# Fiscal Deficits

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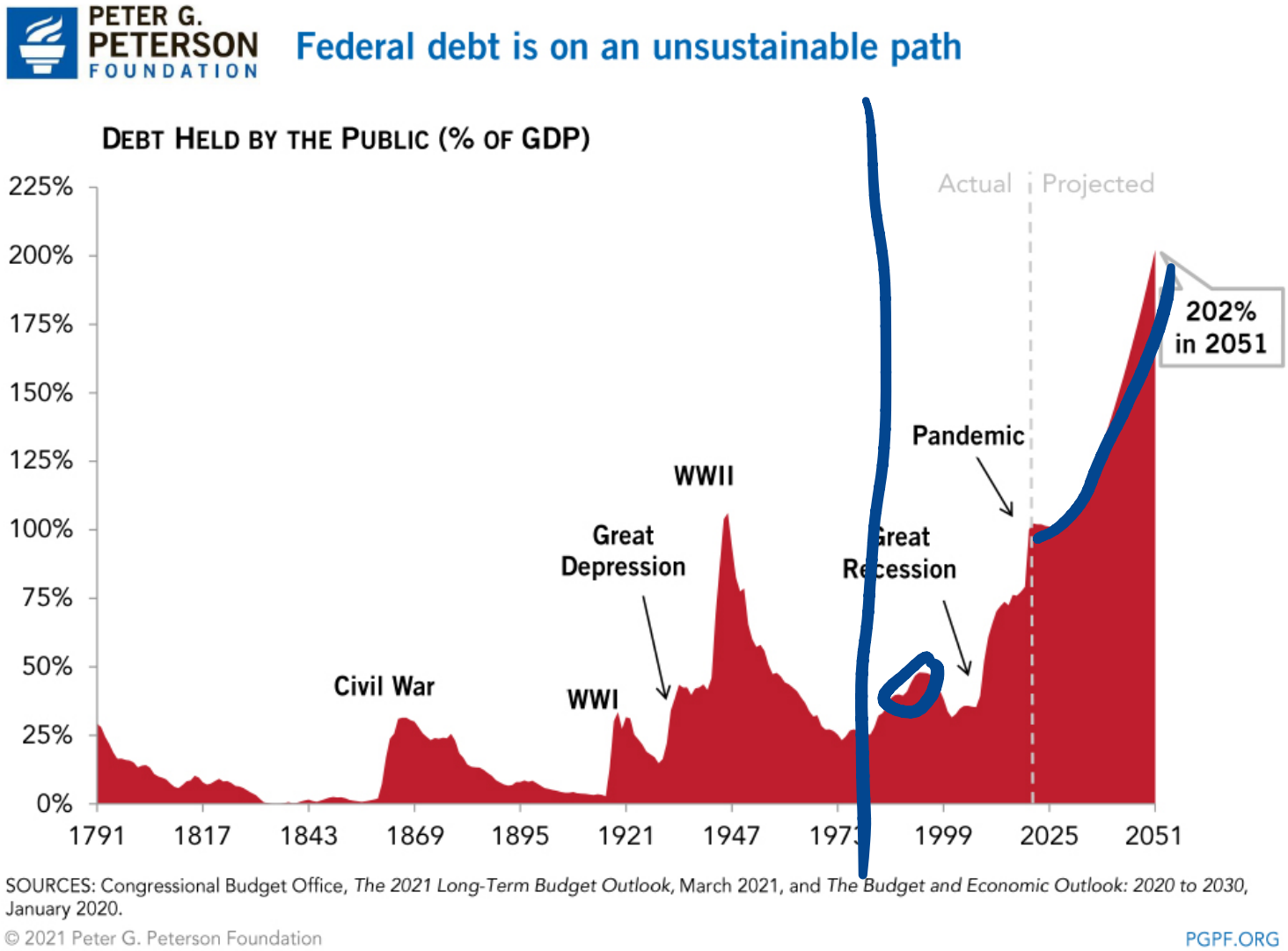
# Topics

In this section you will learn:

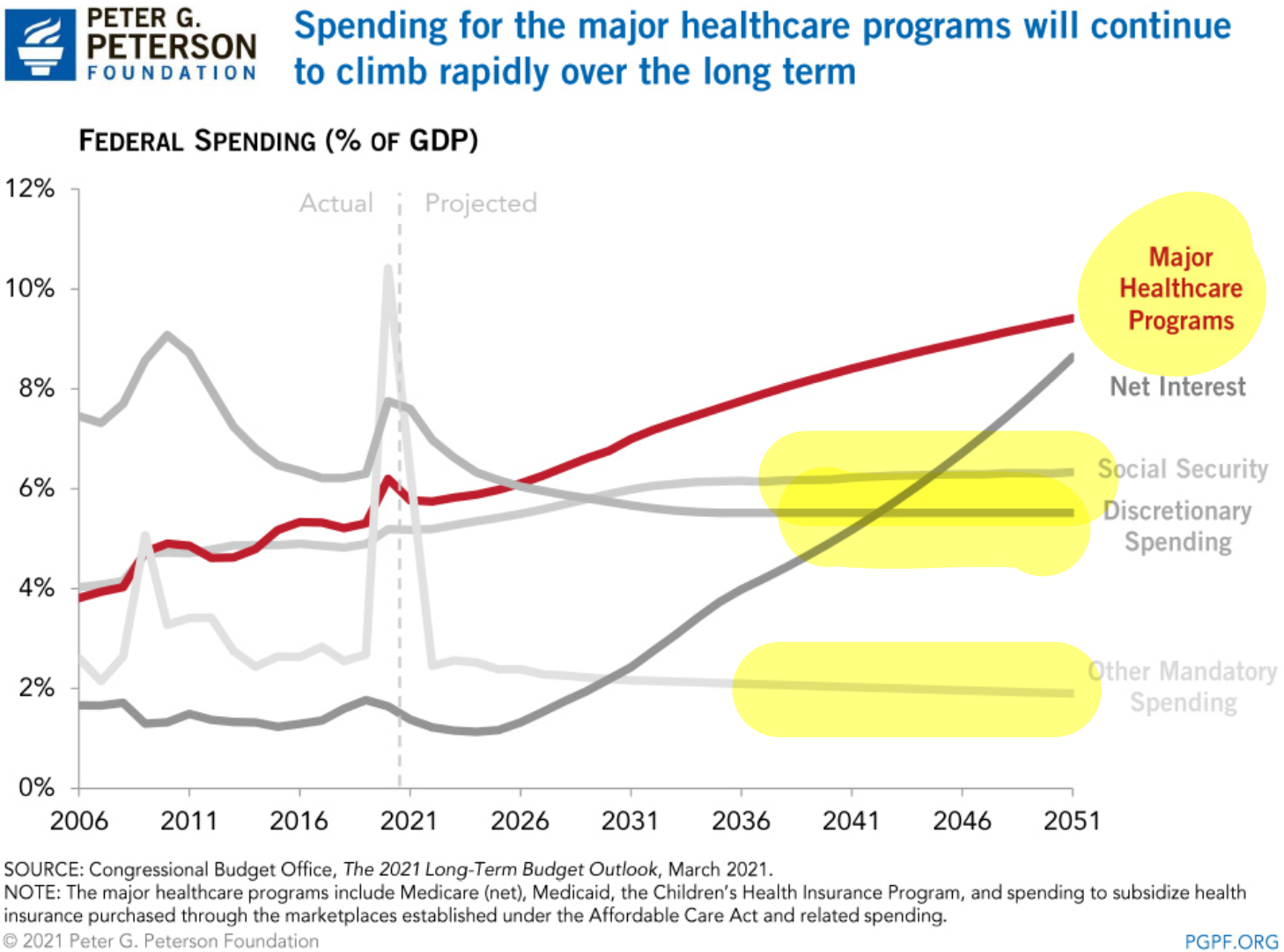
1. what the outlook for the U.S. government budget looks like
2. what deficits do

# Public Debt is Rising




Source: PGPF, 2021

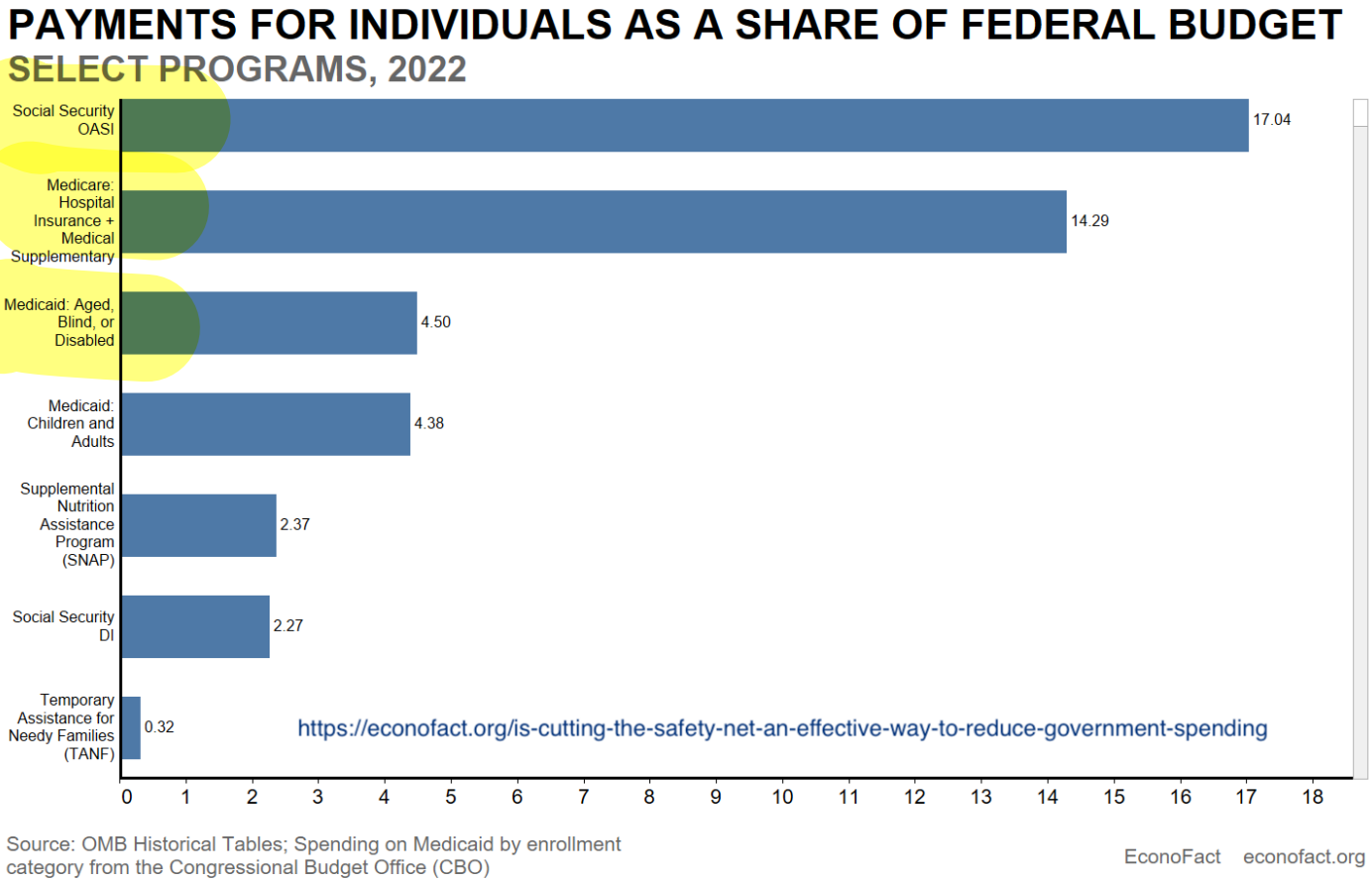
# Main Driver: Health Spending




Source: PGPF, 2021

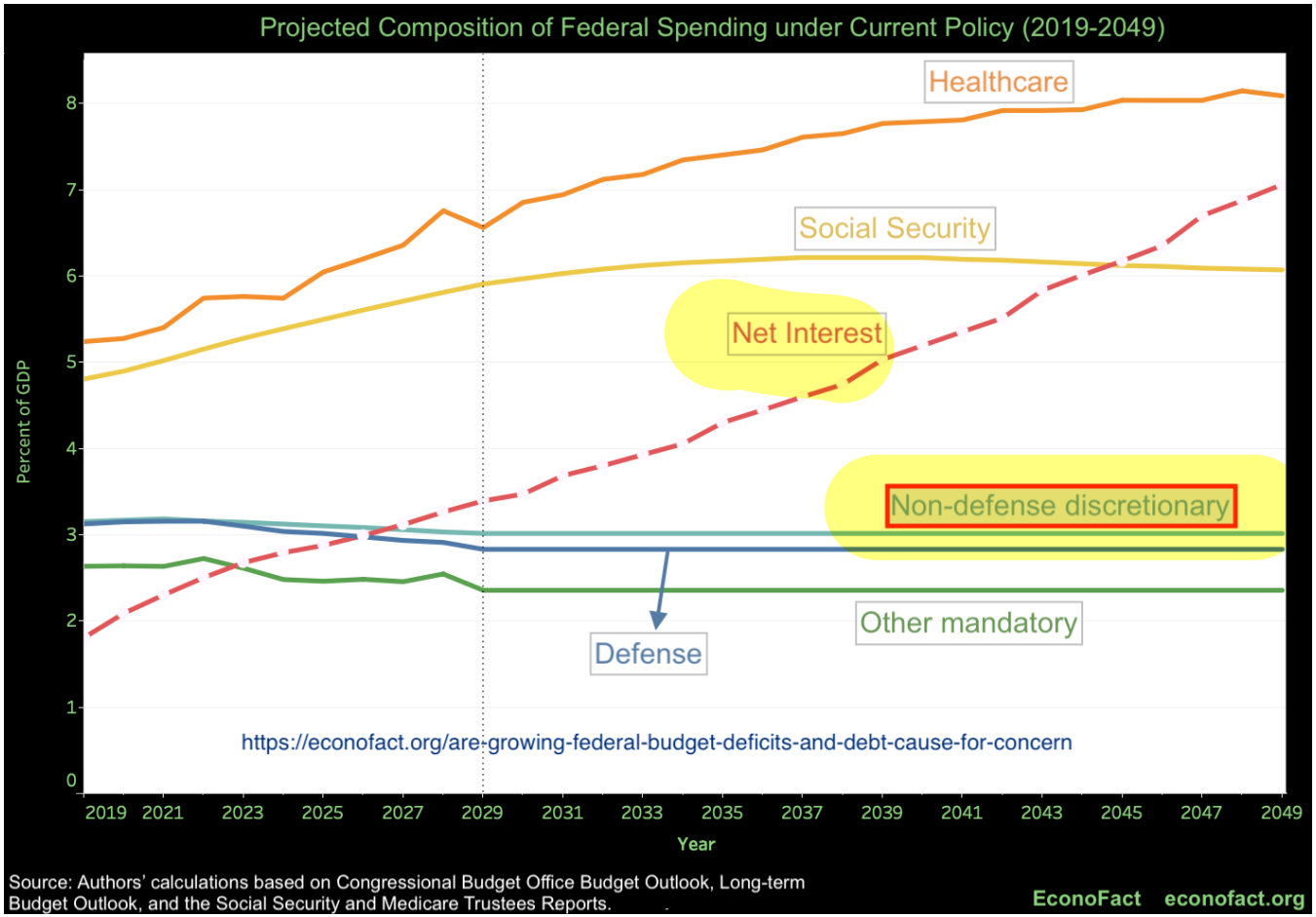
Rising fraction of older people + rising health care prices.

# What would it take to balance the budget?




Transfer payments other than Social Security and Medicare are small fry.

# What would it take to balance the budget?




Discretionary spending is also small fry.

That's why nobody makes serious proposals to fix the deficit.

# Key Facts

**Summary**

1. At given levels of spending and revenues, the deficit will continue to climb.
2. The main problem is rising health care spending.
   But there is also a big Social Security imbalance (which does not appear in the budget).
3. Rising interest payments may be a big part of the problem.

# How Worried Should We Be?

**One view:**

*THE NATIONAL DEBT IS ON AN UNSUSTAINABLE PATH*

*CBO estimates that federal debt, which is already at high levels, will climb significantly over the next 30 years. In CBO's latest projections, debt is expected to climb from 77 percent of GDP in 2017 to 150 percent of GDP in 2047, based on current law.*

*Debt at those levels would be unprecedented. – Peterson Foundation, 2017*

# How Worried Should We Be?

An opposing view:

> *Low interest rates also create numerous opportunities. They expand the scope for expansionary fiscal policy, make the debt more sustainable and increase the scope of public investments that will pay for themselves over time. – Furman and Summers (2020)*

# Questions About Debt

1. What do big deficits do?
   Crowding out?
   Slower growth?
2. How much debt is "sustainable?"
   What happens when debt gets "too large?"

# The government budget constraint

# The government budget constraint

The government has a budget constraint of the form

$$\Delta B_t = r_t B_t - S_t \tag{1}$$

where

- New bond issues: $\Delta B_t = B_{t+1} - B_t$
- Government saving: $S_t = T_t - G_t$
  revenue minus spending
  "**primary surplus**"

Just like any other agent.

$$G_t + rB_t = T_t + \Delta B_t$$

# Intertemporal budget constraint

The budget constraint is accounting.

It says nothing about how much spending / debt is sustainable.

To see how much debt is sustainable, we need to look at the **intertemporal** budget constraint.

Then we can derive:

**Present value of income** = **Present value of spending** + **initial debt**

T G $B_0$

Just like any other agent.

▸ Derivation

# Digression: Present Values

Present value:

- sum of all future values
- discounted by cumulative interest factors $R \equiv 1 + r$

For a payment stream $Y_t$ the present value is

- $Y_t + Y_{t+1}/R + Y_{t+2}/R^2 + \ldots$

In words: The present value answers the question

- "How much money would I have to set aside today to make the payments $Y_t$ in the future?"
- Where money left in the account earns gross interest rate $R$

# Sustainability

We don't know how much debt is "sustainable."

- Some countries have lived with high debt/GDP ratios for decades without trouble (Japan)
- Other countries got into trouble quite suddenly (Greece, Italy, Asian Tigers)

"Trouble" means: countries could not find lenders to roll over debt.

But clearly **debt / GDP has to be stabilized** at some level.

What does it take to prevent debt / GDP from exploding?

# $r$ versus $g$

## Key point

The growth rate of debt / GDP depends on $r$ **versus** $g$.

- $r$ is the real interest rate
- $g$ is the growth rate of GDP

Whether $r > g$ or $r < g$ makes a key difference.

# $r$ versus $g$

If no debt payments are made, debt grows at rate $r$

$$\Delta B_t = r_t B_t - S_t \Longrightarrow g(B_t) = r_t - S_t/B_t \tag{2}$$

where $g(B) = \Delta B/B$ is the growth rate of $B$

Running primary surpluses $(S > 0)$ is needed to keep $g(B) < r$

Tax revenues $T$ grow at rate $g$

- $g$ is the growth rate of GDP
- GDP is closely related to the tax base

$r - g$ is the growth rate of debt/GDP when $S = 0$

$$g\left(\frac{\text{Debt}}{\text{GDP}}\right) = g\left(\frac{B}{Y}\right) = g(B) - g(Y)$$

# Traditional view: $r > g$

Output growth $g$: perhaps 3% p.a.

Real interest rate $r$ (on stocks!):

averages about 7% p.a. over that last 100 years.

**If the government has debt today, it needs to save (enough).**

If $S_t = 0$, $B/Y$ grows at rate $r - g > 0$.

- The interest share of the government budget grows without bounds.
- Not sustainable.

# Traditional view

**If the government borrows today, it has to save in the future.**

This is true even though

- government debt can grow without bounds
- the government never has to repay its debts

The constraint simply comes from the need to keep debt-to-output finite.

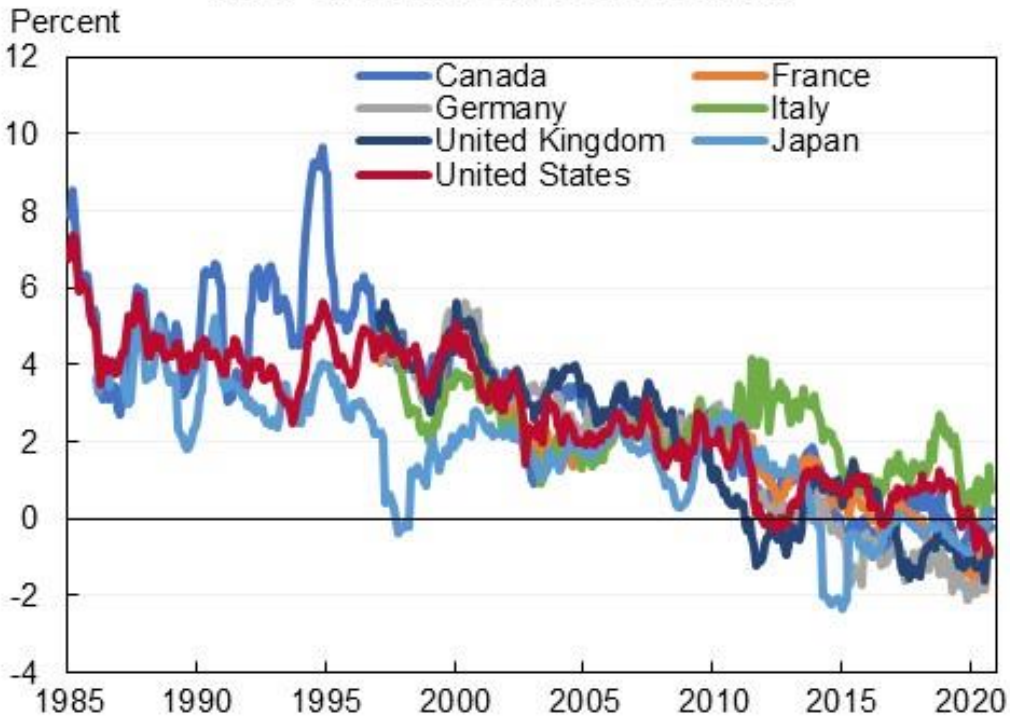
# Implications

1. If the government borrows today, taxes will be higher in the future (or spending must be cut)
2. The longer the government waits before stabilizing the debt, the higher taxes must rise
   because the debt grows due to accumulated interest

The $r > g$ logic explains why in budget projections the share of interest payments grows over time.

# Alternative view: $r < g$

**Figure 1**
**Real Ten-Year Benchmark Rate**




Source: Furman and Summers (2020)

Real interest rates have been falling for a long time (why?).

# Low Interest Rates: $r < g$

Now output grows faster than the interest burden on debt.

- Even if the government runs primary deficits $(S < 0)$

The government can keep rolling over interest payments.

The debt-to-output ratio does not blow up.

The government can invest in future growth without having to worry too much about debt repayment.

- The opportunities that Furman and Summers (2020) have in mind.

# Interest Payments

**Figure 14a**

**U.S. Federal Debt Held by The Public**

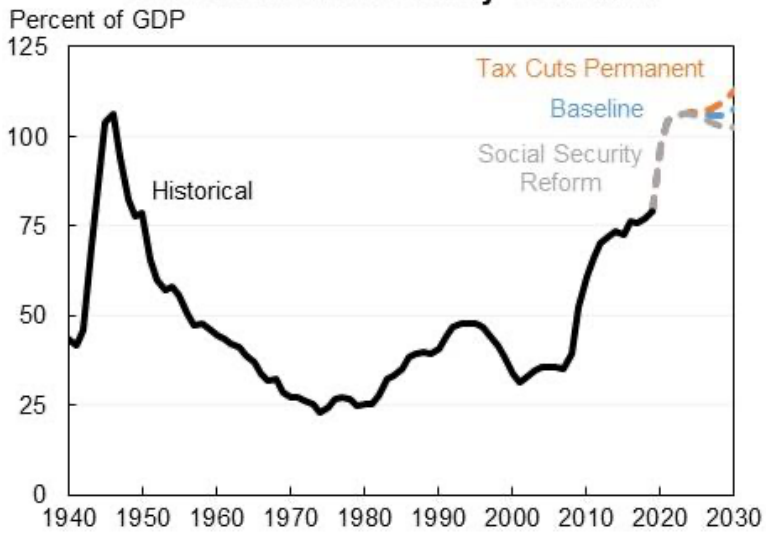
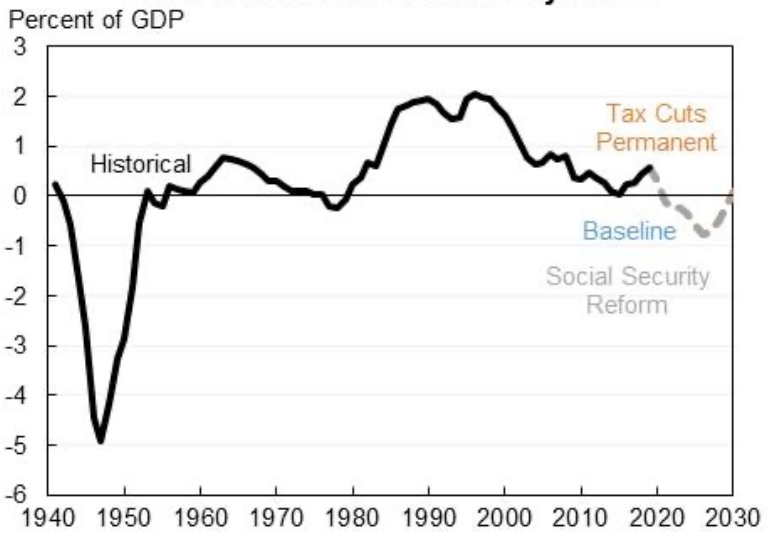



**Figure 14b**

**U.S. Federal Real Interest Payments**




Source: Furman and Summers (2020)

## Key point

It's not the size of the debt that matters, its the size of interest payments relative to output.

One risk: what if interest rates rise in the future?

# Summary

1. The government budget constraint requires:
   present value of spending + initial debt = present value of tax revenues.
2. Does the government need to save to stabilize debt/GDP?
   The answer depends on $r$ versus $g$.
3. Currently $r$ is very low. More debt is sustainable.
   But future $r$ could be higher.
4. How much debt is sustainable?
   Nobody knows.

# The Effects of Deficits

# What Do Deficits Do?

- Does a higher deficit imply that interest rates rise?
- Does government borrowing crowd out private investment?

# Crowding out

- Start from the NIPA identity

$$Y = C + G + I + EX - IM$$

- Rewrite as $I = (Y - C) - G + (IM - EX)$ or

$$\underbrace{Y - T - C}_{private\ saving} + \underbrace{T - G}_{public\ saving} + \underbrace{IM - EX}_{foreign\ saving} = I$$

- Everything else equal, higher government deficits reduce investment.
- But everything else is not equal...

# Crowding out

Key question:

Do private or foreign savings rise when public deficits rise?

Three views:

1. Private savings rise (Ricardian equivalence)
2. Foreign capital inflows fully offset deficits (open economy view)
3. Deficits raise interest rates.

# Ricardian Equivalence

- The government budget constraint implies
  - a current tax cut + borrowing does not change the present value of taxes collected
- The household budget constraint implies
  - present value of consumption = [present value of income] - [present value of taxes]
- Households "should" not change consumption in response to deficits + tax cuts
  - what should they do?
  - what is then the effect of a deficit?

# Why would Foreign $S \uparrow$

$(G - T) \uparrow \Rightarrow i \uparrow$

Foreigners buy US bonds

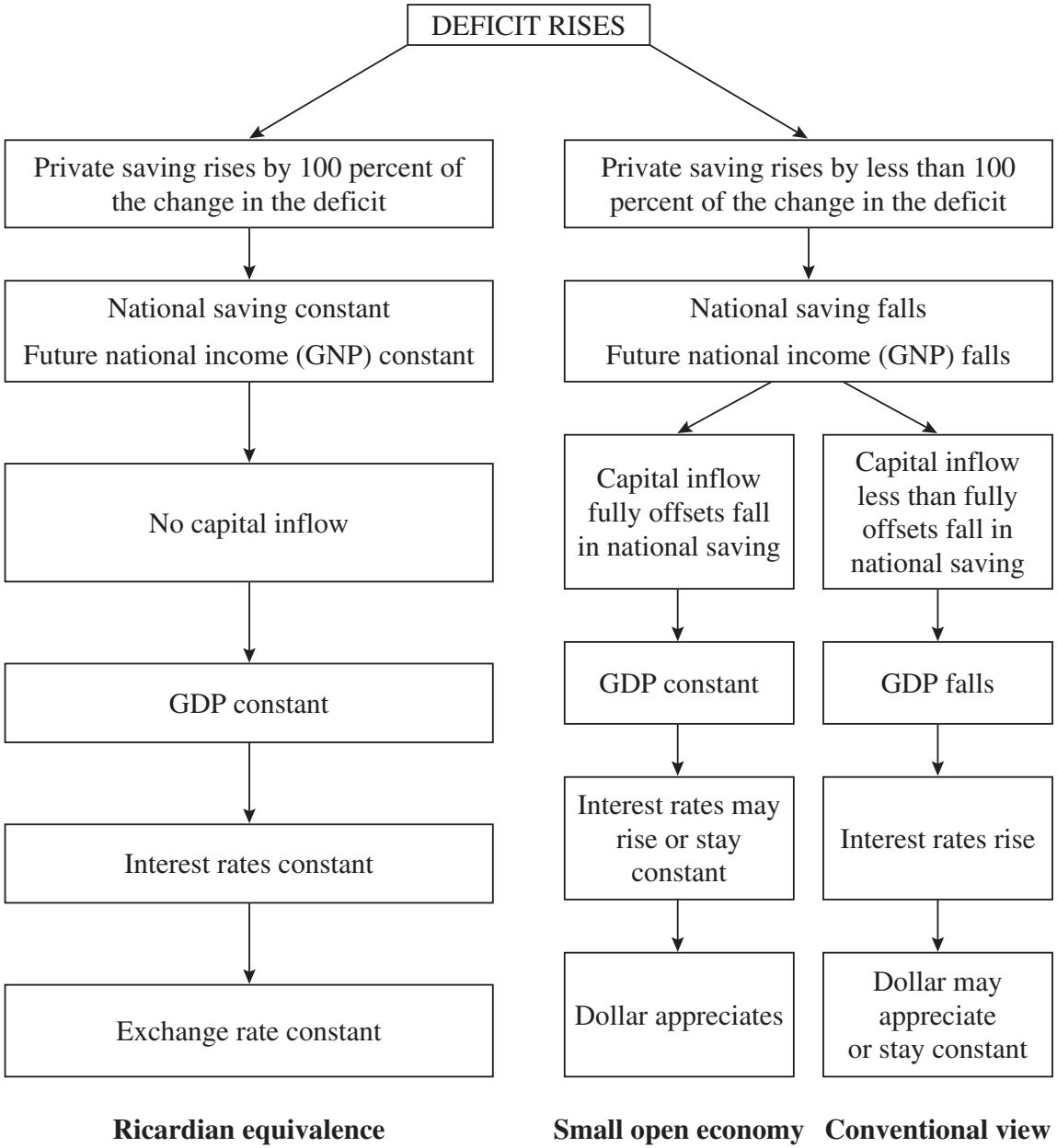
$i \uparrow \Rightarrow I \downarrow$

$T \downarrow \quad Y \uparrow$

$I = (Y - C - T) + (T - G)$

# Three Views

**Figure 5. Theoretical Responses to a Change in the Budget Deficit**




Source: Gale and Orszag (2004)

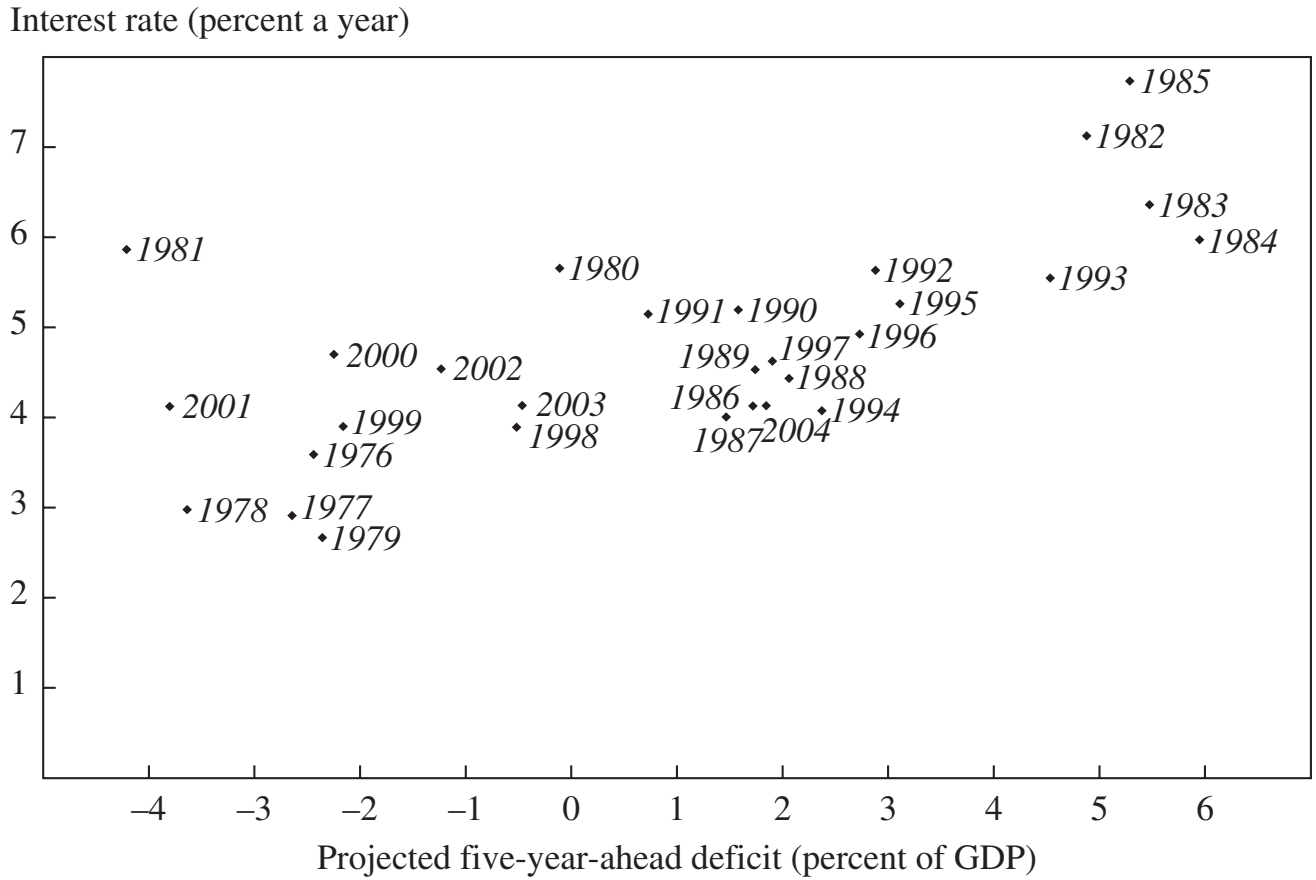
# Deficits and Private Saving

- The evidence suggests: a \$100 increase in the deficit leads to
- a \$25 increase in private saving
- a \$25 capital inflow from abroad
- a \$50 reducing in U.S. investment (Sinai et al. 2004).

$$\underbrace{Y-T-C}_{+\$25}+\underbrace{T-G}_{-\$100}+\underbrace{IM-EX}_{+\$25}=\underbrace{I}_{-\$50}$$

# Deficits and Interest Rates

**Figure 8. Forward Ten-Year Real Treasury Rates and Projected Deficits, 1976–2004**[a]




Source: Gale and Orszag (2004)

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Best estimates suggest: increase in government deficit by 1% of GDP raises interest rates by 0.3 to 0.6%.

# Is Today Different?

Does it look like crowding out is a major concern today?

One view: Furman and Summers (2019).

Real interest rates are very low, even though debt is rising.

# Review Questions

1. Does the government ever need to repay any of its debt?
2. What is the growth rate of debt if primary surpluses are zero?
3. Why would private saving rise when public debt rises?
4. If the government reduces its debt burden by inflating away debt, what do you expect to happen to AD?
5. What is the main limiting factor for government debt?
6. If the government raises the deficit today, does it have to reduce the deficit in the future?
   How does the answer depend on $r$ vs $g$?

$$\frac{\Delta B}{B} = \frac{rB - S}{B}$$

# Appendix: Derivations

# Two period example

The world lasts for $t = 1, 2$.

The economy starts with debt $B_1$.

There is no money (or $M$ is constant)

Budget constraint for $t = 1$:

$$B_2 = RB_1 - S_1 \tag{3}$$

Budget constraint for $t = 2$:

$$B_3 = RB_2 - S_2 \tag{4}$$
$$= R[RB_1 - S_1] - S_2 \tag{5}$$

where $R \equiv 1 + i$.

# Two period example

Combine the 2 budget constraints (substitute out $B_2$):

$$B_3 = R^2 B_1 - RS_1 - S_2 \tag{6}$$

In words...

Rearrange

$$\frac{B_3}{R^2} = B_1 - \frac{S_1}{R} - \frac{S_2}{R^2} \tag{7}$$

The present value of debt at the end equals the present value of borrowing ("primary deficits") in all periods.

This is very general (not limited to examples with a few periods)

# Many periods

We still have

$$\frac{B_{T+1}}{R^T} = B_1 - \frac{S_1}{R} - \frac{S_2}{R^2} \cdots - \frac{S_T}{R^T} \tag{8}$$

$$\frac{B_{T+1}}{R^T} = B_1 - PV(S;R) \tag{9}$$

$PV(S;R)$ is the present value of saving ("primary surpluses") discounted at $R$.

In words:

The increase in the present value of debt equals the present value of all dissaving ("primary deficits").

# Case 1: Finite Horizon

E.g., a person who cannot die in debt: $B_{T+1} = 0$

Consider the case of $B_1 = 0$.

- Any deficit must be offset by savings of equal present value.
- If the agent borrows now, they must save later.

With initial debt, just add repayment of the debt to $t = 1$ spending.

But this does not apply to governments (or firms)!

# Case 2: Infinite Horizon

Now what is the constraint on the present value of future debt $B_{T+1}/R^T$?

The depends on the path of output

- because tax revenues and spending rise with it.

Write output shares as lower case: $b_t \equiv B_t/Y_t$.

Assume output grows at a constant rate: $Y_t/Y_1 = g^{t-1}$.

# Case 2: Infinite Horizon

Then we have

$$\frac{B_{T+1}}{R^T} = \underbrace{\frac{b_{T+1}}{R^T} Y_{T+1}}_{b \equiv B/Y} = \underbrace{\frac{b_{T+1}}{R^T} g^T Y_1}_{Y_{T+1} = g^T Y_1} = \frac{b_{T+1}}{(R/g)^T} Y_1 \tag{10}$$

Apply the intertemporal budget constraint (divided by $Y_1$):

$$\frac{b_{T+1}}{(R/g)^T} = \frac{B_1}{Y_1} - \frac{S_1/Y_1}{R} - \frac{S_2/Y_1}{R^2} - \cdots - \frac{S_T/Y_1}{R^T} \tag{11}$$

$$= b_1 - \frac{s_1}{R} - \frac{s_2}{R^2}\frac{Y_2}{Y_1} - \cdots - \frac{s_T}{R^T}\frac{Y_T}{Y_1} \tag{12}$$

$$= b_1 - \frac{1}{R}\left[\frac{s_1}{1} + \frac{s_2}{(R/g)^1} + \cdots + \frac{s_T}{(R/g)^{T-1}}\right] \tag{13}$$

$$= b_1 - (1/R) \times PV(s; R/g) \tag{14}$$

This uses $S_t/Y_1 = (S_t/Y_t) \times (Y_t/Y_1) = s_t Y_t/Y_1$.

Note: the race between interest and output growth!

# Case 2: Infinite Horizon

Assume that $s_t \equiv S_t/Y_t$ is constant at $\bar{s}$.

Then

$$\frac{b_{T+1}}{(R/g)^T} = b_1 - \frac{\bar{s}}{R}\sum_{t=0}^{T-1}(R/g)^{-t} \tag{15}$$

Recall that

$$\sum_{t=0}^{T-1}(R/g)^{-t} = \frac{(R/g)^{-T}-1}{(R/g)^{-1}-1} \tag{16}$$

Then

$$b_{T+1} = (R/g)^T\left[b_1 - \frac{\bar{s}}{R}\frac{(R/g)^{-T}-1}{(R/g)^{-1}-1}\right] \tag{17}$$

Now what happens depend on $R$ versus $g$.

# Traditional view: $R > g$

$R/g > 1$ and therefore $(R/g)^t$ grows over time.

For large $T$: $(R/g)^T \to 0$.

$$b_{T+1} = (R/g)^T \left[ b_1 - \frac{\overline{s}}{R} \underbrace{\frac{0-1}{(R/g)^{-1} - 1}}_{>0} \right] \tag{18}$$

The government must save to prevent debt/GDP from exploding.

# Low Interest Rates: $R < g$

Now $(R/g)^T \to 0$ over time.

$$b_{T+1} = \underbrace{(R/g)^T b_1}_{\to 0} - \frac{\bar{s}}{R} \underbrace{\frac{1-(R/g)^T}{(R/g)^{-1}-1}}_{\text{finite}} \tag{19}$$

Now output grows faster than the interest burden on debt.

The government can keep borrowing forever.

The debt-to-output ratio does not blow up.

# Reading

Blanchard, Macroeconomics, 7th ed, ch. 23

Also useful:

- Time to Worry Less about Federal Budget Deficits? (Timothy Taylor's summary of Furman & Summers)
- Jones (2013), ch 13.

# Advanced Reading

- Ball and Mankiw (1995): informal. Ideas
- Gale and Orszag (2004): summarizes the evidence of the effects of deficits on interest rates
- Rubin et al. (2004) http://www.brookings.edu/papers/2004/0105budgetdeficit_orszag.a
  - nice summary of possible consequences of budget deficits.

# References I


Ball, L. and N. G. Mankiw (1995): "What do budget deficits do?" Tech. rep., National Bureau of Economic Research.

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