A CUSTOM EDITION

ECONOMICS FOR PROFESSIONALS

2nd Edition

University of Wollongong

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Pearson

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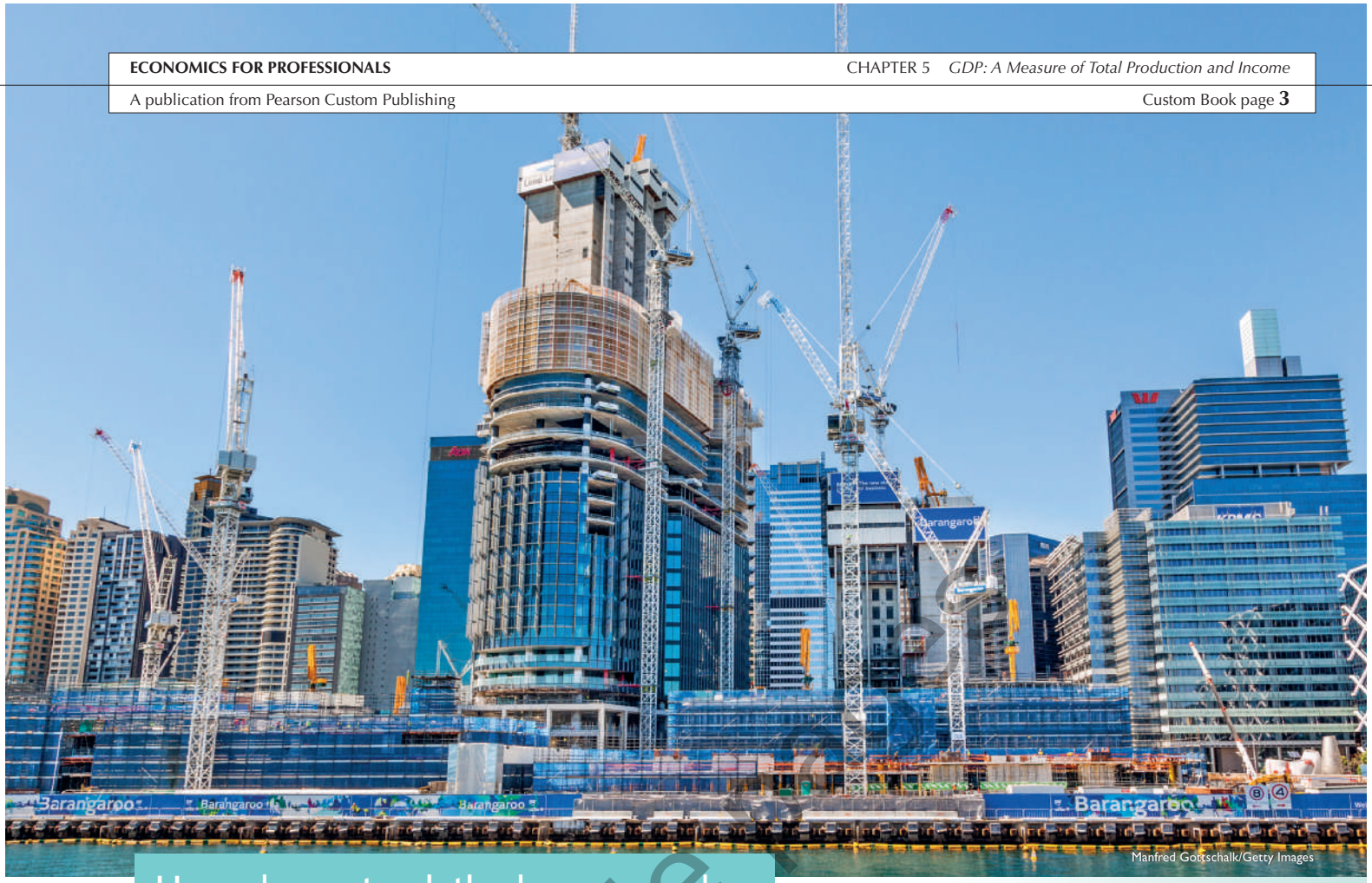

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How do we track the booms and busts in our economy?

GDP: A Measure of Total Production and Income

5

LEARNING OBJECTIVES

When you have completed your study of this chapter, you will be able to

1. Define GDP and explain why the value of production, income and expenditure are the same for an economy.
2. Describe how economic statisticians measure GDP, and distinguish between nominal GDP and real GDP.
3. Describe the uses of real GDP, and explain its limitations as a measure of the standard of living.

5.1 GDP, INCOME AND EXPENDITURE

Where is the Australian economy heading? Will it remain weak, begin to expand more rapidly, or sink into a recession?

Everyone wants to know the answers to these questions. The people who make business decisions—construction companies, boat builders, mobile phone service providers, airlines, miners, farmers and retailers—want to know the answers so they can plan their production to align with demand. Governments want the answers because the amount of tax revenue that they collect depends on how much people earn and spend, which in turn depends on the state of the economy. Governments and the Reserve Bank want to know because they might be able to take actions that avoid excessive bust or boom. Every Australian wants the answers to plan their big decisions such as how long to remain in university, whether to rent or buy a new home and how much to save towards retirement.

To assess the state of the economy we measure gross domestic product, or GDP. You're about to discover that GDP measures the value of total production, total income and total expenditure.

GDP Defined

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

We measure total production as **gross domestic product**, or **GDP**, which is the market value of all the final goods and services produced within a country in a given time period. This definition has four parts, which we'll examine in turn.

Value Produced

To measure total production, we must add together the production of apples and oranges, bats and balls. Just counting the items doesn't get us very far. Which is the greater total production: 100 apples and 50 oranges or 50 apples and 100 oranges?

GDP answers this question by valuing each item at its *market value*—at the price at which the item is traded in the market. If the price of an apple is 10¢ and the price of an orange is 20¢, the market value of 100 apples plus 50 oranges is $20 and the market value of 50 apples and 100 oranges is $25. By using market prices to value production, we can add the apples and oranges together.

What Produced

Final good or service
A good or service that is produced for its final user and not as a component of another good or service.

Intermediate good or service
A good or service that is used as a component of a final good or service.

A **final good or service** is something that is produced for its final user and not as a component of another good or service. A final good or service contrasts with an **intermediate good or service**, which is used as a component of a final good or service. For example, the ice cream you buy is a final good, but the milk from which it is made is an intermediate good. In contrast, if you buy a litre of milk, then that milk is a final good. The same good can be either final or intermediate depending on how it is used.

GDP does not count the value of everything that is produced. With one exception, it includes only those items that are traded in markets and does not include the value of goods and services that people produce for their own use. For example, if you buy a car wash, the value produced is included in GDP. But if you wash your own car, your production is not counted as part of GDP. The exception is the market value of homes that people own. GDP puts a rental value on these homes and pretends that the owners rent their homes to themselves.

Where Produced

Only goods and services that are produced *within a country* count as part of that country's GDP. Telstra, an Australian firm, produces customer support services in India, and the market value of those services is part of India's GDP, not part of Australia's GDP. Toyota, a Japanese firm, produces cars in Georgetown, Kentucky, and the value of this production is part of U.S. GDP, not part of Japan's GDP.

When Produced

GDP measures the value of production *during a given time period.* This time period is either a quarter of a year—called the quarterly GDP data—or a year—called the annual GDP data. The Reserve Bank and others use the quarterly GDP data to keep track of the short-term evolution of the economy, and economists use the annual GDP data to examine long-term trends.

GDP measures not only the value of total production but also total income and total expenditure. The circular flow model that you studied in Chapter 2 explains why.

Circular Flows in the Australian Economy

Four groups buy the final goods and services produced: households, firms, governments and the rest of the world. Four types of expenditure correspond to these groups:

- Consumption expenditure
- Investment
- Government expenditure on goods and services
- Net exports of goods and services

Consumption Expenditure

Consumption expenditure is the expenditure by households on consumption goods and services. It includes expenditures on *nondurable goods* such as orange juice and pizza, *durable goods* such as televisions and smartphones, and *services* such as rock concerts and haircuts. Consumption expenditure also includes house and apartment rents, including the rental value of owner-occupied housing.

Consumption expenditure
The expenditure by households on consumption goods and services.

Investment

Investment is the purchase of new *capital goods* (tools, instruments, machines and buildings) and additions to inventories. Capital goods are *durable goods* produced by one firm and bought by another. Examples are a new office tower built by Meriton and bought by Westpac, and aeroplanes produced by Airbus and bought by Qantas. Investment also includes the purchase of new homes by households.

Investment
The purchase of new *capital goods* (tools, instruments, machines and buildings) and additions to inventories.

At the end of a year, some of a firm's output might remain unsold. For example, if Ford produces 4 million cars and sells 3.9 million of them, the other 0.1 million (100,000) cars remain unsold. In this case, Ford's inventory increases by 100,000 cars. When a firm adds unsold output to inventory, we count those items as part of investment.

It is important to note that investment does *not* include the purchase of company shares and bonds. In macroeconomics, we reserve the term "investment" for the purchase of new capital goods and the additions to inventories.

Government Expenditure on Goods and Services

Government expenditure on goods and services
The expenditure by all levels of government on goods and services.

Government expenditure on goods and services is expenditure by all levels of government on goods and services. For example, the Australian airforce buys jet fuel from BP, the Department of Foreign Affairs buys airline tickets, Parliament buys Internet services and the government of Victoria buys radar and camera equipment to enforce speed limits.

Net Exports of Goods and Services

Net exports of goods and services
The value of exports of goods and services minus the value of imports of goods and services.

Exports of goods and services
Items that firms in Australia produce and sell to the rest of the world.

Imports of goods and services
Items that households, firms and governments in Australia buy from the rest of the world.

Net exports of goods and services is the value of exports of goods and services minus the value of imports of goods and services. **Exports of goods and services** are items that firms in Australia produce and sell to the rest of the world. **Imports of goods and services** are items that households, firms and governments in Australia buy from the rest of the world. Imports are produced in other countries, so expenditure on imports is not included in expenditure on Australian-produced goods and services. If exports exceed imports, net exports are positive and expenditure on Australian-produced goods and services increases. If imports exceed exports, net exports are negative and expenditure on Australian-produced goods and services decreases.

Total Expenditure

Total expenditure on goods and services produced in Australia is the sum of the four items that you've just examined. We call consumption expenditure C, investment I, government expenditure on goods and services G and net exports of goods and services NX. So total expenditure, which is also the total amount received by the producers of final goods and services, is

$$\text{Total expenditure} = C + I + G + NX.$$

Income

Labour earns wages, capital earns interest, land earns rent and entrepreneurship earns profits. Households receive these incomes. Some part of total income, called *undistributed profit*, is a combination of interest and profit that firms retain and do not pay to households. But from an economic viewpoint, undistributed profit is income paid to households and then loaned to firms.

Expenditure Equals Income

Figure 5.1 shows the circular flows of income and expenditure that we've just described. The figure is based on Figures 2.4 and 2.5 (on p. 47 and p. 49), but it includes some more details and additional flows.

We call total income Y and show it by the blue flow from firms to households. When households receive their incomes, they pay some in taxes and save some. Some households receive cash benefits from governments. **Net taxes** equal taxes paid minus cash benefits received and are the green flow from households to governments labelled NT. **Saving** is the amount of income that is not paid in net taxes or spent on consumption goods and services. Saving flows from households to financial markets and is the green flow labelled S. These two green flows are not expenditures on goods and services. They are just flows of money. Because households allocate all their incomes after paying net taxes to consumption and saving,

$$Y = C + S + NT.$$

Net taxes
Taxes paid minus cash benefits received from governments.

Saving
The amount of income that is not paid in net taxes or spent on consumption goods and services.

The red flows show the four expenditure flows: consumption expenditure from households to firms, government expenditure from governments to firms, and net exports from the rest of the world to firms. Investment flows from the financial markets, where firms borrow, to the firms that produce capital goods.

Firms pay out everything they receive as incomes to the factors of production, so total expenditure equals total income. That is,

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

From the viewpoint of firms, the value of production is the cost of production, which equals income. From the viewpoint of purchasers of goods and services, the value of production is the cost of buying it, which equals expenditure. So,

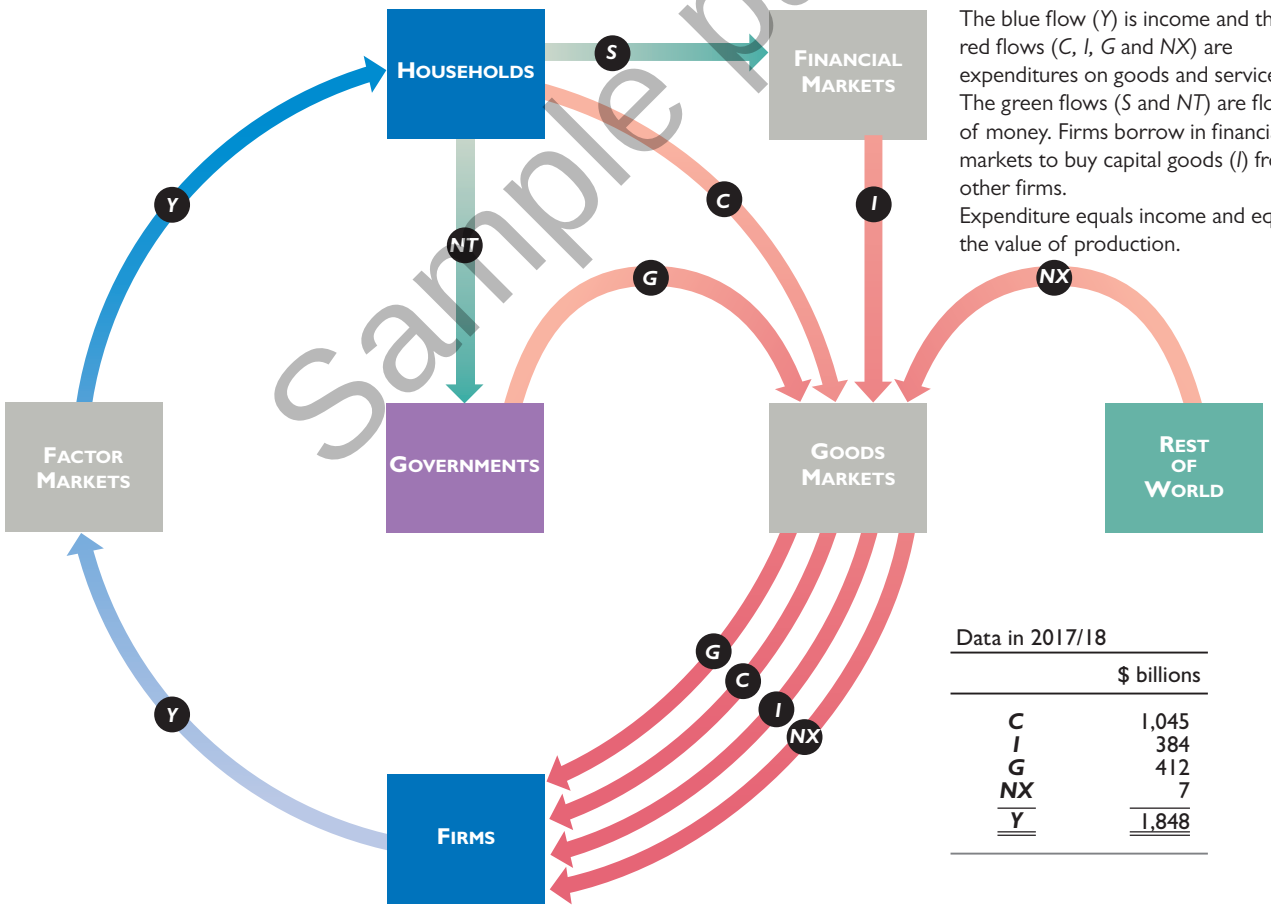
The value of production equals income equals expenditure.

The circular flow and the equality of income and expenditure provide two approaches to measuring GDP that we'll study in the next section.

FIGURE 5.1

The Circular Flow of Income and Expenditure

MyLab Economics Animation



The blue flow (*Y*) is income and the red flows (*C*, *I*, *G* and *NX*) are expenditures on goods and services. The green flows (*S* and *NT*) are flows of money. Firms borrow in financial markets to buy capital goods (*I*) from other firms.
Expenditure equals income and equals the value of production.

Data in 2017/18

	$ billions
C	1,045
I	384
G	412
NX	7
Y	1,848

MyLab Economics
Study Plan 5.1
Key Terms Quiz

REVIEW 5.1

Define GDP and explain why the value of production, income and expenditure are the same for an economy.

Practice Problems

LIST 1

- Banking services bought by a student
- New cars bought by Hertz, the car rental firm
- Paper bought by *The Australian* from Norske Skog Paper Mills
- A new car bought for the Prime Minister's office
- A new flat bought by Steve Smith

1. Classify each item in List 1 as either a final or an intermediate good or service, and identify it as a component of consumption expenditure, investment, or government expenditure on goods and services.
2. Figure 1 shows the flows of expenditure and income on Lotus Island. In 2013, *R* was $10 billion; *W* was $30 billion; *U* was $12 billion; *J* was $15 billion; and *Z* was $3 billion.
   Calculate total expenditure and total income.

In the News

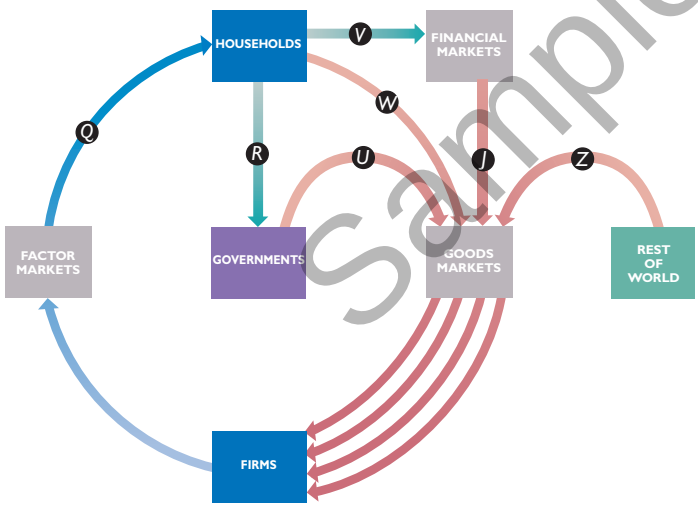
Australian Economy Grew Slowly in September Quarter of 2014

GDP increased by 0.3 per cent in the September quarter. Net exports increased by 0.8 percentage points and consumption expenditure increased by 0.4 percentage points. Private investment fell by 0.5 percentage points and public investment fell by 0.2 percentage points.

Source: ABS news release, 3 December 2014

Use Figure 1 to indicate which flows increased and which decreased.

FIGURE 1



Solutions to Practice Problems

1. The student's banking service is a final service and part of consumption expenditure. Hertz's new cars are additions to capital, so they are part of investment and final goods. Paper is an input into the newspaper, so it is an intermediate good and not a final good. The new car for the Prime Minister is a final good and part of government expenditure. Steve Smith's new flat is a final good and part of investment.
2. Total expenditure is the sum of *C*, *I*, *G* and *NX*. In Figure 1, *C* is the flow *W*; *I* is the flow *J*; *G* is the flow *U*; and *NX* is the flow *Z*. So total expenditure equals *W* + *J* + *U* + *Z*, which is $60 billion. Total income is the blue flow, *Q*. But total income equals total expenditure, so total income is $60 billion.

Solution to In the News

GDP is the sum of flows *W*, *J*, *U* and *Z*. Consumption expenditure is *W*, which increases; investment is *J*, which decreases; public investment is included in government expenditure, *U*, which decreases; and exports, which increases, is part of *Z*. GDP is *Q*, which increased.

5.2 MEASURING AUSTRALIAN GDP

Australian GDP is the market value of all the final goods and services produced within Australia during a year. In 2017/18, Australian GDP was $1,848 billion. The Australian Bureau of Statistics (ABS) measures GDP and its components in the *National Income, Expenditure and Product Accounts*. To do so, it uses two approaches:

- Expenditure approach
- Income approach

The Expenditure Approach

The expenditure approach measures GDP by using data on consumption expenditure, investment, government expenditure on goods and services and net exports. This approach is like attaching a meter to the circular flow diagram and measuring the magnitudes of all the flows running through the goods markets to firms. Table 5.1 shows the results of using this approach. The first column gives the name of the expenditure item and the second column gives the symbols we used in the previous section.

Using the expenditure approach, GDP is the sum of consumption expenditure on goods and services (*C*), investment (*I*), government expenditure on goods and services (*G*) and net exports of goods and services (*NX*). The third column gives the expenditures in 2017/18. GDP measured by the expenditure approach was $1,848 billion.

In 2017/18, net exports were positive because exports exceeded imports. Imports were $394 billion and exports were $401 billion, so net exports (exports minus imports) were $7 billion as shown in the table.

The fourth column in Table 5.1 shows the relative magnitudes of these components of expenditures. Consumption expenditure is by far the largest component of total expenditure; government expenditure is the next largest. Exports are a bit larger than investment but net exports are the smallest component of GDP. In 2017/18, consumption expenditure was 56.5 per cent, investment was 20.8 per cent, government expenditure was 22.3 per cent and net exports were 0.4 per cent of GDP.

TABLE 5.1

GDP: The Expenditure Approach

Item	Symbol	Amount in 2017/18 (billions of dollars)	Percentage of GDP
Consumption expenditure	***C***	**1,045**	**56.5**
Investment	***I***	**384**	**20.8**
Government expenditure	***G***	**412**	**22.3**
Net exports	***NX***	**7**	**0.4**
GDP	***Y***	**1,848**	**100.0**

SOURCE OF DATA: ABS, Cat. No. 5260.0.

The expenditure approach measures GDP by adding together consumption expenditure (*C*), investment (*I*), government expenditure (*G*) and net exports (*NX*).

In 2017/18, GDP measured by the expenditure approach was $1,848 billion.

Expenditures Not in GDP

Total expenditure (and GDP) does not include the expenditure on all the things that people and businesses buy. GDP is the value of *final goods and services*, so spending that is *not* on final goods and services is not part of GDP. Spending on intermediate goods and services is not part of GDP, although it is not always obvious whether an item is an intermediate good or a final good (see *Eye on the Australian Economy* below). Also, we do not count as part of GDP spending on

- Used goods
- Financial assets

Used Goods Expenditure on used goods is not part of GDP because these goods were part of GDP in the period in which they were produced and during which time they were new goods. For example, a house built in 2015 was part of GDP in 2015. If the house is resold in 2020, the amount paid for the house is not part of GDP in 2020.

Financial Assets When households buy financial assets such as bonds and shares, they are making loans, not buying goods and services. The expenditure on newly produced capital goods is part of GDP, but the purchase of financial assets is not.

EYE on the AUSTRALIAN ECONOMY

Is a Computer Program an Intermediate Good or a Final Good?

When Qantas buys a new reservations software package, is that like Peters Ice Cream buying milk? If it is, then software is an *intermediate good* and it is not counted as part of GDP. Airline ticket sales, like Peters' ice cream, are part of GDP, but the intermediate goods that are used to produce air transport or ice cream are *not* part of GDP.

Or when Qantas buys new software, is that like Peters Ice Cream buying a new production plant? If it is, then the software is a capital good and its purchase is the purchase of a final good. In this case, the software purchase is an *investment* and it *is* counted as part of GDP.

The national income statisticians working at the ABS have changed the way they treat software in measurinng GDP, from an intermediate good to a capital good.

The same change has been made by other countries who adhere to an internationally agreed System of National Accounts.

The ABS has also developed a so-called "satellite account" to measure the output of the information technology sector.

How big a deal is treating software as capital? It is big. When the U.S. national accounts made the switch, GDP jumped by 1.5 per cent, about a half a year's growth in GDP.

This change in methodology is a good example of the ongoing effort by the ABS to keep its measurement of GDP as accurate as possible.


Suzanne Long/Alamy

The Income Approach

To measure GDP using the income approach, the ABS uses income data collected by the Australian Taxation Office and other agencies. The ABS records the incomes that firms pay households for the services of the factors of production they hire—wages for labour services, interest for the use of capital, rent for the use of land, and profits for entrepreneurship—and sums those incomes. This approach is like attaching a meter to the circular flow diagram and measuring the magnitudes of all the flows running through the factor markets from firms to households. Let's see how the income approach works.

The Australian National Income, Expenditure and Product Accounts divide incomes into three big categories:

- Wage income
- Company profits and imputed rent
- Mixed income

Wage Income

Wage income, called *compensation of employees* in the national accounts, is the total payment for labour services. It includes net wages and salaries plus fringe benefits paid by employers such as leave, penalty, super and pension fund contributions.

Company Profits and Imputed Rent

Company profits, called *gross operating surplus* in the national accounts, is the total income earned by companies. It consists of interest on capital, rental income from land, and profit earned by entrepreneurship.

Imputed rent is the rent that homeowners implicitly pay to rent the housing they own and use themselves. By including this item in the national accounts, we measure the total value of housing services, whether they are owned or rented.

Mixed Incomes

Mixed incomes are the wages, interest, rent and profit earned by people who run their own businesses.

Table 5.2 shows the relative magnitudes of these components of incomes.

Gross Domestic Income at Factor Cost

The sum of wages, interest, rent and profit is *gross domestic income at factor cost*. Gross domestic income at factor cost is not equal to GDP, and we must make two further adjustments to get to GDP: one from factor cost to market prices and another for a statistical discrepancy.

From Factor Cost to Market Price

The expenditure approach values goods and services at market prices, and the income approach values them at factor cost—the cost of the factors of production used to produce them. Indirect taxes (such as sales taxes) and subsidies (payments by government to firms) make these two values differ. Sales taxes make market prices exceed factor cost, and subsidies make factor cost exceed market prices. To convert the value at factor cost to the value at market prices, we must add indirect taxes and subtract subsidies.

TABLE 5.2

GDP: The Income Approach

The sum of all incomes equals *gross domestic income*. The income approach measure of GDP equals gross domestic income plus indirect taxes less subsidies.

In 2017/18, GDP measured by the income approach was $1,849 billion. This amount is $1 billion more than GDP measured by the expenditure approach—a statistical discrepancy of −$1 billion.

Wage income is the largest part of total income.

Item	Amount in 2017/18 (billions of dollars)	Percentage of GDP
Wage income	871	47.1
Company profits	634	34.3
Mixed incomes	158	8.6
Gross domestic income	1,663	90.0
Indirect taxes less subsidies	186	10.1
GDP (income approach)	1,849	100.1
Statistical discrepancy	–1	–0.1
GDP (expenditure approach)	1,848	100.0

SOURCE OF DATA: ABS, Cat. No. 5260.0.

Statistical Discrepancy

The expenditure approach and income approach do not deliver exactly the same estimate of GDP. If a taxi driver doesn't report all his tips, they get missed in the income approach, but they get caught by the expenditure approach when he spends his income. So the sum of expenditures might exceed the sum of incomes. But most income gets reported to the Australian Taxation Office on tax returns while many items of expenditure are not recorded and must be estimated. So the sum of incomes might exceed the sum of estimated expenditures.

The discrepancy between the estimates of GDP resulting from the expenditure approach and the income approach is called the *statistical discrepancy*, and it is calculated as the GDP expenditure total minus the GDP income total.

The two measures of GDP provide a check on the accuracy of the numbers. If the two are wildly different, we will want to know what mistakes we've made. Have we omitted some item? Have we counted something twice? The fact that the two estimates are close gives some confidence that they are reasonably accurate. But the expenditure total is regarded as the more reliable estimate of GDP, so the discrepancy is added to or subtracted from income to reconcile the two estimates.

Table 5.2 summarises the calculation of GDP using the income approach and its reconcilation with GDP using the expenditure approach. The table also shows the relative magnitudes of the components of the income measure.

GDP and Related Measures of Production and Income

Although GDP is the main measure of total production, you will sometimes encounter some others, one of which is gross *national* product or GNP.

Gross National Product

A country's *gross national product*, or *GNP*, is the market value of all the final goods and services produced anywhere in the world in a given time period by the factors of production supplied by the residents of that country. For example,

Westpac's income from the capital that it supplies to its Taiwanese branches is part of Australian GNP but not part of Australian GDP. It is part of Taiwan's GDP. Similarly, Apple's income on the capital it supplies to its Sydney showroom is part of Australian GDP but not part of Australian GNP. It is part of U.S. GNP.

GNP equals GDP plus net factor income received from or paid to other countries. The difference between Australian GDP and GNP is small. But in an oil-rich Middle Eastern country such as Bahrain, where a large amount of capital is owned by foreigners, GNP is much smaller than GDP; and in a poor country such as Bangladesh, whose people work abroad and send income home, GNP is much larger than GDP.

From Gross Product to Net Product

Gross product includes **depreciation**, which is the decrease in the value of capital that results from its use and from obsolescence. Firms' gross profits, which are included in the income approach, are profits before subtracting depreciation. Investment, which is included in the expenditure approach, includes the purchase of capital to replace worn out or obsolete capital, so the expenditure approach gives a *gross* measure. To get *net* domestic product, we must *subtract* depreciation from total income.

Depreciation
The decrease in the value of capital that results from its use and from obsolescence.

Disposable Income

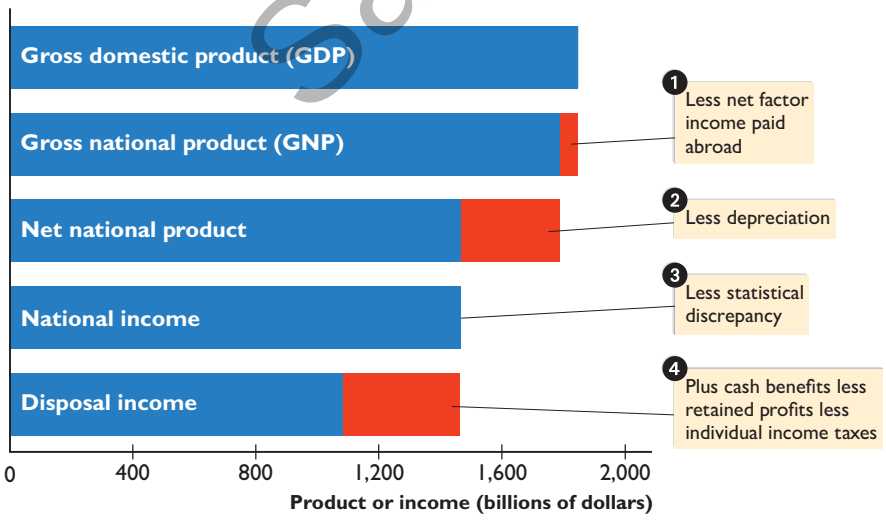
The main influence on consumption expenditure is *disposable income*, which is the income received by households minus individual income taxes paid.

Figure 5.2 shows how disposable income is calculated and how it relates to GDP, GNP and the other intermediate totals that we've just described.

FIGURE 5.2

GDP and Related Product and Income Measures

MyLab Economics Animation



The bars show six related product and income measures and the relationship among them.

1. Subtract net factor income paid abroad from GDP to get GNP.
2. Subtract depreciation from GNP to get net national product.
3. Subtract the statistical discrepancy between the expenditure and income measures (almost invisible in the figure because it is tiny) to get national income.
4. Add cash payments by governments less profits retained by firms to get personal income. Finally, subtract individual income taxes to get disposable income.

SOURCE OF DATA: ABS, Cat. No. 5260.0.

Real GDP and Nominal GDP

You've seen that GDP measures total expenditure on final goods and services in a given period. Suppose that we want to compare GDP in two periods, say 2007/08 and 2017/18. In 2007/08, GDP was $1,177 billion and by 2017/18 it had increased to $1,848 billion—57 per cent higher than in 2007/08. What does this 57 per cent increase mean? The answer is a combination of two things:

- We produced more goods and services.
- We paid higher prices for our goods and services.

Producing more goods and services contributes to an improvement in our standard of living. Paying higher prices means that our *cost of living* has increased, but our standard of living has not. So it matters a great deal why GDP has increased. If the 57 per cent increase is accounted for mainly by higher prices, our standard of living hasn't changed much. But if the 57 per cent increase is accounted for mainly by the production of more goods and services, our standard of living might have increased a lot.

You're now going to see how economists at the ABS isolate the effects on GDP of an increase in production. Their first step is to distinguish between two GDP concepts: *real* GDP and *nominal* GDP.

Real GDP
The value of the final goods and services produced in a given year expressed in terms of the prices in a *reference base year*.

Nominal GDP
The value of the final goods and services produced in a given year expressed in terms of the prices of that same year.

Real GDP is the value of the final goods and services produced in a given year expressed in terms of the prices in a *reference base year*. The *reference base year* is the year we choose against which to compare all other years. In Australia today, the *reference base year* is 2016/17.

Real GDP contrasts with **nominal GDP**, which is the value of the final goods and services produced in a given year expressed in terms of the prices of that same year. Nominal GDP is just a more precise name for GDP.

The method used to calculate real GDP has changed in recent years and is now a bit technical, but the essence of the calculation hasn't changed. Here, we describe the essence of the calculation. An appendix to this chapter describes the technical details of the method used by the ABS.

Calculating Real GDP

The goal of calculating *real GDP* is to remove from the nominal GDP numbers the influence of price changes. To focus on the principles and keep the numbers easy to work with, we'll calculate real GDP for an economy that produces only one good in each of the GDP categories: consumption expenditure (*C*), investment (*I*) and government expenditure (*G*). We'll ignore exports and imports by assuming that net exports (exports minus imports) is zero.

Table 5.3 shows the quantities produced and the prices in 2016/17 (the *base year*) and in 2017/18. In part (a), we calculate nominal GDP in 2016/17. For each item, we multiply the quantity produced by its price to find the total expenditure on the item. We then sum the expenditures to find nominal GDP, which in 2016/17 is $100 million. Because 2016/17 is the base year, real GDP and nominal GDP are equal in 2016/17.

In part (b) of Table 5.3, we calculate nominal GDP in 2017/18. Again, we calculate nominal GDP by multiplying the quantity of each item produced by its price to find the total expenditure on the item. We then sum the expenditures to find nominal GDP, which in 2017/18 is $300 million. Nominal GDP in 2017/18 is three times its value in 2016/17. But by how much has the quantity of final goods and services produced increased? That's what real GDP will tell us.

TABLE 5.3

Calculating Nominal GDP and Real GDP in 2016/17 and 2017/18

	Item	Quantity (millions of units)	Price (dollars per unit)	Expenditure (millions of dollars)
(a) In 2016/17				
C	T-shirts	10	5	50
I	Computer chips	3	10	30
G	Security services	1	20	20
Y	Real GDP and Nominal GDP in 2016/17			100
(b) In 2017/18				
C	T-shirts	4	5	20
I	Computer chips	2	20	40
G	Security services	6	40	240
Y	Nominal GDP in 2017/18			300
(c) Quantities of 2017/18 valued at prices of 2016/17				
C	T-shirts	4	5	20
I	Computer chips	2	10	20
G	Security services	6	20	120
Y	Real GDP in 2017/18			160

The base year is 2016/17, so real GDP and nominal GDP are equal to $100 million in that year.

Between 2016/17 and 2017/18, the production of security services (*G*) increased, but the production of T-shirts (*C*) and computer chips (*I*) decreased. In the same period, the price of a T-shirt remained constant, but the other two prices doubled.

Nominal GDP increased from $100 million in 2016/17 in part (a) to $300 million in 2017/18 in part (b).

Real GDP in 2017/18 in part (c) is calculated by using the quantities of 2017/18 in part (b) and the prices of 2016/17 in part (a). Real GDP increased from $100 million in 2016/17 to $160 million in 2017/18, an increase of 60 per cent.

In part (c) of Table 5.3, we calculate real GDP in 2017/18. You can see that the quantity of each good and service produced is the same as that in part (b). They are the quantities of 2017/18. You can also see that the prices in part (c) are the same as those in part (a). They are the prices of the base year—2016/17.

For each item, we now multiply the quantity produced in 2017/18 by its price in 2016/17 to find what the total expenditure would have been in 2017/18 if prices had remained the same as they were in 2016/17. We then sum these expenditures to find real GDP in 2017/18, which is $160 million.

Nominal GDP in 2017/18 is three times its value in 2016/17, but real GDP in 2017/18 is only 1.6 times its 2016/17 value—a 60 per cent increase in *real* GDP.

Using the Real GDP Numbers

In the example that we've just worked through, we found the value of real GDP in 2017/18 based on the prices of 2016/17. This number alone enables us to compare production in two years only. By repeating the calculation that we have done for 2017/18 using the data for 2017/18 and 2016/17, we can calculate the *annual* percentage change of real GDP—the annual growth rate of real GDP. This is the most common use of the real GDP numbers. Also, by calculating real GDP every three months—known as *quarterly real GDP*—the ABS is able to provide valuable information that is used to interpret the current state of the economy. This information is used to guide both government macroeconomic policy and business production and investment decisions.

MyLab Economics
Study Plan 5.2
Key Terms Quiz

REVIEW 5.2

Describe how economic statisticians measure GDP, and distinguish between nominal GDP and real GDP.

Practice Problems

Table 1 shows some of the items in the Australian *National Income, Expenditure and Product Accounts* in 2012/13. Use Table 1 to work Problems **1** to **4**.

TABLE 1

Item	Amount (billions of dollars)
Consumption expenditure	837
Government expenditure	321
Indirect taxes less subsidies	150
Depreciation	242
Net factor income paid abroad	38
Investment	382
Net exports	–19
Statistical discrepancy	0

TABLE 2

(a) In 2019:

Item	Quantity	Price
Apples	60	$0.50
Oranges	80	$0.25

(b) In 2020:

Item	Quantity	Price
Apples	160	$1.00
Oranges	220	$2.00

1. Use the expenditure approach to calculate Australian GDP in 2012/13.
2. What was Australian GDP as measured by the income approach in 2012/13?
3. Calculate Australian GNP in 2012/13.
4. Calculate Australian net national income in 2012/13.
5. Table 2 shows some data for an economy. If the base year is 2019, calculate the economy's nominal GDP and real GDP in 2020.

In the News

'Income Recession' Confirmed as GDP Growth Slows

The ABS numbers in September 2014 show the biggest fall in the standard of living of Australians since the financial crisis five years ago.

Source: *Australian Financial Review*, 3 December 2014

Which measure of production would we need to examine to determine if there is a decrease in the standard of living of Australians? And which measure would tell us about an "income recession"?

Solutions to Practice Problems

1. GDP was $1,521 billion. The expenditure approach sums the expenditure on final goods and services. That is, GDP = $C + I + G + NX$.
   Australian GDP = $(837 + 382 + 321 − 19) billion = $1,521 billion.
2. GDP as measured by the income approach was $1,521 trillion. The statistical discrepancy was zero, so the two approaches give the same total.
3. GNP = GDP − Net factor income paid abroad. So GNP was $1,483 billion ($1,521 billion − $38 billion).
4. Net national income = GNP − Depreciation, which equals $1,483 billion − $242 billion = $1,241 billion.
5. Nominal GDP in 2020 equals (160 apples × $1) + (220 apples × $2) = $600.
   Real GDP in 2020 at 2019 prices equals
   (160 apples × $0.50 per apple) + (220 oranges × $0.25 per orange) = $135.

Solution to In the News

The measure of production that tells us about the standard of living of Australians is *real* GDP. We need the *real* measure to tell us what happened to the quantities of goods and services produced, stripped of the effects of a change in the cost of living.

Because aggregate production can be measured using the expenditure approach or the income approach, either measure tells us about aggregate income and can be used to determine whether there has been an "income recession".

5.3 THE USES AND LIMITATIONS OF REAL GDP

We use estimates of real GDP for three main purposes:

- To compare the standard of living over time
- To track the course of the business cycle
- To compare the standard of living among countries

The Standard of Living Over Time

A nation's *standard of living* is measured by the value of goods and services that its people enjoy, *on average*. Income per person determines what people can afford to buy and real GDP is a measure of real income. So *real GDP per person*—real GDP divided by the population—is a commonly used measure for comparing the standard of living over time.

Real GDP per person tells us the value of goods and services that the average person can enjoy. By using *real* GDP, we remove any influence that rising prices and a rising cost of living might have had on our comparison.

Table 5.4 provides the numbers for Australia that compare 2017/18 with 58 years earlier, 1959/60. In 1959/60, real GDP per person was $24,708 and in 2017/18 it was $72,629, or 2.9 times its 1959/60 level. To the extent that real GDP per person measures the standard of living, people were 2.9 times as well off in 2017/18 as their grandparents had been in 1959/60.

Figure 5.3 shows the entire 58 years of real GDP per person from 1959/60 to 2017/18 and displays two features of our changing standard of living:

1. The growth of potential GDP per person
2. Fluctuations of real GDP per person around potential GDP

TABLE 5.4 REAL GDP PER PERSON IN 1959/60 AND 2017/18

Year	1959/60	2017/18
Real GDP (billions)	$254	$1,815
Population (millions)	10.28	24.99
Real GDP per person	$24,708	$72,629

Potential GDP
The value of real GDP when all the economy's factors of production—labour, capital, land and entrepreneurial ability—are fully employed.

Potential GDP is the level of real GDP when all the economy's factors of production—labour, capital, land and entrepreneurial ability—are fully employed. When some factors of production are *unemployed*, real GDP is *below* potential GDP. And when some factors of production are *over-employed* and working harder and for longer hours than can be maintained indefinitely, real GDP *exceeds* potential GDP.

You've seen that real GDP per person in 2017/18 was 2.9 times that of 1959/60. But in 2017/18, some labour and other factors of production were unemployed and the economy was producing slightly less than potential GDP. To measure the trend in the standard of living, we must remove the influence of short-term fluctuations and focus on the path of potential GDP.

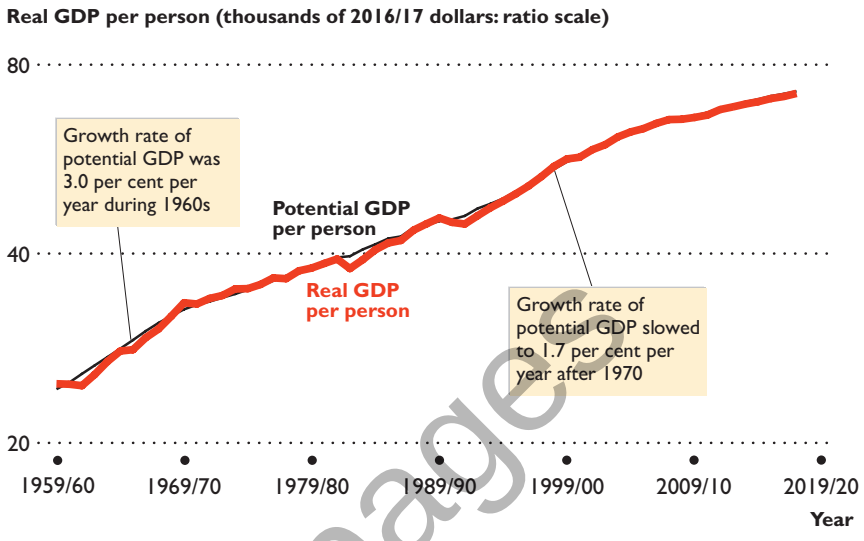
The growth rate of potential GDP fluctuates less than the growth rate of real GDP. During the 1960s, potential GDP per person grew at an average rate of 3.0 per cent a year, but since 1970 its growth rate has slowed to 1.7 per cent a year.

The growth slowdown means that potential GDP is lower today (and lower by a very large amount) than it would have been if the 1960s growth rate could have been maintained. If potential GDP had kept growing at the 1960s pace, potential GDP per person in 2017/18 would have been $60,725 more than it actually was. That's $1,168 a week for every Australian. Imagine the standard of living today if every Australian had an extra $1,168 a week. The *cumulatively* lost income from the growth slowdown of the 1970s is even more staggering at $1 million per person. Understanding the reasons for the growth slowdown and speeding real GDP growth is one of the major tasks of macroeconomists.

FIGURE 5.3

Real GDP and Potential GDP Per Person in Australia: 1959/60–2017/18 MyLab Economics Animation

Real GDP grows and fluctuates around the growth path of potential GDP. Potential GDP per person grew at an annual rate of 3.0 per cent per year during the 1960s and slowed to 1.7 per cent per year after 1970.



SOURCES OF DATA: Real GDP, ABS, Cat. No. 5206.0; population, ABS, Cat. No. 3105.0. Potential GDP calculated by the authors using output gap data from the IMF, World Economic Outlook database and own assumptions.

Tracking the Course of the Business Cycle

Business cycle
A periodic but irregular up-and-down movement of total production and other measures of economic activity.

We call the fluctuations in the pace of economic activity the business cycle. A **business cycle** is a periodic but irregular up-and-down movement of total production and other measures of economic activity such as employment and income. The business cycle isn't a regular, predictable and repeating cycle like the phases of the moon. The timing and the intensity of the business cycle vary a lot, but every cycle has two phases:

1. Expansion
2. Recession

and two turning points:

1. Peak
2. Trough

Figure 5.4 shows these features of the most recent Australian business cycle using real GDP as the measure of economic activity. An *expansion* is a period during which real GDP increases. In the early stage of an expansion, real GDP remains below potential GDP and as the expansion progresses, real GDP eventually exceeds potential GDP.

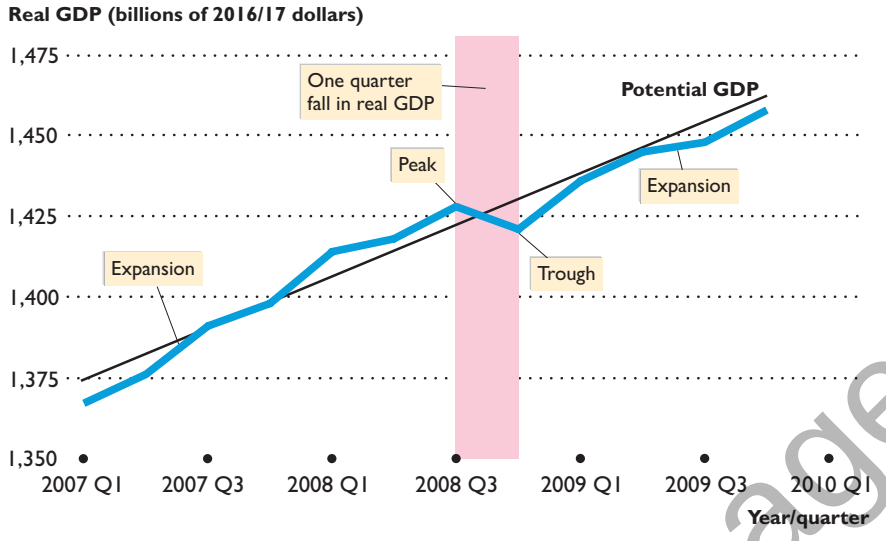
Recession
A period during which real GDP decreases for at least two successive quarters; or a period of significant decline in total output, income, employment and trade, usually lasting from six months to a year, and marked by contractions in many sectors of the economy.

A common definition of **recession** is a period during which real GDP decreases—its growth rate is negative—for at least two successive quarters. The National Bureau of Economic Research (NBER), which dates the U.S. business cycle phases and turning points, defines a recession more broadly as "a significant decline in economic activity spread across the economy, lasting more than a few

FIGURE 5.4

The Most Recent Australian Business Cycle

MyLab Economics Animation



An expansion ended in the third quarter of 2008. Real GDP then decreased for one quarter followed by a new expansion. Between the peak and the trough, the economy was in a short-lived contraction.

SOURCES OF DATA: Real GDP, ABS, Cat. No. 5206.0; population, ABS, Cat. No. 3105.0.

months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales." This definition means that sometimes the NBER declares a recession even though real GDP has not decreased for two successive quarters. A recession in 2001 was such a recession. An expansion ends and a recession begins at a business cycle peak. A peak is the highest level of real GDP that has been attained up to that time. A recession ends at a trough when real GDP reaches a low point and from which a new expansion begins.

Australia's 2008 fall in real GDP, highlighted by the shaded area in Figure 5.4 does not match the standard definitions of recession. It was a contraction in which real GDP decreased for one quarter only. Most other countries had unusually severe recessions in 2008 and 2009, triggered by a global financial crisis.

The end of a recession isn't the end of pain. When an expansion begins, real GDP is below potential GDP. And in a severe recession, even after two years into the expansion, real GDP has not returned to its previous peak level.

Australia's most recent true recession occurred during a severe global recession in 1991. After 1991 and until 2008, the global economy was so free from serious downturns in real GDP that it was called the *Great Moderation*, a name that contrasts it with the *Great Depression* of the 1930s. Some starry-eyed optimists even began to declare that the business cycle was dead.

But the global recession of 2008 and 2009 put the business cycle back on the agenda. Economists were criticised for not predicting it, and old divisions among economists that many thought were healed erupted in the pages of *The Economist* magazine, the financial newspapers and online on a host of blogs.

We'll be examining the causes of recession and the alternative views among economists in greater detail as you progress through the rest of your study of macroeconomics.

Let's now leave comparisons of the standard of living over time and business cycles and briefly see how we compare the standard of living among countries.

EYE on the BOOMS and BUSTS

How Do We Track the Booms and Busts in Our Economy?

It is 25 years since Australia's most recent recession. And it was an interesting recession that illustrates the difficulty and potential ambiguity in dating the business cycle turning points and recession and recovery phases.

Measured by real GDP, the Australian economy was expanding during 1989 and reached a peak in the second quarter of 1990. The economy was also expanding in the third quarter of 1991 and following quarters.

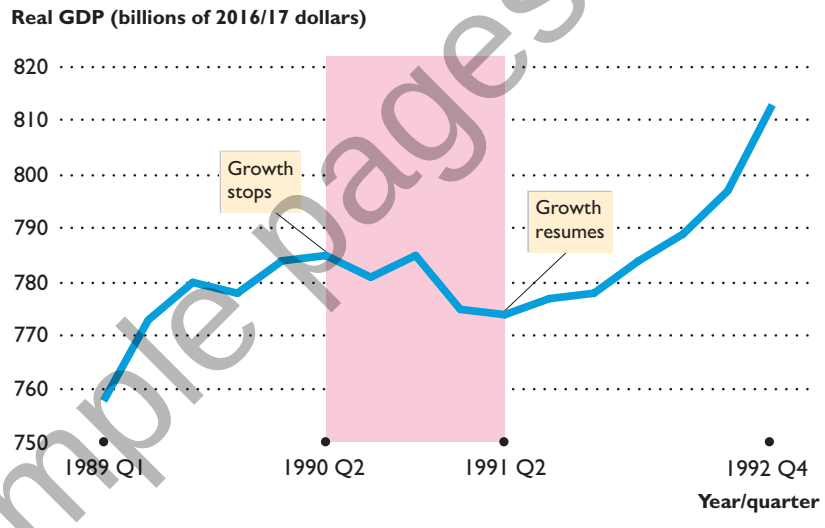
But what was going on between the second quarter of 1990 and the second quarter of 1991? Was that a recession?

On the technical definition of "at least two successive quarters of falling real GDP", it was not a recession. On that definition, there was a recession during these quarters but it didn't begin until the fourth quarter of 1990. Real GDP then shrank for the next two quarters.

But on a more natural reading of the data, a recession began when growth stopped in the second quarter of 1990. Real GDP then decreased for three of the next four quarters. But in the one quarter in which real GDP increased, it didn't quite get back to its previous peak level.

Although growth resumed in the third quarter of 1991, real GDP didn't get back to its previous peak until the second quarter of 1992.

Australia's sustained expansion, and a global *Great Moderation*, began from that trough of 1991.



SOURCES OF DATA: ABS, Cat. No. 5602.0.

The Standard of Living Among Countries

To use real GDP per person to compare the standard of living among countries, we must convert the numbers for other countries into Australian dollars. To calculate real GDP, we must also use a common set of prices—called *purchasing power parity prices*—for all countries. The International Monetary Fund performs these calculations and if you turn back to Figure 2.3 on p. 44 you can see some comparisons based on these data. They tell, for example, that an average American has a standard of living (income per person) almost 4 times that of an average person in China.

Real GDP provides an easy way of comparing living standards. But real GDP doesn't include *all* the goods and services produced. Also, real GDP has nothing to say about factors other than the goods and services that affect the standard of living. Let's explore these limitations of real GDP.