Ch. 2: The Measurement and Structure of the National Economy

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Chapter Outline

- National Income Accounting
- Gross Domestic Product
- Real vs. Nominal GDP
- Saving and Wealth
- Interest Rate

National Income Accounting

- An accounting framework used in measuring current economic activity

System of National Account.

- 3 approaches:
  - **(i)** Production approach – Adding the market values of goods and services produced, excluding any goods and services used up in intermediate states of production.
  - **(ii)** Income approach – Adding all income received by producers of output, including wages received by workers and profits received by owners of firms.
  - **(iii)** Expenditure approach – Adding the amount spent by all ultimate users of output.

National Income Accounting (Cont'd)

- Why are the 3 approaches equivalent?
- Any output produced (product approach) is purchased by someone (expenditure approach) and results in income to someone (income approach)
- Fundamental identity:

total production = total income = total expenditure

An Illustration of National Income Accounting

- OrangeInc Transactions

Wages paid to OrangeInc workers	\$15,000
Taxes paid to Government	\$5,000
Revenue received from sales of oranges	\$35,000
Oranges sold to public	\$10,000
Oranges sold to JuiceInc	\$25,000

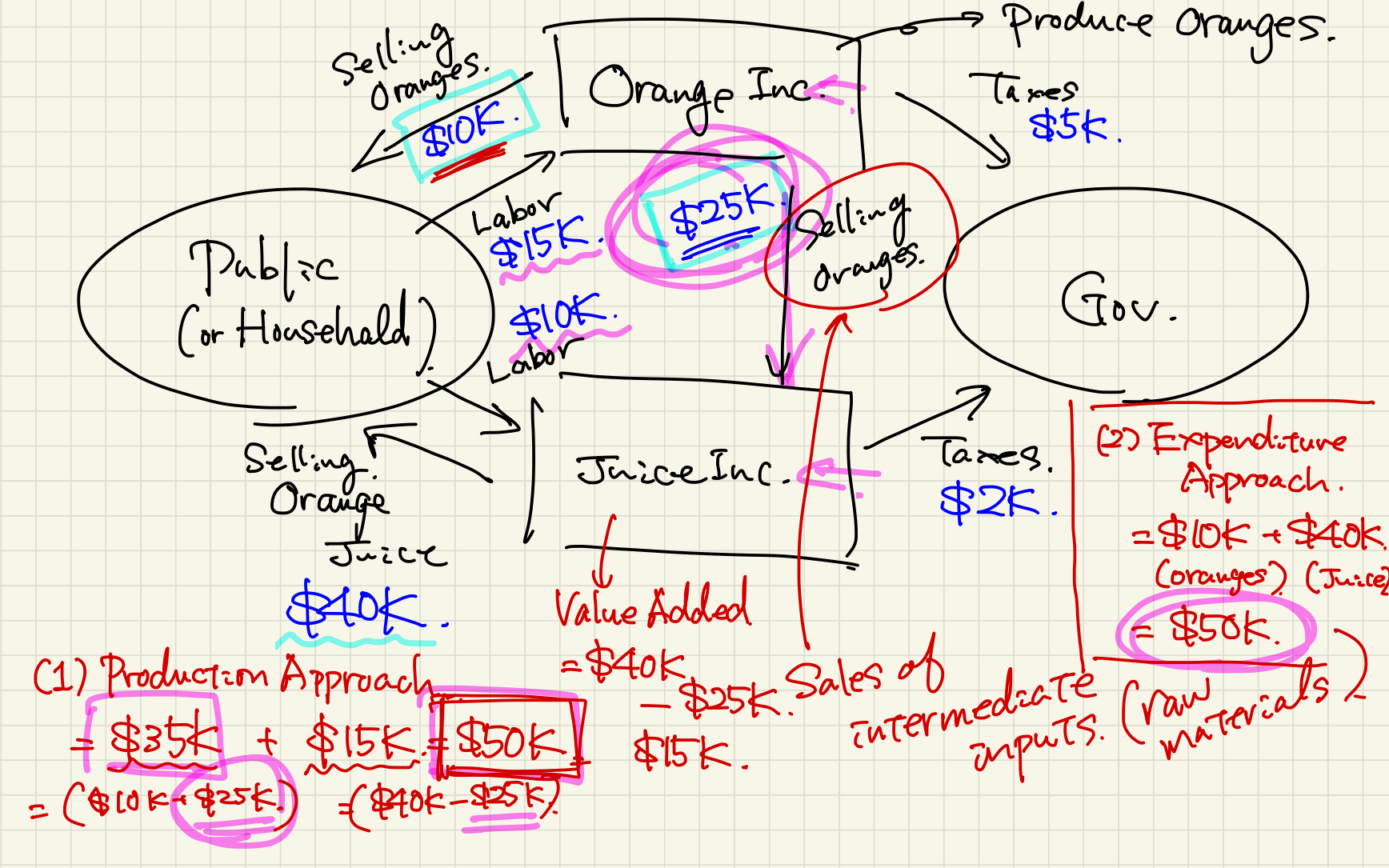
$$\text{After-tax profit} = \underbrace{\$35,000}_{\text{value added}} - \$15,000 - \$5,000 = \$15,000$$

- JuiceInc Transactions

Wages paid to JuiceInc workers	\$10,000
Taxes paid to Government	\$2,000
Oranges purchased from OrangeInc	\$25,000
Revenue received from sales of orange juice	\$40,000

$$\text{After-tax profit} = \underbrace{\$40,000 - \$25,000}_{\text{value added}} - \$10,000 - \$2,000 = \$3,000$$

- What is the total value of the economic activity?


Produce Oranges.
Selling Oranges.
$10K.
Orange Inc.
Taxes
$5K.
Labor
$15K.
$25K.
Selling Oranges.
Public (or Household)
Gov.
$10K.
Labor
Selling Orange Juice
$40K.
Juice Inc.
Taxes.
$2K.
Value Added
=$40K - $25K.
$15K.
Sales of intermediate inputs. (raw materials)
(1) Production Approach
= $35K + $15K. = $50K
= ($10K + $25K) (=$40K - $25K).
(2) Expenditure Approach.
=$10K + $40K.
(Oranges) (Juice)
= $50K.

(3) Income Approach.

= Labor Income. + Capital Income.

= $15K. + $10K + Profits from firms.
(from Orange Inc.) (from Juice Inc.)

Profits of Orange Inc = $35K − $15K. = $20K.

" Juice Inc = $40K. − $25K. − $10K. = $5K.
(costs of oranges)

⇒ $25K + $25K. = $50K.
(labor income) (capital income.)

Gross Domestic Product (GDP)

Bhutan : Gross Domestic Happiness

- The best-known and most often used measure of aggregate economic activity
- The 3 approaches arrive at the same value of GDP, but each views GDP differently

Measuring GDP: The Product Approach

- "The **market value** of all **final goods and services newly produced** within a country in a given period of time"
- Market value
- Final goods and services (excluding intermediate goods)
- Newly produced

Boundary matters.

quarter or year.

Need monetary value to add things up.

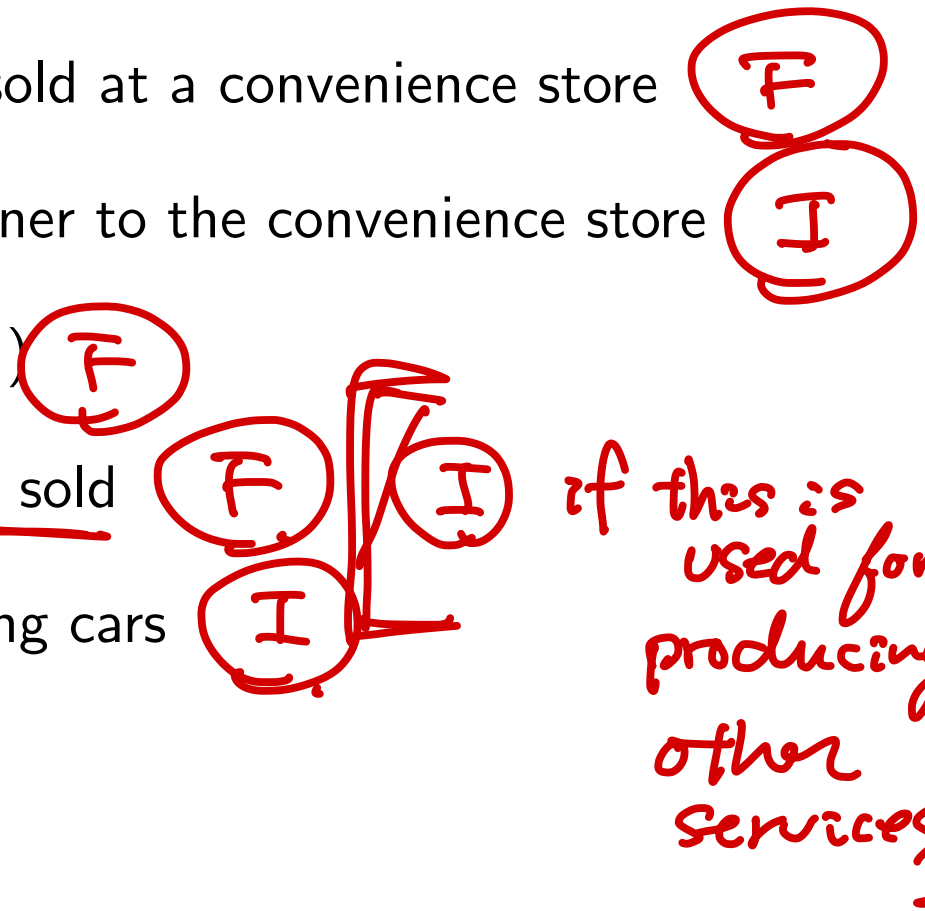
Does not matter whether goods are actually sold or not.

Underground economy is difficult to be incorporated.

Examples of Final Goods and Services

Q: Which items/services are final goods and service?

- A lunchbox that has been just sold at a convenience store
- The sale of the lunchbox container to the convenience store
- A bank transfer fee (using ATM)
- A toothbrush that has not been sold
- Industrial robots used for building cars



Measuring GDP: The Expenditure Approach

- Total spending on final goods and services produced within a country during a specified period of time
- Income-expenditure identity:

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

C : spending by domestic households on final goods and services (including those produced abroad)

I : spending for new capital goods (fixed investment) plus inventory investment

G : spending by the government on good and services

NX : exports minus imports (net exports)

Expenditure Approach to Measuring GDP in Japan

2018 (Calendar Year)	(% in GDP)
Private final consumption expenditure	55.6 %
Government final consumption expenditure	19.8 %
Gross fixed capital formation	24.1 %
Changes in inventories	0.2 %
Exports of goods and services	18.5 %
(less) Imports of goods and services	18.3 %

I.

NX = 0.2%

Source: Cabinet Office, Economic and Social Research Institute, National Accounts for 2018.

Measuring GDP: The Income Approach

- Adds up income generated by production
- Gross Domestic Income (GDI) + Statistical Discrepancy = GDP

Income Approach to Measuring GDP in Japan

2018 (Calendar Year)	(% in GDP)
Compensation of employees	51.8%
Operating surplus and mixed income	17.9%
Consumption of fixed capital	22.6%
Taxes on production and imports	8.4%
(less) Subsidies	0.5%
Statistical discrepancy	−0.1%

Source: Cabinet Office, Economic and Social Research Institute, National Accounts for 2018.

GDP vs. GNP

- GNP (gross national product) = output from the citizens and companies of a particular nation, regardless of whether they are located within its boundaries or overseas
- GDP = output produced within a nation
- GDP = GNP - Net Factor Payments from abroad (NFP)
- NFP = payments to domestically owned factors located abroad minus payments to foreign factors located domestically

Real vs. Nominal GDP

Nominal $GDP_{2019} = P_{2019} \times Q_{2019}$. or $= P_{1,2019} \times Q_{1,2019} + P_{2,2019} \times Q_{2,2019} + \cdots + P_{N,2019} \times Q_{N,2019}$

Real $GDP_{2019} = P_{Baseyear} \times Q_{2019}$.

- Nominal GDP are measured at current prices
- Real GDP is the value of goods and services measured using a constant set of prices (prices in a base year)

Base year = 2015. $\rightarrow P_{2015}$.

Real $GDP_{2019} = P_{1,2015} \times Q_{1,2019} + P_{2,2015} \times Q_{2,2019} + \cdots$

Real $GDP_{2020} = P_{1,2015} \times Q_{1,2020} + P_{2,2015} \times Q_{2,2020}$.

Same price.

Real vs. Nominal GDP – Example

	Apple		Orange		Nominal	Real
	Price	Quantity	Price	Quantity	GDP	GDP
2017	100	1	50	2	200	200
2018	100	1	100	2	300	200
2019	120	2	100	2	440	300

- Base year = 2017
- What is real GDP in 2017?
- How about those in 2018 and 2019?

In the base year, nominal GDP = real GDP.

Chain-Weighted Measures of Real GDP

- In essence, average prices in two consecutive years are used to measure real GDP growth
  (e.g., Average prices in 2018 and 2019 for computing real growth from 2018 to 2019)
- These various year-to-year growth rates are put together to form a "chain"
- That can be used to compare the output of goods and services between any two dates

Price Indices

- A measure of the average level of prices for some specified set of goods and services, relative to the prices in a specified based year
- GDP deflator: Measures the overall level of prices of goods and services included in GDP

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

- Consumer Price Index (CPI): Measures the prices of basket of consumer goods

GDP Deflator vs. CPI

- CPI measures the prices of only goods and services bought by consumers
- GDP deflator only includes the prices of goods produced domestically
- CPI uses a fixed basket of goods, whereas the GDP deflator allows the basket of goods to change

Japan's CPI

Food 25%
Housing 21%
Utility 7%
HH Exp. 3.5%
Clothing 4%
Insurance & Medical 4%
Transp. & Communication 14%
Education 3%
Leasure 11%.

Inflation

- The percentage change in the price index per period

$$\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100$$

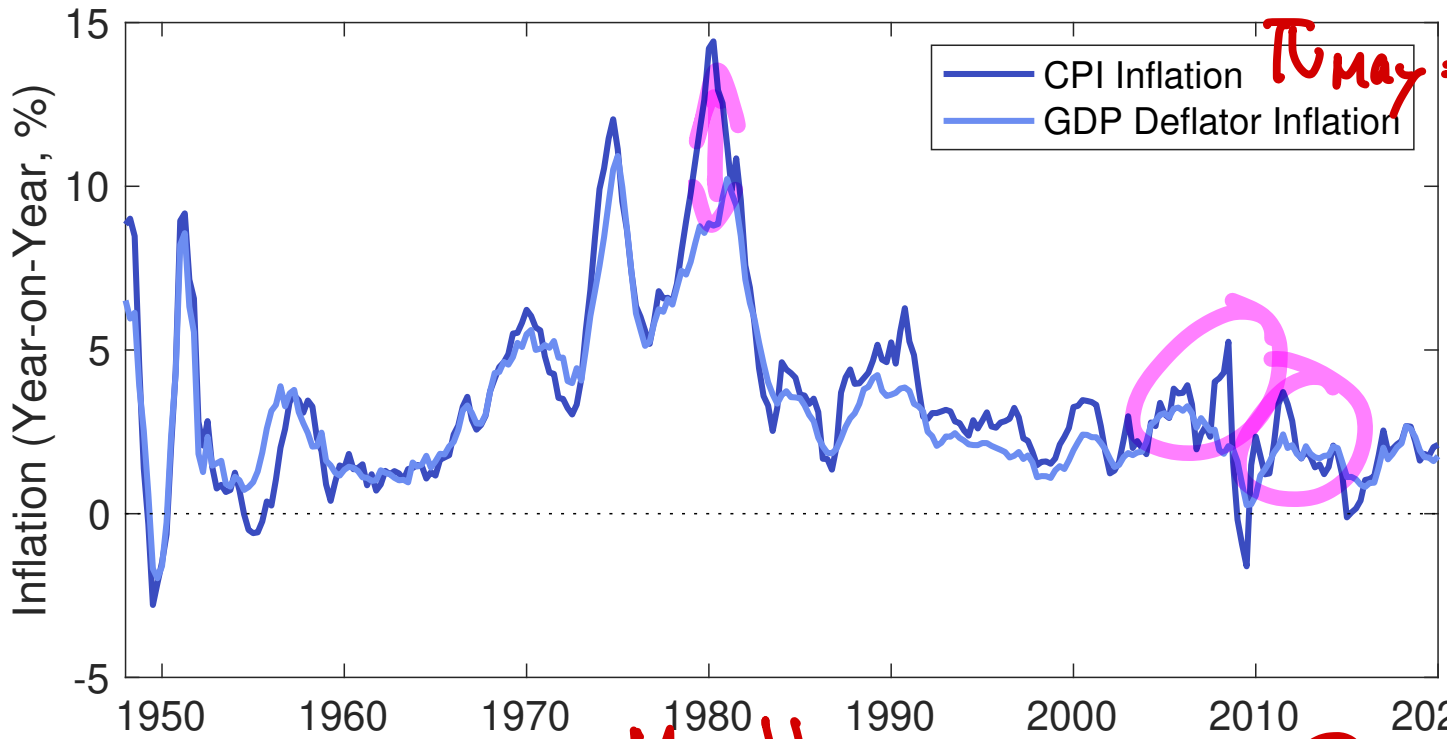


Figure: CPI Inflation vs. GDP Deflator Inflation

Source: FRED database, Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/CPIAUCSL; https://fred.stlouisfed.org/series/GDPDEF.

Does CPI Inflation Overstate ↑ in the Living Cost?

P. ← General price level.

- Probably, yes
- Adjusting the price measures for changes in the quality of goods is very difficult
- Substitution bias ←

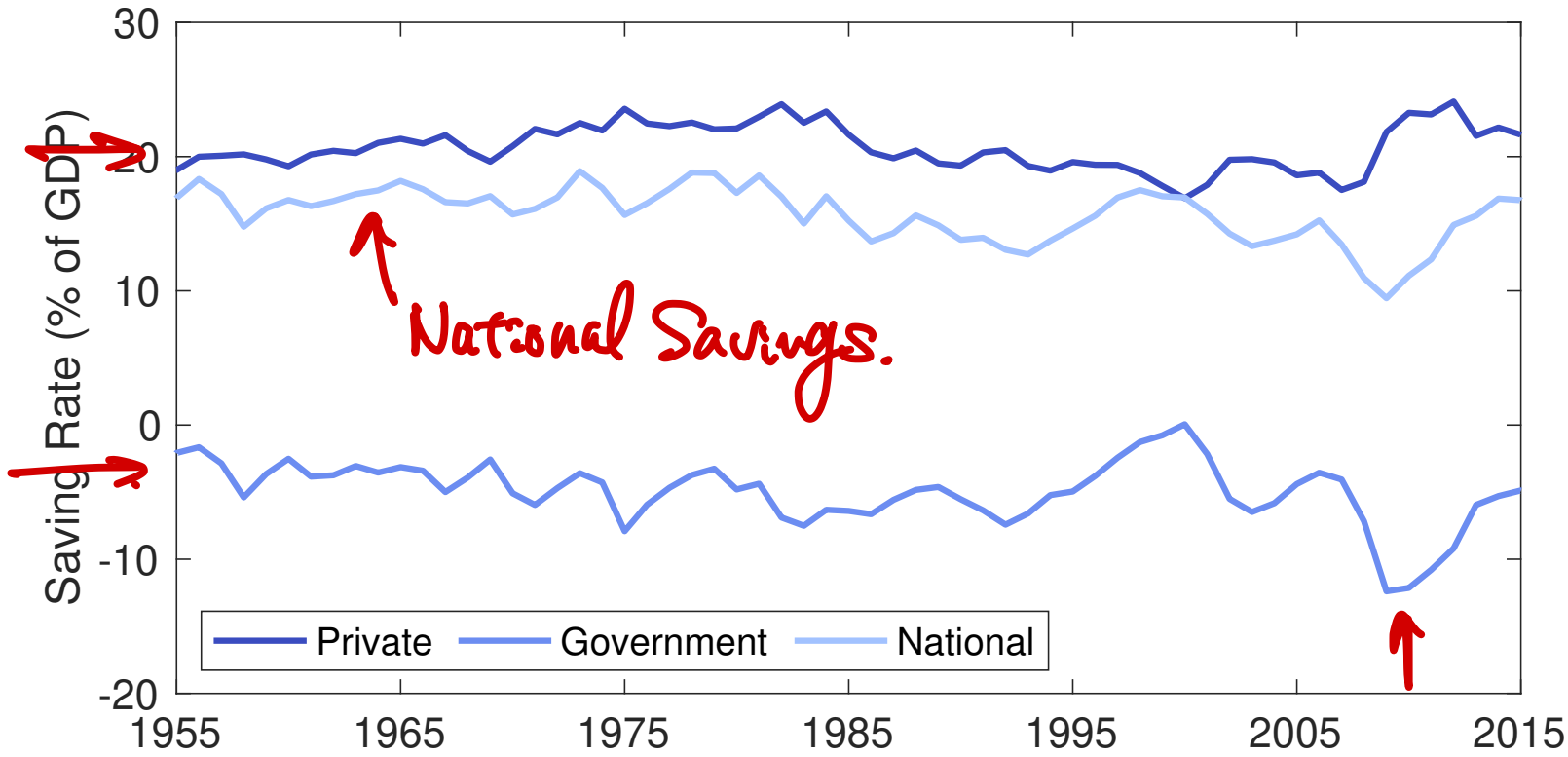
Measures of Aggregate Saving

- Saving = current income − current spending

$$\text{Saving Rate} = \frac{\text{Saving}}{\text{Current Income}}$$

- Private saving = private disposable income − consumption
  → after paying taxes.
- Government saving = net government income − government purchases (goods and services)
- National saving = private saving + government saving

Measures of Aggregate Saving (Cont'd)



Source: FRED database, Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/GPSAVE; https://fred.stlouisfed.org/series/GGSAVE; https://fred.stlouisfed.org/series/A782RC1Q027SBEA. For government saving, government investment is ignored.

National Saving

- National saving = private saving + government saving

$$
\begin{aligned}
S &= S_{prvt} + S_{gov} \\
&= \{(Y + NFP + TR + INT - T) - C\} \\
&\quad + \{(T - TR - INT) - G\} \\
&= Y + NFP - C - G \\
&= GNP - C - G
\end{aligned}
$$

Private Saving

↳ Gov. Saving.

- Alternatively,

$$
\begin{aligned}
S &= Y + NFP - C - G \\
&= I + NX + NFP \\
&= I + CA
\end{aligned}
$$

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

Closed economy w/ $CA = 0 \Rightarrow S = I$.

$CA \equiv NX + NFP$ (Current Account)

Saving Rates in Other Countries

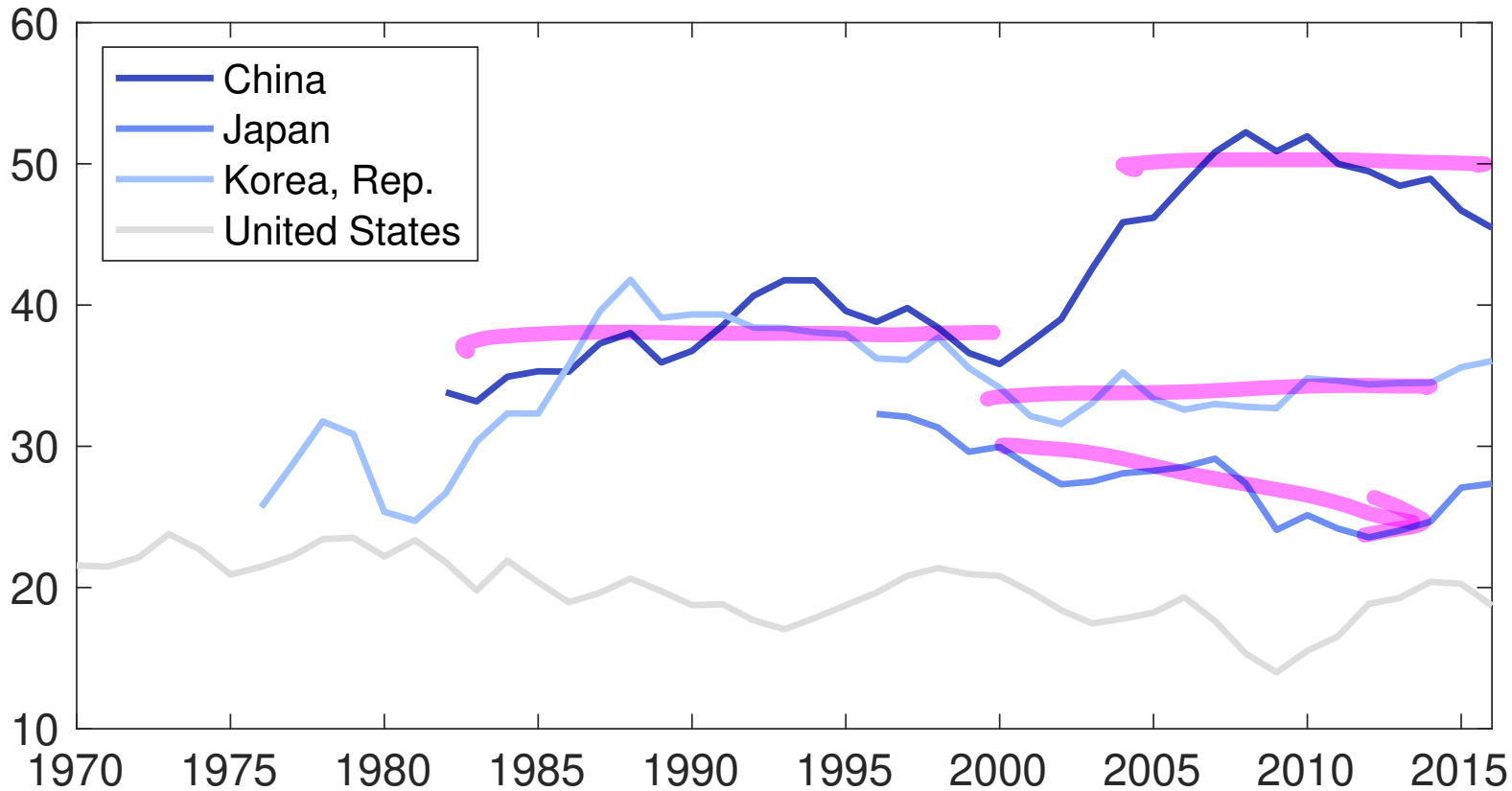
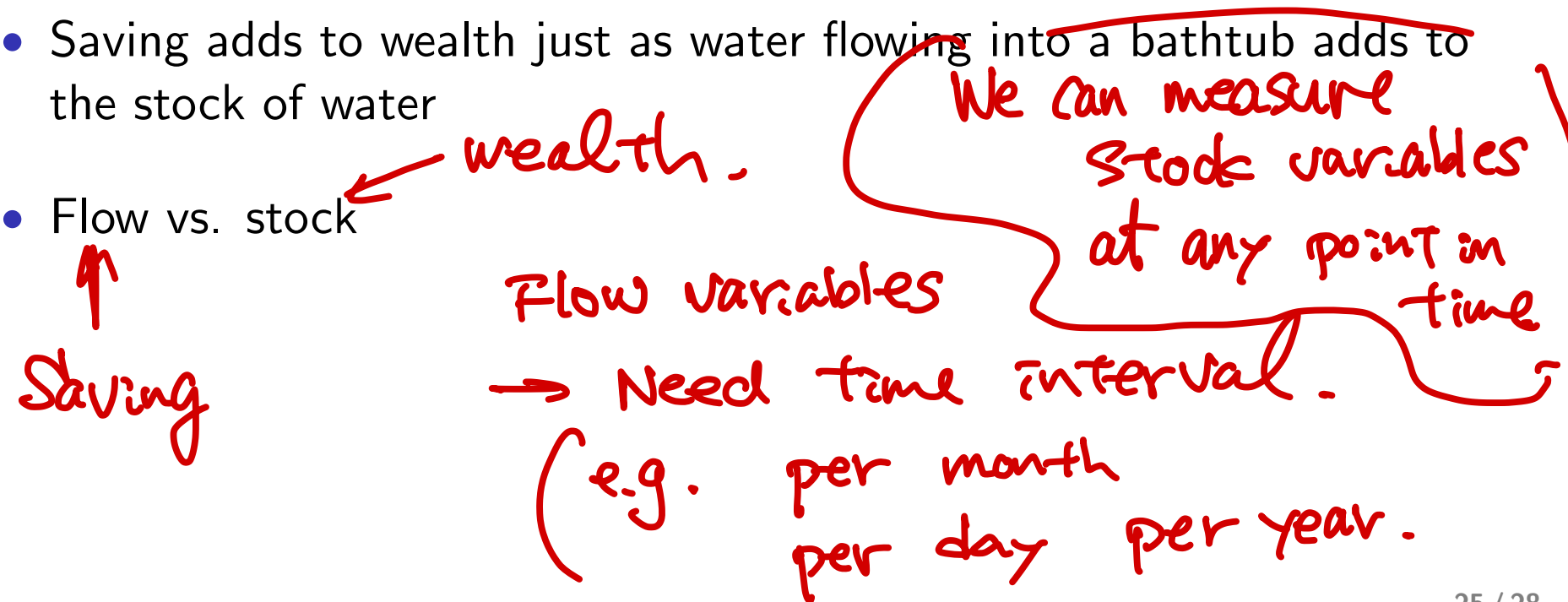


Figure: Gross Domestic Savings (% of GDP)

Source: World Bank, World Development Indicator.

Saving and Wealth

- The wealth of any economic unit is its assets minus its liabilities
- Saving takes the form of an accumulation of assets or a reduction in liabilities
- Saving adds to wealth just as water flowing into a bathtub adds to the stock of water
- Flow vs. stock



National Wealth

- The total wealth of the residents of a country
- Domestic physical assets + net foreign assets
- Net Foreign Assets (NFA) = the country's foreign assets minus its foreign liabilities
- National wealth changes with
  - National savings ($S = I + CA$)
  - Changes in value of existing assets and liabilities (changes in prices of financial assets or depreciation of capital goods)

Interest Rate

- A rate of return promised by a borrower to a lender
- Real vs. nominal interest rates

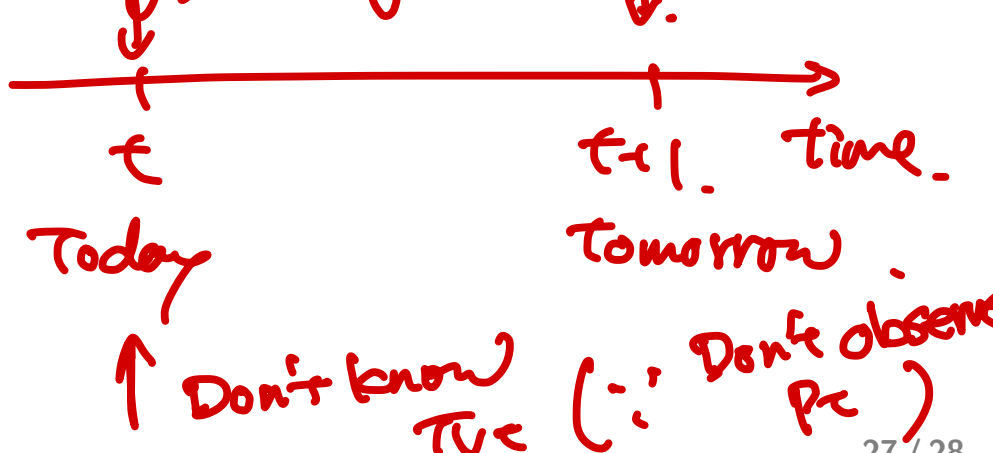
nominal interest rate $= i$

(actual) real interest rate $= i - \pi$

expected real interest rate $= i - \pi^e$

$$\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100$$

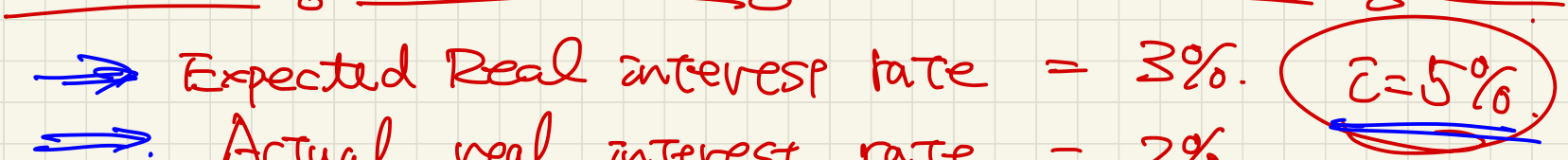
$$\pi_t^e = \frac{P_t^e - P_{t-1}}{P_{t-1}} \times 100$$



Sometimes

actual real interest rate = ex post real interest rate.

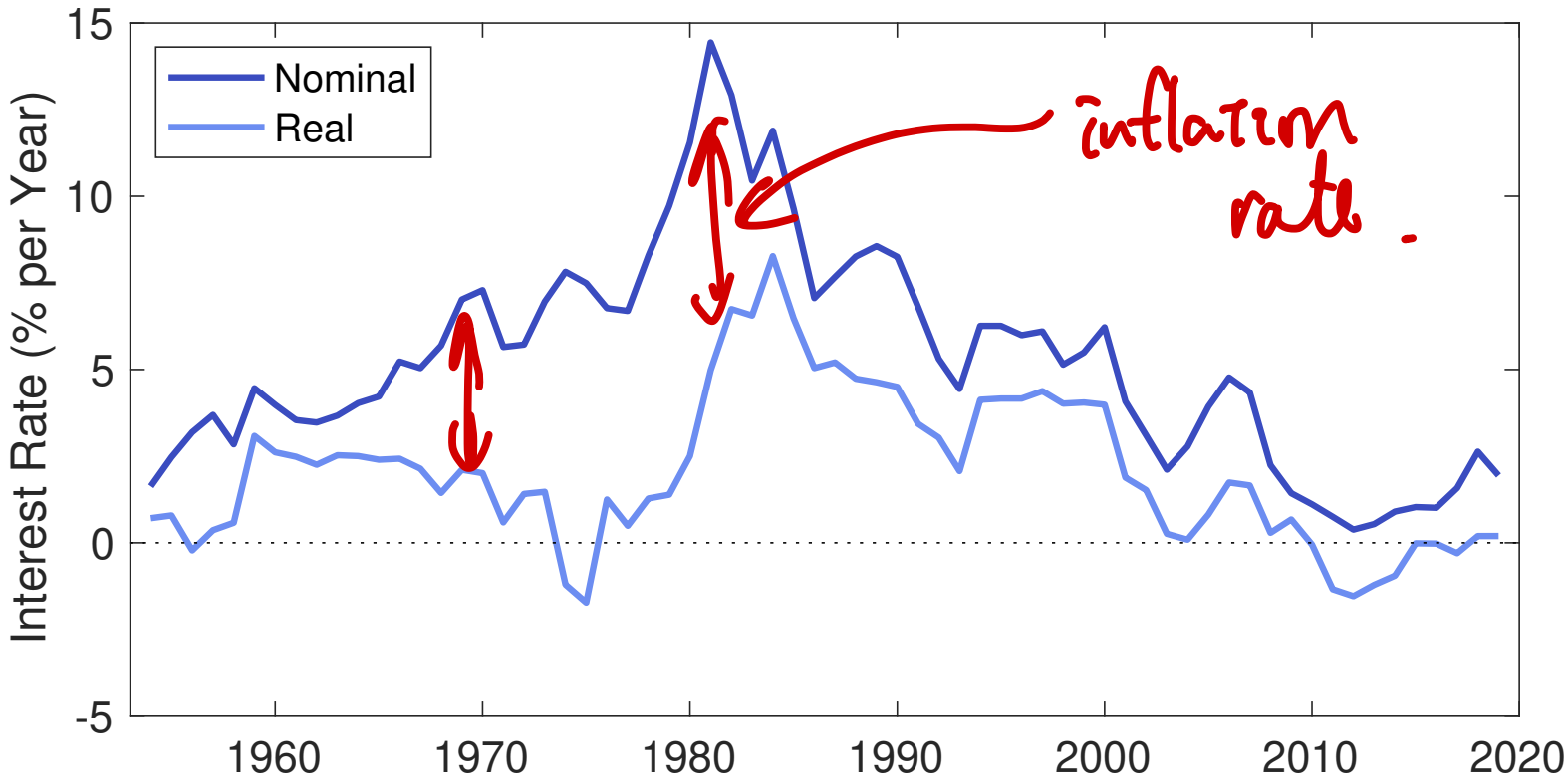
expected = exante.



Borrower expects to pay 3%, but turns out to pay 2% in real terms. → Better off.

Lender expects to get 3%, but receives 2% in real terms. → Worse off.

Nominal and Real Interest Rates



Source: FRED database, Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/GS3; https://fred.stlouisfed.org/series/GDPDEF.