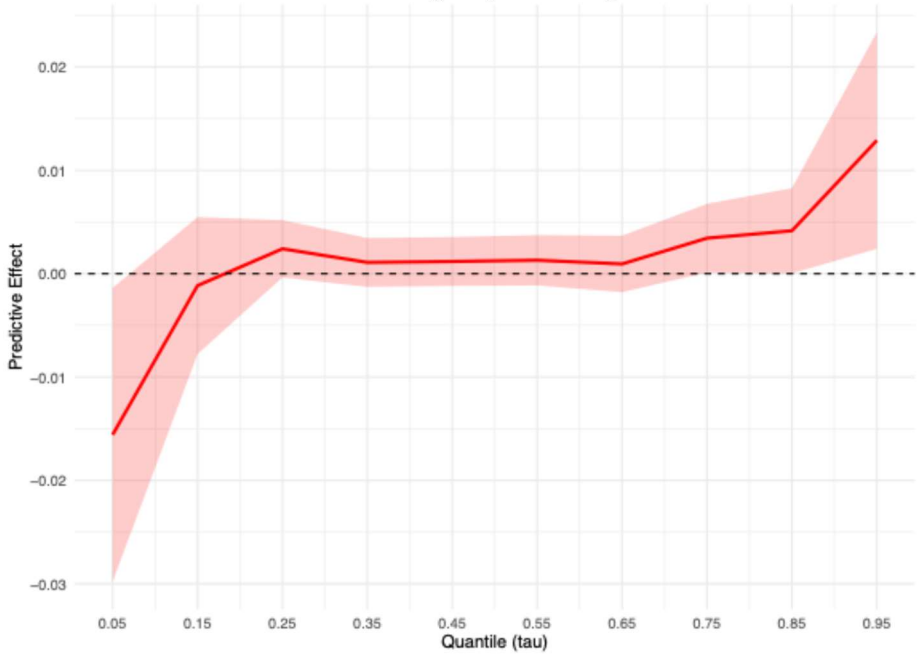
In what follows, in Figures 1 to 3, we extend the analysis by examining additional quantiles of the distribution. Panel A of each figure reports the coefficients capturing the predictive relationship of lagged GDP growth on its current value, while Panel B shows the corresponding effects of lagged debt. The vertical axis represents the magnitude of these effects, and the horizontal axis indicates the quantile at which each effect is estimated. Shadowed areas in blue (Panel A) and red (Panel B) represent 84% confidence intervals with bootstrapped standard errors.

Figure 1. Effects over the Quantiles of the Real Growth Rate of Lagged Growth and Government Debt (All Markets)

Panel A: Effect of Growth Lag



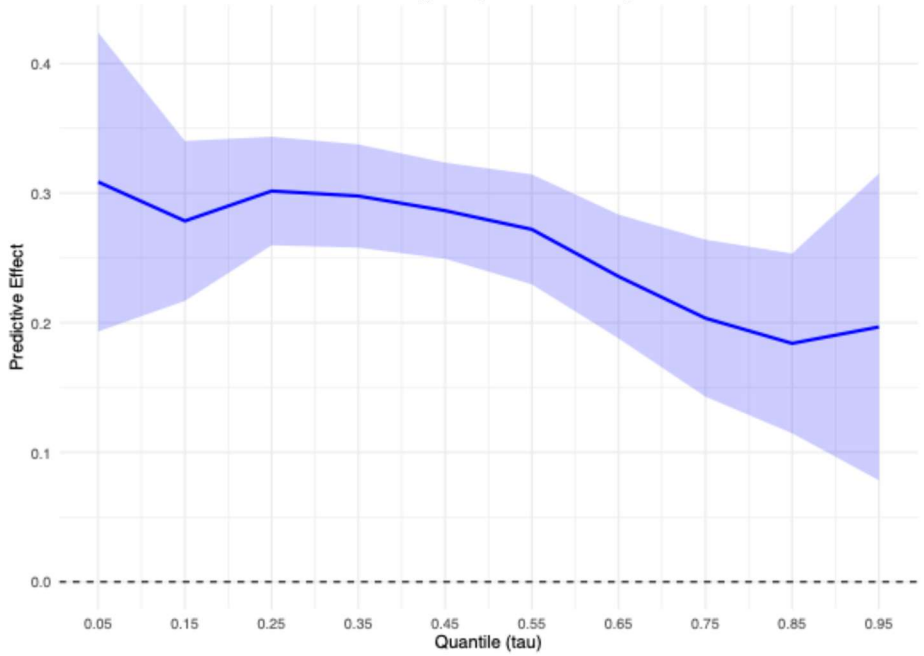
Panel B: Effect of Debt Lag



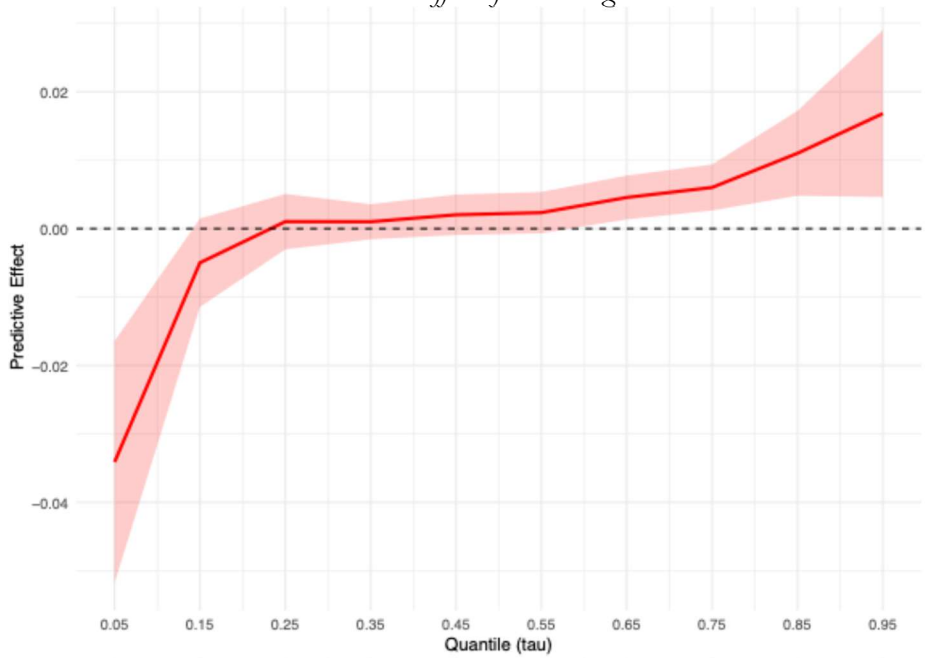
Note: Panel A of each figure displays the coefficients measuring the predictive effect of lagged GDP growth on current growth, while Panel B shows the corresponding effects of lagged debt. The vertical axis represents the magnitude of the estimated effects, and the horizontal axis indicates the quantiles at which these effects are computed, ranging from 0.05 to 0.95 in increments of 0.10. Shadowed areas in blue (Panel A) and red (Panel B) denote 84% confidence intervals, calculated using bootstrapped standard errors. All estimates include country fixed effects.

Figure 2. Effects over the Quantiles of the Real Growth Rate of Lagged Growth and Government Debt (Emerging and Low-Income Developing Markets)

Panel A: Effect of Growth Lag

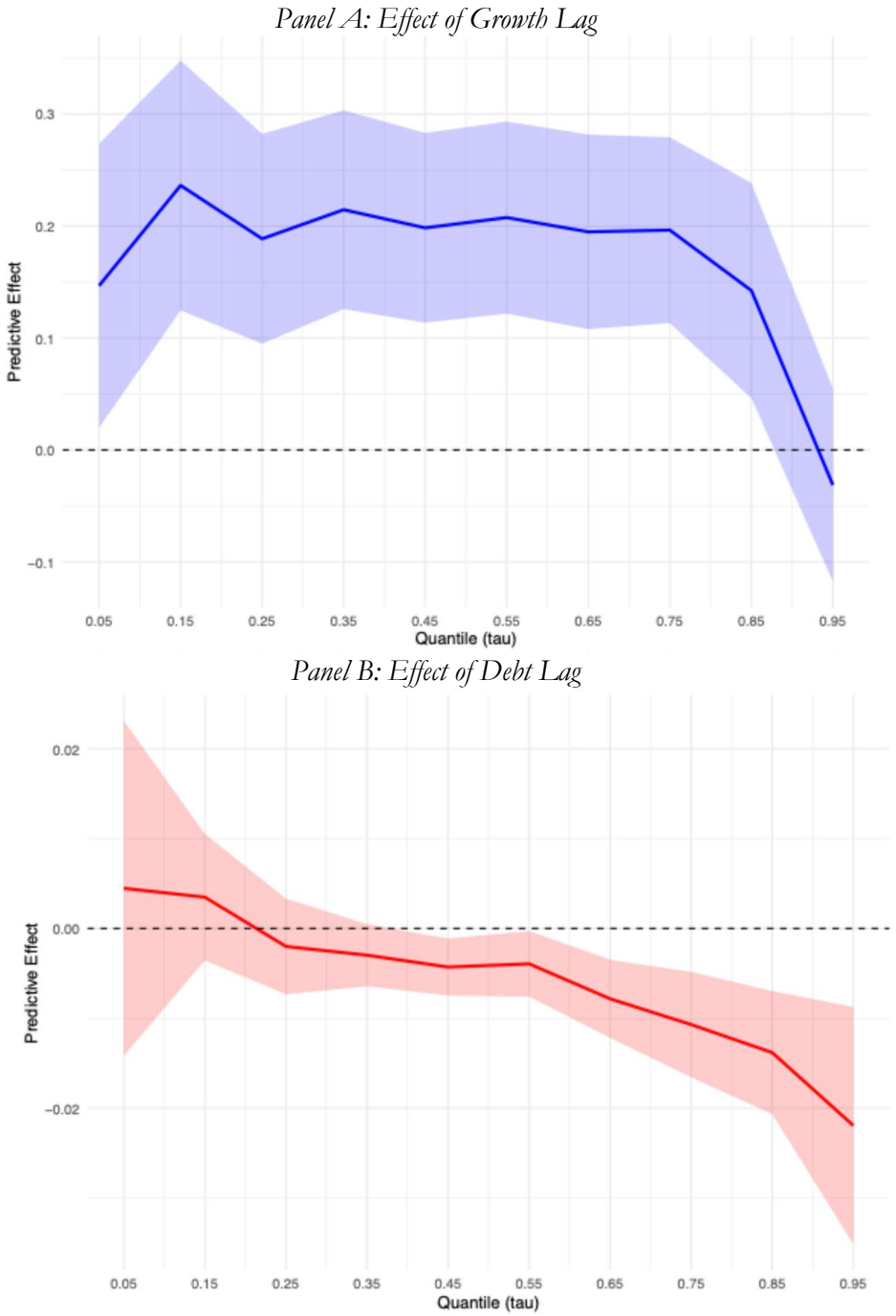


Panel B: Effect of Debt Lag



Note: Panel A of each figure displays the coefficients measuring the predictive effect of lagged GDP growth on current growth, while Panel B shows the corresponding effects of lagged debt. The vertical axis represents the magnitude of the estimated effects, and the horizontal axis indicates the quantiles at which these effects are computed, ranging from 0.05 to 0.95 in increments of 0.10. Shadowed areas in blue (Panel A) and red (Panel B) denote 84% confidence intervals, calculated using bootstrapped standard errors. All estimates include country fixed effects.

Figure 3. Effects over the Quantiles of the Real Growth Rate of Lagged Growth and Government Debt (Advanced Markets)



Note: Panel A of each figure displays the coefficients measuring the predictive effect of lagged GDP growth on current growth, while Panel B shows the corresponding effects of lagged debt. The vertical axis represents the magnitude of the estimated effects, and the horizontal axis indicates the quantiles at which these effects are computed, ranging from 0.05 to 0.95 in increments of 0.10. Shadowed areas in blue (Panel A) and red (Panel B) denote 84% confidence intervals, calculated using bootstrapped standard errors. All estimates include country fixed effects.

Overall, the plots generally confirm our main results, as including additional quantiles near the center of the distribution does not substantially change the empirical patterns documented so far for the tails of the distribution. For emerging markets, there is a striking contrast in the effect of debt on future growth prospects. Higher debt increases growth vulnerability one year ahead, but it also raises the likelihood of exceptionally strong performance.

Taken together, these effects imply that growth volatility is positively associated with debt. Given that growth vulnerability is higher during recessions—and that this effect is persistent, as evidenced by the consistently positive and significant effect of lagged growth on current growth—our results highlight the limitations of higher debt in mitigating recessions. At the same time, they indicate that during expansions, higher debt can increase the probability of better growth outcomes.

In the case of advanced economies, the negative association between current debt and future growth disappears during episodes of high vulnerability but reappears in the upper tail of the growth distribution. This suggests that increases in debt when advanced economies are already experiencing strong growth may not sustain the positive trend.

Another observation, clearer from the figures than from the original results in the tables, is that debt is only related to growth at the extreme tails of the distribution. For emerging markets, even at the 84% confidence level, the predictive power of debt is evident only below the 10th percentile and above the 60th percentile. For advanced economies, this predictive and significant effect appears only above the median. In most cases, especially for emerging markets, the effect is either zero or very close to zero (even when significant) at the center of the distribution.

5.2. Debt-GaR and Fiscal Consolidation

Results in Section 5.1 show that for non-advanced economies, vulnerable growth—understood as the leftmost tail of the growth distribution— is significantly affected by the debt-to-GDP ratio. Specifically, an increase in the debt-to-GDP ratio during periods of vulnerable growth, such as recessions, has a negative impact on subsequent growth outcomes. In other words, higher debt levels worsen the prospects for future growth by making the lowest quantile of the future GDP growth distribution more negative. This effect is not observed when considering only advanced economies, although it is present in the full sample. In advanced economies, by

contrast, the negative impact of higher debt appears only during episodes of high growth—that is, at the right tail of the growth distribution.

However, our baseline model does not provide insights into the underlying sources of these effects. For example, does the negative association observed for emerging and low-income economies reflect a reduction in the debt-to-GDP ratio followed by lower growth vulnerability (i.e., an upward shift in the most negative quantiles toward zero)? Or does it instead reflect an increase in debt leading to weaker subsequent growth outcomes? To address this question, in this section we incorporate a simple measure of fiscal consolidation into our empirical specification. Specifically, we include a dummy variable that takes the value of one when a country's CAPB is positive in a given year and zero otherwise. We also include an interaction term between the debt-to-GDP ratio and this fiscal consolidation variable.

The results are reported in Table 3. Panel A presents the results for the full sample, while Panels B and C focus on emerging markets and advanced economies, respectively. In the case of Panel C, the model is estimated only for quantiles between 0.05 and 0.95, given the larger number of explanatory variables and the reduced precision in estimating the extreme tails of the distribution due to the smaller sample of advanced economies relative to the other groups.

Table 3. Results Panel Quantile with Fixed Effects and Fiscal Consolidation Variable

Panel A: Full Sample

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.01	Intercept	-9.28	1.74	-5.34	<0.01
	Lag of Growth	0.21	0.08	2.71	0.01
	Lag of Debt	**-0.06**	0.02	-2.96	<0.01
	Lag of Fiscal Con.	5.03	3.12	1.61	0.11
	Lag Fiscal Con.*Lag Debt	0.00	0.05	0.01	0.99
tau=0.05	Intercept	-3.56	0.55	-6.51	<0.01
	Lag of Growth	0.21	0.07	3.01	<0.01
	Lag of Debt	-0.02	0.01	-1.51	0.13
	Lag of Fiscal Con.	**4.02**	1.26	3.19	<0.01
	Lag Fiscal Con.*Lag Debt	-0.01	0.02	-0.45	0.65
tau=0.1	Intercept	-1.78	0.41	-4.39	<0.01
	Lag of Growth	0.25	0.06	3.95	<0.01
	Lag of Debt	-0.01	0.01	-0.88	0.38
	Lag of Fiscal Con.	**2.19**	0.83	2.64	0.01
	Lag Fiscal Con.*Lag Debt	0.00	0.01	-0.03	0.97

tau=0.5	Intercept	2.46	0.16	15.80	<0.01
	Lag of Growth	0.29	0.03	10.57	<0.01
	Lag of Debt	0.00	0.00	0.63	0.53
	Lag of Fiscal Con.	**0.74**	0.34	2.19	0.03
	Lag Fiscal Con.*Lag Debt	**-0.01**	0.00	-2.09	0.04
tau=0.9	Intercept	6.17	0.41	15.24	<0.01
	Lag of Growth	0.18	0.05	3.45	<0.01
	Lag of Debt	**0.01**	0.01	1.89	0.06
	Lag of Fiscal Con.	0.11	0.63	0.18	0.86
	Lag Fiscal Con.*Lag Debt	**-0.03**	0.01	-2.35	0.02
tau=0.95	Intercept	7.81	0.54	14.33	<0.01
	Lag of Growth	0.18	0.07	2.46	0.01
	Lag of Debt	0.01	0.01	1.48	0.14
	Lag of Fiscal Con.	-0.71	1.01	-0.70	0.48
	Lag Fiscal Con.*Lag Debt	-0.02	0.02	-1.13	0.26
tau=0.99	Intercept	12.61	1.90	6.64	<0.01
	Lag of Growth	0.28	0.17	1.71	0.09
	Lag of Debt	0.05	0.04	1.41	0.16
	Lag of Fiscal Con.	-4.04	5.43	-0.74	0.46
	Lag Fiscal Con.*Lag Debt	-0.03	0.07	-0.42	0.68

Table 3, Panel A reports the results of panel quantile regressions with country fixed effects for the full sample of economies. The model includes, as predictive variables across quantiles, tau, lagged GDP growth; the lagged debt-to-GDP ratio; and the lag of a fiscal consolidation variable, defined as an indicator that equals 1 when the cyclically adjusted primary balance (CAPB) is positive and 0 otherwise. The model also includes an interaction term between the lagged debt-to-GDP ratio and the fiscal consolidation variable.

The following conclusions emerge from the results reported in Table 3, Panels A to C. For emerging and low-income economies (Panel C), debt remains a significant determinant of future vulnerable growth. Specifically, at the 1st and 5th quantiles of future GDP growth, an increase in the debt-to-GDP ratio is associated with a statistically significant reduction in the conditional distribution of growth. Fiscal consolidation, in turn, exerts—as expected—a positive effect on the lowest quantile (1st percentile) of future GDP growth distribution. The positive association between debt and growth at higher quantiles, documented in the previous section, is also preserved, while fiscal consolidation remains insignificant at this end of the distribution.

Table 3. Results Panel Quantile with Fixed Effects and Fiscal Consolidation Variable

Panel B: Emerging Markets and Low-Income Developing Economies

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.01	Intercept	-8.48	1.26	-6.73	<0.01
	Lag of Growth	0.24	0.08	2.88	<0.01
	Lag of Debt	**-0.08**	0.02	-5.27	<0.01
	Lag of Fiscal Con.	**6.24**	2.89	2.16	0.03
	Lag Fiscal Con.*Lag Debt	-0.02	0.05	-0.45	0.65
tau=0.05	Intercept	-3.22	0.61	-5.26	<0.01
	Lag of Growth	0.31	0.08	3.95	<0.01
	Lag of Debt	**-0.03**	0.02	-2.28	0.02
	Lag of Fiscal Con.	3.34	2.31	1.44	0.15
	Lag Fiscal Con.*Lag Debt	-0.02	0.05	-0.38	0.70
tau=0.1	Intercept	-1.67	0.46	-3.61	<0.01
	Lag of Growth	0.29	0.05	5.31	<0.01
	Lag of Debt	-0.01	0.01	-1.10	0.27
	Lag of Fiscal Con.	1.78	1.32	1.34	0.18
	Lag Fiscal Con.*Lag Debt	0.00	0.03	0.03	0.97
tau=0.5	Intercept	2.54	0.17	14.96	<0.01
	Lag of Growth	0.30	0.03	9.52	<0.01
	Lag of Debt	0.00	0.00	1.16	0.25
	Lag of Fiscal Con.	1.22	0.68	1.79	0.07
	Lag Fiscal Con.*Lag Debt	-0.02	0.01	-1.81	0.07
tau=0.9	Intercept	6.09	0.40	15.32	<0.01
	Lag of Growth	0.20	0.06	3.44	<0.01
	Lag of Debt	**0.02**	0.01	2.55	0.01
	Lag of Fiscal Con.	0.50	1.32	0.38	0.71
	Lag Fiscal Con.*Lag Debt	-0.03	0.03	-1.14	0.25
tau=0.95	Intercept	7.68	0.54	14.23	<0.01
	Lag of Growth	0.20	0.09	2.15	0.03
	Lag of Debt	**0.02**	0.01	1.93	0.05
	Lag of Fiscal Con.	-0.59	1.65	-0.36	0.72
	Lag Fiscal Con.*Lag Debt	-0.02	0.03	-0.62	0.54
tau=0.99	Intercept	11.97	1.29	9.29	<0.01
	Lag of Growth	0.31	0.21	1.48	0.14
	Lag of Debt	**0.08**	0.04	2.18	0.03
	Lag of Fiscal Con.	-1.12	6.58	-0.17	0.86
	Lag Fiscal Con.*Lag Debt	-0.07	0.06	-1.07	0.28

Table 3, Panel A reports the results of panel quantile regressions with country fixed effects for the 152 emerging and low-income economies in our sample. The model includes, as predictive variables across quantiles (tau), lagged GDP growth; the lagged debt-to-GDP ratio; and the lag of a fiscal consolidation variable, defined as an indicator that equals 1 when the cyclically adjusted primary balance (CAPB) is positive and 0 otherwise. The model also includes an interaction term between the lagged debt-to-GDP ratio and the fiscal consolidation variable.

For advanced economies, however, the picture looks different. Probably due to the smaller sample size, most variables (including lagged growth) are not statistically significant. Interestingly, only the fiscal consolidation variable exhibits a significant and positive effect at the 5th and 10th quantiles, consistent with the presence of non-Keynesian fiscal effects. The negative relationship between the debt-to-GDP ratio and the right tail of the growth distribution persists, although it falls short of conventional 95% significance, remaining significant at the 90% level in both cases.

Finally, results for the full sample, reported in Panel A, present a combination of these findings. They confirm the significant role of debt at the lowest end of the distribution (1st percentile) and the positive contribution of fiscal consolidation at the 5th percentile. Overall, fiscal consolidation appears to improve future growth prospects, particularly in the lower quantiles of the growth distribution.

Table 3. Results Panel Quantile with Fixed Effects and Fiscal Consolidation Variable

Panel C: Advanced Economies

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.05	Intercept	-4.96	0.89	-5.56	<0.01
	Lag of Growth	0.14	0.09	1.59	0.11
	Lag of Debt	0.00	0.01	0.32	0.75
	Lag of Fiscal Con.	**4.84**	1.50	3.24	<0.01
	Lag Fiscal Con.*Lag Debt	-0.03	0.02	-1.40	0.16
tau=0.1	Intercept	-2.84	0.62	-4.59	<0.01
	Lag of Growth	0.20	0.10	1.99	0.05
	Lag of Debt	0.01	0.01	1.37	0.17
	Lag of Fiscal Con.	**2.61**	1.36	1.92	0.05
	Lag Fiscal Con.*Lag Debt	-0.02	0.02	-0.93	0.35
tau=0.5	Intercept	2.07	0.29	7.14	<0.01
	Lag of Growth	0.20	0.07	2.91	<0.01
	Lag of Debt	0.00	0.00	-1.19	0.23
	Lag of Fiscal Con.	0.68	0.56	1.21	0.23

	Lag Fiscal Con.*Lag Debt	-0.01	0.01	-1.14	0.25
tau=0.9	Intercept	6.47	0.59	11.02	<0.01
	Lag of Growth	0.08	0.06	1.32	0.19
	Lag of Debt	-0.01	0.01	-1.76	0.08
	Lag of Fiscal Con.	-0.68	0.71	-0.96	0.34
	Lag Fiscal Con.*Lag Debt	0.00	0.01	-0.48	0.63
tau=0.95	Intercept	8.88	1.18	7.51	<0.01
	Lag of Growth	-0.03	0.06	-0.56	0.57
	Lag of Debt	-0.02	0.01	-1.66	0.10
	Lag of Fiscal Con.	-1.61	1.43	-1.12	0.26
	Lag Fiscal Con.*Lag Debt	-0.01	0.02	-0.31	0.76

Table 3, Panel A reports the results of panel quantile regressions with country fixed effects for 40 advanced economies in our sample. The model includes, as predictive variables across quantiles (tau), lagged GDP growth; the lagged debt-to-GDP ratio; and the lag of a fiscal consolidation variable, defined as an indicator that equals 1 when the cyclically adjusted primary balance (CAPB) is positive and 0 otherwise. The model also includes an interaction term between the lagged debt-to-GDP ratio and the fiscal consolidation variable.

5.3. Specification Robustness

Tables 4 presents the results of panel quantile regressions with country fixed effects, where the dependent variable is the annual GDP growth rate and the key explanatory variable is lagged debt. In this section, in addition to lagged growth and debt, we include in our specification three additional contemporaneous variables—trade openness, government effectiveness, and credit-to-GDP—to account for broader macroeconomic and institutional conditions (Gächter et al., 2023). Panel A reports the results for the full sample, while Panels B and C, focus on emerging markets and advanced economies, respectively. Again, in Panel C, the model is estimated only for quantiles between 0.05 and 0.95. Across all panels, the results allow us to examine both the robustness of our main findings and the additional effects of these contemporaneous variables on growth prospects.

Table 4, Panel A reports the results for the full sample of countries. Overall, the patterns largely corroborate our main results in section 5.1. Lagged debt exhibits a slightly negative effect at the lower quantiles (τ = 0.01), while its effect turns positive at higher quantiles (τ = 0.9–0.95), consistent with the earlier finding that debt is detrimental when growth is weak and beneficial when growth is strong. Lagged GDP growth remains positively associated with current growth across almost all quantiles, confirming persistence in growth dynamics. The contemporaneous explanatory variables—trade openness, government effectiveness, and credit-to-GDP—show

distinct patterns: government effectiveness is significant and positive at the lower quantiles, suggesting it supports growth during downturns, while openness and credit tend to have small but sometimes significant effects at the center and upper quantiles.

Table 4. Results Panel Quantile with Fixed Effects and Structural Covariates

Panel A: Full Sample

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.01	Intercept	-2.72	2.99	-0.91	0.36
	Lag of Growth	0.23	0.15	1.54	0.12
	Lag of Debt	**-0.04**	0.02	-2.39	0.02
	Openness	-0.02	0.02	-1.12	0.26
	Gov. Effectiveness	3.29	1.29	2.55	0.01
	Credit	-0.10	0.07	-1.57	0.12
tau=0.05	Intercept	-0.52	0.90	-0.57	0.57
	Lag of Growth	0.20	0.06	3.45	<0.01
	Lag of Debt	0.00	0.01	0.46	0.65
	Openness	-0.01	0.01	-1.68	0.09
	Gov. Effectiveness	1.73	0.46	3.77	<0.01
	Credit	-0.05	0.02	-2.71	0.01
tau=0.1	Intercept	0.94	0.55	1.70	0.09
	Lag of Growth	0.18	0.05	3.86	<0.01
	Lag of Debt	0.00	0.01	0.05	0.96
	Openness	-0.01	0.00	-1.44	0.15
	Gov. Effectiveness	1.17	0.26	4.44	<0.01
	Credit	-0.03	0.01	-5.84	<0.01
tau=0.5	Intercept	3.49	0.29	12.18	<0.01
	Lag of Growth	0.22	0.04	6.07	<0.01
	Lag of Debt	0.00	0.00	1.49	0.14
	Openness	0.00	0.00	2.35	0.02
	Gov. Effectiveness	0.23	0.12	1.87	0.06
	Credit	-0.02	0.00	-5.81	<0.01
tau=0.9	Intercept	6.20	0.53	11.77	<0.01
	Lag of Growth	0.09	0.04	2.55	0.01
	Lag of Debt	**0.01**	0.00	2.22	0.03
	Openness	0.02	0.00	4.13	<0.01
	Gov. Effectiveness	-0.30	0.26	-1.15	0.25
	Credit	-0.02	0.01	-4.58	<0.01
tau=0.95	Intercept	6.65	0.78	8.56	<0.01

	Lag of Growth	0.06	0.04	1.34	0.18
	Lag of Debt	**0.01**	0.01	1.97	0.05
	Openness	0.03	0.01	3.63	<0.01
	Gov. Effectiveness	-0.88	0.39	-2.23	0.03
	Credit	-0.02	0.01	-2.75	0.01
tau=0.99	Intercept	5.91	2.08	2.84	<0.01
	Lag of Growth	-0.04	0.07	-0.52	0.60
	Lag of Debt	0.02	0.03	0.74	0.46
	Openness	0.11	0.03	3.70	<0.01
	Gov. Effectiveness	-2.26	1.25	-1.81	0.07
	Credit	-0.02	0.01	-1.43	0.15

Note: Panel A presents panel quantile regression results with country fixed effects for the full sample of countries. The dependent variable is the annual GDP growth rate. The key explanatory variables are lagged growth and lagged debt, while contemporaneous controls include trade openness, government effectiveness, and credit-to-GDP. Results are reported across multiple quantiles (τ = 0.01, 0.05, 0.1, 0.5, 0.9, 0.95, 0.99) to capture heterogeneous effects. Standard errors are constructed by bootstrap. The table illustrates how the effect of debt varies across the growth distribution and how additional institutional and financial factors shape growth outcomes.

For emerging markets, Panel B of Table 4, reinforces the main results: debt has a negative effect at the lower quantiles and a positive effect at the upper quantiles. This indicates that higher debt increases growth vulnerability during weak growth periods but may boost growth under favorable conditions. Lagged growth remains strongly positive across nearly all quantiles, reflecting persistent dynamics. The new contemporaneous variables show informative patterns: government effectiveness positively contributes to growth mainly at lower and median quantiles, credit-to-GDP negatively affects growth at most quantiles, and trade openness has modest negative effects at lower quantiles but turns positive at higher quantiles.

Table 4. Results Panel Quantile with Fixed Effects and Structural Covariates

Panel B: Emerging Market Economies

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.01	Intercept	-0.84	2.95	-0.28	0.78
	Lag of Growth	0.04	0.15	0.29	0.77
	Lag of Debt	**-0.06**	0.02	-3.27	<0.01
	Openness	-0.03	0.02	-1.49	0.14
	Gov. Effectiveness	1.86	1.77	1.05	0.29
	Credit	-0.10	0.05	-1.79	0.07
tau=0.05	Intercept	1.37	1.25	1.10	0.27

	Lag of Growth	0.20	0.05	4.48	<0.01
	Lag of Debt	-0.01	0.01	-0.79	0.43
	Openness	-0.02	0.01	-1.82	0.07
	Gov. Effectiveness	2.07	0.63	3.30	<0.01
	Credit	-0.07	0.02	-4.52	<0.01
tau=0.1	Intercept	1.87	0.79	2.38	0.02
	Lag of Growth	0.19	0.04	4.52	<0.01
	Lag of Debt	-0.01	0.01	-1.12	0.26
	Openness	-0.01	0.01	-1.15	0.25
	Gov. Effectiveness	1.36	0.38	3.61	<0.01
	Credit	-0.05	0.01	-4.47	<0.01
tau=0.5	Intercept	3.78	0.29	13.19	<0.01
	Lag of Growth	0.23	0.03	7.19	<0.01
	Lag of Debt	0.00	0.00	1.17	0.24
	Openness	0.00	0.00	1.48	0.14
	Gov. Effectiveness	0.55	0.22	2.53	0.01
	Credit	-0.03	0.01	-4.21	<0.01
tau=0.9	Intercept	6.28	0.67	9.31	<0.01
	Lag of Growth	0.10	0.03	3.48	<0.01
	Lag of Debt	**0.02**	0.01	2.55	0.01
	Openness	0.02	0.01	2.48	0.01
	Gov. Effectiveness	0.15	0.41	0.37	0.71
	Credit	-0.03	0.01	-3.59	<0.01
tau=0.95	Intercept	6.81	1.06	6.42	<0.01
	Lag of Growth	0.08	0.04	2.09	0.04
	Lag of Debt	**0.02**	0.01	1.90	0.06
	Openness	0.03	0.01	2.33	0.02
	Gov. Effectiveness	-0.18	0.46	-0.39	0.70
	Credit	-0.03	0.01	-4.14	<0.01
tau=0.99	Intercept	5.69	2.21	2.57	0.01
	Lag of Growth	0.05	0.10	0.46	0.65
	Lag of Debt	**0.08**	0.03	2.69	0.01
	Openness	0.09	0.03	3.16	<0.01
	Gov. Effectiveness	-0.42	1.33	-0.32	0.75
	Credit	-0.06	0.02	-2.71	0.01

Note: Panel B focuses on emerging market economies. The model specification is the same as in Panel A, with country fixed effects and contemporaneous variables (trade openness, government effectiveness, credit-to-GDP). Quantile regressions range from $\tau = 0.01$ to 0.99. The results highlight that debt has a negative effect at lower quantiles and a positive effect at higher quantiles, confirming the main findings for emerging markets in the previous section, while additional contemporaneous variables provide insights into the role of institutional quality and financial development.

For advanced economies, Panel C of the Table, reveals again a contrasting pattern compared to emerging markets. Debt does not exhibit a strong negative effect at lower quantiles; indeed, effects are mostly non-significant after controlling for the set of contemporaneous variables. Lagged growth tend to have weaker or non-significant effects across most quantiles signaling lower persistence of macro-shocks, and in general reflecting smoother growth dynamics in advanced economies.

Contemporaneous variables show that government effectiveness may be decisively positive for growth at the median and bellow quantiles, while it may assert a negative effect at higher quantiles. On its side, trade openness is generally positive at higher quantiles. Credit-to-GDP has modest negative effects across the distribution.

Overall, these results corroborate that debt plays a more nuanced role in advanced economies and emphasize the importance of institutional quality and financial conditions as determinants of growth-at-risk. Indeed, for this new set of results we can conclude that for advanced economies, the previously documented negative effects can be substantially offset by strong institutional quality.

Table 4. Results Panel Quantile with Fixed Effects and Structural Covariates

Panel C: Advanced Economies

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.05	Intercept	-5.29	1.70	-3.11	0.00
	Lag of Growth	-0.05	0.13	-0.36	0.72
	Lag of Debt	0.01	0.02	0.72	0.47
	Openness	0.00	0.01	-0.48	0.63
	Gov. Effectiveness	4.41	0.97	4.53	<0.01
	Credit	-0.05	0.02	-2.15	0.03
tau=0.1	Intercept	-3.41	1.66	-2.06	0.04
	Lag of Growth	0.08	0.13	0.63	0.53
	Lag of Debt	0.01	0.01	0.83	0.40
	Openness	0.00	0.01	-0.49	0.62
	Gov. Effectiveness	3.78	0.89	4.25	<0.01
	Credit	-0.03	0.01	-2.49	0.01
tau=0.5	Intercept	2.98	0.77	3.85	0.00
	Lag of Growth	0.08	0.08	1.01	0.31
	Lag of Debt	0.00	0.00	0.09	0.93
	Openness	0.01	0.00	2.02	0.04

	Gov. Effectiveness	0.96	0.32	2.98	<0.01
	Credit	-0.02	0.01	-3.52	<0.01
tau=0.9	Intercept	8.80	1.70	5.18	<0.01
	Lag of Growth	-0.09	0.10	-0.93	0.35
	Lag of Debt	0.00	0.01	-0.42	0.67
	Openness	0.02	0.00	4.00	<0.01
	Gov. Effectiveness	-1.17	0.56	-2.10	0.04
	Credit	-0.03	0.01	-2.45	0.01
tau=0.95	Intercept	10.62	2.09	5.08	<0.01
	Lag of Growth	-0.19	0.12	-1.58	0.11
	Lag of Debt	-0.01	0.01	-1.20	0.23
	Openness	0.02	0.01	3.08	<0.01
	Gov. Effectiveness	-1.80	0.60	-2.99	<0.01
	Credit	-0.02	0.01	-1.60	0.11

Note: Panel C reports the results for 40 advanced economies. Due to the larger number of explanatory variables and limited observations, the model is estimated only for quantiles between $\tau = 0.05$ and 0.95. The regression includes lagged growth, lagged debt, and contemporaneous variables (trade openness, government effectiveness, credit-to-GDP), with country fixed effects. The results indicate that debt is largely non-relevant as a determinant of future growth once we control for other determinants of growth at risk.

In Table 5, we present the results of our model incorporating fiscal consolidation, this time redefining the fiscal consolidation variable as a dummy that takes the value of one in any year in which the cyclically adjusted primary balance (CAPB) improves by at least 2% of GDP, or during a period of two consecutive years in which the CAPB improves by at least 1.5% of GDP in each year, and zero otherwise. This definition follows the conventional approach in the literature, originally proposed by Alesina and Ardagna (1998). More recent studies have adopted similar, though sometimes less stringent criteria, in order to expand sample coverage—for example, Ardanaz et al. (2021) and Valencia et al. (2025).

Results in Table 5, Panel A, are inconclusive. The inclusion of the new fiscal consolidation variable—available only for a relatively stringent subset of cases—confirms the positive role of fiscal consolidation at the 5th percentile of the growth distribution. However, in other cases, the effects of both fiscal and debt variables, although statistically significant, are economically negligible.

Table 5. Results Panel Quantile with Fixed Effects and Fiscal Consolidation Variable

Panel A: Full Sample

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.01	Intercept	-11.52	1.70	-6.77	<0.01
	Lag of Growth	0.50	0.11	4.40	0.00
	Lag of Debt	**0.01**	0.03	0.34	<0.01
	Lag of Fiscal Con.	5.07	2.99	1.69	0.09
	Lag Fiscal Con.*Lag Debt	-0.06	0.05	-1.09	0.27
tau=0.05	Intercept	-4.62	0.73	-6.30	<0.01
	Lag of Growth	0.44	0.09	4.89	<0.01
	Lag of Debt	0.00	0.01	0.24	0.81
	Lag of Fiscal Con.	**1.01**	1.14	0.89	<0.01
	Lag Fiscal Con.*Lag Debt	0.00	0.02	-0.09	0.93
tau=0.1	Intercept	-2.32	0.43	-5.44	<0.01
	Lag of Growth	0.37	0.06	6.71	<0.01
	Lag of Debt	0.01	0.00	1.02	0.31
	Lag of Fiscal Con.	**0.62**	0.98	0.64	0.52
	Lag Fiscal Con.*Lag Debt	0.00	0.01	-0.08	0.94
tau=0.5	Intercept	2.37	0.20	11.85	<0.01
	Lag of Growth	0.29	0.04	7.86	<0.01
	Lag of Debt	0.00	0.00	-0.49	0.62
	Lag of Fiscal Con.	**0.09**	0.39	0.23	0.82
	Lag Fiscal Con.*Lag Debt	**0.00**	0.01	-0.57	0.57
tau=0.9	Intercept	6.30	0.44	14.41	<0.01
	Lag of Growth	0.13	0.05	2.54	<0.01
	Lag of Debt	**0.00**	0.01	-0.68	0.50
	Lag of Fiscal Con.	0.04	0.68	0.06	0.96
	Lag Fiscal Con.*Lag Debt	**0.00**	0.01	0.38	0.70
tau=0.95	Intercept	7.55	0.48	15.80	<0.01
	Lag of Growth	0.14	0.07	2.05	0.04
	Lag of Debt	0.00	0.01	0.00	1.00
	Lag of Fiscal Con.	-0.08	0.54	-0.15	0.88
	Lag Fiscal Con.*Lag Debt	0.00	0.01	0.18	0.86
tau=0.99	Intercept	12.26	1.58	7.74	<0.01
	Lag of Growth	0.15	0.14	1.05	0.29
	Lag of Debt	0.00	0.02	-0.16	0.87
	Lag of Fiscal Con.	11.28	5.99	1.88	0.06
	Lag Fiscal Con.*Lag Debt	-0.04	0.03	-1.39	0.16

Note: Panel A presents panel quantile regression results with country fixed effects for the full sample of countries. The dependent variable is the annual GDP growth rate. The key explanatory variables are lagged growth, lagged

debt, lagged fiscal consolidation variable and the interaction terms of the latter two variables. Results are reported across multiple quantiles (τ = 0.05, 0.1, 0.5, 0.9, 0.95) to capture heterogeneous effects. Standard errors are constructed by bootstrap. The table illustrates how the effects of debt and fiscal consolidation variables vary across the growth distribution. The fiscal consolidation variable is a dummy that takes the value of one in any year in which the cyclically adjusted primary balance (CAPB) improves by at least 2% of GDP, or during a period of two consecutive years in which the CAPB improves by at least 1.5% of GDP in each year, and zero otherwise.

Panel B is more informative. Focusing on emerging and low-income developing countries, we find that both the debt-to-GDP ratio and the fiscal consolidation variable remain statistically significant. At the lowest quantile, an increase in the debt-to-GDP ratio has a negative impact on future left-tail growth outcomes, while fiscal consolidation continues to exert a positive effect, consistent with our main results. At the 5th percentile, the effect of debt remains significant. Notably, the positive effects observed at higher quantiles in emerging markets, while still present, are considerably smaller in economic magnitude.

Table 5. Results Panel Quantile with Fixed Effects and Fiscal Consolidation Variable

Panel B: Emerging Market Economies

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.01	Intercept	-10.49	2.29	-4.59	<0.01
	Lag of Growth	0.59	0.09	6.75	<0.01
	Lag of Debt	**-0.06**	0.04	-1.37	<0.01
	Lag of Fiscal Con.	**7.22**	2.88	2.50	0.01
	Lag Fiscal Con.*Lag Debt	-0.04	0.06	-0.65	0.51
tau=0.05	Intercept	-5.07	0.92	-5.54	<0.01
	Lag of Growth	0.51	0.06	8.25	<0.01
	Lag of Debt	**-0.01**	0.02	-0.56	0.58
	Lag of Fiscal Con.	2.38	1.85	1.28	0.20
	Lag Fiscal Con.*Lag Debt	-0.03	0.04	-0.65	0.52
tau=0.1	Intercept	-2.29	0.62	-3.68	<0.01
	Lag of Growth	0.39	0.07	5.80	<0.01
	Lag of Debt	0.00	0.01	0.22	0.83
	Lag of Fiscal Con.	0.66	1.40	0.47	0.64
	Lag Fiscal Con.*Lag Debt	0.00	0.02	0.04	0.97
tau=0.5	Intercept	2.79	0.26	10.54	<0.01
	Lag of Growth	0.27	0.06	4.62	<0.01
	Lag of Debt	0.00	0.00	-0.34	0.73
	Lag of Fiscal Con.	-0.06	0.55	-0.10	0.92
	Lag Fiscal Con.*Lag Debt	0.00	0.01	-0.46	0.65

tau=0.9	Intercept	6.39	0.54	11.87	<0.01
	Lag of Growth	0.15	0.09	1.58	<0.01
	Lag of Debt	**0.00**	0.01	0.36	0.72
	Lag of Fiscal Con.	0.44	0.83	0.53	0.60
	Lag Fiscal Con.*Lag Debt	0.00	0.01	0.03	0.98
tau=0.95	Intercept	7.82	0.63	12.34	<0.01
	Lag of Growth	0.14	0.11	1.22	0.22
	Lag of Debt	**0.00**	0.01	0.13	0.89
	Lag of Fiscal Con.	0.44	1.15	0.39	0.70
	Lag Fiscal Con.*Lag Debt	0.00	0.01	-0.15	0.88
tau=0.99	Intercept	12.86	4.74	2.72	<0.01
	Lag of Growth	0.14	0.29	0.49	0.62
	Lag of Debt	**0.01**	0.03	0.34	0.73
	Lag of Fiscal Con.	13.21	8.92	1.48	0.14
	Lag Fiscal Con.*Lag Debt	-0.07	0.06	-1.09	0.27

Note: Panel B focuses on emerging market economies. The model specification is the same as in Panel A. Quantile regressions range from $\tau = 0.01$ to 0.99. The fiscal consolidation variable is a dummy that takes the value of one in any year in which the cyclically adjusted primary balance (CAPB) improves by at least 2% of GDP, or during a period of two consecutive years in which the CAPB improves by at least 1.5% of GDP in each year, and zero otherwise.

In Panel C, which focuses on advanced economies, fiscal consolidation remains significant at the 5th and 10th percentiles, whereas the negative effects of debt documented at the upper end of the distribution in previous specifications disappear.

Overall, the inclusion of the traditional, more stringent definition of fiscal consolidation renders the aggregate results for the full sample of 192 countries largely inconclusive. Nonetheless, when the sample is partitioned by income group, the well-documented patterns discussed in Section 5.2 reemerge.

Table 5. Results Panel Quantile with Fixed Effects and Fiscal Consolidation Variable

Panel C: Advanced Economies

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.05	Intercept	-4.81	1.14	-4.23	<0.01
	Lag of Growth	0.42	0.17	2.52	0.01
	Lag of Debt	0.01	0.01	0.45	0.65
	Lag of Fiscal Con.	**0.53**	2.42	0.22	<0.01
	Lag Fiscal Con.*Lag Debt	-0.01	0.02	-0.26	0.79
tau=0.1	Intercept	-3.03	0.91	-3.34	<0.01
	Lag of Growth	0.42	0.13	3.20	0.00
	Lag of Debt	0.01	0.01	1.16	0.25
	Lag of Fiscal Con.	**0.84**	1.40	0.60	0.55
	Lag Fiscal Con.*Lag Debt	0.00	0.01	-0.26	0.80
tau=0.5	Intercept	1.89	0.30	6.33	<0.01
	Lag of Growth	0.27	0.06	4.30	<0.01
	Lag of Debt	0.00	0.00	-0.43	0.67
	Lag of Fiscal Con.	0.11	0.60	0.19	0.85
	Lag Fiscal Con.*Lag Debt	0.00	0.01	-0.45	0.65
tau=0.9	Intercept	5.68	0.61	9.25	<0.01
	Lag of Growth	0.06	0.07	0.79	0.43
	Lag of Debt	-0.01	0.01	-1.07	0.29
	Lag of Fiscal Con.	1.22	0.60	2.05	0.04
	Lag Fiscal Con.*Lag Debt	-0.01	0.01	-1.65	0.10
tau=0.95	Intercept	6.94	0.71	9.76	<0.01
	Lag of Growth	0.07	0.08	0.95	0.34
	Lag of Debt	-0.01	0.01	-0.69	0.49
	Lag of Fiscal Con.	0.02	1.05	0.02	0.99
	Lag Fiscal Con.*Lag Debt	-0.01	0.01	-0.75	0.45

Note: Panel C reports the results for 40 advanced economies. Due to the larger number of explanatory variables and limited observations, the model is estimated only for quantiles between $\tau = 0.05$ and 0.95. The fiscal consolidation variable is a dummy that takes the value of one in any year in which the cyclically adjusted primary balance (CAPB) improves by at least 2% of GDP, or during a period of two consecutive years in which the CAPB improves by at least 1.5% of GDP in each year, and zero otherwise.

Unfortunately, these measures are available for only a small subset of countries compared to our main sample. Adler et al. (2024) made their data available for 31 economies, of which 18 are advanced and 13 are emerging (all in Latin America). This substantially reduces our sample size and, in fact, reverses the main composition of our sample: whereas our primary analysis focused mainly on non-advanced economies (152 out of 192 countries), this exercise is now dominated

by advanced economies (18 out of 31). Consequently, the results in Table 6 are not fully comparable with those presented in previous tables.

Table 6. Results Panel Quantile with Fixed Effects and Fiscal Consolidation Variable Based on a Narrative Account

		Effect	*Std. Error*	*T- statistic*	*P-value*
tau=0.05	Intercept	-5.37	1.15	-4.68	<0.01
	Lag of Growth	0.58	0.16	3.50	<0.01
	Lag of Debt	0.01	0.02	0.40	0.69
	Lag of Fiscal Con.	**3.51**	1.28	2.75	0.01
	Lag Fiscal Con.*Lag Debt	-0.01	0.02	-0.77	0.44
tau=0.1	Intercept	-3.75	0.77	-4.84	<0.01
	Lag of Growth	0.53	0.11	4.69	<0.01
	Lag of Debt	**0.02**	0.01	2.42	0.02
	Lag of Fiscal Con.	**3.32**	0.80	4.14	<0.01
	Lag Fiscal Con.*Lag Debt	-0.02	0.01	-2.24	0.03
tau=0.5	Intercept	2.18	0.34	6.38	<0.01
	Lag of Growth	0.18	0.03	5.25	<0.01
	Lag of Debt	0.00	0.00	-0.06	0.95
	Lag of Fiscal Con.	-0.06	0.46	-0.13	0.90
	Lag Fiscal Con.*Lag Debt	0.00	0.01	-0.62	0.54
tau=0.9	Intercept	5.81	0.83	6.99	<0.01
	Lag of Growth	-0.02	0.05	-0.35	0.73
	Lag of Debt	0.00	0.01	0.11	0.91
	Lag of Fiscal Con.	-0.52	0.86	-0.60	0.55
	Lag Fiscal Con.*Lag Debt	-0.01	0.01	-0.95	0.34
tau=0.95	Intercept	7.12	0.93	7.67	<0.01
	Lag of Growth	-0.10	0.06	-1.70	0.09
	Lag of Debt	0.00	0.01	0.25	0.81
	Lag of Fiscal Con.	-0.41	1.22	-0.34	0.74
	Lag Fiscal Con.*Lag Debt	-0.02	0.02	-1.11	0.27

Note: The table presents panel quantile regression results with country fixed effects for the full sample of 31 countries. The dependent variable is the annual GDP growth rate. The key explanatory variables are lagged growth, lagged debt, lagged fiscal consolidation variable and the interaction terms of the latter two variables. Results are reported across multiple quantiles (τ = 0.05, 0.1, 0.5, 0.9, 0.95) to capture heterogeneous effects. Standard errors are constructed by bootstrap. The table illustrates how the effects of debt and fiscal consolidation variables vary across the growth distribution. The fiscal consolidation variable is a dummy that takes the value of one in any year in which the action-based indicator by Adler et al. (2024) detects a positive value (including both taxes and government expenditure), and zero otherwise.

Nevertheless, across our results, fiscal consolidation consistently improves growth prospects at the lower tail of the GDP growth distribution, even for advanced economies. As shown in the sole panel of Table 6, this pattern is once again observed. The role of debt, on the other hand, is more ambiguous. However, consistent with previous results for advanced economies, debt exhibits a small positive effect—consistent with a Keynesian perspective—at the 10th percentile of the growth distribution.

6. Conclusions

We show that the relationship between the public debt-to-GDP ratio (frequently used as a measure of debt and debt burden in the literature) and future economic growth is non-linear, depending on the conditional quantile of the growth distribution.

Our contribution brings two influential perspectives in literature together by examining how changes in public debt levels influence the full conditional distribution of future growth. To the best of our knowledge, this is the first study to extend the GaR framework using debt as the key predictive variable to a comprehensive global context, encompassing 152 emerging and low-income economies and 40 advanced economies. We are also the first to assess the predictive power of fiscal consolidations for expected growth outcomes, particularly during episodes of growth vulnerability.

This methodological extension allows us to uncover previously undocumented economic patterns. For instance, in non-advanced economies, debt accumulation during expansionary phases is often followed by stronger subsequent growth, helping to sustain the expansion. However, during vulnerable growth episodes—the focus of the traditional GaR literature—debt increases are associated with weaker future performance. In advanced economies, the evidence is less clear: in our baseline specification, debt accumulation is negatively linked to future growth during expansions and shows no significant relationship during recessions. However, in contrast to non-advanced economies, these effects largely vanish once we account for additional factors—such as credit size, institutional quality, and trade openness—previously identified in the literature as key determinants of Growth-at-Risk.

The role of fiscal consolidations is largely consistent with our baseline estimates and suggests that, during periods of growth vulnerability, fiscal consolidation can reduce future growth risks. This reflects a non-Keynesian, expansionary austerity-type effect, but unlike the original

literature, it operates primarily at the lowest quantiles of growth rather than on its expected value, which is novel to the literature. It is worth noting that our findings do not necessarily contradict those of Guajardo et al. (2014) or Jordà and Taylor (2016), as our results unlike theirs are largely, if not entirely, driven by non-advanced economies.

This outcome is not unexpected, as non-Keynesian mechanisms are more likely to operate in emerging and low-income markets. Indeed, the standard prediction of a positive relationship between fiscal expansion and economic activity can, under certain conditions, be reversed—as shown, for instance, by Blanchard (1990)—when a modest tax increase or expenditure reduction today may reduce the need for a larger and more disruptive fiscal adjustment in the future. By strengthening the confidence of households and investors, fiscal consolidation can, even in the short term, stimulate consumption and investment. These mechanisms are particularly relevant for emerging and low-income economies, which have repeatedly experienced episodes of confidence loss and asset rebalancing triggered by shifts in global risk appetite

Although our analysis is situated within the Growth-at-Risk framework, which emphasizes predictive rather than causal relationships, we contrast our results with models incorporating structural determinants previously identified as relevant for growth-at-risk, such as institutional quality, trade openness, and financial sector indicators.

Our results carry important policy implications specially for emerging market economies. We find that while debt can support growth during favorable periods, it is associated with adverse outcomes during vulnerable growth episodes. This suggests that simply increasing debt is unlikely to enhance growth prospects and may, in fact, be counterproductive in times of vulnerable growth, highlighting the critical importance of the design and timing of fiscal consolidations.

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Appendix
Table A1: List of Countries in the Study Sample

Advanced Economies			*Emerging Market Economies*								
1	AND	Andorra	1	AFG	Afghanistan	41	DOM	Dominican Republic	81	MHL	Marshall Islands	121	SSD	South Sudn
2	AUS	Australia	2	ALB	Albania	42	ECU	Ecuador	82	MRT	Mauritania	122	LKA	Sri Lanka
3	AUT	Austria	3	DZA	Algeria	43	EGY	Egypt	83	MUS	Mauritius	123	KNA	St. Kitts Nevis
4	BEL	Belgium	4	AGO	Angola	44	SLV	El Salvador	84	MEX	Mexico	124	LCA	St. Lucia
5	CAN	Canada	5	ATG	Antigua and Barbuda	45	GNQ	Equatorial Guinea	85	FSM	Micronesia	125	VCT	St. Vicent & Gren.
6	CYP	Cyprus	6	ARG	Argentina	46	ERI	Eritrea	86	MDA	Moldova	126	SDN	Sudan
7	CZE	Czechia	7	ARM	Armenia	47	SWZ	Eswatini	87	MNG	Mongolia	127	SUR	Suriname
8	DNK	Denmark	8	ABW	Aruba	48	ETH	Ethiopia	88	MNE	Montenegro	128	SYR	Syria
9	EST	Estonia	9	AZE	Azerbaijan	49	FJI	Fiji	89	MAR	Morocco	129	STP	São Tomé Príncipe
10	FIN	Finland	10	BHR	Bahrain	50	GAB	Gabon	90	MOZ	Mozambique	130	TJK	Tajikistan
11	FRA	France	11	BGD	Bangladesh	51	GEO	Georgia	91	MMR	Myanmar	131	TZA	Tanzania
12	DEU	Germany	12	BRB	Barbados	52	GHA	Ghana	92	NAM	Namibia	132	THA	Thailand
13	GRC	Greece	13	BLR	Belarus	53	GRD	Grenada	93	NRU	Nauru	133	BHS	The Bahamas
14	HKG	Hong Kong	14	BLZ	Belize	54	GTM	Guatemala	94	NPL	Nepal	134	GMB	The Gambia
15	ISL	Iceland	15	BEN	Benin	55	GIN	Guinea	95	NIC	Nicaragua	135	TGO	Togo
16	IRL	Ireland	16	BTN	Bhutan	56	GNB	Guinea-Bissau	96	NER	Niger	136	TON	Tonga
17	ISR	Israel	17	BOL	Bolivia	57	GUY	Guyana	97	NGA	Nigeria	137	TTO	Trinidad and Tobago
18	ITA	Italy	18	BIH	Bosnia and Herzegovina	58	HTI	Haiti	98	MKD	North Macedonia	138	TUN	Tunisia
19	JPN	Japan	19	BWA	Botswana	59	HND	Honduras	99	OMN	Oman	139	TKM	Turkmenistan
20	KOR	Korea	20	BRA	Brazil	60	HUN	Hungary	100	PAK	Pakistan	140	TUV	Tuvalu
21	LVA	Latvia	21	BRN	Brunei	61	IND	India	101	PLW	Palau	141	TUR	Türkiye
22	LTU	Lithuania	22	BGR	Bulgaria	62	IDN	Indonesia	102	PAN	Panama	142	UGA	Uganda
23	LUX	Luxembourg	23	BFA	Burkina Faso	63	IRN	Iran	103	PNG	Papua New Guinea	143	UKR	Ukraine
24	MAC	Macao	24	BDI	Burundi	64	IRQ	Iraq	104	PRY	Paraguay	144	ARE	United Arab Emirates
25	MLT	Malta	25	CPV	Cabo Verde	65	JAM	Jamaica	105	PER	Peru	145	URY	Uruguay
26	NLD	Netherlands	26	KHM	Cambodia	66	JOR	Jordan	106	PHL	Philippines	146	UZB	Uzbekistan
27	NZL	New Zealand	27	CMR	Cameroon	67	KAZ	Kazakhstan	107	POL	Poland	147	VUT	Vanuatu
28	NOR	Norway	28	CAF	Central African Rep.	68	KEN	Kenya	108	QAT	Qatar	148	VEN	Venezuela
29	PRT	Portugal	29	TCD	Chad	69	KIR	Kiribati	109	COG	Republic of Congo	149	VNM	Vietnam
30	PRI	Puerto Rico	30	CHL	Chile	70	KWT	Kuwait	110	ROU	Romania	150	YEM	Yemen
31	SMR	San Marino	31	CHN	China	71	KGZ	Kyrgyz Rep.	111	RUS	Russia	151	ZMB	Zambia
32	SGP	Singapore	32	COL	Colombia	72	LAO	Lao P.D.R.	112	RWA	Rwanda	152	ZWE	Zimbabwe
33	SVK	Slovak Rep.	33	COM	Comoros	73	LBN	Lebanon	113	WSM	Samoa			
34	SVN	Slovenia	34	COD	Congo Rep	74	LSO	Lesotho	114	SAU	Saudi Arabia			
35	ESP	Spain	35	CRI	Costa Rica	75	LBR	Liberia	115	SEN	Senegal			
36	SWE	Sweden	36	HRV	Croatia	76	MDG	Madagascar	116	SRB	Serbia			
37	CHE	Switzerland	37	CIV	Côte d'Ivoire	77	MWI	Malawi	117	SYC	Seychelles			
38	TWN	Taiwan	38	TLS	Timor-Leste	78	MYS	Malaysia	118	SLE	Sierra Leone			
39	GBR	United Kingdom	39	DJI	Djibouti	79	MDV	Maldives	119	SLB	Solomon Islands			
40	USA	United States	40	DMA	Dominica	80	MLI	Mali	120	ZAF	South Africa			

Note: The table shows the country (territory) names in our sample, 152 emerging market economies and 40 advanced economies, for a total of 192 countries.