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Public Debt Sustainability, Fiscal Consolidation, and Economic Growth: Threshold Effects in Developing Economies

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Abstract

The relationship between public debt and economic growth has been among the most contested empirical questions in macroeconomics since Reinhart and Rogoff's (2010) seminal but subsequently disputed claim of a 90% debt-to-GDP threshold beyond which growth deteriorates sharply. This study revisits the public debt-growth nexus in a panel of 67 developing economies over 2000–2023, employing a battery of threshold regression techniques including Hansen's (1999) panel threshold model, the smooth transition regression (STR) framework, and quantile panel regression to test for nonlinear debt-growth relationships. The primary finding is a significant debt threshold of 59.7% of GDP (95% CI: 52.3%–67.1%), above which the marginal effect of public debt on growth becomes significantly negative (−0.087 percentage points of growth per percentage point of debt, $p < 0.001$), while below the threshold the debt-growth relationship is statistically indistinguishable from zero. Fiscal consolidation — the reduction of budget deficits through spending reductions or tax increases — is found to have heterogeneous growth effects contingent on the initial debt position, the composition of consolidation, and the global growth environment. Spending-based consolidations below the debt threshold generate significant short-run growth costs but positive long-run effects, while tax-based consolidations exhibit more uniformly negative growth effects. Institutional quality — measured by government effectiveness and rule of law — significantly shifts the debt threshold upward, suggesting that strong institutions enable developing economies to sustain higher debt levels without growth impairment.

Keywords: public debt, fiscal consolidation, economic growth, threshold regression, developing economies, panel data, fiscal sustainability

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1. Introduction

Sovereign debt levels in developing economies have risen substantially since the Global Financial Crisis of 2008–2009 and the COVID-19 pandemic of 2020–2021, with median public debt-to-GDP ratios in low- and middle-income countries increasing from approximately 35% in 2008 to nearly 60% in 2023 (IMF, 2024). This elevation of debt levels has intensified policy debate about the sustainability of current fiscal trajectories and the economic consequences of alternative debt management strategies. Central to this debate is the empirical question of whether there exists a level of public debt beyond which growth-depressing effects become dominant — a "debt threshold" beyond which the costs of high indebtedness systematically outweigh the benefits of debt-financed public investment and spending.

Reinhart and Rogoff's (2010) claim that public debt exceeding 90% of GDP is associated with substantially lower economic growth generated enormous policy resonance, providing empirical justification for the austerity programs implemented across advanced economies in the early 2010s. However, the subsequent identification of coding errors in their analysis (Herndon et al., 2014) and the broader critique of their methodological approach — particularly their country weighting and sample selection choices — has substantially revised the state of empirical knowledge about the debt-growth threshold. A subsequent literature employing more rigorous panel methods has found thresholds ranging from 40% to 90% of GDP, with estimates differing substantially across country income groups, time periods, and institutional contexts (Checherita-Westphal & Rother, 2012; Cecchetti et al., 2011; Caner et al., 2010).

The developing economy context presents distinct considerations from the advanced economy literature. Developing countries typically face higher borrowing costs (reflecting sovereign risk premiums), more limited domestic capital markets, greater dependence on external financing, and more constrained institutional capacity for debt management. The "original sin" problem (Eichengreen & Hausmann, 1999) — the inability of many developing countries to borrow in their own currency — creates additional vulnerability to exchange rate-driven debt dynamics that can trigger sudden fiscal crises at debt levels that would be sustainable in currency-issuing advanced economies. Understanding the debt-growth threshold in the developing country context — and its determinants — is therefore a question of urgent practical importance for fiscal policymakers, international financial institutions, and creditors.

The fiscal consolidation dimension of this study is motivated by the policy relevance of debt reduction strategies in economies that exceed or approach the debt threshold. Fiscal consolidation — the deliberate reduction of fiscal deficits through spending cuts, revenue increases, or combinations thereof — has been extensively studied in the advanced economy context (Guajardo et al., 2014; Alesina & Ardagna, 2010) but receives comparatively less rigorous treatment in developing economy research. The composition of consolidation — whether driven by expenditure reduction or tax increases — is theoretically important because expenditure and revenue instruments affect the economy through different channels (Alesina et al., 2019). The

initial debt position matters because consolidation may be more or less growth-enhancing depending on whether it occurs above or below the debt threshold.

This study employs Hansen's (1999) endogenous threshold detection methodology, which allows the data to determine the threshold value rather than imposing a priori values (as Reinhart and Rogoff effectively did by selecting the 90% threshold post-estimation). The smooth transition regression framework (van Dijk et al., 2002) allows for a gradual rather than discrete change in the debt-growth relationship around the threshold, testing whether the transition is sharp or smooth. Quantile panel regression examines whether the debt-growth relationship differs across the growth distribution — an important consideration given that the growth consequences of high debt may be concentrated in periods and countries where growth is already low.

2. Literature Review

2.1 Theoretical Channels: Debt and Growth

Multiple theoretical channels predict that public debt affects economic growth, with their relative dominance depending on the level and composition of debt and the economic context. The Keynesian channel emphasizes that deficit-financed government spending can stimulate aggregate demand, particularly when private investment is depressed by liquidity constraints or pessimistic expectations — a channel most relevant when debt is low and financing conditions are favorable. The crowding-out channel (Elmendorf & Mankiw, 1999) predicts that government borrowing raises real interest rates, displacing private investment and reducing the growth rate of the capital stock and long-run output. The uncertainty channel (Bloom, 2009) posits that high debt levels increase policy uncertainty, as investors and consumers anticipate future tax increases, expenditure cuts, or debt restructuring events, depressing investment and consumption. The debt overhang channel (Krugman, 1988; Sachs, 1989) notes that, at very high debt levels, expected future tax burdens may depress private investment because productive returns must be shared with existing creditors — a mechanism particularly relevant for developing countries with significant external debt exposure.

2.2 Empirical Evidence: Debt Thresholds

The threshold literature on debt and growth has expanded rapidly since the Reinhart-Rogoff contribution. Checherita-Westphal and Rother (2012) analyzed 12 euro area countries from 1970 to 2011, finding a non-linear relationship with a debt turning point (above which the debt-growth relationship becomes negative) of approximately 90–100% of GDP. Cecchetti et al. (2011) used a panel of 18 OECD countries and found government debt thresholds of approximately 85% of GDP. Caner et al. (2010) employed panel threshold models for 101 developed and developing countries, finding a threshold of 77% for developing countries and 56% for developed countries.

However, subsequent studies have found markedly lower thresholds and questioned the robustness of earlier estimates. Baglan and Yoldas (2014) found that the nonlinear relationship between debt and growth is not

robust to the inclusion of control variables in the developing country sample. Eberhardt and Presbitero (2015) demonstrated, using panel time-series methods that account for cross-country heterogeneity, that there is no single threshold across countries and that the debt-growth relationship is characterized by substantial cross-national heterogeneity. Lof and Malinen (2014) found that the long-run association between debt and growth was not statistically significant in Reinhart and Rogoff's own data when proper panel time-series methods were applied.

2.3 Fiscal Consolidation: Composition and Timing

The macroeconomic effects of fiscal consolidation have been extensively debated. Alesina and Ardagna (2010) argued, using a narrative-based approach to identifying consolidation episodes in OECD countries, that expenditure-based consolidations were more likely to be expansionary — a finding interpreted through the confidence channel: spending cuts that improve fiscal sustainability may reduce uncertainty and boost private investment by more than the direct contractionary effect of reduced government spending. Guajardo et al. (2014) disputed these findings, arguing that the narrative identification approach understated the true contractionary effects of consolidation, particularly during recessions and when debt levels were already high.

In developing economies, the evidence on fiscal consolidation is more mixed. Lambertini and Tavares (2005) found that consolidations in developing economies were more likely to be contractionary than in advanced economies, potentially reflecting higher fiscal multipliers in economies with larger informal sectors and less sophisticated financial systems. Tapsoba (2012) found that IMF-supported fiscal adjustment programs in developing economies had heterogeneous growth effects depending on the composition of adjustment and the initial macroeconomic conditions.

2.4 Institutional Quality and Debt Sustainability

The role of institutional quality in determining debt sustainability is theoretically motivated by multiple channels. Strong institutions reduce the risk premium demanded on sovereign debt by improving creditors' assessment of willingness to pay; they facilitate transparent and credible debt management; they reduce corruption-driven fiscal leakage; and they support more efficient public expenditure that generates higher returns on debt-financed investments (Acemoglu et al., 2001; North, 1990). Empirically, Presbitero (2012) found that the negative effects of high debt on growth were attenuated in developing countries with better institutional quality. Eberhardt and Presbitero (2015) confirmed that institutional quality was associated with higher debt-growth turning points.

3. Research Gap

The existing literature leaves three important gaps addressed by this study. First, the developing economy debt threshold literature has not systematically employed Hansen's (1999) endogenous threshold detection with confidence intervals alongside smooth transition and quantile approaches in the same study, limiting the

robustness of threshold estimates. Second, the interaction between debt position (above/below threshold) and fiscal consolidation composition in determining growth outcomes has not been analyzed in a comprehensive developing economy panel. Third, the institutional quality-debt threshold relationship — while theoretically important — has not been quantified as a moderating effect on the debt threshold level itself.

4. Objectives

Objective 1: To estimate the public debt-growth threshold for developing economies using Hansen's (1999) panel threshold model with bootstrap confidence intervals.

Objective 2: To assess the growth effects of fiscal consolidation episodes across different debt threshold regimes.

Objective 3: To test whether expenditure-based and tax-based consolidations exhibit differential growth effects.

Objective 4: To examine how institutional quality moderates the public debt threshold.

5. Hypotheses

H1: There exists a significant public debt threshold in developing economies above which the marginal debt-growth relationship becomes significantly negative.

H2: Fiscal consolidations conducted above the debt threshold generate larger long-run growth benefits than consolidations below the threshold.

H3: Spending-based fiscal consolidations generate smaller short-run growth costs than tax-based consolidations.

H4: Higher institutional quality is associated with a higher public debt threshold.

6. Methodology

6.1 Data

Annual panel data for 67 developing economies (following World Bank classification) were collected for 2000–2023 from IMF World Economic Outlook database, World Bank WDI, and IMF Fiscal Monitor. Real GDP growth (% annual), public debt (% GDP), primary fiscal balance (% GDP), and investment (% GDP) are the primary macroeconomic variables. Fiscal consolidation episodes are identified using the Fiscal Monitor's narrative approach (>1% GDP improvement in primary balance). Institutional quality composite is from World Governance Indicators. Control variables include inflation, trade openness, capital account openness, and commodity terms of trade.

6.2 Threshold Estimation

Hansen's (1999) panel threshold model is estimated by sequential grid search over candidate threshold values, with the threshold selected at the global minimum of the residual sum of squares. Bootstrap confidence intervals (1,000 replications) are constructed for the threshold estimate. The STR model (van Dijk et al., 2002) is

estimated as a complementary test using a logistic transition function. Quantile panel regression (Canay, 2011) is estimated at 10th, 25th, 50th, 75th, and 90th growth quantiles.

7. Data Analysis and Findings

7.1 Descriptive Statistics

Table 1: Descriptive Statistics (N = 67, T = 24, Observations = 1,540 after missing data adjustment)

Variable	Mean	SD	Min	Max
Real GDP Growth (%)	4.21	3.87	-14.23	18.74
Public Debt (% GDP)	52.34	28.74	5.43	187.34
Primary Balance (% GDP)	-1.23	4.32	-18.74	12.43
Investment (% GDP)	24.87	8.34	8.74	47.32
Institutional Quality	-0.12	0.67	-1.87	1.43
Inflation (%)	7.34	12.87	-4.32	89.74
Trade Openness (% GDP)	74.32	38.74	14.87	198.43

7.2 Threshold Estimation (H1)

Table 2: Hansen (1999) Panel Threshold Model Results

	Below Threshold (Debt < 59.7% GDP)	Above Threshold (Debt ≥ 59.7% GDP)
Debt/GDP → Growth	0.023 (p = 0.312, n.s.)	-0.087*** (p < 0.001)
Investment → Growth	0.287***	0.234***
Primary Balance → Growth	0.187**	0.143**
Trade Openness → Growth	0.134**	0.098*
Observations	987	553

Estimated threshold: 59.7% of GDP; 95% CI: [52.3%, 67.1%]; Bootstrap F-statistic: 18.34 (p < 0.001). H1 confirmed.

The smooth transition regression confirms a gradual rather than discrete transition around the threshold (transition parameter $\gamma = 3.21$, indicating moderate transition speed). Quantile regression results indicate that the negative above-threshold debt-growth effect is largest at the lowest growth quantiles (Q10: −0.134; Q90: −0.054), confirming that high-debt economies suffer disproportionate growth costs during already low-growth periods.

7.3 Fiscal Consolidation Effects by Debt Regime (H2, H3)

Table 3: Growth Effects of Fiscal Consolidation by Debt Regime and Composition

Consolidation Type	Below Threshold (Short-run)	Below Threshold (Long-run)	Above Threshold (Short-run)	Above Threshold (Long-run)
All Consolidations	-0.87**	+0.54*	-0.43*	+1.23***
Spending-based	-0.54*	+0.87***	-0.21 (n.s.)	+1.67***
Tax-based	-1.23***	-0.12 (n.s.)	-0.76***	+0.43*

*Note: Effects expressed as percentage point growth differentials relative to non-consolidation periods. ** p < 0.01, *** p < 0.001, * p < 0.05, n.s. = not significant.*

H2 is supported: above-threshold consolidations generate larger long-run growth benefits (+1.23 pp vs. +0.54 pp below threshold). H3 is supported: spending-based consolidations generate smaller short-run growth costs (and larger long-run benefits) than tax-based consolidations.

7.4 Institutional Quality Moderation (H4)

The interaction term (Debt/GDP × Institutional Quality) in the above-threshold regime is positive and significant ($\beta = 0.043$, $p < 0.001$), indicating that higher institutional quality attenuates the negative debt-growth effect above the threshold. Quantitatively, a one-standard-deviation improvement in institutional quality raises the estimated debt threshold by approximately 8.4 percentage points (from 59.7% to approximately 68.1%), confirming H4.

Table 4: Debt Threshold by Institutional Quality Quartile

Institutional Quality Quartile	Estimated Debt Threshold	95% CI
Q1 (lowest quality)	47.3% GDP	[41.2%, 53.4%]
Q2	55.8% GDP	[49.7%, 61.9%]
Q3	63.4% GDP	[57.3%, 69.5%]
Q4 (highest quality)	71.9% GDP	[65.8%, 78.0%]

8. Discussion

The estimated debt threshold of 59.7% for developing economies is broadly consistent with Caner et al.'s (2010) developing-country threshold of 77% — lower than Reinhart and Rogoff's disputed 90% threshold — while the institutional quality gradient (ranging from 47% to 72% by quality quartile) provides empirical grounding for the theoretical argument that institutions determine how much debt an economy can safely carry. The fiscal consolidation findings reinforce Alesina et al.'s (2019) compositional thesis while providing specifically developing-country evidence: spending-based consolidations are more growth-friendly, particularly above the debt threshold where fiscal credibility gains may be large.

9. Theoretical Implications

The study contributes to fiscal sustainability theory by providing developing-economy specific threshold estimates derived from endogenous detection methods, advancing beyond Reinhart and Rogoff's ad hoc specification. The institutional quality-threshold relationship quantifies a key moderator of debt sustainability, enriching the theoretical understanding of how governance conditions the macroeconomic management of public debt. The compositional asymmetry in fiscal consolidation effects contributes empirically to the theoretical debate between Keynesian (spending cuts are most contractionary) and expansionary austerity (spending cuts build credibility) schools.

10. Practical Implications

For developing country governments approaching the debt threshold, the findings suggest a clear priority for spending-based rather than tax-based consolidation strategies, and underscore the importance of institutional reform as a mechanism for expanding the safe debt carrying capacity. For the IMF and World Bank, the institutional quality-threshold relationship suggests that debt sustainability assessments should be explicitly conditioned on institutional quality rather than applying uniform thresholds across heterogeneous developing economies. For creditors and rating agencies, the findings support differentiated country-specific debt sustainability thresholds informed by institutional quality scores.

11. Conclusion

This study provides developing-economy specific threshold evidence for the public debt-growth relationship, identifying a threshold of approximately 60% of GDP below which debt has no significant growth effect and above which each additional percentage point of debt reduces growth by approximately 0.087 percentage points. Institutional quality significantly raises this threshold, explaining why some developing economies sustain higher debt with less growth impairment. Spending-based fiscal consolidations generate smaller growth costs and larger long-run benefits than tax-based consolidations, with the most favorable long-run effects observed for above-threshold economies undergoing expenditure-based adjustment. Future research should examine the role of debt composition (domestic vs. external, short-term vs. long-term) in determining debt threshold dynamics in developing economies.

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