Chapter 20: Measuring GDP and Economic Growth

Gross domestic product (or GDP) is the market value of all final goods and services produced in a country in a given time period.

The above definition has four parts:

1. Market value

GDP is a market value — goods and services are valued at their market prices.

2. Final goods and services

GDP is the value of the *final goods and services* produced.

A *final good* (or *service*) is an item bought by its final user during a specified time period.

A final good contrasts with an **intermediate good**, which is an item that is produced by one firm, bought by another firm, and used as a component of a final good or service.

Example:

* Wheat → Flour → Bread (eaten by an individual)

Excluding the value of intermediate goods/services avoids counting the same value more than once.

3. Produced within a country

GDP measures production within a country — domestic production.

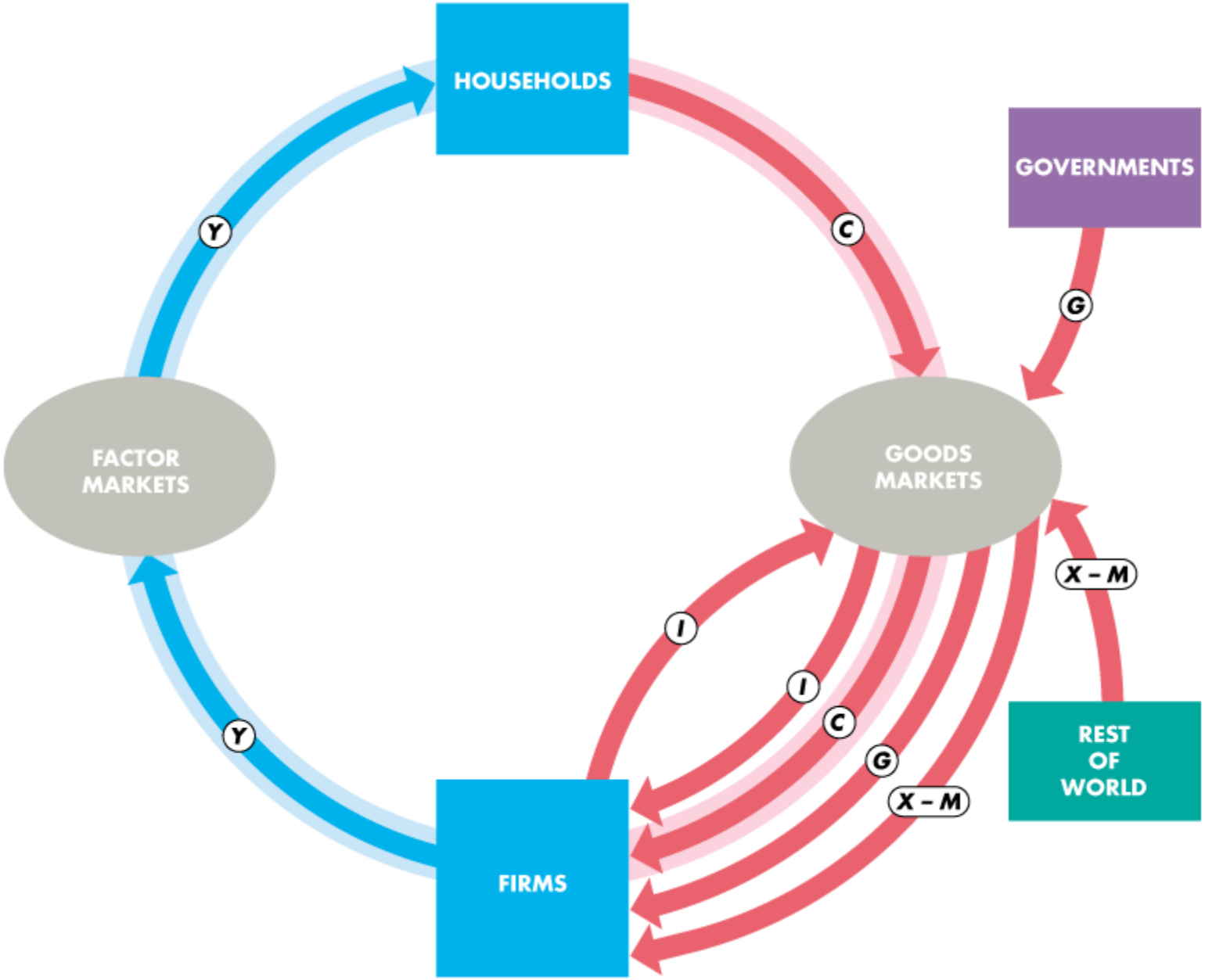
4. In a given time period

GDP measures production during a specific time period, normally a year or a quarter of a year.

GDP and the Circular Flow of Expenditure and Income

GDP measures the value of production, which also equals total expenditure on final goods and total income.

The circular flow diagram illustrates the equality of income and expenditure.


HOUSEHOLDS
GOVERNMENTS
FACTOR MARKETS
GOODS MARKETS
FIRMS
REST OF WORLD
Y
C
G
X – M
I
I
C
G
X – M
Y

The circular flow shows two ways of measuring GDP.

GDP = Total Expenditure = Total Income

Total expenditure on final goods and services equals GDP:

$$\text{GDP} = C + I + G + X - M.$$

Total income equals the total amount paid for the use of factors of production: wages, interest, rent, and profit.

Firms pay out all their receipts from the sale of final goods, so income equals expenditure,

$$Y = C + I + G + (X - M).$$

Why “Domestic” and Why “Gross”?

Domestic

Domestic product is production *within a country*.

It contrasts with *national* product, which is the value of goods and services produced anywhere in the world by the residents of a nation.

Gross

Gross means *before* deducting the depreciation of capital.

The opposite of *gross* is *net*, which means after deducting the depreciation of capital.

Depreciation is the decrease in the value of a firm's capital that results from wear and tear and obsolescence.

Gross investment is the total amount spent on purchases of new capital and on replacing depreciated capital.

Net investment is the increase in the value of the firm's capital.

Net investment = Gross investment − Depreciation

Gross investment is one of the expenditures included in the expenditure approach to measuring GDP.

So total product is a gross measure.

Gross profit, which is a firm's profit before subtracting depreciation, is one of the incomes included in the income approach to measuring GDP.

So total product is a gross measure.

Measuring Canadian GDP

Statistics Canada uses two approaches to measure GDP:

- The expenditure approach
- The income approach

The Expenditure Approach

The *expenditure approach* measures GDP as the sum of consumption expenditure, investment, government expenditure on goods and services, and net exports.

$$GDP = C + I + G + (X - M)$$

The next slide shows the expenditure approach with data (in billions) for 2013.

$$GDP = \$1{,}048 + \$379 + \$486 - \$32$$

$$= \$1{,}881 \text{ billion}$$

The Income Approach

The *income approach* measures GDP by summing the incomes that firms pay households for the factors of production they hire — wages for labor, interest for capital, rent for land, and profit for entrepreneurship.

TABLE 20.1 GDP: The Expenditure Approach

Item	Symbol	Amount in 2013 (billions of dollars)	Percentage of GDP
Consumption expenditure	C	1,048	55.7
Investment	I	379	20.2
Government expenditure on goods and services	G	486	25.8
Net exports of goods and services	$X - M$	−32	− 1.7
Gross domestic product	Y	**1,881**	**100.0**

Nominal GDP and Real GDP

Nominal GDP is the value of final goods and services produced during a given year valued at the prices that prevailed in that same year.

Real GDP is the value of final goods and services produced in a given year when *valued at the prices of a reference base year*.

Currently, the reference base year is 2007 and we describe real GDP as measured in 2007 dollars.

Calculating Real GDP

Table 20.3(a) shows the quantities produced and the prices in 2007 (the base year).

Nominal GDP in 2007 is $100 million.

Because 2007 is the base year, real GDP and nominal GDP both are $100 million.

TABLE 20.3 Calculating Nominal GDP and Real GDP

	Item	Quantity (millions)	Price (dollars)	Expenditure (millions of dollars)
(a) In 2007				
C	T-shirts	10	5	50
I	Computer chips	3	10	30
G	Security services	1	20	20
Y	Real GDP in 2007			100

Table 20.3(b) shows the quantities produced and the prices in 2014.

Nominal GDP in 2014 is $300 million.

Nominal GDP in 2014 is three times its value in 2007.

TABLE 20.3 Calculating Nominal GDP and Real GDP

	Item	Quantity (millions)	Price (dollars)	Expenditure (millions of dollars)
(a) In 2007				
C	T-shirts	10	5	50
I	Computer chips	3	10	30
G	Security services	1	20	20
Y	Real GDP in 2007			100
(b) In 2014				
C	T-shirts	4	5	20
I	Computer chips	2	20	40
G	Security services	6	40	240
Y	Nominal GDP in 2014			300

In Table 20.3(c), we calculate real GDP in 2014.

The quantities are those of 2014, as in part (b).

The prices are those in the base year (2007) as in part (a).

The sum of these expenditures is real GDP in 2014, which is $160 million.

TABLE 20.3 Calculating Nominal GDP and Real GDP

	Item	Quantity (millions)	Price (dollars)	Expenditure (millions of dollars)
(a) In 2007				
C	T-shirts	10	5	50
I	Computer chips	3	10	30
G	Security services	1	20	20
Y	Real GDP in 2007			100
(b) In 2014				
C	T-shirts	4	5	20
I	Computer chips	2	20	40
G	Security services	6	40	240
Y	Nominal GDP in 2014			300
(c) Quantities of 2014 valued at prices of 2007				
C	T-shirts	4	5	20
I	Computer chips	2	10	20
G	Security services	6	20	120
Y	Real GDP in 2014			160

The Uses of Real GDP

Economists use estimates of real GDP for two main purposes:

1. To compare the standard of living over time
2. To compare the standard of living across countries

The Standard of Living Over Time

Real GDP per person is real GDP divided by the population.

Real GDP per person = $\frac{Real\ GDP}{Population}$

By using *real* GDP, we remove any influence that rising prices and a rising cost of living might have had on our comparison.

Real GDP per person tells us the value of goods and services that the average person can enjoy.

A handy way of comparing real GDP per person over time is to express it as a ratio of some reference year.

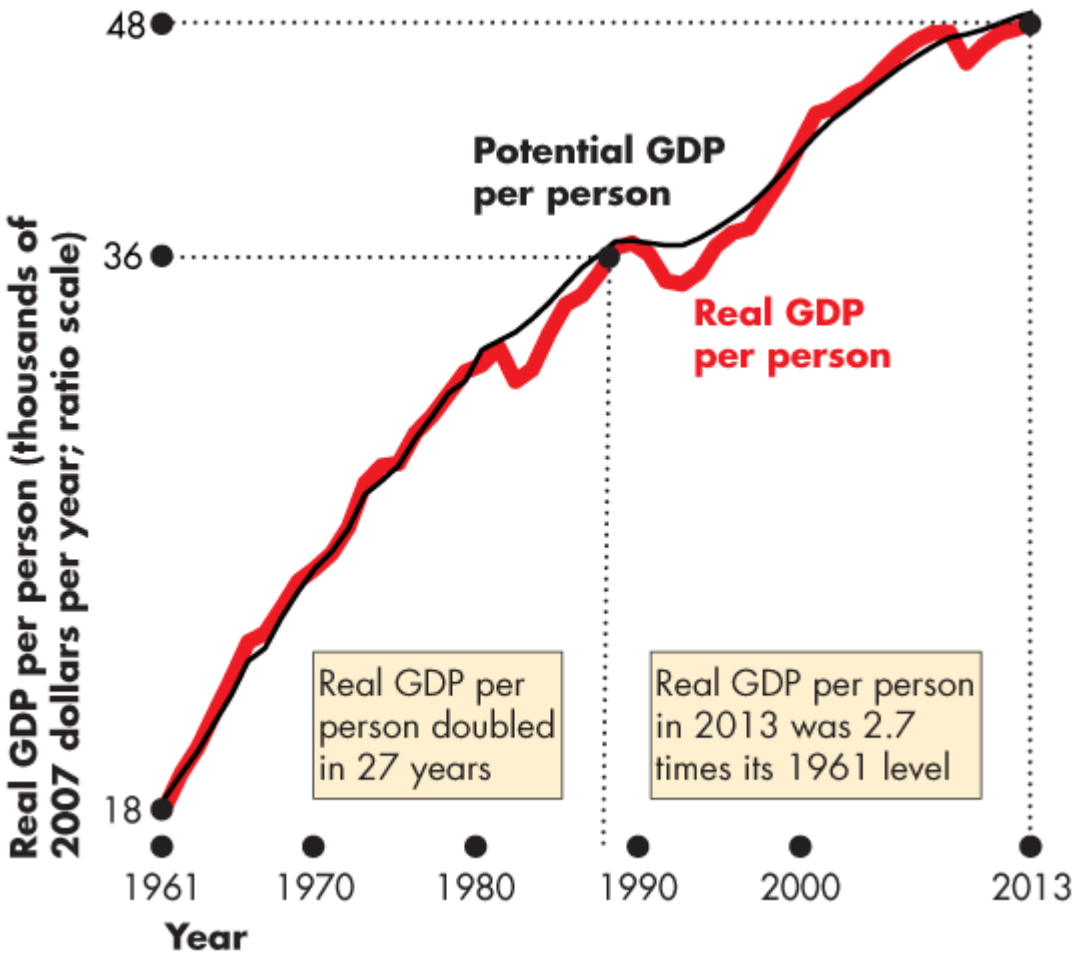
- For example, in 1969, real GDP per person was $19,000 and in 2010, it was $38,000.
- So real GDP per person in 2010 was double its 1969 level—that is,
  $38,000 ÷ $19,000 = 2.

Two features of our expanding living standard are

- The growth of potential GDP per person
- Fluctuations of real GDP around potential GDP

The value of real GDP when all the economy's labor, capital, land, and entrepreneurial ability are fully employed is called **potential GDP**.

Real GDP per person in Canada: Doubled between 1961 and 2010.


48
36
18
Potential GDP per person
Real GDP per person
Real GDP per person doubled in 27 years
Real GDP per person in 2013 was 2.7 times its 1961 level
1961
1970
1980
1990
2000
2013
Year
Real GDP per person (thousands of 2007 dollars per year; ratio scale)

What about the Growth Rates (as opposed to the Level) of Real GDP Per Capita?

We calculate the annual percentage change of real GDP per person:

$$= \frac{Real\ GDP\ per\ person\ in\ current\ year - Real\ GDP\ per\ person\ in\ previous\ year}{Real\ GDP\ per\ person\ in\ previous\ year} \times 100$$

Real GDP per person grows only if real GDP grows faster than the population grows.

From 1926 to 2014, growth in real GDP per person in Canada averaged 2 percent a year.

The **Rule of 70** states that the number of years it takes for the level of a variable to double is approximately 70 divided by the annual percentage growth rate of the variable.

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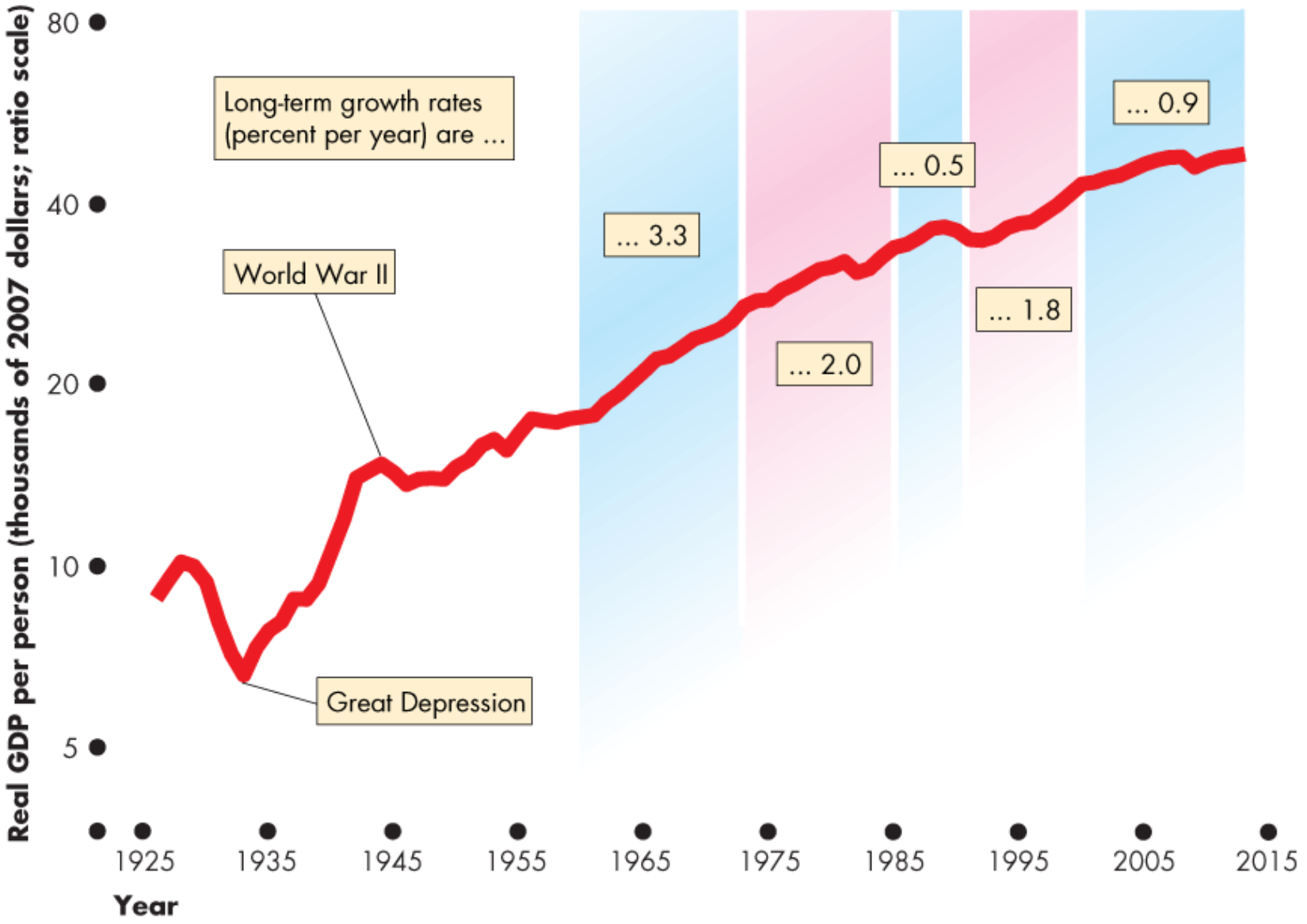
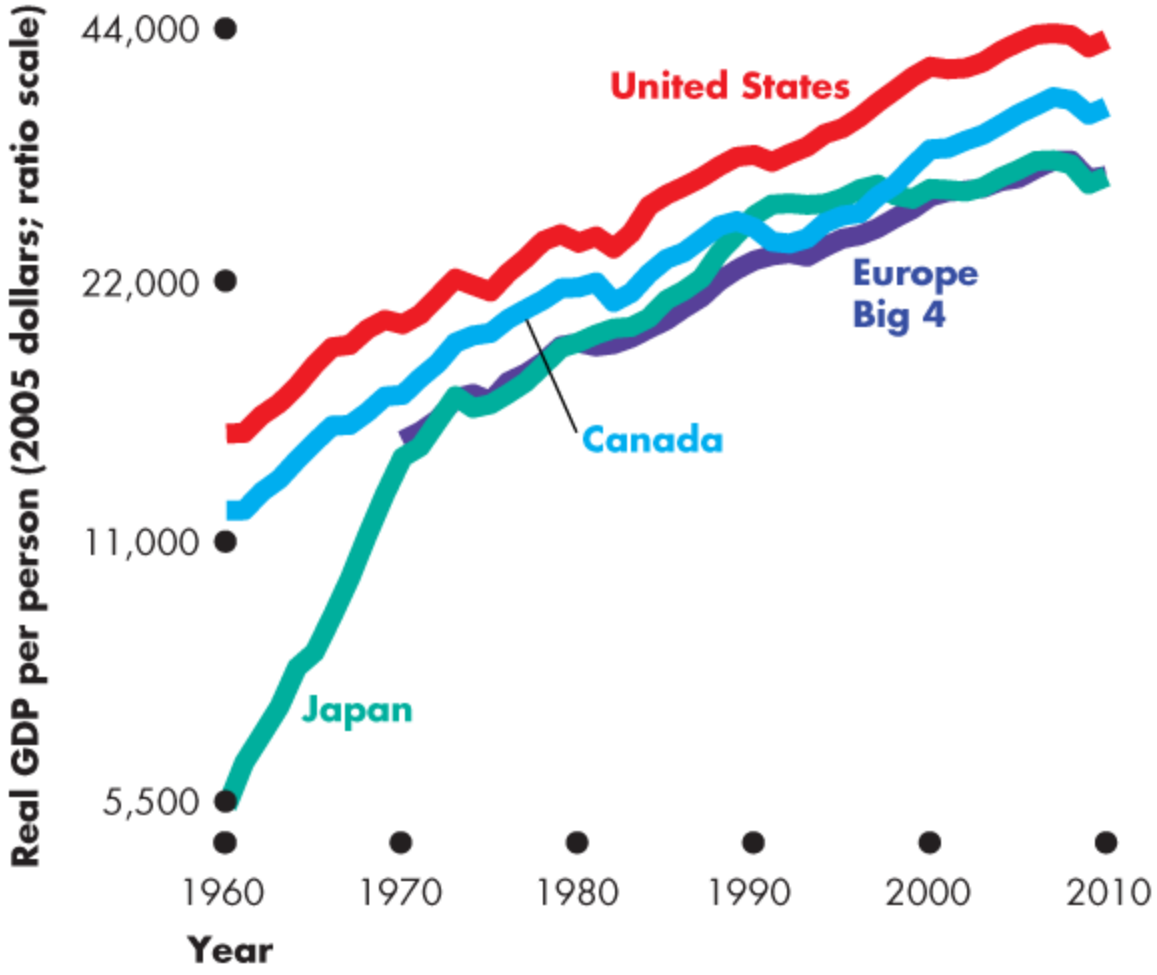
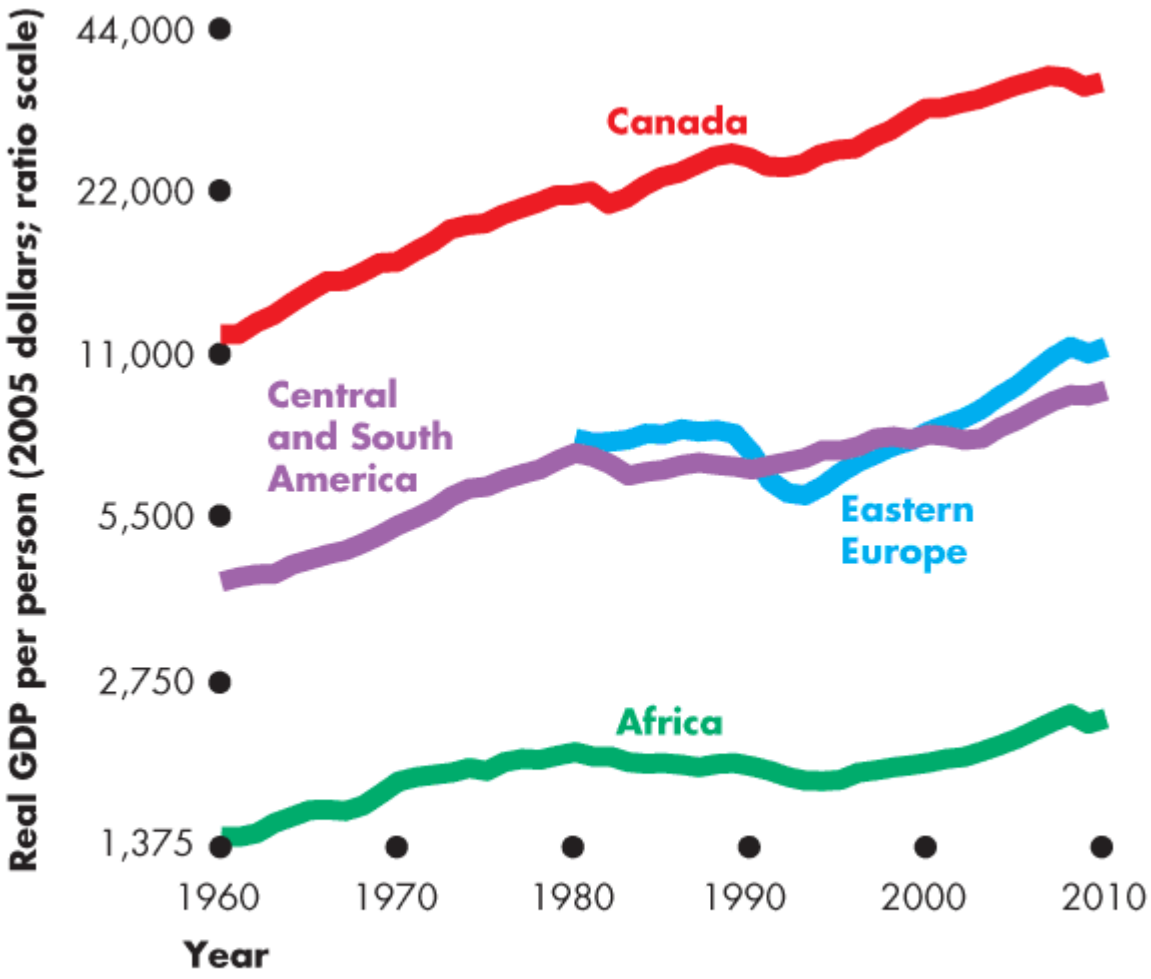
Canadian Real GDP per person: 1926 to 2014




Real GDP per person (2005 dollars; ratio scale)
44,000
22,000
11,000
5,500
United States
Europe
Big 4
Canada
Japan
1960
1970
1980
1990
2000
2010
Year

(a) Catch-up?



(b) Persistent gaps between rich and poor

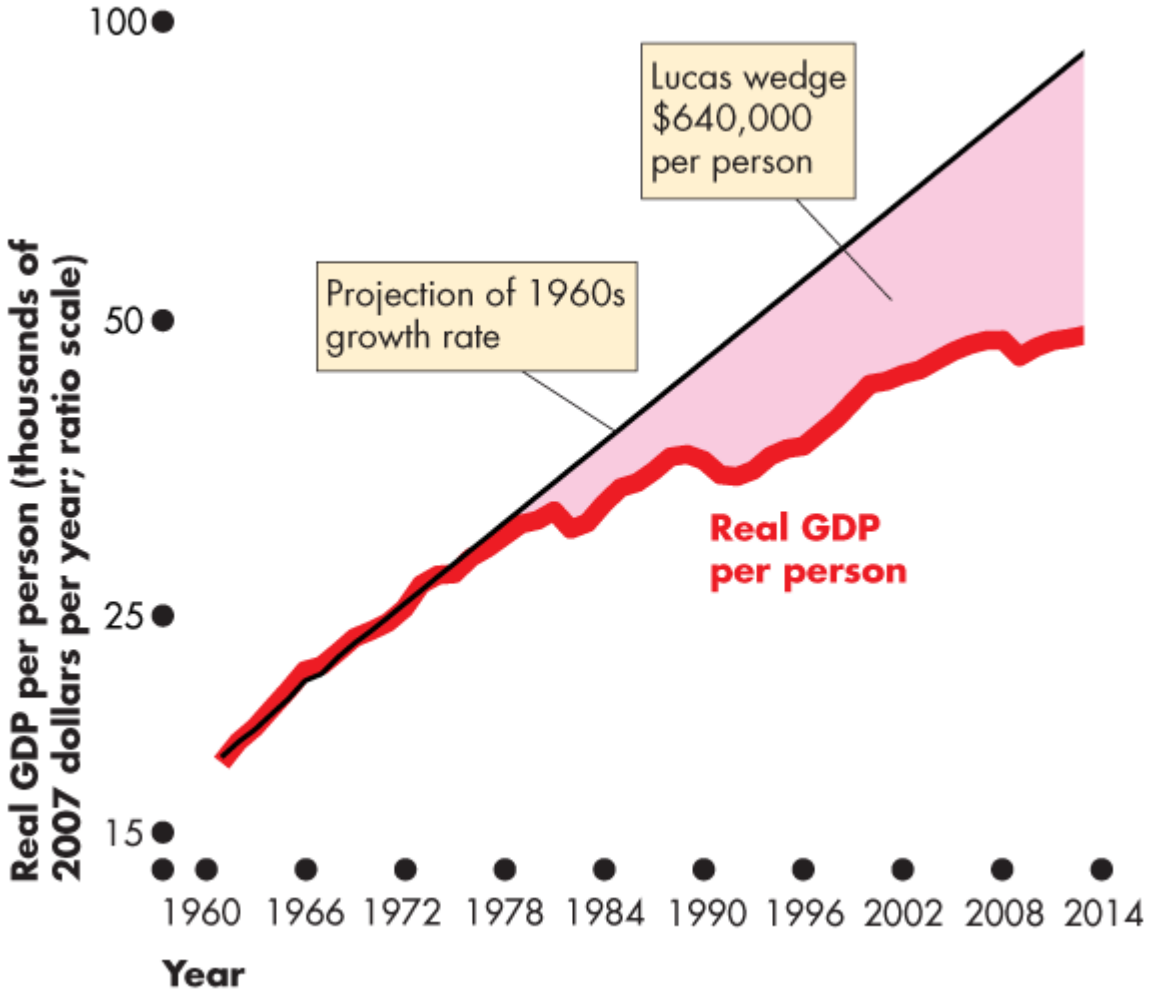
Productivity Growth Slowdown

The growth rate of real GDP per person slowed after 1970.

How costly was that slowdown?

The answer is provided by a number that we'll call the Lucas wedge.

The *Lucas wedge* is the dollar value of the accumulated gap between what real GDP per person would have been if the 1960s growth rate had persisted and what real GDP per person turned out to be.


100
50
25
15
Real GDP per person (thousands of 2007 dollars per year; ratio scale)
Lucas wedge $640,000 per person
Projection of 1960s growth rate
Real GDP per person
1960
1966
1972
1978
1984
1990
1996
2002
2008
2014
Year

A **business cycle** is a periodic but irregular up-and-down movement of total production and other measures of economic activity.

Every cycle has two phases:

1. Expansion

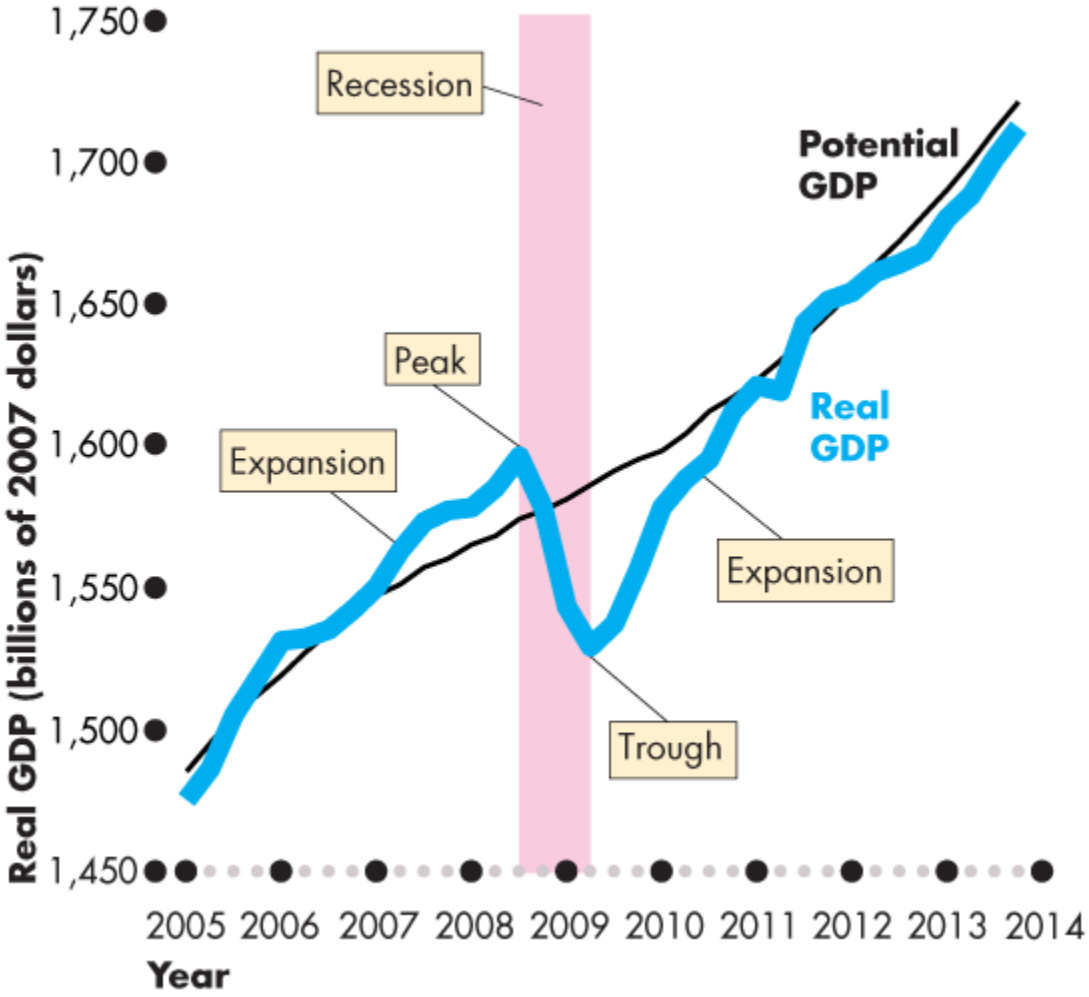
An **expansion** is a period during which real GDP increases—from a trough to a peak.

2. Recession

Recession is a period during which real GDP decreases—its growth rate is negative for at least two successive quarters.

and two turning points:

1. Peak
2. Trough


1,750
1,700
1,650
1,600
1,550
1,500
1,450
Real GDP (billions of 2007 dollars)
Recession
Potential GDP
Peak
Real GDP
Expansion
Expansion
Trough
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Year

The Standard of Living Across Countries

Two problems arise in using real GDP to compare living standards across countries:

1. The real GDP of one country must be converted into the same currency units as the real GDP of the other country.

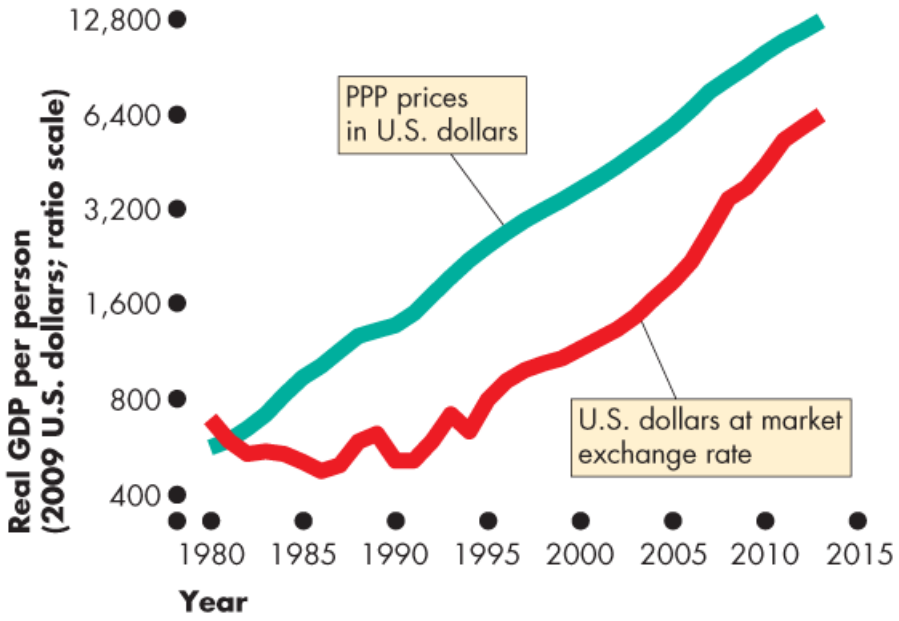
The United States and China provide a striking example.

For example, using the *market exchange rate* to value China's GDP in U.S. dollars leads to an estimate that in 2013, GDP per person in the United States was 7.9 times GDP per person in China.

2. The goods and services in both countries must be valued at the same prices.

Using the market exchange rate and domestic prices makes China look like a poor developing country.

But when GDP is valued at purchasing power parity prices, U.S. income per person is only 5.4 times that in China (not 7.9 times).



Limitations of Real GDP

Real GDP measures the value of goods and services that are bought in markets.

Some of the factors that influence the standard of living and that are not part of GDP are

- Household production
- Underground economic activity
- Health and life expectancy
- Leisure time
- Environmental quality
- Political freedom and social justice

The Bottom Line

Do we get an inaccurate message about the level and growth of economic well-being and the standard of living by looking at the level and growth of real GDP?

The influences that are omitted from real GDP are probably large.

It is possible to construct broader measures that combine the many influences that contribute to human happiness.

Despite all the alternatives, real GDP per person remains the most widely used indicator of economic well-being.