Comparing the Macroeconomic and Budgetary Costs of Debt

National Tax Association, November 2025

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Motivation

Concerns about the sustainability of U.S. federal debt central to policy discussions.

Often expressed in terms of tax increases/spending cuts required to stabilize the debt.

Economic burden of debt generally discussed in terms of crowdout of the capital stock.

This paper offers an intuitive crosswalk linking the budget and macro perspectives.

I ask:

What if the government allows debt to rise for a time and then takes steps to stabilize the debt to GDP ratio.

- How does the change in the capital stock/domestic assets compare to the debt?
- How does the primary surplus needed to stabilize the debt compare to the consumption reduction needed for macroeconomic stabilization?

I consider both a small open economy and a closed economy.

Budget Perspective

All derivations in the paper. I will try to provide intuition for the results.

Call *pd* be the primary deficit, g the growth rate of the effective labor force (labor force growth plus productivity), and r the government's borrowing rate. (For remainder of presentation, per worker means per effective worker.)

Then debt per worker in year T, d_T is:

$$d_T = \sum_{i=1}^{T-1} \frac{pd_i}{(1+g)^{T-i}} \prod_{j=i+1}^{T-1} (1+r_j)$$

To stabilize the debt to worker in year T requires a primary surplus of:

$$ps_T = d_T(r_T - g_T)$$

Small Open Economy (SOE) Macro Perspective

Let w be the wage per worker and s be the net of depreciation return to capital. These are determined globally and are independent of the level of the debt.

Let a be assets (domestically owned capital) per worker, which may differ from domestic capital stock.

In steady state, consumption per worker is equal to wages + assets per worker times the return on assets less the growth rate of workers.

Start with a baseline steady state without budget deficits. Then

$$c_b = a_b(s_t - g) + w_t$$

Introducing budget deficits in an SOE

Introduce budget deficits that increase consumption by θ_t in each year. In an SOE,

$$\theta_t = MPC_t pd_t,$$

where the MPC is the average consumption out of government spending less taxes.

This rise in consumption reduces savings and lowers domestic asset accumulation.

Comparing the debt to the change in assets in an SOE

Debt at time T:

$$d_T = \sum_{i=1}^{T-1} \frac{pd_i}{(1+g)^{T-i}} \prod_{j=i+1}^{T-1} (1+r_j)$$

Decline in assets:

$$a_b - a_T = \sum_{i=1}^{T-1} \frac{MPC_i pd_i}{(1+g)^{T-i}} \prod_{j=i+1}^{T-1} (1+s_j)$$

Two differences:

(1) Risk-free rate (*r*) vs average return to investment (s)

(2) The asset equation multiplies *pd* by MPC

Considering Risk

In a riskless world, government borrowing rate equals the return to investment: r = s.

In a risky world where investors are indifferent between the risky return and the riskless return, the risk-adjusted return to capital, s, equals r.

- People **still** choose to buy Treasuries despite lower return.

In the riskless or certainty-equivalent world, where r = s (or risk-adjusted s),

$$a_T - a_b = \text{-MPC } d_T$$

where MPC is a weighted average MPC on the policies that gave rise to the debt.

Change in consumption to stabilize assets vs primary surplus to stabilize debt

To stabilize debt to GDP, we need primary surpluses:

$$ps = d_T(r_T - g_T)$$

To stabilize assets to GDP, and assuming *r* = *s*, consumption needs to fall by:

$$\Delta c = -(a_b - a_T)(r_T - g_T) = -MPC\ d_T(r_T - g_T)$$

Let SMPC be the MPC out of stabilization policies.

Primary surpluses *ps* reduce consumption by:

$$\Delta c = -SMPC\ ps = -SMPC\ d_T(r_T - g_T)$$

This stabilizes assets only if SMPC = MPC.

If the MPC of the policies to stabilize the debt is smaller than those that gave rise to the debt (e.g., taxing the rich), stabilizing the debt won't stabilize assets.

Closed Economy Macro Perspective

In a closed economy, no wedge between assets and capital.

Capital per worker in the baseline is k_b.

Baseline steady state no fiscal policy:

Consumption per worker is equal to output $f(k_b)$ less depreciation (δk_b) and the output required to keep the capital/labor ratio constant (gk_b) .

$$c_b = f(k_b) - k_b(g + \delta)$$

Introducing budget deficits in a closed economy

Change in k after T years of budget deficits:

$$k_T - k_b \approx -\sum_{i=1}^{T-1} \frac{\theta_i}{(1+g)^{T-i}} \prod_{j=i+1}^{T-1} (1 + ANMP_j)$$

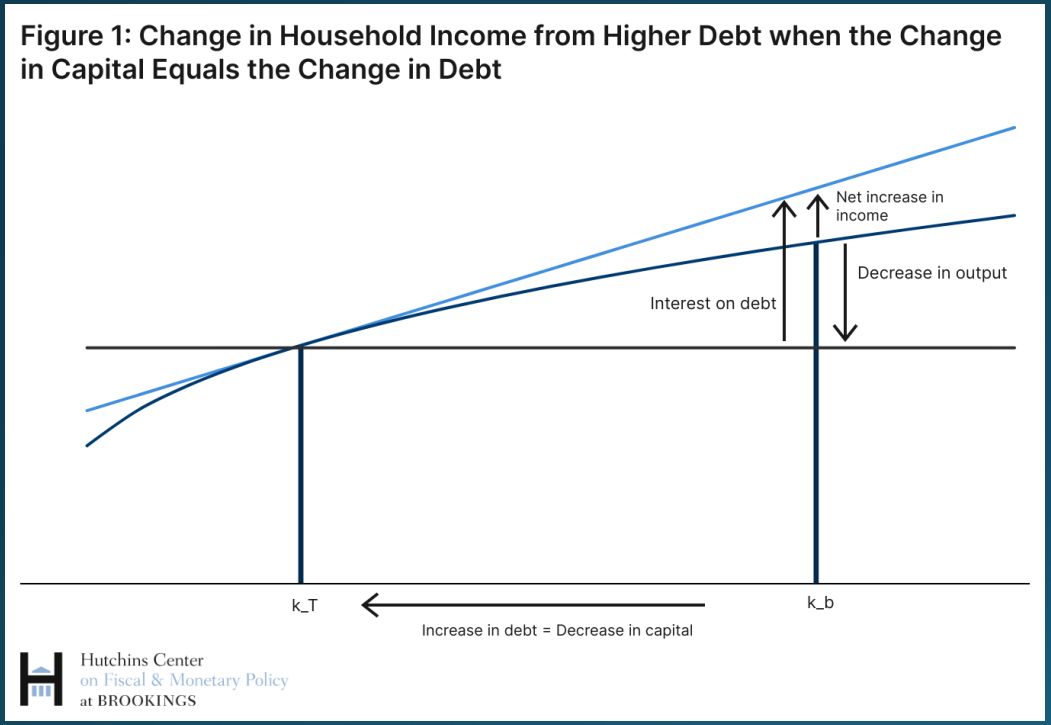
where $ANMP_t$ is the average net-of-depreciation marginal product of capital in the baseline and at time t.

Relative to change in asset equation, only difference is discount factor: *ANMP in c*losed economy vs *s* in SOE. *ANMP* > *s.*

- Each additional unit of capital crowded out in a closed economy costs more, but declines in assets don't affect s in SOE.

In the closed economy, θ is likely to be larger because changes in interest rates change household income.

Changes in household income



Baseline household income is $f(k_b)$, the black line .

A deficit that fully crowds out investment reduces capital to k_T.

The drop in capital raises the MPK and the interest rate on debt.

Households receive $f(k_T)$ plus interest on the debt, which exceeds $f(k_b)$.

Higher income might lead to higher consumption, in addition to direct effects of fiscal policies giving rise to debt.

Comparing effects of debt on steady state consumption

SOE: $\Delta c = (a_T - a_b)(s_T - g)$

Closed economy: $\Delta c = \cong (k_T - k_b)(ANMP_T - g)$

Fall in capital greater than fall in assets:

- For any given consumption response to deficits, , θ, capital declines more in closed economy because MPK rises as capital falls—but return on investment s in SOE is independent of the debt.
- And θ likely to be larger in a closed economy.

For any given decline in capital/assets, consumption has to adjust more in closed economy because ANMP>s.

Debt is more costly in a closed economy than an open economy.

What I Learned by Slogging Through the Math

Crowdout is about consumption responses to policies.

Different policies → different crowdout.

Household income doesn't fall until stabilization policies occur.

- Declining GDP growth only leads to declining consumption growth if households anticipate policies to stabilize the debt.

- This abstracts from distributional consequences that could also affect consumption: in a closed economy, higher debt raises the income of capital owners and lowers the income of wage earners.

Stabilizing the debt may not stabilize the capital stock.

- If concern about debt is potential fiscal crisis, macroeconomic consequences of stabilization policies are less important.

- If concern about debt is crowdout, macro consequences of stabilization policies matter a great deal.