Chapter 2

Macroeconomic Accounting

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The Macro Before the Micro

Most of Ch. 1 was spent talking about microfoundations, but this is a macro class

What is the "macro" part of our analysis?

- Study how micro-level choices shape aggregate outcomes across the economy
- Recall: aggregate = sum, or economy as a whole

Before we make the micro $\rightarrow$ macro jump, we need to understand what we're aggregating to

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National Income Accounting

Three equal approaches

1. Product approach [*anything produced*] $\rightarrow$
2. Expenditure approach [*is purchased by someone*] $\rightarrow$
3. Income approach [*must be income for someone else*]

National income identity:

$$\textbf{Total Production} =$$

$$\textbf{Total Income} =$$

$$\textbf{Total Spending}$$

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Gross Domestic Product

Gross Domestic Product (GDP, or *Y*) is the total market value of all the new final goods and services produced within a specific time and set of borders

Let's go through each term in our definition

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Market Value

Market value: use prices to compare different goods

- This is inherently a subjective value
- Why subjective? What happens if **preferences** change?

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New and Final Goods

New final goods and services:

- New is simple: only things produced in the period we're studying, not earlier
  - A period is usually a year, but can be a decade, quarter, month, day, etc.

Final goods and services are more complicated

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Final Goods and Services

Anything not used up in the production of other goods and services this period.

Includes:

- **Capital goods** – goods that produce other goods (they are not used up in production)
  - Ex: assembly line equipment
- **Inventory investment** – unsold final goods, goods in process

Intermediate goods are not final goods

- Anything used up in production of final goods (or other intermediate goods)
  - Ex: flour in a cake

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Value-added Approach

To avoid counting intermediate goods twice, we use the **value-added approach**

- Only adds the additional value of each step to GDP

Step	Sale	Value Added
Farmer grows apples	1	1
Processor cleans apples	3	2
Vendor sells apples	4	1
Baker sells apple pie	7	3
Consumer buys apple pie	7	0

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Time and Borders

Within a specific time and set of borders:

Time can mean anything; usually a year or quarter

Borders is more nuanced. Where do you include the profits of an Italian firm operating in the U.S.?

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Gross National Product

Gross National Product (GNP) is production from nationals, regardless of borders

- Technically residents, but nationals is fine

GDP = output produced within borders regardless of nationality

Net Factor Payments (NFP): $GNP - GDP$

- Less than 1% for U.S.

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GDP vs GNP

So where do profits from an Italian-owned firm operating in the U.S. go?

- Italian GNP (owned by Italian nationals)
- U.S. GDP (operating within U.S. borders)

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Expenditure Approach

Measured by total spending on final goods

- GDP (Y) = consumption (C) + investment (I) + government purchases (G) + net exports (NX)
- NX = Exports − Imports[1]

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

[1] Importing does NOT lower GDP. It is subtracted as a correction since C, I, or G increased but production went abroad. They do represent a potential opportunity cost, depending on whom you ask.

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Components of the Expenditure Approach

Consumption: durable/non-durable goods and services

- $\sim$68% of U.S. GDP

Investment: capital goods, inventory, residential/non-residential buildings, IP (not buying stocks and bonds)

- $\sim$18% of U.S. GDP

Government purchases: NOT including transfers (Social Security) and interest payments on debt

- $\sim$17% of U.S. GDP

Net exports: spending on exports minus spending on imports

- $\sim -3\%$ of U.S. GDP (BEA, 2026)

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Income Approach

When I was hired here, I asked a former chair how they taught the income approach

Answer: "Hire an accountant."

$$Y = Wages + Rent + Interest + Profits +$$
$$Sales\ \ Taxes - Subsidies + Depreciation - NFP$$

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Issue with GDP?

GDP does not measure:

- Happiness, learning, opportunity, kindness, ethics
- Though, *ceteris paribus*, most people prefer high GDP to low GDP

We can look at GDP per capita, or GDP per person, but that doesn't solve the issue if the distribution is skewed

Can compare with **Gini Coefficient**, which looks at income inequality

- 0 = perfectly equal; 1 = total inequality

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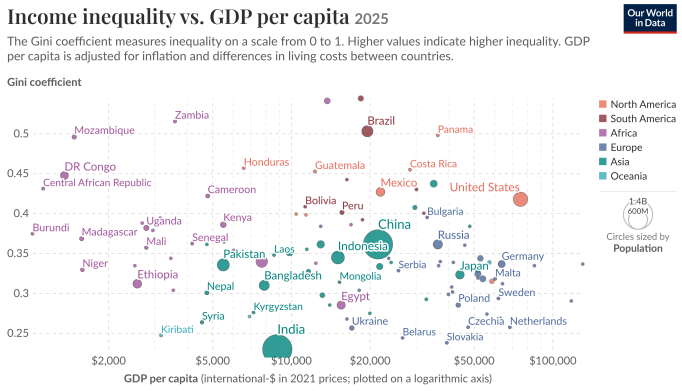
Gini Coefficient and GDP per Capita



No clear correlation (consumption-based Gini used for Asian and African countries (DeSilver, 2022))

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Another Issue

Assume a two good economy: apples and oranges

2010: 9 apples sold at \$2 each; 8 oranges sold at \$3 each

- GDP = \$18 + \$24 = \$42

2020: 9 apples sold at \$4 each; 10 oranges sold at \$5 each

- GDP = \$36 + \$50 = \$86

How much did the economy *really* grow? How much was just inflation?

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Nominal vs Real Values

The \$42 and \$86 values of **nominal GDP**

- **Nominal:** in name only
- Does not represent purchasing power
- Influenced by **inflation (π):** rate of change in *aggregate* price level

2010	2020
$P_{\text{apples}} = 2$ $P_{\text{oranges}} = 3$	$P_{\text{apples}} = 4$ $P_{\text{oranges}} = 5$
$Q_{\text{apples}} = 9$ $Q_{\text{oranges}} = 8$	$Q_{\text{apples}} = 9$ $Q_{\text{oranges}} = 10$

Real GDP is found by picking a "base year"

- **Real:** adjusted for inflation; purchasing power
- Base year prices and current year quantities
- If 2010 is the base, real GDP in 2020 is:
- \$18 + \$30 = \$48

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GDP Deflator

GDP deflator measure of inflation:

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

GDP deflator in 2020 =

$$\frac{86}{48} \times 100 = 179, \text{ or } 79\% \text{ inflation over 10 years}$$

2010	2020
$P_{\text{apples}} = 2$ $P_{\text{oranges}} = 3$	$P_{\text{apples}} = 4$ $P_{\text{oranges}} = 5$
$Q_{\text{apples}} = 9$ $Q_{\text{oranges}} = 8$	$Q_{\text{apples}} = 9$ $Q_{\text{oranges}} = 10$

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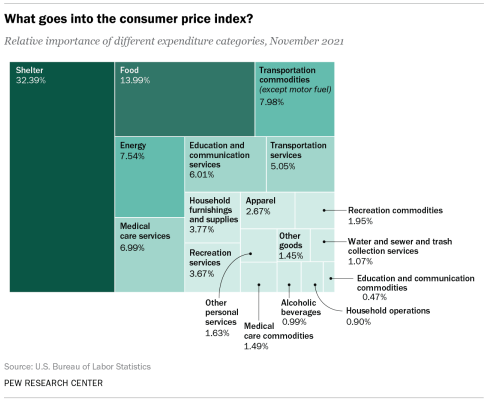
Consumer Price Index

Can also use **Consumer Price Index (CPI)**

- Instead of fixing base prices, we fix a "basket" of goods in base year
- Common price index in media; fix quantities for average consumer



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Calculating CPI

$$\text{CPI} = \frac{\text{Costs Current Year}}{\text{Costs Base Year}} \times 100$$

CPI for basket fixed in 2010 =

$$\frac{76}{42} \times 100 = 181, \text{ or } 81\% \text{ inflation over 10 years}$$

2010	**2020**
$P_{\text{apples}} = 2$	$P_{\text{apples}} = 4$
$P_{\text{oranges}} = 3$	$P_{\text{oranges}} = 5$
$Q_{\text{apples}} = 9$	$Q_{\text{apples}} = 9$
$Q_{\text{oranges}} = 8$	$Q_{\text{oranges}} = 10$

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Pros and Cons to CPI

Unlike GDP deflator, CPI tries to focus on the consumer, but can be biased upwards

Substitution bias: cannot see substitution by consumers to relatively cheaper goods

- **Outlet substitution bias:** substitution towards cheaper stores (big-box, online)

New-goods bias: difficult to compare baskets when new products are introduced

- Imagine a basket before the iphone, using prices after the iphone

Quality bias: quality improvements $\Rightarrow$ price increases for same quantity

Can overstate inflation by 1pp (Schüle and Wessel, 2018)

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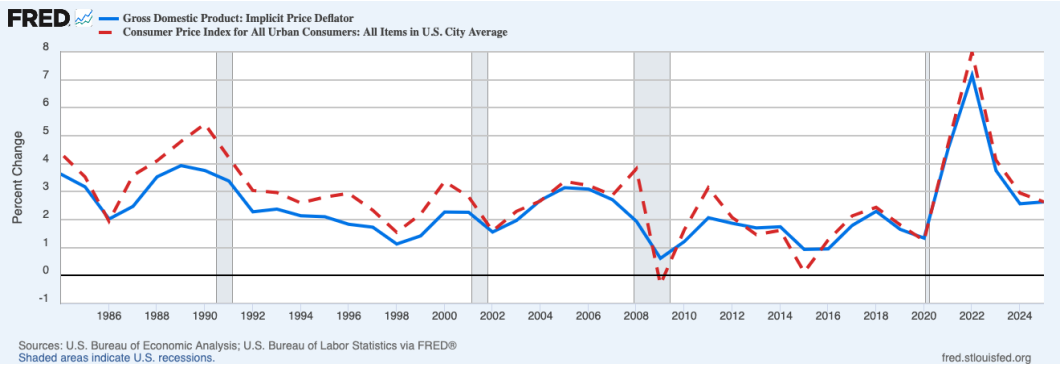
CPI vs GDP Deflator



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Personal Consumption Expenditures

Personal Consumption Expenditures (PCE) price index is the preferred series by **the Federal Reserve (Fed)**, the U.S. central bank, since 2000

- More products covered, plus purchases on behalf of households (e.g. Medicare)
- Weights updated monthly vs annually for CPI
  - Can catch substitutions quicker; outlet substitution is a little harder to pick up
- Faster integration and broader tracking can help capture newer products
- Quality remains the hardest to address

Fed targets 2%/year, long term (Pendered, 2026)

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Headline vs Core

All measures we've seen so far are **headline** measures. A **core** measure of inflation excludes food and energy to study short to medium-term trends

- Far more volatile markets that obscure the trend

For forecasting and policy adjustments to hit its 2% headline PCE target, the Fed uses core PCE (Board of Governors of the Federal Reserve System, 2026)

- Think of this as the short to medium term "guide" for inflation
- HW will take a deeper dive into headline PCE vs core PCE

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Appendix

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Product Approach Example (1/5)

Let's look at an economy with two firms: Frank Co and Coop Inc

- Coop produces cheese and Frank produces pizza
- Coop sells cheese to consumers and to Frank
- Frank sells pizza to consumers only

The following is an accounting breakdown of activity

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Product Approach Example (2/5)

Coop:

Total revenue from cheese	$10,000
Selling cheese to public	$8,000
Selling cheese to Frank	$2,000
Wages paid to workers	$4,000

Frank:

Total revenue from pizza	$15,000
Buying cheese from Coop	$2,000
Wages paid to workers	$5,000

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Product Approach Example (3/5)

So just add up total revenue?

- Not quite

Total revenue double counts the value of the cheese Coop sold to Frank

- If it's included in Coop's total revenue, it adds no value to the total when adding Frank's revenue

Coop:

Total revenue from cheese	$10,000
Selling cheese to public	$8,000
Selling cheese to Frank	$2,000
Wages paid to workers	$4,000

Frank:

Total revenue from pizza	$15,000
Buying cheese from Coop	$2,000
Wages paid to workers	$5,000

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Product Approach Example (4/5)

We use the **value added** approach to deal with this

- Value of output minus purchased value of inputs

Since cheese is an intermediate good for Frank, it is not counted

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Product Approach Example (5/5)

GDP = \$23,000 =

- 10,000 + 15,000 − 2,000

Total value of production minus value of intermediate goods

Coop:

Total revenue from cheese	\$10,000
Selling cheese to public	\$8,000
Selling cheese to Frank	\$2,000
Wages paid to workers	\$4,000

Frank:

Total revenue from pizza	\$15,000
Buying cheese from Coop	\$2,000
Wages paid to workers	\$5,000

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Expenditure Approach Example

GDP = \$23,000 =

- 8,000 + 15,000

Total spending on final goods

- Cheese the public buys
- Pizza the public buys
- No capital goods, inventory, government, exports, in this example

Coop:

Total revenue from cheese	\$10,000
Selling cheese to public	\$8,000
Selling cheese to Frank	\$2,000
Wages paid to workers	\$4,000

Frank:

Total revenue from pizza	\$15,000
Buying cheese from Coop	\$2,000
Wages paid to workers	\$5,000

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Income Approach Example

Add up all firm, household, government income:

GDP = $23,000 =

- Coop's income (10,000 - 4,000) +
- Frank's income (15,000 - 2,000 - 5,000) +
- Coop employee income (4,000) +
- Frank employee income (5,000)

Coop:

Total revenue from cheese	$10,000
Selling cheese to public	$8,000
Selling cheese to Frank	$2,000
Wages paid to workers	$4,000

Frank:

Total revenue from pizza	$15,000
Buying cheese from Coop	$2,000
Wages paid to workers	$5,000

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