The debt–growth nexus strikes back: Evidence from the world, with implications for the COVID–19 policy response

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Abstract

Our paper examines the economic growth impact of surging global public debt, both in the short and long run. Using information content of 81 countries drawn from all continents globally, we first examine the nonlinear debt-growth nexus for the full and subpanel of countries. This allows us to comprehensively study the nonlinear dynamics of debt and growth and to obtain results for several groups of heterogeneous subregions. Second, unlike existing studies, we draw on the novel dynamic panel threshold model recently developed by Seo and Shin (2016) to perform our nonlinear impact evaluation of public debt on growth. This model is most appropriate for our analysis because (i) it extends existing methods as it has a built-in mechanism that allows the threshold variable and other covariates to be endogenous, and (ii) it does not require the more laborious, less efficient procedure of regressing suspected endogenous variables on their past values and resubstituting the resulting predicted values into the original model.

1 Introduction

Amid record-low interest rates and loose financial conditions across countries, total worldwide debt has risen to record-high levels of well over $260 trillion. This has been advanced, in large

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parts, by higher borrowing by governments and corporations. The outbreak of the COVID–19 pandemic has further worsened the elevated debt. The pandemic forced governments around the world to increase borrowing and central banks to engage in a barrage of bond-buying schemes to improve liquidity and limit the effect of the pandemic on the global economy and financial markets. According to the Institute of International Finance (IIF), the global debt-to-output ratio, at a staggeringly all-time high of over 322% in 2023, is set to continue growing given the rapid increase in debt-fueled government spending embarked upon in response to growth-destructive shocks observed in recent times.

By and large, this growing debt is a global phenomenon. Together with the recent turn of events, it has resurrected the importance of determining the short- and long-run economic growth impact of public debt around the world. Also, it has sparked debates among researchers and policymakers as to whether the accelerated debt trajectory is sustainable. In particular, the COVID–19 crisis and the massive sell-off in the commodities market—a perfect storm that has induced fiscal and monetary policy responses which have culminated in higher debt levels for governments—have revived the longstanding debate on the economic impact of public debt in a world that is fast morphing into a global village. Concerns regarding fiscal sustainability in vulnerable commodities-exporting developing countries and pandemic-ravaged advanced economies have grown, bringing to bear a primary concern that elevated debt levels might well be inimical to subsequent economic growth in the global economy. These concerns lend credence to the pressing call for a comprehensive study of the nonlinearities between debt and growth across a wide spectrum of countries globally. This paper addresses this need in the literature.

We perform a wide-ranging study that examines the short- and long-run impact of public debt on growth around the world. Our work contributes to the existing literature through its broader scope and deeper reach compared to existing studies, which have mostly focused on a few economic areas. Also, whilst true that previous studies have examined possible nonlinearities in the debt-growth nexus, we are not aware of a study that comprehensively examines the nonlinear effects of debt on growth for a large collection of countries globally and uses the newly developed threshold model of Seo and Shin (2016) to capture nonlinearities and address potential endogeneity of our threshold variable and covariate of focus, debt. This article fills these gaps in the literature.

In the empirical literature, studies on the debt-growth nexus have been receiving some attention over time, see for example Schclarek (2004), Reinhart and Rogoff (2010), Kumar and Woo (2010), Panizza and Presbitero (2014), and Puente-Ajovín and Sanso-Navarro (2015). A few of them perform some form of nonlinear impact analysis. For instance, in a study on the relationship between debt and growth in the euro area, Checherita-Westphal and Rother (2010) specify growth as an explicit quadratic function of debt in a sample of twelve euro area countries. They find evidence of a significant concave debt-growth relationship wherein there is a debt turning point of about 90–100% of GDP beyond which debt begins to depress growth. In a more recent study of large panels of countries, Eberhardt and Presbitero (2015) examine the debt-growth nexus, focusing on heterogeneity and nonlinearity. They model the potential nonlinearity within and across countries in the debt–growth relationship using novel methods that account for parameter heterogeneity and cross-section dependence. Their results support a negative relationship between debt and growth, based on different debt thresholds across countries. This finding enables them to advance their country-specific thresholds hypothesis.

Other studies in the literature have employed nonlinear panel threshold models. These include studies by Chang and Chiang (2009), Cecchetti et al. (2011), Baum et al. (2013) and Caner et al. (2021). Using yearly observations, Chang and Chiang (2009) examine a panel of 15 OECD countries for the period 1990–2004. They specify a generalized form of Hansen (1999) panel threshold model and find two threshold values of 32.3% and 66.25% for debt-to-GDP. By controlling for unemployment and gross fixed capital formation, they find that the impact of debt on growth is positive and significant in all three regimes, where the positive impact is highest in the middle regime and least in the two other regimes, leading them to reject the dampening effect of debt on growth even for higher debt levels. Extending the sample in Chang and Chiang (2009), Cecchetti et al. (2011) employ a panel of 18 OECD countries for the period 1980–2010 and obtain a single threshold of 85% for debt-to-GDP. Using this threshold, they find a negative impact of debt on growth for debt in the regime where debt-to-GDP is over 85%, in contrast to Chang and Chiang (2009), who document varying positive effects of debt on growth in all regimes.

Focusing on 12 countries in the euro area for the period 1990–2010, Baum et al. (2013) employ dynamic panel threshold models to investigate the nonlinear impact of public debt on growth. Using a dynamic threshold model in the spirit of Kremer et al. (2013), they report that the short-run impact of debt on growth is positive and highly significant but shrinks progressively and loses significance when the debt-to-GDP ratio exceeds 67%. They also find that for high debt-to-GDP ratios of above 95%, marginal increases in debt dampen economic activity. Their results are robust in both dynamic and non-dynamic threshold models. In a study examining how the interaction of government and private debt influences economic growth, Caner et al. (2021) analyze whether this interaction variable, which is also the threshold variable and considered endogenous, gives rise to nonlinear debt-growth relations. Using data from 29 OECD countries from 1995–2014, they find strong evidence of threshold effects between the interaction term and economic growth. The threshold effect turns negative and significant when it reaches the level of 137%; they argue that the effect potentially operates through the channels of household and public debt.

Perhaps closest to our work in methodology is Caner et al. (2021) since the study is based on the Seo and Shin (2016) threshold model that allows for threshold variables to be endogenous. Nonetheless, their work is limited to a panel of 29 OECD countries from 1995 to 2014 whereas our study is more extensive and covers a broader scope of countries globally, which gives rise to rich and broader policy implications with potential to stimulate interventions not just in a few panels of countries, but for a wider range of countries, allowing us to make a far-reaching contribution to the literature. Also, we contribute to the literature by examining the growth impact of debt in both the short run (based on annual growth) and long run (based on 5-year cumulative non-overlapping growth). Existing studies have mostly concentrated on either the short- or long-term growth impact of public debt, and not all studies have examined the short- and long-term growth impact of debt as is done in this paper. Thus, this constitutes another contribution to the literature.

Overall, the review of the empirical studies on the debt-growth nexus reveals three existing gaps and hence uncharted territories that need to be filled: (i) most previous studies have yet to embrace the dynamic panel threshold technique that addresses bias when the threshold may be endogenous; (ii) many emphasize either long-run or short-run effects, but not both; and (iii) there is a paucity of broad-based studies across a large set of countries. Our paper fills this void using a dynamic threshold approach with an endogenous threshold (debt) and a wide global panel.

2 An Illustrative Model

Here, we briefly sketch an overlapping generations (OLG) model of endogenous growth, showing how government debt as an expenditure-financing tool may impact growth under low- and high-debt regimes. The model follows Teles and Cesar Mussolini (2014) and draws on Barro (1990), Glomm and Ravikumar (1997), Adam and Bevan (2005), and Bräuninger (2005).

Consumers

Each cohort lives for two periods. At each $t = 0, 1, 2, \dots$ a unit mass of identical agents is born. Let $(c_t^t, c_{t+1}^t) > 0$ denote period-t and period-$(t+1)$ consumption of the cohort born at

t. Preferences are

$$u_t(c) = U(c_t^t) + \beta U(c_{t+1}^t) = \ln c_t^t + \beta \ln c_{t+1}^t, \quad 0 < \beta < 1.$$

The old at $t-1$ are endowed with k_0; subsequent generations have one unit of labor supplied at after-tax wage $(1-\tau)w_t$. The budget and saving relations are

$$\begin{aligned} c_t^t + s_t^t &\leq (1-\tau)w_t, \\ c_{t+1}^t &= (1+r_{t+1})\, s_t^t, \qquad s_t^t = k_{t+1} + d_{t+1}. \end{aligned} \tag{2.1}$$

Agents invest in physical capital k_{t+1} or government bonds d_{t+1} and take w_t, r_{t+1}, τ as given.

Firms

A representative firm produces

$$y_t = A\, e_t^{1-\alpha} k_t^{\alpha} \ell_t^{1-\alpha}, \qquad \ell_t = 1, \tag{2.2}$$

with productive government expenditures e_t. Let $e_t = x\, y_t$ with constant share x, then output is linear in k_t:

$$y_t = A^{1/\alpha}\, x^{(1-\alpha)/\alpha}\, k_t. \tag{2.3}$$

Government

Government spending comprises consumption $p_t = gy_t$ and productive $e_t = xy_t$, so $p_t + e_t = (g+x)y_t$. Revenues are τw_t. One-period debt d_t is issued at rate r_t; the budget dynamics are

$$d_{t+1} - d_t = (g+x)y_t + r_t d_t - \tau w_t, \tag{2.4}$$

the period-t deficit.

Borrowing need not exactly match the deficit. We distinguish regimes as

$$\begin{cases} 0 < d_{t+1} - d_t \leq (g+x)y_t + r_t d_t - \tau w_t, \\ d_{t+1} - d_t \leq 0 \leq (g+x)y_t + r_t d_t - \tau w_t, \\ d_{t+1} - d_t > (g+x)y_t + r_t d_t - \tau w_t > 0, \\ 0 \geq d_{t+1} - d_t > (g+x)y_t + r_t d_t - \tau w_t\ , \end{cases} \tag{2.5}$$

interpreted as low- vs. high-debt regimes.

Competitive equilibrium (sketch)

Given k_0, an equilibrium is sequences $\{w_t, r_t\}_{t=0}^{\infty}$ and $\{k_{t+1}, d_{t+1}, y_t, c_t^t, c_{t+1}^t, s_t^t\}_{t=0}^{\infty}$ such that households and firms optimize and markets clear. The household problem

$$\max \ln c_t^t + \beta \ln c_{t+1}^t \quad \text{s.t.} \quad c_t^t + s_t^t \le (1-\tau)w_t,\ c_{t+1}^t = (1+r_{t+1})s_t^t$$

yields, via the Lagrangian,

$$c_t^t = \frac{1-\tau}{1+\beta}w_t, \quad c_{t+1}^t = \frac{\beta(1+r_{t+1})(1-\tau)}{1+\beta}w_t, \quad s_t^t = \frac{\beta}{1+\beta}(1-\tau)w_t. \tag{2.6}$$

Firm FOCs imply

$$r_t = \alpha A^{1/\alpha} x^{(1-\alpha)/\alpha}, \qquad w_t = (1-\alpha)A^{1/\alpha}x^{(1-\alpha)/\alpha}\, k_t. \tag{2.7}$$

Debt regimes and growth

Collecting key relations,

$$\begin{cases} s_t^t = k_{t+1} + d_{t+1}, \qquad s_t^t = \dfrac{\beta}{1+\beta}(1-\tau)w_t, \\ d_{t+1} - d_t = (g+x)y_t + r_t d_t - \tau w_t, \\ y_t = A^{1/\alpha}x^{(1-\alpha)/\alpha}k_t, \\ r_t = \alpha A^{1/\alpha}x^{(1-\alpha)/\alpha}, \quad w_t = (1-\alpha)A^{1/\alpha}x^{(1-\alpha)/\alpha}k_t, \end{cases} \tag{2.8}$$

and letting the exogenous deficit ratio be γ with $(d_{t+1} - d_t)/y_t = \gamma$, we obtain

$$\tau = \frac{(g+x-\gamma) + \alpha\, d_t/k_t}{1-\alpha}, \qquad 1-\tau = \frac{(1-\alpha) - (g+x-\gamma) - \alpha\, d_t/k_t}{1-\alpha}. \tag{2.9}$$

Substituting into savings and dynamics,

$$\begin{aligned} k_{t+1} = {} & \frac{\beta}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha}k_t\Big[(1-\alpha) - (g+x-\gamma) - \alpha\,\frac{d_t}{k_t}\Big] \\ & - \gamma A^{1/\alpha}x^{(1-\alpha)/\alpha}k_t - d_t, \end{aligned} \tag{2.10}$$

so that

$$\frac{k_{t+1}-k_t}{k_t} = \frac{\beta}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha}\Big[(1-\alpha)-(g+x-\gamma)\Big] \\ -\gamma A^{1/\alpha}x^{(1-\alpha)/\alpha} - \left[\alpha\frac{\beta}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha}+1\right]\frac{d_t}{k_t}-1. \tag{2.11}$$

Since $y_{t+1}/y_t = k_{t+1}/k_t$, growth obeys

$$\frac{y_{t+1}-y_t}{y_t} = \frac{\beta}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha}\Big[(1-\alpha)-(g+x)\Big] \\ -\gamma\frac{1}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha} - \left[\alpha\frac{\beta}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha}+1\right]\frac{d_t}{k_t}-1. \tag{2.12}$$

Let $\delta = (g+x)+(r_t d_t - \tau w_t)/y_t$. Using the regime cases in (**??**), set $\gamma = \theta > 0$ (high debt) or $\gamma = -\theta \leq 0$ (low debt). Then

$$\frac{y_{t+1}-y_t}{y_t} = \begin{cases} \frac{\beta}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha}[(1-\alpha)-(g+x)] - \theta\frac{1}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha} \\ \quad -\left[\alpha\frac{\beta}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha}+1\right]\frac{d_t}{k_t}-1, & \gamma=\theta, \\ \frac{\beta}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha}[(1-\alpha)-(g+x)] + \theta\frac{1}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha} \\ \quad -\left[\alpha\frac{\beta}{1+\beta}A^{1/\alpha}x^{(1-\alpha)/\alpha}+1\right]\frac{d_t}{k_t}-1, & \gamma=-\theta\ . \end{cases} \tag{2.13}$$

3 Data and Structural Considerations

We estimate the model for a large collection of countries using yearly data from 1990 to 2023. The dependent variable is real GDP growth; the regime-dependent covariate and threshold variable is the debt-to-GDP ratio. In the benchmark specification we control for trade openness (imports + exports as % of GDP), population growth, the deposit interest rate, and gross fixed capital formation (% of GDP). Robustness tests include current account balance, unemployment, and an old-age dependency ratio.

Data are drawn primarily from the IMF *International Financial Statistics* and the World Bank. The resulting panel covers 81 countries across Africa (23), Europe (22), the Americas (18), and Asia (15). To assess stationarity we implement Levin–Lin–Chu tests; Table 1 reports statistics and p-values.

Table 1: Levin–Lin–Chu unit root tests

Variables	Africa	Europe	America	Asia	All
GDPgrowth	−8.2502 (0.0000)	−8.5237 (0.0000)	−7.2348 (0.0000)	−8.7107 (0.0000)	−16.5449 (0.0000)
DebttoGDP	−2.0082 (0.0223)	−3.4168 (0.0003)	−2.7701 (0.0028)	−1.8102 (0.0351)	−4.0427 (0.0000)
TRADE	−2.0315 (0.0211)	−3.0848 (0.0010)	−2.6865 (0.0036)	−1.4715 (0.0706)	−4.2141 (0.0000)
DINT	−3.6415 (0.0001)	−4.9470 (0.0000)	−4.2306 (0.0000)	−57.5560 (0.0000)	15.7107 (1.0000)
POP	−4.2942 (0.0000)	−1.8221 (0.0342)	−3.2334 (0.0006)	−6.4669 (0.0000)	−6.0761 (0.0000)
CAB	−4.0041 (0.0000)	−2.4283 (0.0076)	−4.2596 (0.0000)	−5.1292 (0.0000)	−7.5947 (0.0000)
GCF	−2.5076 (0.0061)	−3.5274 (0.0002)	−2.8223 (0.0024)	−3.5536 (0.0002)	−6.3228 (0.0000)
UNEMP	−0.9850 (0.1623)	−3.7502 (0.0001)	−2.3723 (0.0088)	−1.3058 (0.0958)	−4.9510 (0.0000)
OLD	0.2700 (0.6064)	−5.2478 (0.0000)	−1.6771 (0.0468)	3.0710 (0.9989)	5.5186 (1.0000)

4 Empirical Methodology

To model growth g_{it} with persistence and an endogenous threshold, we adopt the dynamic panel threshold model of Seo and Shin (2016):

$$g_{it} = \mu_i + \delta g_{i,t-1} + \boldsymbol{\alpha}'\boldsymbol{X}_{it} + \beta_1 d_{it}\,\mathbf{1}(q_{it} \le \gamma) + \beta_2 d_{it}\,\mathbf{1}(q_{it} > \gamma) + \varepsilon_{it}, \tag{3.1}$$

with $q_{it} = d_{it}$ the endogenous threshold variable, γ the threshold, and $\boldsymbol{X}_{it}$ controls (some possibly endogenous). First-differencing and GMM instrumentation (Arellano–Bond, 1991) address correlation with fixed effects and endogeneity:

$$\Delta g_{it} = \boldsymbol{\phi}'\Delta\boldsymbol{y}_{it} + \omega\boldsymbol{X}_{it}'\mathbf{1}_{it}(\gamma) + \Delta\varepsilon_{it}, \qquad \omega = \beta_2 - \beta_1. \tag{3.2}$$

Threshold effects are tested via a supremum Wald statistic

$$\sup W = \sup_{\gamma}\; n\,\widehat{\omega}(\gamma)'\,\widehat{\Sigma}(\gamma)^{-1}\,\widehat{\omega}(\gamma). \tag{3.3}$$

5 Estimation Results

Benchmark model (1990–2018)

For 1990–2018 the benchmark specification is:

$$y_{it} = \mu_i + \chi y_{i,t-1} + \alpha_1\mathrm{TRADE}_{i,t-1} + \alpha_2\mathrm{DINT}_{i,t-1} + \alpha_3\mathrm{POP}_{i,t-1} + \alpha_4\mathrm{GCF}_{i,t-1} + \beta_1 d_{i,t-1}\mathbf{1}(d_{i,t-1} \le d^*) + \beta_2 d_{i,t-1}\mathbf{1}($$

Table 2: Threshold regression results (1990–2018)

Variables	Africa	Europe	America	Asia	All
TRADE	0.00430 (0.00822)	0.0233** (0.00948)	0.0159 (0.0124)	0.0166*** (0.00632)	0.0208*** (0.00409)
DINT	−0.0445* (0.0232)	−0.138*** (0.0122)	−0.000598** (0.000250)	−0.0298*** (0.00508)	/
POP	0.344 (0.216)	−1.159*** (0.412)	0.355 (0.364)	0.0403 (0.160)	−0.0797 (0.123)
GCF	0.0270 (0.0234)	0.220*** (0.0439)	0.412*** (0.0487)	0.171*** (0.0264)	0.115*** (0.0157)
d_{t-1} if $d \leq d^*$	−0.00718 (0.00765)	−0.0225*** (0.00722)	0.0450** (0.0210)	0.159*** (0.0578)	0.0661*** (0.0238)
d_{t-1} if $d > d^*$	−0.0183*** (0.00452)	0.00478 (0.00491)	−0.00399 (0.00675)	−0.00844 (0.00892)	−0.0189*** (0.00257
Threshold estimate	127.8900	164.5000	27.3371	20.1000	18.7632
Constant	3.318*** (1.056)	−1.959 (1.280)	−7.693*** (1.416)	−1.611 (1.239)	0.0262 (0.547)

Notes: Standard errors in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 3: All regions, robustness (1990–2018)

	model 2018-2	model 2018-3	model 2018-4
TRADE	0.0198*** (0.00409)	0.0199*** (0.00409)	0.0192*** (0.00429)
POP	−0.0646 (0.122)	−0.0587 (0.122)	−0.0520 (0.123)
GCF	0.143*** (0.0172)	0.146*** (0.0176)	0.147*** (0.0177)
CAB	0.0606*** (0.0158)	0.0603*** (0.0158)	0.0600*** (0.0159)
UNEMP		0.0324 (0.0354)	0.0350 (0.0357)
OLD			0.0224 (0.0402)
d_{t-1} if $d \leq d^*$	0.0687*** (0.0237)	0.0680*** (0.0237)	0.0678*** (0.0237)
d_{t-1} if $d > d^*$	−0.0179*** (0.00257)	−0.0182*** (0.00259)	−0.0184*** (0.00262)
Threshold estimate	19.0835	19.0835	19.0835
Constant	−0.487 (0.561)	−0.824 (0.672)	−1.088 (0.822)

Notes: Standard errors in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Table 4: Regions, robustness (1990–2018)

	Africa_2018			Europe_2018			
VARIABLES	m2018-2	m2018-3	m2018-4	m2018-2	m2018-3	m2018-4	m2018-2
TRADE	0.00982 (0.00819)	0.00928 (0.00825)	0.00924 (0.00840)	0.0166* (0.00961)	0.0167* (0.00952)	0.0237** (0.0109)	0.00416 (0.0131)
DINT	−0.0437* (0.0229)	−0.0396 (0.0241)	−0.0396 (0.0243)	−0.142*** (0.0122)	−0.142*** (0.0121)	−0.146*** (0.0123)	−0.000664*** (0.00024
POP	0.385* (0.213)	0.386* (0.213)	0.385* (0.215)	−1.028** (0.410)	−0.673 (0.419)	−0.698* (0.419)	0.407 (0.362)
GCF	0.0543** (0.0238)	0.0525** (0.0240)	0.0525** (0.0241)	0.299*** (0.0494)	0.370*** (0.0529)	0.365*** (0.0530)	0.496*** (0.0573)
CAB	0.0938*** (0.0205)	0.0941*** (0.0205)	0.0940*** (0.0206)	0.167*** (0.0491)	0.181*** (0.0489)	0.189*** (0.0492)	0.113*** (0.0414)
UNEMP		−0.0345 (0.0647)	−0.0349 (0.0660)		0.231*** (0.0658)	0.210*** (0.0677)	
OLD			−0.00534 (0.179)			−0.109 (0.0822)	
d_{t-1} if $d \leq d^*$	−0.00283 (0.00760)	−0.00259 (0.00761)	−0.00254 (0.00780)	−0.0206*** (0.00718)	−0.0259*** (0.00727)	−0.0235*** (0.00749)	0.0450** (0.0210)
d_{t-1} if $d > d^*$	−0.0160*** (0.00448)	−0.0159*** (0.00448)	−0.0159*** (0.00450)	0.00589 (0.00488)	0.00509 (0.00484)	0.00499 (0.00484)	−0.00399 (0.00675)
Threshold estimate	127.8900	127.8900	127.8900	164.5000	164.5000	164.5000	27.3371
Constant	2.371** (1.060)	2.736** (1.262)	2.775 (1.832)	−3.283** (1.328)	−6.722*** (1.639)	−4.750** (2.209)	−7.693*** (1.416)

Including further explanatory variables

To test robustness we add current account balance (CAB), unemployment (UNEMP), and old-age dependency (OLD). Regional results (Table 4) and the all-region panel (Table 3) indicate coefficient magnitudes shift modestly, with significance patterns largely stable.

Including the years 2019–2023

We re-estimate including post-COVID years; Tables 5–6 summarize results.

Table 5: Model with 2019–2023 included (by region)

	Africa_2023			Europe_2023			
VARIABLES	m2023-2	m2023-3	m2023-4	m2023-2	m2023-3	m2023-4	m2023-2
TRADE	0.00653 (0.00776)	0.00610 (0.00782)	0.00615 (0.00785)	0.0140 (0.00894)	0.0148* (0.00885)	0.0236** (0.0101)	0.0381** (0.0152)
DINT	−0.0142 (0.0224)	−0.0107 (0.0236)	−0.0107 (0.0236)	−0.135*** (0.0122)	−0.136*** (0.0121)	−0.141*** (0.0124)	−0.0163 (0.0120)
POP	0.214 (0.217)	0.213 (0.217)	0.215 (0.220)	0.710*** (0.233)	0.890*** (0.235)	0.811*** (0.239)	0.217 (0.412)
GCF	0.0499** (0.0222)	0.0485** (0.0223)	0.0486** (0.0224)	0.209*** (0.0467)	0.282*** (0.0497)	0.274*** (0.0498)	0.420*** (0.0670)
CAB	0.0862*** (0.0190)	0.0863*** (0.0190)	0.0864*** (0.0190)	0.121** (0.0471)	0.143*** (0.0470)	0.152*** (0.0472)	0.0196 (0.0470)
UNEMP		−0.0285 (0.0590)	−0.0279 (0.0599)		0.237*** (0.0590)	0.197*** (0.0632)	
OLD			0.00802 (0.125)			−0.112* (0.0631)	
d_{t-1} if $d \leq d^*$	−0.0323*** (0.00594)	−0.0322*** (0.00594)	−0.0323*** (0.00594)	−0.0262*** (0.00668)	−0.0296*** (0.00666)	−0.0266*** (0.00686)	0.0484* (0.0258)
d_{t-1} if $d > d^*$	−0.0181*** (0.00428)	−0.0181*** (0.00428)	−0.0181*** (0.00430)	0.00299 (0.00482)	0.00165 (0.00478)	0.00219 (0.00478)	−0.00908 (0.00799)
Threshold estimate	155.2792	155.2792	155.2792	176.1278	176.1278	176.1278	27.4500
Constant	4.065*** (1.009)	4.371*** (1.192)	4.308*** (1.547)	−1.564 (1.202)	−5.112*** (1.482)	−2.970 (1.911)	−7.930*** (1.669)

Table 6: All regions with 2019–2023 included

	model 2023-2	model 2023-3	model 2023-4
TRADE	0.0221*** (0.00398)	0.0220*** (0.00399)	0.0238*** (0.00417)
POP	0.216** (0.105)	0.215** (0.106)	0.191* (0.107)
GCF	0.129*** (0.0164)	0.129*** (0.0168)	0.126*** (0.0169)
CAB	0.0486*** (0.0151)	0.0486*** (0.0151)	0.0491*** (0.0151)
UNEMP		−0.00477 (0.0336)	−0.0153 (0.0344)
OLD			−0.0437 (0.0308)
d_{t-1} if $d \leq d^*$	0.0756*** (0.0232)	0.0758*** (0.0233)	0.0763*** (0.0233)
d_{t-1} if $d > d^*$	−0.0186*** (0.00253)	−0.0186*** (0.00254)	−0.0179*** (0.00260)
Threshold estimate	18.7632	18.7632	18.7632
Constant	−0.901* (0.535)	−0.851 (0.642)	−0.295 (0.752)

Notes: Standard errors in parentheses. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Conclusion

This paper investigates the debt–growth relationship in 81 countries using a dynamic panel threshold model and explores post-pandemic differences. Thresholds vary markedly across regions; below thresholds additional debt tends to be growth-enhancing in the Americas, Asia, and globally, while above thresholds the marginal effect turns negative (significantly so for Africa and the all-country panel). Including 2019–2023 leaves broad patterns intact but shifts some coefficients and threshold levels, notably raising thresholds in Africa and Europe and altering sensitivity to controls in America and Asia.

References

- Adam, C.S., Bevan, D.L. (2005). Fiscal deficits and growth in developing countries. *Journal of Public Economics*, 89, 571–597. `https://doi.org/10.1016/j.jpubeco.2004.02.006`

- Arcand, J.-L., Berkes, E., Panizza, U. (2015). Too much finance? *Journal of Economic Growth*, 20, 105–148. `https://doi.org/10.1007/s10887-015-9115-2`

- Arellano, M., Bond, S. (1991). Some Tests of Specification for Panel Data. *Review of Economic Studies*, 58, 277–297.

- Badu Ochieng, J., Kiprop, S., Kalio, A., Gisore, M. (2014). External debt and economic growth in the East Africa community. *African Journal of Business Management*, 8, 1011–1018.

- Barro, R.J. (1990). Government Spending in a Simple Model of Endogenous Growth. *Journal of Political Economy*, 98, S103–S125.
- Baum, A., Checherita-Westphal, C., Rother, P. (2013). Debt and growth: New evidence for the euro area. *Journal of International Money and Finance*, 32, 809–821.
- Beetsma, R., Giuliodori, M., Klaassen, F. (2006). Trade spill-overs of fiscal policy in the European Union: a panel analysis. *Economic Policy*, 21, 640–687.
- Benetrix, A.S., Lane, P.R. (2013). Fiscal Shocks and the Real Exchange Rate. *International Journal of Central Banking*, 9, 6–37.
- Bräuninger, M. (2005). The Budget Deficit, Public Debt, and Endogenous Growth. *Journal of Public Economic Theory*, 7, 827–840.
- Caner, M., Fan, Q., Grennes, T. (2021). Partners in debt: An endogenous non-linear analysis of the effects of public and private debt on growth. *International Review of Economics & Finance*, 76, 694–711.
- Caner, M., Hansen, B.E. (2004). Instrumental variable estimation of a threshold model. *Econometric Theory*, 20, 813–843.
- Cecchetti, S.G., Mohanty, M.S., Zampolli, F. (2011). The Real Effects of Debt.
- Chang, T., Chiang, G. (2009). The Behavior of OECD Public Debt: A Panel Smooth Transition Regression Approach. *Empirical Economic Letters*, 8.
- Checherita-Westphal, C., Rother, P. (2010). The impact of high and growing government debt on economic growth: an empirical investigation for the euro area. ECB Working Paper 1237.
- Eberhardt, M., Presbitero, A.F. (2015). Public debt and growth: Heterogeneity and non-linearity. *Journal of International Economics*, 97, 45–58.
- Futagami, K., Morita, Y., Shibata, A. (1993). Dynamic Analysis of an Endogenous Growth Model with Public Capital. *Scandinavian Journal of Economics*, 95, 607–625.
- Glomm, G., Ravikumar, B. (1997). Productive government expenditures and long-run growth. *Journal of Economic Dynamics and Control*, 21, 183–204.
- Hansen, B.E. (1999). Threshold effects in non-dynamic panels. *Journal of Econometrics*, 93, 345–368.

- Hansen, B.E. (2000). Sample Splitting and Threshold Estimation. *Econometrica*, 68, 575–603.
- Kremer, S., Bick, A., Nautz, D. (2013). Inflation and growth: new evidence from a dynamic panel threshold analysis. *Empirical Economics*, 44, 861–878.
- Kumar, M., Woo, J. (2010). Public Debt and Growth.
- Lombardi, M.J., Mohanty, M.S., Shim, I. (2017). The Real Effects of Household Debt in the Short and Long Run.
- Mian, A., Sufi, A., Verner, E. (2017). Household Debt and Business Cycles Worldwide. *Quarterly Journal of Economics*, 132, 1755–1817.
- Nickell, S. (1981). Biases in Dynamic Models with Fixed Effects. *Econometrica*, 49, 1417–1426.
- Panizza, U., Presbitero, A.F. (2014). Public debt and economic growth: Is there a causal effect? *Journal of Macroeconomics*, 41, 21–41.
- Puente-Ajovín, M., Sanso-Navarro, M. (2015). Granger causality between debt and growth: Evidence from OECD countries. *International Review of Economics & Finance*, 35, 66–77.
- Ramey, V.A. (2011). Can Government Purchases Stimulate the Economy? *Journal of Economic Literature*, 49, 673–685.
- Reinhart, C.M., Rogoff, K.S. (2010). Growth in a Time of Debt. *American Economic Review*, 100, 573–578.
- Schclarek, A. (2004). Debt and Economic Growth in Developing and Industrial Countries. Working Paper 2005:34.
- Seo, M.H., Shin, Y. (2016). Dynamic panels with threshold effect and endogeneity. *Journal of Econometrics*, 195, 169–186.
- Teles, V.K., Cesar Mussolini, C. (2014). Public debt and the limits of fiscal policy to increase economic growth. *European Economic Review*, 66, 1–15.