National Accounts

Spring 2026
Econ 256, College of the Holy Cross
Prof. Josh Abel

Chapters 4-1, 22-1, 7-1, 7-2, and Bernanke (2005)

Gross Domestic Product (GDP)

- GDP is the most-cited measure of the macroeconomy. It is
  - The market value ($)
  - Of final goods and services
  - Produced in a given country
  - At some point in time

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Because an economy produces many types of goods, aggregating them requires a common unit of measurement. We use dollars (or whatever currency).

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If you buy lumber to build a house, and then you sell the house you've built, the price you received for the house counts as GDP, but the price you paid for the lumber does not. Lumber is an intermediate good whose value is built into the house. Including it in GDP would be double-counting.

(If you just use the lumber as a skateboard ramp, then it is a final product and would be GDP.)

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If you build the house and then employ a real estate agent to sell it, the house is GDP, and so is the real estate agent's fee.

Note that if you sell an existing home, that is not part of GDP – it was already created – but the real estate agent's fee is.

Similarly, the value of stocks bought and sold is not GDP, but any fees/commissions paid to brokers are.

Gross Domestic Product (GDP)

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A foreign-owned company that produces in the US counts as GDP. A US-owned company producing abroad does not count as GDP (for the US).

Gross National Product (GNP) takes the reverse perspective: it measures US-owned production, regardless of where it occurs.

Gross Domestic Product (GDP)

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  - The market value ($)
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GDP is a flow of value – it measures production in a specific window (often, a quarter). It is not a direct measure of wealth, which is a stock of value.
Countries that are wealthy also tend to have higher GDPs, but they are distinct concepts.

The 3 Faces of GDP

Domestic output

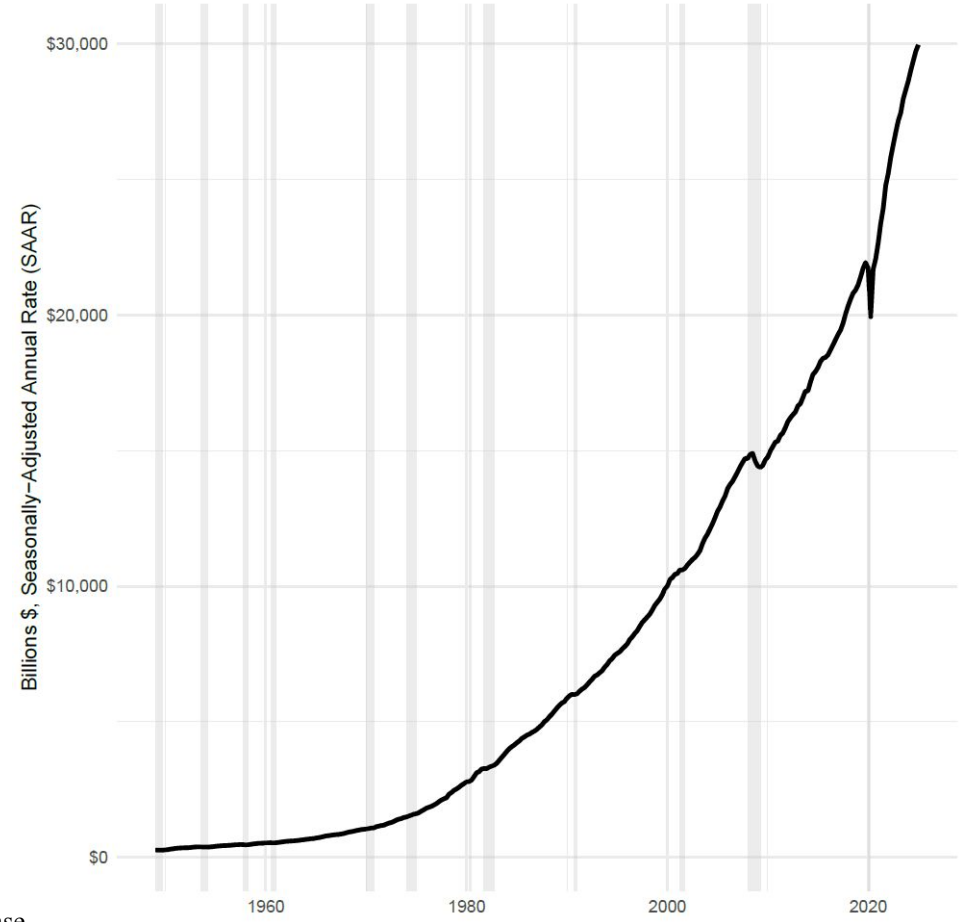
=

Expenditure on domestic goods and services

=

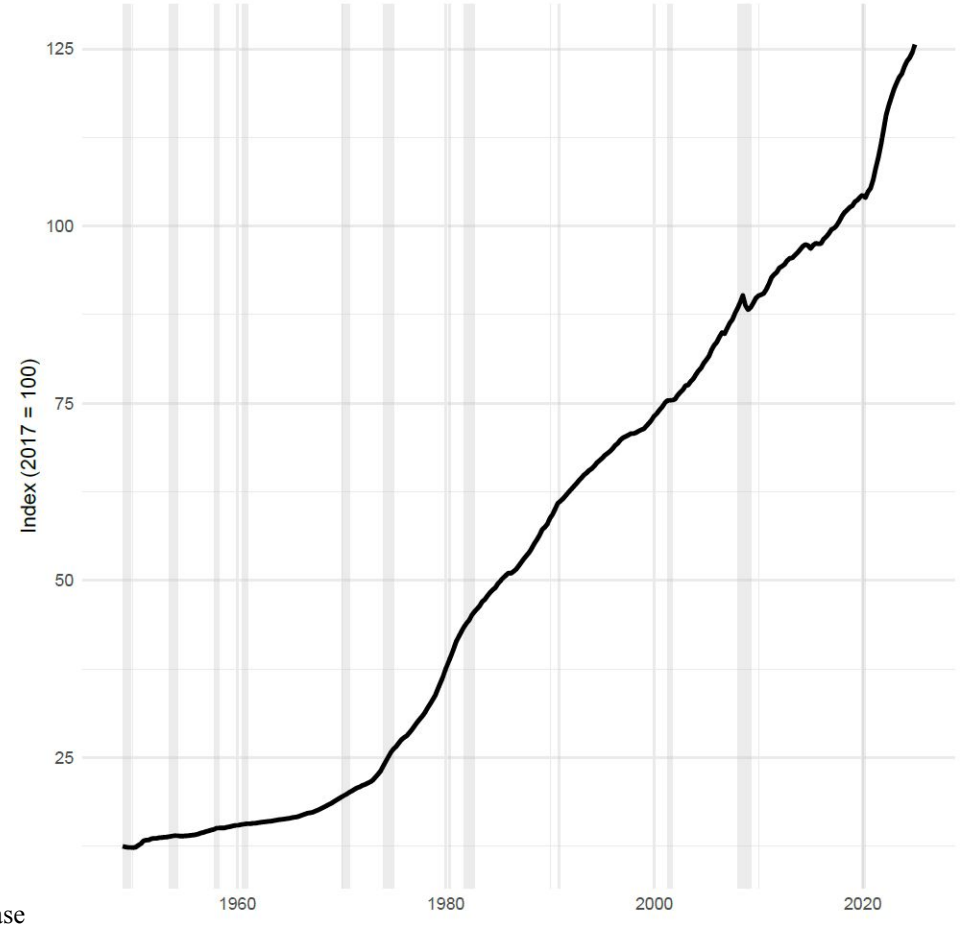
Income from domestic production

Nominal GDP



Source: Federal Reserve Economic Database

Aggregate Price Level



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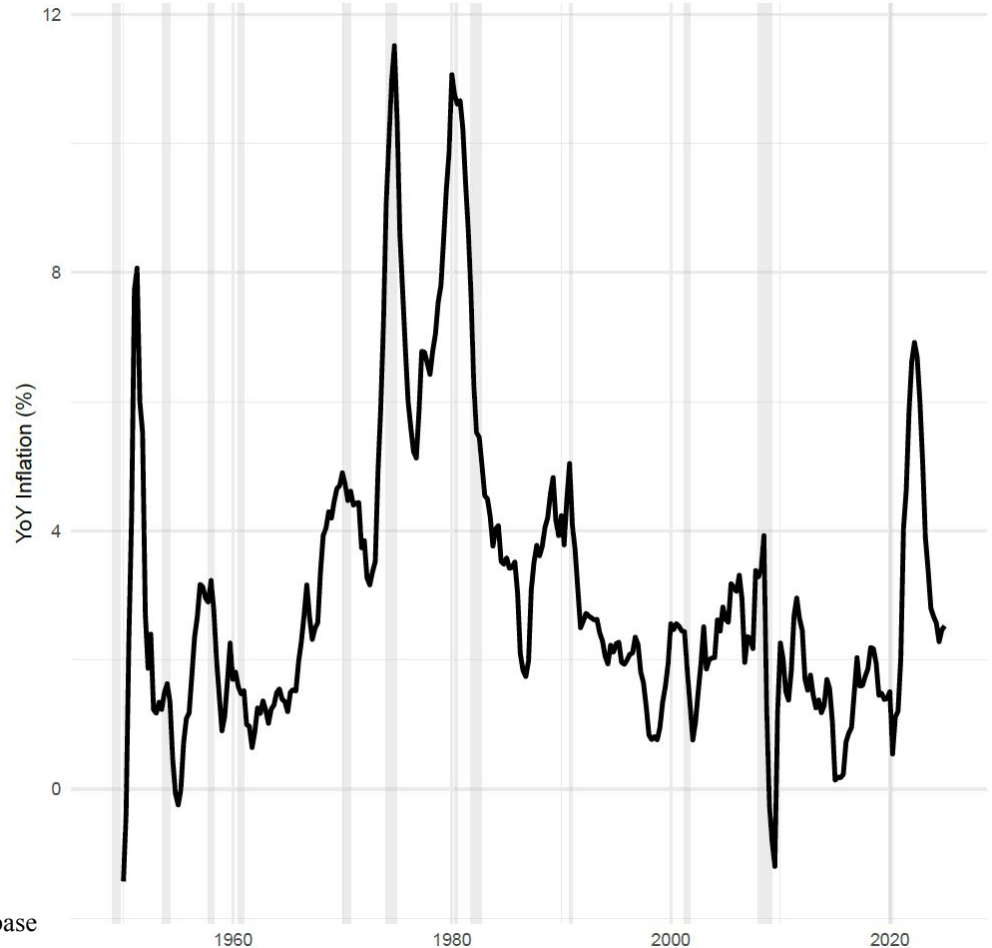
Price Inflation



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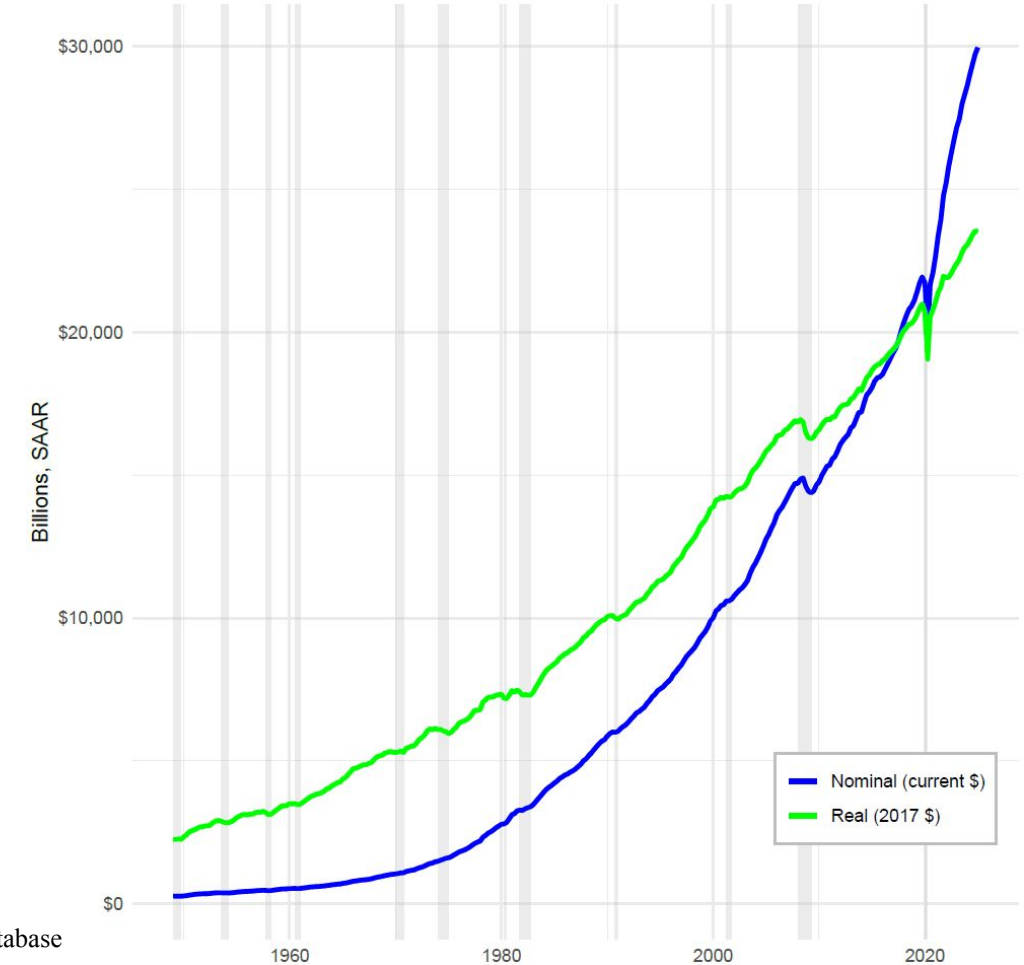
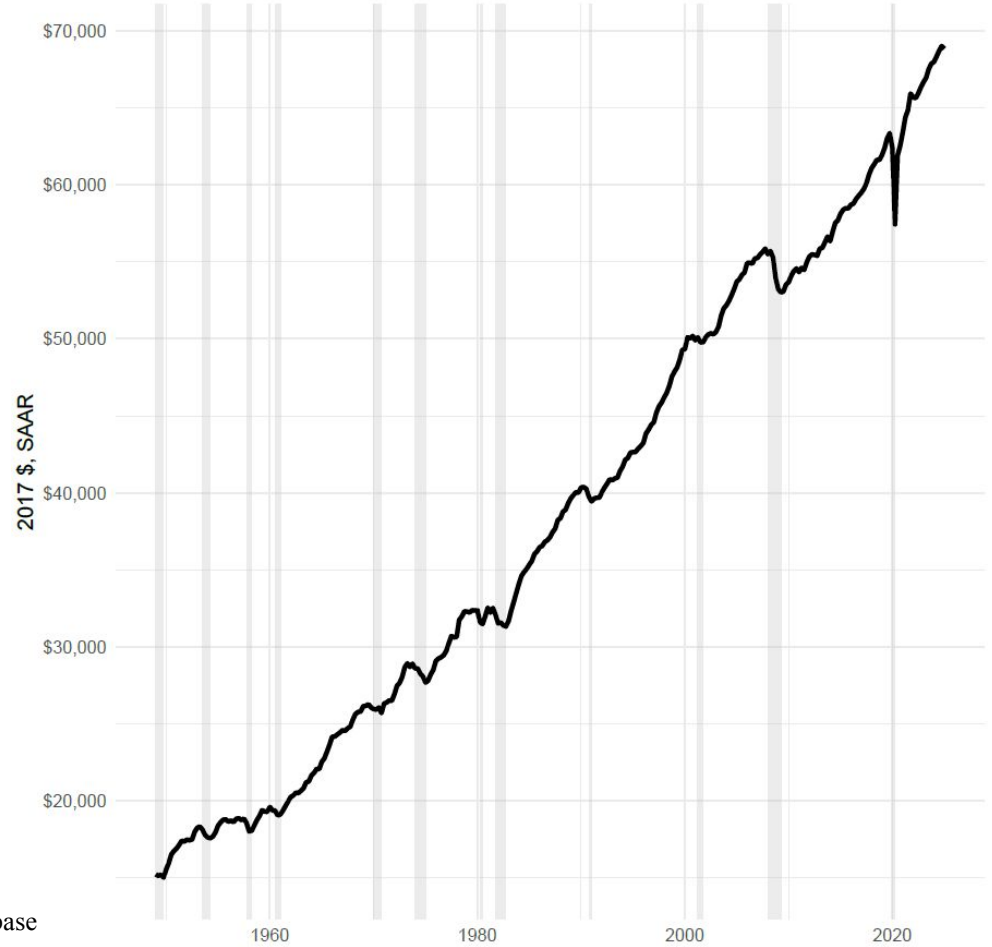
Real GDP



Source: Federal Reserve Economic Database

Real GDP per capita

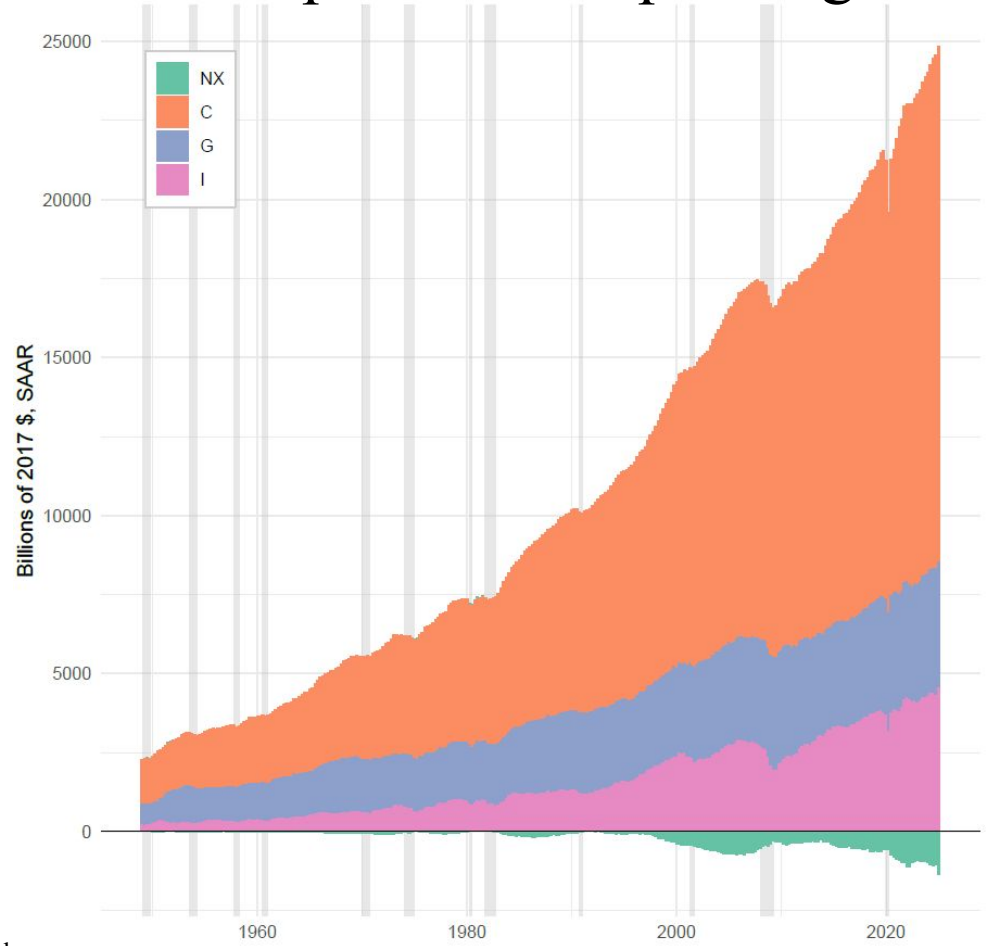


Source: Federal Reserve Economic Database

Components of Spending
$Y = C + I + G + NX$

- Domestic output/GDP: Y
- Expenditure on domestic output:
  - Private consumption (mostly by households): C
  - Investment: I
  - Government consumption: G
  - Net exports: NX
- So C + I + G is domestic expenditure…
  - If we export more than we import ($NX > 0$), then output exceeds domestic spending
  - If we export less than we import ($NX < 0$), then domestic spending exceeds output

Components of Spending



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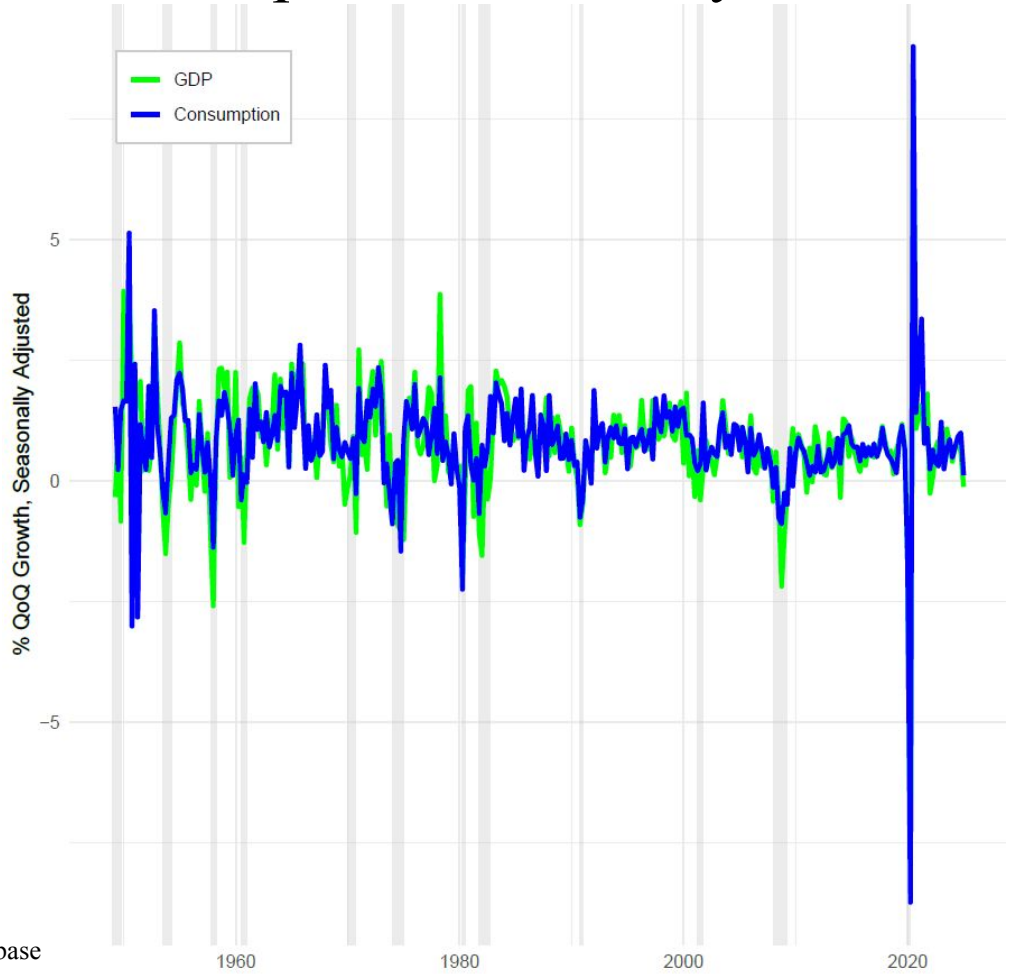
Consumption is relatively smooth



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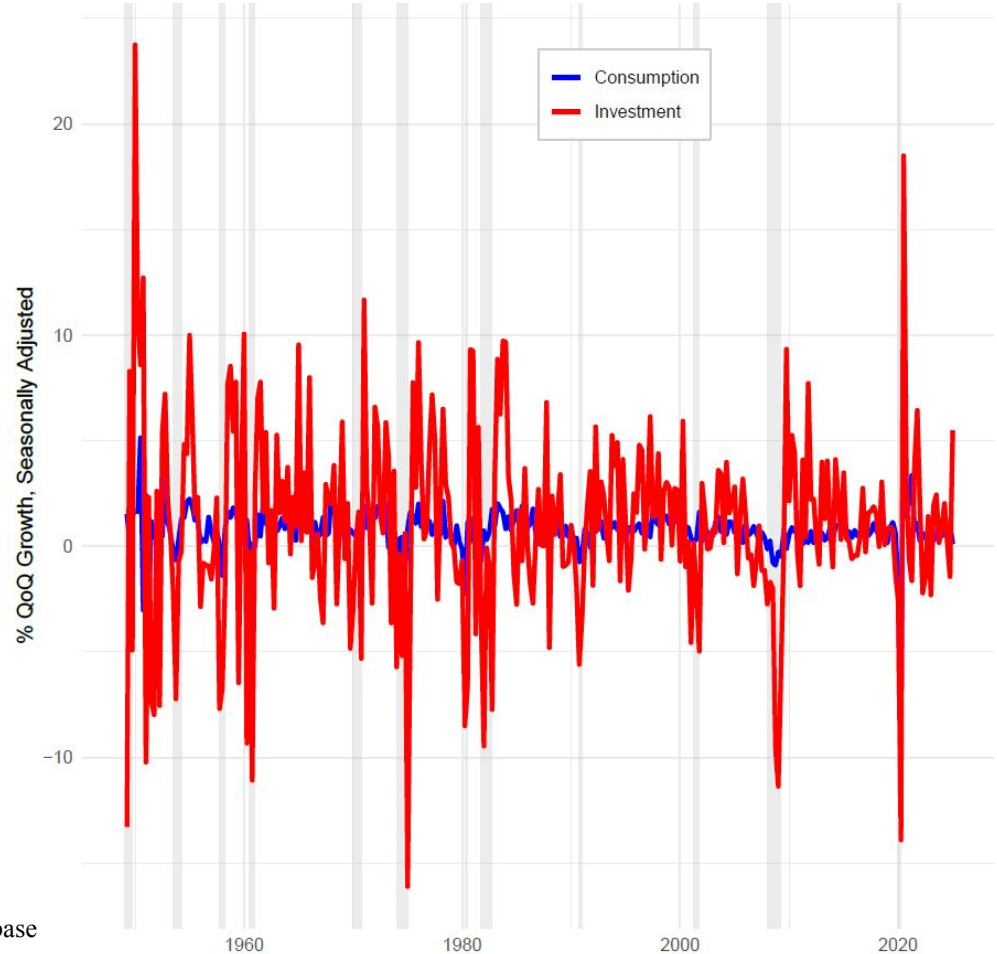

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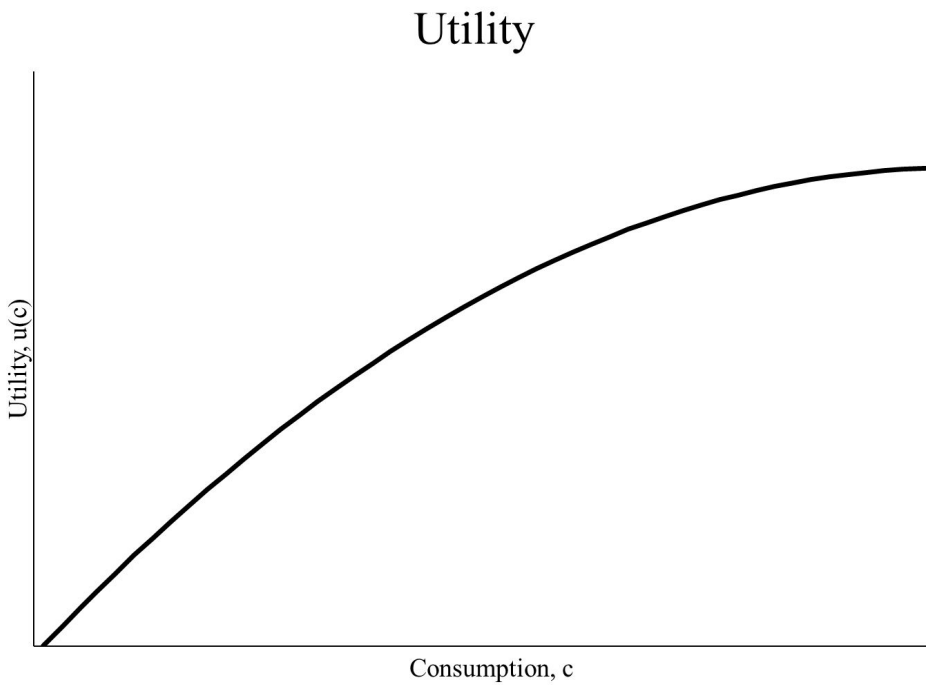
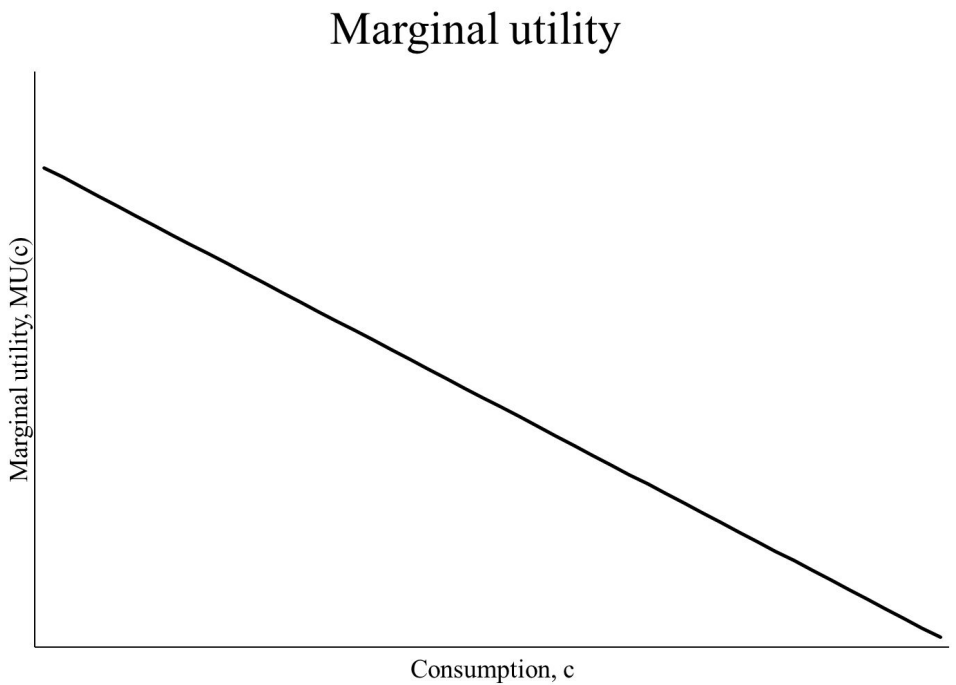
Concave Utility

- A utility function, u(c), tells us how much utility (i.e. satisfaction/happiness) the household gets as a function of how much they consume.
  - The first derivative of the utility function, u'(c), is called "marginal utility" – MU(c).
- Economists will typically assume:
  - $u'(c) > 0$ – more consumption leads to more utility
    - Marginal utility is positive
  - $u''(c) < 0$ – each unit of consumption is less valuable than the one before it
    - Marginal utility decreases
- Example (quadratic utility): $u(c) = a \cdot c - b/2 \cdot c^2$ for $c < a/b$
  - $u'(c) = a - b \cdot c > 0$
  - $u''(c) = -b < 0$

Quadratic Utility, Visualized





Utility maximization

$$\text{Maximize: } u(C_1) + \beta \cdot u(C_2),$$

$$\text{where } C_2 = Y_2 + (1+i)\cdot(Y_1 - C_1)$$

- Substitution gives us a univariate, unconstrained problem:

$$\text{Maximize: } u(C_1) + \beta \cdot u(Y_2 + (1+i)\cdot(Y_1 - C_1))$$

- Calculus says you solve such a problem by setting the derivative equal to 0 (remember the Chain Rule!):

$$u'(C_1) - \beta \cdot (1+i) \cdot u'(Y_2 + (1+i)\cdot(Y_1 - C_1)) = 0$$

$$u'(C_1) = \beta \cdot (1+i) \cdot u'(Y_2 + (1+i)\cdot(Y_1 - C_1))$$

$$u'(C_1) = \beta \cdot (1+i) \cdot u'(C_2)$$

Alternative Derivation

Maximize: $u(C_1) + \beta \cdot u(C_2)$,

where $C_2 = Y_2 + (1+i) \cdot (Y_1 - C_1)$

- "Perturb" C_1 by $+\Delta$
  - Benefit today:
    - Utility rises by $\Delta \cdot u'(C_1)$
  - Cost tomorrow:
    - Consumption falls by $\Delta \cdot (1+i)$
    - Utility falls by $\Delta \cdot (1+i) \cdot u'(C_2)$
    - Discounted utility falls by $\beta \cdot \Delta \cdot (1+i) \cdot u'(C_2)$
- Total change in utility is $\Delta \cdot (u'(C_1) - \beta \cdot (1+i) \cdot u'(C_2))$
  - If this is positive, then you should increase C_1 – i.e. you were not optimizing
  - If this is negative, then you should decrease C_1 – i.e. you were not optimizing
  - So must have $\Delta \cdot (u'(C_1) - \beta \cdot (1+i) \cdot u'(C_2)) = 0$

$$u'(C_1) = \beta \cdot (1+i) \cdot u'(C_2)$$

Consumption smoothing

$$u'(C_1^*) = \beta \cdot (1+i) \cdot u'(Y_2 + (1+i) \cdot (Y_1 - C_1^*))$$

We can get *most* of the intuition if we set $\beta = 1$ and $i = 0$:

$$u'(C_1^*) = u'(Y_2 + Y_1 - C_1^*)$$

- Suppose Y_1 falls by Δ and you cut C_1 by Δ to match. Is that optimal?

Consumption smoothing

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$$u'(C_1^*) = u'(Y_2 + Y_1 - C_1^*)$$

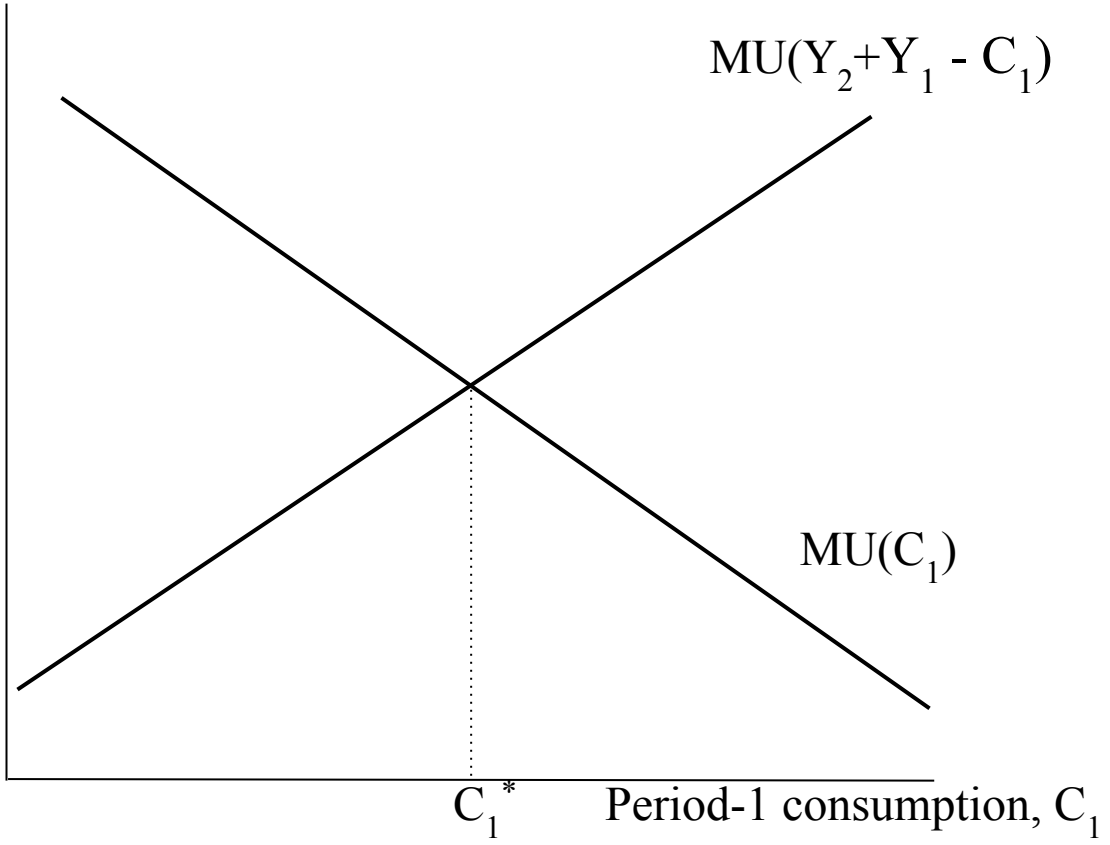
- Suppose Y_1 falls by Δ and you cut C_1 by Δ to match. Is that optimal?
- No!

$$\text{FOC: } u'(C_1^* - \Delta) > u'(Y_2 + Y_1 - C_1^*)$$

- Need to **smooth consumption**
  - If income falls, dissave (or borrow) to help spread some of that pain to the future, rather than bearing it all now
  - Much of macroeconomics and finance is premised on this very simple idea

Consumption Smoothing and Marginal Utilities, Visualized

(Assumes $\beta = 1$ and $i = 0$.)



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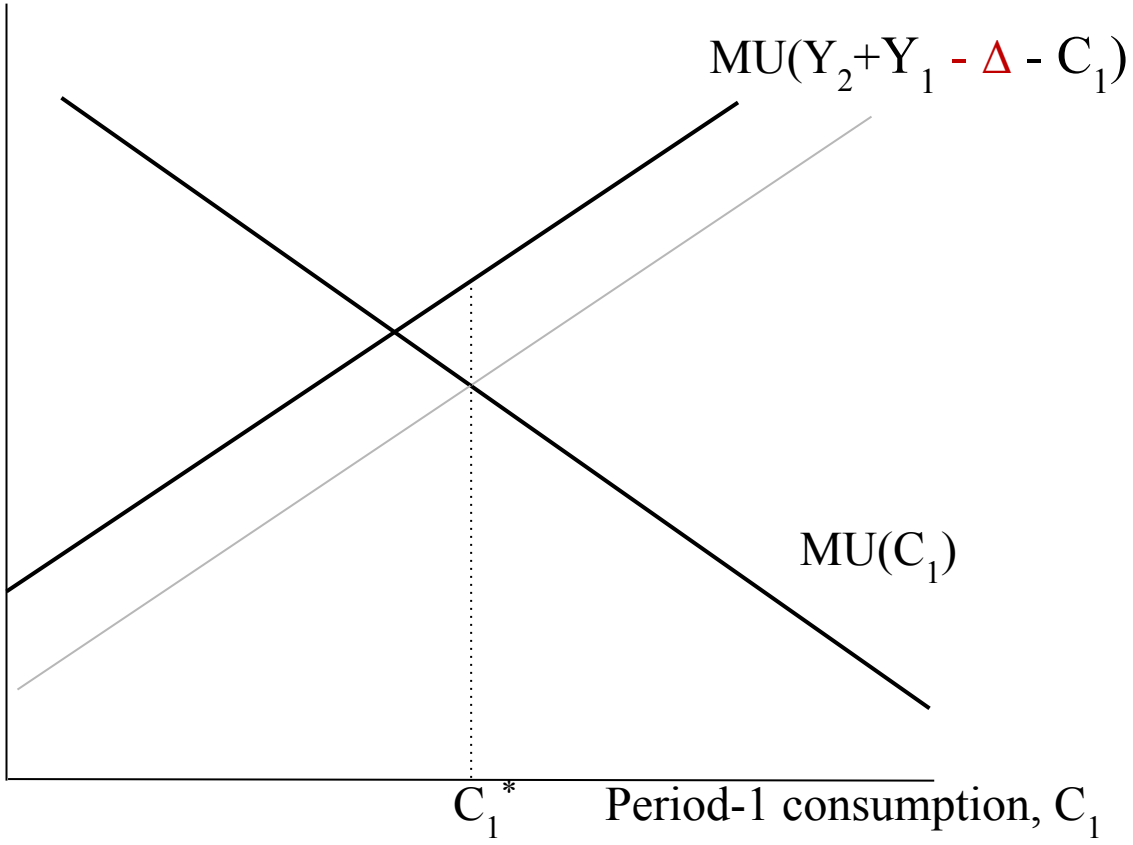

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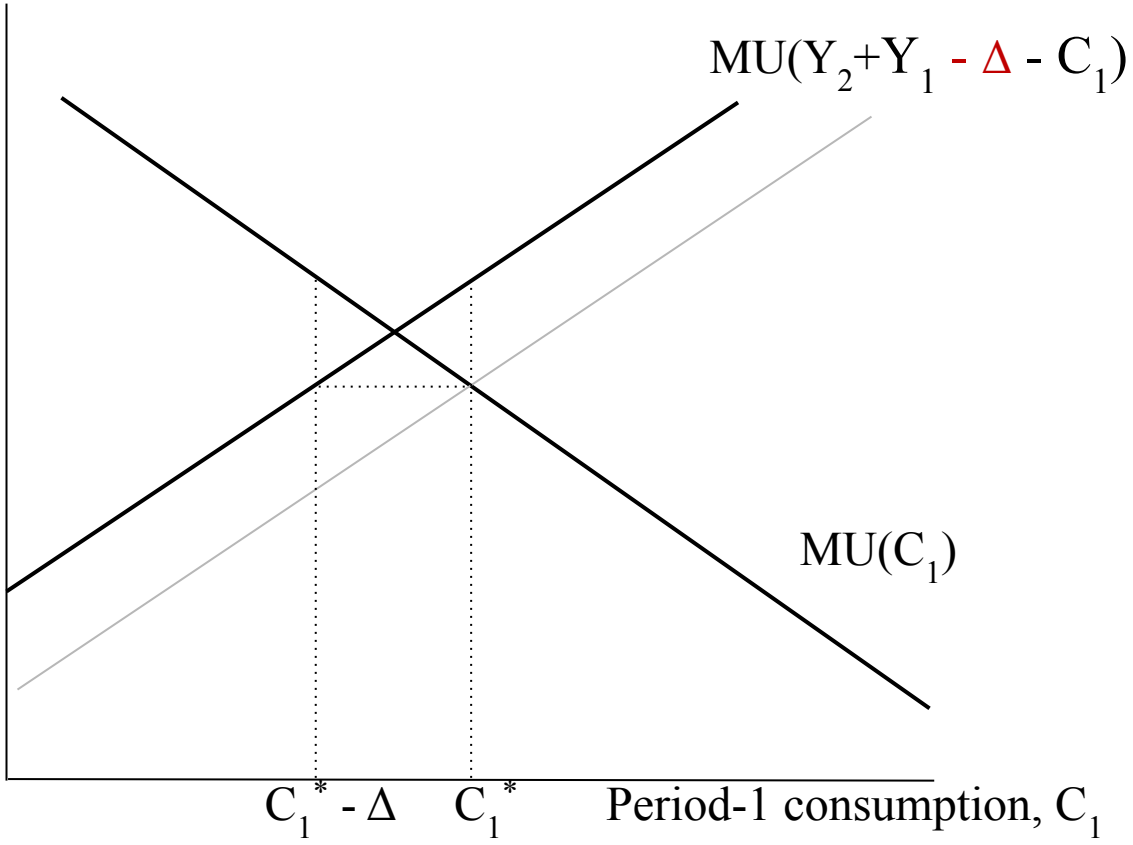

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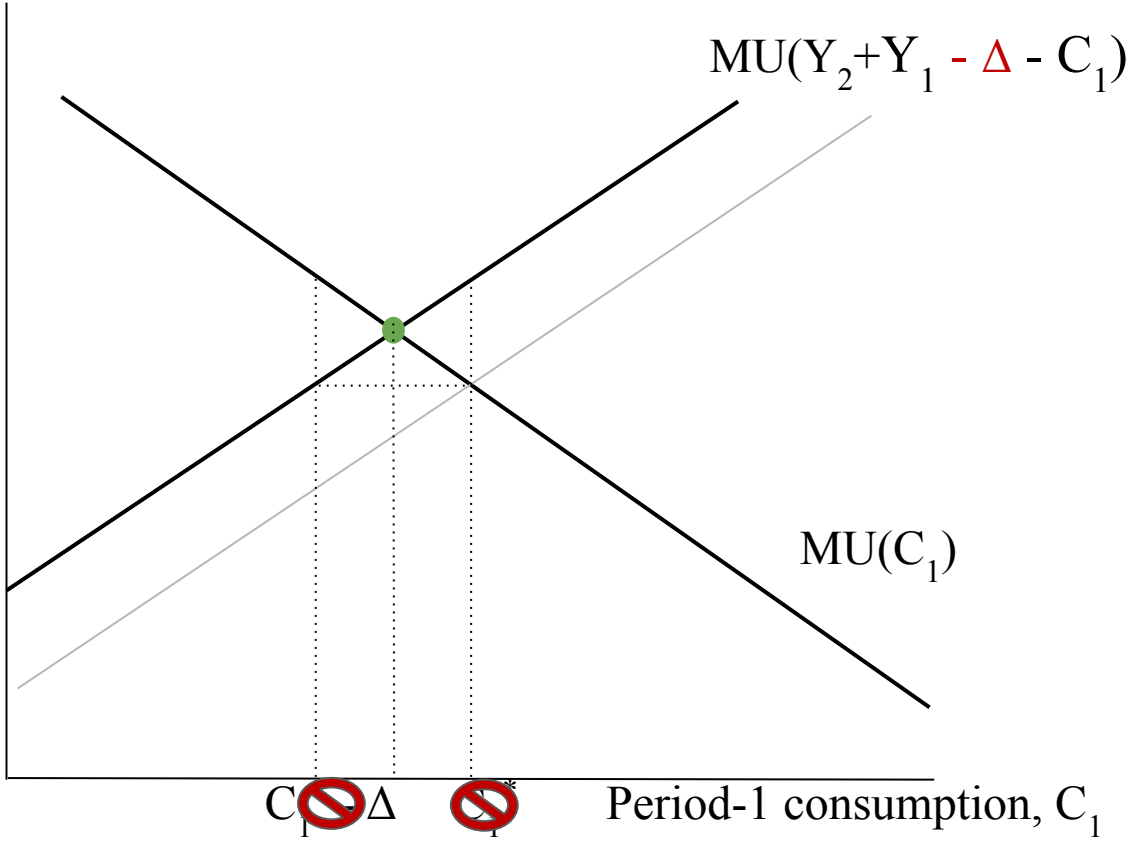
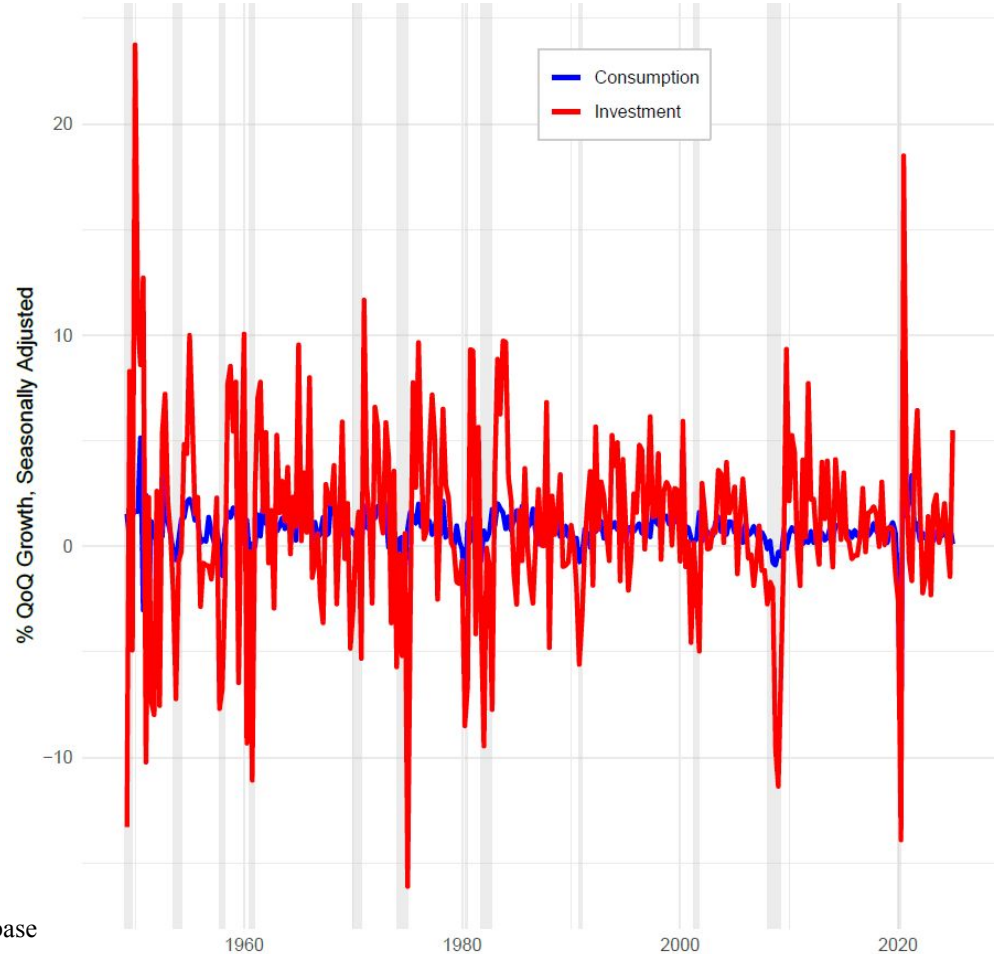
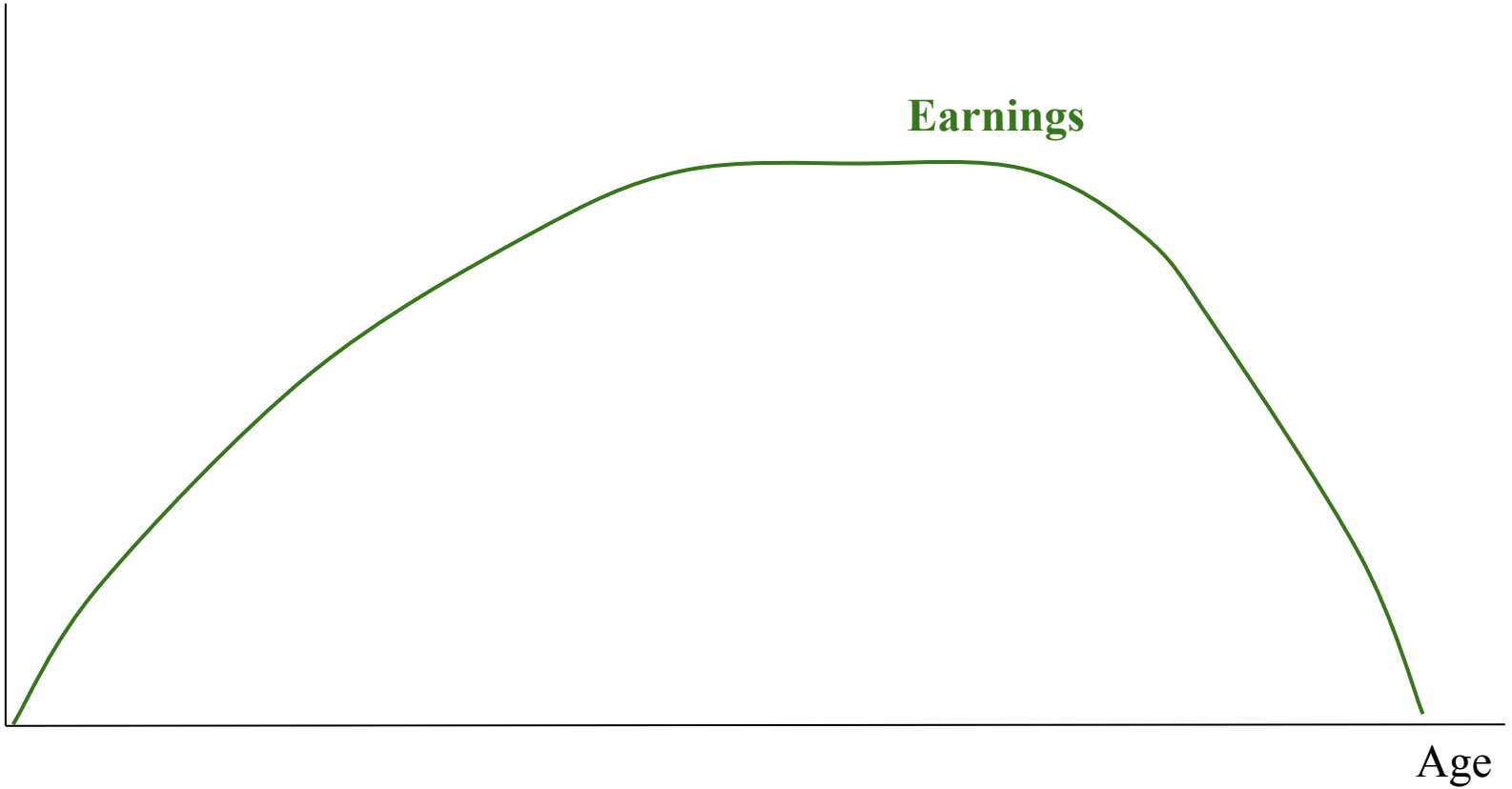


Consumption is relatively smooth



Source: Federal Reserve Economic Database

Life Cycle/Permanent Income Hypothesis



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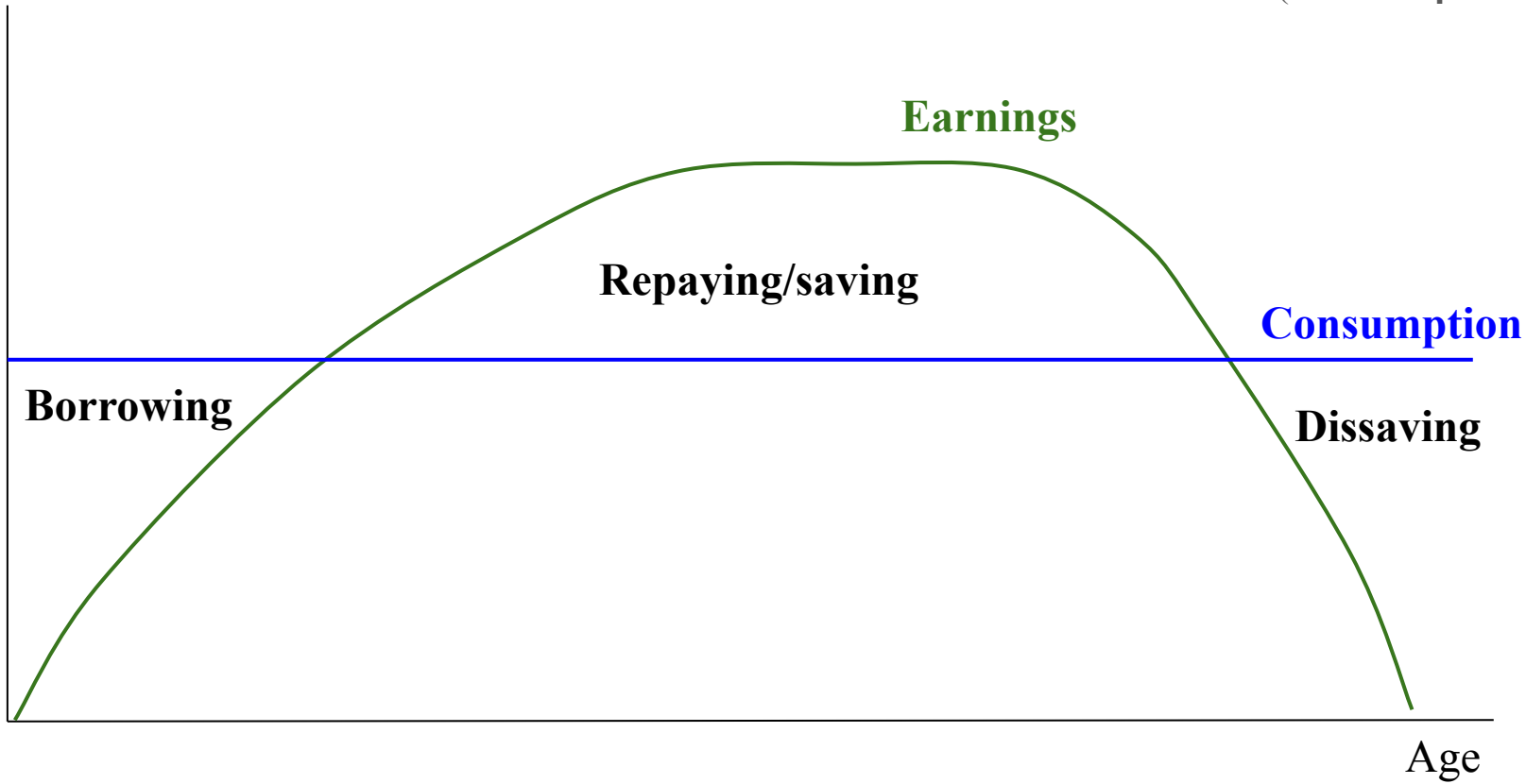
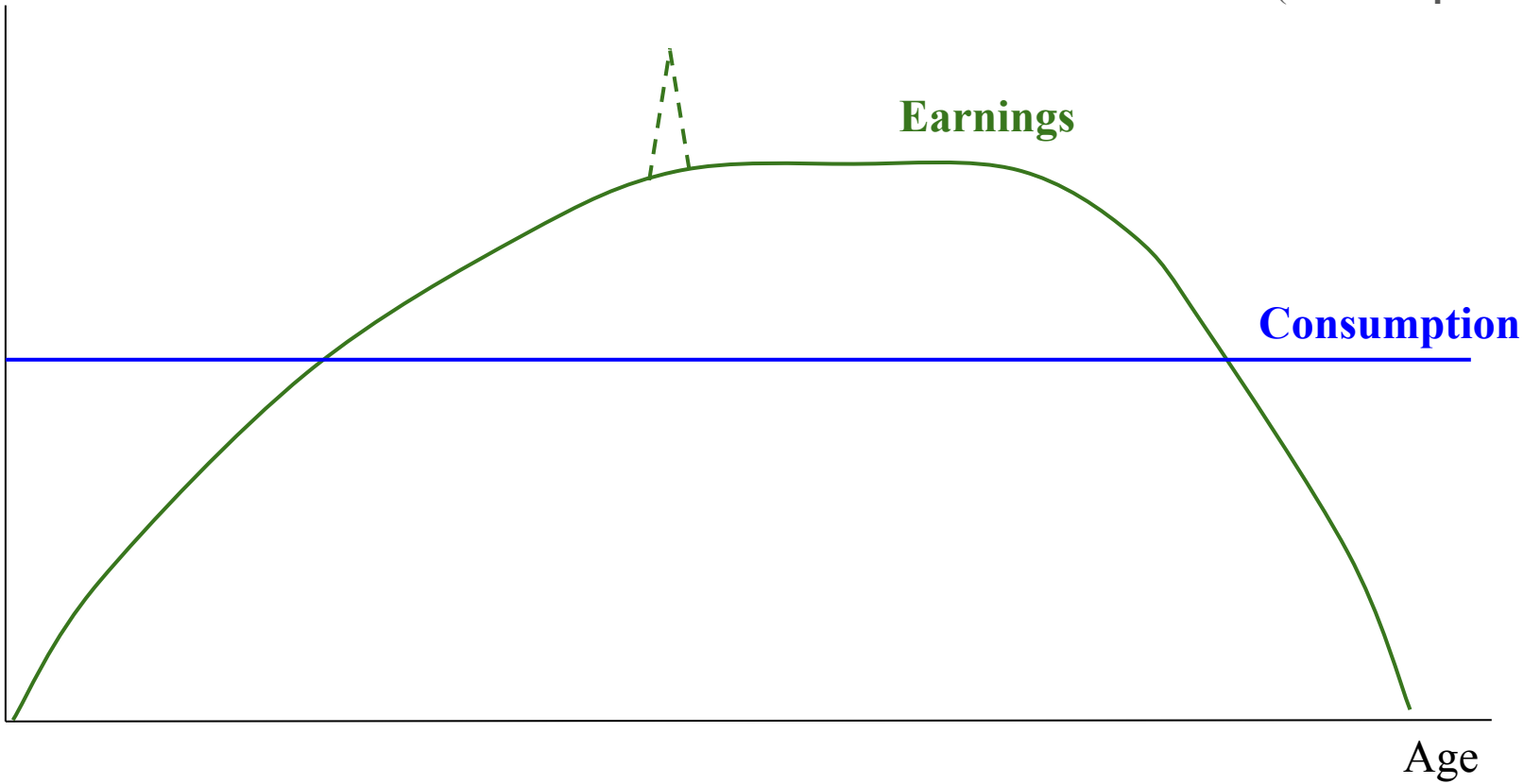


Smoothing of a Transitory Shock

(Assumes $\beta = 1$ and $i = 0$.)



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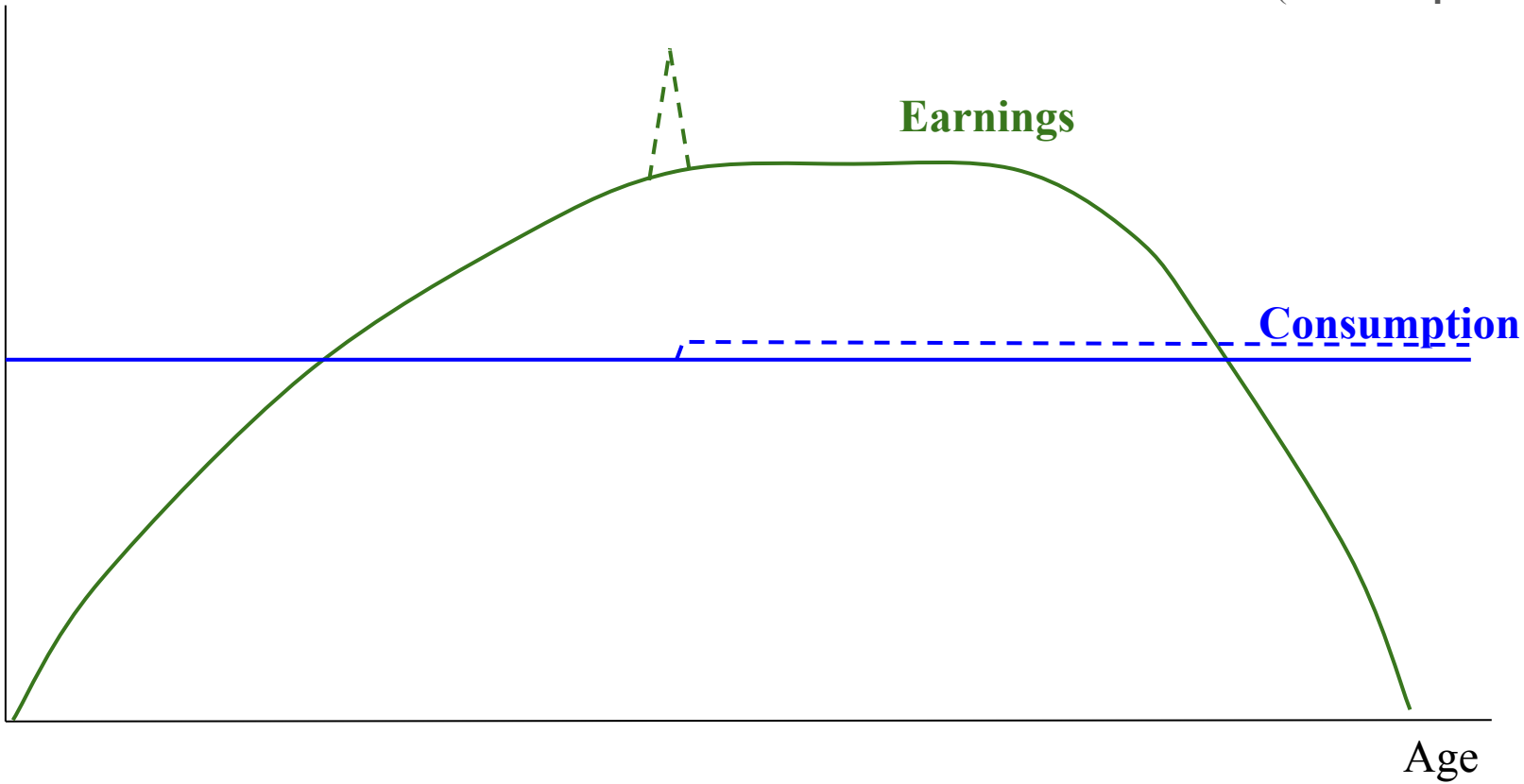

Effect of a Persistent Shock

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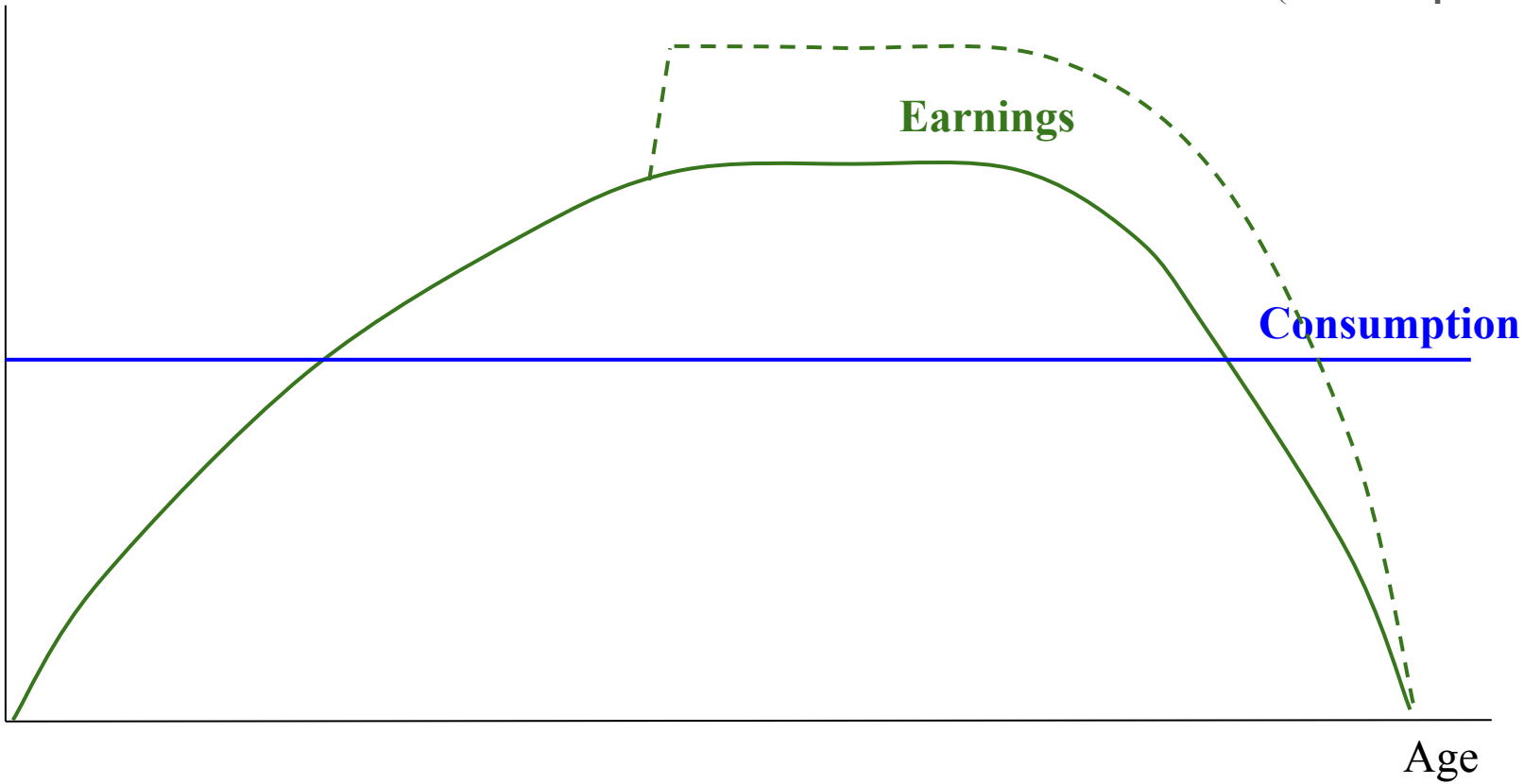

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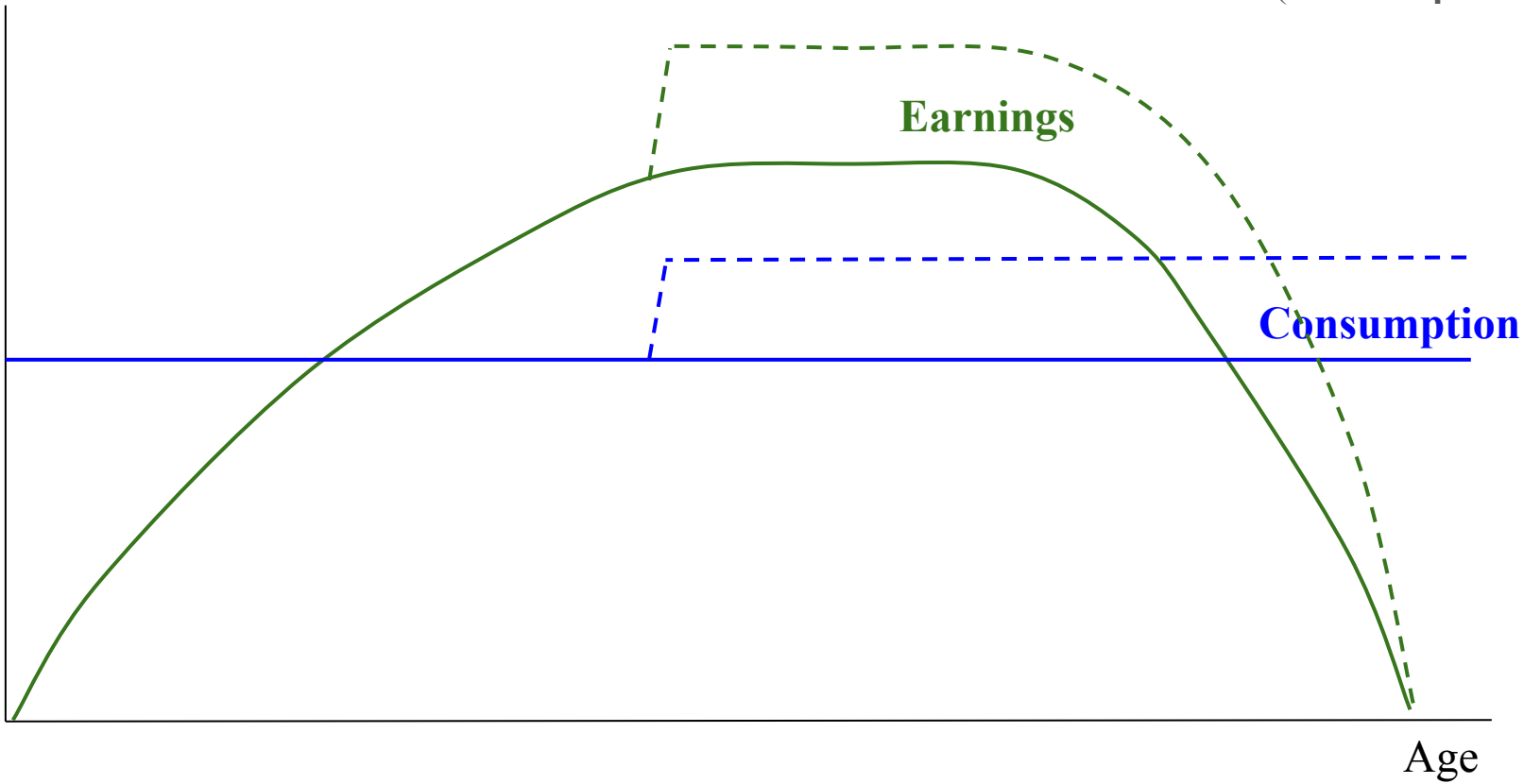
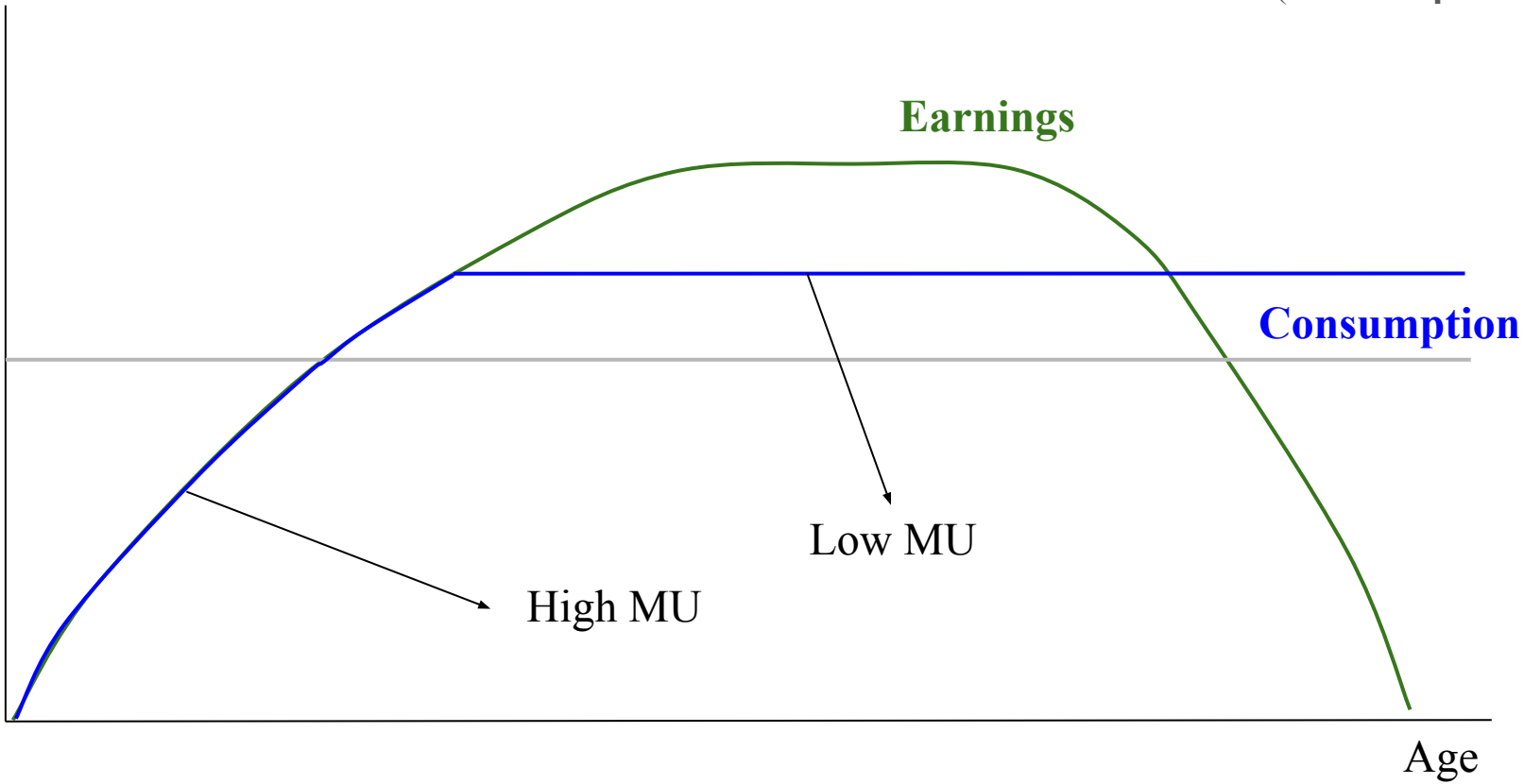


Borrowing Constraint

(Assumes $\beta = 1$ and $i = 0$.)



Borrowing-constrained households do not smooth income shocks

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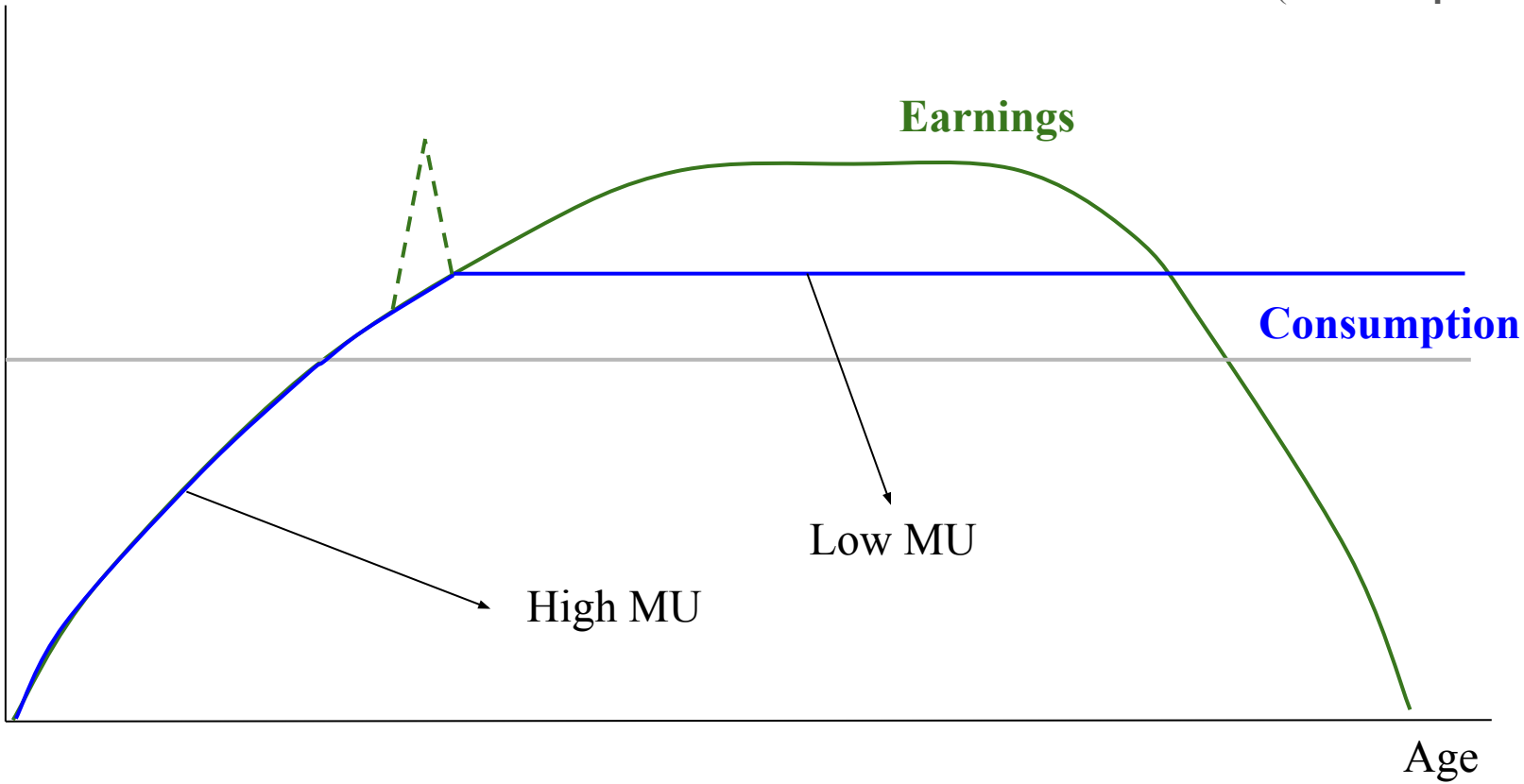

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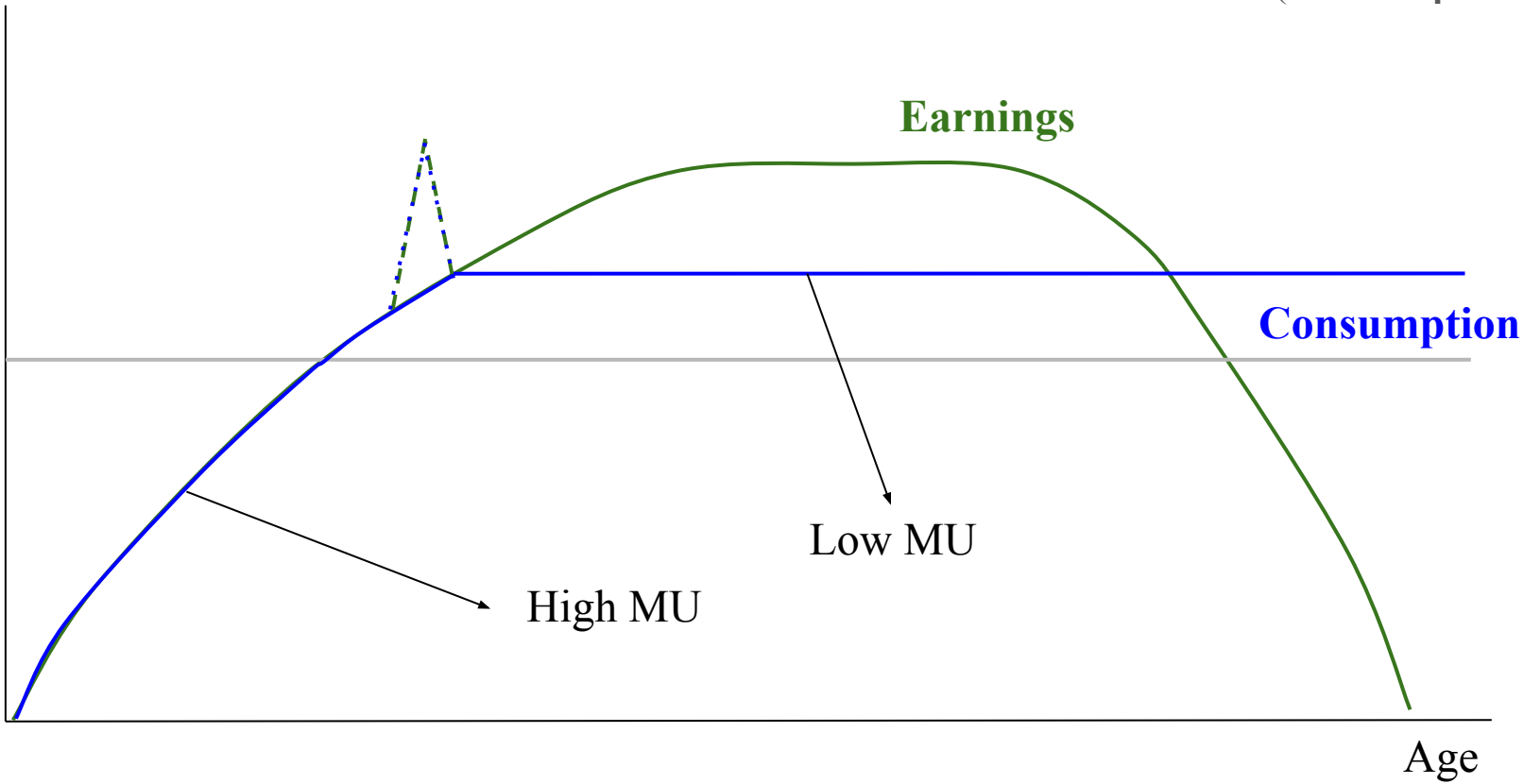

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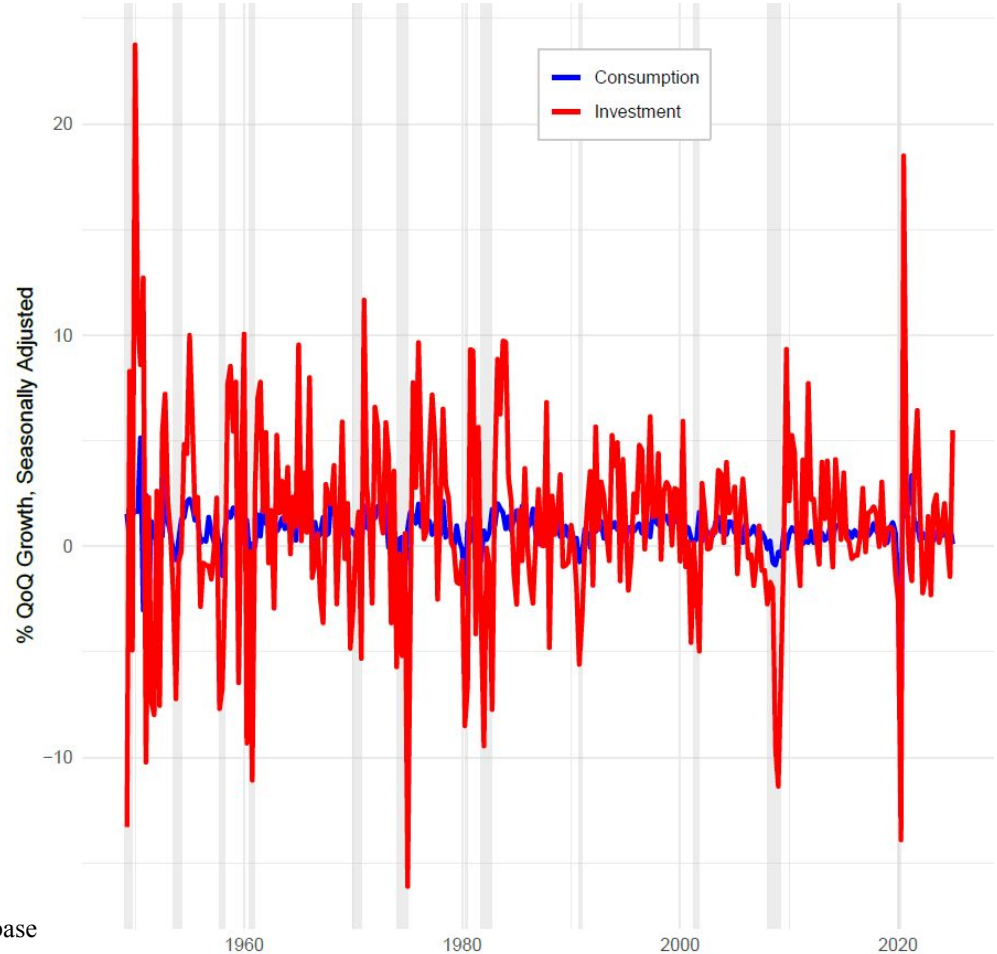


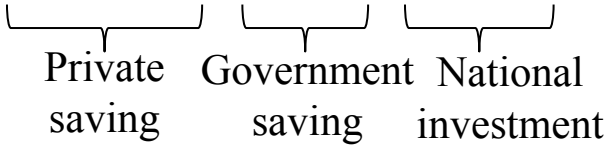
Source: Federal Reserve Economic Database

National Savings and Investment

$$Y = C + I + G + NX$$

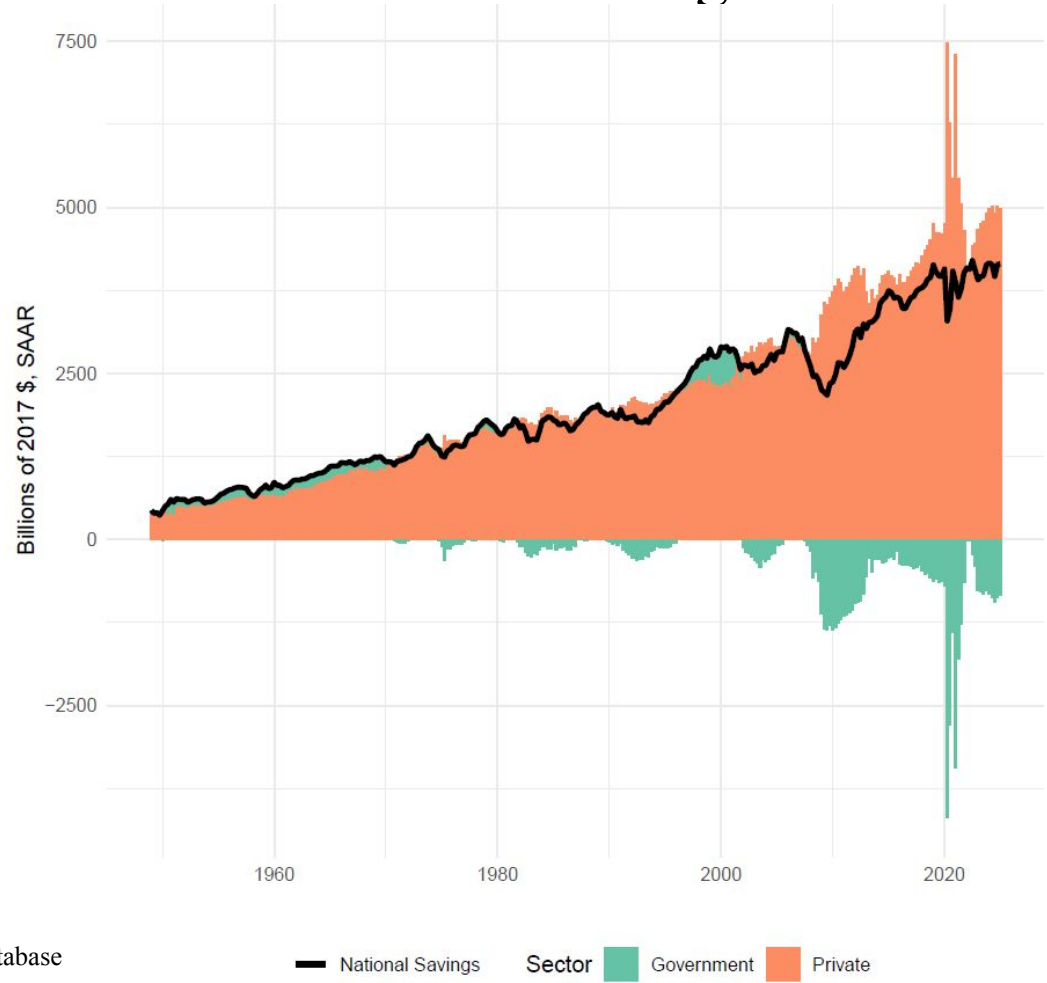
$$Y - C - G = I + NX$$

$$Y - T - C + T - G = I + NX$$



- National Savings = National Investment. When we save a dollar, we either:
  - Invest in out own economy (I)
  - Take ownership of foreign economies (NX > 0)

National Savings



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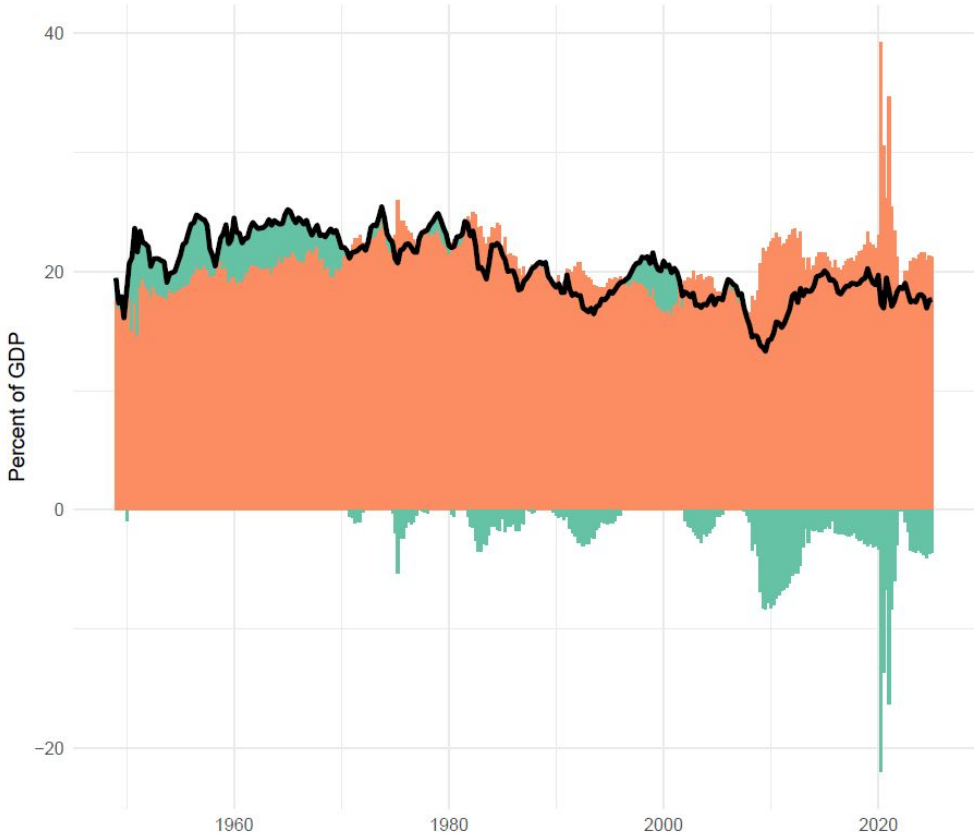
National Savings



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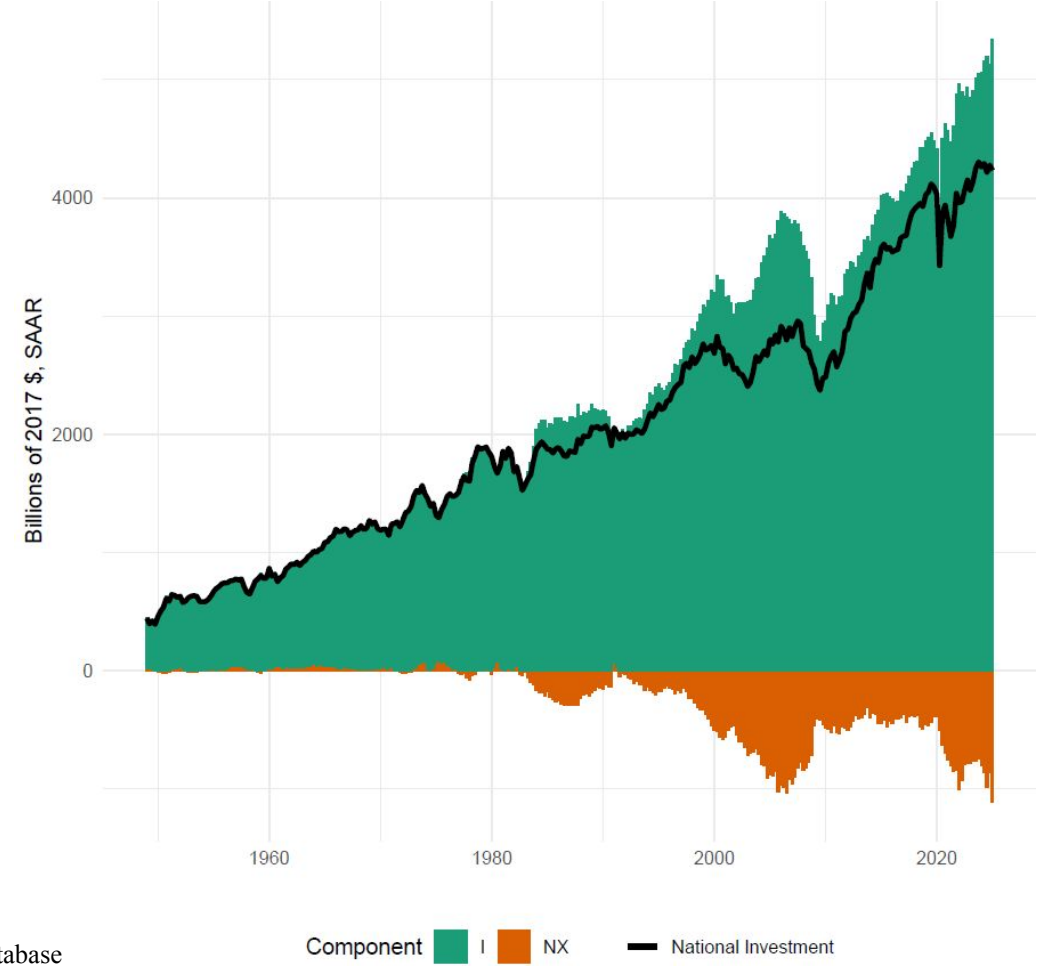

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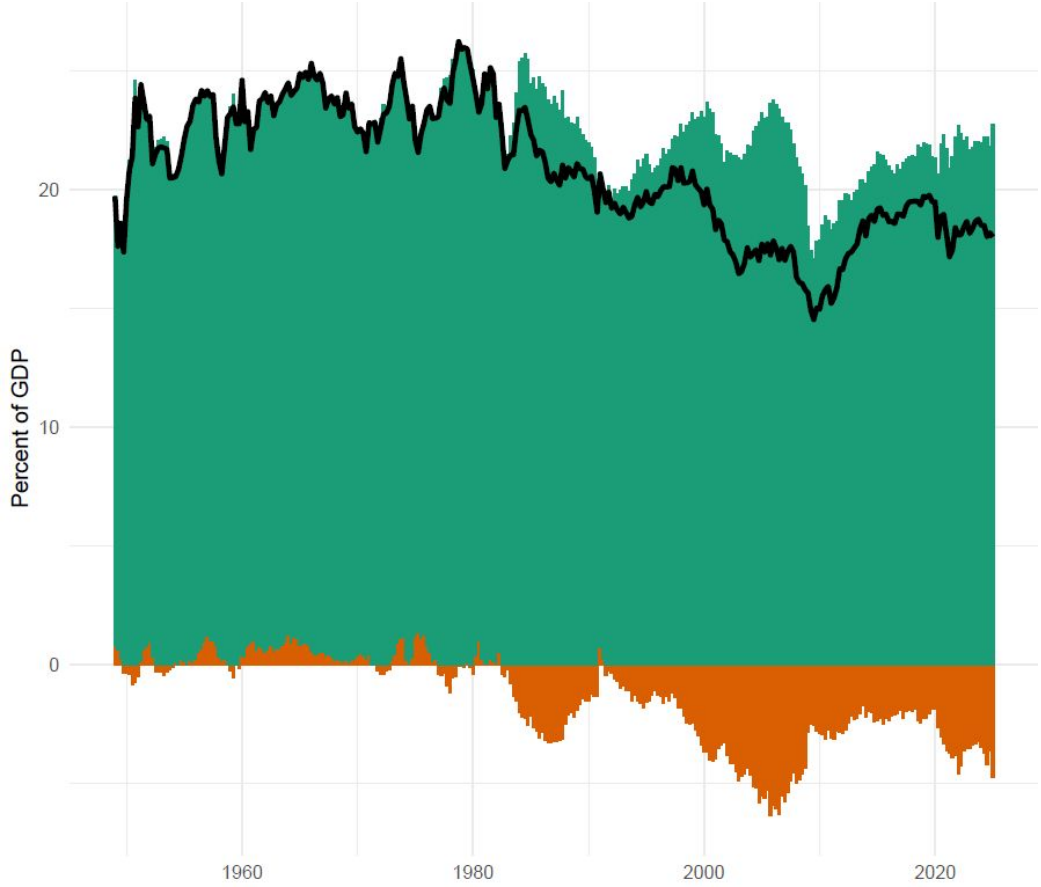

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Trade Balance

$$Y = C + I + G + NX$$

$$NX = \underbrace{Y - C - G}_{\text{National saving}} - I$$

Trade balance

Domestic investment

- If we save more than we want to invest domestically:
  a. We invest in foreign assets
  b. We run a trade surplus
     - The link: we send them more than they send us, so they owe us…

Trade Balance

$$Y = C + I + G + NX$$

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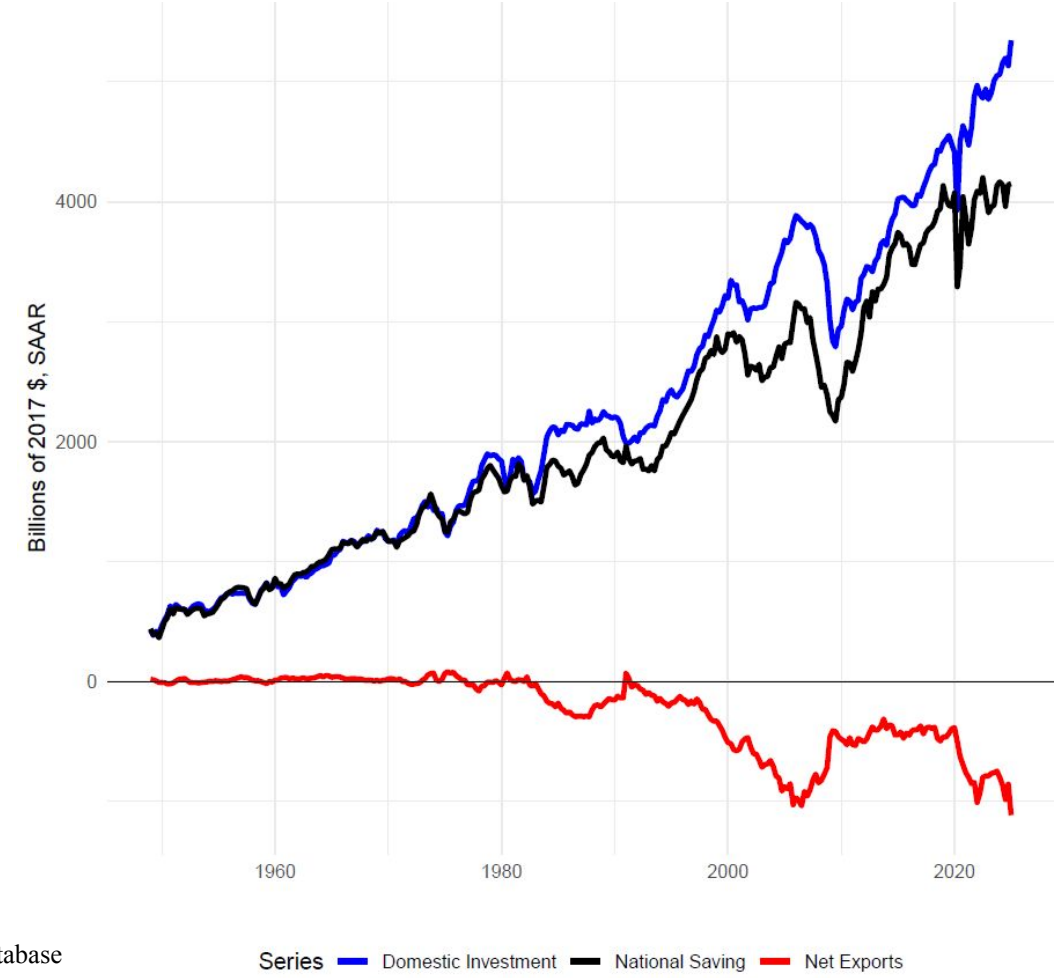
Trade balance

Domestic investment

- If we save less than we want to invest domestically:
  a. Foreigners invest in our assets
  b. We run a trade deficit
     - The link: we send them less than they send us, so we owe them…

Trade Balance



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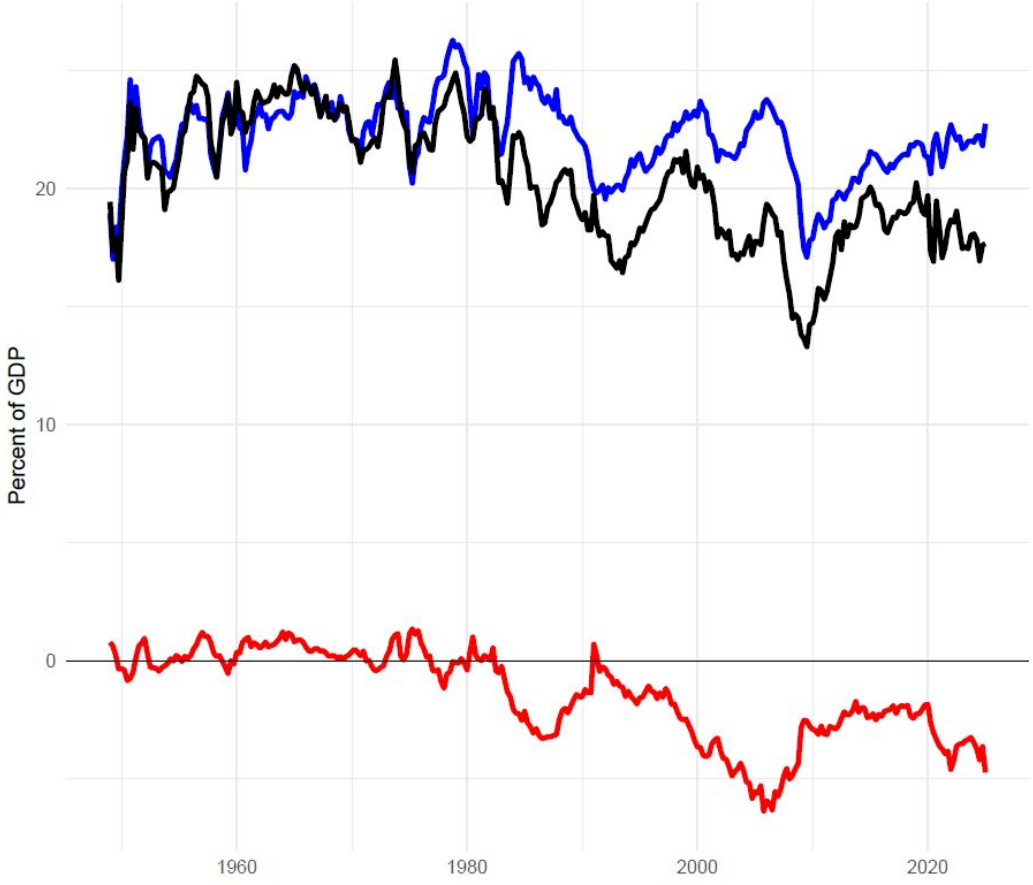

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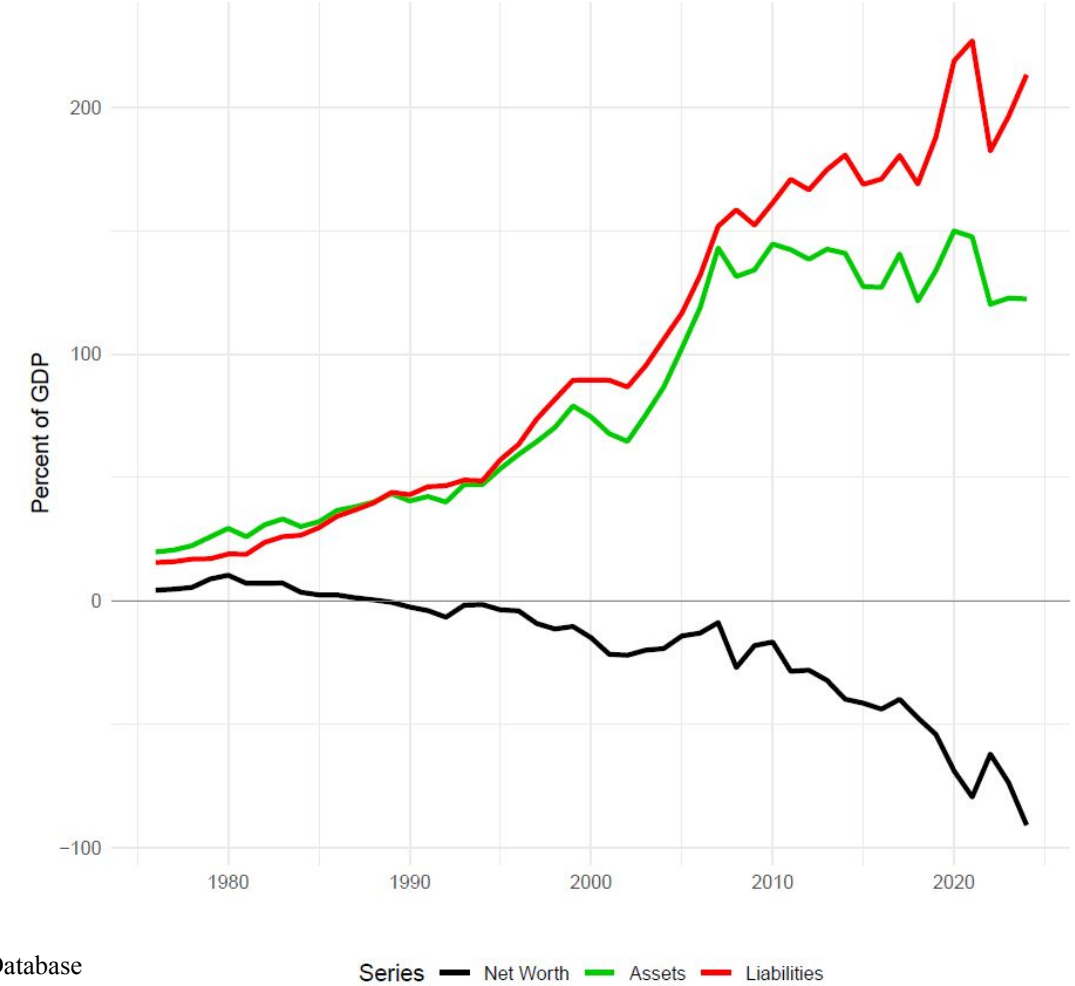
Net International Asset Position



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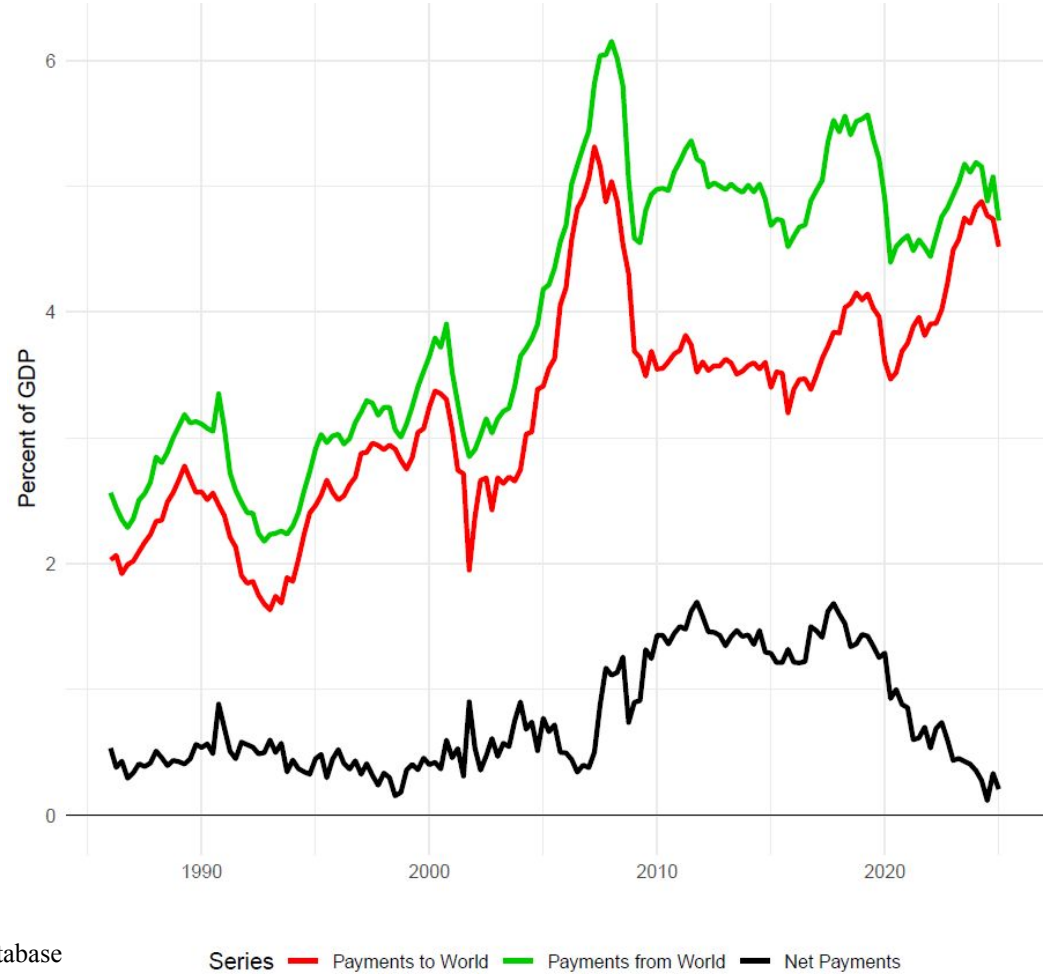
Net International Asset Payments



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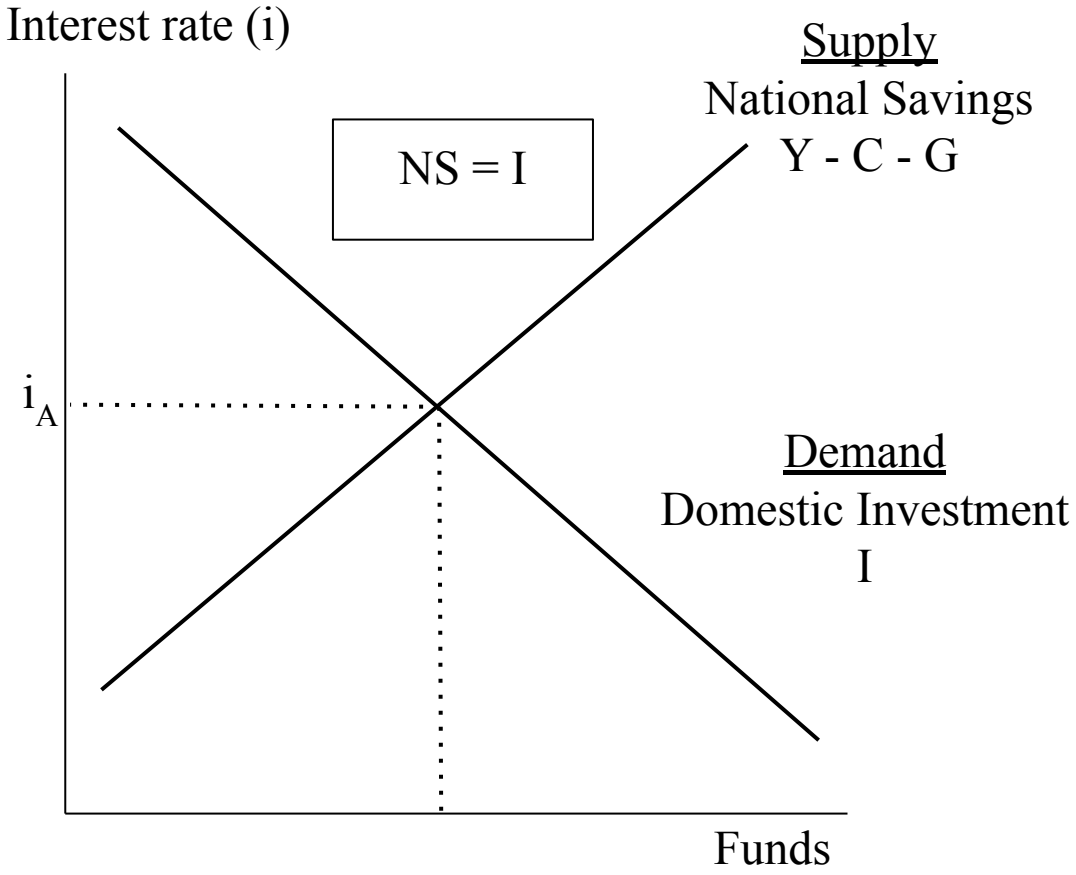
Model of trade balance

Closed economy: NX = 0



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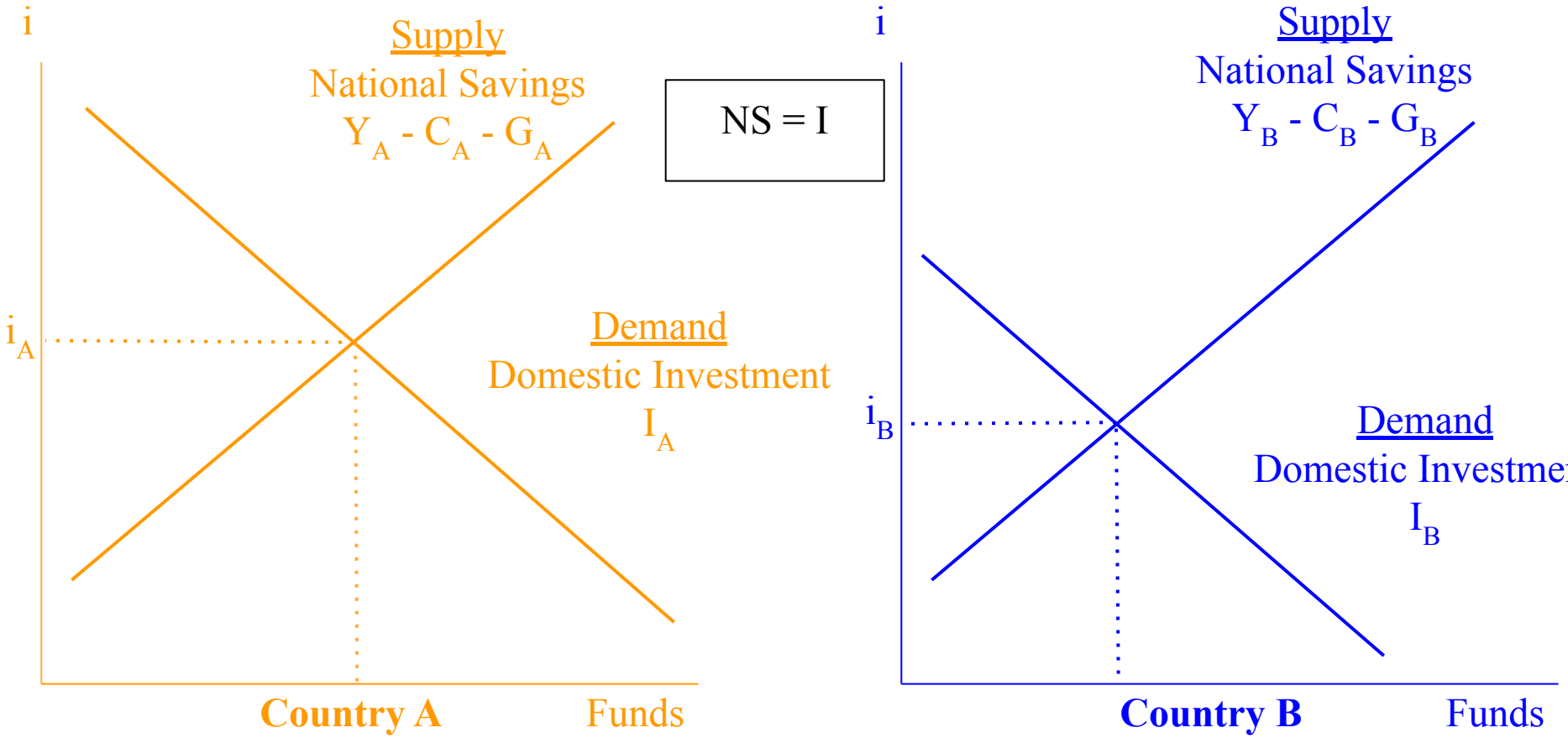
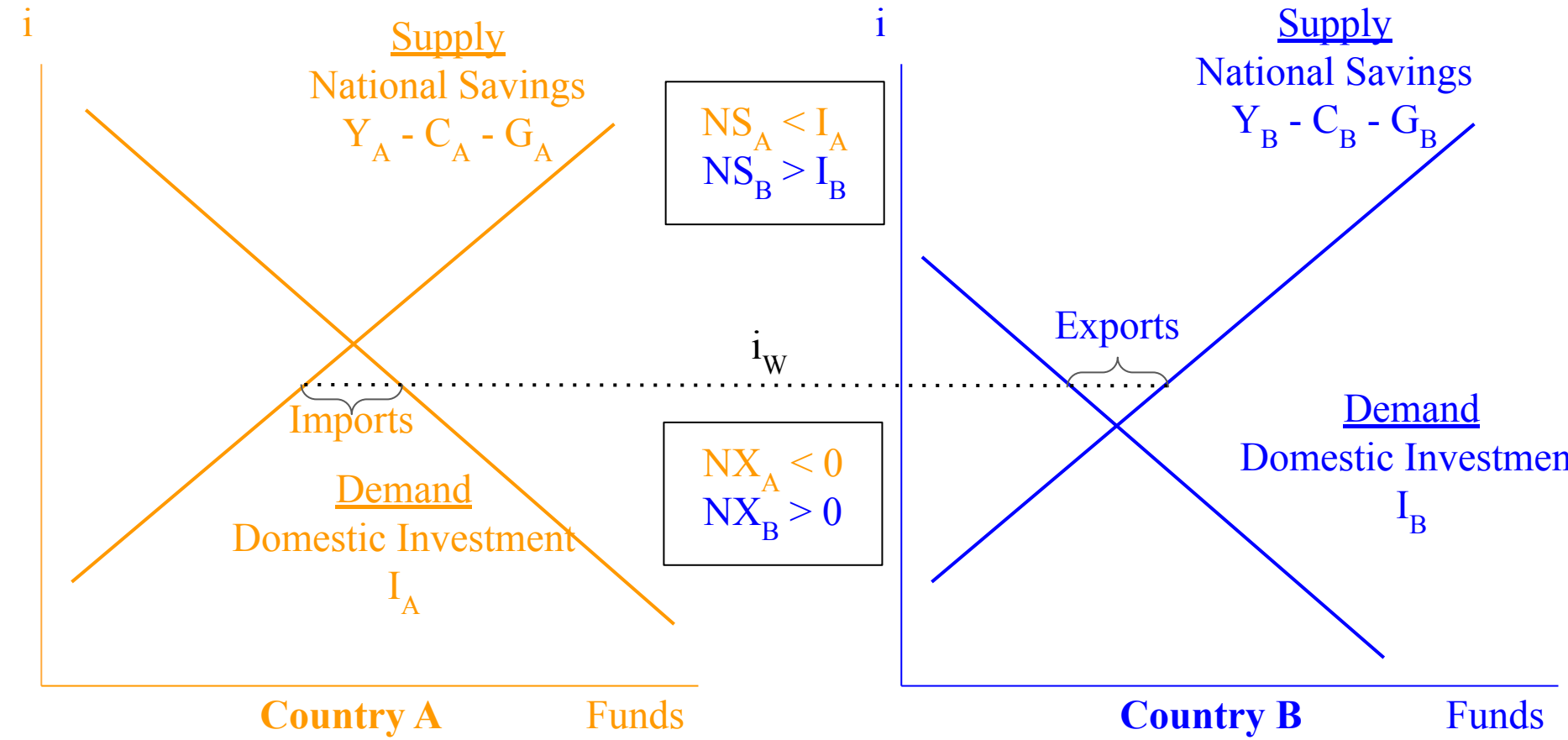


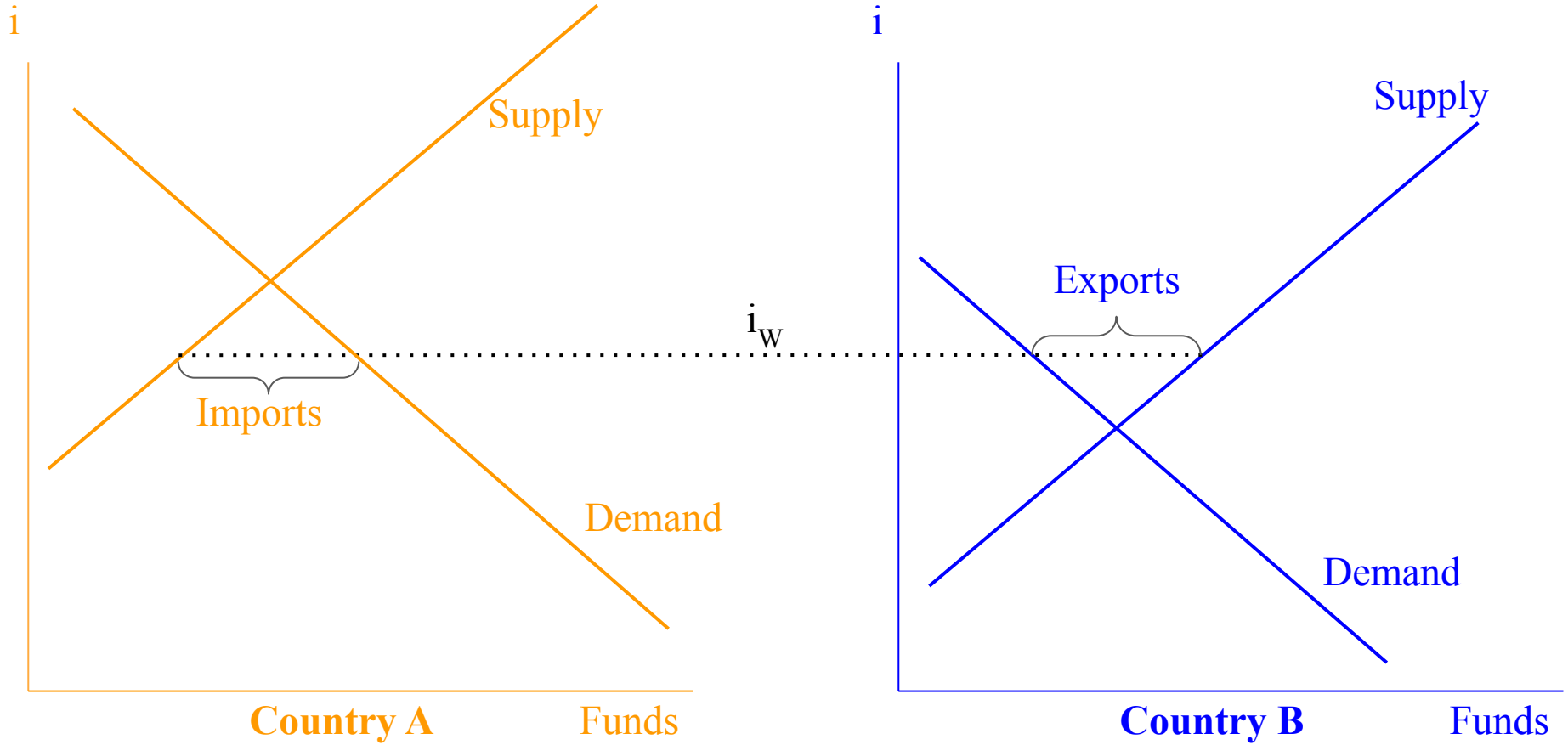
Model of trade balance

Open economy

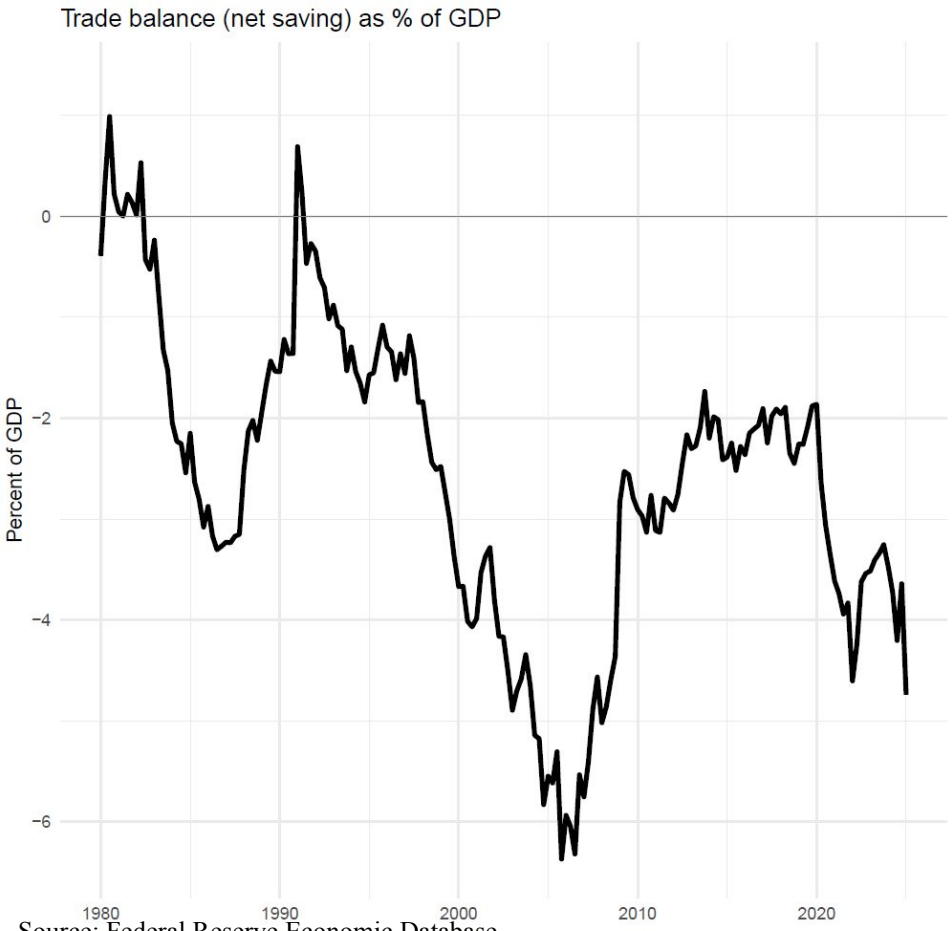


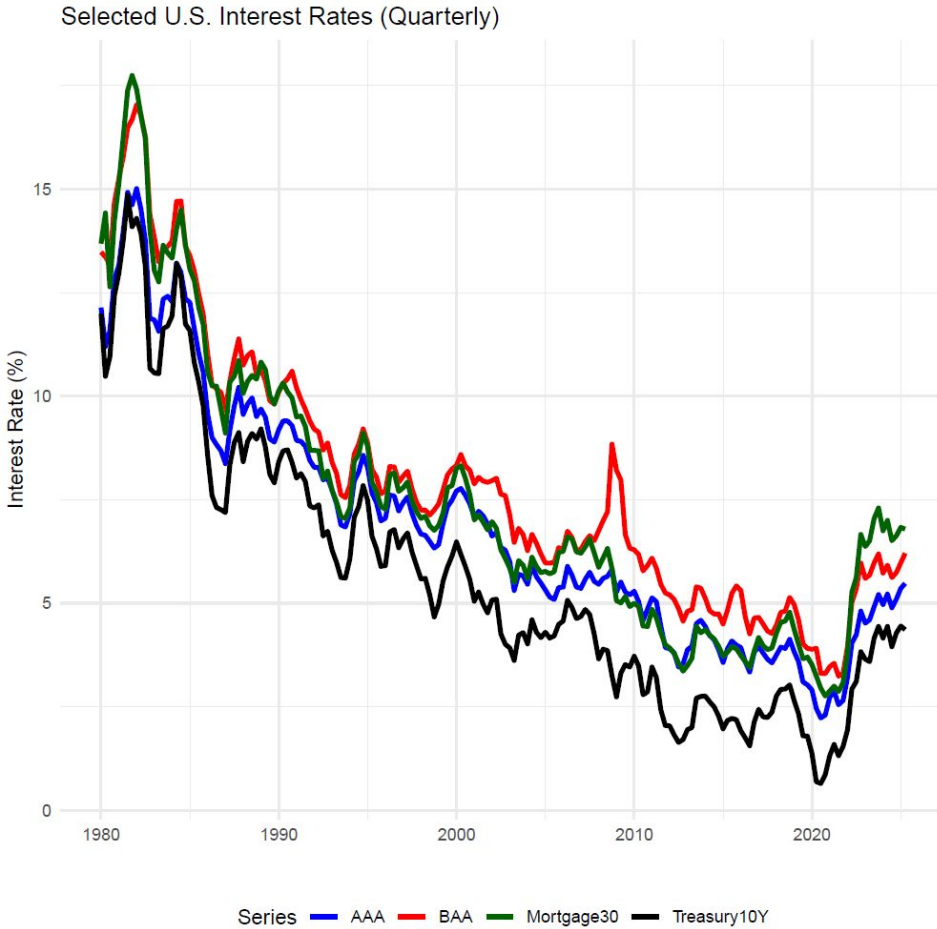
"Americans are profligate"

Open economy



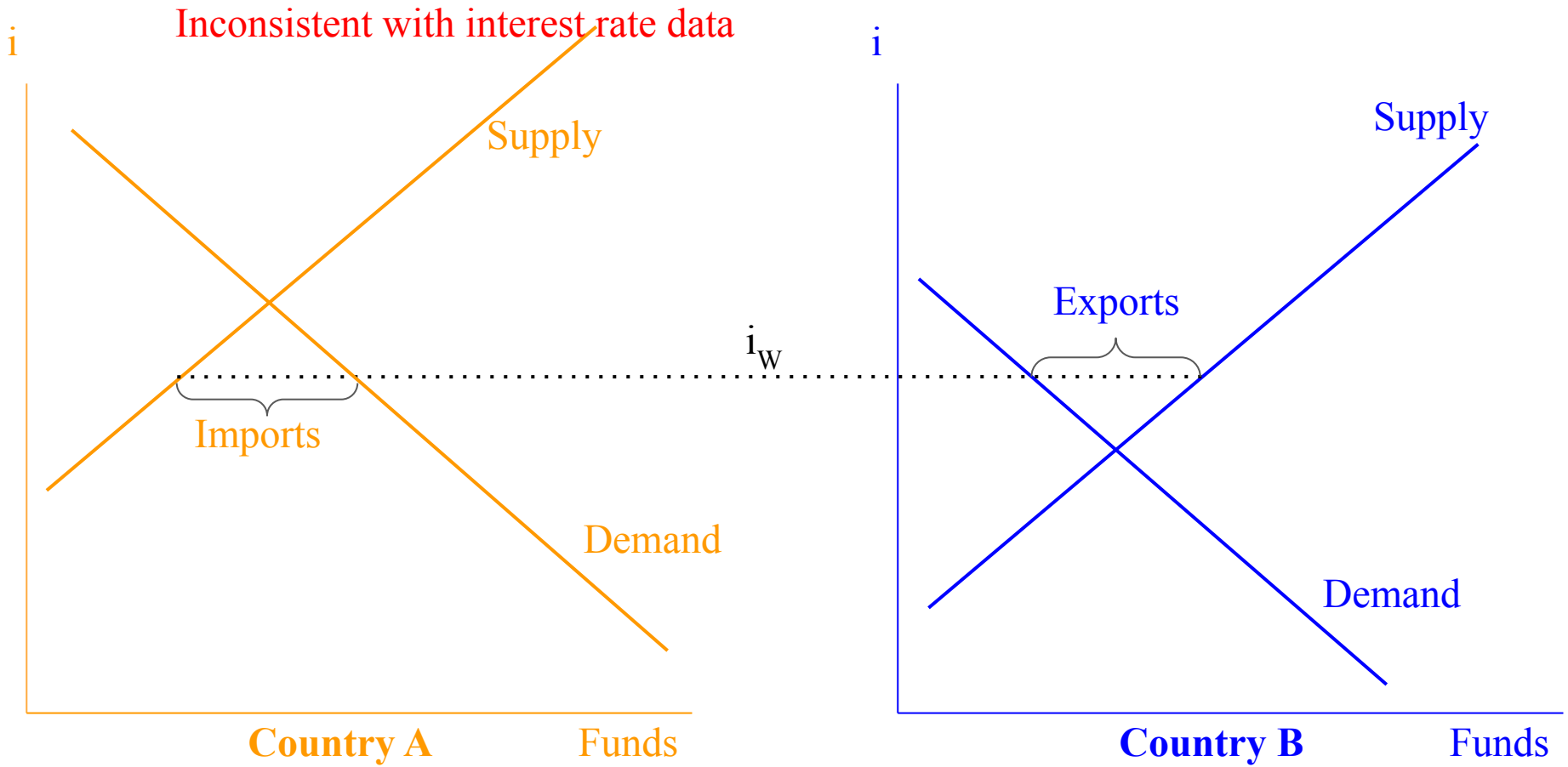
“The global savings glut”



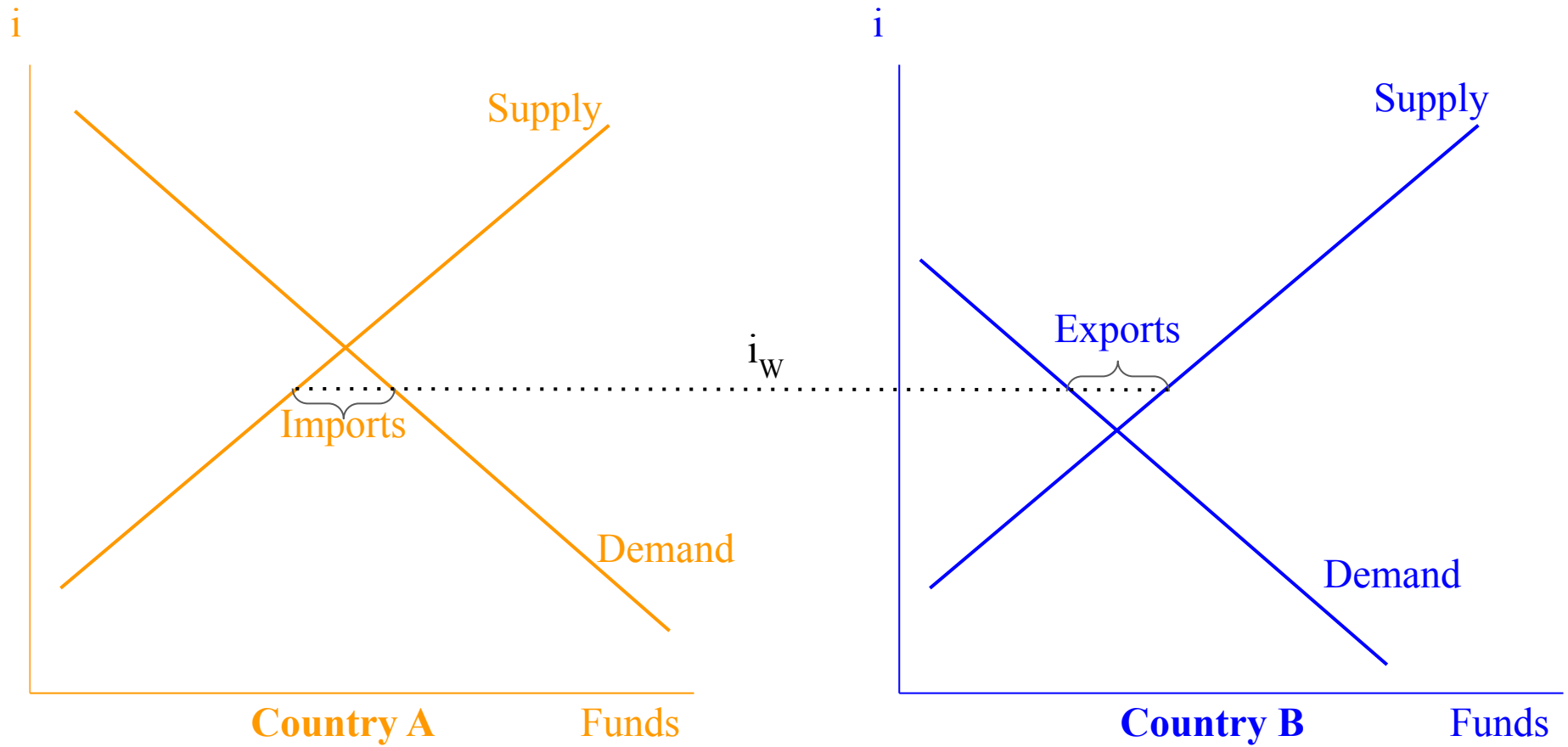


Source: Federal Reserve Economic Database

“Americans are profligate”



“The global savings glut”



"The global savings glut"