

## Chapter 4

### **Production: What it includes and excludes**

*This chapter looks at measuring production. Broadly, production leads to an “output” of goods and services, creating jobs, and generating income. Output is a central concept for national accounts, but what does output cover precisely? This chapter traces the “production frontier”, looking at how economists decide what to include in GDP and what to exclude. It considers the relation of the illegal and underground economies to this frontier, and it also looks at the measurement of output and of value added.*

**P**roduction is what leads to “output” (as it is termed in the national accounts), creating jobs, generating income for workers and owners of capital, and resulting in the goods and services found in our stores. Output is a central concept in economics. It is essentially used by economists in *volume* terms (i.e. not at current prices).

Output results from the three *factors of production*: labour, capital and intermediate consumption (inputs). Standard macroeconomic presentations often use a measure based on value added (rather than output) making it possible to dispense with intermediate consumption and hence show only labour and capital as the factors of production. When modelling the growth of output in volume (or, rather, the growth of value added when intermediate consumption has been deducted from both sides of the equation), OECD economists use the following formula:

$$Y' = [f(L,K) \times MFP]'$$

$Y'$  is the growth rate of value added;  $L$  stands for labour and  $K$  for capital;  $f$  is the production function; and the sign  $'$  means the derivative. The term “MFP” stands for “multifactor productivity”, which is that part of the change in value added that cannot be attributed to changes in the volume of labour or to capital inputs in production. Its rate of change represents the contribution to value added growth of a more productive combination of labour and capital (for example, improved organisation of work or new techniques). MFP is sometimes called “disembodied technological progress”, since it is the result of technical progress that is not reflected in the measurement of capital and labour. MFP is not directly measurable and can only be obtained as a residual from the above formula. Despite its elusive nature, MFP provides the main driving force behind long-term increases in the standard of living. In recent years, numerous studies have shown that MFP has been growing faster in the United States, Canada, Australia and Nordic European countries compared with France, Germany and Italy. Within continental Europe, this has triggered an awareness of the need to invest in new technologies and R&D and to carry out structural reforms.

OECD economists also use output (value added) statistics, again in volume terms, to estimate the “output gap”. They do so as part of the regular monitoring of the economic situation in member countries. The basic idea is simple. Given the quantity of labour and capital available at a given moment, what is the maximum growth rate of GDP in volume that can be obtained

without fuelling inflation? The corresponding level is known as “potential GDP”. Potential GDP is compared with observed GDP. If observed GDP is lower than potential GDP, there is said to be a “negative output gap”. In this situation, governments often resort to stimulating demand, either by tax cuts or by additional public spending (major infrastructure projects, and/or recruitment of civil servants, for example). The Central Bank, for its part, may decide to reduce its key interest rates. If there is a “positive output gap” – actual growth exceeds potential growth – it may then be difficult to raise public spending or lower taxes without automatically generating inflation, and the most common response is for the Central Bank to raise its key interest rates.

Although the idea itself is simple, the calculation of potential GDP is a complex matter, since it requires measuring the stock of capital and the value of the services provided by this capital, as well as measuring the labour factor. The latter is not simply the number of workers but rather the number of hours worked, adjusted for the qualitative composition (skill levels) of the workforce. Next, it is necessary to estimate the macroeconomic production function that relates these production factors to output. Despite these difficulties, the OECD evaluates the potential GDP growth rate for its members and regularly publishes the resulting “output gaps”. For example, in 2013 OECD economists thought that the Japanese output gap is nil (meaning that growth was at its potential level), whereas it was negative in the United States (-3.1), Germany (-0.8) and France (-2.4) (OECD, 2013). These figures vary according to the phases of the economic cycle.

*Economic growth is not steady but follows “economic cycles”. Following a recession (a lower increase or even a decline in GDP), the economy driven by increasing demands (e.g. corporate investment) picks up again, reaches a peak and then declines, falling back again into a recession. The whole cycle usually lasts between 6 to 10 years. And then a new cycle starts again.*

Non-inflationary growth above potential GDP can only be obtained by increasing the apparent productivity of capital and labour (see Box 4.1), and one of the ways to achieve this is via structural reforms.

Studies published by the OECD systematically include major sections on the progress made by member countries in regard to “structural reforms”. This expression often arouses suspicion on the part of the trade unions, which see it as a code word for attacks on acquired social rights, such as guaranteed minimum wages, employment-protection legislation and the entitlement to unemployment benefits following the loss of a job. However, this is a one-sided view of the matter, since structural reform involves deregulating

**Box 4.1. Apparent labour productivity**

Apparent labour productivity is defined as the ratio of output to labour. If  $Y$  denotes the volume of output and  $L$  the volume of labour, labour productivity is equal to  $Y/L$ , i.e. the quantity of output per unit of labour. For macroeconomic work, economists prefer to use value added in volume (i.e. GDP) as the numerator rather than output. The denominator used is the volume of labour, measured by the number of workers multiplied by average working hours (ideally adjusted for the skill level). In practice, one is usually more interested in growth in labour productivity than in its absolute level. This means calculating  $Y' - L'$  (rather than  $Y/L$ ), where  $Y'$  is the growth in volume of value added, and  $L'$  is the growth in the volume of labour.

markets for goods and services in addition to the labour market. Structural reform of product markets involves increased competition between producers through, for example, the opening up of markets to foreign competitors, the abolition of cartels and other anti-competitive arrangements, and the abandonment of state monopolies, especially in such fields as rail and air transport, telecommunications, electricity, gas and water.

In order to identify which sectors of the economy are particularly in need of structural reform, OECD economists compare the productivity of various industries in different member countries. They pay particular attention to the growth of certain sectors, such as carmakers, airlines and electricity companies. They then try to identify the institutional structures in countries with the fastest growth. What apparently works in these countries can be tried in others. All these analyses are largely based on the data for output, or value added in volume, provided by national accounts.

**1. The production frontier**

As it may have become clear from the above, **output** is a central concept for national accountants aiming to compile useful data.

*But the concept of “output” is foreign to business accounting, which focuses exclusively on “sales”.*

But it remains to be seen precisely what output covers. To do that, we need to trace the “production frontier”, deciding what to *include* in GDP and what to *exclude*. Most of what to include in GDP is non-controversial. For a start, output as measured in the national accounts includes what creates the goods and services that households buy for their everyday needs, and that

firms buy to be able to produce these goods and services. The important word in this last sentence is “buy”, implying that all transactions that are “monetised” are included in GDP. But what about the activity of civil servants and members of the armed forces? Nobody buys the output of ministries or of the army. Another grey area is that of household services rendered free of charge. If one person pays another to clean his windows, this is output, since a service has been sold. But what if people clean their own windows? Does this lie within the production frontier?

As we shall see later, there is general consensus favouring the inclusion in GDP of the services provided by general government. Although these services are not sold, they are included as output (value added) in the national accounts and are called non-market services produced by general government. This value added is very substantial, since it represents roughly 15% to 20% of GDP, depending on the OECD country concerned. By contrast, the “non-traded output” of households – cooking, cleaning, child care, etc. – is, with one exception, not included in the national accounts. The exception consists of the housing that homeowners implicitly provide for themselves. The national accounts act as if the owner-occupiers provided housing services (a dwelling to live in) to themselves. These notional, or in national accounts jargon “imputed” transactions, are estimated to be equal to the rents that homeowners would have paid to live in dwellings of the same type, in the same district and with the same service facilities. These imputed rents are added to actual rents to calculate the total output of “housing services”.

Imputations are carried out only when they are absolutely necessary for the analysis of changes over time in macroeconomic aggregates or for comparisons between several countries. This is the case for these imputed rents of owner-occupiers. If this output were not included by imputation, the result would be a structural decline over time in GDP, because the long-term upwards trend in home ownership would automatically produce a downward trend in the total value of actual rents (and thus in GDP, all things being equal). It would also make it difficult to compare the GDPs of different countries because the rate of home ownership varies markedly among countries.

Another example of imputation in national accounts is that of goods (mainly food) that some households produce for their own consumption. This represents only a very small part of output in OECD countries, but in developing countries, where farmers consume much of their own production, the proportion of this production for own consumption is much higher. In some countries, farmers and other households even produce their tools, houses, outbuildings or their own clothes. As a result, the convention adopted in national accounts has been to impute in the calculation of GDP the output of all **goods** going into households' own consumption, attributing to them the market price of an identical good. On the other hand, as we saw earlier, the

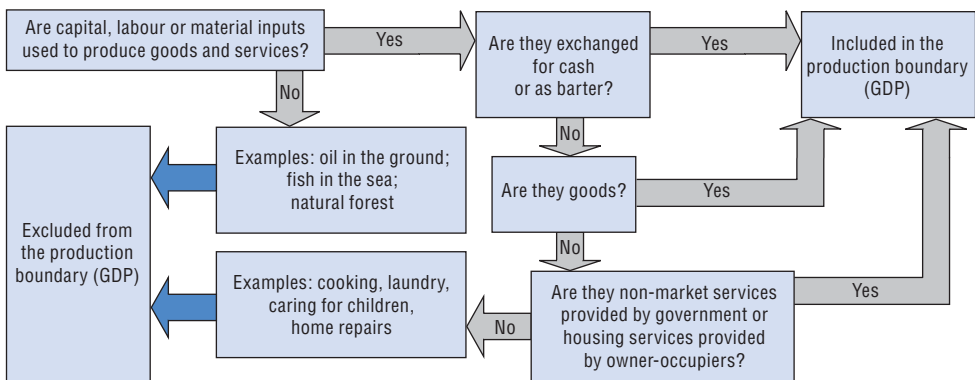
**services** households produce for themselves are not imputed in the national accounts, with the notable exception of housing services in the case of owner-occupiers. Nor is any account taken of the services some households provide to others free of charge (repairing a neighbour’s dripping tap for nothing).

*When services are provided for payment, attempts are made to include them in output by estimating, for example, the value of paid lessons or paid baby-sitting services.*

Such exclusions may seem arbitrary, but they at least have the merit of avoiding having to make too many imputations, some of them extremely hazardous (see box “Household Services” at the end of this chapter).

In conclusion, national accounts define output as the result of the utilisation of one, or more, of the three factors of production: labour, capital and intermediate consumption (material inputs). This necessary condition leads to a very broad definition of output. However, this is later narrowed down by the imposition of other criteria, as the following “decision tree” shows (start reading the diagram from the top left-hand corner). The most important arrow in the diagram, which one could regard as the heart of national accounts, is in the top right-hand corner. It indicates that output consists essentially of the value of goods and services produced by certain economic agents *for sale* to other economic agents (monetary exchange, or in exceptional cases, barter). In the economies of the OECD countries, this constitutes the bulk of output. However, one must not overlook the non-market services produced by general government and the imputed housing services enjoyed by owner-occupiers.

**The production decision tree**



Before going into more detail, it is important to note that output in the national accounts is the output of productive activity *during* a period, which can be a year or a quarter. It is described as a “flow variable” as opposed to a “stock variable”, which measures a stock, such as the stock of finished products on the 31 December of a given year. Flow variables can be summed; in other words the output for a given year is the sum of the output of the individual quarters. This is not true of stock variables.

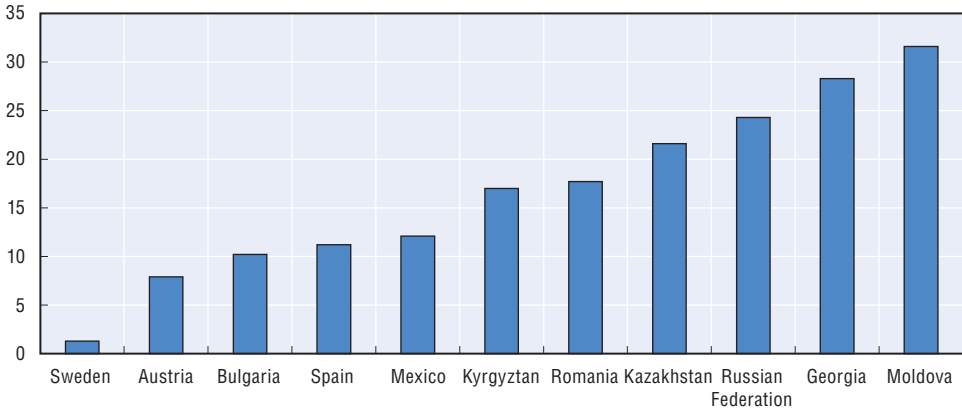
## 2. The illegal economy and the underground economy

In the diagram shown above, there is no distinction made between legal and illegal production. One can therefore conclude that illegal activities are within the production frontier and are hence included in GDP. Such activities are of two types: (1) illegal, such as trading in stolen goods, organised prostitution (in countries where it is illegal) and drug production and drug-dealing; and (2) legal but illegally conducted, such as plumbing or repair work paid in cash and not declared to the tax authorities.


In the OECD countries, illegal activities are marginal in macroeconomic terms. Most estimates have put them at less than 1% of GDP. Although theoretically included in GDP, in practice they are not estimated and can therefore be considered not to figure in GDP.\* On the other hand, legal activities carried out illegally (in order to avoid paying taxes and social contributions) constitute what is known as the “black” or “hidden” economy and are estimated to be anywhere from 2% to 15% of GDP in OECD countries. This proportion is so large that national accountants have had to develop special techniques to ensure they are included in GDP estimates. Figure 4.1 shows the share of GDP generated by hidden or underground activities. In the figure, these are referred to as the “non-observed” economy because they cannot be observed by the usual types of surveys. In Spain, for example, the non-observed economy represented at that time 11.2% of official GDP. This is the share of value added that has been added to the official statistical sources using these special techniques. It is therefore not true to say that the national accounts do not include the “underground” economy. For a concrete example of how this is done, see the box entitled “The adjustments for the underground economy in the case of France” in the section Going further.

\* It can be noted, however, that more and more countries are trying to capture illegal activities as well. In the European Union, with the introduction of the new standards, it has become mandatory as per the end of 2014 to also include an estimate of these activities.

Figure 4.1. **Non-observed activities included in the GDP (selected countries)**  
Adjustment for non-observed activities, in %, years around 2002



Source: United Nations Economic Commission for Europe: Non-observed economy in national accounts, Survey of country practices (2008)

StatLink  <http://dx.doi.org/10.1787/888933143750>

### 3. Measurement of output and of value added: The general case

As we saw earlier, output in the national accounts mainly consists of the value of goods and services produced in order to be sold to other agents (output not intended for sale is not recorded, with certain exceptions). As pointed out in Chapter 1, this poses a problem of aggregation, in that the sum of output measured in this way can change over time, not because more goods and services are produced but because firms are able to outsource certain activities previously carried out in-house (see Box 4.2: “The trap of internalisation and externalisation”). National accountants have therefore created the concept of **value added**. We shall be returning to this later.

However, even if value added is preferred to output, the concept of **output** is widely used in national accounts. How is it measured? Output at current prices is generally measured by sales. But an adjustment is necessary. In the case of goods, at least part of the output produced in the designated period may not be sold, and so it is stocked as inventory. Similarly, some of the goods sold in the current period may have come out of inventory (and not produced during the period). Finally, part of the output during the period may not have been completely finished and is stocked as “work in progress”. In the end, output at current prices is measured as: sales plus the change (positive or negative) in inventories of finished products or work in progress. This formula is regularly used to calculate output, since the data required exist in company accounts, albeit not always in easily usable form (see Box 4.3).



**Box 4.2. The trap of internalisation and externalisation**

In the measurement of output, national accounts do not include “own-account” production – that is, the intermediate goods and services produced and consumed by companies internally. National accounts record own-account production of firms only when the goods are intended for investment. For example, if a company makes cars, the national accounts will not record the production of the engines that power these cars if they are manufactured by the same company. Similarly, national accounts will not include the personnel services of this carmaker, if these services are provided internally. Recording the “own-account” output of intermediate goods and services would result in unduly inflating the figure for total output. On the other hand, if personnel services and the manufacture of engines are outsourced, in other words if the carmaker purchases these goods and services from another company, then this output will be recorded. A move from one form of organisation to another will therefore inflate total output, although in reality no new good or service has been created. Hence the attraction of the concept of value added (see Chapter 1), whose total is independent of a change in how firms are organised.

It is important to note that own-account output of capital goods, such as machines or software, is recorded in the national accounts. But why is own-account output of intermediate goods not recorded? It is not recorded, because intermediate goods and services have no impact on GDP, since by definition they will be consumed during the production process. Capital goods, on the other hand, are used over longer periods of time.

**Box 4.3. The problem of changes in the value of inventories**

One might think it is a simple matter to use data in company accounts to determine inventory changes. However, in practice it is not so easy, because inventories generate holding gains when prices are rising and holding losses when they are falling. It is a fundamental principle of national accounts to exclude holding gains and losses in the measurement of output. Indeed, if a firm makes a holding gain by merely keeping products in inventories, this does not constitute a productive process and therefore cannot be included in GDP. As a result, it is necessary to adjust the figures for inventory changes obtained from company accounts in order to eliminate holding gains and losses on inventories.

As for the prices at which output is measured, these are the “basic prices” corresponding to the revenue per unit of products sold that remain in the hands of the producer.

*An exception among OECD countries is the USA, which calculates its output and value added at market prices (i.e. including taxes on products). See Chapter 12.*

Basic price therefore does not include taxes on products (for example, value-added taxes or special taxes on petroleum products or alcoholic beverages), because these amounts do not remain with the producer but are forwarded to the tax authorities. On the other hand, the basic price includes the subsidies received on products. Therefore, in the national accounts, the prices for exported agricultural products are not the low prices made possible by the export subsidies granted to farmers of OECD countries but the actual sales prices plus the subsidies, thus a price that is closer to the real costs of production. Finally, output in volume is compiled as output at current prices deflated by the appropriate price index.

**Intermediate consumption** represents the value of the basic materials, components and semi-manufactured goods going into the product, as well as the value of the electricity, the cost of rents, IT services, insurance, legal and accounting services, etc., used in the production of a good or a service. In short, intermediate consumption consists of everything needed to produce other goods and services intended for sale, other than the labour of the internal workforce and the services provided by plant and machinery, offices and factory buildings.

Just as output is not equal to sales, intermediate consumption is not equal to the purchases of goods and services intended to be intermediately consumed. This is because certain intermediate goods used in the production during the period may have been bought and stocked in a previous period. Similarly, some purchases during the period may be consumed after it has ended, having been stocked in the meantime. In the end, intermediate consumption is equal to the purchases during the period *minus* the change (positive or negative) in the value of the inventories of goods and services for intermediate consumption. Firms often refer to these inventories as “materials inventories”. Like output, intermediate consumption is a flow, corresponding to what has been consumed *during* a period (a year or a quarter). This leads to the exclusion from the definition of intermediate consumption of the goods used for production but not entirely consumed during the period, such as machinery or software. These capital goods are classified as “gross fixed capital formation” or GFCF.

**Value added**, as its name implies, measures the value the firm adds to the products used to manufacture the output and is equal to: output minus intermediate consumption. It can be deduced, using the definitions given earlier for the measurement of output and intermediate consumption, that value added at current prices is equal to: sales minus purchases plus total inventory changes (finished products, work in progress and materials). Value added is a central concept in national accounts. However, because it is defined as a difference between two monetary values (output minus intermediate consumption), it is not clear at first sight exactly what it represents. A useful way of defining value added at current prices is to consider it as the amount of money generated by production that remains available to pay:

- wages and salaries and social contributions (*compensation of employees*);
- production taxes (other than that on products) net of operating subsidies;
- replacement of equipment gradually worn out during production (*consumption of fixed capital*);
- interest payments on loans;
- dividends paid to shareholders;
- purchase of new equipment; and
- financial saving – or the firms' investment in financial products.

It is sometimes this approach that is used in practice to measure firms' value added at current prices in the national accounts (see box "The data sources for the value added of non-financial enterprises in France" at the end of chapter). Value added in volume is the difference between output in volume and intermediate consumption in volume.

#### 4. The measurement of output and of value added: Special cases

The definition of output at current prices as equal to sales plus changes in inventories of finished products and work in progress is applicable to virtually the totality of the business sector in the national accounts. This sector is also known as the **market sector**, for which there exists a market with recorded sales, transactions and prices that permit the direct measurement of output. Note however that, even in the market sector, there are activities whose output is difficult to measure or even identify such as banks, insurance companies and retail distributors for which the definition of output based on sales does not work very well. They are all market activities, but their output is mainly purchased indirectly. Therefore an alternative measure of output is needed. Furthermore, there are large activities for which the notion of sales is non-existent, and these constitute the **non-market sector**, covering mainly services provided by general government. The

organizations concerned do not sell their services, and it is therefore necessary to find a different measure of their output.

**Non-market producers** are those that provide services, and in some cases goods, either free of charge or at prices that are not economically significant, meaning in practice prices that cover less than half the cost of production. General government bodies constitute the bulk of the non-market producers, but there are others, like the non-profit institutions (see Chapter 5). Most of the services provided by general government – defence, economic policy, foreign policy, public education and public health care – are provided to the general public without charge. These services are obviously financed through taxation and social contributions, but there is no direct link between the payment of the tax and the level of services received. Citizens or firms are not entitled, for example, to vary their taxes based on the amount of defence or policing they want to consume. A tax is a compulsory transfer to general government and is not the price of a public service.

Certain services provided by general government, like education and healthcare, are provided to households on an individualised basis, meaning that it is possible to know who consumes them. For instance, a family sends its children to the state school, and one therefore knows that it is a consumer of these services. Other services are provided only on a collective basis, meaning it is impossible to know who consumes what. An example is policing: all economic agents, households and firms consume part of the services of the police, but it is impossible to know how much each consumes. In the case of the individualised services, government can sometimes charge part of the price to the consumer (for example, the contribution to the cost of a hospital bed), but this price is usually well below the production costs of the services consumed, and the services are therefore considered non-market.

Whether individual or collective, as there are practically no sales, non-market output at current prices is conventionally measured as equal to the sum of its production costs, including: (a) the intermediate consumption; (b) the compensation of employees; (c) the consumption of fixed capital, which is the utilisation cost of the equipment used by non-market producers (see following Box 4.4); and, in rare cases (d) the other taxes paid on production. Exercise 4, at the end of this chapter, shows that measurement of non-market output in the national accounts basically assumes that these are non-profit activities, a very reasonable assumption.

The general formula for measuring output from sales cannot be used to measure the **output of banks**, because banks invoice directly only a very limited portion of their services (for example, foreign exchange commissions, cheque-handling fees, stock-market transaction fees, separately-charged financial advice), but not the bulk of their service, which is making loans.

**Box 4.4. Is the output of general government understated?**

Before a firm decides to buy capital goods, it calculates the return, or yield, on the funds it will be investing. This return must be sufficient to cover wear and tear (the consumption of fixed capital) plus a net income that is at least equal to the interest that could be obtained by investing the funds in financial products (bonds, for example). If the return is not sufficient to cover these two elements, a rational entrepreneur will buy the financial products rather than the physical capital. The sum of the consumption of fixed capital and this net return is known as services from capital.

In the case of general government, the production costs used to evaluate output include consumption of fixed capital, but they omit the net return. For a firm, the net return is close to its net operating surplus (see Chapter 7). Because government services are not sold (or only to a marginal extent), it is not possible to calculate the net operating surplus, but the net return could be estimated by applying an appropriate rate of interest to the value of the general government's capital. Views may differ regarding the appropriate interest rate, but it can be said that the present method of valuing non-market output significantly understates the contribution of general government to GDP. For example, the present method implies that scanners or x-ray machines produce no net return when they are used in a public hospital but do so when used in a private clinic.

Measurement using the general formula would result in their value added being very small, if not negative; in other words, their intermediate consumption would be greater than their sales! Because banks are obviously profit-making enterprises, there is something wrong here. The fact is that banks make the bulk of their profits by borrowing at low interest rates from depositors and then lending the proceeds to other borrowers at a higher interest rate. The difference between these two interest rates, which provides the essential part of banks' remuneration, is interpreted in national accounts as their **financial intermediation** service. The banks are in fact intermediaries between those who want to save – mainly households – and those who want to borrow – mainly firms. Without the banks, these agents would have greater difficulty in coming together. The national accounts therefore measure the output at current prices of banks as the sum of their sales *plus*, approximately, the difference between the interest received from borrowers and the interest paid to lenders. This difference, which forms the bulk of the total, is known as **financial intermediation services indirectly measured** or FISIM (see Going Further).

Measuring the output of **insurance companies** is even more problematic than in the case of banks. For the sake of simplicity, we shall deal here only with non-life (property) insurance (automobile insurance, home insurance, etc.). The money received by these non-life insurers in the form of premiums does not constitute payment for an insurance service but instead mainly goes into a fund from which indemnities will be paid in the event of claims. This being said, insurance premiums cover these indemnities *plus* claim management expenses *plus* the profits of insurance firms. The output at current prices of insurance companies corresponds to these two last items: management expenses and profits. The output will therefore be measured in the national accounts as the *difference between premiums received and indemnities paid out*, this being mathematically equal to management expenses plus profits. Things are in fact slightly more complicated than this, because insurance companies immediately invest the premiums received and leave them invested until such time as they are paid out in the form of indemnities. They therefore derive incomes which, economically speaking, belong to the insured and not to the insurance companies. Therefore, the national accountants impute a repayment of this income from the insurance companies to the insured (households or firms), which then pay them back to the insurance companies, the sums involved still being imputed. It is as if households paid not only premiums but also the investment income. In the end, the output at current prices of insurance companies is equal to the premiums *plus* the investment income *minus* the indemnities.

When measuring output for the national accounts, **distribution** (both wholesale and retail) also constitutes a special category. This is because if the general formula were applied the results would significantly overestimate total output, since sales in the distribution channel are already recorded as the value of the goods created by the actual producers. Therefore, the output for distribution is measured as the margin obtained on the products sold. So the output at current prices of distributors is equal to the value of their sales minus the value of the products bought for resale.

*This is made on the assumption that inflation is low and hence that there are no significant rises in market prices between the time of purchase and the time of resale. If this assumption does not hold, the rises must be taken into account and the sums involved deducted from the margin. Remember that holding gains or losses are not included in the measure of output in national accounts.*

This is known as their distribution margin. The intermediate consumption of distributors therefore excludes their purchases for resale; it consists only of rent, electricity, advertising, packaging and other operating

expenses. Their value added is calculated in the usual way, by deducting their intermediate consumption from their output.

## 5. Nomenclatures and classifications

The broad nature of the production frontier used in national accounts has several advantages. It provides a useful, albeit approximate, measure of total production (or rather total value added) that is reasonably comparable between countries and over time. However, it is too global for certain economists, who would prefer to concentrate on more narrowly defined parts of the economy. For example, studies of productivity normally concentrate solely on the market sector, excluding the output of general government and eliminating imputations such as the output of housing services by owner-occupiers. In other cases, the economic researcher will want to focus on, for example, agriculture, the metalworking industries or business services.

To meet these specific needs, national accountants have compiled classifications (sometimes known as nomenclatures) of *industries* (also called *branches*). A branch of activity is defined as a grouping of homogeneous production units. Branches are identified by reference to a product classification, so that a branch produces only the goods or services described under a given heading of the product classification. The international reference classification for branches is the ISIC Revision 4.

*The international reference classification for products is the CPC (Central Product Classification) and is described in Chapter 11.*


Table 4.1 shows percentages of total value added for major branches in four OECD countries. The classification used is the international industry classification in the national accounts (which is based on the ISIC) at the so-called A10 level (10 major branches shown in bold type in the table), and is divided into 21 sections (the branches lettered from A to U). For example, the A10 level 2 “Manufacturing, mining and quarrying and other industrial activities” is broken down into four sections, B Mining and quarrying, C Manufacturing, D Electricity, gas, steam and air conditioning supply and E Water supply, sewerage, waste management and remediation activities. Firms often operate in several branches, since many of them are diversified. In this case, they are broken down into virtual units producing a homogeneous good. For example, the “Manufacturing” branch includes all productive units producing industrial goods, whether these units are entire firms or parts of firms, known as “establishments”. Differences in structure can be seen between highly developed countries, such as the United States and France, where services are very substantial, and less advanced countries like Korea

where industry is still very important. Note that the total of values added is not called GDP in the table. This is not an omission; GDP is not equal to the sum of gross values added. GDP is equal to the sum of gross value added plus taxes net of subsidies on products (see Chapters 1 and 10).

Table 4.1. **Value added by industry at current prices**  
As a percentage of total value added, 2010

Industry	France	Korea	Italy	United States
<b>A Agriculture, forestry and fishing</b>	<b>1.8</b>	<b>2.6</b>	<b>1.9</b>	<b>1.1</b>
<b>Manufacturing, mining and quarrying and other industrial activities</b>	<b>12.8</b>	<b>33.1</b>	<b>19.0</b>	<b>15.5</b>
B Mining and quarrying	0.1	0.2	0.3	1.6
C Manufacturing	10.3	30.3	16.1	11.7
D Electricity, gas, steam and air conditioning supply	1.6	1.8	1.7	1.8
E Water supply; sewerage, waste management and remediation activities	0.8	0.8	0.8	0.3
<b>F Construction</b>	<b>6.1</b>	<b>6.3</b>	<b>6.1</b>	<b>3.5</b>
<b>Wholesale and retail trade, transportation and storage, accommodation and food service activities</b>	<b>18.4</b>	<b>15.4</b>	<b>20.4</b>	<b>17.6</b>
G Wholesale and retail trade, repair of motor vehicles and motorcycles	11.0	8.9	10.7	11.6
H Transportation and storage	4.8	4.2	5.6	3.2
I Accommodation and food service activities	2.5	2.3	4.1	2.9
<b>J Information and communication</b>	<b>5.0</b>	<b>4.0</b>	<b>4.5</b>	<b>5.6</b>
<b>K Financial and insurance activities</b>	<b>4.8</b>	<b>6.8</b>	<b>5.3</b>	<b>8.5</b>
<b>L Real Estate Activities</b>	<b>13.2</b>	<b>7.1</b>	<b>13.4</b>	<b>10.8</b>
<b>Professional, scientific, technical, administrative and support service activities</b>	<b>12.0</b>	<b>5.4</b>	<b>8.4</b>	<b>12.1</b>
M Professional, scientific and technical activities	6.4	3.2	6.0	8.1
N Administrative and support service activities	5.6	2.1	2.5	4.0
<b>Public administration and defence, education, human health and social work activities</b>	<b>22.6</b>	<b>16.8</b>	<b>17.4</b>	<b>21.9</b>
O Public administration and defence; compulsory social security	7.8	6.2	6.8	8.8
P Education	5.7	6.2	4.7	5.5
Q Human health and social work activities	9.1	4.5	5.9	7.6
<b>Other service activities</b>	<b>3.4</b>	<b>2.4</b>	<b>3.5</b>	<b>3.4</b>
R Arts, entertainment and recreation	1.5	1.4	1.0	1.0
S Other service activities	1.6	1.1	1.4	2.3
T Activities of households as employers; undifferentiated goods and services producing activities of households for own use	0.4	0.0	1.1	0.1
U Activities of extraterritorial organizations and bodies	0.0	0.0	0.0	0.0
<b>Total value added</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Source: OECD (2013), "STAN Industry Rev. 4", STAN: OECD Structural Analysis Statistics (database), doi: <http://dx.doi.org/10.1787/data-00649-en>.

StatLink  <http://dx.doi.org/10.1787/888933143775>




For a yet more detailed picture, look at Table 4.2, based on the “A38” level of the international classification. This gives output, intermediate consumption and value added for Belgium in 2010, broken down by sub-branches of manufacturing.

**Table 4.2. Output, intermediate consumption and value added of manufacturing branches**

Belgium, 2010, million euros

Industry code and title	Output	Intermediate consumption	Gross value added
C Manufacturing	198 876	155 126	43 751
CA Manufacture of food products, beverages and tobacco products	32 685	26 069	6 616
CB Manufacture of textiles, wearing apparel, leather and related products	5 648	4 145	1 502
CC Manufacture of wood and paper products; printing and reproduction of recorded media	10 527	7 642	2 884
CD Manufacture of Coke and refined petroleum products	30 397	29 048	1 349
CE Manufacture of chemicals and chemical products	26 857	20 603	6 254
CF Manufacture of basic pharmaceutical products and pharmaceutical preparations	9 364	5 270	4 095
CG Manufacture of rubber and plastics products, and other non-metallic mineral products	12 544	8 618	3 927
CH Manufacture of basic metals and fabricated metal products, except machinery and equipment	33 057	26 571	6 486
CI Manufacture of computers and peripheral equipment	3 559	2 302	1 257
CJ Manufacture of electrical equipment	3 506	2 116	1 390
CK Manufacture of machinery and equipment n.e.c.	8 070	5 131	2 939
CL Manufacture of transport equipment	17 096	14 016	3 080
CM Other manufacturing; repair and installation of machinery and equipment	5 567	3 595	1 971

Source: OECD (2013), “STAN Industry Rev. 4”, STAN: OECD Structural Analysis Statistics (database), doi: <http://dx.doi.org/10.1787/data-00649-en>.

StatLink  <http://dx.doi.org/10.1787/888933143785>

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## Key points

- The production frontier used for national accounts includes:
  - ❖ the production of goods and services intended to be sold, known as market output;
  - ❖ the unsold production, known as non-market output, of general government and non-profit institutions;
  - ❖ the production of goods by households for their own consumption, and the own-account production of capital goods by businesses;
  - ❖ the housing services (imputed rents) of homeowner-occupiers, not including the other services produced by households for their own account.
- Market output at current prices is measured as: sales plus changes in inventories of finished products and work in progress.
- Output is measured at the basic price, which equals the per-unit revenue received by the producer, excluding taxes on products but including subsidies on products.
- Non-market output (that of general government and non-profit organizations) is measured by the sum of its costs, including intermediate consumption, compensation of employees, consumption of fixed capital and other taxes on production.
- Housing services provided by homeowner-occupiers are imputed as being equal to the rents they would have paid for comparable housing.
- The output of banks is measured, for simplification, as the difference between interest received and interest paid, plus the sales of directly invoiced services.
- The output of insurance companies is measured as the difference between premiums and indemnities, plus investment income.
- The output of the distribution sector is measured by the distribution margin.

## Going further

### Household Services

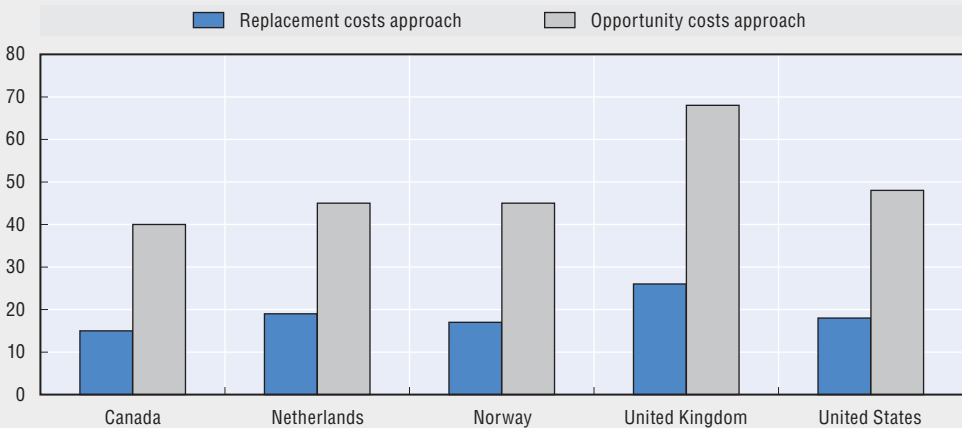
Official national accounts do not include the domestic and personal services provided by members of a household for their own consumption. This means that activities like cooking, housecleaning, washing clothes and looking after children or elderly people are excluded from GDP unless these activities are carried out by people paid for doing so. This had led John Hicks, the famous economist and national accounts pioneer, to remark that it was possible to reduce GDP by marrying one's cook.

National accountants have rejected the idea of including these services in GDP for practical reasons: the difficulty of imputing values to such services, and to the consequences this would have for the analysis of variations in GDP, which would then contain a substantial portion that is completely "invented". How indeed can one value the service provided by a mother making meals for her family? At the price of an employee in a fast-food preparing a hamburger or at the price of a chef in a three-star restaurant? This method is referred to as "replacement costs". On the other hand, some people have suggested estimating the price of the imputed salary at its "opportunity costs", in other words what the mother would have earned had she been working outside the household. This estimation method would produce widely differing results. For example, if the mother is a senior executive, the opportunity cost will be much higher than if she is a cashier in a supermarket. Another difficulty is how to distinguish between activities when there is joint production. A father is simultaneously peeling vegetables for the family meal, keeping an eye on the baby and helping another child with homework. How much time should one allocate to the cooking, to looking after the baby and to the education of the other child? Should the value of these activities be reduced because they are being carried out at the same time?

The *OECD Working Paper "Incorporating Estimates of Household Production of Non-Market Services into International Comparisons of Material Well-Being"* (Ahmad and al., 2011) discusses the differences of the two approaches, which are illustrated in the figure below. The example of the UK shows the valuation issue very well. While household production of non-

market services calculated according to the replacement costs approach are equal to 26.0% of GDP, the opportunity costs approach suggests that these services are as high as 68.0% of GDP.

Figure 4.2. **Household production of non-market services**  
Percentage of GDP



Source: Ahmad, N. and S. Koh (2011), "Incorporating Estimates of Household Production of Non-Market Services into International Comparisons of Material Well-Being", *OECD Statistics Working Papers*, No. 2011/07, OECD Publishing, doi: <http://dx.doi.org/10.1787/5kg3h0jgk87g-en>.

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The decision to place unpaid domestic services outside the production frontier of the national accounts has been quasi-controversial. In most countries, these unpaid services are mainly carried out by women and are manifestly just as important for the general welfare as many of the paid services that are within the production frontier. It is mainly for practical reasons that the activities are excluded. Moreover, one has to realise that including these activities in the system of national accounts would also change the meaning of a whole range of other indicators, such as household disposable income and final consumption expenditure. Both would also increase with the value of the unpaid activities. As a consequence, someone becoming unemployed could very well see his/her income increasing, because the value of the additional unpaid activities could well be higher than the loss of cash income. However, in order to provide the public with better information, several statistical offices compile so-called satellite accounts containing an estimate of this unpaid domestic work. These statistics, forming an annex to the national accounts, show what GDP would have been had unpaid domestic work been included.

## The adjustments for the underground economy in the case of France

To account for the underground economy, all OECD countries make substantial adjustments to the officially obtained GDP. In the case of France, this adjustment amounts to around 4%. It must be made clear, however, that this figure is just an approximation. What INSEE (the French statistical office) calls the underground economy comprises three sub-groupings: illegal activities (drug dealing, organised prostitution, etc); black labour (clandestine enterprises); and tax fraud. INSEE, like other statistical institutes, does not try to evaluate illicit activities. To account for black labour, it adjusts GDP by roughly 1%. The approach adopted is highly empirical: on the basis of official investigations and socio-economic research, INSEE has picked out sectors where there is a strong presumption of underground work and then estimated, very crudely, sector by sector, the scale of this activity, based on expert opinion.

In the case of tax fraud and tax evasion, INSEE adjusts the accounts by around 3%, of which 2.5% is for dissimulation of receipts and 0.5% for unpaid VAT (Value-Added Tax). As regards the dissimulation of receipts, the sources used are official figures from the tax authorities compiled on the basis of sample tax investigations. For VAT, the source is a comparison between the theoretical VAT amount calculated on recorded taxable transactions, and the VAT actually recovered by the government, together with several minor adjustments. In addition to these adjustments, there are accounting adjustments for undeclared gratuities and benefits in kind. Each of these represents roughly 0.5% of GDP.

## Data sources for the value added of non-financial enterprises: The example of France

One of the drivers that enhance the quality of national accounts is that they are based on the extensive aggregation of individual firms' accounts. In the case of France (but this is applicable to other countries too), INSEE (the French statistical office) has access, albeit after a certain delay, to all the accounts sent by firms to the tax authorities as part of their declarations for profits tax. This source is virtually exhaustive as regards firms and individual entrepreneurs. It is therefore from this source that the largest part of GDP is estimated. Sales of non-financial enterprises as shown in company accounts constitute an essential source for the calculation of the output of the non-financial market sector in the national accounts. However, this is not as simple as it might seem, since there are numerous adjustments to be made to the company accounts, which do not use exactly the same definitions as the national accounts. Adjustments also have to be made to allow for the

underground economy and to take into account other sources of an even more reliable nature, such as those derived from the government budget. For example, the national accountants have to make sure that the taxes paid by enterprises, as included in the company accounts, are equal to the relevant taxes received by the authorities. When this is not the case, it is the government accounts that are considered as taking precedence and the data from the company accounts are altered accordingly. This adjustment clearly modifies the measurement of company profits (the gross operating surplus). Onto these figures have to be added the results of INSEE's direct surveys of enterprises (the EAE, or Enquête Annuelle d'Entreprise), whose results are mainly used to make a detailed breakdown of sales by branch.

## FISIM

FISIM (financial intermediation services indirectly measured) is the term used to describe the services that banks provide to their customers but which are not invoiced. For bank depositors, these services generally include the management of current accounts, the sending out of bank statements and fund transfers between accounts. Instead of directly invoicing these services, the banks reduce the interest paid to depositors. This interest is in fact lower than the one customer could have obtained by lending their money directly to borrowers. For bank borrowers, these services include the monitoring of their creditworthiness, financial advice, the smoothing over time of repayments and the recording of these repayments for accounting purposes. The cost of these services is an inseparable part of the interest rate that the bank charges to these borrowers.

FISIM at current prices is calculated using the following (simplified) formula:

$$(rl - rr) \times L + (rr - rd) \times D$$

In the formula above,  $rl$  is the observed interest rate on loans,  $rr$  is the so-called reference rate,  $rd$  is the observed rate of deposits,  $L$  is the amount of loans, and  $D$  is the amount of deposits. The reference rate  $rr$  is an estimate of a pure interest rate, involving no risk element, thus corresponding to economics agents' preference for the present. The difference between the interest rate paid by borrowers ( $rl$ ) and the reference interest rate ( $rr$ ) is used to measure the price of FISIM for the borrowers. The difference between the reference interest rate ( $rr$ ) and the rate of interest received on bank deposits ( $rd$ ) is used as the price of FISIM for depositors. These prices are then multiplied by total borrowing, and by total deposits, in order to arrive at the total FISIM consumed by the various economic agents.

The logic of national accounts requires that if FISIM is counted in the measurement of output it must also be recorded as consumption on the part

of those using these services. For a firm borrowing from a bank, FISIM will therefore be intermediate consumption. For a household depositing money with a bank or obtaining a loan from a bank, FISIM will be an element in final consumption expenditure. For a long time, national accountants had found no convincing way of allocating this output to consumers and, except in the United States, Canada and Australia, FISIM was conventionally regarded as intermediate consumption at the level of the economy as a whole. Fortunately, a solution has been found in 2005 and adopted by all OECD countries. This still leaves the problem of the choice of reference interest rate. European countries have chosen a rate that is an average of the short-term inter-bank rate and certain longer-term rates, while the United States has chosen the rate on US Treasury Bonds. The allocation between households and enterprises is made pro rata, based on the respective shares of loans and deposits of these two groups.

The financial crisis of 2007-09 (see Chapter 13) has attracted the attention on the role of banks in the economy and on the measurement of their output in the national accounts. Some commentators went to say that banks should not have any positive output in the national accounts, as they were, in the end, responsible for the great recession of 2007-09. Without going so far, others commented that the national accounts were inappropriate as they showed an increase of the output of banks during the recession, which is counter-intuitive. Such statements should be corrected. Even if one has to recognise that national accountants still have difficulties to obtain a convincing measure of the volume of the banking output, it is to be reminded that the important measure for national accounts is the volume measure and not the current price measure. In this context, any increase in the spread between  $r_l$ ,  $r_d$  and  $r_r$  is to be interpreted as a change in the price of FISIM and not in the volume of FISIM. In other terms, a change in the risk premium is a change in the price of intermediation services. In any case, the output of the financial sector in the United States national accounts does not increase during the crisis period of 2007-12. On the contrary, it decreases both in current prices and in volume.

## Exercises for Chapter 4

### **Exercise 1. Change in the structure of production**

This exercise is based on the table in next page taken from Austrian national accounts at current prices. Show that the Austrian economy has increasingly become a service economy. Illustrate the result by a graph. In which branches are non-market activities to be found? Which branch contains the imputation of rents for homeowner/occupiers? What difference is there between the sum of the values added in this table and GDP? Which of the large branches has grown most since 1980? Express the result as an annual average growth rate. Which of the large branches has grown the least? Is this result in current prices totally convincing?

### **Exercise 2. Branches and products**

Table 4.2 in this chapter shows output, intermediate consumption and value added of the manufacturing branch for Belgium. Using examples from this table, reconstitute the fundamental relationship linking these three magnitudes. Illustrate for certain branches the differences in their so-called outsourcing rates (externalisation rates). What differences would have been made to this table if one had wanted to present the data by product, and not by branch?

### **Exercise 3. Calculation of output**

The following are the simplified data for a firm producing cars. Sales of cars: 1 353 500. Purchases: raw materials: 540 000; temporary employment services: 350 500; machine tools: 264 000. Inventories of finished products at the start of the period: 245 000; at the end of the period: 346 700. Inventories of raw materials at the beginning of the period: 73 200; at the end of the period: 43 000. Calculate the output, the intermediate consumption and the value added at current prices, assuming no change in prices during the period. Why is this last condition important?

### **Exercise 4. Calculation of output: the non-market case**

The following are simplified data for a unit of general government. Civil servants' gross wages and salaries: 562 980; employers' social contributions:



**Austria: gross value added by branch**

	1980	1995	2011
<b>Agriculture, forestry and fishing</b>	<b>3 400</b>	<b>3 883</b>	<b>4 494</b>
<b>Manufacturing, mining and quarrying and other industrial activities</b>	<b>19 139</b>	<b>37 199</b>	<b>61 376</b>
Mining and quarrying	921	543	1 389
Manufacturing	15 819	30 581	50 925
Electricity, gas, steam and air conditioning supply	1 899	4 192	6 082
Water supply; sewerage, waste management and remediation activities	500	1 883	2 980
<b>Construction</b>	<b>5 755</b>	<b>12 758</b>	<b>18 499</b>
<b>Wholesale and retail trade, transportation and storage, accommodation and food service activities</b>	<b>16 458</b>	<b>35 210</b>	<b>61 080</b>
Wholesale and retail trade, repair of motor vehicles and motorcycles	9 931	20 478	34 911
Transportation and storage	3 854	8 531	12 819
Accommodation and food service activities	2 673	6 201	13 350
<b>Information and communication</b>	<b>1 746</b>	<b>5 240</b>	<b>8 278</b>
<b>Financial and insurance activities</b>	<b>3 532</b>	<b>8 997</b>	<b>13 876</b>
<b>Real Estate Activities</b>	<b>3 011</b>	<b>12 013</b>	<b>26 050</b>
<b>Professional, scientific, technical, administrative and support service activities</b>	<b>2 225</b>	<b>9 023</b>	<b>24 043</b>
Professional, scientific and technical activities	1 318	5 154	12 642
Administrative and support service activities	907	3 869	11 401
<b>Public administration and defence, education, human health and social work activities</b>	<b>11 024</b>	<b>28 754</b>	<b>47 219</b>
Public administration and defence; compulsory social security	3 940	10 632	15 545
Education	3 765	8 782	14 774
Human health and social work activities	3 319	9 339	16 900
<b>Other service activities</b>	<b>1 642</b>	<b>4 295</b>	<b>7 617</b>
Arts, entertainment and recreation	441	1 600	3 374
Other service activities	1 149	2 630	4 136
Activities of households as employers; undifferentiated goods and services producing activities of households for own use	52	64	107
<b>Total value added</b>	<b>67 931</b>	<b>157 371</b>	<b>272 532</b>
GDP	76 359	174 794	299 240

65 450; purchases of materials: 85 340; tax revenue: 485 770; depreciation: 124 320. Calculate output, intermediate consumption and value added. Verify that the measure of output corresponds to the assumption that this administrative body is non-profit.

**Exercise 5. Calculation of output: the case of banks**

The following are the simplified data for a bank: foreign exchange commissions: 32 980; stock-market trading commissions: 23 430; interest received: 357 850; interest paid: 204 650; purchases of materials: 34 520; purchases of IT consultancy services: 32 890; purchases of software: 12 590; inventory of materials at the start of the period: 7 420; inventory of materials at the end of the period: 3 860. Calculate the output, the intermediate consumption and the value added. Assume the figure for FISIM is interest received minus interest paid.

**Exercise 6. Calculation of output: the case of distributors**

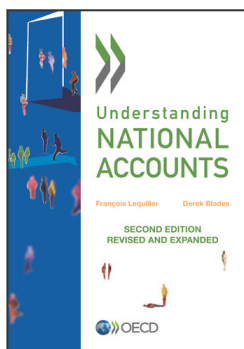
The following are the simplified data for a retail chain: sales: 4 567 800; total purchases: 4 120 500 (of which, goods for resale: 3 987 350); inventories of goods for resale at start of period: 476 000; at end of period: 548 400; inventories of materials at start of period: 120; at end of period: 3 250. Calculate the output, the intermediate consumption and the value added. Inflation is assumed to be negligible.

**Exercise 7. Calculation of output: the case of insurance companies**

The following are the simplified data for an insurance company: premiums received: 210 400; indemnities paid out on claims: 187 500; income from the investment of reserves: 34 270; purchases of consumables: 24 320; inventories of materials at the start of the period: 5 630; at the end of the period: 20. Calculate the output, the intermediate consumption and the value added. Now suppose that an exceptional claim raises the amount of indemnities for this same period to 245 000. Recalculate the output. How is this result to be interpreted?

**The solutions to these exercises are available at:**

<http://dx.doi.org/10.1787/9789264214637-22-en>



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