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Post COVID-19 exit strategies and emerging markets economic challenges

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Abstract

We study emerging markets' 1980s lost growth decade, triggered by the massive reversal of the snowball effect in the US during 1974–1984, finding that higher flow costs of servicing debt overhang explain the dramatic decline in growth rates of exposed emerging markets. We also show how lowering the US cost of servicing its public debt has been associated with higher US, Japan, and Western Europe real output growth rates during the post WWII recovery decades, 1946–1956, and validate that fiscal adjustments of large countries have strong growth and volatility spillovers effects on exposed emerging markets and developing countries.

KEYWORDS

COVID-19, financial crisis, globalization

JEL CLASSIFICATION

F3, F6, F41

1 | INTRODUCTION

The COVID-19 pandemic has wreaked havoc on the global economy in 2020. To contain the spread of the virus, many countries shut down their economies by halting the movement of people and goods in the spring of 2020, leading about one-third of the world's population to experience constrained life conditions due to these lockdowns. Consequently, the world economy contracted significantly. To calm financial markets and avoid a possible free fall into a Great Depression, many countries, especially advanced economies (AEs), mobilized policy resources. According

to the Manhattan Institute, the US alone will run a budget deficit of $4.2 trillion, or 19% of its GDP—the largest share since the deficit peak during WWII. That would push the US national debt held by the public to $41 trillion, or 128% of GDP, by 2030. This level of the national debt would exceed the level that occurred in 1946.

A key global challenge is finding an effective economic exit strategy into the post-COVID era. The road the US will take will have overarching repercussions on the global economy, given the size and the pivotal role of the US dollar as the anchor of the global financial system. To gain more insight on the road ahead, one can compare two divergent US post-COVID economic strategies. The first is just "*kicking the can down the road*"—that is, the US government could delay implementing needed macroeconomic adjustments and gamble for a resurrection of the economy while continuing to run lax monetary and expansionary fiscal policies. This choice may bring about short-term buoyancy to the US economy but will more likely come with growing exposure to the risk of a future global crisis, possibly worse than the 2008–2011 crisis. Alternatively, the administration could adopt a two-pronged policy of reallocating the fiscal efforts first, while aiming at reaching a primary surplus over time. Specifically, it could retrench from expenditures oriented toward COVID-related challenges, and move toward expenses with a high social payoff (upgrading K-12 education, investing in medical infrastructures, etc.). With a lag, the restructured fiscal policy, together with a rise in tax collection, may reduce primary budget deficits, aiming to reach surpluses.

In this article, we analyze these divergent policies in terms of their implications on the gap between the interest rate paid to service government debt, denoted by r, and the growth rate of the economy, denoted by g.[1] This gap, $r - g$, also known as the snowball effect, is the exponential growth of the public debt/GDP in countries with zero primary deficit. It is tempting to presume that the new normal for the future comprises negative snowball effects associated with secular stagnation, as in Summers (2013). Yet, there are several concerns to keep in mind. First, Wyplosz (2019) points out that negative snowball effects are not the rule; even in the US, $r - g < 0$ happened in 56% of the years. Furthermore, the past performance of the US as the safe anchor of the global financial system does not guarantee maintaining the "exorbitant privilege" status into the future (Carney, 2019; Chițu et al., 2014; Eichengreen, 2011; Gourinchas et al., 2010). The two-pronged US post-COVID exit strategy discussed in our article may mitigate the growing discontent with the dominance of the US dollar. Greater attention on the part of the US to scaling down its public debt overhang over time will mitigate the present centrifugal forces working toward multipolar global currencies discussed by Carney (2019). An additional concern is that the record of predicting future changes of the snowball effects is mixed, at best. Presuming that the new normal is a negative snowball effect may increase the risk of a deeper future crisis over time, as was the case in the late 1990s and early 2000s when the presumption of an enduring "Great Moderation" permeated policymaking (see also Rogoff [2016]).

The main contribution of this article is analyzing periods when fiscal adjustments of large countries had strong spillovers in emerging markets and developing countries (EMDC). Size matters, and one expects that the fiscal decisions of the largest blocks, the US, EU, and China, will generate large spillovers affecting EMDC. These challenges are reflected in IMF's Chief Economist Gita Gopinath, overviewing Managing Divergent Recoveries (April 2021): "Multi-speed recoveries could pose financial risks if interest rates in the United States rise further in unexpected ways. This could cause inflated asset valuations to unwind in a disorderly manner, financial conditions to tighten sharply, and recovery prospects to deteriorate, especially for some highly leveraged emerging markets and developing economies. Policymakers will need to

continue supporting their economies while dealing with more limited policy space and higher debt levels than prior to the pandemic."

To gain further insight, we examine in this article the interest-rate-growth differentials in the post-WWII period. In the period of 1946–1956, the post-WWII US fiscal policy facilitated global growth where the US, Western European countries, and Japan successfully grew while repressing the interest rate. Their snowball effect, $r - g$, was often negative during that period. This helped to load-off the public debt overhang associated with the war and reconstruction efforts. In contrast, during 1974–1984, the snowball effect became unsustainably high for many emerging market economies (EMEs), triggering a series of financial crises.[2] In Section 2, we overview development of debt sustainability, and in Section 3, we investigate whether and to what extent the cost of servicing the public debt affected real output growth. The flow cost of servicing debt is estimated by the snowball effect times the public debt as a share of GDP. A higher flow cost of servicing the debt may lead investors to question debt sustainability, raising the interest rate, reducing the growth rate, and further increasing the snowball effect. This negative feedback may induce costly market corrections, financial instability, and crisis. The emerging markets' lost growth decade during the 1980s, and the euro area sovereign debt crisis affecting mostly the Southern euro area states illustrate these dynamics vividly. Section 4 concludes with an overview of the US two-pronged economic exit strategy from the WWII debt overhang.

2 | DEVELOPMENT OF DEBT SUSTAINABILITY AND THE COST OF SERVICING DEBT

The public debt accumulation over time can be approximated by[3]: $B_{t+1} - B_t = (r_t - g_t)B_t + D_t$ where B_t is the public debt at the end of period t, D_t is the period's primary budget deficit, both as shares of GDP, and r_t and g_t are the interest rate cost of public debt and the growth rate of the GDP, respectively. From this equation, it follows that the interest-rate-growth differential, $r_t - g_t$, (*aka the snowball effect*) *times the public debt/GDP plus the primary deficit/GDP* determine the public debt accumulation path.[4] Castro et al. (2015) outline a detailed theoretical setting, showing that the snowball effects are amplified with initial debt, and by feeding themselves into contemporaneous debt. They derive conditions under which fiscal adjustments may increase the public debt-to-GDP ratio in the short run, even for consolidations carried out in normal times in economies characterized by moderate indebtedness levels. In the medium run credible fiscal adjustments entail a decline in the public debt ratio, though at potentially large output losses when carried out under unfavorable budgetary and economic conditions. Eichengreen et al. (2021) provides a detailed analysis of the public debt and fiscal dynamics in the past two centuries. Chapters 7 and 9 overview and analyze successful debt consolidations associated with adjustments aiming at reaching spells of primary surpluses at times of modest inflation and renewed growth during the 19th and the 20th century by UK, US, France, and several other countries. These examples illustrate the feasibility of such trajectory, though reaching these goals require political perseverance and will, benefiting from policy coordination between Treasury and the Monetary Authorities. The purpose of our article is to take stock of the patterns of snowballs effects and macro policies post WWII of the US and the Emerging Markets. This allows us to outline the implications of possible exit strategies from its public debt overhang on emerging markets' and global stability.

We focus first on the interest-rate-growth differential. The simple correlation between $r_t - g_t$ and $B_{t+1} - B_t$ is found to be −0.060 for our full sample that is composed of mainly traditional

TABLE 1 Proportion of deficit ($B_{t+1} - B_t$) changes depending on the sign of $r - g$

(a) Full sample **Corr $(B_{t+1} - B_t, r - g) = -0.060$**		
	$r - g > 0$	$r - g < 0$
$B_{t+1} - B_t > 0$	0.536	0.401
$B_{t+1} - B_t < 0$	0.464	0.599
(b) AEs **Corr $(B_{t+1} - B_t, r - g) = 0.323$**		
	$r - g > 0$	$r - g < 0$
$B_{t+1} - B_t > 0$	0.587	0.361
$B_{t+1} - B_t < 0$	0.413	0.639
(c) EMEs and developing **Corr $(B_{t+1} - B_t, r - g) = -0.060$**		
	$r - g > 0$	$r - g < 0$
$B_{t+1} - B_t > 0$	0.501	0.487
$B_{t+1} - B_t < 0$	0.499	0.513

OECD economies, and Latin American and Asian EMEs during 1946–2019. Table 1 shows the proportion of changes in public debt/GDP (= the first difference of B) depending on the sing of $r - g$. When the snowball is positive, it is more likely for the debt/GDP to rise (53.6% of the time). When $r - g < 0$, the debt would more likely decrease. This characterization is more distinct for the subsample of AEs compared with that of the group of developing and EMEs. This simple exercise suggests that the interest-rate-growth differential, $r - g$, can play an important role in affecting the path of debt accumulation. When $r - g < 0$, the debt would be more sustainable whereas $r - g > 0$ may lead the country of concern to experience an exponential rise in public debt.

Figure 1 the post-WWII development of the interest-rate-growth differentials ($r - g$) for our sample, composed of 23 traditional OECD countries and 34 EMEs. The data availability for the sample economies is presented in the Appendix.[5] For the interest rate, we use the 10-year government bond yields for the countries for which such data are available. The long-term interest rate data is limited in the case of EMEs, especially those in Latin America and East Asia. Hence, to maximize the country coverage, we also use the lending rate.[6] We measure potential output growth (g) with the growth rate of potential nominal GDP in US dollars for which we use nominal GDP that is smoothed by applying the HP-filtering method.[7]

Figure 1 is a dual scale chart, shows that the median interest-rate-growth differential, $r - g$, is mostly low and in the negative territory during the 1940s and 1950s. Thereby, the US, Japan, and Western European countries benefited from low costs of servicing their public debt during the post-WWII recovery decades. The snowball differential continues to be in the negative territory through the 1970s. In the early 1980s, the differential rises up rapidly to the positive territory and mostly remains there until 2000.

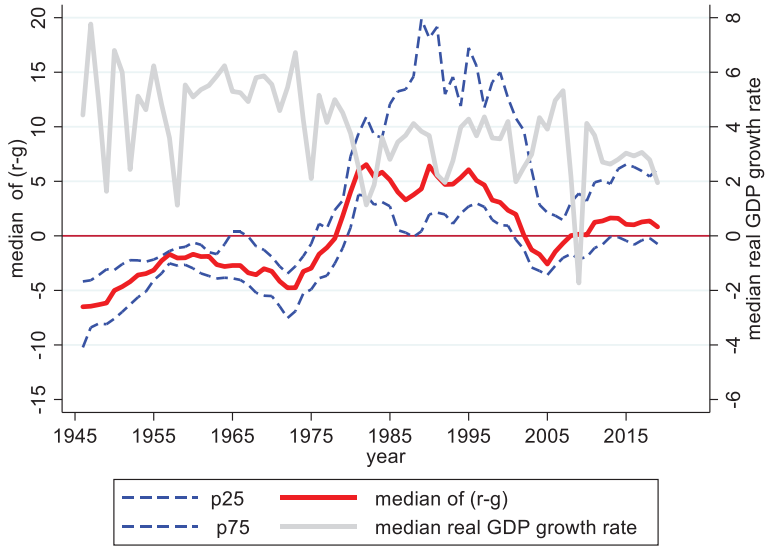

FIGURE 1 The interest-rate-growth differential (percentage points). The figure illustrates the post-WWII development of the interest-rate-growth differentials ($r - g$) for the sample of 23 advanced economies and 34 emerging market economies. *Source*: Author compilation using the IMF-IFS, OECD's database and the long-term historical data from the Clio Infra project https://clio-infra.eu/index.html#about [Colour figure can be viewed at wileyonlinelibrary.com]

The 75th percentile (dotted blue) line hovers at high levels in the 1980s and 1990s, indicating that the top 25% of countries in the interest-rate-growth differentials faced very high costs of servicing their public debt. These countries include mostly Latin American states, experiencing debt crises and hyperinflation spells during the 1980s. In the mid-2000s, the differential drops toward negative figures, but rises up again to the positive territory in the 2010s.

The gray solid in Figure 1 is the median growth rate of real GDP (in local currency), measured by the right scale. A casual observation is that there is a negative correlation between real output growth and the interest-rate-growth differential. The simple correlation between the median of the real GDP growth rates and that of the interest-rate-growth differential is −49.5%. When an economy experiences higher real output growth, its debt-servicing cost tends to decrease, which is not surprising because $r - g$ includes output growth.

Next, we investigate the variation patterns between the interest rate (r) and the snowball effect, $r - g$. Specifically, we regress the interest-rate-growth differentials ($r - g$), on the interest rate (r): $r\_g_{it} = \alpha + \beta r_{it} + u_{it}$ where r_g_{it} is the interest-rate-growth differential and r_{it} is the nominal interest rate.

Figure 2 reports the estimated β coefficients for the full sample, the subsamples of AEs, EMEs, and non-EME developing countries. Expecting the estimated coefficient to vary over time, we run the regressions for the following subsample periods:

- 1946–1969—This is the Bretton Woods (BWs) period where most countries imposed capital controls and fixed their currency to the US dollar. Regulating domestic financial markets was prevalent. Tight capital controls and domestic financial regulations induced financial repression, inducing lower real interest rates. These policies and moderate inflation reduced

the debt overhang of AEs riddled during the post-WWII reconstruction effort (see Reinhart and Sbrancia [2015] for detailed analysis). Even when the interest rate went up, the net cost of servicing debt frequently rose less proportionally due to favorable environment for output growth.

- 1970–1979—The BWs system collapsed in the beginning of this decade, leading many AEs to pursue exchange rate flexibility. Developing countries continued to peg their currencies to hard currencies, namely, the US dollar. Some EMEs, especially those in Latin America, implemented partial financial liberalization; and their governments issued sovereign bonds in international financial markets at times when the saving glut associated with elevated petro-dollar revenue reduced the interest rate. These economies experienced influx of capital and investment boom, co-funded by higher public debt, most of which was issued in US dollar.
- 1980–1989—After the US greatly tightened its monetary policy to rein the rising inflation during the late 1970s, Latin American economies and South Korea experienced sudden stop and debt crises. Consequently, several Latin American economies experienced hyperinflation, a rapid rise in the interest rates, and deep recessions. In these circumstances, one expects rising correlations between the interest rate and the flow cost of servicing sovereign debt.
- 1990–2009—In the early 1990s, EMEs, including Asian ones, liberalized financial markets, mostly creating offshore markets allowing the private sector to have access to foreign capital, and experienced investment and output booms. The resultant higher growth was halted by the Mexican sudden stop Crisis (1994–1995), the Asian financial crisis (1997–1998), followed by the crises in Brazil, Russia, Turkey, and Argentina. Despite these crises, EMEs continued to increase their financial openness. AEs enjoyed lower inflation, and lower perceived risks associated with "Great moderation." The rapidly declining cost of risk, along with financial deregulation and laxer leverage policies led the US and growing share of European economies to experience the housing bubbles in the mid-2000s. The US housing bubble busted in 2007–2008, and the Global Financial Crisis (GFC) of 2008–2010 broke out.
- 2010–2019—In response to the GFC and the Eurozone 2010–2012 crisis, AEs implemented expansionary monetary policy. The US policy interest rate dropped to zero, and three rounds of quantitative easing (QE) reduced the shadow policy interest rates below zero (Wu & Xia, 2016). With a lag, the euro area and Japan have implemented their own sizable QE polices, inducing negative interest rates on growing share of their sovereign debt. With the rate of returns falling among the AEs, investors searched for higher yields, resulting with massive capital inflows to EMEs. Many EMEs allowed their currency values to fluctuate and let capital influx feed currency appreciation. Currency appreciation and the low interest rate in the advanced world made it much easier for EMEs to borrow capital from overseas in the hard currency. These EMEs became highly indebted. In these circumstances, the lower and more stable interest rate induces lower correlations between the interest rate and the flow cost of servicing sovereign debt. EMEs in general took advantage of the declining severing spreads, and increased significantly their external borrowing.

Issuing debt in foreign currencies can make a country more vulnerable to external shocks due to growing currency mismatch. This growing exposure to financial instability reflect the

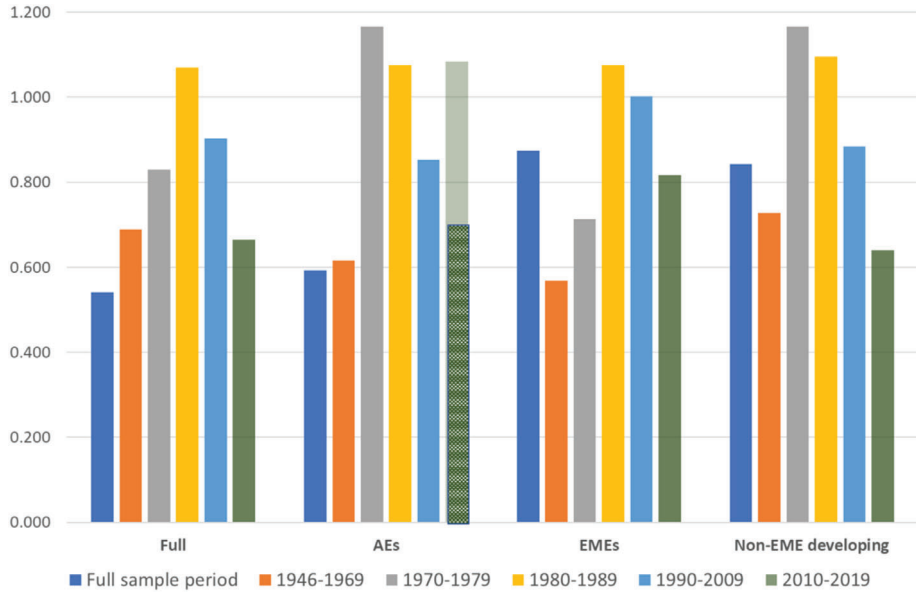

FIGURE 2 Estimated coefficients of the interest rate (r) in the regression for the interest-rate-growth differential ($r - g$). The figure illustrates the estimated β coefficients for for different sample groups when the interest-rate-growth differentials ($r - g$) is regressed on the interest rate (r). AE stands for advanced economies; EME for emerging market economies; and non-EME for developing economies that are not categorized as EMEs. For the definitions of the country groups, refer to endnote 3. *Source*: Author compilation [Colour figure can be viewed at wileyonlinelibrary.com]

"original sin" syndrome (Eichengreen et al., 2002; Hausmann & Panizza, 2003, 2010; Ize & Levy-Yeyati, 2003). Remarkably, the search for yield by OECD savers during the 2010s increased the demand for local currency bonds issued by investible EMEs, contributing to the partial redemption of the "original sin." These changing regimes are traced by the inverted U-shape estimated β coefficients reported in Figure 2. Accordingly, the interest rate and the interest-rate-growth differential are positively correlated in both the full sample and the subsamples of different country groups. The interest-rate-growth differentials are least responsive to the interest rate during the 1946–1969 BWs period for AEs and EMEs. The responsiveness rises and peaks in 1970–1979 for AEs and non-EME developing countries. EMEs experience the peak of the positive correlation in the 1980s, the period of the Latin American debt crisis. The magnitude of the estimated β declines toward the end of the sample period among all the country groups.[8] However, even in the last two subsample periods, the magnitude of remains mostly larger for EMEs and developing countries.

Figure 3 illustrates the size of gross public debt as a share of GDP for our sample since 1945. The dotted line reports the full sample, the red solid line traces the AEs sub-sample, and the blue solid line plots EMEs and developing countries sub-sample.[9] Notably, countries reduced the debt-GDP ratio significantly after the end of WWII. After the mid-1970s, both AEs and EMEs increase their debt ratios gradually, at rates greater for AEs than for Developing and EMEs. After the GFC of 2008, the debt-GDP ratio further goes up for AEs, reflecting the bailouts and the fiscal policies associated with the GFC and the Eurozone crisis. The ongoing COVID-crisis will keep contributing to a bigger rise in the debt-GDP ratios of both groups, probably pushing the debt overhang of AEs well above levels reached at the end of WWII.

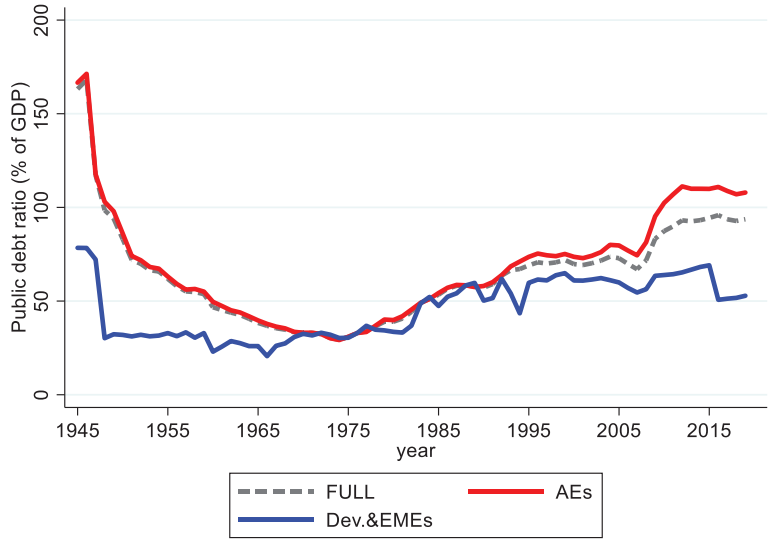

FIGURE 3 Gross public debt as % of GDP. The size of gross public debt as a share of GDP since 1945, calculated by dividing the aggregation of gross debt values of the sample countries by the aggregation of nominal GDP in US dollars. The dotted line reports the full sample, the red solid line traces the AEs sub-sample, and the blue solid line plots EMEs and developing countries sub-sample. *Source*: Author compilation using the data from the IMF-IFS [Colour figure can be viewed at wileyonlinelibrary.com]

Figure 4 illustrates the gross and external public debt for our sample of EMEs.[10] The external debt/GDP is high through the mid-1980s. Since 2000, the external debt/GDP has been dwindling. Notably, the difference between the solid blue line and the dotted red line has been moderately increasing.

3 | ESTIMATING THE IMPACT OF THE COST OF SERVICING DEBT ON OUTPUT GROWTH

This section explores whether and to what extent changes in the debt burden would affect output growth. We first run the following regression:

$$y_{it}^{\text{Local}} = \alpha + \sum_{k=1}^{3} \beta_k \Delta \left(r_{i,t-k} - g_{i,t-k}^{\text{USD}} \right) \left(\text{GrossDebt}/Y \right)_{i,t-k}^{\text{USD}} + X_{i,t}' \Gamma + \varepsilon_{it}. \quad (1)$$

y_{it}^{Local} is the growth rate of real GDP per capita in local currency. The snowball effect, $\left(r_{i,t-k} - g_{i,t-k}^{\text{USD}} \right)$, is the differential between the interest rate for the sovereign government of country i (r_t) and the growth rate of potential output. The potential output is estimated using HP-filtered nominal GDP series in the US dollar (g_{it}^{USD}). The first-difference of the interest-rate-growth differential $\left(\text{i.e. } \Delta \left(r_{it} - g_{it}^{\text{USD}} \right) \right)$ is multiplied by the gross domestic debt (normalized by nominal GDP in the US dollar), $\left(\text{Debt}/Y \right)_{it}^{\text{USD}}$. The product of the changing snowball effect and the debt GDP ratio is lagged up to the third order, that is, $\Delta \left(r_{i,t-k} - g_{i,t-k}^{\text{USD}} \right) \left(\text{GrossDebt}/Y \right)_{i,t-k}^{\text{USD}}$ where $1 \leq k \leq 3$.[11] X is a vector of other factors that may affect per capita output growth, including relative income to the

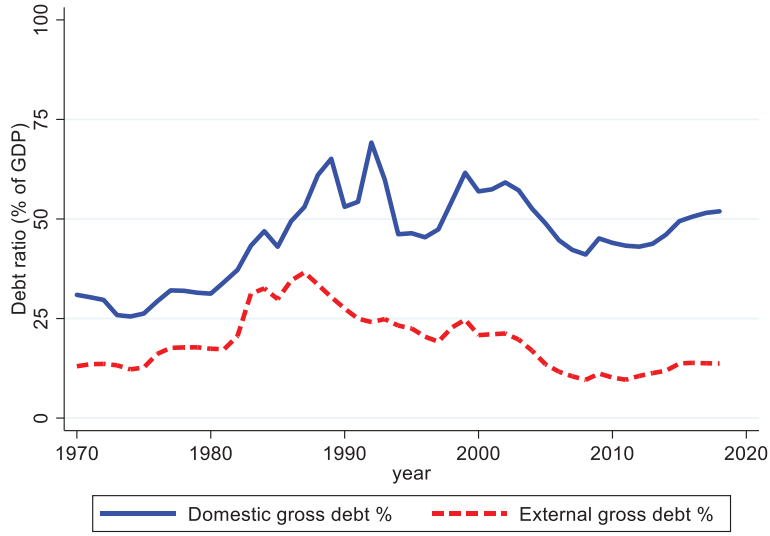

FIGURE 4 Gross and external public debt for EMEs (as a share of GDP). The figure illustrates the gross and external public debt for the sample of EMEs. *Source*: Author compilation using the data from the IMF-IFS and the International Debt Statistics database [Colour figure can be viewed at wileyonlinelibrary.com]

US in PPP. We lag this variable by 1 year to avoid bidirectional causality. Following Rodrik (1999), we also examine the impact of institutional factors on economic growth.

While the above estimation looks into the impact of the change in the cost of servicing gross public debt on real per capita output growth, we also investigate how changes in the cost of servicing the domestic and external debt may affect output growth. For that, we estimate the following model:

$$y_{it}^{\text{Local}} = \alpha + \sum_{k=1}^{3} \beta_k^{\text{Local}} \Delta \left(r_{i,t-k}^{\text{Local}} - g_{i,t-k}^{\text{Local}} \right) \left({}^{\text{Debt}}/_{Y} \right)_{i,t-k}^{\text{Local}} + \sum_{k=1}^{3} \beta_k^{\text{HC}} \Delta \left(r_{i,t-k}^{\text{HC}} - g_{i,t-k}^{\text{HC}} \right) \left({}^{\text{Debt}}/_{Y} \right)_{i,t-k}^{\text{HC}} + X_{i,t}' \Gamma + \varepsilon_{it}. \quad (2)$$

r_{it}^{Local} represents government's cost of borrowing from the domestic financial market; g_{it}^{Local} is the growth rate of potential nominal GDP in local currency, for which we use HP-filtered nominal GDP series. The first-difference of the interest-rate-growth differential $\left(\text{i.e. } \Delta \left(r_{it}^{\text{Local}} - g_{it}^{\text{Local}} \right)\right)$ is multiplied by the gross domestic debt (normalized by nominal GDP in local currency), $\left({}^{\text{Debt}}/_{Y} \right)_{it}^{\text{Local}}$, and the product is lagged up to the third order.[12] Country i's central government could also borrow from the international market in hard currencies with the cost of borrowing, r_{it}^{HC}, net of the growth rate of potential nominal GDP denominated in a group of hard currencies (g_{it}^{HC}). For r_{it}^{HC}, we use the "average interest on new external debt commitments for the official sector (%)" from the International Debt Statistics database. We measure hard-currency-denominated potential GDP with HP-filtered nominal GDP in US dollars.[13] The interest-rate-growth differential ($r_{it}^{\text{HC}} - g_{it}^{\text{HC}}$) is again first-differenced and multiplied by external debt denominated in US dollars $\left({}^{\text{Debt}}/_{Y} \right)_{it}^{\text{HC}}$.[14] Strictly speaking, for $\left({}^{\text{Debt}}/_{Y} \right)_{it}^{\text{HC}}$, we should use external debt of the public

sector denominated in a basket of hard currencies. However, most of our sample countries issue international debt in the US dollar. Thereby, the use of nominal GDP in US dollar to normalize the external debt is appropriate. The term $\Delta\left(r_{it}^{HC}-g_{it}^{HC}\right)\left(\text{Debt}/Y\right)_{it}^{HC}$ has the same lag structure as the domestic counterpart.[15]

For the first estimation model, Equation (1), we use the full sample of 57 countries, including both AEs and EMEs, covering 1961 through 2019. Due to limited availability of external debt series, estimating Equation (2) covers 35 EMEs in the period from 1970 through 2019. Some of the countries in this sample experienced hyperinflation spells, resulting with spells of extreme values for changes in the cost of servicing their debts. We therefore remove the observations of Δ(Cost of gross debt$_{t-k}$), Δ(Cost of domestic debt$_{t-k}$), or Δ(Cost of external debt$_{t-k}$) where there are notable large outliers.

Column (1) of Table 2 shows that higher cost of servicing gross public debt dampens the per capita real output growth. The impact is found in all the three lagged variables, thereby having persistent impacts on economic growth. More developed economies (in terms of the relative level of per capita income to the US) tend to grow at slower rates. Given that we deal with a sample of diverse countries, we add country-fixed effects in column (2). The results are intact, except of magnifying the absolute value of the relative income variable.

To put the results in perspective, we standardize the coefficients of the explanatory variables of column (1). The coefficients in column (3) show by how many standard deviations the per capita real output growth rate moves when one of the explanatory variables increases by one standard deviation, ceteris paribus.[16] The relative income variable has the largest significant and negative impact on per capita output growth. Among the variables dealing with the change in the cost of servicing gross public debt, the impact of the year $(t-1)$ is the largest, followed by that of $t-3$ and that of $t-2$. Next, we add a dummy for East Asian countries, finding consistently positive estimates for the dummy, which confirms that Asian specific factors have contributed to the region's higher output growth.[17]

To gain insight about the impact of governance, we include LEGAL as a measure of legal/institutional development—the first principal component of law and order (LAO), bureaucratic quality (BQ), and anti-corruption measures (CORRUPT).[18] Legal and institutional factors have a positive impact on economic growth. Among the three factors represented by LEGAL, the level of bureaucratic quality and the retaining of law and order are important positive contributors to economic growth. Countries with more stable governments tend to experience higher economic growth, while the *lack* of military involvement in policy decision making does not matter. Notably, governments' democratic accountability contributes negatively to economic growth.[19]

The estimation so far includes both AEs and EMEs. Developing and EMEs have been more reliant on external debt and hard currencies debt, whereas AEs may rely more on their deeper domestic markets and domestic currency debt. Therefore, we also estimate the subsamples of AEs and EMEs, reporting the results in Tables 3 and 4, respectively. Overall, the estimation results are similar between the two groups, with several subtle differences. For the AEs, all the three lagged variables matter whereas the second lag does not matter for the EMEs. All the institutional variables, except for the military in power and democratic accountability, have positive impacts on real output growth for AEs. For both AE and EME subsamples, now, all of anti-corruption measures, bureaucratic quality, and law and order positively contribute to output growth. While having stable government positively contributes to economic growth among AEs, it does not matter for EMEs. Neither the lack of military in power nor democratic accountability has any impact on output growth for both sub-samples.

TABLE 2 Regression of the impact of change in gross debt burden on real output growth, full sample

	Basic	Fixed	Standardized	With control variables							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Δ(Cost of gross debt$_{t-1}$)	−0.496	−0.454	−0.200	−0.436	−0.442	−0.437	−0.437	−0.411	−0.436	−0.438	−0.414
	(0.054)***	(0.051)***	(0.022)***	(0.055)***	(0.056)***	(0.056)***	(0.055)***	(0.055)***	(0.055)***	(0.055)***	(0.055)***
Δ(Cost of gross debt$_{t-2}$)	−0.108	−0.095	−0.045	−0.104	−0.108	−0.106	−0.103	−0.094	−0.105	−0.103	−0.093
	(0.055)**	(0.051)*	(0.023)**	(0.055)*	(0.055)**	(0.055)*	(0.055)*	(0.055)*	(0.055)*	(0.055)*	(0.055)*
Δ(Cost of gross debt$_{t-3}$)	−0.194	−0.178	−0.085	−0.214	−0.216	−0.214	−0.214	−0.197	−0.214	−0.215	−0.199
	(0.050)***	(0.047)***	(0.022)***	(0.050)***	(0.050)***	(0.050)***	(0.050)***	(0.050)***	(0.050)***	(0.050)***	(0.050)***
Relative income$_{(t-1)}$	−0.009	−0.056	−0.306	−0.020	−0.013	−0.017	−0.021	−0.021	−0.020	−0.020	−0.021
	(0.002)***	(0.006)***	(0.064)***	(0.004)***	(0.003)***	(0.003)***	(0.003)***	(0.004)***	(0.004)***	(0.004)***	(0.004)***
East Asia				0.011	0.012	0.011	0.011	0.011	0.011	0.010	0.009
				(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
LEGAL$_{(t)}$				0.002				0.002	0.003	0.003	0.003
				(0.001)***				(0.001)***	(0.001)***	(0.001)***	(0.001)***
Anti-corruption$_{(t)}$					0.001						
					(0.001)						
Bureaucratic quality$_{(t)}$						0.003					
						(0.001)***					

(Continues)

TABLE 2 (Continued)

	Basic	Fixed	Standardized	With control variables							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Law and order$_{(t)}$							0.003				
							(0.001)***				
Government stability$_{(t)}$								0.021			0.020
								(0.005)***			(0.005)***
Military in power$_{(t)}$									−0.001		0.002
									(0.004)		(0.005)
Democratic account$_{(t)}$										−0.011	−0.009
										(0.004)**	(0.005)**
Constant	0.027	0.052	0.157	0.027	0.021	0.019	0.016	0.014	0.027	0.035	0.021
	(0.001)***	(0.003)***	(0.039)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.003)***	(0.003)***	(0.004)***	(0.005)***
N	2080	2080	2080	1616	1616	1616	1616	1616	1616	1616	1616
Adj. R^2	0.07	0.08	0.07	0.10	0.10	0.10	0.11	0.11	0.10	0.11	0.11
# of countries	57	57	57	57	57	57	57	57	57	57	57

Note: Column (2) reports the results when country fixed effects are added in the estimation. In column (3), the estimated coefficients are standardized. That is, the coefficients show by how many standard deviations the per capita real output growth rate moves when one of the explanatory variables increases by one standard deviation, ceteris paribus. Country fixed effects are not included in the estimation for the column (3) model. From column (4) on, we do not include country fixed effects, and do not report standardized variables. LEGAL is a measure of legal/institutional development—the first principal component of law and order (LAO), bureaucratic quality (BQ), and anti-corruption measures (CORRUPT). The sample period is 1961 through 2019 for the first three models, and for the other models with institutional control variables, it is 1984 through 2019.

*$p < .1$.

**$p < .05$.

***$p < .01$.

TABLE 3 Regression of the impact of change in gross debt burden on real output growth, AE sample

	Basic	Fixed	Standardized	With control variables							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Δ(Cost of gross debt$_{t-1}$)	−0.624	−0.567	−0.205	−0.579	−0.580	−0.584	−0.587	−0.528	−0.579	−0.578	−0.527
	(0.092)***	(0.088)***	(0.030)***	(0.092)***	(0.093)***	(0.092)***	(0.092)***	(0.091)***	(0.092)***	(0.092)***	(0.092)***
Δ(Cost of gross debt$_{t-2}$)	−0.574	−0.543	−0.182	−0.641	−0.644	−0.642	−0.646	−0.612	−0.641	−0.640	−0.612
	(0.100)***	(0.095)***	(0.032)***	(0.100)***	(0.100)***	(0.100)***	(0.100)***	(0.099)***	(0.100)***	(0.100)***	(0.099)***
Δ(Cost of gross debt$_{t-3}$)	−0.362	−0.362	−0.115	−0.488	−0.486	−0.483	−0.490	−0.468	−0.487	−0.488	−0.468
	(0.092)***	(0.088)***	(0.029)***	(0.090)***	(0.091)***	(0.090)***	(0.091)***	(0.089)***	(0.091)***	(0.091)***	(0.089)***
Relative income$_{(t-1)}$	−0.021	−0.066	−0.831	−0.009	−0.006	−0.011	−0.009	−0.012	−0.009	−0.009	−0.012
	(0.003)***	(0.006)***	(0.135)***	(0.004)**	(0.004)*	(0.004)***	(0.004)**	(0.004)***	(0.004)**	(0.004)**	(0.004)***
LEGAL$_{(t)}$				0.004				0.004	0.004	0.004	0.004
				(0.001)***				(0.001)***	(0.001)***	(0.001)***	(0.001)***
Anti-corruption$_{(t)}$					0.002						
					(0.001)***						
Bureaucratic quality$_{(t)}$						0.008					
						(0.002)***					
Law and order$_{(t)}$							0.005				
							(0.001)***				

(Continues)

TABLE 3 (Continued)

	Basic	Fixed	Standardized	With control variables							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Government stability$_{(t)}$								0.027			0.027
								(0.006)***			(0.006)***
Military in power$_{(t)}$									−0.002		−0.001
									(0.011)		(0.010)
Democratic account$_{(t)}$										−0.004	−0.002
										(0.013)	(0.012)
Constant	0.036	0.070	0.630	0.013	0.009	−0.006	−0.002	−0.002	0.015	0.017	0.001
	(0.003)***	(0.005)***	(0.106)***	(0.003)***	(0.005)**	(0.007)	(0.007)	(0.005)	(0.010)	(0.011)	(0.015)
N	1095	1095	1095	763	763	763	763	763	763	763	763
Adj. R^2	0.17	0.21	0.17	0.22	0.21	0.22	0.22	0.24	0.22	0.22	0.24
# of countries	23	23	23	23	23	23	23	23	23	23	23

Note: The dummy variable for East Asian and Pacific countries is not included. Column (2) reports the results when country fixed effects are added in the estimation. In column (3), the estimated coefficients are standardized. That is, the coefficients show by how many standard deviations the per capita real output growth rate moves when one of the explanatory variables increases by one standard deviation, ceteris paribus. Country fixed effects are not included in the estimation for the column (3) model. From column (4) on, we do not include country fixed effects, and do not report standardized variables. LEGAL is a measure of legal/institutional development—the first principal component of law and order (LAO), bureaucratic quality (BQ), and anti-corruption measures (CORRUPT). The sample period is 1961 through 2019 for the first three models, and for the other models with institutional control variables, it is 1984 through 2019.

*$p < .1$.

**$p < .05$.

***$p < .01$.

TABLE 4 Regression of the impact of change in gross debt burden on real output growth, dev., and EME sample

	Basic	Fixed	Standardized	With control variables							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Δ(Cost of gross debt$_{t-1}$)	−0.420	−0.381	−0.187	−0.357	−0.363	−0.356	−0.362	−0.350	−0.356	−0.358	−0.350
	(0.072)***	(0.067)***	(0.032)***	(0.070)***	(0.071)***	(0.071)***	(0.070)***	(0.071)***	(0.070)***	(0.070)***	(0.071)***
Δ(Cost of gross debt$_{t-2}$)	0.026	0.035	0.012	0.029	0.025	0.026	0.031	0.032	0.030	0.029	0.033
	(0.071)	(0.066)	(0.033)	(0.068)	(0.069)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)	(0.068)
Δ(Cost of gross debt$_{t-3}$)	−0.151	−0.126	−0.076	−0.144	−0.149	−0.146	−0.145	−0.138	−0.145	−0.144	−0.140
	(0.064)**	(0.060)**	(0.032)**	(0.062)**	(0.062)**	(0.062)**	(0.061)**	(0.062)**	(0.062)**	(0.062)**	(0.062)**
Relative income$_{(t-1)}$	0.006	−0.039	0.182	−0.020	−0.008	−0.012	−0.018	−0.020	−0.021	−0.020	−0.022
	(0.005)	(0.011)***	(0.152)	(0.007)***	(0.006)	(0.006)*	(0.006)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***
East Asia				0.015	0.017	0.016	0.014	0.015	0.015	0.015	0.015
				(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***
LEGAL$_{(t)}$				0.005				0.005	0.005	0.005	0.005
				(0.001)***				(0.001)***	(0.001)***	(0.001)***	(0.001)***
Anti-corruption$_{(t)}$					0.002						
					(0.001)*						
Bureaucratic quality$_{(t)}$						0.004					
						(0.001)**					
Law and order$_{(t)}$							0.006				
							(0.001)***				

(Continues)

TABLE 4 (Continued)

	Basic	Fixed	Standardized	With control variables							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Government stability$_{(t)}$								0.007			0.007
								(0.008)			(0.008)
Military in power$_{(t)}$									0.005		0.006
									(0.005)		(0.006)
Democratic account$_{(t)}$										−0.002	−0.003
										(0.005)	(0.006)
Constant	0.024	0.035	−0.044	0.029	0.018	0.017	0.010	0.024	0.026	0.030	0.024
	(0.002)***	(0.003)***	(0.048)	(0.002)***	(0.003)***	(0.003)***	(0.003)***	(0.005)***	(0.004)***	(0.005)***	(0.007)***
N	985	985	985	853	853	853	853	853	853	853	853
Adj. R^2	0.04	0.02	0.04	0.10	0.08	0.09	0.11	0.10	0.10	0.10	0.10
# of countries	34	34	34	34	34	34	34	34	34	34	34

Note: Column (2) reports the results when country fixed effects are added in the estimation. In column (3), the estimated coefficients are standardized. That is, the coefficients show by how many standard deviations the per capita real output growth rate moves when one of the explanatory variables increases by one standard deviation, ceteris paribus. Country fixed effects are not included in the estimation for the column (3) model. From column (4) on, we do not include country fixed effects, and do not report standardized variables. LEGAL is a measure of legal/institutional development—the first principal component of law and order (LAO), bureaucratic quality (BQ), and anti-corruption measures (CORRUPT). The sample period is 1961 through 2019 for the first three models, and for the other models with institutional control variables, it is 1984 through 2019.

*$p < .1$.

**$p < .05$.

***$p < .01$.

The estimation model based on Equation (2) provides more insight on the dynamic impacts of changes in the cost of servicing debt. The EMEs results are reported in Table 5. Column (1) of Table 5 indicates that an increase in the domestic debt burden is associated with economic slowdown in the following year. The impact of higher cost of servicing external debt takes more time to materialize; an increase in the external debt burden is associated with economic slowdown 2 years later. An increase in external debt burden 3 years ago is also associated with negative per-capita economic growth effects. The estimation with country-fixed effects yields similar results to the basic estimation model (column 2). When we lengthen the lag structure to $t-4$, the results are not affected, and the estimates of the fourth lag are not statistically significant (not reported).[20] EMEs with better bureaucracy, more established law and order, and more stable governments tend to experience higher economic growth. Thus, institutional factors continue to matter for economic growth. Including the variables for these institutional factors in the regression does not affect the negative contributions of domestic or external debt.

3.1 | Stability of the estimated coefficients

We test now the stability over time of the results reported in Tables 2, 5. We first include the dummies for the time periods identified in the previous section: 1970–1979, 1980–1989, 1990–2009, and 2010–2019. We also interact them with the lagged variables for the cost of debt burden, which we found to be significant in Tables 2 and 5. Considering that the estimates of the legal and institutional variables indicate that sample economies are heterogeneous, and that the legal and institutional variables tend to be less time variant, from here on, we use the estimation model with country-fixed effects as the base model.

It turned out that only the estimated coefficient on $\Delta(\text{Cost of gross debt}_{t-1})$ from Table 2 are not stable over years.[21] Before the 1980s, faster change in the cost of servicing gross debt was associated with larger negative impact on output growth (Figure 5). Thereby, if the cost of servicing gross debt drops, like in the case of AEs before the 1970s, that would be associated with greater output growth. The magnitude of this effect is the highest during the BWs system. Then, it falls, more drastically after the 1970–1979 period. The impact becomes the smallest in the 1990–2009 Great Moderation period, followed by a small rise in the last decade. Panels (b) and (c) report the results for the AEs, and for developing and EMEs, respectively.[22] Notably, the changes of the estimated coefficients over years do not differ so much among the three sub-samples, except for that the estimated coefficient is the smallest in the 1980–1989 period for the AEs, and in 1990–2009 for the Developing-EMEs group.

Figure 6 illustrates how the impact of changing the cost of servicing gross debt evolves over time. We plug in the actual values of $\Delta\left(r_{i,t-1}-g^{\text{USD}}_{i,t-1}\right)\left(\text{Debt}/Y\right)^{\text{USD}}_{i,t-1}$ and show its actual contribution to the growth rate of per capita real output, that is, Figure 6 plots $\left(\widehat{\beta}_1 + D'\widehat{B}\right)\cdot \Delta\left(r_{i,t-1}-g^{\text{USD}}_{i,t-1}\right)\left(\text{Debt}/Y\right)^{\text{USD}}_{i,t-1}$, where D is a vector of the dummies for the subsample periods. Recognizing the heterogeneity across countries, we report in Figure 6 three groups: median, the 25th percentile, and the 75th percentile of $\Delta\left(r_{i,t-1}-g^{\text{USD}}_{i,t-1}\right)\left(\text{Debt}/Y\right)^{\text{USD}}_{i,t-1}$.

Figure 6a shows that in before 1970, the median level of the change in the cost of servicing gross debt would contribute positively to real annual output growth by about 0.2 percentage points.[23] A country with a fall in the cost of servicing gross debt represented by the 25th percentile change in the cost of servicing gross debt in the graph would experience higher annual

TABLE 5 Regression of the impact of change in the cost of servicing domestic and external debt on real output growth

	Basic	Fixed	Standardized	With control variables							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Δ(Cost of domestic debt$_{t-1}$)	−0.238	−0.200	−0.096	−0.181	−0.188	−0.177	−0.173	−0.162	−0.183	−0.181	−0.162
	(0.105)**	(0.101)**	(0.042)**	(0.103)*	(0.105)*	(0.105)*	(0.101)*	(0.102)	(0.103)*	(0.103)*	(0.103)
Δ(Cost of domestic debt$_{t-2}$)	0.065	0.087	0.028	0.083	0.093	0.100	0.079	0.081	0.083	0.083	0.082
	(0.113)	(0.107)	(0.048)	(0.110)	(0.112)	(0.111)	(0.108)	(0.109)	(0.110)	(0.110)	(0.109)
Δ(Cost of domestic debt$_{t-3}$)	−0.041	0.009	−0.019	−0.070	−0.059	−0.054	−0.066	−0.059	−0.070	−0.069	−0.062
	(0.095)	(0.092)	(0.043)	(0.093)	(0.094)	(0.094)	(0.091)	(0.092)	(0.093)	(0.093)	(0.092)
Δ(Cost of external debt$_{t-1}$)	0.247	0.174	0.030	0.292	0.346	0.336	0.192	0.282	0.269	0.291	0.257
	(0.312)	(0.303)	(0.039)	(0.311)	(0.317)	(0.315)	(0.307)	(0.309)	(0.313)	(0.312)	(0.310)
Δ(Cost of external debt$_{t-2}$)	−0.768	−0.766	−0.097	−0.660	−0.632	−0.662	−0.729	−0.662	−0.685	−0.661	−0.688
	(0.295)***	(0.292)***	(0.037)***	(0.291)**	(0.296)**	(0.295)**	(0.286)**	(0.288)**	(0.292)**	(0.291)**	(0.290)**
Δ(Cost of external debt$_{t-3}$)	−1.060	−1.001	−0.136	−1.006	−0.974	−0.980	−0.986	−0.961	−1.025	−1.009	−0.974
	(0.301)***	(0.291)***	(0.039)***	(0.294)***	(0.300)***	(0.298)***	(0.289)***	(0.292)***	(0.295)***	(0.295)***	(0.293)***
Rel. income$_{(t-1)}$	−0.021	−0.035	−0.638	−0.031	−0.015	−0.021	−0.024	−0.032	−0.027	−0.030	−0.028
	(0.012)*	(0.032)	(0.371)*	(0.014)**	(0.014)	(0.014)	(0.013)*	(0.014)**	(0.015)*	(0.014)**	(0.014)*
East Asia				0.011	0.015	0.012	0.009	0.010	0.010	0.011	0.010
				(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***
LEGAL$_{(t)}$				0.008				0.007	0.008	0.008	0.007
				(0.001)***				(0.002)***	(0.002)***	(0.002)***	(0.002)***

(Continues)

TABLE 5 (Continued)

	Basic	Fixed	Standardized	With control variables							
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)
Anti-corruption$_{(t)}$					0.002						
					(0.001)						
Bureaucratic quality$_{(t)}$						0.005					
						(0.002)***					
Law and order$_{(t)}$							0.009				
							(0.001)***				
Government stability$_{(t)}$								0.029			0.029
								(0.008)***			(0.009)***
Military in power$_{(t)}$									−0.006		−0.007
									(0.007)		(0.007)
Democratic account$_{(t)}$										−0.001	0.004
										(0.007)	(0.007)
Constant	0.026	0.028	0.107	0.032	0.018	0.015	0.001	0.015	0.035	0.033	0.015
	(0.002)***	(0.005)***	(0.072)	(0.003)***	(0.004)***	(0.004)***	(0.004)	(0.006)**	(0.005)***	(0.006)***	(0.008)*
N	707	707	707	638	638	638	638	638	638	638	638
Adj. R^2	0.04	−0.00	0.04	0.09	0.06	0.07	0.12	0.11	0.09	0.09	0.10
# of countries	25	25	25	25	25	25	25	25	25	25	25

Note: Column (2) reports the results when country fixed effects are added in the estimation. In column (3), the estimated coefficients are standardized. That is, the coefficients show by how many standard deviations the per capita real output growth rate moves when one of the explanatory variables increases by one standard deviation, ceteris paribus. Country fixed effects are not included in the estimation for the column (3) model. From column (4) on, we do not include country fixed effects, and do not report standardized variables. LEGAL is a measure of legal/institutional development—the first principal component of law and order (LAO), bureaucratic quality (BQ), and anti-corruption measures (CORRUPT). The sample period is 1961 through 2019 for the first three models, and for the other models with institutional control variables, it is 1984 through 2019.

*$p < .1$.

**$p < .05$.

***$p < .01$.

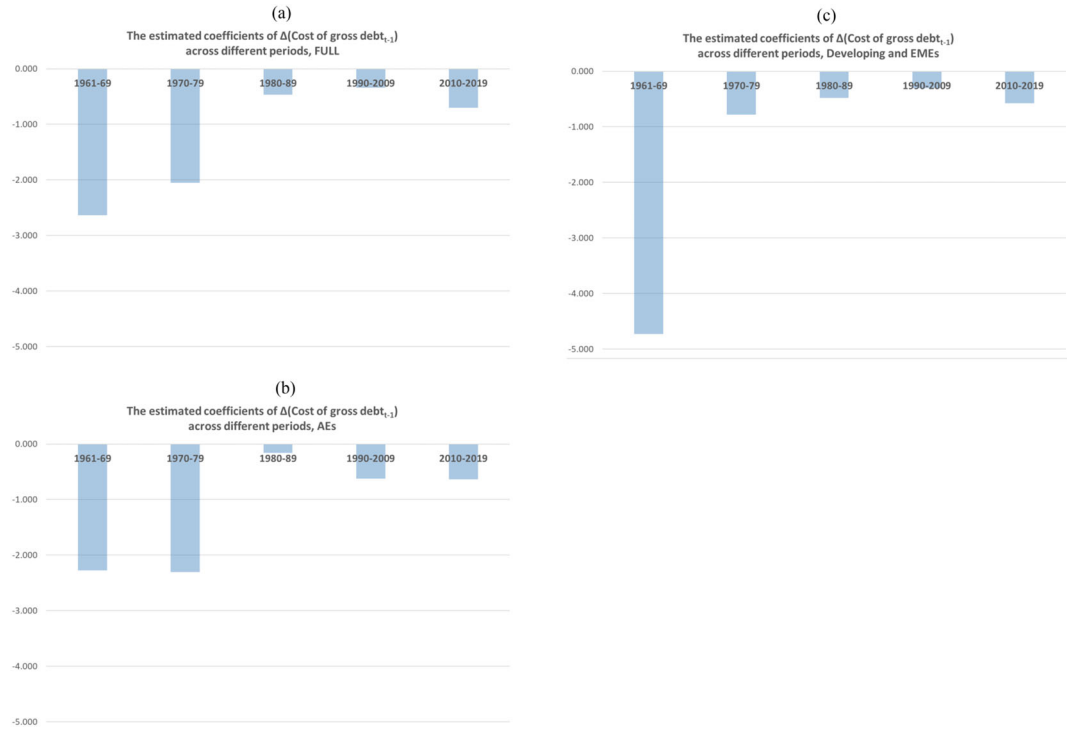

FIGURE 5 The estimated coefficients of Δ(cost of gross debt$_{t-1}$) across different periods. (a) Full sample, (b) AEs, (c) developing and EMEs. For the full sample and the AE subsample, the interaction term for the 1970–1979 period is found to be insignificant (i.e. the estimated coefficient is the same as the one for 1961–1969). For the Dev-EME subsample, the estimate of Δ(Cost of gross debt$_{t-1}$) is statistically significant, but all of its interaction terms with the time period dummies are insignificant. *Source*: Authors' estimations [Colour figure can be viewed at wileyonlinelibrary.com]

output growth rate with the contribution of a little more than 0.4 percentage points. When interpreting these numbers, one should keep in mind that a rise in the cost of servicing debt would lead with lags of 1–3 years to output growth slowdown. Once the lagged impacts are incorporated, the actual contributions to output growth of changes in the cost of servicing debt are much larger.

In the decades of 1970–1979, 1980–1989, and the last decade of our sample, the median change in the cost of servicing gross debt contributes negatively to output growth. In the Great Moderation period, the median change in the cost of servicing gross debt barely contributes to output growth. Among most of the AEs, during the pre-1970s period, a change in the cost of servicing gross debt contribute positively whereas among developing and EMEs, changes in the cost of servicing gross debt hardly impacted output growth. Interestingly, among developing and EMEs, a median change in the cost of servicing gross debt during the 1980s contributed negatively to output growth by close to two percentage points. The 75th percentile increase in the cost of servicing gross debt lowered real output growth by 0.4 percentage points during the 1980s.

Figure 6d takes a close look at the impact of a change in debt-servicing cost for Latin American countries. The bars in the figure show the actual contributions to the growth rate of per capita real output $\left(\text{i.e. } \left(\widehat{\beta}_1 + D'\widehat{B}\right)\Delta\left(r_{i,t-1} - g^{\text{USD}}_{i,t-1}\right)\left(\text{Debt}/_{Y}\right)^{\text{USD}}_{i,t-1}\right.$, where D is a vector of the dummies for the subsample periods and the estimated coefficients are from the full sample, panel (a)$\Big)$. For the actual values we include the median, the 25th percentile, and the 75th percentile of

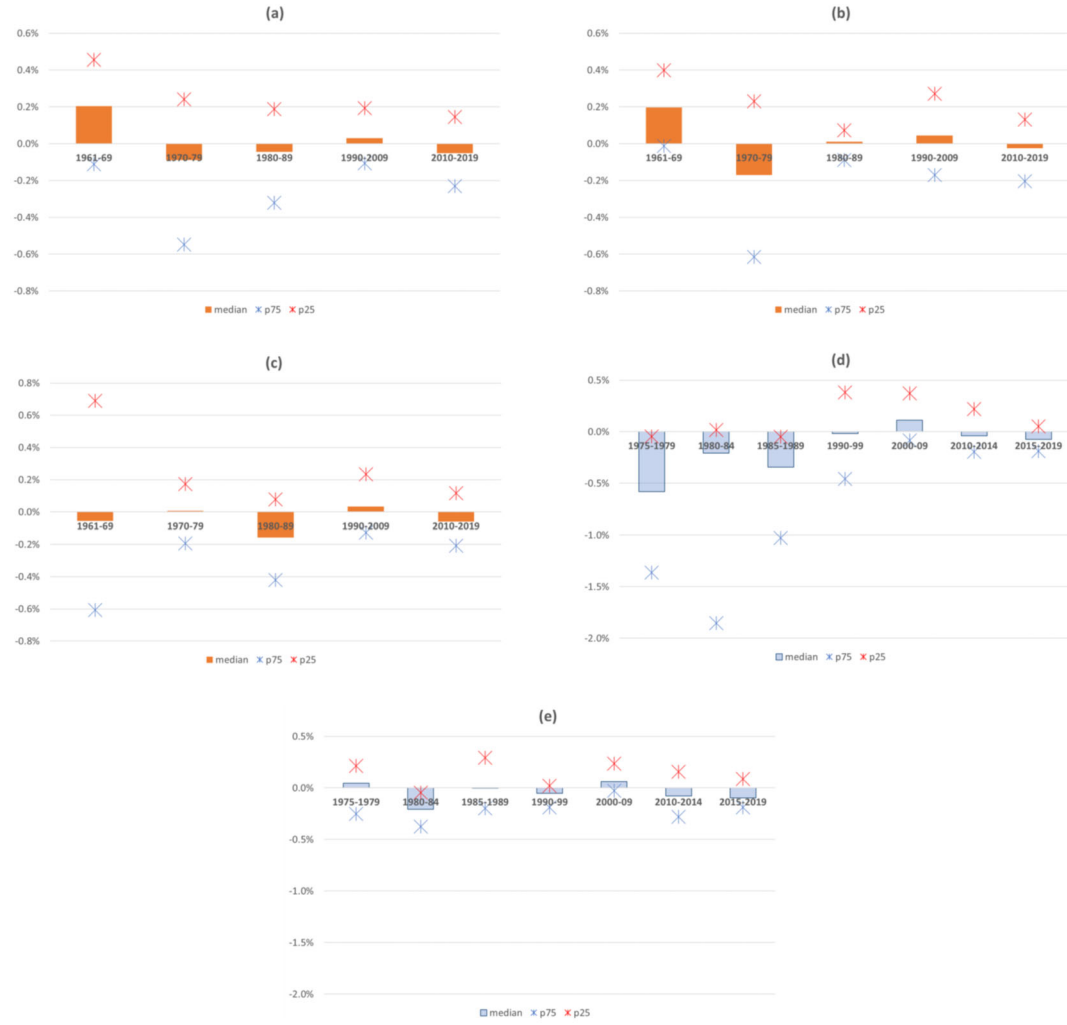

FIGURE 6 Actual contributions of the cost of servicing gross debt to annual output growth rates. (a) Full sample, (b) AEs, (c) developing and EMEs. The figure plots $\left(\widehat{\beta}_1 + D'\widehat{B}\right) \cdot \Delta\left(r_{t-1} - g^{\mathrm{USD}}_{t-1}\right)\ \left({}^{\mathrm{Debt}}/_{Y}\right)^{\mathrm{USD}}_{t-1}$, where D is a vector of the dummies for the subsample periods. . Actual contributions of the cost of servicing gross debt to annual output growth rates for (d) LATAM and (e) Asian economies. The p75 annual growth effect during 1980–1984 was an outlier of 1.9%, missing thereby from the figure due to scaling consideration. This effect translates to cumulative output drop of 9.5% GDP during that period. *Source*: Authors' estimation [Colour figure can be viewed at wileyonlinelibrary.com] *Source*: Authors' estimation

$\Delta\left(r_{i,t-1} - g^{\mathrm{USD}}_{i,t-1}\right)\left({}^{\mathrm{Debt}}/_{Y}\right)^{\mathrm{USD}}_{i,t-1}$ of the Latin American economies. Each original subsample period is divided in this panel into two subsamples (e.g. 1980–1984 and 1985–1989 instead of 1980–1989, etc.). Figure 6e is created in the same manner for Asian countries.[24]

Figure 6d shows that the negative contributions to the annual real output growth of rises in the cost of servicing gross public debt are greater in 1975–1979, 1980–1984, and 1985–1989, ranging 0.2–0.6 percentage points. In the 1980–1984 period, the 75th percentile increase in the cost of servicing gross debt would lower annual real output growth by at least 1.9 percentage points, adding up to cumulative output drop by 9.5% during the peak of the lost growth decade.

We need to keep in mind that a rise in the cost of servicing debt would have a lasting negative impact on output growth for the next 2–3 years. These observations account for the devastating growth impact of the US disinflation of 1980–1982 on most Latin American countries during the 1980s, aka the Lost Growth Decade.

Asian countries were significantly less exposed to the spike of the snowball effects than LATAM (Figure 6e). The 1980–1984 period is associated with mild impact of the rising cost of servicing debt to lowering output growth. Even in the 1990–1999 period, which includes the Asian financial crisis period, the negative contribution is rather small (about 0.2 percentage points for the 75th percentile). Notably, unlike Latin American economies, the blue stars are consistently scattered at low negative values, meaning that Asian economies tend to face "small snowball" effects and smaller debt-GDP ratios.[25] These findings indicate that higher flow costs of servicing gross public debt can have economically significant impacts, accounting for the dramatic decline in growth rates of most Latin American countries during the debt crises in the 1980s.

Next, we extend the empirical analysis, investigating interactions with other variables, adding real exchange rate controls, financial openness and developments, current account and IR controls, and allowing for possible asymmetric effect of the snowball effects.

3.2 | Interactions with other variables

The dynamic impact of the cost of servicing debt on output growth may also depend upon other macroeconomic and policy variables, including the real exchange rate, financial openness, financial development, current account and international reserves. We examine these issues by including these variables and interacting them with the variables dealing with the cost of servicing debt. We conduct the estimations looking into the impact of changes in the cost of servicing gross public debt, using the models in column (2) of Table 2, and the estimations of the impact of changes in the cost of servicing both domestic and external public debt, using the model of column (2) of Table 5. The former uses the full sample while the latter contains only EMEs due to data availability.[26]

3.2.1 | Real effective exchange rate

Adverse shocks may induce currency depreciation and stagflation pressures, impacting the real effective exchange rate (REER). These forces in turn may affect the burden of external hard debt. We report these results in Table 6, controlling the REER rate of change, applying the Global Development Indicators as of time (t),[27] and interact it with changes in the cost of servicing debt for all three lags. In column (1), the estimate on the change in the first lag of the cost of servicing gross debt, $\Delta(\text{Cost of gross debt}_{t-1})$, is significantly negative while the estimate of its interaction with the rate of change in REER, ΔREER, is significantly positive. Thus, a faster rise in the cost of servicing gross debt has a negative impact on output growth. This impact is dampened if the country experiences real appreciation, as it reduces the debt burden. The interaction term between $\Delta(\text{Cost of domestic debt}_{t-3})$ and ΔREER_t is found to be negative, but the magnitude of the estimate is smaller than that of the interaction between $\Delta(\text{Cost of gross debt}_{t-1})$ and ΔREER_t. Similar patterns for $\Delta(\text{Cost of external debt}_{t-2})$ and its interaction with ΔREER apply when we focus on EMEs (column 2).

TABLE 6 Interactive effects w. REER

	(1)		(2)
Δ(Cost of gross debt$_{t-1}$)	−0.409	Δ(Cost of domestic debt$_{t-1}$)	−0.087
	(0.055)***		(0.106)
Δ(Cost of gross debt$_{t-2}$)	−0.081	Δ(Cost of domestic debt$_{t-2}$)	0.081
	(0.055)		(0.117)
Δ(Cost of gross debt$_{t-3}$)	−0.195	Δ(Cost of domestic debt$_{t-3}$)	0.052
	(0.049)***		(0.096)
		Δ(Cost of external debt$_{t-1}$)	−0.144
			(0.389)
		Δ(Cost of external debt$_{t-2}$)	−1.117
			(0.394)***
		Δ(Cost of external debt$_{t-3}$)	−1.514
			(0.370)***
ΔREER$_{(t)}$	0.074	ΔREER$_{(t)}$	0.070
	(0.011)***		(0.017)***
Δ(Cost of gross debt$_{t-1}$) × ΔREER$_{(t)}$	1.470	Δ(Cost of external debt$_{t-1}$) × ΔREER$_{(t)}$	−2.028
	(0.671)**		(4.770)
Δ(Cost of gross debt$_{t-2}$) × ΔREER$_{(t)}$	−0.392	Δ(Cost of external debt$_{t-2}$) × ΔREER$_{(t)}$	12.035
	(0.758)		(4.367)***
Δ(Cost of gross debt$_{t-3}$) × ΔREER$_{(t)}$	−1.266	Δ(Cost of external debt$_{t-3}$) × ΔREER$_{(t)}$	−3.371
	(0.594)**		(4.381)
N	1397	*N*	363
Within	0.14	Within	0.17
Between	0.00	Between	0.02
Overall	0.05	Overall	0.15
# of countries	44	# of countries	13

Note: The estimation includes relative income and the constant term, but their estimations are omitted from presentation to save space. The dummy for East Asia is not included in the estimation. Country fixed effects are included.

*$p < .1$.

**$p < .05$.

***$p < .01$.

Source: Authors' estimations.

3.2.2 | Interactive effects of financial openness

The impact of the cost of servicing debt on output growth may depend on financial openness. We use the Chinn and Ito (2006, 2008) index of financial openness and assign the dummy with the value of one if the index of the concerned country is greater than the sample median. We also interact it with the three lagged variables for the change in the cost of servicing gross or external debt. The estimated coefficient on Δ(Cost of gross debt$_{t-i}$) or Δ(Cost of external debt$_{t-i}$)

TABLE 7 Interactive effects with financial openness (FO)

	(1)		(2)
Δ(Cost of gross debt$_{t-1}$)	−0.454	Δ(Cost of domestic debt$_{t-1}$)	−0.183
	(0.065)***		(0.100)*
Δ(Cost of gross debt$_{t-2}$)	−0.016	Δ(Cost of domestic debt$_{t-2}$)	0.107
	(0.064)		(0.106)
Δ(Cost of gross debt$_{t-3}$)	−0.189	Δ(Cost of domestic debt$_{t-3}$)	0.036
	(0.059)***		(0.092)
		Δ(Cost of external debt$_{t-1}$)	0.223
			(0.506)
		Δ(Cost of external debt$_{t-2}$)	−0.027
			(0.459)
		Δ(Cost of external debt$_{t-3}$)	−1.387
			(0.467)***
Dummy for financial open$_{t-1}$	−0.003	Dummy for financial open$_{t-1}$	0.013
	(0.002)*		(0.003)***
Δ(Cost of gross debt$_{t-1}$) × D for FO$_{t-1}$ > median (FO)	0.011 (0.106)	Δ(Cost of external debt$_{t-1}$) × D for FO$_{t-1}$ > median (FO)	−0.313 (0.622)
Δ(Cost of gross debt$_{t-2}$) × D for FO$_{t-1}$ > median (FO)	−0.199 (0.107)*	Δ(Cost of external debt$_{t-2}$) × D for FO$_{t-1}$ > median (FO)	−1.232 (0.588)**
Δ(Cost of gross debt$_{t-3}$) × D for FO$_{t-1}$ > median (FO)	0.018 (0.097)	Δ(Cost of external debt$_{t-3}$) × D for FO$_{t-1}$ > median (FO)	0.688 (0.601)
N	1880	N	707
Within	0.09	Within	0.07
Between	0.04	Between	0.00
Overall	0.05	Overall	0.05
# of countries	56	# of countries	25

Note: The estimation includes relative income and the constant term, but their estimations are omitted from presentation to save space. The dummy for East Asia is not included in the estimation. Country fixed effects are included.

*$p < .1$.

**$p < .05$.

***$p < .01$.

Source: Authors' estimations.

is the impact of a change in the cost of servicing gross or external debt on output growth for financially closed economies, whereas the estimated coefficient on the interaction with the financial openness dummy represents the impact for financially open economies. Table 7 shows that financially closed economies are negatively affected by a more rapid increase in the cost of servicing gross debt with lags of 1 and 3 years. In contrast, financially open economies might perform better in terms of output growth even with a rise in the cost of servicing gross debt from the previous year. However, when it comes to the impact of a faster rise in debt-servicing cost 3 years

ago, it would be more negative. These mixed results can be attributed to sample heterogeneity, and can be untangled by disaggregating the full sample into the subsamples of AEs and developing and EMEs.

For the AE subsample, all the three interactions are significantly negative (not reported), suggesting that a faster rise in the cost of servicing public debt would have an additional negative impact on output growth if the economy of concern is more open to overseas financial markets. For the subsample of developing and EMEs, the interaction terms with the first- and third-lags have *positive* impact on output growth. Unlike AEs, greater financial openness would dampen the negative impact of a rise in the debt servicing cost on output growth. Greater financial openness in EMEs may signal higher levels of credibility and market-friendliness, mitigating sudden stops concerns. Column (2) shows that only financially open EMEs would observe a rise in the cost of servicing external debt 2 years ago affecting output growth negatively, while the impact of a rise in the debt-servicing cost from 3 years before affect only financially closed economies.

3.2.3 | Interactive effects of financial development

Table 8 shows the estimates three interaction terms with financial development (FD), reporting significantly negative coefficients.[28] Thereby, financially developed economies tend to have greater negative impacts on output growth from a rise in the cost of servicing public debt. The impact is identified for all the lag lengths. Financially developed economies also have negative impacts on output growth from a rise in the debt-servicing cost one or three years ago. The significantly negative estimates on the interactions mean that the negative impacts are greater for financially developed countries. Ito and Tran (2019) found that developing economies with more developed or open financial markets tend to have a weaker interest rate passthrough, that is, find it harder to control the longer-end of the yield curve by manipulating the short-term policy rate. Greater financial development and openness would raise the substitutability between domestic and foreign financial bonds. This may help explain the results in Tables 7 and 8.

For the second set of estimations, which are only applied to developing and EMEs, only the interaction term for $t-2$ is found to have significantly negative estimate.

3.2.4 | Interactive effects with international reserves

A series of financial crises in the 1980s and 1990s have led many central banks in EMEs to increase their international reserves holding (IR), viewing these reserves as an effective buffer, and mitigating exposure to financial instability. Thereby, holding more IR may dampen the negative output growth effect of the rising debt servicing cost. Table 9 reports the estimation results, where we include a dummy for an economy that experiences an increase in the volume of IR holding during period $t-1$ (D for $\Delta \text{IR}_{t-1} > 0$), and interact it with the three lagged variables for the cost of servicing gross or external debt. While the estimates on three Δ(Cost of gross debt_{t-k}) are significantly negative in column (1), the estimate on the interaction term between Δ(Cost of gross debt_{t-2}) and the dummy for increasing IR is significantly positive. The same observation can be made for Δ(Cost of external debt_{t-2}) and its interaction (column 2). These findings imply that the negative growth effect of rise in the cost of servicing debt could be mitigated in countries experiencing a rise in IR holding. This applies also to EMEs subsample.

TABLE 8 Interactive effects with financial development (FD)

	(1)		(2)
Δ(Cost of gross debt$_{t-1}$)	−0.345	Δ(Cost of domestic debt$_{t-1}$)	−0.216
	(0.055)***		(0.100)**
Δ(Cost of gross debt$_{t-2}$)	−0.012	Δ(Cost of domestic debt$_{t-2}$)	0.039
	(0.053)		(0.106)
Δ(Cost of gross debt$_{t-3}$)	−0.131	Δ(Cost of domestic debt$_{t-3}$)	0.003
	(0.048)***		(0.091)
		Δ(Cost of external debt$_{t-1}$)	0.363
			(0.318)
		Δ(Cost of external debt$_{t-2}$)	−0.424
			(0.305)
		Δ(Cost of external debt$_{t-3}$)	−0.714
			(0.300)**
Dummy for financial develop$_{t-1}$	−0.005	Dummy for financial develop$_{t-1}$	−0.008
	(0.002)**		(0.005)*
Δ(Cost of gross debt$_{t-1}$) × D for FD$_{t-1}$ > median (FD)	−0.357 (0.164)**	Δ(Cost of external debt$_{t-1}$) × D for FD$_{t-1}$ > median FD)	−1.082 (1.036)
Δ(Cost of gross debt$_{t-2}$) × D for FD$_{t-1}$ > median (FD)	−0.593 (0.188)***	Δ(Cost of external debt$_{t-2}$) × D for FD$_{t-1}$ > median (FD)	−2.180 (0.967)**
Δ(Cost of gross debt$_{t-3}$) × D for FD$_{t-1}$ > median (FD)	−0.543 (0.169)***	Δ(Cost of external debt$_{t-3}$) × D for FD$_{t-1}$ > median (FD)	−1.591 (1.022)
N	1657	N	648
Within	0.13	Within	0.07
Between	0.05	Between	0.00
Overall	0.06	Overall	0.05
# of countries	57	# of countries	25

Note: The estimation includes relative income and the constant term, but their estimations are omitted from presentation to save space. The dummy for East Asia is not included in the estimation. Country fixed effects are included.

*$p < .1$.

**$p < .05$.

***$p < .01$.

Source: Authors' estimations.

3.2.5 | Interactive effects with the sign of the change in the cost of servicing debt

We close this section by testing the possible asymmetric effect of a rise versus a drop of the interest-rate-growth differentials, $r - g$. We create a dummy that takes a value of one if $\Delta(r_{it} - g_{it}) \left(\text{Debt}/Y\right)_{it} > 0$, where "debt" can mean either gross debt like in the case of Equation (1) or external debt like in the case of Equation (2). We also interact this dummy

TABLE 9 Interactive effects with changes in IR

	(1)		(2)
Δ(Cost of gross debt$_{t-1}$)	−0.550	Δ(Cost of domestic debt$_{t-1}$)	−0.181
	(0.081)***		(0.100)*
Δ(Cost of gross debt$_{t-2}$)	−0.259	Δ(Cost of domestic debt$_{t-2}$)	0.063
	(0.076)***		(0.106)
Δ(Cost of gross debt$_{t-3}$)	−0.209	Δ(Cost of domestic debt$_{t-3}$)	0.027
	(0.066)***		(0.092)
		Δ(Cost of external debt$_{t-1}$)	−0.044
			(0.431)
		Δ(Cost of external debt$_{t-2}$)	−1.351
			(0.395)***
		Δ(Cost of external debt$_{t-3}$)	−0.984
			(0.409)**
Dummy for $\Delta IR_{t-1} > 0$	0.006	Dummy for $\Delta IR_{t-1} > 0$	0.013
	(0.001)***		(0.002)***
Δ(Cost of gross debt$_{t-1}$) × D for $\Delta IR_{t-1} > 0$	0.169 (0.104)	Δ(Cost of external debt$_{t-1}$) × D for $\Delta IR_{t-1} > 0$	0.568 (0.590)
Δ(Cost of gross debt$_{t-2}$) × D for $\Delta IR_{t-1} > 0$	0.274 (0.104)***	Δ(Cost of external debt$_{t-2}$) × D for $\Delta IR_{t-1} > 0$	1.329 (0.570)**
Δ(Cost of gross debt$_{t-3}$) × D for $\Delta IR_{t-1} > 0$	0.046 (0.096)	Δ(Cost of external debt$_{t-3}$) × D for $\Delta IR_{t-1} > 0$	−0.140 (0.568)
N	2075	N	707
Within	0.12	Within	0.09
Between	0.02	Between	0.03
Overall	0.04	Overall	0.08
# of countries	57	# of countries	25

Note: The estimation includes relative income and the constant term, but their estimations are omitted from presentation to save space. The dummy for East Asia is not included in the estimation. Country fixed effects are included.

*$p < .1$.

**$p < .05$.

***$p < .01$.

Source: Authors' estimations.

variable with the variable $\Delta(r_{it} - g_{it}) \left(\text{Debt}/Y\right)_{it}$. Table 10 presents interesting results. While $\Delta\left(r_{i,t-1} - g^{\text{USD}}_{i,t-1}\right)\left(\text{Gross debt}/Y\right)^{\text{USD}}_{i,t-1}$ takes a significantly negative estimate, its interaction with a dummy for $\Delta\left(r_{i,t-1} - g^{\text{USD}}_{i,t-1}\right)\left(\text{Gross debt}/Y\right)^{\text{USD}}_{i,t-1} > 0$ also takes a significantly negative coefficient (column 1). This means that a change in the cost of servicing gross debt affects output growth negatively, but that the impact of a rise in the cost of servicing gross debt is larger when the debt

TABLE 10 Interactive effects with the sign of $\Delta(r_t - g_t) \times (^{\text{Debt}}/_{Y})_t$

	(1)		(2)
Δ(Cost of gross debt$_{t-1}$)	−0.221	Δ(Cost of domestic debt$_{t-1}$)	−0.140
	(0.085)***		(0.101)
Δ(Cost of gross debt$_{t-2}$)	0.042	Δ(Cost of domestic debt$_{t-2}$)	0.083
	(0.072)		(0.108)
Δ(Cost of gross debt$_{t-3}$)	−0.000	Δ(Cost of domestic debt$_{t-3}$)	0.045
	(0.062)		(0.092)
		Δ(Cost of external debt$_{t-1}$)	1.274
			(0.420)***
		Δ(Cost of external debt$_{t-2}$)	−0.370
			(0.400)
		Δ(Cost of external debt$_{t-3}$)	0.063
			(0.424)
Dummy for $\Delta(r-g)_{t-1}(^{\text{Debt}}/_{Y})_{t-1} > 0$	−0.010 (0.001)***	Dummy for $(r-g)_{t-1}(^{\text{Debt}}/_{Y})_{t-1} > 0$	−0.004 (0.004)
Δ(Cost of gross debt$_{t-1}$) × D for $\Delta(r-g)_{t-1}(^{\text{Debt}}/_{Y})_{t-1} > 0$	−0.215 (0.114)*	Δ(Cost of external debt$_{t-1}$) × D for $\Delta(r-g)_{t-1}(^{\text{Debt}}/_{Y})_{t-1} > 0$	−2.746 (0.714)***
Δ(Cost of gross debt$_{t-2}$) × D for $\Delta(r-g)_{t-1}(^{\text{Debt}}/_{Y})_{t-1} > 0$	−0.035 (0.113)	Δ(Cost of external debt$_{t-2}$) × D for $\Delta(r-g)_{t-1}(^{\text{Debt}}/_{Y})_{t-1} > 0$	−1.111 (0.711)
Δ(Cost of gross debt$_{t-3}$) × D for $\Delta(r-g)_{t-1}(^{\text{Debt}}/_{Y})_{t-1} > 0$	−0.164 (0.111)	Δ(Cost of external debt$_{t-3}$) × D for $\Delta(r-g)_{t-1}(^{\text{Debt}}/_{Y})_{t-1} > 0$	−2.583 (0.712)***
N	2080	*N*	673
Within	0.13	Within	0.08
Between	0.02	Between	0.00
Overall	0.05	Overall	0.07
# of countries	57	# of countries	25

Note: The estimation includes relative income and the constant term, but their estimations are omitted from presentation to save space. The dummy for East Asia is not included in the estimation. Country fixed effects are included.

*$p < .1$.

**$p < .05$.

***$p < .01$.

Source: Authors' estimations.

servicing cost is rising. There pattern reflects the asymmetry in the impact of a rise versus a fall of the debt-servicing costs.

Such an asymmetry can be also observed when we disaggregate the cost of servicing gross debt into that of domestic and external debt. The estimated coefficients of the interaction terms for $(t-1)$ and $(t-3)$ are found to be significantly negative.[29] Thereby, the cost of servicing debt, whether gross or external, contribute negatively to output growth, and the impact is worse when the debt-servicing cost is rising.

4 | CONCLUDING REMARKS

Our analysis validates that a rise in the cost of external debt would lead with lags of two to three years to output growth slowdown. A faster rise in the flow cost of servicing external debt has a negative impact on output growth, and this effect is dampened if the country experiences real appreciation. Consequently, US post COVID exit policies reducing the odds of rapid increase in snowball effects may reduce future volatility, stabilize and increasing the global growth rate.

It is tempting to presume that the new normal for the future comprises negative snowball effects associated with secular stagnation. Yet, there are several concerns to keep in mind. First, the past performance of the US as the safe anchor of the global financial system does not guarantee maintaining the "exorbitant privilege" status into the future [see Gourinchas et al., 2010; Eichengreen, 2011; Carney, 2019]. Greater attention on the part of the US to scaling down overtime its public debt overhang will mitigate the present centrifugal forces working toward multipolar global currencies discussed by Carney (2019). An additional concern is that the record of predicting future changes of the snowball effects is mixed, at best.[30] Presuming that the new normal is a negative snowball effect may increase overtime the risk of a deeper future crisis, as was the case in the late 1990s and early 2000s when the presumption of an enduring "Great Moderation" permeated policy makers.

The history of the US after WWII provides a vivid example of the success of a two-pronged approach in facilitating the exit from a public debt overhang, stabilizing the global economy, and solidifying the global role of the dollar. The rapid decline in public debt/GDP from 1946 to 1955, was accommodated by financial repression inducing lower r, mild inflation (~4.2%), higher taxes and robust GDP growth (Aizenman & Marion, 2011; Reinhart & Sbrancia, 2015; Reinhart et al., 2015; Eichengreen et al., 2021). The end of WWII US induced sharp drop of fiscal revenue mobilization from 50% GDP points in 1944 toward 20% by 1946. Starting in 1947, this large revenue contraction was followed by an upwards trend, increasing the fiscal revenue/GDP to 35% in the 1970s. Remarkably, the US government was running mostly primary surpluses during that period. These policies supported a solid economic growth, reducing the public debt/GDP from 106% in 1946 to 23% in 1974. The post WWII success story illustrates the feasibility and gains from a two-pronged fiscal strategy.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study were derived from the following resources available in the public domain: the International Monetary Fund International Financial Statistics (https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b); the Organization for Economic Cooperation and Development (OECD) Database (https://data.oecd.org/); the World Bank World Development Indicators (https://databank.worldbank.org/source/world-development-indicators); the Clio Infra project (https://clio-infra.eu/index.html#about); the Global Prices and Incomes Database of the University of California, Davis (https://gpih.ucdavis.edu/); the World Bank International Debt Statistics Database (https://data.worldbank.org/products/ids); the Penn World Trade 9.1 database (https://www.rug.nl/ggdc/productivity/pwt/pwt-releases/pwt9.1?lang=en); and the ICRG database (https://www.prsgroup.com/explore-our-products/international-country-risk-guide/).

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ENDNOTES

[1] Refer to NBER Working Paper #27966 for a longer version of this article.

[2] Emerging market economies (EMEs) are those classified as either emerging or frontier in 1980–1997 by the International Financial Corporation, plus Hong Kong and Singapore. This group of economies is a subset of the group of less developed, or developing, countries (LDC). The advanced economies (AEs) refer to traditional Organization of Economic Cooperation and Development (OECD) member countries whose IMF numerical codes are below 186 plus Australia and New Zealand. "Developing and EMEs" or "EMEs and developing countries" refer to the economies of LDC, that is, non-AEs. These groupings are not time variant.

[3] See Escolano (2010) for IMF a practical guide to public debt dynamics.

[4] Blanchard (2019) argues that the primary balance is independent of $r-g$, and is not significant enough to affect the debt accumulation. Wyplosz (2019) argues that the primary balance can be endogenously affected by $r-g$, contributing to debt accumulation.

[5] In Figure 1, country coverage varies over the sample period. The data before the 1970s is available mostly for European traditional OECD countries. The summary statistics of $r-g$ is reported (as $r-g^{USD}$) in Table A1a of Online Appendix 1.

[6] Using the data of the lending rate (usually with shorter maturities) can be more appropriate for many EMEs because those economies were not able to borrow using long-term maturities during most of our sample. The data for 10-year government bond yields is obtained from the International Monetary Fund's *International Financial Statistics* (*IFS*). We supplement the dataset with OECD's database and the long-term historical data from the Clio Infra project https://clio-infra.eu/index.html#about.

[7] The GDP data are extracted from the World Bank's *World Development Indicators*. The WDI data is available after 1960. For the period before 1960, we use the Global Prices and Incomes Database of the University of California, Davis and extrapolated backwards to 1945.

[8] For the subsample, the estimated coefficient for the interest rate is found to be greater than one in the 2010–2019 period. This result is driven mostly by outliers. Once Greece is removed from the AEs regression, the estimated coefficient for the AEs falls to about 0.7, as is illustrated by the striped green bar.

[9] It is calculated by dividing the aggregation of gross debt values of the sample countries by the aggregation of nominal GDP in US dollars.

[10] Gross government debt is the total amount of debt the government has issued. The external gross public debt is composed of the public debt liabilities to foreign parties, covering both foreign and local currency debt. The gross debt ratio in this figure is recalculated so that it is comprised only of the countries for which the external debt data exists. Hence, the debt ratio for EMEs in this figure does not appear the same as the one shown in Figure 1. The data for external debt is extracted from the International Debt Statistics database.

[11] We measure r_{it} by either the 10-year government bond yields or other comparable interest rates that represent the cost of borrowing from the financial markets.

[12] For the domestic gross debt, we use the difference between the gross public debt (from Abbas et al. [2010] and the IMF World Economic Outlook [October 2019]) and external debt stock (from the World Bank's International Debt Statistics). Here, we assume all domestic debt is denominated in the local currency, which is a safe assumption for EMEs.

[13] Using dollar-denominated nominal GDP may not be appropriate for countries that borrow in non-US dollars such as Eastern European countries. However, our sample for this regression exercise (shown in the Appendix) predominantly consists of Latin American and East Asian countries all of which are highly dependent on the US dollar for most of financial transactions.

[14] Debt_t^{HC} is measured by external debt stock of the public sector, obtained from the International Debt Statistics database, divided by nominal GDP in the US dollar.

[15] The summary statistics of the variables for the net interest rates in local currency and USD and the debt to GDP ratios are reported in Tables A1b–f of Online Appendix 1.

[16] These beta coefficients show the level of relative importance among the explanatory variables. In the estimation, we do not include country-fixed effects.

[17] From column (4) on, we do not include country-fixed effects, and do not report standardized variables.

[18] LAO, BQ, and CORRUPT are from the ICRG database. Higher values of these variables indicate better conditions. Because the ICRG data are only available after 1984, from here on, the sample period for the regression becomes 1984–2019. Their summary statistics are reported in Table A1g of Online Appendix 1.

[19] The negative estimated coefficient for governments' democratic accountability is somewhat counterintuitive. However, countries with higher levels of democratic accountability tend to have mature, low-growth economies. Once the sample is disaggregated to the subsample of AEs and that of EMEs, the negative estimate becomes insignificant.

[20] The fourth lag is never significant for the other estimations reported in Tables 2–4. The results of the estimations with the fourth lag are reported in Tables A2-1, A2-2, and A2-3 of Online Appendix 2. When the lag is reduced to $t-2$, the estimation results remain intact, though the goodness of fit declines significantly. These results suggest that the lag length of three is appropriate.

[21] These results are available from the authors upon request.

[22] If the interaction terms are significant, the impact of a change in the cost of serving debt (gross, domestic, or external debt) changes across different periods. For the full sample and the AE subsample, the interaction term for the 1970–1979 period is found to be insignificant (i.e., the estimated coefficient is the same as the one for 1961–1969). For the Dev-EME subsample, both the $\Delta(\text{Cost of gross debt}_{t-1})$ and all of its interaction terms with the time period dummies are insignificant.

[23] The estimation results to test the stability of the estimated coefficients of $\Delta(\text{Cost of gross debt}_{t-1})$ are presented in Table A3 of Online Appendix 2.

[24] For both panels (d) and (e), due to data availability we show the bars starting only from 1975 to 1979.

[25] Arguably, these effects were modest for Asian countries during the 1980s reflecting their lower reliance on outside funding than LATAM countries, and the lower dependence of Asian countries on volatile commodity exports.

[26] For the second estimation model, we interact the variables of our interest only with the variable for changes in the cost of serving external debt because external debt is more important for developing and EMEs.

[27] A rise in the REER index means real currency appreciation.

[28] We measure the level of financial development with the IMF's Financial Development Index (https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B).

[29] The estimated coefficient for the change in the cost of serving external debt is significantly positive, which is counterintuitive.

[30] While "secular stagnation" gained prominence following Summers (2013) analysis, it occurred 5 years after the Global Financial Crisis, a backward-looking perceptive interpretation of the "great moderation" and the on-set of demographic transitions, at times when concerns regarding the future of the dollar system were muted.

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SUPPORTING INFORMATION

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APPENDIX. COUNTRY LIST AND AVAILABILITY

	Country name	Available years
1	Australia	1946–2019
2	Austria	1965–2019
3	Bangladesh[EME]	1976–2019
4	Belgium	1947–2019
5	Bolivia[LDC]	1987–2019
6	Brazil[EME]	1964–2019
7	Canada	1946–2019
8	Chile[EME]	1985–2018
9	Colombia[EME]	1964–2019
10	Costa Rica[LDC]	1982–2019
11	Denmark	1946–2019
12	Dominican Rep.[LDC]	1991–2017
13	El Salvador[LDC]	1996–2019
14	Finland	1946–2019
15	France	1946–2019
16	Germany	1957–2019
17	Greece	1998–2019
18	Guatemala[LDC]	1997–2019
19	Haiti[LDC]	1994–2019
20	Honduras[LDC]	1982–2019
21	Hungary[EME]	2000–2019
22	Iceland	1992–2019
23	India[EME]	1949–1985, 2005–2017
24	Indonesia[EME]	1986–2019
25	Ireland	1971–2019
26	Israel[EME]	1992–2014
27	Italy	1946–2019
28	Japan	1966–2019
29	Korea, Rep. of[EME]	1973–2019
30	Luxembourg	1977–2017
31	Malaysia[EME]	1969–2019
32	Mexico[EME]	1975–2019
33	Netherlands	1946–2018
34	New Zealand	1946–2019

(Continues)

	Country name	Available years
35	Nicaragua[LDC]	1988–2019
36	Norway	1946–2019
37	Pakistan[EME]	1950–1985, 1991–2019
38	Panama	1986–2017
39	Paraguay[LDC]	1994–2017
40	Peru[EME]	1946–1965, 1985–2017
41	Philippines[EME]	1976–2019
42	Poland[EME]	2001–2019
43	Portugal	1946–2011
44	Russia[EME]	1999–2017
45	Singapore[EME]	1978–2019
46	South Africa[EME]	1946–2019
47	Spain	1978–2019
48	Sri Lanka[EME]	2001–2019
49	Sweden	1946–2019
50	Switzerland	1946–2019
51	Thailand[EME]	1976–2019
52	Turkey[EME]	1964–2019
53	United Kingdom	1946–2019
54	United States	1948–2019
55	Uruguay[EME]	1946–1969, 1976–2019
56	Venezuela, Rep.[EME]	1984–2017
57	Vietnam[LDC]	1993–2019

Note: "EME" refers to "emerging market economies." "LDC" refers to developing economies but not recognized as EMEs.