

Macroeconomics A, EI056

Class 10

Government spending and fiscal policy

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November 28, 2023

What you will get from today class

- Economic roles of governments.
- **Deficits**: stylized facts and theories.
 - Tax smoothing, **political economy** considerations.
- Can government spending sustain growth? The fiscal **multiplier**.
- **Debt**: empirical pattern and policies.
 - The **dynamics** of debt, and “debt revenue”.
 - Debt overhang and fiscal **consolidation**.

A question to start

*Public debt reflect excessive short-term views of politicians.
We should require that it is ultimately paid back so as to limit the
temptation to borrow.*

Do you agree? Why or why not?

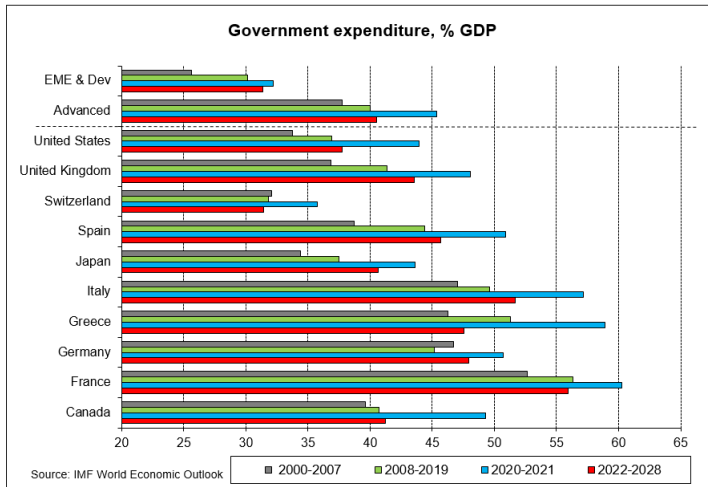
ECONOMIC SHARE OF GOVERNMENT FACTS

Economic roles of governments

- Provision of **public goods**: cannot be appropriated for private consumption (law and order, defense), or entail externalities (roads, education).
- Income **redistribution** motivated by equity.
 - Progressive income tax with rates rising with income
 - Retirement, health care
 - Entails some cost in efficiency.
- **Smoothing** of the business cycle.
- Multiple layers of government: national government, states, towns.
 - National is the main component in most countries (France).
 - Sub-national plays a substantial role in others (U.S.), or can be the dominant component (Switzerland).
- “Core” government functions (tax and purchases of goods and services), other functions can be operated outside the core (retirement administration, health care).
- The size of government varies across countries.

Spending

- Steady increase of spending / GDP, with substantial heterogeneity, surge in Covid.



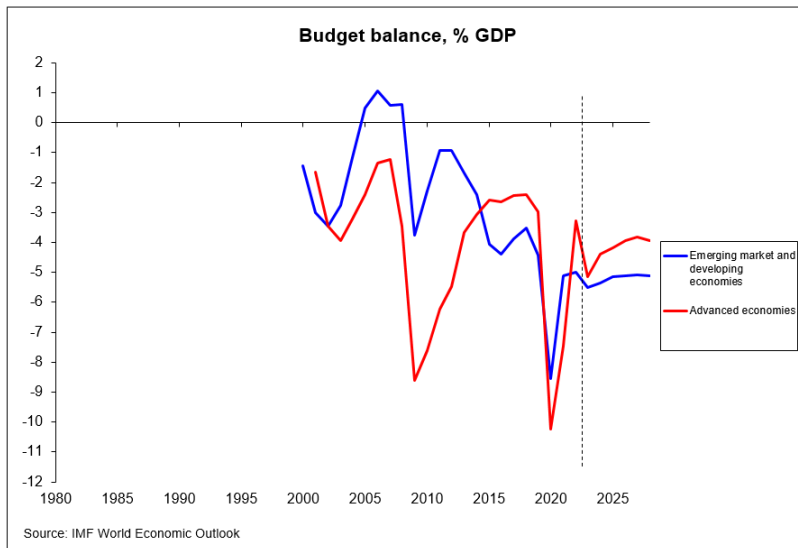
DEFICITS

Budgetary deficits

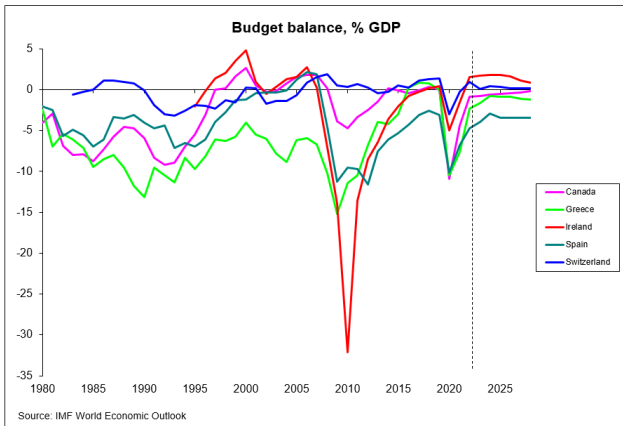
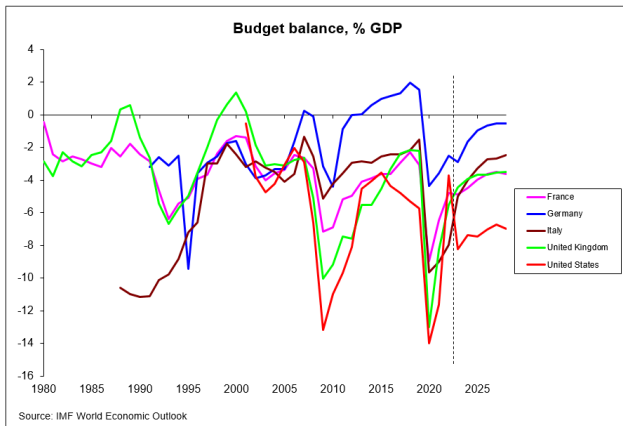
- Governments rarely raise enough in taxes to finance its expenditures. The gap is funded through borrowing.
 - **Persistent deficits** are a broad feature of the public sector.
- Borrowing is appropriate to finance investments (such as infrastructure), more worrying for current expenditures if sustained.
- Deficit automatically increases in recessions: tax revenue falls and spending increases (unemployment benefits).
 - **Automatic stabilizers**, as government activity moves against the business cycle.
- Concepts of deficit (purchases G_t , taxes T_t , debt B_t with interest rate i_t).
 - **Primary deficit**, $D_t^{\text{prim}} = G_t - T_t$: difference between purchases and taxes. **Overall deficit**, $D_t^{\text{total}} = G_t - T_t + i_t B_t$: includes interest payments:
 - **Structural deficit**: overall deficit filtering out the impact of the business cycle.

Deficits: advanced and emerging countries

- Higher deficits in advanced economies.



Deficits by countries.



Why do we have deficits? Tax smoothing

- If government spending does not matter much for growth (i.e. it is offset by lower private spending), shouldn't we aim for a balanced budget with taxes covering spending period by period?
- Yes if taxes entail no side effects (lump sum taxes unrelated to earnings or labor supply).
- In reality **taxes distort economic decisions** (wage tax discourages work), and more so when taxes are high.
- Model this as a cost, $Cost$, that is **convex** in the tax / GDP ratio ($f(0) = 0$, $f'(0) = 0$ and $f'' > 0$, as in a quadratic function):

$$\frac{Cost_t}{Y_t} = f\left(\frac{T_t}{Y_t}\right)$$

- The government minimizes the net present value of the cost, subject to the intertemporal budget constraint. This implies a **constant tax rate** T_t/Y_t . ► Smoothing computations

Debt dynamics

- G^{perm} : **permanent**-equivalent level of government spending (gives the same present value as actual spending):

$$\sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G^{perm} = \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G_t$$
$$G^{perm} = r \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G_t$$

- From flow constraint, **debt** changes reflect movements in spending **around** the permanent level (similar to permanent income hypothesis for consumption):

$$B_{t+1} - B_t = r(B_t - B_0) + (G_t - G^{perm})$$

- Temporary expenditures (wars) funded by debt instead of large temporary taxes.
- Problem: implies zero deficit on average, which is not the case empirically.

Political economy view of deficits

- Two period model (interest rate set to zero). In each period the economy has an endowment W .
- Government spending on **two types** of goods, M and N . Budget constraints are (B denotes debt):

$$M_1 + N_1 = W + B \quad ; \quad M_2 + N_2 = W - B$$

- Heterogenous population, **different preferences** over the two goods. Utility of individual i is:

$$V_i = E \sum_{t=1}^2 [\alpha_i U(M_t) + (1 - \alpha_i) V(N_t)]$$

- U and V are standard concave utility functions. Individuals differ according to their weight $\alpha_i \in [0, 1]$ on good M .

- In each period spending and debt are chosen by the **median voter**: the individual whose α_i is the median of the distribution.
- Variant with **corner preferences**.
 - Some people care only about good M , so that $\alpha_i = 1$.
 - Others care only about good N , so that $\alpha_i = 0$.
- In period 2 spending falls entirely on M if the median voter cares only about M . Otherwise, spending falls entirely on N .
- π : probability that the median voter of period 1 is still the median voter in period 2.

Choice of spending and debt

- If median voter in period 1 cares only about M , she maximizes:

$$\begin{aligned} & E \sum_{t=1}^2 [\alpha_{High} U(M_t) + (1 - \alpha_{High}) V(N_t)] \\ &= U(W + B) + [\pi U(W - B) + (1 - \pi) U(0)] \end{aligned}$$

- First-order condition with respect to debt:

$$\frac{U'(W + B)}{U'(W - B)} = \pi < 1$$

- U is concave, so U' is a decreasing function. This implies $W + B > W - B$, and **there is debt** $B > 0$. Similar reasoning also leads to debt if median voter cares only about N .
- Intuition: risk that the next government buys goods that the current median voter does not like. Debt is a way to **limit future spending**.

More general preferences

- Instead of corner preferences, U and V are CRRA utilities:

$$V_i = E \sum_{t=1}^2 \left[\alpha_i \frac{(M_t)^{1-\theta}}{1-\theta} + (1-\alpha_i) \frac{(N_t)^{1-\theta}}{1-\theta} \right]$$

- Two offsetting forces:
 - Median voter of period 1 wants to **constrain the future** median voter to avoid wasteful spending (as before).
 - But **not too much** because the future median voter will also purchase goods that the current median voter likes.
- With a log utility ($\theta = 1$) the two cancel out and we get no deficit.
- If utility is **not very concave** ($\theta < 1$) we get an initial **debt** ($B > 0$) as the desire to constrain the future dominates.
- We get a surplus ($B < 0$) if utility is very concave ($\theta > 1$), as the desire to get enough consumption of the preferred good dominates. [▶ Detailed computations](#)

ARE DEFICITS EXPANSIONNARY?

How to measure effectiveness

- Governments in advanced economy has massively used fiscal policy during the 2008-9 and Covid crises.
- How much extra GDP do we get with extra spending?

$$\text{multiplier} = dY / dG$$

- **Three ranges** of the multiplier:
 - 0: higher government spending fully offset by lower private spending (crowding **out**). Only the composition of GDP changes.
 - Between 0 and 1: strong offset from private demand, but not a full one. GDP increases.
 - Above 1. **No offset**, maybe even a positive spillover as higher public demand stimulates investment because firms see better prospects (crowding **in**).
- Theory: does government spending / taxes affect labor input, as capital cannot be changed in the short run?

Multiplier in theory

- **Wealth** effect: higher spending raises taxes and lowers private wealth. Lower consumption of goods and leisure, higher hours worked. Small magnitude.
- With **nominal frictions** labor is demand determined. Effects can be big if specific conditions are met.
 - “Hand to mouth” consumers do not optimize across time (Ricardian equivalence is not an issue). Households with **borrowing constraints** who would like higher consumption but cannot borrow. More generally, bigger effect if resources are under-utilized.
 - **Zero lower bound** of interest rate. Central bank does not raise interest rates to counter inflationary pressures from higher government spending, so the real interest rate falls.
 - Government spending on infrastructure that raises private productivity.
 - Limited use of distortionary taxes to ultimately finance government spending.

Empirical evidence

- Little interest before the crisis, studies found a small multiplier, especially before the 1980s. Fiscal expansion fuels inflation, leading to monetary contraction.
- Survey puts multiplier between 0.8 and 1.5, or 0.6-1.0 more recently (Ramey 2019). Quite **heterogenous**.
 - **Composition** of spending: spending on infrastructure raises productivity of private firms, and thus raises GDP more.
 - State of the **business cycle**. Fiscal stimulus more effective in recessions (multiplier of 1.0-1.5) than in booms (0-0.5), sensitive to econometric approach.
 - **Monetary policy**. Stimulus more effective if central bank remains passive (stuck at ZLB). Recent proposals for central-bank directed fiscal expansions.
- Higher multiplier for tax cuts, but evidence is limited.
- Evidence on multiplier from transfers limited, points to stronger effect is **targeted** at constrained households (unemployment benefits).
- Effect may rely on a well-anchored long run fiscal picture.

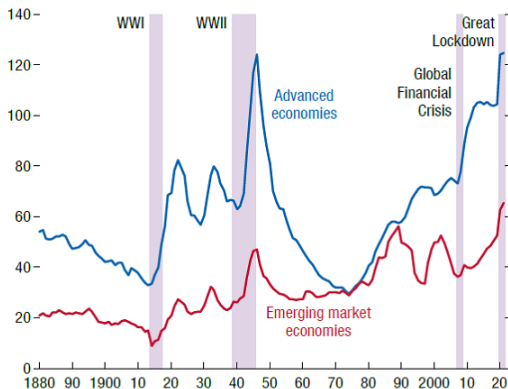
PUBLIC DEBT

- Deficit add up to debt.
- Successive increases during the global financial crisis (especially in advanced economies) and Covid.
 - Increases particularly sharp in US and China.
- Long time series show that debt levels have been higher in history (following wars).

Historical paths of debt

- Recent increases, especially in advanced economies.

Figure 1.2. Historical Patterns of General Government Debt
(Percent of GDP)



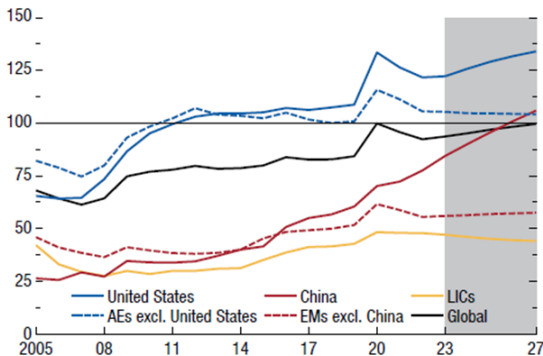
Sources: IMF, Historical Public Debt Database; IMF, World Economic Outlook database; Maddison Database Project; and IMF staff calculations.
IMF Fiscal Monitor

Recent increase and prospects

- Recent increases, especially in advanced economies.

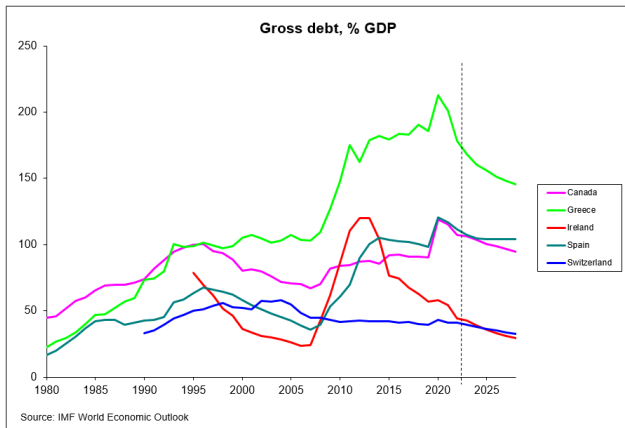
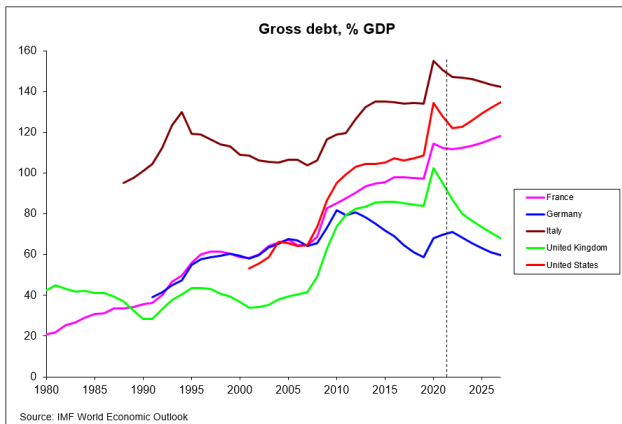
Figure 3.1. Public Debt Trends
(Percent of GDP)

Public debt remains elevated.



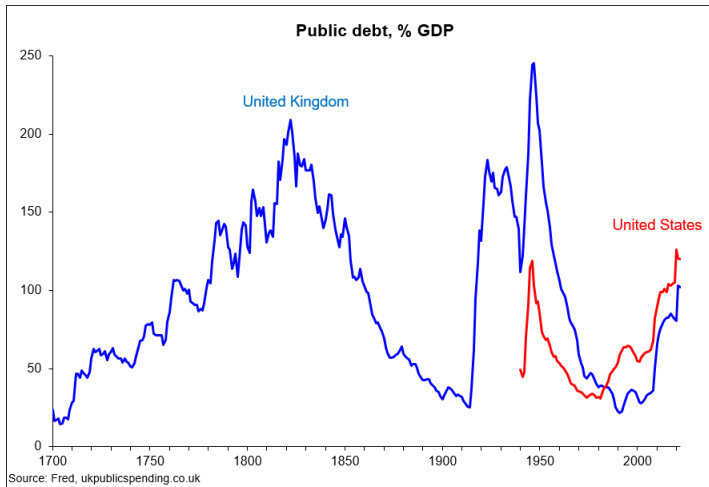
IMF (2023). "Coming Down to Earth: How to Tackle Soaring Public Debt", *World Economic Outlook* chapter 3, April.

Debt by countries.



Long series: UK and US

- Larger debt levels in previous episodes (but current one large nonetheless).



ARE DEBT DYNAMICS "SELF STABILIZING"?

Flow budget constraints

- Government expenditures are funded by taxes and new debt (also transfer from central bank from printing money, but these are small):

$$G_t + i_t B_t = T_t + B_{t+1} - B_t$$

- Debt increases with the deficit and interest payments:

$$B_{t+1} = D_t^{\text{prim}} + (1 + i_t) B_t$$

- What matters is the **debt/GDP ratio**:

$$\frac{B_{t+1}}{Y_{t+1}} \frac{Y_{t+1}}{Y_t} = \frac{D_t^{\text{prim}}}{Y_t} + (1 + i_t) \frac{B_t}{Y_t}$$

- Nominal GDP grows at a rate g_t .

Debt dynamics: interest vs. growth

- Dynamics of the debt ratio $b = B/Y$:

$$b_{t+1} - b_t = \frac{d_t^{\text{prim}}}{1 + g_{t+1}} + \frac{i_t - g_{t+1}}{1 + g_{t+1}} b_t$$

- If $i_t > g_{t+1}$, debt has **explosive** dynamics. Keeping b constant requires a primary surplus:

$$d^{\text{prim}} = -(i - g) b < 0$$

- **Self-stabilizing** dynamics if $i_t < g_{t+1}$. A primary deficit is possible.
 - Blanchard (2019): $i_t < g_{t+1}$ is the case for the US, and advanced economies. Even more pronounced in Germany and Switzerland.
 - Emerging economies have destabilizing dynamics. the budget constraint is fine.
 - **Non-pecuniary return** on government bonds: liquid and safe (parallel with cash).
- Even a growing b can be OK if the discounted value goes to zero (transversality).

- Nominal interest rate is mostly lower than the nominal growth rate in the US.

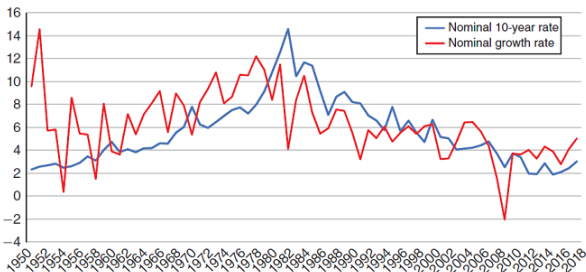


FIGURE 2. NOMINAL GDP GROWTH RATE AND 10-YEAR BOND RATE, 1950–2018

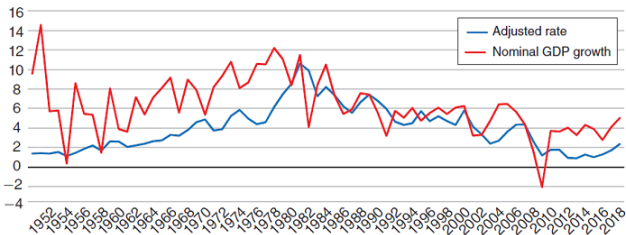


FIGURE 4. NOMINAL GDP GROWTH RATE AND ADJUSTED RATE, 1950–2018

Blanchard, Olivier (2019a). "Public debt and low interest rates", *American Economic Review* 109 (4), pages 1197-1229.
<https://www.aeaweb.org/articles?id=10.1257/aer.109.4.1197>

The “debt revenue”

- Intertemporal budget constraint (constant i_t and g_t for brevity):

$$b_t = \frac{1}{1+i} \sum_{s=0}^{\infty} \left(\frac{1+g}{1+i} \right)^s \left(-d_{t+s}^{\text{prim}} \right) + \lim_{k \rightarrow \infty} \left(\frac{1+g}{1+i} \right)^k b_{t+k+1}$$

- Last term does not converge to zero if $i < g$.
- Discount with return to private capital, $m > g$ (Reis 2022):

$$b_t = \frac{1}{1+m} \sum_{s=0}^{\infty} \left(\frac{1+g}{1+m} \right)^s \left[-d_{t+s}^{\text{prim}} + (m-i) b_{t+s} \right] + \lim_{k \rightarrow \infty} \left(\frac{1+g}{1+m} \right)^k b_{t+k+1}$$

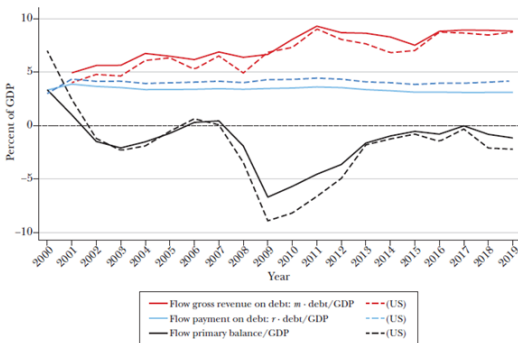
- Last term goes to zero. Second term, $(m-i) b_{t+s}$, is “debt revenue”: government earns a spread (Reis: $m-i$ between 0% and 8.9%).

Debt revenue

- $m \cdot b$ much larger than $i \cdot b$.

Figure 1

The Flow Budget Components as a Ratio of GDP for the G-7 Countries and the United States



Source: IMF (1972–2019a, b, 2021b).

Note: Interest payments as a ratio of GDP; public debt as a ratio of GDP times 0.06 plus inflation; primary balance as a ratio of GDP. Adding over all countries in the G-7.

Reis, Ricardo (2022). “Debt revenue and the sustainability of public debt”, *Journal of Economic Perspectives* 36(4), pages 103-124.
<https://www.aeaweb.org/articles?id=10.1257/jep.36.4.103>

GETTING OUT OF DEBT

3 approaches

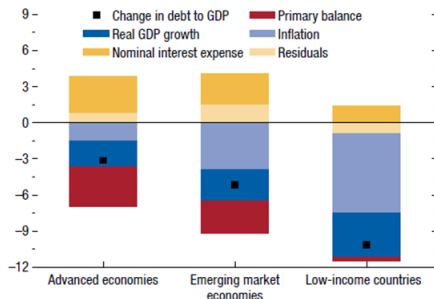
- Debt can be lowered through a primary **surplus**, fast **growth**, **inflation**, or **default**.
- Inflation lowers the real value of existing debt. Nominal interest rate on new debt is higher as investors expect inflation. Repeated use can lead to hyperinflation.
- Default can lead to country to be shut out of financial markets (does not happen much in practice) or face high interest rates. It imposes a cost on domestic agents (disruption of financial markets) which limits its use.
- Recent study of policy to reduce debt (IMF WEO 2023).

Role of inflation in past reduction

- Higher nominal GDP growth reduces debt ratios, but often via inflation (with adverse side effects). Interest expenses are a headwind.

Figure 3.2. Contribution to Change in Debt to GDP during Reduction Episodes
(Percent)

Primary balance is more important in advanced economies, but growth and inflation play a bigger role in emerging market economies and low-income countries.



IMF (2023). "Coming Down to Earth: How to Tackle Soaring Public Debt", *World Economic Outlook chapter 3*, April.

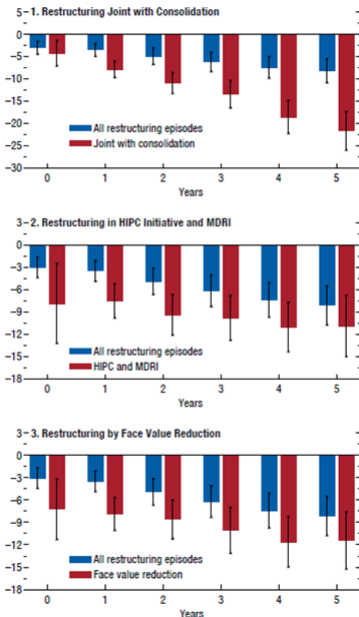
How to reduce debt to GDP?

- Fiscal **consolidation** (lower deficit) reduced debt / GDP only in half the cases.
- A fiscal consolidation is more likely to be successful if:
 - Done at time of relatively high **growth** (don't wait for a recession).
 - Done by **lower spending** rather than higher taxes.
 - Done as part of a **broad package** with reforms to support growth.
- In problematic cases, debt **restructuring** is needed (reduction of face value of debt, lengthening of maturity).
 - Effective in lowering debt to GDP.
 - Especially if done with consolidation, as part of a broad package, and via reduction of face value.

- Debt / GDP ratio decreases after a restructuring, especially with consolidation, face value reduction, and broad package.

Figure 3.9. Impact of Restructuring on Debt to GDP
(Percentage point change)

Debt restructuring has a large and long-lasting impact on the debt ratio and is more effective when combined with fiscal consolidation.



IMF (2023). "Coming Down to Earth: How to Tackle Soaring Public Debt", *World Economic Outlook* chapter 3, April.

- Detailed study of **austerity** episodes (200) with deliberate action to reduce the deficit (higher taxes or lower spending, Alesina, Favero and Giavazzi 2019).
- Austerity lowers growth, but less if **done by lower spending** than if done by higher taxes.
 - Austerity of 1% of GDP reduces GDP by 0.24% over two years if done by spending, and by 2% over 3-4 years if done by taxes.
 - Difference reflects behavior of investment.
- Debt / GDP ratio is reduced if adjustment via expenditures, not if via taxes because of recession.
- Sharp effect of fiscal austerity in euro area consistent with estimates. Driven by the reliance on higher taxes.

- Concern of “free-rider” problem in the euro area (countries do not face prompt discipline from markets).
 - Stability and growth **pact** restricting deficits and debt, clause that no country would be bailed out. Rules were not respected.
- **Anchor medium-run** fiscal behavior to free space for short-run adjustment (similar to rules for monetary policy).
- Debt brake rules in Germany and Switzerland to avoid persistent deficit.
 - Asymmetric reaction led to persistent surpluses (overestimation of expenditures in surplus).
- Independent fiscal councils making judgments on whether the structural balance is adequate or not.
 - Advisory role only.

EXTRA SLIDES :

TAX SMOOTHING

Tax smoothing

- Intertemporal budget constraint: net present value of spending, G_t , plus initial debt, B_0 , equal to the net present value of taxes, T_t :

$$\sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} T_t = B_0 + \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G_t$$

- Minimize the net present value of the cost subject to the intertemporal budget constraint. Lagrangian:

$$\mathcal{L} = \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} Y_t f\left(\frac{T_t}{Y_t}\right) - \mu \left[\sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} T_t - B_0 - \sum_{t=0}^{\infty} \frac{1}{(1+r)^{t+1}} G_t \right]$$

- Optimal to have a **constant marginal cost** and T_t/Y_t : [Return](#)

$$f'\left(\frac{T_t}{Y_t}\right) = \mu$$

EXTRA SLIDES :

POLITICAL ECONOMY

Choice with CRRA preference

- Utility of agent of type i is:

$$V_i = E \sum_{t=1}^2 \left[\alpha_i \frac{(M_t)^{1-\theta}}{1-\theta} + (1-\alpha_i) \frac{(N_t)^{1-\theta}}{1-\theta} \right]$$

- Median voter in period 2 maximizes (weight $\alpha_{med,2}$ on M):

$$\alpha_{med,2} \frac{(M_2)^{1-\theta}}{1-\theta} + (1-\alpha_{med,2}) \frac{(W-B-M_2)^{1-\theta}}{1-\theta}$$

- Optimal choice **equalizes marginal utilities** of spending:

$$M_2 = \frac{(\alpha_{med,2})^{\frac{1}{\theta}}}{(1-\alpha_{med,2})^{\frac{1}{\theta}} + (\alpha_{med,2})^{\frac{1}{\theta}}} (W-B)$$
$$N_2 = W-B-M_2 = \frac{(1-\alpha_{med,2})^{\frac{1}{\theta}}}{(1-\alpha_{med,2})^{\frac{1}{\theta}} + (\alpha_{med,2})^{\frac{1}{\theta}}} (W-B)$$

Spending choice in period 1

- Median voter in period 1 has preference weight $\alpha_{med,1}$ and maximizes ($\Omega_2 \in [0, 1]$ is a function of $\alpha_{med,1}$ and $\alpha_{med,2}$):

$$\begin{aligned} & E \sum_{t=1}^2 \left[\alpha_{med,1} \frac{(M_t)^{1-\theta}}{1-\theta} + (1 - \alpha_{med,1}) \frac{(N_t)^{1-\theta}}{1-\theta} \right] \\ &= \alpha_{med,1} \frac{(M_1)^{1-\theta}}{1-\theta} + (1 - \alpha_{med,1}) \frac{(W + B - M_1)^{1-\theta}}{1-\theta} \\ &\quad + \frac{(W - B)^{1-\theta}}{1-\theta} \Omega_2 \end{aligned}$$

- First-order condition with respect to M_1 implies:

$$M_1 = \frac{(\alpha_{med,1})^{\frac{1}{\theta}}}{(1 - \alpha_{med,1})^{\frac{1}{\theta}} + (\alpha_{med,1})^{\frac{1}{\theta}}} (W + B)$$

Debt choice in period 1

- Using the solution for M_1 the expected utility is ($\Omega_1 \in [0, 1]$ is a function of $\alpha_{med,1}$):

$$\frac{(W+B)^{1-\theta}}{1-\theta}\Omega_1 + \frac{(W-B)^{1-\theta}}{1-\theta}\Omega_2$$

- First-order condition with respect to debt implies:

$$\frac{W+B}{W-B} = \left(\frac{\Omega_1}{\Omega_2}\right)^{1/\theta}$$

- If $\Omega_1 = \Omega_2$ we get $B = 0$. This is the case with log utility ($\theta = 1$).
- With limited concavity ($\theta < 1$) we get a debt ($B > 0$). [Return](#)