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National Income and Economic Performance

2.1 Introduction

This chapter is concerned with national product and national income, how it is produced and how it is measured. We summarise briefly some basic ideas about how the factors of production are combined to produce the output on which our living standards and income depend. We then move to a more detailed discussion of how national product and income are measured, using 2011 data for Ireland.

2.2 The Aggregate Production Function

A nation's output of goods and services (denoted by the symbol Y) is produced by the factors of production, particularly:

- labour
- physical capital
- human capital
- natural resources.

Physical capital refers to the stock of equipment and structures that are used to produce goods and services. This includes plant and machinery, buildings and so on. Physical capital makes workers more productive. The accumulation of physical capital has been one of the drivers of modern economic growth.

Human capital is the knowledge and skills that workers acquire through education, training and experience. Investment in education and skills has been another driver of modern economic growth.

Natural resources refer to the inputs into the production of goods and services that are provided by nature, such as land, rivers and mineral deposits. These can enrich a country when exploited in a sustainable way.

These inputs are combined together according to the available *technology*: the economy's application of science and know-how to producing goods and services. Better technology allows more to be produced from a given input of labour and capital. Waves of inventions, from the steam engine to modern computers, have been a major source of increased productivity and rising living standards.

The relationship between the factors of production and output is described by the aggregate production function:

$$Y = AF(L, K, H, N) \quad (1)$$

Where:

Y = output or GNP

A = the level of technology

L = labour
 K = physical capital
 H = human capital
 N = natural resources
 (all measured in physical units or quantities).

$F(\)$ is a mathematical function (read as ‘function of’) that shows how the inputs (explanatory variables in brackets) are combined to produce output (the dependent variable). As technology improves, high A will shift the whole production function upwards. More will be produced from a given level of inputs.

Returns to scale

A key characteristic of a production function is *returns to scale*. To illustrate what is meant by this concept, let us consider the following production function (we ignore technology and natural resources for simplicity):

$$Y_1 = F(K_1, L_1)$$

Now multiply all the inputs up by the same factor z , so that:

$$K_2 = zK_1 \text{ and } L_2 = zL_1$$

If $z = 1.2$, all inputs are increased by 20 per cent. Returns to scale tells us what happens to output as a result of the increase in the factors of production employed, $Y_2 = F(K_2, L_2)$.

- *Constant returns to scale* occurs if $Y_2 = zY_1$, that is, a 20 per cent increase in the inputs leads to a 20 per cent increase in output.
- *Increasing returns to scale* occurs if $Y_2 > zY_1$, that is if output increases by more than 20 per cent.
- *Decreasing returns to scale* occurs if $Y_2 < zY_1$, that is if output increases by less than 20 per cent.

Increasing returns to scale implies that as an economy grows bigger, output increases more rapidly than the inputs of labour and capital. Many modern industrial processes enjoy increasing returns to scale and this leads to rapid productivity growth as the size of firms increases. Firms serving global markets enjoy economies of scale that could never be achieved by firms confined to local markets.

Production functions with constant returns to scale have an interesting implication. Setting $z = 1/L$,

$$(Y/L) = AF(1, K/L, H/L, N/L)$$

Output per worker (Y/L), or labour productivity, depends on physical capital per worker (K/L), human capital per worker (H/L), and natural resources per worker (N/L), as well as the state of technology, (A).

Productivity

Productivity refers to the amount of output produced for each unit of input. Labour productivity can be measured as the amount of output produced per hour worked. If other inputs, such as capital, are also increasing, we need to measure ‘total factor productivity’, that is output adjusted for all the inputs that are used to produce it.

Increased productivity explains most of the variation in living standards over time and between poor and rich countries. Countries with high living standards (high output per capita) have higher productivity than countries with lower living standards. Improved technology as well as more capital has been the key to modern economic growth.

2.3 Measuring the Output of Nations

In the previous section we denoted ‘output’ as Y , without specifying what is contained in Y . In this section and the next we introduce some of technicalities of measuring national output and income in a modern economy.

Gross domestic product (GDP) is probably the most familiar concept in macroeconomics. (The relationship between GDP and GNP is explained below.) It is widely referred to in commentaries on how countries are performing. GDP is a measure of the total output of goods and services produced in the country over a period of time, usually a calendar year or quarter. The Irish Central Statistics Office (CSO) estimates that GDP in Ireland in 2011 was €159 billion. The population of Ireland was 4,588,3000 at the 2011 census, so in 2011 Irish GDP per person was equal to €34,652. This is the statistic that is almost universally used in international comparisons of living standards and economic performance. However, as we shall see later, it needs to be used with caution because it suffers from many limitations, and some of these apply with particular force to the Irish data.

NOTE: The source for most of the data in this chapter is the *National Income and Expenditure Accounts* (NIE) published by the CSO and available at www.cso.ie/en/media/csoie/releasespublications/documents/economy/current/nie.pdf.

The value of a nation’s output is closely linked to the value of its income. If a person works harder at his or her job and produces more goods and services that are sold in the market place, their income should rise accordingly. The same is true at the national level: the more goods and services a nation produces, the more income it generates. GDP is therefore closely related to *gross national income* (GNI). The exact relationship between them is explained below.

The variation in GNI per person between countries is huge. However, care must be taken in making such international comparisons. Each country measures its national income in its own currency. Ireland uses the euro, the UK the pound sterling, the USA the dollar, India the rupee and so on. To obtain international comparability, the easiest approach would be to convert each country’s national income to a common currency, usually the US dollar. But this suffers from the major drawback that the purchasing power of a currency within a country is often not accurately reflected in its exchange rate.

For example, the exchange rate between the Thai baht and the US dollar is about 31:1, but an American tourist in Thailand finds that 310 baht will buy a lot more *local* goods and services than \$10 would in the USA. An evening meal, for example, would cost much less in Thailand than in the USA.

The poorest countries in the world are not as poor as is suggested by comparing their national income per person at market exchange rates. To get a truer picture of relative standards of living round the world it is common to use an artificial currency such as the purchasing power parity (PPP) dollar to adjust for differences in purchasing power. (We discuss the concept of PPP in detail in Chapter 15.) This is the measure we use in Table 2.1.

Table 2.1 shows GNI per person in international dollars for a selection of countries in 2011; the countries on the left are among the richest in the world and the countries on the right a mixture of middle income and very poor countries.

NOTE: The methodology behind measuring living standards in ‘PPP dollars’ was devised by the Irish statistician R. C. Geary (1896–1983), who in 1949 became the first Director of our CSO and went on to become head of the National Accounts Branch of the United Nations (UN) in New York (1957–1960) and founding director of the Economic and Social Research Institute (ESRI) in 1960.

TABLE 2.1 Gross national income (GNI) per capita (2011) in PPP terms

Country	GNI	Country	GNI
Norway	47,557	Brazil	10,162
USA	43,017	South Africa	9,469
Switzerland	39,924	Albania	7,803
Canada	35,166	China	7,476
Germany	34,854	India	3,468
Australia	34,431	Gambia	1,282
UK	33,296	Haiti	1,121
New Zealand	23,737	Congo, Dem. Rep	280

Note: This measures national income in 'constant 2005 PPP dollars'

Source: UN Human Development Index 2011 Ranking: <http://hdr.undp.org/en/statistics/>

It is clear that even when allowance is made for the differences in purchasing power within countries, there are enormous international differences in national income per person. Norway, the USA, Switzerland, Canada, Germany and Australia are among the richest countries in the world, and Ireland too belongs in the rich countries' club. In contrast, some of the poorest countries are to be found in Africa – Gambia, Congo, Kenya, and Ethiopia, for example – while Haiti and several countries in the Caribbean and Latin America are also very poor. Countries like Brazil, South Africa, India and China could be labelled fast-growing emerging economies.

Table 2.1 suggests that the average Norwegian is 170 times better off than the average resident of the Congo and 14 times better off than the average Indian. However, as we discuss in the appendix to this chapter ('Beyond GDP'), there are many reasons for treating these comparisons with some scepticism. They tend to exaggerate the true differences in economic well-being between countries. Nonetheless, the gap between the standard of living in the world's poorest and richest countries is huge.

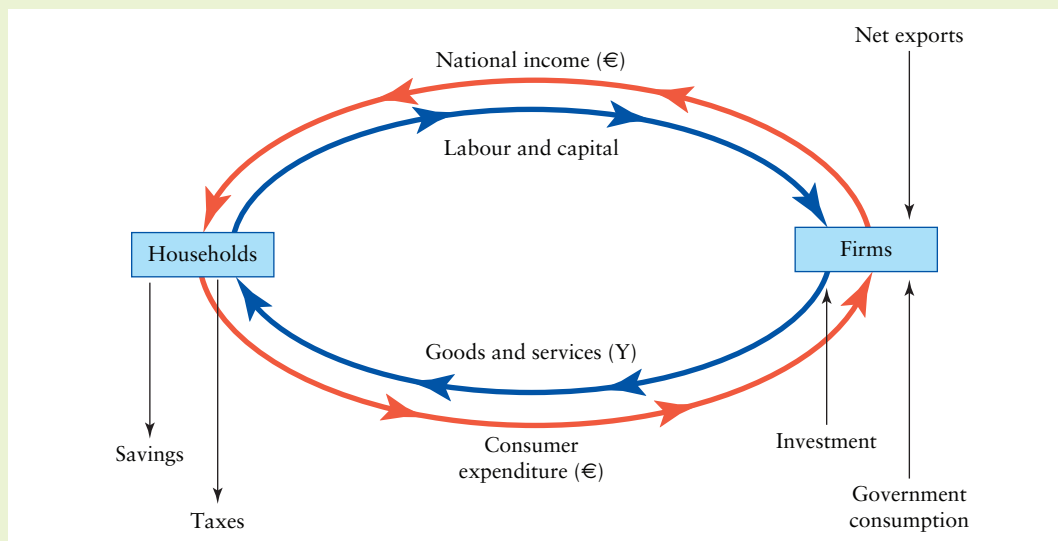
It is important to emphasise that the national income per person measure (so widely used in international comparisons) is an average. Even in the poorest countries of the world there are wealthy families. For example, while average income in India is very low, it is estimated that it is home to more than 150,000 millionaires. For this reason, statisticians pay attention to the distribution of income, as well as to its average level, when comparing well-being across countries.

One measure of poverty is income of as little as a dollar a day. While this monetary value may have a bearing in the developed world, it can mean little in a less developed country where people are constantly seeking the basic needs of food and water from one day to the next. Statistics are never going to reflect the gap in welfare or the standard of living between today's rich and poor countries.

2.4 The National Income Accounts

In this section we give some details of the methodology that lies behind the measurement of domestic and national product. There are three basic approaches to measuring the nation's economic activity:

- adding up the expenditure on domestically produced goods and services
- adding up the income earned by the factors of production, principally capital and labour
- adding up all the output produced by the country's factors of production.

FIGURE 2.1 The circular flow of income

These approaches should yield the same total because every euro spent by a person or firm on Irish goods and services becomes income to an Irish resident. Put another way, national output is the source of national income.

We start by looking at the income and expenditure approaches. Figure 2.1 presents a simplified model of the economy as a circular flow of income. This model can be traced back to a court physician to Louis XV, François Quesnay (1694–1774). The modern version owes much to the work of John Maynard Keynes in the 1930s.

Initially, we assume that there is no government and foreign trade sector. We also assume that the price level is fixed or constant. These simplifying assumptions will be dropped later and the model elaborated to correspond more closely to the real world.

Due to these simplifying assumptions, there are only two kinds of economic agent in the economy: households and firms. Households own the factors of production: land, labour and capital (which includes not just physical capital such as machinery, buildings and natural resources but also human capital in the form of know-how, technology and institutional structures, e.g. the legal system). The diagram shows the flows between the sectors as two loops.

The factors of production – land, labour and capital – are made available to firms in return for payments of rent, wages, interest and profit. Wages are paid for the use of labour, rent for the use of land, interest for the use of capital, and the owners of firms receive profits. The sum of rent, wages, interest and profit equals national income.

NOTE: If we ignore rent, interest and profits, the two loops on the top of the diagram simply represent people going to work and receiving a salary or wage for their labour, which produces output that is sold to consumers.

Consider the two loops on the bottom of the diagram. Firms combine the factors of production to produce goods and services (GDP, denoted by the symbol Y). We just assume that inputs of land,

labour and capital enter the production function, and outputs of goods and services emerge on the other side (Y). To close the loop, households, using the income they have earned (national income), purchase the goods and services produced by firms. We refer to this household expenditure as personal consumer expenditure (C). Given that the two loops on the bottom are equal, that is, expenditure equals output, it follows that:

$$Y \equiv C \quad (1)$$

where the symbol \equiv denotes an identity or something that is true as an accounting definition or identity. Personal consumption (C) is the value of all goods and services bought by households. It includes durable goods (goods that last a long time, e.g. cars and TVs), non-durable goods that have a short lifespan (food, clothing) and services (work done for consumers, e.g. dental and medical treatment, car repairs, restaurant meals).

Going a stage further, since all the money received by firms is passed on to households in the form of wages, rent, interest, and profit, total expenditure equals national income (NI). Hence:

$$NI \equiv Y \equiv C \quad (2)$$

The essential message of the simplified circular flow diagram given in Figure 2.1 is that, in the aggregate, we consume what we produce, and we spend what we earn. People go to work and get paid, and spend their income purchasing the goods and services produced by the firms for which they work. If there were a general strike, people would not go to work, they would not receive any income and firms would not produce output. The economy would collapse.

Saving and investment

We can now add two additional flows showing saving (S) and investment (I) to the diagram. Households do not spend all their income; they save some of it. This represents a leakage from the circular flow and is shown as the line pointing away from Households labelled Savings. Now given that people must either spend or save their income, it follows that the sum of consumer expenditure and saving equals NI. That is:

$$NI \equiv C + S \quad (3)$$

In the modern economy, household savings are channelled through the financial system (banks and building societies). This system is discussed in detail in Chapter 9. Firms borrow from the financial institutions in order to finance investment (I). Investment refers to firms' expenditure on new machinery and buildings. This implies that households do not buy all of the goods and services produced by firms; firms purchase goods and services from other firms. This is shown as the line labelled Investment pointing towards Firms.

Investment (I) is spending on capital goods that will be used to produce other goods – or provide a flow of services – in the future. It includes spending on plant and equipment (machinery), spending by households and landlords on housing units and offices, and inventory investment (or changes in stocks).

NOTE: Investment is the output of new capital in the course of a year. It is a flow. Suppose at the start of a year the Irish economy had €1,000 billion worth of capital and during the year investment goods worth €10 billion are produced: by the end of the year the capital stock of the economy will have grown to €1,010 billion (ignoring the depreciation of capital in the course of the year). The stock of capital at the end of year has increased by the new investment. The distinction between stocks and flows is very important. A *stock* is a quantity measured at a point in time. A *flow* is the quantity produced over a time period. A person's wealth is a stock, but a person's annual income is a flow. The level of debt is a stock, but the level of borrowing is a flow.

In this expanded model, total expenditure now equals consumer expenditure plus investment (there are two forms of expenditure). Substituting into (2), above, we obtain:

$$NI \equiv Y = \text{Total expenditure} \equiv C + I \quad (4)$$

This relationship states that NI equals Y, which in turn equals total expenditure. Total expenditure, in turn, is divided into households' consumer expenditure and firms' investment expenditure.

NOTE: Two components of 'investment' are listed in the NIE. The main one is 'gross domestic fixed capital formation'. It includes both private and government investment. The word 'fixed' tells us that changes in stocks are not included. A much smaller component of 'investment' consists of changes in the level of stocks. When firms run down their inventories or stocks to meet demand, this is like negative investment, whereas accumulating stocks is like positive investment. The NIE lists the 'value of physical changes in stocks' separately. The significance of 'gross' is that no allowance has been made for depreciation or 'capital consumption'. 'Domestic' investment takes place in the country. It excludes investment undertaken by Irish firms abroad.

The government sector

We now expand the circular flow of income model to include a government sector. The government affects the circular flow of income and expenditure because it levies taxes on households and firms and makes transfer payments to them under various social welfare schemes such as the state pension and the Jobseeker's Allowance. (Transfer payments are not made in return for any goods or services supplied. They are sometimes called benefits or entitlements.)

We denote the difference between taxes and transfer payments as net taxes (NT), which measures the net flow from households to government. Net taxes represent another leakage from the circular flow, shown in Figure 2.1 as the line pointing towards Taxes.

The government uses its net tax revenue to pay the people who work in the public sector and to purchase goods and services from private sector firms. These purchases are known as government current expenditure or public consumption, G. This is shown in Figure 2.1 as the line labelled Government expenditure pointing towards Firms.

At this point we have three types of expenditure on goods and services: consumer spending (C); investment (I); and government spending (G):

$$NI \equiv Y = \text{Total expenditure} \equiv C + G + I \quad (5)$$

NOTE: In the NIE accounts, government consumption (G) is called 'net expenditure by public authorities on current goods and services'. It does not include social welfare payments, national debt interest paid to Irish residents, grants to farmers and firms – which are transfer payments – or government investment spending, which is included in investment (I). Government consumption expenditure (G) amounted to 40 per cent of total government spending in the last decade, the remaining 60 per cent being transfer payments.

The foreign sector

Let us now consider the relationships between the rest of the world and the domestic economy. The output of Irish firms sold to non-residents is known as exports of goods and services (X). This is an additional source of income and stream of spending that must be included in the circular flow of income and expenditure. On the other hand, purchases by Irish households and firms from abroad constitute imports of goods and services (M) and must be deducted as a leakage from the circular flow.

So now we have four types of spending on Irish produced goods and services: personal consumption expenditure (C); government consumption expenditure (G); investment (I); and exports (X). However, the C, G, and I measures include spending on imported goods and services. If you buy a book imported from the UK it is included in C. Much of the capital equipment purchased by firms is imported from abroad. We need to deduct imports (M) from total spending to arrive at spending on Irish-produced goods and services.

If we subtract imports from exports we arrive at net exports, $NX = X - M$. This NX is the net demand for Irish-produced goods and services occurring in the ‘foreign sector’ of the economy. It is shown in Figure 2.1 as the line pointing towards Firms.

By adding up C, G, I and NX we obtain a measure of the total expenditure on the nation’s output of goods and services. This is GDP, denoted by the symbol Y.

$$Y \equiv C + I + G + X - M$$

or:

$$Y \equiv C + I + G + NX \quad (6)$$

In Table 2.2 we present the estimates of gross domestic product (Y) for 2011 published in mid-2012. (These estimates are preliminary and will be revised over time.) It may be seen that the shares of private consumption (C), government consumption (G) and investment (I) in GDP are respectively 51 per cent, 16 per cent and 10 per cent of the total, which are all close to the corresponding EU averages. However, exports (X) and imports (M) amount to 105 per cent and 83 per cent of GDP respectively, which are among the highest in the world. The net exports figure, $(X - M)$, is also exceptionally large relative to GDP, amounting to 22 per cent of GDP.

The output or value added approach

The output approach to measuring the value of domestic production concentrates on the value added at each stage of production. Value added is the difference between the value of a firm’s output and the cost of the inputs it uses. We can illustrate this approach using a very simple example. Assume that only one good – a book – is produced in the economy. A sawmill produces timber, which it sells to a paper mill for €4. The value added at this stage is €4 ($4 - 0$). The paper mill uses

TABLE 2.2 Expenditure on GDP at current market prices, 2011

Symbol	Full description	€ million	As a % of total expenditure
C	Personal consumption of goods and services	81,308	51%
+ I	Gross domestic capital formation	16,112	10%
+ G	Net expenditure by public authorities on current goods and services	25,410	16%
	Physical change in stocks	227	
+ X	Exports of goods and services	166,791	105%
– M	Imports of goods and services	–131,875	–83%
	Statistical discrepancy	1,020	
equals GDP (Y)	GDP at current market prices	158,993	100%

Source: CSO, National Income and Expenditure Annual Results for 2011 (July 2012), Table 5

the timber to produce €7 worth of paper, which is sold to the publisher. The value added at this stage is €3 (7 – 4). The authors produce a manuscript (using no inputs except their own labour) and sell it to the publisher for €10. The value added by the authors is €10 (10 – 0). Finally, the publisher combines the paper and the manuscript and produces a book that is sold in the bookshops for €30. The value added by the publisher and distributors is €13 = (30 – [10 + 4 + 3]).

By summing the value added at each stage in the production process we obtain domestic output, which in this case is €4 + €3 + €10 + €13 = €30. Only one final product – a book – is produced and its value is €30.

The expenditure and income or value added approaches to estimating GDP in principle yield the same figure and could be used to cross-check the statistical accuracy of the estimates. In reality the information available does not allow both approaches to be completed independently and there are limitations to the accuracy with which the components of these flows are measured.

Gross national product (GNP)

GDP (denoted by the symbol Y) is a measure of the value of the total output of final goods and services produced in the country and the income to which it gives rise. However, not all of the income generated in producing this output actually stays in the country or accrues to people resident here. In Ireland a substantial outflow of money occurs because of the repatriation of profits by multinational firms operating here and the interest on externally held Irish national debt. The difference between inflows and outflows of this type is referred to as ‘net factor income from the rest of the world’ (F). When these are added to GDP we obtain GNP.

In Ireland in 2011, F amounted to a net outflow of €31,977 million. It therefore has to be entered as a *negative* number:

$$\begin{aligned} \text{GDP} + \text{F} &= \text{GNP} \\ €159,000 - €31,977 &= €127,023 \end{aligned}$$

In most countries the ratio of GNP to GDP is close to 100. It is 102 in the UK, 99.3 in the euro area and 100.7 in France. For this reason, GDP is often used and GNP ignored in international comparisons of living standards. But this is misleading for Ireland, where the GNP/GDP ratio is 80. GDP overstates by a significant margin the income actually accruing to Irish residents as a result of the output produced in Ireland. For this reason, it is preferable to use Ireland’s GNP per person in international comparisons even when GDP per person is used for other countries.

If we divide Ireland’s GNP by the population we obtain a figure of €27,683 for Ireland in 2011. This is a better measure of Ireland’s standard of living than the GDP per person figure quoted earlier.

2.5 From National Product to National Income

National income measures the net value added by the factors of production. Traditionally these payments are classified as wages and salaries (payments to labour), rent (payments for the use of land and property), interest (payment for the use of capital), and profits, which can be thought of as a residual payment to entrepreneurs who take risks.

However, the data are not classified in exactly this manner in any table in the Irish NIE accounts. Instead income is broken down into two broad categories: agricultural income and non-agricultural income. The latter is then broken down into wages and salaries (‘remuneration of employees’), profits and into several sub-categories.

These magnitudes are measured at ‘factor cost’ and not at ‘market prices’ as in the previous section. To give an example of the difference between factor cost and market prices, consider the example of a pint of beer. The market price of a pint of beer may be €4.00 in a pub, but indirect taxes (VAT and excises) account for about €2.00 of this. Only €2.00 goes to pay for the production and

distribution of the beer. This €2 is paid to factors of production and enters into national income at factor cost. Hence the difference between market price and factor cost is the indirect taxes.

Only payments that actually go to the factors of production are included in national income at factor cost. Indirect taxes, T_i , like VAT and excise taxes levied on expenditure, are stripped out, while subsidies (S_u) that lower the price of goods and services below what they would otherwise be are added back in.

Table 2.3 shows how the CSO presents Irish national income. First, the sum of agricultural and non-agricultural income equals net value added at factor cost, NVA_{fc} . The fact that agriculture accounts for only three per cent of national income may come as a surprise. It is a long time since Ireland could have been characterised as an ‘agricultural country’.

When net factor income from the rest of the world, F , is added to NVA_{fc} we obtain net national product at factor cost, NNP_{fc} :

$$NVA_{fc} + F = NNP_{fc}$$

To move from NNP_{fc} to NNP_{mp} we must add indirect taxes (T_i) and subtract subsidies (S_u).

$$NNP_{fc} + T_i - S_u = NNP_{mp}$$

TABLE 2.3 Irish net national income, 2011

	€ million	% of NNI_{fc}
Income from agriculture, forestry, fishing	3,248	3
Non-agricultural income	125,201	
of which:		
Wages and salaries	62,450	65
Profits	46,598	49
Employers' contribution to social service	5,315	6
Adjustment for stock appreciation	-620	
Statistical discrepancy	-1,020	
NVA_{fc} Net value added at factor cost	127,429	
F Net factor income from rest of the world	-31,976	
NNP_{fc} Net national product at factor cost	95,453	100
T_i National indirect taxes	17,678	
S_u National subsidies	640	
NNI_{mp} Net national income at market prices	112,491	
GDP_{mp} Gross domestic product at market prices	158,993	
D Provision for depreciation	15,809	
NDP_{mp} Net domestic product at market prices	143,184	
F Net factor income from rest of world	-31,977	
NNP_{mp} Net national product at market prices	111,207	
EU EU subsidies less taxes	1,284	
NNI_{mp} Net national income at market prices	112,491	

Source: CSO, National Income and Expenditure, Annual Results for 2011, Tables 1 and 7

This is usually referred to as net national income at market prices or just net national income (NNI):

$$\text{NNI}_{\text{mp}} = \text{NNP}_{\text{mp}}$$

Table 2.3 also shows the distribution in 2011 of national income at factor cost between the various categories. Sixty-five per cent of national income accrued to labour and another six per cent was paid as social insurance contributions, bringing the total to 71 per cent. This is very much in line with international experience. In the United States, labour's share in national income has been approximately constant close to 70 per cent over the post-war period.

At the end of Table 2.3 we travel back in the other direction and show how GDP is related to national income. If we start from GDP measured at market prices, we can derive NNI by first subtracting the allowance for depreciation (D) and then adding net factor income from the rest of the world (F) and EU subsidies less taxes. The identity is:

$$\text{GDP}_{\text{mp}} - D + F + \text{EU} = \text{NNI}_{\text{mp}}$$

It can be seen that NNI_{mp} amounts to only 71 per cent of GDP_{mp} , due to the outflow of income abroad due to debt service and profit repatriation and the allowance for depreciation. NNP_{fc} equals only 60 per cent of GDP_{mp} . We emphasise yet again that these gaps are unusually large in Ireland due, in particular, to the size of the net outflow of factor payments to the rest of the world.

When estimating national income, the CSO starts by estimating agricultural income from data on crop production, etc. Non-agricultural income (wages and salaries, the income of the self-employed, profits, interest payments and rents) is estimated from data supplied by the Revenue Commissioners and other sources. These estimates of income form the basis of the GDP estimate. The expenditure figure is then reconciled with the income figure by treating personal consumer expenditure (C) as a residual. This may seem somewhat unsatisfactory as it means that errors in the measurement of other parts of GDP accumulate in C.

National disposable income

Deriving gross national disposable income (GNDI) follows much the same route as was followed in deriving NNI, but we do not subtract out depreciation. Table 2.4 starts with GDP_{mp} . As in Table 2.3, net factor income from the rest of the world, F, is added to obtain GNP_{mp} and then EU subsidies less taxes (EU) are added to obtain gross national income at market prices (GNI_{mp}). Finally, other transfers to and from the rest of the world (TR_{rw}) are added to obtain GNDI:

$$\text{GDP}_{\text{mp}} + F = \text{GNP}_{\text{mp}}$$

$$\text{GNP}_{\text{mp}} + \text{EU} = \text{GNI}_{\text{mp}}$$

$$\text{GNI}_{\text{mp}} + \text{TR}_{\text{rw}} = \text{GNDI}$$

We are now in a position to show how savings (S) fits into the NIE accounts. Household income is either spent or saved. Similarly, gross national disposable income (GNDI) is either consumed or saved.

$$\text{GNDI} = \text{Consumption} + \text{Savings}$$

Total consumption can be divided into two categories: personal consumption (C); and public or government consumption (G). Hence:

$$\text{GNDI} = C + G + S$$

Table 2.4 shows that personal consumption accounts for almost 65 per cent of GNDI, government consumption for another 20 per cent, leaving only 15 per cent for gross national savings.

TABLE 2.4 Gross national disposable income and its uses, 2011

		€ million	
GDP _{mp}	GDP at market prices	158,993	
plus F	Net factor income from rest of world	−31,977	
equals GNP _{mp}	GNP at market prices	127,016	
plus EU	EU subsidies less taxes	1,285	
equals GNI _{mp}	Gross national income at market prices	128,301	
plus TR _{rw}	Net current transfers from rest of world	−2,443	
equals GNDI	Gross national disposable income	125,858	
Uses of GNDI = C + S	Consumption + Savings		% of GNDI
C	Personal consumption of goods and services	81,308	65
G	Government consumption	25,410	20
GNS	Gross national savings	19,140	15
D	Provision for depreciation	15,809	13
NNS	Net national savings	3,331	3

Source: NIE, Annual Results for 2011, Table 7

Box 2.1 EU taxes and subsidies and transfers from the rest of the world

In the past, EU subsidies were relatively large because of the importance of the support to farm prices and other current subsidies received from the EU, but they have declined sharply in recent years while our tax contribution to the EU has increased.

Current transfers from the rest of the world include a variety of flows. Remittances to Ireland from emigrants living abroad were relatively large in the past, but nowadays there may be a net outflow under this heading as immigrants to Ireland send some of their savings back to their home countries. Money is also transferred from Ireland to the rest of the world in the form of overseas development assistance. This figure amounts to approximately 0.5 per cent of GDP.

When an allowance is made for depreciation, we see that net national savings accounts for only three per cent of GNDI. The savings rate is among the most important determinants of growth in the long run. The present Irish savings rate is very low, due in particular to the high level of borrowing in the public sector.

2.6 Adjusting for Inflation

Earlier in this chapter we briefly discussed some issues that arise when comparisons are made on the level of national income between countries. Somewhat different issues arise when we compare national income or GDP within a country over time. We discuss the measurement of inflation in some detail in Chapter 3, but here we present a brief account of how it has affected comparisons of GDP or GNP over time.

As GDP changes from year to year, it is important to distinguish between changes in nominal and real GDP. *Nominal GDP* is measured using the current year's prices. It could be thought of as the volume of output (hundreds of bicycles, millions of computer chips, thousands of opera performances and so on) multiplied by the current price level.

$$\text{Nominal GDP} = \text{real GDP} \times \text{current price level}$$

Nominal GDP can increase just because the price level rises, even if there is no increase in the volume of output. An increase in *real GDP*, on the other hand, means that a larger quantity of goods and services has been produced (more bicycles, computer chips, operas). In terms of improving the country's standard of living, it is the change in volume GDP or real GDP that matters. Changes in real GDP are also what drive the level of employment in a country.

Put another way, people are not better off because the price level has risen. If they were, Robert Mugabe's Zimbabwe, with its one million inflation rate in 2007, would be one of the richest countries in the world.

If we calculate GDP at a given price level, that is by holding the price level constant, we obtain a measure of real output called GDP at constant market prices, to distinguish it from GDP at *current* market prices. The price index used to calculate GDP at constant market prices is known as the GDP deflator. In the next section we use data for real GNP to show how the Irish economy has performed over the decades.

As an example, consider the hypothetical data in Table 2.5. There are only two goods: A and B. The prices and quantities of each good are given for three years. Given this data, we wish to compute nominal and real GDP in each year using 2011 as the base year (the year from which prices are frozen). Nominal GDP is calculated by multiplying the Ps and Qs for each year:

$$2011: \text{€}25,860 = \text{€}22 \times 900 + \text{€}30 \times 202$$

$$2012: \text{€}27,200 = \text{€}24 \times 950 + \text{€}32 \times 210$$

$$2013: \text{€}33,310 = \text{€}26 \times 1000 + \text{€}34 \times 215$$

Real GDP is calculated by multiplying each year's Qs by the 2011 P.

$$2011: \text{€}25,860 = \text{€}22 \times 900 + \text{€}30 \times 202$$

$$2012: \text{€}27,200 = \text{€}22 \times 950 + \text{€}30 \times 210$$

$$2013: \text{€}28,450 = \text{€}22 \times 1000 + \text{€}30 \times 215$$

It can be seen that once prices are held constant, over the period there is a much smaller increase in real GDP (€28,450) compared to nominal GDP (€33,310). The percentage change in real GDP from one year to the next is known as the *real growth rate*. This is a particularly important variable in macroeconomics and receives a great deal of media attention when the figure is published. Using the hypothetical data in Table 2.5, in 2012 the real growth rate was 5.18 per cent:

$$5.18 = \left(\frac{27,200 - 25,860}{25,860} \right) \times 100$$

TABLE 2.5 Real and nominal GDP (hypothetical)

	2011 P	2011 QTY	2012 P	2012 Q	2013 P	2013 Q
Good A	22	900	24	950	26	1000
Good B	30	202	32	210	34	215

TABLE 2.6 Gross national product at constant market prices

Year	GNP € millions	% change	Population	GNP per capita €	% change
2006	137,145		4,239,800	32,347	
2007	142,848	4.2%	4,307,314	33,164	2.5%
2008	140,316	-1.8%	4,375,801	32,066	-3.3%
2009	128,988	-8.1%	4,445,376	29,016	-9.5%
2010	130,202	0.9%	4,516,057	28,831	-0.6%
2011	126,983	-2.5%	4,588,300	27,675	-4.0%

Note: Chain-linked volume measures, with prices referenced to 2010

Source: CSO, National Income and Expenditure Annual Results for 2011 (July 2012), Table A

In 2013, the hypothetical real growth rate was 4.6 per cent.

$$4.6 = \left(\frac{28,450 - 27,200}{27,200} \right) \times 100$$

NOTE: When calculating real GDP, it would appear that prices are held constant. That is, prices never change from their base year values. However, relative prices are changing all the time. In Table 2.5, for example, over time the price of good A may fall and the price of good B may rise. If you change these relative prices, the corresponding real growth rates will change as well. (Experiment with the prices in Table 2.5 to see this.)

To keep the base up to date, every few years a new base year is chosen. Prices are again held fixed and real GDP calculated. Recently the CSO moved to a new chain-weighted method. In this case, the base year prices change continuously over time. Average prices in 2011 and 2012 are used to compute real GDP in 2012, and average prices in 2012 and 2013 are used to compute 2013 real GDP. The year-to-year growth rates are then put together to form a 'chain'. This technique ensures that prices used to compute real GDP are never far out of date and hence it is a more accurate measurement.

Table 2.6 shows GNP at constant market prices for the Irish economy from 2006 to 2011. (Note that we now switch to GNP, as opposed to GDP, as this is the most relevant measure for the Irish economy.) This is the output of the Irish economy over time, but holding prices constant. It can be seen that real output increased significantly in 2006 but fell dramatically in 2009. A graph of the real growth rates over time is referred to as the *business cycle*.

In Table 2.6 we also show the population numbers and derive GNP per capita. This data again highlights the dramatic fall in the real growth rate in 2009.

2.7 The Business Cycle

The holy grail of macroeconomic policy is to keep the economy close to what may be called its potential real growth rate, avoiding inflation on one side, and unemployment on the other. We can think of potential real growth rate as the economy's sustainable growth path. Associated with this potential growth rate is the natural rate of unemployment. This is not zero unemployment as it is never possible to have no unemployment (see Chapter 4).

NOTE: In New Zealand it is said that there were four people unemployed in the early 1960s and that the Minister for Labour knew both their names and their addresses. Times have changed and in 2012, the unemployment rate in New Zealand is seven per cent.

Potential output is also associated with full utilisation of the country's capital equipment and other resources. If the economy grows faster than potential it will overheat, generating inflationary pressures. If it grows more slowly, the unemployment rate will rise and spare capacity will emerge. We discuss this issue in greater detail in Chapter 4.

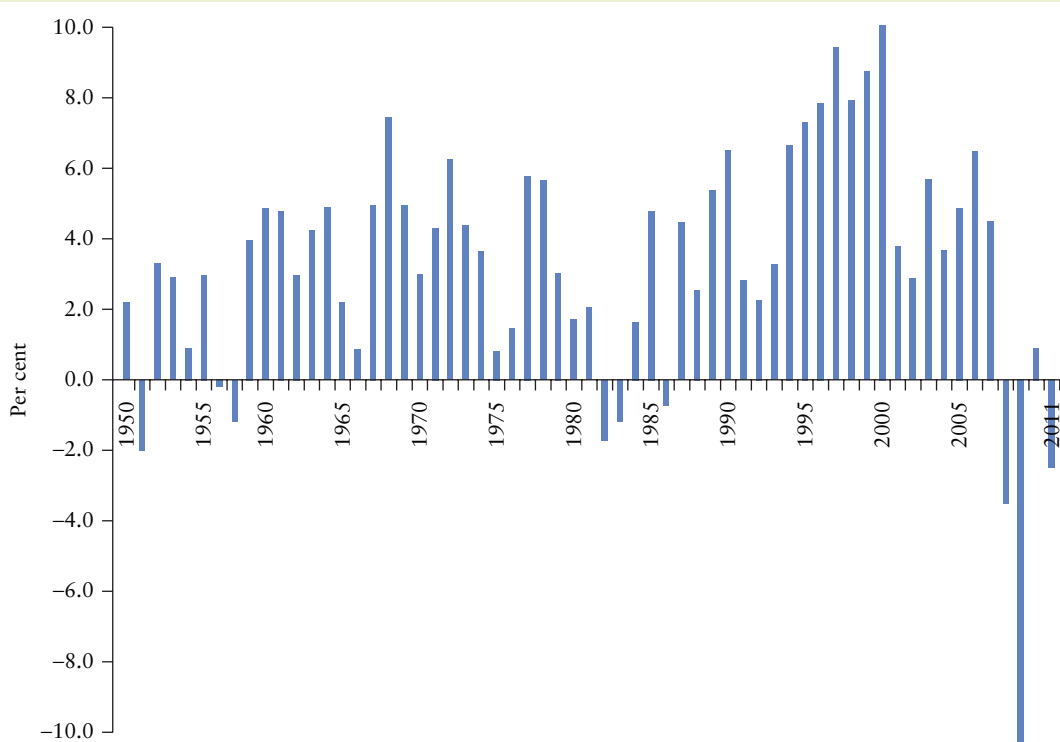
NOTE: As explained at the outset of this chapter, the rate of growth is determined by the economy's factors of production (the labour force and capital stock) and technological improvements. The potential growth rate is the rate consistent with full employment and low inflation. In an Irish context it is hard to define what this sustainable growth rate is. During the boom years of the last decade we experienced a huge inflow of immigrants to our labour force. In a sense this raised our potential growth rate. Our sustainable growth rate is also affected by inflows of high-tech foreign direct investment that augment our productive capacity. The sustainable growth rate can also be high during a period of 'catching up', as the economy moves from low-productivity activities (such as traditional farming) to high-productivity activities (such as software development). It is difficult at this point in time to gauge what is the relevant figure for our long-run potential growth rate in the years ahead, but it is certainly lower than it was between 1994 and 2007.

In reality, modern economies do not grow at a steady, constant rate, year in, year out. Instead the growth rate is quite erratic. There are booms, when the growth rate is above its sustainable level, followed by busts, when the growth rate falls below this level. These fluctuations constitute the business cycle. During the 1990s and early part of the present century, many economies experienced a long period of steady growth with low unemployment and low inflation. This was called 'the Great Moderation'. It seemed as if the business cycle had been tamed. But this hope was rudely dashed after 2007, when most of the advanced economies of the world were plunged into a very deep recession.

There is no hard and fast definition of how long a downturn must last to constitute a recession. The convention in the USA is that if a contraction lasts for two or more consecutive calendar quarters, the economy is said to be in a recession. If a recession is prolonged and deep, it may be called a depression, but the distinction is not clear-cut. The present crisis has been the severest many countries have experienced since the 1930s, but hardship is not on the same scale as it was then. As a compromise, it has been labelled the Great Recession.

One thing that has not changed is that the business cycle remains unpredictable. We can be sure that a boom will not last indefinitely, but we cannot predict when the downturn will occur. Hopefully, the present recession will not continue forever, but who can foresee when it will end?

Figure 2.2 shows the real growth rate of the Irish economy for each year from 1950 to 2011. The rate has not been adjusted for population change, so it shows the growth of the whole economy, including the part attributable to the increase in the labour force and population. It is clear from the chart that the performance of the Irish economy has been very erratic, with growth as high as nine per cent in several years in the late 1990s but falling to *minus* eight per cent in 2009. While the long-run growth rate has averaged just over three per cent, there have been very significant fluctuations round this average. This volatility shows that we have not succeeded in stabilising the economy around its potential growth rate. Much the same could be said for many other economies, although the Irish experience has been more volatile than most.

FIGURE 2.2 Real GNP growth rate (%) Ireland, 1951–2011

The economy went through a severe recession in the mid-1950s, with negative growth rates recorded in two years. Things picked up during the 1960s, although there was a brief downturn in 1967. The 1970s were marked by some initial growth followed by a severe recession caused by the 1973 global oil crisis. The second energy crisis at the end of the 1970s, combined with poor economic policies, triggered a prolonged recession in the 1980s.

However, the economy finally recovered at the end of the decade and during the 21 years from 1987 to 2007 we experienced an amazing growth spurt. Real GNP grew at an annual average rate of 5.6 per cent, while real GNP per person averaged 4.6 per cent. The size of our real GNP more than trebled over this period and real GNP per person grew to two and a half times its starting level.

The rapid growth of the Irish economy attracted international attention and the label ‘Celtic Tiger’ was used to describe it by economist Kevin Gardiner in a 1994 report for the stockbrokers Morgan Stanley. Ireland’s growth spurt was to last much longer than anyone anticipated in the 1990s, only finally coming to an end with the post-2007 crash. We return to a discussion of the factors that contributed to this exceptional performance in Chapter 22.

In 2007 the Irish property and banking bubble began to collapse and our economy felt the repercussions of the worst global recession in decades. The subsequent downturn was very severe. As shown in Table 2.6, real output increased significantly in 2007 but since then has fallen by a cumulative total of just over 11 per cent. On a per person basis, the fall has been equal to almost 17 per cent. This is by far the biggest contraction in real output we have suffered since World War II.

Business firms have an enormous interest in gauging the prospects for future growth. If they believe that the markets into which they are selling are going to expand they are likely to hire more workers, employment will rise and unemployment fall. However, if they are gripped by pessimism and believe that sales will fall, they will shed workers and unemployment will rise. Figure 2.2 implies that doing business in Ireland over the last 60 years has been like being on a roller-coaster. During the 1980s and since 2008 firms struggled to survive, whereas in the 1990s and early 2000s firms and businesses prospered and expanded.

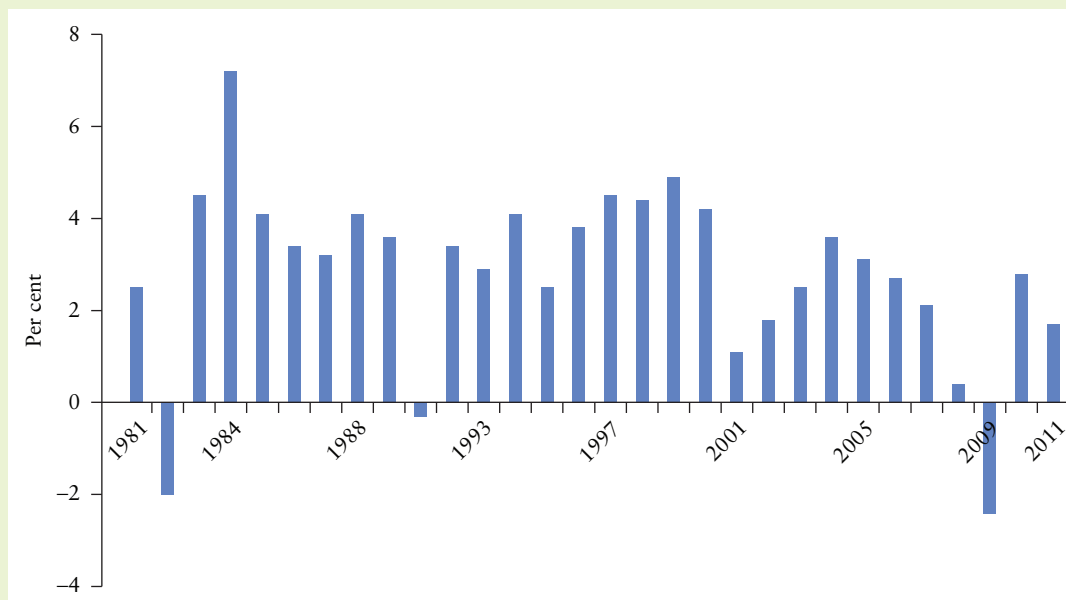
Firms are eager to obtain forecasts of economic growth both for Ireland and for the foreign markets into which they sell. These forecasts influence their decisions about hiring and investment. Preparing economic forecasts is now a big industry. Numerous national and international agencies, banks and consulting firms prepare forecasts giving their view of the likely performance of the Irish and other economies one or two years into the future. In Ireland the forecasts prepared by the Central Bank of Ireland, the ESRI, the OECD and the IMF attract headlines every quarter.

Unfortunately, economists' ability to forecast the future is poor. Economics is not like astronomy, which can make very precise predictions of the movements of the planets years into the future. As we pointed out above, the business cycle does not follow a predictable path. The economic system is subject to a high degree of randomness because it is buffeted by 'shocks' – external factors that of their nature cannot be predicted.

The list of shocks is long and includes the impact of wars on oil prices, spells of extreme weather, political upheavals and changes in technology. These are the 'unknown unknowns' that can blow even the most sophisticated forecast off course. If you look back just five years, you will see that few forecasters in Ireland or elsewhere foresaw the severity of the recession that would hit the economy in 2007.

Figure 2.3 shows the business cycle for the United States from 1980 to 2011 using GDP figures. Again, the volatility is apparent. The fastest spell of economic growth was during the two Clinton

FIGURE 2.3 The US business cycle, 1980–2010



presidencies from January 1993 to December 2000, when growth averaged 3.4 per cent. (Clinton used the slogan ‘It’s the economy, stupid’ during the 1992 presidential campaign to remind voters of the recession.)

If a trend line is fitted to the US real growth rate it is downward sloping, perhaps reflecting the fact that the USA is a mature economy on the frontier of technology. This means that it cannot grow as fast as Ireland did in the 1990s and early in this century, when we were catching up with the advanced economies.

2.8 The Long-run Performance of the Irish Economy

The previous section dealt mainly with the short-run, cyclical performance of the economy. In this section we provide a brief account of the performance of the Irish economy over the long run. We present a more detailed discussion of this topic in Chapter 22.

When looking at the long-run behaviour of the economy, it is important to take account not only of inflation but also of population change. The population of Ireland has fluctuated to an unusual extent. During the 1950s the population declined by over one per cent a year, reaching a low point of 2,818 thousand in 1961. In the 1970s it grew by about 1.5 per cent a year, the highest population growth rate in Europe.

In the late 1980s the population declined due to the resumption of large-scale emigration and the decline in the birth rate. But during the 1990s the population again increased at about 1.5 per cent a year. This was due to the combination of the rise in the Irish birth rate and the unprecedented rate of net immigration to the country.

The 2011 Census of Population revealed that the population had grown to 4,588 thousand – an increase of 63 per cent over the 1961 figure and the highest total recorded in the twenty-six counties since 1861. Our view of the country’s economic performance would be distorted if we did not take these population fluctuations into account.

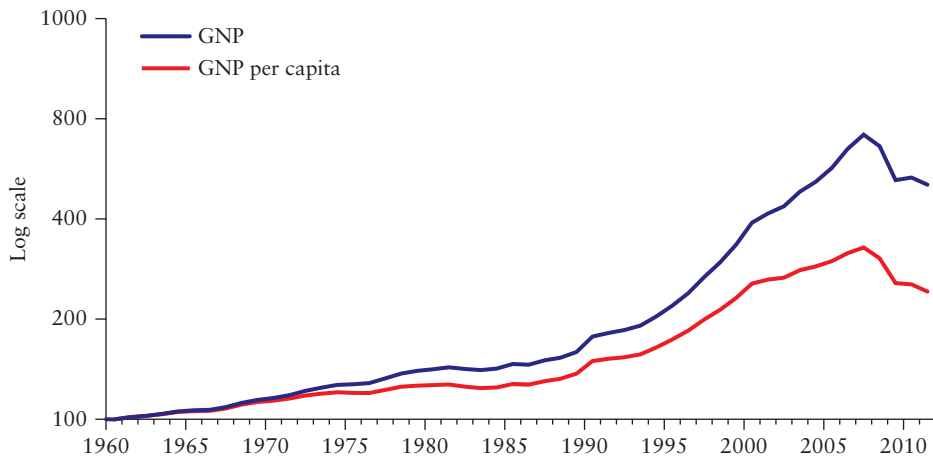
Figure 2.4 shows the trend in Irish GNP and GNP per person at constant prices from 1960 to 2011. The data are presented as indices equal to 100 in 1960. This allows us to see each year’s income as a percentage of the 1960 level. The graph is on a logarithmic scale, so that proportional increases in GNP appear equal – doubling from 100 to 200 is the same distance as doubling from 200 to 400. For a given growth rate the slope of the line is constant. So changes in the slope of the lines indicate changes in the growth rate. This brings out the very high growth rates recorded in the 1990s and early in this century.

The data show that between 1960 and 2011 real GNP grew at an annual average rate of 3.7 per cent, while real GNP per person grew at 2.7 per cent. If income grows at 2.7 per cent it will double in just over 26 years. This implies that each generation is twice as well off as its predecessor. Despite the setback after 2007, in 2011 Irish real income per person was almost four times the level recorded in 1950.

However, it is unlikely that Irish income will average this high growth rate in the future – the fast growth recorded in certain periods since World War II contained a large element of ‘catch-up’ as Ireland moved from being one of the poorest nations in Europe to being up there among the leaders.

People today may not necessarily be ‘happier’ than they were in the past, but they certainly have more and a greater variety of goods and services at their disposal. Many students now drive their own cars to college, whereas in the past almost all of them cycled, walked or took the bus! Virtually all of them have mobile phones and other electronic gadgets that were unheard of a generation ago.

Real GNP has not risen in all countries over the years. Some countries have had no long-term improvement in living standards and a few have even experienced decline. North Korea is an

FIGURE 2.4 GNP and GNP per capita at constant market prices

example of a country where there has been little economic progress for decades. Africa contains many ‘failed states’ that have been torn apart by civil wars, economic mismanagement and natural disasters. However, there are many rapidly growing countries in Africa today, with many formerly extremely poor countries experiencing new prosperity on the back of a boom in commodity prices and better economic policies. Once poorer states begin to grow they can record very high growth rates as they go through the catch-up process that Ireland experienced in the 20 years before 2008.

It is also relevant to look at the level of income and output per person at work. When the participation rate (the proportion of the population in the labour force) is rising, the rate of growth of income per person will be faster than that of output per worker. A rising participation rate, especially among women, was one of the factors behind the rapid rate of growth of income per person in Ireland in the 1990s and the first decade of this century.

2.9 Key Terms and Concepts

In this chapter we:

- outlined the concepts of gross domestic product (GDP), gross national product (GNP) and national income (NI) and the relationships between them
- discussed how to adjust for inflation and derive the real growth rate
- provided data on Ireland’s real growth rate over the short run (the business cycle)
- discussed some aspects of Ireland’s longer-term economic performance.

Appendix 2.1 Beyond GDP

Economists have always been aware of the limitations of GDP and related concepts as measures of economic well-being. They caution that these measures include only what can be brought under the ‘measuring rod of money’, as the Cambridge economist Alfred Marshall put it. But despite this caveat, journalists and policy-makers have tended to pay enormous attention to the latest estimates of GDP and little heed to its shortcomings as a standard by which to measure human progress.

This has changed in recent years. The growing interest among policy-makers and academic economists in supplementing the conventional measures of economic welfare with broader indicators of the progress of society was signalled by the publication in 2009 of the *Report of the Commission on the Measurement of Economic Performance and Social Progress*, whose authors included two Nobel Prize-winning economists, Joseph Stiglitz and Amartya Sen, as well as the prominent French economist Jean-Paul Fitoussi.

In 2010 the EU launched the website Beyond GDP (www.beyond-gdp.eu/), and in 2012 the American economist Jeffrey Sachs co-edited the first *World Happiness Report*. In the preface to this report he states:

The United States has achieved striking economic and technological progress over the past half century without gains in the self-reported happiness of the citizenry. Instead, uncertainties and anxieties are high, social and economic inequalities have widened considerably, social trust is in decline, and confidence in government is at an all-time low. Perhaps for these reasons, life satisfaction has remained nearly constant during decades of rising Gross Domestic Product (GDP) per person.

The last point is consistent with the famous Easterlin hypothesis, according to which beyond a certain threshold the average level of subjective well-being is not significantly higher in richer than in poorer countries; and well-being does not increase within countries as their incomes rise over time. This paradox is usually explained in terms of the declining marginal utility of income, the importance of relative rather than absolute income, and the tendency for expectations to rise with increasing affluence (Easterlin 1974).

A recent study of the effects of the Great Recession on the US population concluded that even large macroeconomic shocks to income and unemployment produce only small and hard-to-detect effects on life satisfaction. Although unemployment remained very high, by the end of 2010 measures of subjective well-being had largely recovered from the impact of the recession. Similarly, the Irish evidence suggests that despite soaring unemployment and falling income, most measures of subjective well-being have held up quite well since 2007 (Walsh 2012).

Behind this new emphasis in economics is a broad agreement on the need to take account of data on both objective and subjective quality of life indices to supplement the traditional measures of economic growth and well-being. The CSO has responded to these trends by publishing since 2003 an annual report called *Measuring Ireland's Progress*. This contains not only the standard economic indicators, but also a wealth of information on demographic and educational trends, environmental standards and other indicators of the quality of life.

In addition to these broad and philosophical issues as to what exactly GDP measures, other technical difficulties relating to the measurement of GDP have long been recognised by economists and national income accounting statisticians. These include the following.

DOUBLE COUNTING

Only final goods should be included in GDP, which is based on adding up all the value added in the economy. Intermediate goods that are used to produce final goods should not also be included because this would give rise to double counting and an overestimate of GDP. In this

chapter we gave the example of producing a book and emphasised that the value of the paper and other inputs to book production should not be counted on top of the value of the book itself. That seems clear enough, but in reality the dividing line between intermediate and final goods is not always so clear-cut. A lot of what we count as ‘final’ output is really only needed to help the rest of the economy function – policing and the legal system are important examples. A country does not become richer or happier by recruiting more police officers or locking up more people in jails.

HOUSEHOLD PRODUCTION AND NON-MARKET ACTIVITIES

National income accounting is primarily concerned with activities that are bought and sold: that is, brought under the measuring rod of money. Non-market activities, such as ‘do-it-yourself’ repairs or cooking and cleaning in the home, are not included in GDP. So, for example, if a parent stays home and looks after his or her children it does not count in the NIE statistics. But if the children are put into a crèche it does, because money is paid for the service.

A related issue is how to value ‘leisure’. A person who works 60 hours a week will earn more money than they would if she only worked 40 hours, but they forego a lot of free time for this extra income. Should some value be attached to this loss of leisure time and deducted from the increased GDP that results from the overtime? This is not a trivial issue. In the United States people work notoriously long hours and have relatively few vacations – on average the working year comes to about 1,800 hours, whereas in countries like France, Germany and Denmark it is around 1,400. (The figure for Ireland is 1,500.) In many Western European countries there is a strong emphasis on the importance of free time as a component of well-being, but this is not reflected in the GDP data.

SPILOVER EFFECTS

Spillover effects or ‘externalities’ can be either positive or negative. An example of a negative spillover or external diseconomy is the pollution caused by a factory. The environmental damage caused by the sulphur dioxide (SO₂) emissions from the Moneypoint power station in County Clare, equal to about 67,000 tonnes per annum, is a pertinent example. One of the biggest issues facing the world in our century is how to deal with the effects on the world’s climate of the carbon emissions from burning fossil fuels. Ideally, the polluter should compensate those affected by the pollution, but in practice the ‘polluter pays’ principle is difficult to enforce. Various ‘emissions trading’ systems have been devised in response to the problem of global warming, but these have had limited effect so far.

Important examples of positive spillover effects or external economies are rarer, but they do exist. For example, the grounds of a university campus yield positive benefits to local residents. More importantly, the civilising effect of educating students may benefit not just those students, through their enhanced earning capacity, but also the whole community.

A lot of work is being done to ‘green’ the national accounts by taking account of the impact of economic activity on the environment. This involves preparing estimates of the damage done to the environment in the production of economic output and subtracting this figure from the conventional measure of GDP.

THE UNDERGROUND OR ‘BLACK’ ECONOMY

The underground economy consists of unreported, undetected and unmeasured economic activity. There are two main types of unrecorded transaction: illegal transactions, such as drug trafficking and prostitution, which are not reported for obvious reasons; and legal transactions, such as small building jobs and ‘nixers’, that are kept hidden to avoid paying taxes. It is estimated that the black economy in Ireland could be between three and 10 per cent of GDP. Other countries, such as Italy and Greece, are believed to have even higher levels of unrecorded economic activity.

ISSUES RELATING TO MULTINATIONAL COMPANIES

The activities of multinational companies (MNCs) in Ireland have a major impact on our GDP estimates. Because of Ireland's relatively low corporation tax rate (12.5 per cent) there is an incentive for international companies to engage in 'transfer pricing': selling components and raw materials at artificially low prices to subsidiary companies in Ireland in order to maximise the profits they record in this low tax jurisdiction. This has the effect of artificially boosting the Irish GDP figures. As we saw, in Ireland GNP is about 20 per cent lower than GDP. This is an unusually large gap. To avoid this distortion, it is recommended that Irish GNP be used in international comparisons, even when GDP is used for other countries.