Chapter 1

The essential macroeconomic aggregates

This chapter offers an initial definition of essential macroeconomic variables, taken from the May 2013 edition of OECD Economic Outlook. *Germany is taken as the example country. The chapter first looks at GDP, before turning to the other principal indicators used by the OECD economists: private consumption, gross fixed capital formation, GDP deflator, household saving ratio and financial balance of general government.*

In this first chapter, our aim is to give an initial definition of the essential macroeconomic variables, listed in the table below, and taken from the *OECD Economic Outlook* May 2013 (OECD, 2013a).[1] We have chosen to illustrate this chapter using the example of Germany, but we might as well have chosen any other OECD country, since the structure of the country chapters in the *OECD Economic Outlook* is the same for all countries.

Each chapter of this book uses an example from a different country.

Table 1.1. **Main macroeconomic variables**
Germany,[a] 2005 euros, annual changes in percentage

	2010	2011	2012	2013	2014
Private final consumption	0.8	1.7	0.6	1.0	2.2
Gross capital formation	9.8	7.6	-4.9	-0.5	5.4
Gross domestic product	4.0	3.1	0.9	0.4	1.9
Imports	10.9	7.5	2.2	1.9	6.4
Exports	13.4	7.9	4.3	0.9	4.6
Household net saving ratio	10.9	10.4	10.3	10.3	10.1
GDP Deflator	0.9	0.8	1.3	1.2	1.7
Government net lending, as a percentage of GDP	-4.2	-0.8	0.2	-0.2	0.0

a) The *OECD Economic Outlook* dates from May 2013. At that time, the data for 2013 and 2014 were forecasts by the OECD economists. The data for 2010, 2011 and 2012 were actual observations by Destatis, the Federal Republic of Germany's statistical office.

Source: OECD (2013), "OECD Economic Outlook No. 93", OECD Economic Outlook: Statistics and Projections (database), doi: *http://dx.doi.org/10.1787/data-00655-en*.

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Comments made by OECD economists in May 2013 included the following:

> "After decelerating throughout 2012 and turning negative in the fourth quarter, real GDP growth is expected to strengthen gradually during 2013 and reach 2% in 2014. While subdued activity in the euro area will hold back the recovery, the pick up of world trade is projected to increase export growth. Wage and employment gains as well as low interest rates will support domestic demand, narrowing the current account surplus to 6% of GDP. The unemployment rate is expected to fall somewhat further, while consumer price inflation may rise to 2% in 2014." (OECD, 2013a).

The OECD economists, commenting on the development of the German economy in May 2013, expected a stronger growth of the **gross domestic product** (commonly known as **GDP**) for 2014 thanks to a strengthened world trade and thus an increase in exports.

Definitions of terms appearing in bold are available in the glossary of this book.

In Germany, as in most OECD countries, 2009 was a terrible year: GDP decreased by 5.1%. The table shows the rebound of the GDP in 2010 (4.0%), the modest growth of the GDP in 2012 (0.9%) and 2013 (0.4%) and an expected positive growth of 1.9% in 2014. This last positive prospect, however, largely depended on further developments of the crisis in the euro area, which imposed a potential threat on the expected recovery. The deceleration of growth between 2012 and 2013 is of 0.5 percentage point. This may be seen very small, but it must never be forgotten that national accounts variables are measured in billions.

In practice, most OECD countries technically compile their national accounts in millions, and thus many tables published appear in millions. But this is far from meaning that the data are accurate at the level of millions. It is wise to round these data to billions.

In the case of Germany, 1% of GDP amounts to roughly 26 billion euros, and thus 0.5% to 13 billion euros, corresponding to roughly the total annual earnings of 400 000 employees, a substantial number.

In this chapter, we begin by defining GDP, before turning to the other principal indicators used by the OECD economists: private consumption, gross fixed capital formation**,** GDP deflator, **household** saving ratio, and financial balance of **general government**. For all the national accounts data discussed in this chapter, we refer the reader to the OECD web site for this book, or to the general OECD web site under the heading "quarterly national accounts" or "annual national accounts". The quarterly national accounts are more pertinent for those who wish to have the most recent figures.

1. Defining GDP

GDP, Gross Domestic Product, is the most frequently used indicator in the national accounts. It lies at the heart of the entire system of national accounts, and its definition is now internationally agreed upon (see Box 1.1 on "The reference manuals"). GDP combines in a single figure, and with no double counting, all the *output* (or *production*) carried out *by all the firms, non-profit*

institutions, government bodies and households in a given country during a given period, regardless of the type of goods and services produced, provided that the production takes place within the country's economic territory. In most cases, it is calculated quarterly or annually, but it can also be calculated monthly.

Box 1.1. **The reference manuals and their implementation**

The standards governing national accounts are enshrined in two international reference manuals: the "System of National Accounts 2008" (SNA 2008), which is recognised globally, and its European version, called the "European System of Accounts 2010" (ESA 2010). The global manual (SNA 2008) is co-signed by the five major international economic organisations: the United Nations, the International Monetary Fund, the OECD, the World Bank and the European Commission. The European manual is totally compatible with the global manual and includes additional useful details. It also has a more legally binding character because, according to European regulations, EU member countries are obligated to implement it. These manuals have contributed substantially to improving the international comparability of data, although further progress still has to be made in this endeavor (see Chapter 3). The current complete versions of SNA 2008 and ESA 2010 are available online.

Warning: while the manuals date from 2008 or 2010, their implementation takes time because the process of production of national accounts statistics is quite heavy. The present book is published in 2014 just before the majority of OECD countries have implemented them. United States of America, Australia, Israel, Mexico and Canada have implemented it in 2013, Korea in March 2014. But European countries implemented the ESA 2010 only in October 2014, at the exact same moment as the publication of this book. The data illustrating the chapters of the present book are therefore sometimes extracted from the previous system. One should not however give too much importance on this limitation. Compared with the old system, the main change is that R&D expenditure is now counted as investment rather than intermediate consumption (see Chapter 14). In practice, this leads to an increase of the level of GDP by around +2.5% in the United States of America, and +1.9% in average in the European Union. It is important to note that this impact is "structural" in the sense that the increase affects more or less all years. In other words, the time-series of GDP is increased more or less by the same amount in all years, thus the growth rate of GDP, which is the main headline indicator, is only marginally affected. In order to illustrate the impact of the change for France, which published its new accounts in May 2014, see Chapter 14. For Germany, the statlink of Table 1.1 of this book contains a table illustrating the changes due to the implementation of ESA 2010 for the main indicators included in Table 1.1.

However, measuring a country's total output is not a simple matter (see boxes "Accuracy" and "Limitations and pitfalls" at the end of this chapter), and national accountants have therefore had to devise innovative methods of calculation.

The output of a single firm can be measured fairly easily. In the case of a firm making pasta, for example, it can be measured as tonnes of pasta made during the year, or, if we multiply the number of tonnes by the price of the pasta, by the amount of output valued in dollars (or in euros in the case of Germany, since this is the national currency). But we shall see that it makes little sense to add together the output measured in dollars from all firms to arrive at a macroeconomic figure. That is because the result of this calculation depends heavily on the way the firms are organised.

Take again the example of the pasta manufacturer and compare two different production scenarios in a given region. Suppose that in the first year there is only one firm, firm A, that makes both the pasta and the flour used to make the pasta. Its output amounts to 100 000 dollars, corresponding to 100 tonnes of pasta, with each tonne valued at 1 000 dollars. Now suppose that the following year, firm A is split into two, with firm A1 specialising in making flour and selling 30 000 dollars' worth to firm A2, which carries out the final production of pasta. Firm A2 makes the same quantity of pasta as in the first year, i.e. 100 tonnes, and at the same price, i.e. 1 000 dollars per ton.

Pasta industry

	Year 1	
	Firm A	
Output	$ 100 000	
	Year 2	
	Firm A1	Firm A2
Output	$ 30 000	$ 100 000

In the first year, the output in this region will be worth 100 000 dollars; in the second year, the value of total output could be the sum produced by firm A1, i.e. 30 000 dollars, and that of firm A2, i.e. 100 000 dollars, resulting in a total of 130 000 dollars. But it would clearly be absurd to use this total as our macroeconomic indicator of activity in the region. It shows an increase of 30% (130 000/100 000 = 1.30, often written as + 30 %, or more simply 30 %), when in fact no change at all took place at the strictly macroeconomic level. The same quantity of pasta was produced at the same price. All that changed was the legal and commercial organisation of the firms.

The above discrepancy generated the national accountants' innovative idea of calculating the contribution of each firm not as its output, but as its **value added**. This expression is profound since it consists of measuring *the value* that the firm *adds* to that of the firms that supply its inputs. Let us consider the pasta example again. Compared with the situation in the first year, when there was only firm A, the value added by firm A2 is not equal to 100 000 dollars. That is because firm A2 buys 30 000 dollars' worth of flour, whereas previously it had made this flour itself and did not count this as output. Therefore, the national accounts system proposes calculating the value added of firm A2 as 100 000 – 30 000 dollars. In other words, the value of the firm's output minus the value of the products used to carry out its production during the period.

The products consumed in the production process during the period are known as **intermediate consumption**. By deducting their value from that of output, one eliminates the *double counting* that occurred earlier when summing of the output of firms A1 and A2. In the second year, the output of flour was in fact counted twice: once in the value of the output of firm A1 (30 000 dollars) and a second time in the value of the output of firm A2 (whose 100 000 dollars in output in fact includes the value of the flour bought and used in the production process).

If one applies this same reasoning to all firms, calculating for each its value added, it is then possible to add together the value added of each firm, *without double counting*. The result will be an indicator that is independent of the way firms are organised. This is illustrated in the following table, which includes the farm that produced the wheat from which the flour was made. For the sake of simplicity, let us assume the farmer uses no intermediate consumption; he obtains his wheat solely from his labour and machinery, without buying seeds or fertilisers. As can be seen from the following diagram, the sum of the output of each unit changes, but the *sum of the value added of each unit* remains equal to 100 000 dollars, regardless of the pattern of organisation.

	Year 1	
	Farmer	Firm A
Input	*Labour + machinery + wheat*	*Labour + machinery + wheat*
Output	$ 10 000	$ 100 000
Intermediate consumption	0	$ 10 000
Value Added	**$ 10 000**	**$ 90 000**

	Year 2		
	Farmer	Firm A 1	Firm A2
Input	*Labour + machinery*	*Labour + machinery + wheat*	*Labour + machinery + flour*
Output	$ 10 000	$ 30 000	$ 100 000
Intermediate consumption	0	$ 10 000	$ 30 000
Value Added	**$ 10 000**	**$ 20 000**	**$ 70 000**

This is why GDP is defined as being equal to the sum of the value added of each firm, government institution and producing household in a given country: **GDP = Σ Values Added**.

To be more precise, one should say "GDP = ΣGross Values Added, plus taxes minus subsidies on products". See Table 1.5.

Because each value added is itself equal to output minus intermediate consumption, the end result is: GDP **= Σ outputs – Σ intermediate consumptions**.

The composite formula for GDP (known as an "**aggregate**") constitutes a macroeconomic indicator of output that is independent of the pattern of organisation and avoids double counting. It provides a good illustration of the three essential rules followed by national accountants when they move from the microeconomy to the macroeconomy:

- avoid double counting;
- devise aggregates that are economically significant (i.e. whose value is independent of non-economic factors); and
- create indicators that are measurable in practice.

GDP vs. other aggregates

Why the bizarre title "Gross Domestic Product", or GDP? It should be clear by now that "product" describes what one is trying to measure, i.e. the result of production. "Domestic" indicates that the output measured is produced within the economic territory of the country, or the group of countries, concerned. (It is in fact entirely possible to calculate GDP for a group of countries, such as that of the euro area.) "Gross" means the **consumption of fixed capital** is not deducted (see below).

"Domestic" is also in opposition to "National", as in **GNI** or **Gross National Income**, which is the current title of what was referred to as **GNP**, or **Gross National Product**, in previous systems of national accounts ("GNP" is still widely used out of habit). GDP measures the total *production* occurring within the territory, while GNI measures the total *income* (excluding capital gains and

losses) of all economic agents residing within the territory (households, firms and government institutions).

To convert GDP into GNI, it is necessary to add the income received by resident units from abroad and deduct the income created by production in the country but transferred to units residing abroad. For example, the earnings of workers living in Germany but working in neighbouring parts of Switzerland or Luxembourg have to be added to the German GDP to obtain its GNI. Conversely, the earnings of the seasonal or regular workers living in France or Poland and working across the border in Germany have to be deducted from the German GDP to obtain the German GNI.

For large countries like Germany, the difference between GDP and GNI is small (2.4%, as seen in the following table). But it is larger for a small country like Luxembourg, which pays out a substantial percentage of its GDP as workers' earnings and other so-called "primary income" to the "**rest of the world**" (which is the term used by national accounts to signify "all countries other than Luxembourg", in this case). Primary income includes interest paid on money invested in Luxembourg. Luxembourg also receives substantial primary income from abroad, including interest. In the final analysis, the difference between GDP and GNI is around -31.9% for Luxembourg. Ireland is in a comparable situation to Luxembourg, since it pays out substantial dividends to the parent companies of the American multinational firms that have set up there, partly, but not entirely, for tax reasons. The result is that Ireland's GNI is 18.3% lower than its GDP. While for these two countries GNI is lower than GDP, the opposite also happens – Germany and Switzerland are a case in point.

Table 1.2. **Reconciliation of GDP and GNI for Germany, Luxembourg and Ireland**

Million euros

Year 2012	Germany	Luxembourg	Ireland
B1_GS1: Gross domestic product	2 666 400	42 899	163 938
(+) D1_D4FRS2: Primary incomes receivable from the rest of the world	206 600	101 109	58 316
(-) D1_D4TOS2: Primary incomes payable to the rest of the world	142 930	114 784	88 390
B5_GS1: Gross national income at market prices	2 730 070	29 225	133 864
Difference between GDP and GNI (%)	2.4	-31.9	-18.3

Source: OECD (2013), "Aggregate National Accounts: Disposable income and net lending/borrowing", OECD National Accounts Statistics (database), *http://dx.doi.org/10.1787/data-00002-en*.

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A distinction is also made between GDP and **Net Domestic Product (NDP).** In order to produce goods and services ("the output") at least three factors are required: labour (the "labour force"), goods and services (intermediate consumption) and capital (machinery). These various factors represent the "inputs" in the production process.

In order to arrive at a genuine measurement of the *new wealth created during the period*, a deduction has to be made for the cost of using up capital (such as the "wear and tear" on machinery). This is known as **consumption of fixed capital**. When this consumption is deducted, the result is **net value added,** and NDP is the sum of these net values added: NDP = Σ Net Values Added. Although less widely used than GDP, NDP is, in theory, a better measure of the wealth produced since it deducts the cost of wearing out the machinery and other capital assets used in production. For similar reasons, in theory, Net National Income is a better measure than GNI of the income created because Net National Income deducts the cost of using up capital assets. However, OECD economists tend to prefer GDP or GNI (over NDP and NNI) for two reasons. First, methods for calculating consumption of fixed capital are complex and tend to differ between countries, thus creating doubts about the comparability of results. Second, when ranking countries or analysing growth, the differences between GDP and NDP are small and do not change the conclusions.

2. The first fundamental equation: Deriving GDP in volume

Let us go back to Table 1.1: "Main Macroeconomic Variables", shown at the very beginning of the chapter. Comments from OECD economists (shown below the table) indicate that they are not interested in GDP growth as such, but in the growth of "real" GDP. What does this expression mean?

> *Economists and journalists have acquired the unfortunate habit of using the general term "growth" instead of specifying "growth in real GDP". A typical sentence is: "growth is 2%" instead of "growth in real GDP is 2%". This lack of precision sometimes results in bizarre terminology, such as "negative growth", which is an oxymoron; it would be better to say "a decrease of GDP in volume". Incidentally, national accountants prefer the term "GDP in volume" to "real GDP" because inflation is just as real as growth.*

The A-B-C of macroeconomics consists of distinguishing what part of the change in national accounts aggregates at current prices stems from a change in the quantities produced and what part stems from a change in prices. Let us suppose, for example, that the output of pasta is worth 100 000 dollars in

the first year and 110 000 dollars in the second. The macroeconomist will immediately want to know if this 10% growth (which may be described as "nominal" or "in value" or, better still, "at current prices") is due to an increase in the quantity of pasta or to an increase in its price. An increase in quantity is good news, while an increase in prices ("inflation") tends to be bad news. Keeping in mind the aim of separating the good growth (the quantities) from the bad growth (inflation), national accountants have developed sophisticated methods for separating out movements in GDP "at current prices" into two components: (1) an indicator of the change in quantity (the "real GDP" or, preferably, "**GDP in volume**"); and (2) an indicator of the change in prices, called the "**GDP deflator**". These methods are described in detail in Chapter 2.

Recall that the 100 000 dollars' worth of pasta production mentioned earlier equals 100 tonnes of pasta (the quantity) multiplied by 1 000 dollars (the price per tonne). In almost the same way, the index of the growth rate of GDP at current prices is exactly equal to the index of the growth rate of GDP in volume multiplied by the index of the growth rate of the GDP deflator:

Fundamental equation (1)

[1 + the growth rate (divided by 100) of GDP at current prices] =
[1 + the growth rate (divided by 100) of GDP in volume] ×
[1 + the growth rate (divided by 100) of the GDP deflator]

This is a fundamental equation in the national accounts, and the term "deflator" stems directly from it. This is because one can derive from this fundamental equation the following equation:

[1 + (Growth rate of GDP in volume/100)] =
[1 + (Growth rate of GDP at current prices/100)] /
[1 + (Growth rate of the GDP deflator/100)]

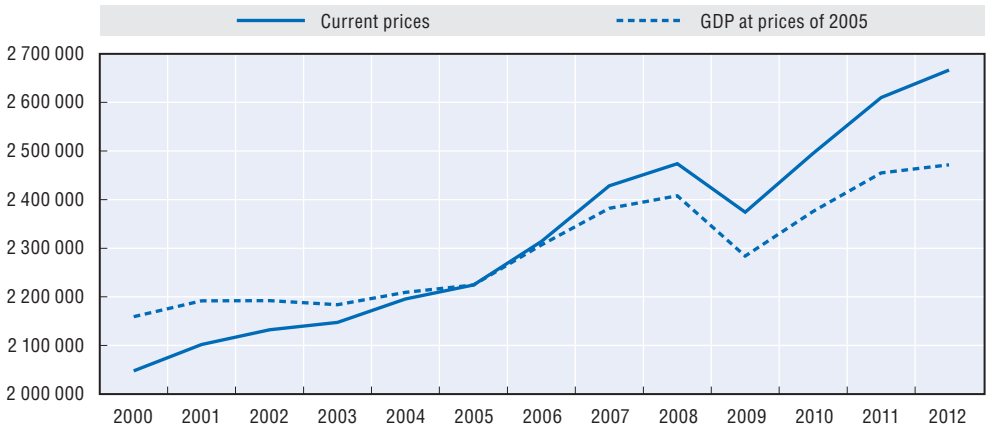
In this way, starting with GDP growth at current prices, one "deflates" (i.e. divides) this by the price indicator (the GDP deflator) to obtain the volume indicator (GDP volume). Conversely, in the previous version of the equation, GDP growth in volume was "inflated" by the price indicator in order to obtain GDP growth at current prices. Note that these equations showing the breakdown into volume and price movements apply not only to GDP but also to some of the other key variables in the national accounts, notably investment and consumption. Note also that this equation also applies to absolute levels. Thus, GDP in volume at absolute levels (i.e. in millions of dollars of the "base" year) is equal to GDP at current prices at absolute levels (i.e. in millions of dollars) divided by the implicit deflator, expressed as a price index divided by 100. When this operation is done, the base year for GDP in volume corresponds to the year for which the price index is conventionally equal to 100.

Macroeconomists pay very little attention to the evolution of GDP at current prices. It does not even appear in the main OECD table for Germany (see Table 1.1). In contrast, its two main components – real GDP and the GDP deflator – feature prominently in the table, one of them being used to measure growth and the other to measure inflation. GDP at current prices is, however, used as the denominator to standardise many important aggregates, such as the public deficit, the balance of exports and imports, national savings, etc. Ratios calculated as percentages of GDP, with both numerator and denominator usually expressed in current prices, are used to make international comparisons of variables that would otherwise depend on the size of the country.

Figure 1.1 below illustrates for Germany the relationship between GDP at current prices, GDP in volume and the GDP deflator. Unlike the earlier OECD table, which shows growth rates, this figure contains "absolute amounts". In other words, the two aggregates – GDP at current prices and GDP in volume – are expressed in billions of euros.

Figure 1.1. **Gross domestic product, in value and in volume**

Germany, million euros



Source: OECD (2013), "Aggregate National Accounts: Gross domestic product", OECD National Accounts Statistics (database), *http://dx.doi.org/10.1787/data-00001-en*.

StatLink http://dx.doi.org/10.1787/888933143546

It can be seen that the Germany GDP at current prices was roughly 2 470 billion euros in 2008, while the German GDP in volume (i.e. constant prices, shown in the figures as "GDP at prices of 2005") was around 2 410 billion euros for the same year. The GDP deflator (inflation) cannot be calculated in billions of euros and therefore does not appear as a separate line on the figure.[2] However, the GDP deflator can be inferred as the gap between

GDP in volume and GDP at current prices. The widening of this gap after the year 2005 indicates, in principle, the existence of inflation.[3] This is indeed the case, as can be seen from the fact that after 2005, GDP at current prices (the dark line) increases much faster than GDP in volume (the dotted line).

Notice that the two lines coincide in the year 2005. That is because in this figure, GDP in volume for all the years has been calculated using the prices prevalent in the year 2005. It is for this reason that the legend for the dotted line refers to GDP "at prices of 2005". By definition, the two aggregates – GDP at current prices and GDP in volume – have to be equal for this particular year (known as the "base year" or the "reference year"). We shall come back to these questions in Chapter 2, but what one should infer from this example is that it is very important whether the aggregate is in volume or not. The choice of the base year is less important, especially when applied to growth rates, which is what economists focus on.

Table 1.3 shows the variations in Germany's GDP deflator. It can be seen that the years 2010 to 2012 were characterised by fairly low inflation, which remained near to 1%. For comparison, the table also shows the annual variation in the consumer price index (CPI).[4] This index is another indicator of inflation that is better known and more frequently used than the GDP deflator, mainly because it is available monthly and relates to the aggregate that is of most interest to people, namely consumption. The GDP deflator, also called "the implicit GDP price index" or, simply "implicit GDP deflator", is on the one hand more general in scope than the CPI, since it also covers capital goods. But on the other hand, it is less general because it measures only domestic inflation, with increases in import prices not directly taken into account. Moreover, except for the very few countries that compile their national accounts each month, the GDP deflator is available only quarterly.

Table 1.3. **GDP deflator and consumer price index**
Germany, annual growth rates in percentage

	2010	2011	2012	2013	2014
PGDP: Gross domestic product, deflator, market prices	0.9	0.8	1.3	1.2	1.7
CPIH: Consumer price index, harmonised	1.2	2.5	2.1	1.6	2.0

Source: OECD (2013), "OECD Economic Outlook No. 93", OECD Economic Outlook: Statistics and Projections (database), doi: *http://dx.doi.org/10.1787/data-00655-en*.

StatLink http://dx.doi.org/10.1787/888933143552

3. Defining demand: the role of investment and consumption

Let us return to Table 1.1 at the beginning of this chapter. The OECD economists had noted an upturn in investment by firms and households that can be seen in Table 1.1 by looking at the variable "Gross capital formation",

which had declined 4.9% in 2012, 0.5% in 2013, but was expected to significantly rebound by 5.4% in 2014. Like real GDP, this variable is shown in Table 1.1 "at 2005 prices", in other words "in volume". For a macroeconomic aggregate, growth of more than 3% in volume is a good performance, even if China or India show even better performance. However, at the time of writing, this was still only a forecast waiting to be confirmed.

In the national accounts, investment, i.e. the purchase of machinery (including software) and buildings (offices, infrastructure, dwellings) and the constitution of stocks (inventories) is known as **gross capital formation (GCF)**. When stock-building (or **"changes in inventories"**) is excluded, leaving only the purchases of buildings and machinery, the result is known as **gross fixed capital formation (GFCF)**. This variable measures total expenditures on products intended to be used for future production. These types of products are collectively known as "fixed" capital".[5] Why not simply call them investment, as economists in fact often do? Because the word "investment" in everyday use applies as much to financial investment ("I invest in shares of the stock market") as it does to investment in machinery and buildings. So to make a clear distinction between the two applications, the national accountants use this somewhat peculiar terminology. Finally, the word "gross" indicates that the expenditure is measured without deducting the consumption of fixed capital (the wear and tear).

The OECD economists were counting to some extent on "*wage and employment gains to support domestic demand*". "Private final consumption" is the main part of domestic demand and OECD economists expected a surge of private consumption of 2.2% in 2014. "Private consumption" is essentially what the national accountants call **household final consumption expenditure**.

Private consumption includes household consumption expenditure and also expenditure by "non-profit institutions serving households" (NPISHs). For the definition of "households" and "NPISHs", see Chapters 5 and 6.

This variable covers all purchases made by consumers: food, clothing, housing services (rents), energy, durable goods (notably cars), spending on health, on leisure and on miscellaneous services. Consumption expenditure does not, however, include households' purchases of dwellings, which are counted as household GFCF. The "consumption" variable is in contrast to "GFCF", with consumption intended to designate purchases that are consumed (in the sense of "used up" or "destroyed") during the period, while GFCF refers to purchases intended to be used for future production. However, this

distinction is somewhat arbitrary, since purchases of cars by households (goods that are certainly intended to last) are classified as consumption (see box "Limitations and pitfalls"). Why "final" consumption? It is in contrast to intermediate consumption, referred to earlier.

After GDP, household final consumption is undoubtedly the most important variable in the national accounts, representing in general more than 60% of GDP. Indeed, the economic model providing the underlying framework for the national accounts is aimed at maximising this consumption, although today there is increasing concern that consumption should be sustainable in the longer term ("sustainable development").

4. Second fundamental equation: Reconciling global output and demand

Final consumption and investment are two of the main components of "final" macroeconomic demand. The great attraction of the national accounts is that they constitute a "reconciled" model of the economy, balancing supply and demand. In fact, the second fundamental equation of the national accounts can be written as follows:

Fundamental equation (2)

GDP = Sum of final demand aggregates

In order to grasp the origin of this essential accounting equation, let us return to the example of the pasta industry.

	Year 2		
	Farmer	Firm A1	Firm A2
Input	*Labour + machinery*	*Labour + machinery + wheat*	*Labour + machinery + flour*
Output	$ 10 000	$ 30 000	$ 100 000
Intermediate consumption	0	$ 10 000	$ 30 000
Value added	**$ 10 000**	**$ 20 000**	**$ 70 000**

Recall that GDP is equal to total value added or, equivalently, to total output minus total intermediate consumption. If one adds up the output, this means adding together the 10 000 dollars' worth of wheat, the 30 000 dollars' worth of flour and the 100 000 dollars' worth of pasta, resulting in a total of 140 000 dollars. If one now deducts the intermediate consumption, this means removing the 10 000 dollars' worth of wheat and the 30 000 dollars' worth of flour, leaving the 100 000 dollars' worth of pasta. If one simplifies matters by ignoring possible inventory accumulation in the factory and in the distribution circuit, the 100 000 dollars corresponds exactly to the purchases by households, in other words to household final consumption expenditure.

This example shows that GDP, the sum of all values added, is equal, *by definition*, to final demand, which, in this case, consists only of household demand for pasta.

Only a small amount of elaboration is needed to bring this example much closer to reality. If one introduces a firm that makes the machinery used to manufacture pasta, it can be verified that GDP equals exactly the consumption of pasta plus the purchase of the machinery used to make it, i.e. household consumption plus GCF. This opens the system up to GCF in addition to household consumption. In addition, if we assume that the economy is open to imports and that there is external demand reflected in exports, the equation is now supplemented with these additional flows:

GDP + Imports = Household consumption + GCF + Exports

The left-hand side of the equation consists of supply at the macroeconomic level, made up of domestic production (GDP) and external supply (imports). The right-hand side consists of final demand, broken down into domestic demand (household consumption and GCF) and external demand (exports). Macroeconomists often use this equation in another, mathematically equivalent form:

GDP = Household consumption + GCF + Net Exports

The left-hand side now consists solely of GDP, the principal indicator of economic activity. The right-hand side consists of the "final uses" that are the major components of domestic demand together with "net exports", which is simply the difference between exports and imports. This accounting equation is fundamental in analysing the economic condition. It provides a perfect illustration of the impact of demand on supply, according to Keynesian reasoning. It is no accident, in fact, that national accounting was developed during the 1940s, just after Keynes' major discoveries.

To be fully precise, the above equation has to be made slightly more complex, as shown in Table 1.4. The second fundamental equation in the national accounts can easily be verified by looking at this table. The addition of the rows in bold type (total final consumption, gross capital formation, external balance of goods and services) is equal to GDP, to the nearest million euros. This table introduces the concept of *final consumption of NPISHs* ("non-profit institutions serving households"), which accounts for only a tiny proportion of GDP (1.6 %),[6] so that economists often add it to household consumption, thus creating the "private consumption" aggregate.

A much more important introduction is that of *general government consumption* (19.3% of GDP), which exceeds GFCF (17.6%) but is substantially smaller than household consumption (55.9%). We shall return to the significance of this "general government consumption" variable in Chapter 5. The table also shows stock-building ("changes in inventories"). Although

usually small in absolute terms, stock-building nevertheless plays an important role in the short term. In fact, inventories come into play as a "shock absorber" between production and final demand from households and firms. Note that unlike other variables, changes in inventories are not shown in macroeconomic tables as a percentage of GDP or as a growth rate, but as contributions to GDP growth (see Box 1.2: "Contributions to growth").

Table 1.4. **Germany, expenditure approach**
Germany, 2012

Codes[a]		Million euros	% of GDP
B1_GE	Gross domestic product (expenditure approach)	2 666 400	
P3	**Final consumption expenditure**	**2 048 220**	
	of which:		
P31S14	Final consumption expenditure of households	1 490 500	55.9
P31S15	Final consumption expenditure of non-profit institutions serving households	43 370	1.6
P3S13	Final consumption expenditure of general government	514 350	19.3
P5	**Gross capital formation**	**460 270**	
	of which:		
P51	Gross fixed capital formation	470 550	17.6
P52	Changes in inventories	-13 150	
B11	**External balance of goods and services**	**157 910**	
	of which:		
P6	Exports of goods and services	1 381 030	51.8
P7	Imports of goods and services	1 223 120	45.9

a) The table shows the official SNA codes, which the reader can find on the website accompanying this book. These codes facilitate the understanding and manipulation of the data.

Source: OECD (2013), "Aggregate National Accounts: Gross domestic product", OECD National Accounts Statistics (database), *http://dx.doi.org/10.1787/data-00001-en*.

StatLink *http://dx.doi.org/10.1787/888933143564*

Short-term macroeconomic analysis relies heavily on the equation set out on the previous page, but expressed in volume. The equation provides a mathematical explanation of GDP growth in terms of its various components. The value of national accounts is that the general macroeconomic concept of the influence of demand on supply in this way takes concrete form as an accounting equation.[7] This was the same equation underpinning the OECD economists' remark: *"While subdued activity in the euro area will hold back the recovery, the pick up of world trade is projected to increase export growth…and thus GDP"*.

Box 1.2. **Contributions to growth**

In this box, the sign Δ will be used to express the difference between two years (or two quarters), so that ΔGDP_t signifies $GDP_t - GDP_{t-1}$, in other words the difference between GDP in year (quarter) t and GDP in year (quarter) t–1. Using this notation, $\Delta GDP_t/GDP_{t-1}$, will be equal to the GDP growth rate for year (or quarter) t compared with year (or quarter) t–1.

The starting point is a simplified volume equation: $GDP_t = C_t + I_t + X_t$ (where GDP = Final consumption + GFCF + Exports). For this simplified equation, we assume that there are no imports and no inventories. Mathematically, this results in the "difference" equation: $\Delta GDP_t = \Delta C_t + \Delta I_t + \Delta X_t$. Dividing both sides by GDP_{t-1} then results in equation (a):

$$\frac{\Delta GDP_t}{GDP_{t-1}} = \frac{\Delta C_t}{GDP_{t-1}} + \frac{\Delta I_t}{GDP_{t-1}} + \frac{\Delta GDP_t}{GDP_{t-1}}$$

Dividing and multiplying each term on the right-hand side by its value in t–1 and reorganising, one obtains equation (b):

$$\frac{\Delta GDP_t}{GDP_{t-1}} = \frac{C_{t-1}}{GDP_{t-1}}\frac{\Delta C_t}{C_{t-1}} + \frac{I_{t-1}}{GDP_{t-1}}\frac{\Delta I_t}{I_{t-1}} + \frac{X_{t-1}}{GDP_{t-1}}\frac{\Delta X_t}{X_{t-1}}$$

The verbal translation of this second equation is as follows: GDP growth breaks down exactly into the contribution of consumption plus the contribution of investment plus the contribution of exports. Each contribution is equal to the weight of the variable multiplied by the growth rate of the same variable in the current period. The weight of the variable is equal to its value in the previous period divided by the GDP of the previous period.

This breakdown of growth is widely used by macroeconomists. As can be seen, it is based on the second fundamental equation. Exercise 4, at the end of this chapter, will enable you to carry out a practical application. It involves the calculation of the contribution of changes in inventories and net exports. Since these variables can be positive or negative, it is necessary to use version (a) of the above equation to calculate their contributions to growth, and not version (b). In macroeconomic tables expressed in growth rates, changes in inventories and net exports are never shown in terms of percentage growth rates but solely as contributions to growth.

It is important to note that the calculation of contributions to growth basically relies on the accounting identity between GDP and final demand. Unfortunately, this mathematical link is no longer fully valid when using chain-linked volume measures because the results are not additive. Chapter 2 explains chain- linked volume accounts, their advantages and disadvantages, and shows how to compile contributions to growth in this new context.

5. Third fundamental equation: Reconciling global output and income

The previous section dealt with the first macroeconomic reconciliation, between global output (measured by the sum of the values added) and final demand. There is a second reconciliation, this time between global output and the income of economic agents. Any production activity generates income that is shared between the three "factors of production": labour, capital and intermediate consumption. Since value added is equal to output minus intermediate consumption, this second macroeconomic reconciliation can be written more simply by eliminating intermediate consumption and using value added as the global indicator of output. This means that there are now just two factors creating value added, namely labour and capital, which are compensated respectively by salaries and by the profits generated through production. It is these types of income that subsequently enable economic agents – households and firms – to consume and invest. For example, the 100 000 dollars of GDP of our now-familiar pasta industry are divided between the profits of the farmer, the two firms A1 and A2, and the salaries of the staff at firms A1 and A2.

In the end, our two macroeconomic reconciliations can be summarised in the following double fundamental equation:

Fundamental equation (3)

Output (sum of the values added) =
Income (employees' salaries + company profits) =
Final demand (Consumption + GFC + Net exports)

We shall be evaluating the way in which the national accounts record income in the chapters dealing with the accounts of households, enterprises and government sectors. For the moment, let us note simply the following fundamental result: GDP is also equal to total income. This is the third fundamental equation. Note also that in the national accounts one talks of **"compensation of employees"** rather than salaries, because the cost of labour includes social contributions paid by the employers, and that profits are known as **operating surplus** or, in some cases, as **mixed income**.[8] The operating surplus is described as "gross" when no deduction is made for the cost of the depreciation of capital, known as "consumption of fixed capital" in the national accounts. It is in fact preferable to analyse this surplus in "net" terms, in other words, after deducting consumption of fixed capital, as we shall see in Chapter 7.

Three ways to measure GDP

To summarise, there are three "approaches" to GDP: (1) the output approach (the sum of gross values added); (2) the final demand approach (consumption + investment + net exports); and (3) the income approach (compensation of employees + gross operating surplus + gross mixed income).[9]

Table 1.5 illustrates the equality of the three approaches for 1991 and 2012. The presentation is slightly more complicated than the double equation set out above, notably because of the introduction of **taxes net of subsidies**. For the time being, however, we will ignore this difficulty. Below, the reader can verify that the "three" GDPs are exactly equal, at 1 535 billion euros in 1991 and 2 666 billion euros in 2012.[10] Comparison between the two years illustrates certain fundamental changes that have taken place in Germany since reunification and the recent impact of the 2008 economic crisis. As Figure 1.2 shows, the share of employee compensation in GDP fell regularly from 56.0% in 1991 to 49.0% in 2007 but rebounded then to 51.6% in 2012. This rebound originates from the fact that it was the profits that bore the brunt of the shock of the crisis in 2008-09.

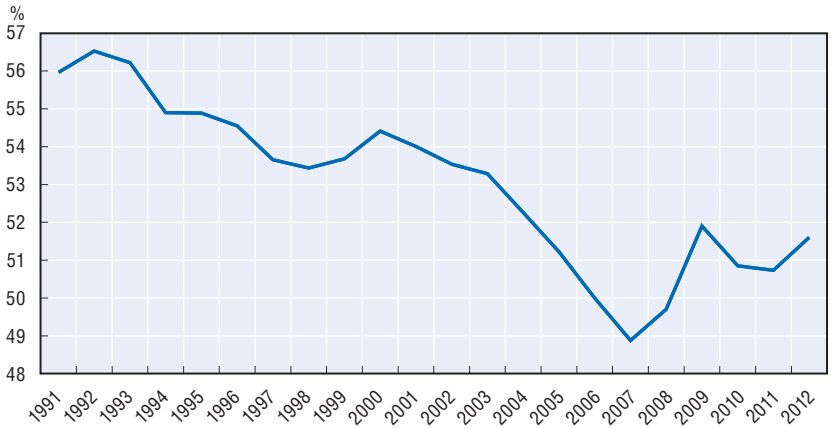
Table 1.5. **The three approaches to GDP**
Germany, billion euros

		1991	2012
GDP	Gross domestic product (output approach)	1 535	2 666
B1B	Gross value added at basic prices, excluding FISIM	1 393	2 387
D21_D31	+ Taxes less subsidies on products	141	280
GDP	Gross domestic product (expenditure approach)	1 535	2 666
P3	Final consumption expenditure	1 171	2 048
P5	+ Gross capital formation	369	460
P6	+ Exports of goods and services	394	1 381
P7	– Imports of goods and services	400	1 223
GDP	Gross domestic product (income approach)	1 535	2 666
D1	Compensation of employees	859	1 376
B2+B3	+ Gross operating surplus and gross mixed income	554	1 016
D2	+ Taxes less subsidies on production and imports	122	274

Source: OECD (2013), "Aggregate National Accounts: Gross domestic product", OECD National Accounts Statistics (database), *http://dx.doi.org/10.1787/data-00001-en*.

StatLink http://dx.doi.org/10.1787/888933143571

Figure 1.2. **Employee compensation**
As a percentage of GDP, Germany



Source: OECD (2013), "Aggregate National Accounts: Gross domestic product", OECD National Accounts Statistics (database), *http://dx.doi.org/10.1787/data-00001-en*.

StatLink *http://dx.doi.org/10.1787/888933143584*

Saving ratio and the general government financial balance

The principal macroeconomic indicators used by the OECD in Table 1.1. include two aggregates to which no reference has yet been made: the *household saving ratio* and the *general government financial balance*. They are shown again below.

Germany
Summary of recent results and forecasts

	2010	2011	2012	2013	2014
Household saving ratio[a]	10.9	10.4	10.3	10.3	10.1
General government financial balance[b]	-4.2	-0.8	0.2	-0.2	0.0

a) Net saving as % of net disposable income.
b) % of GDP.
Source: OECD (2013), "OECD Economic Outlook No. 93", OECD Economic Outlook: Statistics and Projections (database), doi: *http://dx.doi.org/10.1787/data-00655-en*.

The household saving ratio is equal to saving by households expressed as a percentage of their disposable income,[11] both these variables being expressed at current prices. The ratio represents the portion of household income that is not consumed. In 2012, the German household saving ratio was 10.3%. In other words, out of every thousand euros of household income (after tax), 103 euros were saved – for investment in housing, kept as cash or used to purchase financial products such as shares, bonds or life insurance. This

variable is of great importance in macroeconomics, as its evolution determines the relationship between income and consumption.

The general government financial balance corresponds to what is commonly referred to as the public surplus or deficit.

"General government" includes the central government, local authorities, social security and the various organisations depending on them. However, it does not cover enterprises such as railways, telephone companies or electricity firms, which are state-owned in some countries. We shall be returning to these classifications in Chapters 7 and 9.

In the national accounts, it has the more complicated but fairly eloquent title "net lending/net borrowing of general government". This variable is equal to the difference between the sum of all general government revenues and the sum of general government expenditures, whether they be "current" (civil service salaries, interest on the public debt) or "capital" (investment). A negative difference shows that government has a borrowing requirement. That is because when revenue falls short of expenditure it will be necessary to find financing for the difference, mainly through borrowing and hence increasing the public debt. A positive difference shows the existence of a financing capacity. Since the 1991 unification, this has occurred three times, in 2000, 2007 and 2012, in Germany, and the budget is expected to be balanced in 2014.

It has become customary, especially for European countries since the signing of the Maastricht Treaty, to express "net lending/net borrowing of general government" as a percentage of GDP at current prices. This is one of the cases in which GDP at current prices is used in absolute terms as the denominator of a magnitude. This approach makes it possible to compare deficits between countries while automatically adjusting for the different size of their economies, and it underlies the "Maastricht criterion" stipulating that the public deficit must not exceed 3% of GDP. Following the recent financial and economic crisis, most governments of the European Union found themselves in "excessive deficit" because they had to increase their social expenses, in particular unemployment benefits, while, at the same time tax and social contributions revenues were lower because of recession or very slow growth. The European Commission has significantly increased the constraints of the Stability and Growth Pact during 2010-11 to face the increasing threat posed by the high debt level due to the accumulation of these deficits.

This completes our presentation of all the variables that appear in Table 1.1: "Main Macroeconomic Variables".

Notes

1. The *OECD Economic Outlook* contains the biannual macroeconomic forecasts for each OECD country and the OECD area as a whole. Each edition is numbered, with the edition for May 2013 being the 93rd in the series.
2. When not shown as a growth rate, the GDP deflator is shown, like all price indices, as a series of dimensionless numbers whose change represents changes in prices, with the value in a given base year equal to 100.
3. Strictly speaking, one should use a logarithmic scale for the vertical axis.
4. In fact, what we have here is the European version of this index, known as the "Harmonised index of consumer prices" (HICP) for Germany.
5. In contrast to "variable" capital, consisting of changes in inventories. These expressions go back to Karl Marx, who provided the far-distant inspiration for some of the ideas behind the national accounts.
6. Non-profit institutions may account for an appreciable part of GDP but most of them are recorded in a different sector in the national accounts. For example, mutual insurance institutions are included in the insurance sector. The NPISH sector covers only a small portion of all non-profit institutions, specifically those that are both financed and controlled by households.
7. Unfortunately, modern calculating methods mean that fundamental equation 2 no longer holds exactly in volume. We shall be returning to this problem of non-additivity in Chapter 2. For the time being, it is possible to ignore this difficulty.
8. "Mixed income" is the term applied to the gross operating surplus of "non-incorporated enterprises". Further light will be thrown on this point in Chapter 6.
9. One could also calculate the three approaches in terms of Net Domestic Product: the output approach (the sum of net values added); the final demand approach (consumption + net investment plus net exports); and the income approach (compensation of employees + net operating surplus + net mixed income).
10. This equation is not strictly verifiable for all countries, because of statistical discrepancies – notably in the case of the United States. See Chapters 10 and 12. Moreover, and this is a remark valid for the rest of the book (including exercices), the numbers shown in the tables are often rounded, so that totals do not match exactly the sum of their components. It may happen that there is a mistake, but more often it is simply that the sum of rounded numbers is not exactly equal to the rounding of the sum. This is the case in Table 1.5 with the value of 1 535 for the GDP (demand approach) for 1991. If one compiles P3 + P5 + P6 – P7, one obtains 1 534, and not 1 535. There is no mistake here. It is simply that the equality holds exactly when numbers are expressed in millions of euros, but does not when they are rounded into billions.
11. In this case, the saving and the disposable income are both net, meaning that consumption of fixed capital on dwellings owned by households is deducted from both aggregates. It is also possible to calculate the saving ratio on a gross basis.

References

European System of Accounts 2010 (ESA 2010), ISBN 978-92-79-31242-7 doi: *http://dx.doi.org/10.2785/16644*.

OECD (2013a), *OECD Economic Outlook*, Vol. 2013/1, OECD Publishing, doi: *http://dx.doi.org/10.1787/eco_outlook-v2013-1-en*.

OECD (2013b), "OECD Economic Outlook No. 93", OECD Economic Outlook: Statistics and Projections (database), doi: *http://dx.doi.org/10.1787/data-00655-en*.

OECD (2013c), "Aggregate National Accounts: Disposable income and net lending/borrowing", OECD National Accounts Statistics (database), *http://dx.doi.org/10.1787/data-00002-en*.

OECD (2013d), "Aggregate National Accounts: Gross domestic product", OECD National Accounts Statistics (database), *http://dx.doi.org/10.1787/data-00001-en*.

SNA 2008, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank, New York, 2009, System of National Accounts 2008, *http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf*.

Key points

- GDP is the sum of output within the country's territory minus the sum of intermediate consumption (increased by taxes net of subsidies on products).
- GDP is equal to the sum of the gross value added of each firm, non-profit institution, government body and household producing on the territory (increased by taxes net of subsidies on products).
- The change in GDP expressed in volume is the principal indicator of the change in macroeconomic activity.
- First fundamental equation: the index of the variation in GDP (or any other variable) at current prices breaks down precisely into the product of the index's variation in volume and the index's variation in prices, the latter being known as the "deflator" or the "implicit price index". The deflator can be used as a measure of inflation but differs from the consumer price index.
- Second fundamental equation: GDP is equal to the sum of the final demand aggregates.
- Third fundamental equation: GDP is equal to the sum of incomes (compensation of employees, gross operating surplus and gross mixed income of firms) increased by taxes net of subsidies on production.
- There are therefore three equivalent approaches to GDP: the output approach (sum of gross values added); the final demand approach (the sum of final consumption, GFCF, changes in inventories and net exports); and the income approach (sum of employee compensation, gross operating surplus and mixed income).

Going further

How are these figures obtained?

This is probably the most difficult question to answer in a short textbook on national accounts, but we shall attempt to do so. The illustrations will be taken from the French case, the one the authors know best. However, it will not be possible to give the reader precise answers, since many different methods are used, as is only natural in drawing up accounts covering all economic agents, including in the French case some 25 million households.

Despite their name, the national accounts bear only a partial similarity to the accounts of a company. The general frameworks are similar but the data sources are entirely different. The company accountant has at his disposal a ledger showing to the last cent all the transactions carried out by the firm during the period. The national accountant obviously has nothing similar for all agents, especially for households. For this reason, it is not unreasonable to speak of "national accounts statistics". The addition of the word "statistics" implies acceptance of the notions of approximation, estimation and revision, things in which the national accountants excel but which are anathema to company accountants.

In France, the principal methods for calculating the figures in the national accounts are based on the exploitation of the extremely comprehensive administrative sources available. These consist, on the one hand, of the database built up by Insee (the French public statistics office) on the basis of companies' tax declarations and, on the other, on the centralised information gathered by the public accounting system regarding government institutions. The tax source provides Insee with regular and virtually exhaustive information on more than 2 million French firms. Because these firms are obliged to submit fairly complete accounts drawn up according to precise rules (the "plan comptable general" or general accounting framework), it is possible to use these accounts to calculate the value added of each individual firm (in the case of the large firms) or for groups of firms (in the case of the small ones) and then to add them up. This covers the private sector (referred to as the "market" sector in the national accounts). As regards the "non-market" sector (central government, local authorities and tens of thousands of government institutions) the centralisation of their accounts is

carried out by the "Direction de la Comptabilité Publique" (Public Accounts Directorate) in the Finance Ministry, making it possible to calculate fairly precisely the value added for the non-market sector.

There is no such direct source in the case of households, whose consumption represents 60% of GDP. The national households' account is often calculated indirectly by using statistics from other sources. For example, the compensation of employees received by households is calculated by adding up compensation of employees paid out by firms, non-profit institutions and public units. Another common method is to obtain estimates of household aggregates "by difference". Take dividends for example. The dividends paid out by firms are known and the receipts of these dividends by firms and public bodies are also known. The balance of payments provides estimates of the dividends paid to, and received from, the rest of the world, from which one can compile the net dividends received from abroad (dividends received from abroad less dividends paid to other countries). There is a macroeconomic "accounting identity" which states that: "Dividends paid by firms = Dividends received by general government and firms + Net dividends from abroad + Dividends received by households". Turning this equation around gives: "Dividends received by households = Dividends paid by firms – Dividends received by firms and by general government – Net dividends received from abroad". Dividends received by households can therefore be calculated in this way as a "balance", i.e. what is left over. National accountants readily admit that it would be better to have direct sources concerning households, since calculation as a balance has the drawback of concentrating all measurement errors on the single household item. However, it is out of the question to ask households to draw up accounts, and it is therefore necessary to make the best of what is available.

As for the measurement of changes, the sources differ between quarterly accounts (these being the first to be published) or annual accounts. Quarterly accounts use monthly indicators to extrapolate the value of the national accounts variables. These indicators may not correspond perfectly to the definition used in the national accounts but are rapidly available. For example, use is made of the monthly turnover statistics that Insee obtains using Value-Added Tax (VAT) declarations in order to extrapolate, as a growth rate, the "output at current prices" variable. The figure for turnover is admittedly not exactly equal to output, since there may have been changes in inventories between the two periods concerned, but it is the only reasonably similar variable readily available. These "provisional" figures are subsequently revised when Insee has at its disposal (one year later) first-hand information regarding companies' accounts, the result being the so-called "semi-definitive" and, (two years later) the "definitive" accounts based on quasi exhaustive companies' accounts. This term is in fact an overstatement,

because these "definitive" accounts can themselves later be revised when a new "base" year is introduced. We shall be returning to these issues in Chapter 10.

Accuracy of national accounts

National accounts could better be called "national accounts statistics" because without this qualifier users may think they are as reliable as the business accounts of a company. This is not true. In particular, while GDP for technical reasons is often expressed in millions of units of the national currency, users should be aware that they are very, very far from being accurate at the level of millions. National accounts' quality is highly dependent on the quality of the statistical system that exists in a given country. And in all countries, at varying degrees, this system does not cover all units, leaving a significant number of adjustments to be made. National accounts data are therefore approximations. It is not even possible to give a summary figure of the accuracy of the GDP. Indeed, national accounts, and in particular GDP, are not the result of a single big survey for which one might compile a confidence interval. They are the result of combining a complex mix of data from many sources, many of which require adjustment to put them into a national accounts database and which are further adjusted to improve coherence, often using non-scientific methods.

It is useful to know that GDP levels can be revised by 1 to 3 percentage points when new benchmark data are introduced (excluding conceptual changes). It can even happen, although rarely, that some countries modify their estimate of GDP by more than 15% (Italy in 1987, China in 2005). In international comparisons, it is important to note that the quality of national accounts is not the same in all countries (see Chapter 3 on international comparisons). Overall, the OECD Statistics Directorate believes it may be misleading to establish a strict order of ranking countries based on GDP per capita at purchasing power parity in cases when countries are clustered around a narrow range of outcomes of less than 5 percentage points.

Limitations and pitfalls to be avoided

The results provided by the national accounts are now such a familiar part of everyday economic information that there is a tendency to forget how extremely ambitious the original project was and still is. It is no accident that the two major creators of modern national accounts (Simon Kuznets of the United States and Richard Stone of the United Kingdom) were both awarded Nobel prizes for economics (Kuznets in 1971 and Stone in 1984). However, it must be realized that, in order to achieve the aim of summarising a country's entire economic activity in a set of internally consistent tables, national

accounts have to accept significant approximations and adopt conventions that are sometimes arbitrary. It is necessary to be well aware of these conventions in order to avoid certain pitfalls. The following are a few of them.

Households' internal production (cooking, cleaning, running errands) is not covered in the national accounts. The principal reason is that inclusion would involve making very bold estimates of market value. This leads to the familiar criticism of GDP that if a man marries his cook the result is a reduction in GDP – perfectly true, but the problem is nevertheless marginal.

On the other hand, the national accounts include an estimate of the production of services in the form of the accommodation house owners provide for themselves. This is called "imputed rents" and is fairly difficult to estimate, since there is no observable transaction involved. However, if one were not to make this estimate, the change in GDP could be affected by a change in the proportion of households owning their own dwelling.

GDP includes the value added of general government. However, part of the production of general government ought in fact to be counted as the intermediate consumption of other branches. The national accounts assume only households are users of the services of general government. But in reality, firms also use the services of the police and other collective services provided by government. However, since there is no means of measuring this intermediate consumption, it is ignored, and GDP can therefore be said to be correspondingly overestimated.

The underground economy is badly measured in the national accounts. While, in principle, illicit activities should be included in GDP, this is difficult in practice. However, statistical offices make adjustments to take into account "underground" employment or tax fraud. In the case of France, for example, these adjustments increase GDP by around 4%.

The current version of the international system of national accounts (SNA 2008) contains a recommendation that R&D (including software) be counted as GFCF (investment) and not as intermediate consumption (current expenditure), with the result that GDPs have been revised upwards, by between 1% and 4% depending on the country. This is because GFCF forms part of final demand and hence GDP (fundamental equation 2), whereas intermediate consumption does not.

Expenditure for the purchase of a house is recorded as GFCF, but expenditure on durable goods, cars in particular, is classified as consumption. And yet the services rendered by a car generally last a fairly long time, although obviously not as long as those of a house. However, it was necessary to draw a line somewhere between consumption and investment.

It may seem strange that GDP rises if there are more road accidents. This is partly because of greater activity by emergency services. On the contrary,

one would intuitively like to see GDP diminishing in such circumstances. But this would be to confuse a measure of output (GDP) with a measure of welfare, which GDP is not (see Chapter 15). At most, GDP is a measure of the contribution of production to welfare. There are a great number of other dimensions to welfare that GDP does not claim to measure.

We shall be returning to these conventions throughout this book. They may be open to criticism, but it must not be overlooked that they have been the subject of lengthy discussions by national accountants and were often chosen for sound practical reasons. For example, we shall see in Chapter 10 that indirect taxes can be said to be counted twice over in GDP, but this was the only solution that met other criteria.

While the national accounts system has the above major limitations, it should not be criticised out of misunderstanding about its objectives and definitions. For example, many people fail to understand why GDP does not fall following major natural catastrophes (or terrorist attacks). This is because they misunderstand the definition of GDP, which, as we have seen, measures output during a given period. People tend to confuse GDP with the country's economic wealth. Undoubtedly, major calamities destroy part of the economic wealth (buildings, houses, roads and infrastructure*), but they do not, per se, constitute negative production and so do not directly contribute to a decline in GDP. Destruction can indirectly affect production in a negative or positive way. When a factory is destroyed it ceases production, but it also has to be rebuilt and this constitutes production. For this reason, paradoxically, it is possible for a natural catastrophe to have a positive impact (in the purely mathematical sense of the word "positive") on GDP.

The above remarks should also make it clear to the reader that GDP does not represent "the national wealth", as is sometimes said. National wealth is the stock of the nation's assets, while GDP is a flow of output. At the very most, GDP might be considered a measure of the change in national wealth. But even this is incorrect, since GDP does not contain the whole of this change because it excludes capital gains and losses. It is therefore preferable to speak of GDP simply as total output during a specific period.

Shortcuts

The national accounts are complicated and at the same time have important implications. For example, a major part of the EU Member countries' contributions to the budget of the European Commission depends

* Only a very few economic accounting systems, and not the national accounts, include an evaluation of human capital (see Chapter 15). This is why human losses do not appear in this list.

directly on their relative levels of GDP (GNI to be more precise). When methods are modified or figures are revised, it is useful for national accountants to know rapidly whether these modifications have "an impact on GDP", in their jargon. In order to find a quick answer to this question, the national accounts experts use certain "shortcuts". For example, they use this rule based on final demand: GDP is modified only if an element of final demand is modified.

Consider the following example. In 2012, the accounts for the year 2010 are recalculated using the database consisting of comprehensive company accounts. It then turns out, on the basis of these more reliable statistics, that the output of temporary employment services (in other words, the hiring of manpower) was substantially underestimated in the initial estimates. This leads to an appreciable increase in total output. Does this have an impact on GDP? The immediate answer is, no! The hiring of manpower is not part of household consumption; it is not investment; it does not enter foreign trade (or only to a very small extent). It therefore does not enter into final demand and is instead intermediate consumption. As a consequence, GDP is unaffected. This does not mean, however, that no modification has taken place. For one thing, the distribution of value added between the various branches has changed, with that of services increasing and that of manufacturing decreasing because of the increase in its intermediate consumption. However, the modification in total output is neutralised by an increase in intermediate consumption. See Exercise 7 for a practical application of this point.

This final demand rule works well in numerous cases. Take two other examples, R&D (Research and Development expenditure) and VAT (Value Added Tax, a type of sales tax). The new system of national accounts SNA 2008 introduced new rules for the treatment of R&D. Instead of being recorded as intermediate consumption, purchases of R&D were to be regarded as GFCF. Does this modification have an impact on GDP? The answer is, yes, because GFCF forms part of final demand, which is modified accordingly. Suppose the government decides to finance its expenditure by reducing income tax (which is unpopular) by 5 billion euros and by correspondingly increasing VAT (a less painful tax). This modification appears to be neutral at the macroeconomic level, since the deficit is unchanged. But that is not actually the case. Because final demand includes household consumption, which is measured at market prices and includes VAT, GDP will be increased by 5 billion euros (everything else remaining equal). It can therefore be shown that the precise origin of government financing (direct or indirect taxes) can affect the Maastricht public deficit criterion without any change in the deficit itself. This is because the denominator of the ratio on which the criterion is based is GDP. The ratio can therefore change even if the numerator, in this case the deficit, is unchanged. The national accounts are full of surprises.

On the other hand, GDP does not change if two elements of final demand are adjusted in opposite directions. For example, if the estimate for exports is reduced, and if this reduction is offset by an increase in final consumption, GDP remains unchanged.

Exercises for Chapter 1

Exercise 1: Observations and forecasts

Go to the OECD web site (*www.oecd.org*), find the most recent issue of the "Economic Outlook" and update Table 1.1 at the beginning of this chapter using the most recent figures. Comment on the differences between the new figures and the old. What has happened to bring about the change in the figures? In which direction did the OECD forecasters err?

Exercise 2: A simple calculation of GDP

Consider four firms: firm A, a mining enterprise, extracts iron ore; firm B, a steelmaker, uses iron to make steel sheets and ingots; firm C, a carmaker, makes automobiles using steel; firm D, a manufacturer of machinery and robots, also uses steel. Calculate the production, intermediate consumption and values added in millions of euros based on the following assumptions.

Firm A extracts 50 000 tonnes of ore, at 200 euros per tonne, its purchases during the period limited to the purchase of one machine made by firm D, costing 10 million euros. Firm B produces 15 000 tonnes of steel sheet at 3000 euros per tonne, having bought and used all the ore produced by firm A. Firm C has manufactured 5000 vehicles and sold them all to households for 15 000 euros each, having purchased 20 million euros' worth of steel sheet from firm B, but using only 18 million euros' worth in the manufacture of its cars. In addition, Firm C imported 5000 engines from a foreign subsidiary, each being valued at 4000 euros, and purchased domestically 2 robots made by firm D. Firm D sold one machine for 10 million euros and two robots, each worth 5 million euros, having used 10 million euros' worth of steel sheet from firm B.

Calculate the GDP of this economy. Calculate also the final demand of this economy, assuming that it has no exports. Verify that GDP is equal to final demand. (Remember that purchases of machinery are not intermediate consumption, but GFCF).

Exercise 3: Relationship between current prices, volume and deflator

The table below shows the series for GDP growth at current prices and the GDP deflator growth rate in the case of France. GDP at current prices in 2005

was equal to 1 718 047 million euros. Calculate the series for GDP in volume in millions of "2005 euros". Show how to calculate the series for GDP in volume directly from the growth rates, without using absolute amounts and without using division. Comment.

	2005	2006	2007	2008	2009
(1) Growth rate GDP	1.83	2.47	2.29	-0.08	-3.15
(2) Growth Rate Deflator	1.91	2.14	2.59	2.54	0.72

Exercise 4: Calculation of contributions to growth

The following table shows the French quarterly national accounts for Q2 2013, in volume, chained at previous year's prices, base 2005. Using the box earlier in the text, calculate to two decimal places the breakdown of growth in Q2 2013 for the contributions of domestic demand excluding inventories, changes in inventories and net exports. Comment.

Warning: in order to simplify the exercise, changes in inventories have been calculated for the sake of this exercise as the balancing item of the equation. This circumvents the difficulty raised by the chain linking process (see Chapter 2 for chain linked national accounts).

Quarterly national accounts

Volumes chained at previous year's prices, base 2005

	Q1 2013	Q2 2013
Change in inventories	-958	-274
Imports	131 850	134 137
Exports	125 297	127 769
Net exports	-6 553	-6 368
Total final domestic demand excluding inventories	458 369	459 839
Total gross domestic product	450 858	453 197

Exercise 5: The public deficit and the Maastricht criterion

On the basis of the following table, determine whether France meets the public deficit criterion (not more than 3% of GDP) during the period in question.

	2007	2008	2009	2010	2011	2012
Total expenditure	992.6	1 030.0	1 070.6	1 095.6	1 118.5	1 151.2
Total revenue	940.7	965.4	928.0	958.3	1 012.7	1 052.4
Gross domestic product	1 886.8	1 933.2	1 885.8	1 936.7	2 001.4	2 032.3

Exercise 6: Synonyms

There are a number of terms that are used in national accounts, but economists use a wide range of synonyms for them. Choose from the list in italics below all the correct synonyms for: (A) GDP at current prices; (B) GDP in volume; (C) GDP deflator; (D) public deficit. Beware that not all of them are synonyms for any of the above.

1. GNP, 2. GNI at current prices, 3. Nominal GDP, 4. Sum of output in euros, 5. GDP in quantities, 6. GDP in value, 7. GDP at constant prices, 8. Sum of gross values added in volume, 9. Deflated Net Domestic Product, 10. Real GDP, 11. GDP price index, 12. Consumer price index, 13. GDP at 1995 prices, 14. Sum of deflated incomes, 15. "Growth", 16. Financing capacity of public enterprises, 17. General government net borrowing.

Exercise 7: Impact of modifications to GDP

(Follow-up to Exercise 2 and application of the "Shortcuts" box.) In Exercise 2, you calculated the GDP of this economy. Let us now suppose that we omitted to mention that firm C, the car maker, hired manpower from firm E, the temporary employment agency, for the sum of 15 million euros. Has the GDP of the economy been modified by this fresh information? Confirm your reply by reconstituting the table for the different industries, with comments.

Exercise 8: Deflators and growth

There has been in the first decade of this century controversy regarding the comparability of growth as measured in Europe and in the United States. More particularly, this concerns the deflator for firms' investment in computers, now a very large item of expenditure. The statistical methods used in the United States mean that the relevant deflator falls faster than in Europe (see box in Section 3 of Chapter 2). First, show why for the same growth in purchases of computers at current prices, this difference in statistical method leads to a difference in GDP growth in volume. Go on to explain why this difference in GDP diminishes (to a vanishing point) if European countries produce few computers (or none).

The solutions to these exercises are available at:
http://dx.doi.org/10.1787/9789264214637-19-en