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POLICY BRIEF

Public Debt and Economic Growth in the United States: Channels, Thresholds, and the Role of Monetary Policy Absorption

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Using quarterly US data from 1975 through 2025, this paper investigates whether rising public debt harms economic growth and, if so, through which channels. Much recent empirical work has found that debt does not harm growth, because a simple regression of GDP growth on debt finds no statistically significant effect. But this paper demonstrates that the null finding is misleading: It arises from two offsetting forces operating simultaneously, and from the Federal Reserve's (Fed's) balance sheet suppressing the primary transmission mechanism during the period when debt was highest.

Three core findings emerge:

1. Debt damages growth through reduced capital accumulation. A higher debt-to-GDP ratio (debt/GDP) reduces the annual growth rate of the private nonresidential capital stock by approximately 0.12–0.15 percentage points for every percentage point increase in debt/GDP. This capital stock growth, in turn, is a statistically robust predictor of GDP growth ($p = 0.008$). The complete indirect channel—debt → capital stock growth → GDP growth—produces a confirmed negative indirect effect of approximately −0.04 percentage points of GDP growth for every percentage point increase of debt/GDP. A bootstrap confidence interval with 2,000 draws lies entirely below zero, indicating that this negative effect is statistically significant.

2. The Federal Reserve's Treasury holdings suppress the interest rate transmission mechanism, but only above a quantifiable threshold. When the Federal Reserve holds fewer than 13.7 percent of outstanding Treasurys (the pre–quantitative easing baseline), higher debt raises real yields, crowding out private borrowing in the conventional manner. Once the Fed's portfolio share exceeds 13.7 percent, the relationship inverts: Additional debt no longer raises yields and may even reduce them. This threshold was crossed during both the post-2008 and post-2020

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quantitative easing (QE) episodes, which explains why the rate channel appeared inoperative precisely when debt was rising fastest.

3. The total debt-growth effect is obscured by a short-run demand offset. Debt-financed government spending contributes directly to measured GDP in the short run, generating an offsetting positive effect that nearly cancels the negative supply-side channel in total-effect regressions. Distinguishing these pathways is essential for policy analysis.

These findings have direct implications for fiscal sustainability debates. The absence of a detectable total effect in simple regressions should not be interpreted as evidence that debt levels are inconsequential. The damage accumulates through the capital stock over years and is masked during periods of unconventional monetary policy. Fiscal projections and debt-sustainability analyses should separate short-run demand effects from long-run capital formation costs.

1. Introduction

The United States federal debt held by the public reached approximately 100 percent of GDP in 2024, a level not sustained since the immediate post–World War II period. Policymakers, budget analysts, and economists hold sharply divergent views on whether this debt level matters for long-run economic growth. One camp, drawing on the foundational work of Harvard economists Carmen Reinhart and Kenneth Rogoff and subsequent cross-country research, argues that high and rising public debt ratios are associated with meaningfully lower growth.[1] A second camp, bolstered by historically low interest rates during the post-2008 fiscal expansion, argues that the cost of public borrowing has been moderated, in part by monetary policy, and that fiscal space remains ample.[2]

This disagreement persists in part because the empirical literature is divided on methodology. Cross-country panel studies suffer from reverse causality (slow growth raises debt ratios mechanically), parameter heterogeneity across countries, and identification challenges. Time-series studies using US data alone have generally found weak or insignificant total effects, lending support to those who take a more lenient view of high debt/GDP. But total-effect regressions answer the wrong question. If the negative effect of debt operates through a specific channel—say, the crowding-out of private capital formation—but is offset by a positive demand-side effect of debt-financed spending in the same regression, the two forces cancel and the coefficient is biased toward zero.

Using quarterly US data spanning 1975 through 2025, this paper takes a channel-based approach to the debt-growth question. Rather than asking whether debt reduces growth in a single reduced-form regression, I ask: (1) does debt suppress private capital accumulation, (2) does capital accumulation predict growth, and (3) does the Federal Reserve's balance sheet moderate the conventional

interest-rate-transmission channel? The answers to all three questions are empirically tractable and provide a more complete and policy-relevant picture than the aggregate literature.[3]

The remainder of the paper proceeds as follows. Section 2 describes the data. Section 3 presents the baseline total-effect results and explains why they are misleading. Section 4 traces the capital accumulation channel. Section 5 examines the role of Federal Reserve Treasury holdings in moderating the interest-rate-transmission channel. Section 6 discusses policy implications. Section 7 concludes.

2. Data

The primary dataset consists of 203 quarterly observations covering 1975 Q1 through 2025 Q4 for the United States. Key variables include the following:

- **Real GDP growth** (quarter-over-quarter, annualized, percent), sourced from the Bureau of Economic Analysis (BEA)
- **Federal debt held by the public as a share of GDP** (percent), from the Congressional Budget Office (CBO) and Federal Reserve Economic Data
- **Private nonresidential fixed investment as a share of GDP** (percent), from the BEA
- **Current-cost net stock of private nonresidential structures** (billions of current dollars, annual), from the BEA Fixed Assets accounts, interpolated to quarterly frequency using the Denton–Cholette proportional method with quarterly investment as the indicator series
- **10-year Treasury yield** and **CPI inflation**, used to construct the ex post real yield
- **Unemployment rate**, from the Bureau of Labor Statistics
- **Primary deficit as a share of GDP**, from the CBO
- **Federal funds rate**, as the baseline monetary policy indicator
- **Foreign holdings of US Treasury securities as a share of the total outstanding**, from the Treasury International Capital System—a control for external demand for Treasurys that suppresses yields independently of the Fed's policy stance
- **Fed holdings of Treasury securities as a share of the total outstanding** (2003 Q1 onward), constructed from the Federal Reserve H.4.1 statistical release—the key QE-absorption control introduced in this paper

Debt ratios and monetary policy variables enter regressions with lags of one, four, and eight quarters to allow time for transmission and to mitigate reverse causality from short-run growth fluctuations to the measured debt ratio.

3. The Total-Effect Puzzle: Why Simple Regressions Find Nothing

The starting point for any debt-growth analysis is the most straightforward specification: regress real GDP growth on lagged debt/GDP, controlling for inflation, unemployment, lagged growth, and investment. Across lag lengths of one, four, and eight quarters, this baseline regression consistently yields statistically insignificant coefficients on debt, with point estimates near zero or positive.

This null result is not unique to my data. It replicates the finding of numerous studies using US time-series data and has led some analysts to conclude that the debt-growth relationship is either absent or economically trivial.[4] I argue that this interpretation is incorrect and that the null result arises from three concurrent forces:

1. Reverse causality compresses the signal. GDP growth automatically reduces the debt ratio in the short run (the denominator rises), creating a mechanical negative correlation between growth and contemporaneous changes in debt/GDP. Lagging debt mitigates but does not eliminate this problem. Granger causality tests find stronger evidence that growth predicts future debt than that debt predicts future growth, consistent with short-run fiscal stabilizers dominating the sample.
2. Unconventional monetary policy severed the transmission mechanism. The conventional theory of debt's harm runs through interest rates: Higher debt raises borrowing costs, which crowds out private investment.[5] This channel requires that debt accumulation actually raise real yields. But for most of the post-2008 period, precisely when the debt ratio was rising most rapidly, the Federal Reserve was purchasing Treasury securities at a pace that more than offset the upward pressure on yields. Section 5 quantifies this suppression exactly.
3. Demand-side and supply-side effects offset each other. Debt-financed government spending contributes directly to GDP in the short run. Over longer horizons, the tax or inflation risk associated with that debt suppresses private capital formation. In a single total-effect regression, the positive short-run Keynesian effect and the negative long-run crowding-out effect appear in the same coefficient, producing a near-zero net result. The appropriate analysis separates these pathways.

The autoregressive distributed lag (ARDL) long-run multiplier illustrates the subsample heterogeneity concealed in the full-sample estimate. Across the full 1975–2025 period, the long-run multiplier of debt on growth is approximately −0.08. Estimated on pre–Global Financial Crisis data (through 2007), it is +0.08, consistent with a period when debt was low and primarily cyclical. Estimated on post-GFC data, it is −0.02, reflecting a period when the mix of debt, monetary conditions, and growth dynamics shifted structurally.

This structural shift reflects an era of "secular stagnation," characterized by a chronic excess of savings over investment and a zero-lower-bound environment where the traditional relationship

between debt, interest rates, and growth was fundamentally altered.[6] The full-sample average of these two subperiods conceals the sign change entirely.

4. The Capital Accumulation Channel

4.1 Path A: Debt suppresses capital stock growth

The first link in the crowding-out chain is the relationship between public debt and private capital formation.[7] Prior analyses using quarterly investment flows (investment/GDP) find a statistically weak relationship that becomes significant only after controlling for monetary policy and foreign demand for Treasurys. Substituting the annual growth rate of the private nonresidential capital stock, a stock measure that accumulates the multiyear effect of investment decisions, substantially strengthens this finding.

The progression across specifications in table 1 is informative. Without monetary policy controls, path A is marginally significant ($p = 0.080$). Adding the Fed Funds Rate (FFR) and foreign Treasury demand strengthens it ($p = 0.016$). Substituting the Federal Reserve's share of Treasury holdings as the monetary policy control produces the largest and most significant estimate ($\beta = -0.034$, $p = 0.001$), and this holds even when the Fed share is imputed for the pre-2003 period ($\beta = -0.026$, $p < 0.001$).

The improvement over FFR-based controls reflects the zero-lower-bound problem: From 2009 through 2015 and again from 2020 through 2022, the FFR was constrained at or near zero, providing no variation with which to identify the rate-suppression effect. The Fed's balance sheet, by contrast, continued to vary substantially through asset purchases and was the operative monetary policy instrument during precisely those high-debt years.

While table 1 shows that higher debt is associated with lower private investment flows (investment/GDP), this measure is inherently volatile and may not fully capture the cumulative effect on capital formation. To address this, I next examine the impact of debt on the growth rate of the private capital stock, which reflects the net result of investment over time.

TABLE 1. Path A: Effect of debt/GDP on private investment/GDP (4-quarter lag, Newey–West standard errors)

SPECIFICATION	β (DEBT/GDP → INV/GDP)	STANDARD ERRORS	*p*-VALUE
Baseline (no monetary controls)	−0.0115	0.0066	0.080
+ Fed Funds Rate + Foreign Share	−0.0151	0.0062	0.016
+ Fed Treasury Share, post-2003 sample (N=92)	−0.0341	0.0096	0.001
+ Fed Treasury Share, full sample (imputed)	−0.0256	0.0067	0.000

Source: Author's estimates using the data described in section 2.

4.2 Path B: Capital stock growth predicts GDP growth

The second link in the chain is the relationship between private capital accumulation and GDP growth. Here the choice of capital measure is decisive. As table 2 shows, quarterly investment flows (investment/GDP) bear no statistically significant relationship to GDP growth when debt and macro controls are included ($\beta = 0.22$, $p = 0.70$). The annual growth rate of the capital stock, by contrast, is a strong and robust predictor ($\beta = 0.48$, $p = 0.008$).

This difference is not surprising in retrospect. Capital goods depreciate and compound over years; a factory built this quarter contributes to the productivity of future quarters, not necessarily the current one. The quarterly investment flow measure is dominated by noise, volatile purchases that reverse within the sample window, while the capital stock measure filters out this noise by accumulating net investment over the asset's lifetime.

The effect of debt on the capital *stock* growth rate is even more pronounced. Controlling for real yields, inflation, unemployment, growth, and monetary policy, table 3 below shows that a one-percentage-point increase in debt/GDP is associated with a 0.12–0.15 percentage point decline in annual capital stock growth ($p < 0.0001$ across lag specifications). An ARDL bounds test confirms that this relationship is a long-run equilibrium, not a transitory cyclical correlation ($F = 4.27$, $p = 0.023$); the estimated long-run multiplier is −0.147.[8]

TABLE 2. Path B: Effect of capital variable on real GDP growth (Newey–West standard errors)

CAPITAL MEASURE	β	STANDARD ERRORS	*p*-VALUE
Capital stock growth (annual, %)	0.4816	0.1799	0.0081
Investment/GDP (quarterly flow, %)	0.2249	0.5846	0.7009

Source: Author's estimates using the data described in section 2.

TABLE 3. Effect of debt/GDP on annual capital stock growth (%, Newey–West standard errors)

DEBT LAG	SPECIFICATION	β (DEBT/GDP → CAPITAL STOCK GROWTH)	STANDARD ERRORS	*p*-VALUE
1 quarter	Baseline	−0.0567	0.0332	0.089
4 quarters	Baseline	−0.0623	0.0320	0.053
8 quarters	Baseline	−0.0776	0.0293	0.009
1 quarter	Full Controls	−0.1191	0.0256	0.000
4 quarters	Full Controls	−0.1244	0.0264	0.000
8 quarters	Full Controls	−0.1469	0.0273	0.000

Source: Author's estimates using the data described in section 2.

4.3 The complete channel: Mediation analysis

Combining paths A and B, the indirect effect of debt on growth through capital accumulation is

$$\text{Indirect effect} = \text{Path A} \times \text{Path B} = (-0.071) \times (0.583) = -0.041$$

This indirect effect is statistically significant (Sobel $z = -2.23$, $p = 0.026$) and is confirmed by a nonparametric bootstrap with 2,000 replications: The bias-corrected accelerated (BCa) 95 percent confidence interval is [−0.095, −0.003], lying entirely below zero.

Table 4 reveals the suppressor structure that produces the null total-effect finding. The total effect of debt on growth is small and insignificant (+0.011, $p = 0.64$). However, this aggregate combines a negative indirect effect (−0.041, operating through capital accumulation) with a positive direct effect. Using the mediation identity (Total = Direct + Indirect), the implied direct effect is

$$0.011 - (-0.041) = +0.052$$

In other words, the total effect is the net of these two components:

$$0.052 + (-0.041) = 0.011$$

This positive direct effect likely reflects the Keynesian demand channel: Debt-financed expenditure raises short-run GDP mechanically. The supply-side damage accumulates over years through the capital stock and cannot be detected in a simple contemporaneous regression.

The implication is that policymakers who rely on total-effect regressions to conclude debt is harmless are conflating a short-run aggregate demand benefit with the absence of a long-run structural cost. The two are not the same.

Over longer horizons, the positive short-run demand effect fades as the spending dissipates or projects complete. The capital drag, however, is persistent, and the ARDL confirmed it as a

TABLE 4. Baron–Kenny mediation: Debt → capital stock growth → GDP growth (4-quarter lag, full controls)

PATH	ESTIMATE	STANDARD ERRORS	*p*-VALUE
Path A: Debt/GDP → Capital Stock Growth	−0.071	0.026	0.007
Path B: Capital Stock Growth → GDP Growth	+0.583	0.152	0.000
Total effect: Debt/GDP → GDP Growth (direct)	+0.011	n.s.	0.640
Indirect effect: A × B (via capital accumulation)	−0.041	0.019	0.026
Bootstrap BCa 95% CI (indirect)	[−0.095, −0.003]		

Note: BCa 95% CI = bias-corrected accelerated confidence interval of 95 percent. *Source:* Author's estimates using the data described in section 2.

long-run cointegrating relationship, meaning it does not revert. At this horizon, there is a roughly −0.041 percentage point drag on GDP growth for every percentage point increase in debt/GDP, with the demand offset largely gone. The ARDL long-run multiplier for debt on capital stock growth effectively doubles at the long-term horizon, leading to a persistent annual growth penalty of almost 0.09 percentage points for every percentage point increase in the public debt ratio.

4.4 Regime analysis

An important robustness check stratifies observations by the prevailing debt regime. Restricting to the low-debt era (debt/GDP below 50 percent, covering the bulk of the pre-1990s sample, $N = 138$), the effect of debt on capital stock growth is −0.158 ($p = 0.0002$). This low-debt-era estimate is the cleanest: It predates large-scale Fed balance sheet intervention, predates structural foreign demand for Treasurys as a reserve asset, and covers a period when the fiscal-monetary nexus was more conventional.

The medium-debt regime (50–80 percent, $N = 43$) produces a sign reversal that is concentrated in the 2008–2015 transition—an economically idiosyncratic period combining postrecession fiscal stimulus, zero interest rates, and a partial recovery in business investment. I do not interpret this reversal as evidence that moderate debt levels stimulate capital formation; the sample is too small and the period too confounded by extraordinary monetary accommodation.

5. The Federal Reserve as a Moderating Force: Quantifying the QE Threshold

The conventional transmission mechanism from debt to growth runs through real interest rates.[9] Higher public borrowing increases the demand for loanable funds, pushing up yields, raising the cost of private capital, and reducing investment. This paper introduces a novel test of when and whether this mechanism operates, using the Fed's share of outstanding Treasury securities as a direct measure of balance sheet absorption.

The interaction model estimates:

$$\text{Real Yield} = \alpha + \beta_1 \cdot \text{Debt} + \beta_2 \cdot \text{FedShare} + \beta_3 \cdot (\text{Debt} \times \text{FedShare}) + \text{controls}$$

The estimated interaction coefficient is −0.0091 ($p = 0.003$), implying that each additional percentage point of Fed Treasury holdings reduces the debt-yield sensitivity by 0.009 basis points per unit of debt/GDP. More usefully, this yields a break-even threshold:

$$\text{Break-even FedShare} = -\beta_1 / \beta_3 = -0.125 / (-0.0091) \approx 13.7\%$$

Table 5 illustrates the practical significance of this threshold. At a Fed portfolio share of 5 percent, each additional percentage point of debt/GDP raises the real 10-year yield by approximately 8 basis points, consistent with the conventional crowding-out narrative. Once the Fed holds 13.7 percent

TABLE 5. Marginal effect of debt/GDP on real 10-year yield at different Fed portfolio shares

FED TREASURY SHARE	DEBT → REAL YIELD (β)	INTERPRETATION
5%	+0.080	Conventional crowding-up
10%	+0.034	Weakening
13.7% (break-even)	0.000	Neutral
20%	−0.057	Suppressed
25% (post–Global Financial Crisis)	−0.103	Inverted

Source: Author's estimates using the data described in section 2.

or more of outstanding Treasurys, that relationship disappears. At the QE peak (approximately 20–25 percent), the relationship inverts: Higher debt is associated with *lower* real yields, as the Fed's purchases more than absorb the incremental supply.

This finding has two implications. First, it explains the timing of the empirical puzzle: The debt-growth literature began finding null effects precisely as the Fed's balance sheet expanded most aggressively, which is when debt was also rising fastest. The two forces moved together, making it difficult to detect the structural relationship.

Second, and more important for policy, QE suppression of the rate channel does not eliminate the debt's harm through capital accumulation. The capital stock channel documented in section 4 does not operate through interest rates; it reflects the opportunity cost of debt-financed spending displacing private investment at the portfolio level, working through credit allocation, risk premia, and expectations of future taxation.

Concretely, even in a low-rate environment, financial intermediaries must allocate balance sheet capacity between government securities and private investment. Large-scale Treasury issuance absorbed by the Fed can stabilize yields, but it does not create new real resources. To the extent that fiscal expansion directs labor and capital toward consumption or transfer programs rather than productive investment, or increases expected future tax burdens, firms may scale back capital expenditures despite low borrowing costs.

This mechanism is consistent with emerging evidence on the banking effects of unconventional monetary policy. University of Austin economics professor Thomas Hogan finds that the Fed's introduction of interest on excess reserves induced banks to shift away from lending and toward reserve holdings, accounting for a substantial portion of the postcrisis decline in bank credit.[10]

Similarly, a study published in the *Journal of Financial Economics* documents a "reserve supply channel" in which QE-induced reserve creation raises loan rates and crowds out bank lending,

with each dollar of reserves reducing lending by approximately 7.7 cents.[11] These findings suggest that even when Treasury yields are suppressed, monetary interventions can redirect financial intermediation away from private capital formation, reinforcing the capital accumulation channel identified in this paper.

The absence of conventional rate crowding-out during QE therefore does not imply that crowding-out of capital is absent; it may simply operate through less visible channels.

6. Policy Implications

The findings in this paper challenge two common arguments in contemporary fiscal policy debates.

The "no effect" argument

Proponents of large-scale deficit financing frequently cite the absence of a statistically significant debt-growth coefficient in reduced-form regressions as evidence that debt is costless. This paper demonstrates that this conclusion is a statistical artifact. The total effect is near zero because a Keynesian demand benefit and a supply-side capital cost offset each other in the same coefficient. The capital accumulation damage is real, confirmed by mediation analysis, and robust to bootstrapping. This suggests that interpretations based on total-effect regressions may conflate short-run demand effects with long-run supply effects.

The "low rates mean no crowding-out" argument

A second common claim is that, given the historically low interest rates of the 2008–2021 era, there was no crowding-out because borrowing costs did not rise. This paper agrees that the interest rate channel was suppressed but identifies the mechanism precisely as the Fed's own balance sheet expansion, not a structural change in the relationship between debt and yields. When the Federal Reserve eventually reduces its Treasury portfolio through quantitative tightening, the data suggest the conventional rate channel will reassert itself. At a Fed share of 5–10 percent, each percentage point of debt/GDP raises real yields by 3–8 basis points. With a public debt stock about to exceed 100 percent of GDP, the rate effects of further debt accumulation become economically material.

A longer horizon for policy evaluation

The failure of quarterly investment flows to predict GDP growth ($p = 0.70$), versus the success of capital stock growth ($p = 0.008$) to do the same, underscores a broader measurement problem in near-term fiscal analysis. The productive capacity of an economy responds to the sustained path of investment over years, not to the quarter-by-quarter flow. Fiscal projections and cost-benefit analyses of deficit-financed programs should account for the multiyear suppression of capital accumulation, not merely near-term demand multipliers.

Compositional context

The results also highlight that the composition, not just the level, of debt matters. In periods when Federal Reserve absorption is high, foreign demand for Treasurys is strong, and the primary deficit is cyclically driven, debt can accumulate without immediately visible harm. When those conditions normalize, the structural cost reasserts itself. The post-COVID normalization of both monetary policy and foreign demand may represent exactly such a transition.

7. Conclusion

This paper investigates the debt-growth relationship in the United States using 50 years of quarterly data and a channel-based empirical design. The central finding is that public debt harms long-run economic growth through crowding out capital accumulation, but that this effect is masked in conventional total-effect regressions by two offsetting forces: a short-run Keynesian demand benefit from deficit spending, and Federal Reserve balance sheet expansion that suppressed the interest rate transmission mechanism during the highest-debt years.

The key empirical results are as follows:

- A one percentage point increase in debt/GDP reduces annual private capital stock growth by 0.12–0.15 percentage points, controlling for monetary policy, foreign demand, and the business cycle.
- Capital stock growth is a statistically robust predictor of GDP growth ($\beta = 0.48$, $p = 0.008$); quarterly investment flows are not ($p = 0.70$).
- The complete mediation chain—debt suppresses capital accumulation, which suppresses growth—produces an indirect effect of −0.041, confirmed by bootstrap analysis, which reaches −0.086 at the long-term horizon.
- The Federal Reserve's Treasury portfolio suppresses the debt-yield channel once it holds more than 13.7 percent of outstanding securities, a threshold crossed during both post-2008 and post-COVID QE programs.
- In the low-debt era (debt/GDP below 50 percent), when the analysis is cleanest, debt reduces capital stock growth by 0.16 percentage points for every percentage point of debt/GDP ($p = 0.0002$).

The policy relevance of these findings depends on one's view of the Federal Reserve's future balance sheet path and the US fiscal trajectory. If quantitative tightening takes place and the Fed's Treasury share returns toward its pre-QE baseline, the conventional interest rate channel will reassert itself, adding rate crowding-out to the already-operating capital accumulation channel. If debt continues to rise above 100 percent of GDP, the low-debt-era elasticities suggest increasingly visible drag on private capital formation, and through it, on long-run growth.

About the Author

Jack Salmon is a Gibbs Scholar and research fellow at the Mercatus Center at George Mason University, where he focuses on economic and fiscal policy, with an emphasis on federal budgets, taxation, economic growth, and institutional analysis. His research and commentary have been featured in a variety of outlets, including *The Hill*, *Business Insider*, *RealClearPolicy*, *National Review*, the American Institute for Economic Research, and *Reason* magazine. Salmon has provided expert analysis on fiscal and economic issues in various policy forums, including testimony before Congress on the risks of debt accumulation, deficit spending, and inflation.

Notes

1. Carmen M. Reinhart and Kenneth S. Rogoff, "Growth in a Time of Debt," *American Economic Review* 100, no. 2 (2010): 573–78.
2. See Olivier Blanchard, "Public Debt and Low Interest Rates," *American Economic Review* 109, no. 4 (2019): 1197–229; see also Jason Furman and Lawrence Summers, "A Reconsideration of Fiscal Policy in the Era of Low Interest Rates," Harvard University and Peterson Institute for International Economics, November 30, 2020.
3. Other channels have been proposed in the literature, including the effects of future distortionary taxation on saving and investment, increases in inflation or sovereign risk premia at high debt levels, and potential effects on expectations and policy credibility. These mechanisms are conceptually important but are difficult to isolate cleanly in US time-series data. The approach here therefore focuses on the capital accumulation and interest-rate channels, which can be directly tested and quantified in a consistent empirical framework.
4. See Ugo Panizza and Andrea F. Presbitero, "Public Debt and Economic Growth: Is There a Causal Effect?," *Journal of Macroeconomics* 41 (September 2014): 21–41; see also Markus Eberhardt and Andrea F. Presbitero, "Public Debt and Growth: Heterogeneity and Non-linearity," *Journal of International Economics* 97, no. 1 (2015): 45–58.
5. Jack Salmon, "The Impact of Public Debt on Interest Rates" (Mercatus Policy Brief, Mercatus Center at George Mason University, May 2025).
6. Lawrence H. Summers, "US Economic Prospects: Secular Stagnation, Hysteresis, and the Zero Lower Bound," *Business Economics* 49, no. 2 (2014): 65–73.
7. See Manmohan S. Kumar and Jaejoon Woo, "Public Debt and Growth," IMF Working Paper No. 10/174 (International Monetary Fund, July 2010); see also Stephen G. Cecchetti, M. S. Mohanty, and Fabrizio Zampolli, "The Real Effects of Debt," BIS Working Paper No. 352 (Bank for International Settlements, September 2011).
8. For bounds test approach, see M. Hashem Pesaran, Yongcheol Shin, and Richard J. Smith, "Bounds Testing Approaches to the Analysis of Level Relationships," *Journal of Applied Econometrics* 16, no. 3 (2001): 289–326.
9. Davide Furceri, Carlos Goncalves, and Hongchi Li, "The Impact of Debt and Deficits on Long-Term Interest Rates in the US," IMF Working Paper No. 25/142 (International Monetary Fund, July 2025).
10. Thomas L. Hogan, "Bank Lending and Interest on Excess Reserves: An Empirical Investigation," *Journal of Macroeconomics* 69 (September 2021).
11. William Diamond, Zhengyang Jiang, and Yiming Ma, "The Reserve Supply Channel of Unconventional Monetary Policy," *Journal of Financial Economics* 159 (September 2024).