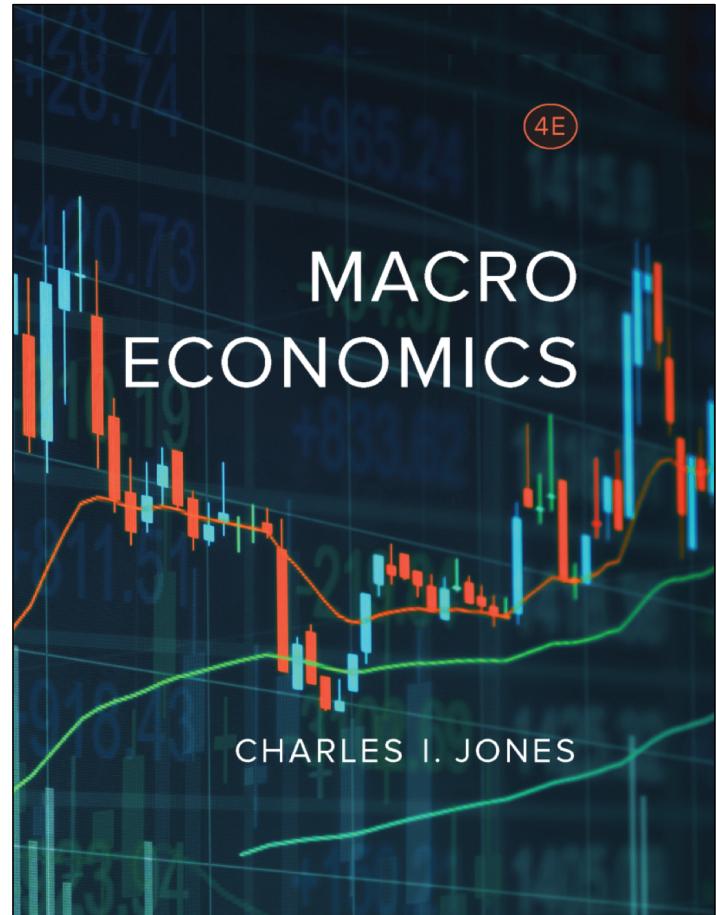


Chapter 2

Measuring the Macroeconomy



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2.1 Introduction

- In this chapter, we learn:
 - The importance of gross domestic product (GDP)
 - The composition of GDP, and how it has changed over time
 - How to use GDP to examine
 - the evaluation of living standard.
 - differences in living standard across countries

Introduction

- National income accounting
 - Method of aggregating the production of diverse goods into a single measure of overall economic activity
- National accounting is useful tool to describe:

- State of an economy at a given time
 - changes to an economy over time
 - differences across countries
- ↑
change
over time.
living standard
transformation of economy
emerging or declining*

2.2 Measuring the State of the Economy

- Gross domestic product (GDP) *market final time period*
 - the market value of the final goods and services produced in an economy over a certain period
 - www.bea.gov.
- United States GDP *keep track of number ①*
 - \$ 12.5 trillion in 2005
 - \$ 14.4 *2007* (\$47,000 per person)
 - \$ 20.7 *3rd quarter 2018* (\$ 62,869 —)

Measuring the State of the Economy—1

⑤ keep track of changes

use ln
nature in operation wiki?

2005 2006 2007 2008

GDP (in trillions of \$)	12.6	13.4	14.0	14.3
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Growth
rate GDP

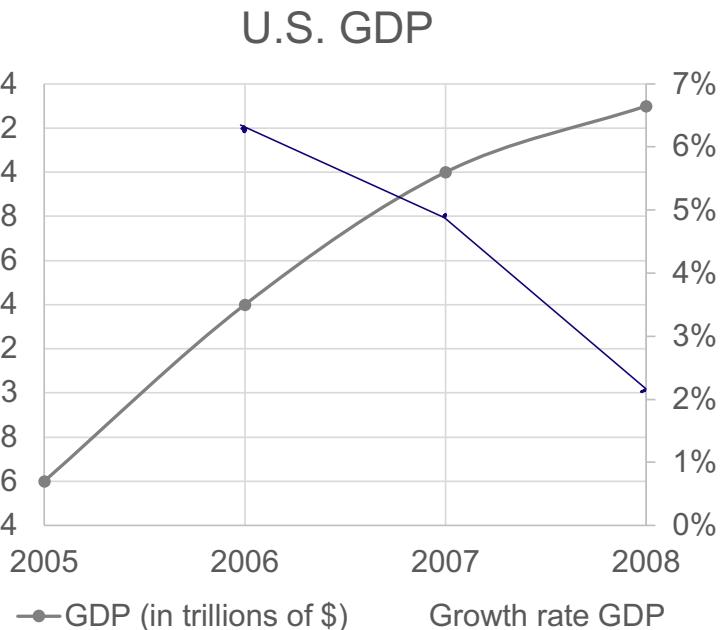
6.3% 4.5% 2.1%



$$\frac{13.4 - 12.6}{12.6} \approx 6.3\%$$

$$= \ln \frac{13.4}{12.6}$$

↑ 不被 base period 影响。



Measuring the State of the Economy—2

- Production measure of GDP
 - the number of goods produced in the economy *is final*
- Expenditure measure of GDP
 - the total purchases in the economy
- Income measure of GDP
 - all the income earned in the economy
- All three ...

production = expenditure = income

close to def of GDP.

The Expenditure Approach

- The **national income accounting identity** states: $Y = C + I + G + NX$
- where:
 - Y = GDP
 - C = Consumption most: household
 - I = Investment
 - G = Government Purchases
 - NX = $X - M$ = Exports - Imports

Investment (four categories)

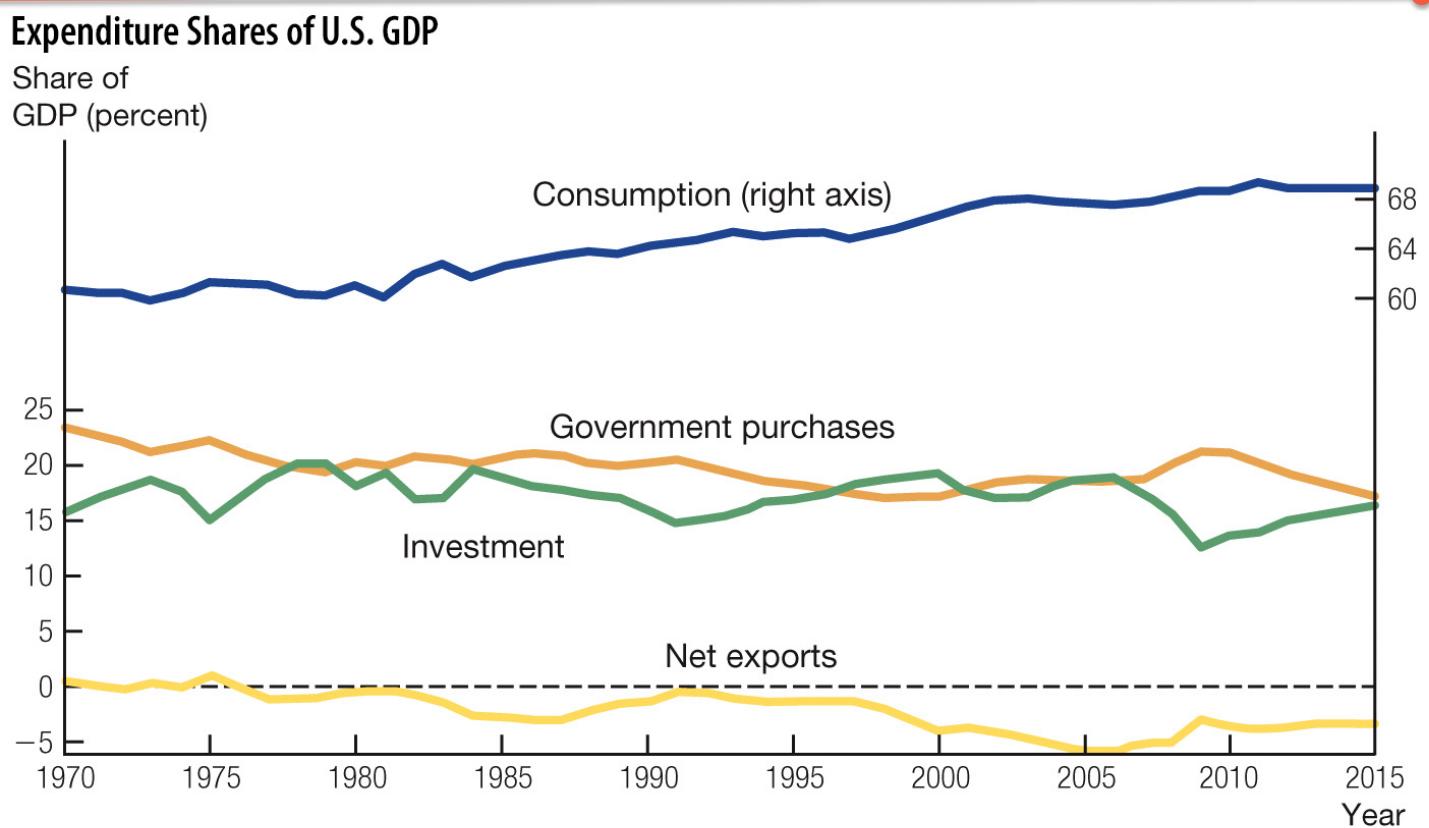
- Business fixed investment (nonresidential):
 - spending by firms on plants, machinery and equipment
- Residential investment:
 - construction of new houses and apartment buildings
- Inventory investment:
 - changes in inventories (of final or intermediate goods)
- Intellectual property products:
 - R&D expenditures, purchase of software

Variables	2018Q2	% of GDP	Per Capita
Gross domestic product	20,411.9	100.0	62,240.0
Personal consumption expenditures	13,871.6	68.0	42,297.3
Goods	4,327.8	21.2	13,196.3
Durable goods	1,458.7	7.1	4,447.9
Nondurable goods	2,869.1	14.1	8,748.5
Services	9,543.8	46.8	29,101.0
Gross private domestic investment	3,586.7	17.6	10,936.6
Fixed investment	3,587.9	17.6	10,940.2
Nonresidential	2,789.9	13.7	8,507.0
Structures	641.9	3.1	1,957.3
Equipment	1,228.4	6.0	3,745.6
Intellectual property products	919.7	4.5	2,804.4
Residential	797.9	3.9	2,433.0
Change in private inventories	-1.2	0.0	-3.7
Net exports of goods and services	-551.9	-2.7	-1,682.9
Exports	2,567.5	12.6	7,828.8
Goods	1,705.0	8.4	5,198.9
Services	862.4	4.2	2,629.6
Imports	3,119.3	15.3	9,511.4
Goods	2,536.4	12.4	7,734.0
Services	583.0	2.9	1,777.7
Government consumption expenditures and gross investment	3,505.5	17.2	10,689.0
Federal	1,312.9	6.4	4,003.3
National defense	772.5	3.8	2,355.5
Nondefense	540.4	2.6	1,647.8
State and local	2,192.5	10.7	6,685.4

Source: Bureau of Economic Analysis

Notes: Billions of dollars; Last Revised on: August 29, 2018

Expenditure Shares of U.S. GDP



The Income Approach to GDP

- The income approach

- measures the sum of all income earned in the economy.

- Labor income

wages / tips -- → vague of labor income and usage in office.

- Capital

- capital is an input into production other than labor that is not used up in the production processes
 - is increased by firms through investment
 - Capital income = corporate profits, rents
 - Capital depreciation is the deterioration of the capital stock due to wear and tear

?

The Income Approach to U.S. GDP in 2015

TABLE 2.2

The Income Approach to U.S. GDP in 2015

	Total (billions of dollars)	Share of GDP (percent)	Per person (dollars)
Gross domestic product	17,940	100.0	55,750
Compensation of employees	9,660	53.8	30,040
Wages and salaries	7,830	43.6	24,350
Benefits	1,830	10.2	5,690
Taxes less subsidies on businesses	1,180	6.6	3,660
Net operating surplus of businesses	4,270	23.8	13,280
Depreciation of fixed capital	2,820	15.7	8,770

Source: U.S. Department of Commerce, Bureau of Economic Analysis, www.bea.gov.

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Total Share of GDP to Inputs

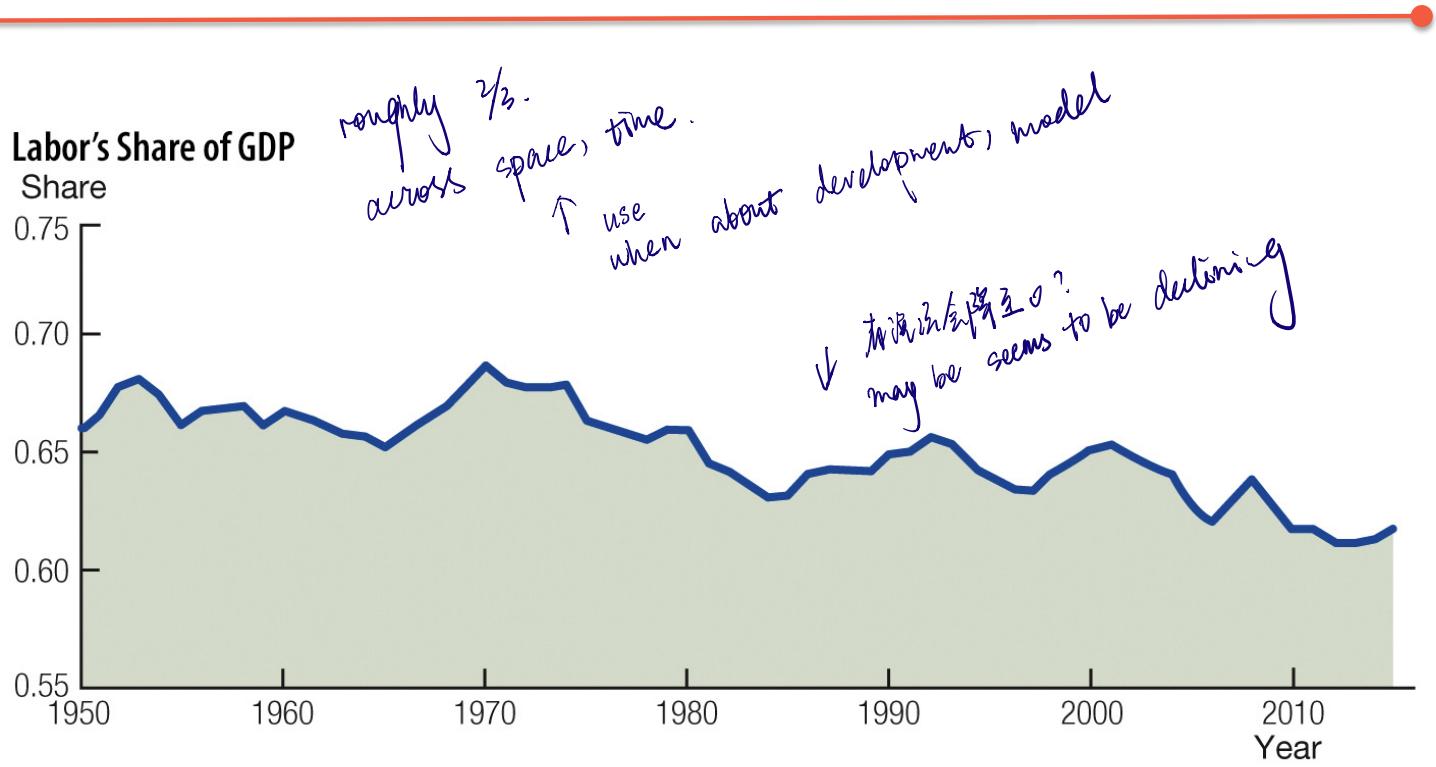
- Share of GDP to Labor:

- $\frac{2}{3}$
 - Labor's share of GDP has remained approximately over time

- Share of GDP to Capital:

- $\frac{1}{3}$

Labor's Share of GDP



Trend(s) in Labor and Capital Shares?

Trend or no trend in Labor Share? dropping?

Trends in labor + Capital Share? dropping?

else: Profits!
(measures)
C firms play's marginal product → leftover.

more economic ↑

1990: Markup ↓ → 4% (now 1/3). different between marginal revenue - marginal cost
↓ price - marginal cost
↑ hard to measure

straight goes up.

The Production Approach to GDP

3 approach? data different angels

- No “double counting” in GDP → close implementation
 - only the ~~final sale~~^{of definition of GDP} of goods and services count
t_{summarize}
- Add up “value added” at each production step
 - value added is the amount each producer contribute to GDP
 - Value added = revenue generated by each producer minus the value of intermediate products.
- Only new production of goods and services counts towards GDP.

What Is Included in GDP and What Is Not?—1

- Only considers **final** goods and services
- **Intermediate goods** are **not** included in GDP calculations
 - eg if Alcoa sells aluminum to Ford to make a focus ST the sale of the car is included in GDP, but not the sale of the aluminum to Ford.

What Is Included in GDP and What Is Not?—2

■ Included

- Government spending on goods/services
- Factory production of goods / services
- Ingredients and food purchased
- kids in day care

■ Not included

- Government transfer payment (Social Security, Medicare)
- pollution associated with production
- Time spent cooking at home
- babysitter (paid to neighbour)

Measures of Well-Being

- GDP is used by economists as a proxy for standards of living.
misses out
- Potential problems with GDP per capita:
 - GDP includes healthcare expenditures (ie they are considered good) but not health as such \Leftarrow well-being.
 - But couldn't one argue that life expectancy (or some other health-related statistic) should be included in a measure of the standard of living.

Differences in GDP Over Time

- <http://www.gapminder.org/videos/200-years-that-changed-the-world-bbc/>

2.3 Measuring Changes Over Time

- When examining GDP over time, we need to take into account changes in prices.
- Nominal GDP
 - A measure of GDP when prices and quantities have not been separated
 - Using current year prices
- nominal GDP = price level × real GDP
- Real GDP
 - Actual quantity of goods and services
 - Using base year prices

$$real Y = \frac{nominal Y}{price level}$$

Measuring Changes Over Time

- To compute GDP across time, we must use one year's prices.
 - Real GDP will be measured in a certain year's dollars.
 - Nominal GDP is measured in current dollars.
- Nominal GDP: $Y_t = P_{1t}Q_{1t} + P_{2t}Q_{2t} + \cdots + P_{Nt}Q_{Nt}$
 - where N is the total number of goods and services in the economy,
 - and $P_{1t} \dots P_{Nt}$ are prices in year t.
- Real GDP: $Y_t = P_{1,t-1}Q_{1t} + P_{2,t-1}Q_{2t} + \cdots + P_{N,t-1}Q_{Nt}$ in $t-1$ prices
 - where N is the total number of goods and services in the economy.
 - and $P_{1,t-1} \dots P_{N,t-1}$ are prices in year t-1.

An Example of Changes in Nominal GDP—1

- Consider an economy that produces 2 goods: steak (s) and basketballs (b).
- Nominal GDP in 2014:

$$Y_{2014} = P_{s,2014}Q_{s,2014} + P_{b,2014}Q_{b,2014}$$

- If the quantity of goods and services produced does not change, but prices do change:
 - Nominal GDP will change.
 - Real GDP will not change.

An Example of Changes in Nominal GDP—2

- Suppose:

Year	Price of Steak	Quantity of Steak	Price of Basketballs	Quantity of Basketballs
2014	\$10	50	\$25	100
2015	\$12	50	\$28	100

- Nominal GDP in 2014:

$$\text{Nominal } Y_{2014} =$$

- Nominal GDP in 2015:

$$\text{Nominal } Y_{2015} =$$

Real GDP

- Now suppose:

Year	Price of Steak	Quantity of Steak	Price of Basketballs	Quantity of Basketballs
2014	\$10	50	\$25	100
2015	\$12	60	\$28	105

- Real GDP in 2015:

$$Real Y_{2015} =$$

- Real GDP in 2015 (in 2014 prices):

$$Real Y_{2015} =$$

Real and Nominal GDP in a Simple Economy, 2018-2020

TABLE 2.4

Real and Nominal GDP in a Simple Economy, 2018–2020

	2018	2019	2020	Percentage change 2019–2020
Quantity of apples	500	500	550	10.0
Quantity of computers	5	5	6	20.0
Price of apples (dollars)	1	2	3	50.0
Price of computers (dollars)	900	1,000	1,000	0.0
Nominal GDP	5,000	6,000	7,650	27.5
Real GDP in 2018 prices	5,000	5,000	?	?
Real GDP in 2019 prices	6,000	6,000	7,100	18.3
Real GDP in 2020 prices	?	6,500	7,650	17.7
Real GDP in chained prices, benchmarked to 2020	?	6,483	7,650	18.0

2.4 Comparing Economic Performance across Countries

- The exchange rate:
 - Price at which different currencies are traded
- To make comparisons of GDP across countries:
 - GDP must be expressed in a common currency by first adjusting it by the exchange rate.
 - This value of nominal GDP must be multiplied by the ratio of prices in the countries.

An Example of Comparisons of Economies

- Suppose we are trying to compare GDP in China and the United States
 - 1) Use the exchange rate to turn Chinese yuan into U.S. dollars

$$26.4 \text{ trillion yuan} \times \frac{\$1}{7.6 \text{ yuan}} = \$3.5 \text{ trillion}$$

- 2) Adjust for relative price level of goods

real Y_{China} (in US prices).

$$= \text{price Level}_{\text{US}}^{\text{cl}} \times \frac{\text{nominal } Y_{\text{China}} (\text{in dollars})}{\text{price Level}_{\text{China}}} \leftarrow 0.59$$

higher

GDP = Measure of Welfare?

- How accurately does GDP measure welfare?
- What's missing from GDP?



Jones & Klenow – Beyond GDP? Welfare Across Countries and Time (2016)

What fraction λ of US consumption makes the individual indifferent between the US and any other country (equivalent variation)?

represent income
How GDP measure well-being? fault in
but might still be a good way to count
source

Country	Welfare λ	Per capita income	Log difference	Life expectancy	C/Y	Leisure	Inequality
USA	1.000	1.000		0.000 77.0	0.000 0.762	0.000	0.000
France	0.941	0.701	0.295	0.084 78.9	-0.055 0.721	0.140	0.125
Singapore	0.426	0.829	-0.667	0.036 78.1	-0.581 0.426	-0.106	-0.016
Botswana (HIV)	0.074	0.179	-0.887	-0.577 48.9	-0.171 0.642	0.028	-0.167

Correlation coefficient between λ and GDP per capita: **0.95!**

$$T_V = PY - wL - rK$$

output ↑ work cost ↑
 = \$100 rental rate of Capital
 $= i + \delta$ ↑ appreciation
 interest rate

$$wL = \$65$$

$$\text{left } T_V + rK = \$35$$

$$rK = \$5$$

$$T_V + \delta K = \$30$$

↓
depreciation of fixed capital

$$GDP - \underset{\substack{\uparrow \\ \text{net}}}{\text{Depreciation}} = NDP$$