Chapter 2: Measurement

- Two things are important in economics:
  - Measurements: refer to physical measures or values (quantity, quality).
  - Theory: provides the most efficient ways to understand economic measurements

- The objective of this chapter is to understand the basic issues about how macroeconomic variables are measured, important for for the setup of economic models.

Chapter 2: Measurement

Topics:

- Measuring GDP
- Nominal and real GDP and price indices
- Savings, wealth and capital
- Labour market measurement

II.1. Measuring GDP: The National Income and Product Accounts

Two important questions:

- What is GDP?
- How do we measure GDP: The Equivalence of Three Methods

II.1.1. What is GDP?

- Measure of aggregate economic activity (Ch.1)
- Value of Domestically Produced Output
- So GDP of Canada is the $C value of final output produced in Canada.
- The data on GDP are published by Statistic Canada, on a quarterly basis, as part of National Income and Expenditure Accounts (NIEA)

II.1.2. How do we measure GDP?

Three Approaches:

- The product approach: Value added;
- The expenditure approach;
- The income approach.

A Simple Fictional Island Economy

Sectors: a coconut producer, a restaurant, consumers, and a government

Coconut producer: produces 10 million coconut, each sold at $2. 6 million go to the restaurant, remaining 4 go to the consumers.

Restaurant: sells $30 million meals

Government: provides protection from attacks from other islands. It collects taxes ($4.5 million from firms, 1 million from consumers).

Consumers: work for the business and government, receive interest, pay taxes.

Table 2.1 Coconut Producer

Total Revenue	$20 million
Wages	$5 million
Interest on Loan	$0.5 million
Taxes	$1.5 million

Table 2.2 Restaurant

Total Revenue	$30 million
Cost of Coconuts	$12 million
Wages	$4 million
Taxes	$3 million

Table 2.3 After-Tax Profits

Coconut Producer	$13 million
Restaurant	$11 million

Table 2.4 Government

Tax Revenue	$5.5 million
Wages	$5.5 million

Table 2.5 Consumers

Wage Income	$14.5 million
Interest Income	$0.5 million
Taxes	$1 million
Profits Distributed by Producers	$24 million

a). The Product Approach

- Value Added: VA = total revenue – the value of intermediate goods

- Why do we subtract the value of intermediate goods and services: **Double counting**

Table 2.6 GDP Using the Product Approach

Value added—coconuts	$20 million
Value added—restaurant food	$18 million
Value added—government	$5.5 million
GDP	$43.5 million

b). The Expenditure approach

- GDP is the total spending on all FINAL goods and services produced IN the economy.

- GDP = Consumption (C)
  + Investment (I)
  + Government Expenditure (G)
  + Net Exports (NX=X-M)

so **GDP=C+I+G+NX**

Table 2.7 GDP Using the Expenditure Approach

Consumption	$38 million
Investment	0
Government Expenditures	$5.5 million
Net Exports	0
GDP	$43.5 million

c). The Income approach

- GDP is the sum of incomes received by economic agents contributing to production.
- GDP = Wage Income
  + After-Tax Profits
  + Interest Income
  + Taxes

Table 2.8 GDP Using the Income Approach

Wage income	$14.5 million
After-tax profits	$24 million
Interest income	$0.5 million
Taxes	$4.5 million
GDP	$43.5 million

d). Why do the three approaches yield the same GDP value?

Because the total quantity of output (or VA) is ultimately sold and what is spent by the economic agents on all output produced is income for the economic agents of the same economy.

Income/expenditure identity

Add in Inventory Investment

- **Inventory:** Goods and materials produced, but stored for ultimate purposes (P.37). This is considered as part of the income.
- Suppose now the coconut producer produces 13 million instead 10 million, but only sell out 10 million. What is GDP now?

Answer: $49.5 million.

Add in International Trade

Suppose now the restaurant imports additional 2 million coconuts from other islands at $2 each. What is GDP now?

Answer: $39.5 million.

II.1.3. What is GNP?

- GNP = GDP + NFP

  Canada NFP: Net Factor Payments

  = Factor payments to Canadian citizens

  - Factor payments to foreigners in Canada

- GDP= income made in Canada

  GNP= income made by Canadian citizens no matter where they are.

II.1.4. What does GDP Leave Out?

- Nonmarket activity: home production, leisure, ……
- Underground economy: illegal drug trade, baby-sitting, ……
- Valuing Government Production

II.2. Nominal and Real GDP and Price Indices

II.2.1. Nominal and Real GDP

- Nominal GDP: GDP at current price
- Real GDP: GDP corrected for inflation. Current quantities at base year prices.

Table 2.10 Real GDP: Example

	Apples	*Oranges*
Quantity in year 1	$Q_1^a = 50$	$Q_1^o = 100$
Price in year 1	$P_1^a = \$1.00$	$P_1^o = \$0.80$
Quantity in year 2	$Q_2^a = 80$	$Q_2^o = 120$
Price in year 2	$P_2^a = \$1.25$	$P_2^o = \$1.60$

Nominal GDP

GDP1 = $130,

GDP2 = $292

Growth = (GDP2-GDP1)/GDP1 = 225%

Real GDP: GDP is calculated using the base year prices

- Base year 1: RGDP1 = $130, RGDP2 = $176

Change (g1) = 35.4%

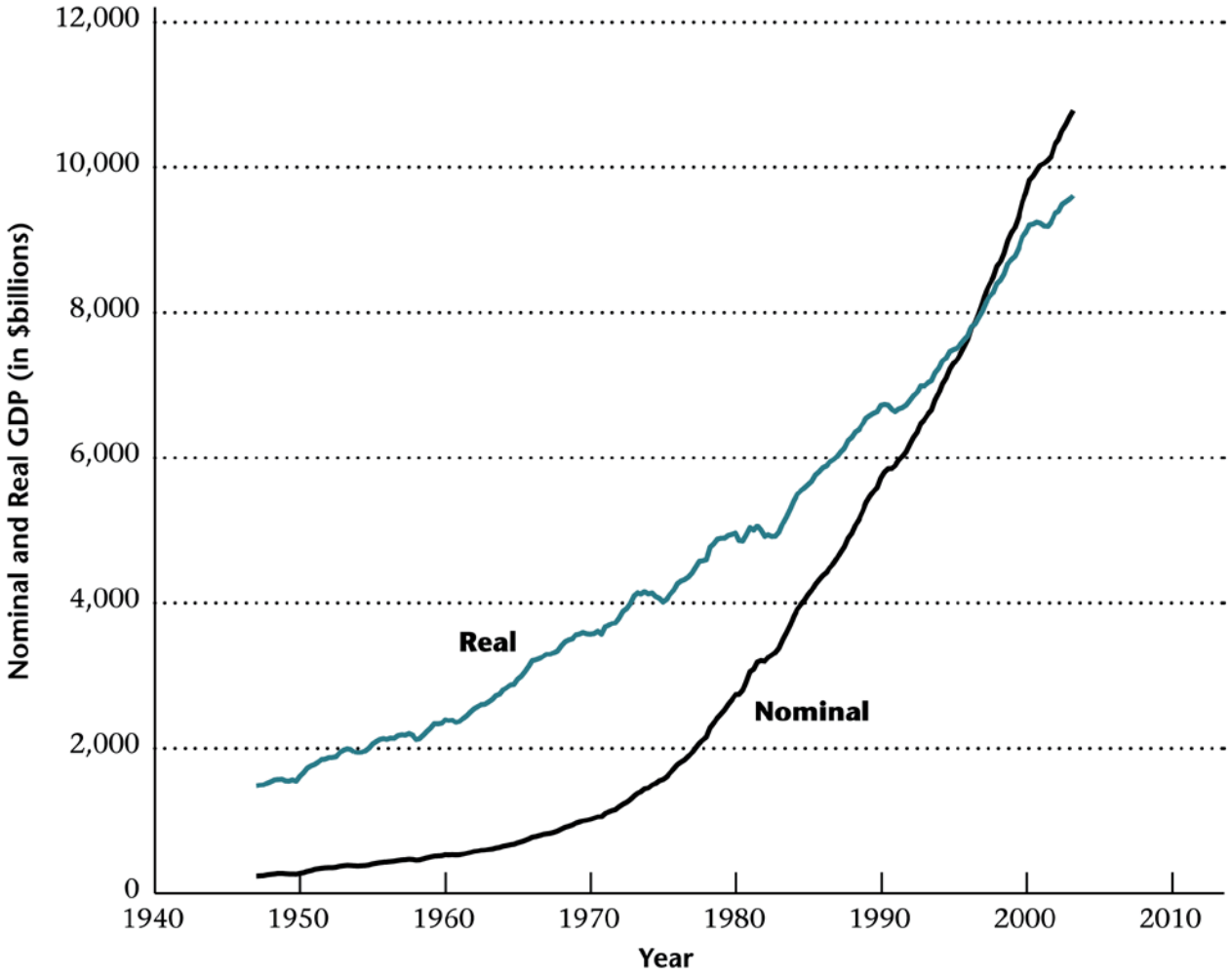
- Base year 2: RGDP1 = $222.50, RGDP2 = $292

Change (g2) = 31.2%

Chain-Weighting Scheme

$$g_c = \sqrt{g_1 \bullet g_2}$$

Figure 2.1 Nominal GDP (black line) and Chain-Weighted Real GDP(colored line) for the Period 1947–2003



II.2.2. Measures of the Price Level

- Implicit GDP Price Deflator

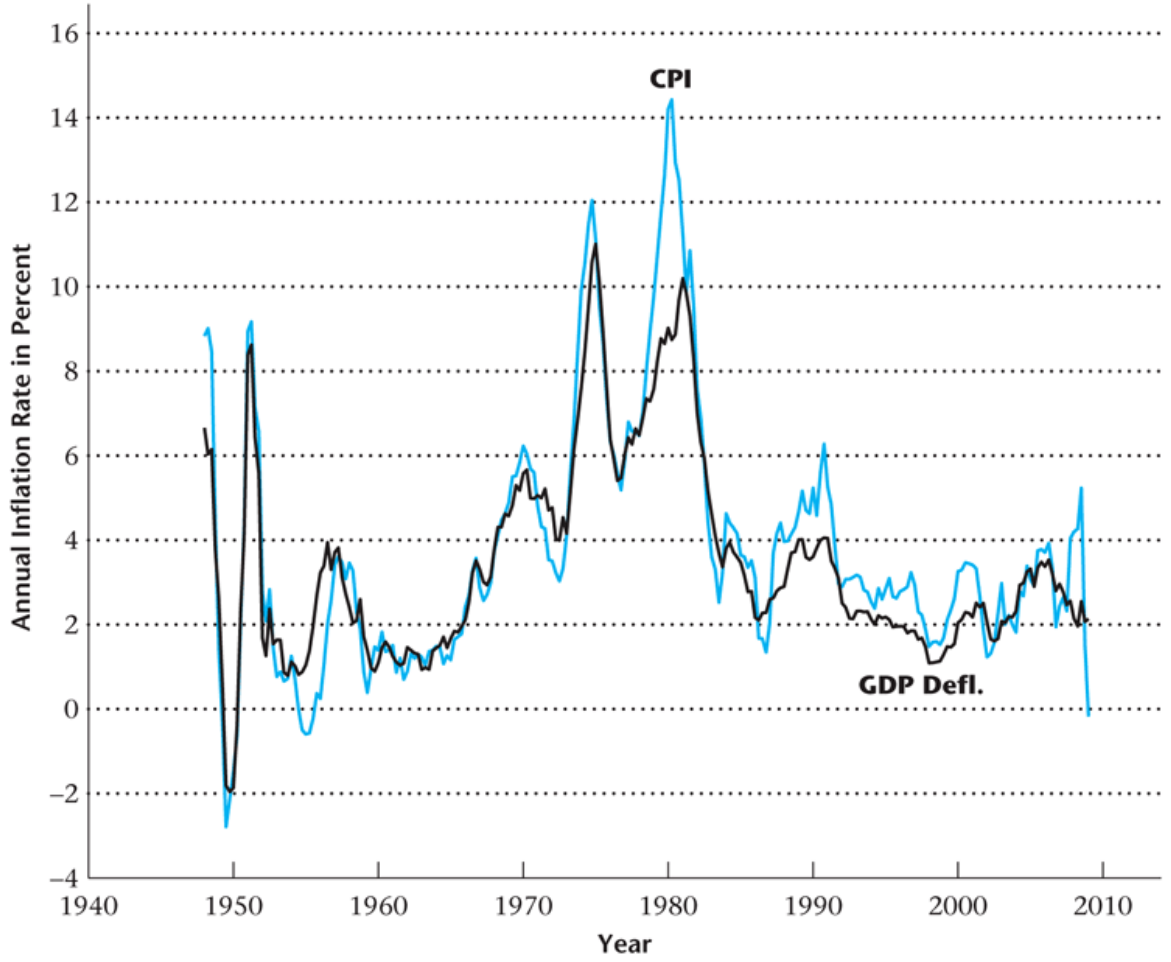
$$= \frac{GDP}{RGDP} x100$$

- CPI(t) = (Cost of base year quantities at prices of year t / Cost of base year quantities at base year prices) * 100

Table 2.11 Implicit GDP Price Deflators: Example

	Year 1	Year 2	% Increase
Year 1 = base year	100	165.9	65.9%
Year 2 = base year	58.4	100	71.2
Chain-weighting	100	168.5	68.5

Figure 2. Inflation Rate Calculated from the CPI (blue line), and Calculated from the Implicit GDP Price Deflator (black line).
Fig 2.3 (new version)



II.3. Measures of Savings, Wealth, and Capital

- Flow: a rate (change) per unit of time
  - Saving, Investment, Consumption, …
- Stock: the quantity in existence of some object at a point in time
  - Capital, Wealth, …

II.3.1. Private Disposable Income and Private Sector Saving

$$Y^d = Y + NFP + TR + INT - T$$

$$S^p = Y^d - C$$

II.3.2. Government Surpluses, Deficits, and Government Saving

$$S^g = T - TR - INT - G$$

If S^g is positive = Government Surplus

If S^g is negative = government deficit

II.3.3. Saving, Investment, and the Current Account

- National Saving:

$$S = S^p + S^g = Y + NFP - C - G$$

$$S = I + NX + NFP$$

$$CA = NX + NFP \Rightarrow S = I + CA$$

II.3.3. Saving, Investment, and the Current Account (Next)

$$S \Longrightarrow \Delta Wealth$$

$$I \Longrightarrow \Delta K$$

$$CA \Longrightarrow \Delta \text{Claims on Foreigners}$$

II.4. Labor Market Measurement

- Statistics Canada Categories
  - Employed
  - Unemployed: unemployed but actively searching for work
  - Not in the Labor Force

II.4. Labor Market Measurement

- The Unemployment Rate =

  Number unemployed / Labor force

- Participation Rate =

  Labor force / Total working age population