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Facts and theories meet in analysis. The combination of the two is essential if economics is to progress, since it is neither a pure subject, like mathematics, of which one does not ask that the theories should be applicable to actual phenomena, nor is it a collection of facts, like the objects on a junk heap, of which one does not ask how they are related.

Richard Stone[1]

2.1 Overview

Every science has its own special language; not necessarily to exclude non-experts, but to make discussion more meaningful and precise. In this chapter we will start learning to speak the language of macroeconomics. We first provide a quantitative description of the economy and definitions of more frequently used concepts. As a natural point of departure, the chapter begins with a discussion of the national income accounts and **accounting identities**—how magnitudes we are interested in relate to each other, by construction. The national income accounts play a central role throughout the study of macroeconomics.

Chapter 2 will be limited to a description of what happens in an economy. Knowing the facts and how these facts are measured are essential for understanding the underlying behaviour of aggregate magnitudes. The distinction between description (this chapter) and analysis (the rest of the book) is similar to that found in biology. As was already noted in Chapter 1, it is important to know that living organisms consist of a collection of different cells; yet this biological description is only a first step. Analysing and understanding how cells function and affect each other is vastly more important. In a similar way, decomposing the gross domestic product into its components and examining the external accounts describe interactions and relationships without explaining how or why. That is the job of subsequent analytic chapters. It is thus unavoidable to spend time with these definitions. As we shall frequently see, there is much more to them than first meets the eye.

2.2 Gross Domestic Product

2.2.1 Three Definitions of Gross Domestic Product

The **gross domestic product** (GDP) is a measure of productive activity. It is defined for a particular geographic area—usually a country, but possibly a region or a city, or a group of countries such as the European Union (EU) or the euro area. It is also defined over a time interval, usually a year or a quarter. This is because the GDP is a **flow variable**, much like the amount of water flowing down a river. Flow variables differ from **stock variables**, which are always defined with reference to a particular point in time, such as the quantity of water held back by a dam.[2]

It turns out that there are three ways to measure GDP, and a different definition corresponds to each. Our first definition of GDP is the sum of all final

[1] Sir Richard Stone (1913–1991) of Cambridge University received the Nobel Prize in Economics in 1984 and is generally regarded as the father of national income accounting.

[2] Another example of a stock variable is a company's balance sheet, which measures its financial state at a single point in time, say 31 December. A corresponding example of a flow variable is an income statement, which records the profit or loss attributed to the firm over a time period, say 1 January to 31 December.

sales of goods and services sold during the measurement period.

Definition 1

GDP = the sum of final sales within a geographic location during a period of time, usually a year.

This definition refers specifically to **final sales**, i.e. goods and services sold to the consumer or firm that will ultimately use them. For example, the purchase of a loaf of bread or a motor car by a household is a final sale. In contrast, a car sold to a dealer which is subsequently resold during the measurement period, or a loaf of bread purchased by a grocery store which is later sold to a household are not final but **intermediate sales**. Intermediate sales are excluded from GDP to avoid double counting. For this reason, GDP should never be confused with total sales, or turnover. Consistent with this approach, exports are always counted as final sales regardless of how the foreigners use them, because they leave the geographic borders of the national economy.

Our second definition of GDP recognizes that each final sale of a good or service represents the ultimate step that validates all the efforts that have gone into producing and making it available to the buyer. It encompasses a chain of economic activities which are each seen as **value added**.

Definition 2

GDP = the sum of value added occurring within a given geographic location during a period of time.

A firm creates value added by transforming raw materials and unfinished goods into products it can sell in the market place. The firm's value added is the difference between its sales (turnover) and the costs of raw materials, unfinished goods, and imports from abroad. If the firm produces intermediate goods, its sales are costs to its customers, who themselves are producers. This value added should not be counted twice, and it is deducted from those customers' own sales in computing its own value added. When the final consumer purchases a good or a service in the market, the price includes all the value added created at each stage in the production process; hence the consistency between Definitions 1 and 2. Box 2.1 uses a concrete example to show how various productive activities contribute to a country's total value added.

GDP includes all incomes earned within a country's borders—by residents and non-residents alike. Because one person's final spending must be someone else's income, the third definition of GDP is also consistent with the first.

Definition 3

GDP = the sum of factor incomes earned from economic activities within a geographic location during a period of time.

GDP statistics are mentioned constantly in the financial and political press. The GDP, and in particular, its rate of growth, are generally considered to be the most important indicators of an economy's health, and their evolution is closely watched by managers, economists, and politicians. They allow us to study the performance of a single economy over time as well as to compare different countries. Three important points are worth mentioning:

(1) For comparison over time, we want to distinguish two reasons why GDP can increase: (1) more real economic activity and (2) higher prices for the same economic activity. This aspect is taken up in Section 2.2.2.

(2) For comparison across countries, we need to convert all GDP measures into a common currency. But, as we will see later, exchange rates are quite volatile and may give a faulty picture. For that reason, we usually use the concept of purchasing power parity, which is presented in Chapter 6.

(3) Small countries tend to have small GDPs, and yet they may be well-off. This is why we often look at **GDP per capita**, dividing the GDP measures by the population.

The definition of GDP contains a fair amount of arbitrariness, and it is open to debate whether every positive movement in GDP constitutes an improvement in national well-being. All the same, it is the best indicator we have. More details on this controversial issue are provided in Box 2.2.

2.2.2 Real versus Nominal Quantities, Deflators versus Price Indices

Real and nominal GDP

Now that we know what GDP is and how GDP data are constructed, we can immediately see how the national income statisticians have solved the problem of adding up apples and oranges: the solution is to use *prices* to convert volumes (the numbers of apples and oranges) into values (sales of apples and oranges). Suppose an economy produces only these two goods and requires no imports. Final sales of apples and oranges are obtained by multiplying the quantities of apples and oranges sold, Q^a and Q^o, by their respective prices, P^a and P^o, yielding **nominal GDP**, or GDP at current prices:

$$\text{nominal GDP} = P^aQ^a + P^oQ^o. \tag{2.1}$$

Yet there is a slight problem: If the price of oranges increases from one year to the next, nominal GDP rises even while the volume of final sales has not changed at all! An increase in nominal GDP can result from either higher prices *or* more output. To separate the effects of output and price movements, national income accountants distinguish between nominal and **real GDP**. Increases in real GDP correspond to increases in physical output, the number of apples and oranges produced and sold. Whereas nominal GDP is computed, as in (2.1), using the actual selling prices, real GDP is computed by using

Box 2.1 Value Added and Value Subtracted: Two Examples

Consider the following example of value added. A keg of beer is produced and sold for final use by consumers at the price of €100. It is useful to break up this final sale into the steps of value added which were involved in its production. First, a brewery bought barley from a farmer, paying €10, used and paid for energy in the brewing process with a value of €20, and bought a keg from a keg manufacturer at a cost of €5. (For simplicity, the intermediate inputs of the farmer, energy producer, and keg manufacturer are assumed to be zero.) The beer is sold to a wholesaler for €80, so the brewery's own contribution to value added per keg is €45, given by his sale price (€80) less costs of inputs (€10 + €20 + €5 = €35). Next, the wholesaler sells the filled keg for €90 to a retailer, contributing value added of €10. The retailer sells the keg for €100, generating €10 of value added on his own. Summing up, the final price can be broken down into value added at each stage of production and delivery of the final good:

Value added contributed by the:	
Farmer	€10
Energy producer	€20
Keg manufacturer	€5
Brewery	€45
Wholesaler	€10
Retailer	€10
Sum	€100

Each step in the value added chain represents a source of income for factors of production involved. Suppose for example that the brewer had labour costs of €35 (wages and salaries as well as social security contributions) and €5 in beer taxes. Then the brewery's activity led to profits of €5, which are the income to the owners—assuming there were no further costs such as interest on loans, royalties for brands or trademarks, or rent. Similarly, if the wholesaler had no costs (employees, rent, or interest), the €10 of value added would represent his income, which can also be thought of as the profit which he receives as owner of the business. The example shows how the division of the value added is arbitrary and potentially separable from the issue of whether value added is generated at all.

Because value added is the source of income for labour, capital and other factors of production, few economic activities could survive very long if they *subtracted* value, i.e. if sales did not even cover material input costs. Not only would labour and capital not receive income for their efforts, but also someone would have to pay for the operating loss on each unit of output sold. Yet there are many examples of value subtraction. In the centrally planned economies before the fall of communism, many industries were requested to sell cheaply. As a result, firms produced too little goods of poor quality, exemplified by the Trabant car which citizens of the German Democratic Republic had to wait for years. In capitalist countries, some public services are thought to be worth less than they cost, but this is not visible because they have no price and the costs are covered by taxpayers.

prices observed in some agreed base year.[3] In our example, if prices of apples and oranges were P_0^a and P_0^b in the base year, the real GDP in year t, when net final sales of apples and oranges are Q_0^a and Q_0^b is:

(2.2) $$\text{real GDP}_t = P_0^a Q_t^a + P_0^b Q_t^b$$

This distinction is very general and applies to all macroeconomic variables: nominal variables represent values at current prices; real variables represent volumes at constant prices. As an example, Table 2.1 reports growth rates of nominal and real GDP for the euro area.[4]

Price deflators and indices

The distinction between nominal and real GDP can be used as a measure of the general price level, or the price of goods in terms of money. The **GDP deflator**, one way of measuring the price level at some particular time, is simply the ratio of nominal to real GDP:

(2.3) GDP deflator = nominal GDP/real GDP.

In the base year, nominal and real GDP coincide and the GDP deflator equals 1.0. (Sometimes it is multiplied by 100 for ease of comparison over the years.) It can be thought of as an average of all prices of final goods in terms of money, where each price is implicitly weighted by the proportion of the corresponding good in the GDP. As these proportions change over the years, so do the weights.

The inflation rate can be measured by the rate of increase in the GDP deflator, which in turn can be approximated by the following formula:[5]

(2.4) $$\text{GDP deflator inflation} = \text{nominal GDP growth rate} - \text{real GDP growth rate}$$

Table 2.1 Growth Rates of Nominal GDP, Real GDP, and GDP Deflator: Euro Area 1999–2010 (% per annum)

	Nominal GDP	Real GDP	GDP deflator
1999	4.6	3.0	1.6
2000	5.2	3.9	1.3
2001	4.3	1.9	2.4
2002	3.4	0.9	2.5
2003	3.0	0.8	2.2
2004	4.1	2.2	1.9
2005	3.6	1.7	1.9
2006	5.0	3.1	1.9
2007	5.3	2.9	2.4
2008	2.3	0.3	2.0
2009	–3.2	–4.2	1.0
2010	2.6	1.7	0.9

Source: Eurostat.

For example, Table 2.1 shows that in 2005 the nominal GDP of the euro area rose by 3.6% while the real GDP increased only by 1.7%. On average, therefore, prices rose by roughly 1.9%.[6]

An alternative measure of inflation is based on an average of prices with fixed weights, called a **price index**. A basket of goods is selected and the amount of each good, or category of goods, in the basket is used to weight the corresponding prices. An example is the **consumer price index (CPI)**. This is based on a basket of goods consumed by a representative or average individual.

Figure 2.1 shows the growth rates of the GDP deflator and of the CPI in Italy. Differences between the two measures of inflation are usually not very large,

[3] Problems arise when new goods are introduced (MP3 players), or existing goods improve in quality (personal computers). National income accountants have devised procedures to deal with such effects.

[4] In previous decades, it was common to update the base year for prices used every five or more years. Rapidly changing product mixes and globalization have increased the value of redefining base years more frequently. It is now EU national income accounting practice to redefine the base year *every* year, effectively rendering real GDP a so-called chain standard index. With this change, growth rates in real GDP are more reliably measured. As a result, some national statistically authorities have even stopped publishing real GDP levels, using an index number without units instead.

[5] Box 6.3 in Chapter 6 provides the arithmetical background for this formula. If we denote nominal GDP as Y, real GDP as Q and the GDP deflator as P, we have $Y = PQ$, which means $P = Y/Q$. Then, using the results from Box 6.3, we have $\Delta P/P = \Delta Y/Y - \Delta Q/Q$.

[6] To see why this formula is an approximation, suppose real GDP increased at rate g and inflation at rate π. The rate of nominal growth must be $(1+g)(1+\pi) - 1 = g + \pi + g\pi$. For g and π small, $g\pi \approx 0$, so the rate of growth of nominal GDP is approximately equal to $g + \pi$.

Box 2.2 What GDP Measures

The GDP is a measure of recorded market transactions. This leaves out many activities which are not carried out through legal channels or do not reach the market place, like growing vegetables in the garden. Furthermore, since the value of goods and services are measured using their transaction prices, two identical goods may enter the GDP differently if one of them is sold at a discount. Finally, it is not a measure of happiness: painful expenses (having a tooth removed, for example) enter the GDP in the same way as pleasurable ones. When someone dies, GDP rises: the funeral service, the hospital expenses, and the execution of the will by lawyers and bankers all represent additional final sales of goods and services. Despite the fact that they are costs, pollution and other forms of environmental damage are not considered in the GDP, since they are not traded in markets.

Services enter the GDP exactly like goods. Services include medical doctors' fees or an estate agent's commission when an existing house is sold. The GDP also excludes many forms of income. In the case of real estate, if the house's value has increased since it was purchased, the previous owner enjoys a capital gain, but capital gains do not enter the GDP. Used-goods sales, such as cars or antique furniture, do not enter the GDP either. Such transactions represent a transfer of ownership rather than production. These goods entered GDP when first sold, but the fees of the dealers represent a service which is accounted for. Sales by retailers from inventory accumulated in earlier periods actually reduce GDP, as they represent a depletion of stocks.

Public services are part of GDP, even if they are not really sold. Their price is simply measured by their cost of production. For example, public education enters GDP as the sum of teachers' salaries, operating costs such as electricity or heating costs, and equipment including rents. Similarly, the national defence enters the GDP as total expenditure on armed forces.

A related measure is **gross national income (GNI)**.[7] Unlike the location-based GDP, the GNI is *ownership based*. It is the value added attributable to all factors of production owned by a country's residents, regardless of where those factors are actually employed. It thus includes value added or income earned abroad and repatriated by residents. For example, an Italian living in Como and commuting to work in Lugano in Switzerland contributes to the Italian GNI and to the Swiss GDP, but not to the Italian GDP or Swiss GNI. Because GNI is harder to measure, economists tend to follow GDP more closely. We will do the same.

To see how important the distinction between GDP and GNI can be, consider the case of Ireland. After several years of high economic growth, Ireland's GDP per capita rose above that of the UK in the late 1990s. Nevertheless, many of Ireland's factories are owned by foreigners—Britons, Germans, or Americans—or were purchased with money borrowed abroad. Investment income and interest paid to those foreigners was significant enough that until 2005, Irish per capita GNI remained lower than the UK's. Since then, however, Irish residents even have a higher GNI per capita than those of the UK, a remarkable turn of the economic tables!

but they can become significant when the import prices—which matter for the CPI but not for the GDP deflator—behave differently from domestically produced good prices. For example, in the late 1980s the price of crude oil increased less than prices of goods and services produced in Italy. In the early 2000s, domestic wage increases put pressure on domestic production costs and the GDP deflator rose faster than the CPI, an evolution that backfired with the financial crisis.

Other price indexes can be tailored to describe the prices of certain types of goods, of certain types of consumer, or for certain sectors of the economy. Along with price deflators, there is a large menu to choose from, each price index or deflator having its own special emphasis. Box 2.3 presents some frequently used deflators and indexes.

2.2.3 Measuring and Interpreting GDP

The GDP, which represents the economic performance of an entire economy, is not easy to measure.

[7] This measure was known previously as the gross national product (GNP).

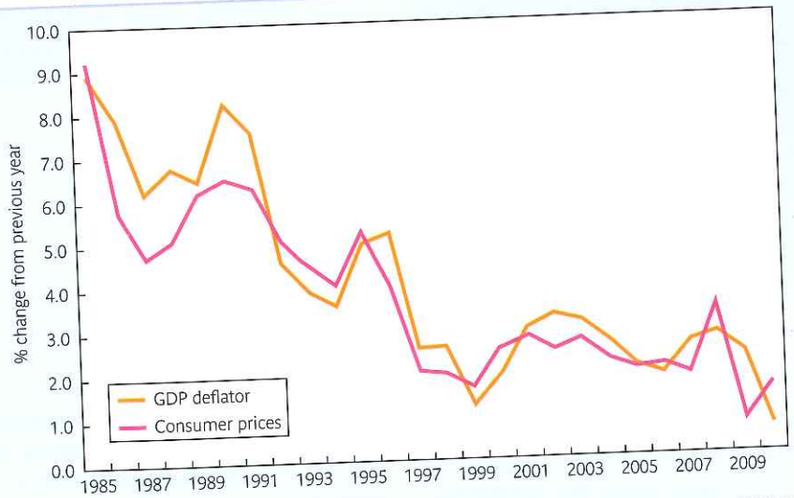

Fig. 2.1 Inflation rates, GDP Deflator and Consumer Price Index: Italy, 1985–2010

Both the GDP deflator and the consumer price index (CPI) measure the price level, or the price of goods in terms of money. The inflation rate is simply the rate of growth of one of these price level measures. The figure shows that both GDP deflator and CPI measures of inflation tend to move together over time, with occasional exceptions when the difference in the underlying 'baskets' matters. In the late 1980s, world oil prices declined sharply. Since gas and heating oil are part of household consumption, inflation measured by the CPI declined. Since oil is imported, it does not contribute value added directly in Italy, and has only a small impact on the GDP deflator.

Source: International Financial Statistics.

The task is generally carried out by official statistical offices which draw on various sources of information. One natural source is the tax authorities. Firms report sales (first definition of GDP), individuals report incomes (third definition), and in most countries (all EU countries, but not the USA) value added taxes (VAT) are collected by intermediate and final sellers who then report their value added when they pay the tax (second definition).

The fact that GDP figures are collected through tax returns immediately raises the suspicion that individuals and firms may misrepresent their finances to the fiscal authorities. Such unreported income and output is frequently referred to as the **underground economy**. Box 2.4 presents estimates of how large it could be. It also alerts us to the importance of work that is not paid for in the marketplace.

Another shortcoming associated with the magnitude of the task is the time it takes to get reasonably accurate numbers. Data from tax returns are usually processed with delay. Usually at the end of the first month of each quarter, figures for the preceding quarter are released. Box 2.5 explains how such flash estimates are produced and updated several times over the following years. The inaccuracy of these estimates is unsettling because they are frequently used by governments when deciding on economic policies, by investors when valuing their assets, and by firms deciding on hiring or firing workers and on acquiring new plant and equipment. This is why other indicators are often used to supplement the GDP figures.[8] It is also why analysts tend to concentrate on growth rates rather than levels. As long as the distortions do not change much over time, measured GDP growth rates offer a good picture of average economy performance.

It is tempting to compare GDPs across countries. Because countries have different populations, it is natural to look at GDP per capita, or the average

[8] Chapter 16 discusses some of the most frequently used indicators.

Box 2.3 Price Deflators and Price Indexes

The price index closest to the GDP deflator is the producer price index (PPI), with fixed weights corresponding to a basket representative of national production. Similarly, the CPI is closely tracked by the consumption deflator, the ratio of nominal and real aggregate consumption expenditures by households. A price index like the CPI or the PPI is an example of a fixed-weight, or *Laspeyres index*. The consumption deflator, which is based on the actual share of goods in the corresponding year's consumption, is called a variable weight or *Paasche index*. The CPI and the consumption deflator include goods and services produced abroad and imported, while the PPI and the GDP deflator do not, but these latter measures include goods and services locally produced and exported. Figure 2.1 suggests a growing divergence between the PPI and the CPI in Italy in the late 1980s. The reason is that imported goods prices increased by less than those of domestically produced goods.

Other frequently used deflators are related to exports, imports, investment goods, and government purchases. The wholesale price index (WPI) measures the average price of goods at the wholesale stage, and various commodity price indexes track the evolution of raw materials prices. The dizzying diversity of indexes and deflators simply reflects the fact that there is no absolute 'average' price. Different price levels are used for different purposes. For example, wage-earners wish to tie their wages to their cost of living; in this case, the relevant index is the CPI or the consumption deflator. In the case of Italy, linking wages to the CPI rather than to the PPI resulted in higher profits for firms whose sales are better tracked by the PPI. Because the CPI and other Laspeyres indexes are easier to compute, they tend to be used most often in practice.

Box 2.4 The Underground Economy and Unpaid Work

Who hasn't had an offer from a carpenter, a car mechanic, or painter to do some work 'without a receipt'? Agents engage in the underground, or informal economy for straightforward reasons. First, they want to avoid taxes (the value added tax, employment and social security charges, profit taxes). Second, while significant, criminal activities, such as drug-dealing, prostitution, or racketeering, are intentionally concealed and kept underground by market participants. By definition, the size of the underground economy is unknown, but national income statisticians often attempt to guess its importance. They use various approaches such as monitoring household electricity use, which tends to be higher in economies where unreported market activity is more significant, or looking at the amount of large-denomination currency in circulation, since underground transactions do not use bank accounts and profits are conveniently held in large bills. The sale of intermediate inputs related to final production often indicates underground economy activities. For example, a large discrepancy exists between the purchase of construction materials and reported construction activity. Figure 2.2 shows the extent of the underground economy in a number of countries.

Another serious drawback of GDP as a measure of economic activity is unpaid work. Minor repairs around the house, caring for children, cooking for the family and cleaning up take up much time and effort. Wealthier people hire help for these chores, in which case it becomes part of GDP (if reported to the tax authorities). Most people do it themselves, and it is unrecorded.

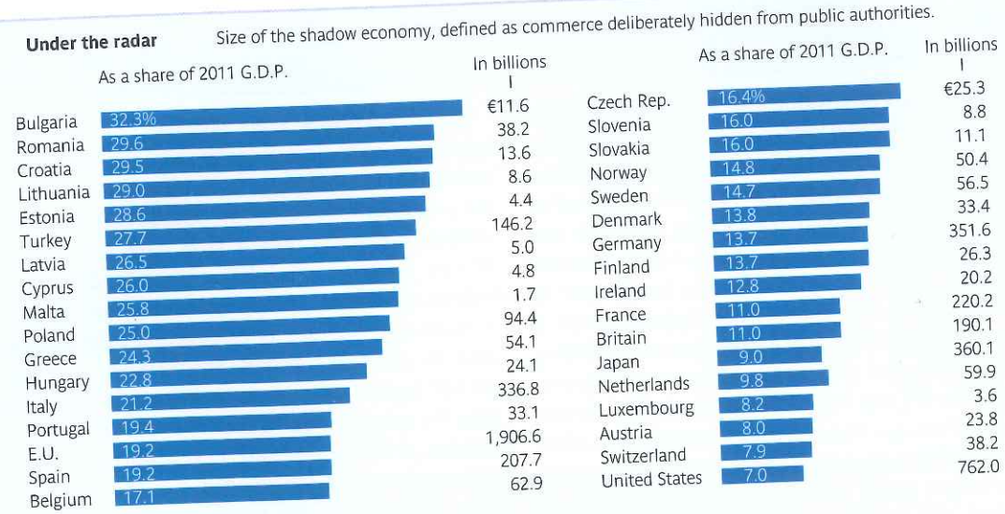

Fig. 2.2 Estimates of the Size of the Underground Economy (% of GDP)

Source: International Herald Tribune, 3 November 2011, p.II.

Box 2.5 How National Accounts Estimates Vary over Time

Because governments, firms, and investors require timely information about the economy, national statistical institutes in advanced economies have devised ways of quickly producing preliminary estimates of GDP. The procedure is based on the knowledge that the value added of, for example, the 100 largest corporations represents a given proportion of GDP. If the proportion were 10%, as these firms fill in VAT tax reports or respond to specially designed questionnaires, multiplying by 10 their combined value added provides a rough early estimate of GDP. A few months later, revised estimates can be based on data provided by a larger sample of firms. Waiting still longer will allow the incorporation of estimates based on an early and partial analysis of tax returns. Detailed analysis of all tax returns data—using procedures to reconcile differences between measures based on the three definitions—leads to a final figure. Table 2.2 shows successive estimates of German GDP in 2008. The first estimate, published in January 2009, exceeded the final figure by €8 billion, or by about 0.3% of the initial estimate.

income earned within a country's boundaries. Such data must be regarded with caution, however. First, GDP is a measure of income, not wealth. Income is a flow, while wealth is the stock of assets accumulated over longer periods of time. For example, the average income earned in the UK is lower than that of Abu Dhabi. Yet average British wealth is likely to be much higher because Britain has been accumulating wealth for centuries, in the form of private assets (e.g. houses, factories, jewels, stocks) and national assets (e.g. the London Bridge, paintings in the British Museum, railroads, highways and telecommunication networks, and much more).

Second, a large number of transactions are not recorded, especially in developing countries. They belong to what is sometimes called the informal

Table 2.2 Estimates of 2008 German Nominal GDP

Date of publication	GDP (bn EURO of 2000 prices)	% difference from previous estimate	% difference from Jan 2009
Jan 2009	2489.4	—	—
Feb 2009	2489.4	0.00%	0.00%
May 2009	2492.0	0.10%	0.10%
Aug 2009	2491.4	–0.02%	0.08%
Nov 2009	2495.8	0.18%	0.26%
May 2010	2495.8	0.00%	0.26%
Nov 2010	2481.2	–0.58%	–0.33%
Feb 2011	2481.2	0.00%	–0.33%

Source: Estimates as published in the monthly bulletin of the Deutsche Bundesbank, various issues.

economy. For example, much food can be produced within the extended family (a non-market activity), or exchanged for other food (a non-reported market activity). Very low reported per capita income levels in developing economies underestimate true value added and income. Finally, GDPs are measured in the country's local monetary unit, or currency, and are then converted into a common currency using the exchange rate. But local costs are often much lower in poor countries, for reasons presented later in Chapter 15. To correct for this effect, economists often use GDP figures that have been adjusted for differences in purchasing power.

2.3 Flows of Incomes and Expenditures

2.3.1 The Circular Flow Diagram

From final expenditures to net taxes and factor income

Each individual's expenditure necessarily contributes to some other individual's income. The simplified **circular flow** diagram represented in Figure 2.3 is based on this simple truth and goes a long way in tracking the functioning of an economy. Based on the first and third definitions of GDP, it shows how GDP arises as final sales, and how it is paid out to households, the owners of the factors of production. In addition, it shows how firms—around which market activity is organized—households, and the government interact to make GDP possible.

The GDP appears in the left part of the figure. It represents the final net sales of firms. Since firms are owned by households, the GDP represents the gross income of factors of production employed in the geographic region under consideration.[9] To see what firms do with revenues coming from their final sales, we move clockwise. The government, shown as the circle inside the flow diagram, takes (in the form of taxes) and gives (in the form of various transfers). It

[9] Technically, GDP also includes 'sales' of labour services by the self-employed. It also excludes sales of households' labour and capital services abroad. In order to keep things simple, we will ignore these latter components of GDP in what follows, so that all value added in the economy represents income to residents.

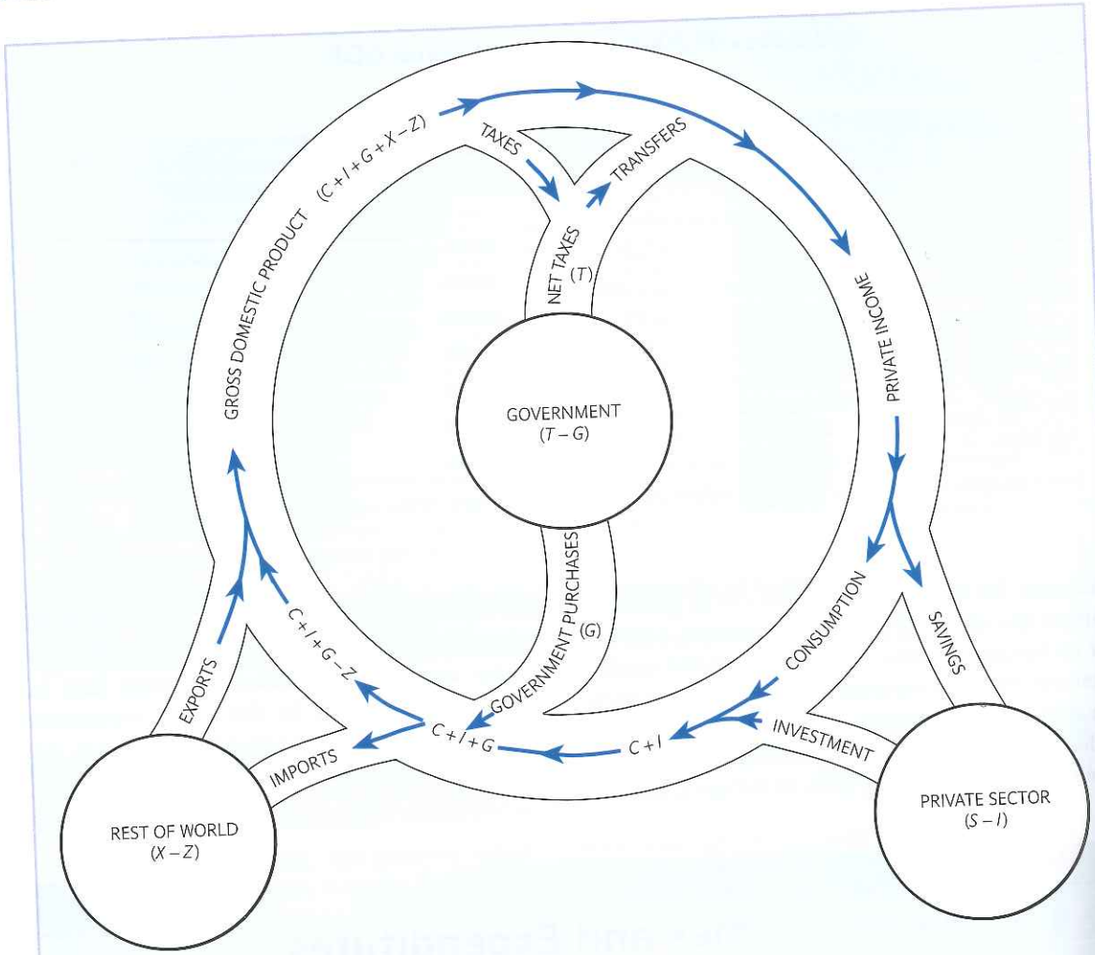

Fig. 2.3 The Circular Flow Diagram

The lower left part of the wheel represents final sales of goods and services which are domestically produced. It is the sum of consumption spending (C), investment spending (I), government purchases (G), and exports (X) less imports (Z). In the upper left part of the wheel this is interpreted as income to residents. This income is taxed by the government, but is also supplemented by transfers to households and firms (T). The remainder is private income, which may be saved (S) or spent (C). The private sector invests in productive equipment (I), which it finances in part by savings (S); the balance $S - I$ is the private sector's net saving behaviour. Similarly, the public sector's net saving behaviour is reflected in its budget surplus $T - G$. The balance $X - Z$ represents both net exports of goods and services as well as the net import of financial assets (claims against the rest of the world).

also purchases goods and services. Because it needs to pay for them, the government will almost always take in more than it gives away in transfers. The difference between taxes and transfers is called **net taxes** and is represented by T. These taxes are taken in at several points of the value added chain—as indirect taxes such as value added taxes, or as direct taxes on different types of income. Here we consolidate them for simplicity. What is left of GDP after these taxes and transfers are subtracted is called **private income**, $Y - T$.

From private income to absorption plus net exports—GDP

Private income is ultimately earned by those households which own the factors of production involved in creating the value added. The largest part of

private income is wages and salaries paid to workers plus payments for rent and royalties, as well as net interest on loans from banks. The residual which remains after firms pay all these other factors is known as gross profit. This profit can either be saved by the firm or redistributed back to firm owners as income.[10] Since all factors of production are ultimately owned by some households, households receive income as employees, as bondholders, as shareholders, as owners of land, and as holders of patents. Households can either save this income, or spend it on **consumption**.

The private sector represents the consolidation of households with the firms that they own. The flow diagram shows how the aggregate savings of the private sector (S) are deposited with the financial sector. The financial sector includes banks, financial institutions, and stock markets whose function is to collect savings and channel them to firms seeking to invest, that is, to purchase productive equipment. This activity, called **financial intermediation**, is represented by the lower-right circle. In the aggregate, the private sector uses its **savings**—the income that it does not consume—to finance, or pay for, the acquisition of new productive equipment by firms. The stock of existing productive equipment, including structures, is referred to as **physical capital**, while the purchase of new equipment is called **investment**. The excess of private saving over investment ($S - I$) is called net private saving. Net private saving can be positive or negative. Firms and households spend their income—part of it borrowed—to consume (C) and to invest (I).[11]

To private sector expenditures on goods and services ($C + I$) the government adds its own demand (G). Governments purchase goods (roads, military equipment, newly built buildings, and stationery for the bureaucracy) and services (of civil servants and other employees). While governments transfer lots of income, distribute various subsidies to firms and households, and pay interest on the public debt, these are not purchases of goods and services and not included here. Total national spending, sometimes called **absorption**, is the sum ($C + I + G$) of private and public spending on all goods and services. Part of absorption includes the purchase of imported goods and services (Z). This is shown as the branch going into the leftmost circle, which represents the rest of the world. It should not be thought of merely as merchandise purchases, but as covering all kinds of services, including labour and capital services, as long as they are rendered within the boundaries of the nation. Similarly, while some domestic income thus leaks abroad, foreigners buy domestically produced goods and services, the country's exports (X). Netting these two flows with the rest of the world gives net exports ($X - Z$). When positive, net exports increase demand for domestic production above that originating with domestic residents; when negative, demand for domestic production is less than total domestic demand.

The sum of absorption and net exports represents the total final sales that occur within the geographic area, i.e. the GDP. The circular flow of income is closed. This circularity is the essence of economic activity: we (collectively) earn to (collectively) spend.

2.3.2 Summary of the Flow Diagram

The flow diagram can be summarized using the first and third definitions of GDP (Y). As net final sales, the GDP is broken down into four main categories: (1) final sales of consumption goods and services (C), (2) final sales of investment goods and additions to inventory stocks (I), (3) final sales to the government (G), and (4) sales to the rest of the world (X). Since part of domestic income leaks abroad to pay for imported goods, imports (Z) must be subtracted, which gives the first decomposition of GDP by final expenditures:

$$Y = C + I + G + X - Z. \tag{2.5}$$

The flow diagram also shows that GDP can be viewed as net incomes earned by factors of production. What do they do with this income? The three possibilities are given on the right-hand side of the flow diagram: they pay taxes net of transfers (T), they save (S), and

[10] The other production costs are mainly land and buildings, financial costs (borrowing from banks and bondholders), and raw materials and intermediate goods which, for the country as a whole, are frequently imported.

[11] There is an important difference between this terminology and that used in the business or popular press, in which 'investment' includes the acquisition of existing assets or financial instruments. Although stocks and bonds are often issued by firms to finance purchases of productive equipment, their simple acquisition or sale does not necessarily imply 'investment' in economics, i.e. the creation of new productive capacity.

Table 2.3 Components of GDP by Expenditure, 1999–2010 (% of GDP)

	Consumption (*C*)	Investment (*I*)	Government purchases (*G*)
Australia	56.4	22.4	17.4
Germany	58.5	18.2	18.9
France	56.8	20.1	23.6
UK	65.0	17.0	21.0
Italy	59.3	20.7	19.9
Japan	57.4	24.0	18.1
Canada	56.4	21.4	19.7
Switzerland	59.1	21.4	11.3
USA	69.8	18.8	15.8
EURArea	57.2	20.8	20.5

Source: IMF.

they consume (*C*). Hence the second decomposition by uses of income:

$$Y = C + S + T. \tag{2.6}$$

Table 2.3 displays the components of the first decomposition as a percentage of GDP for a few countries. Consumption typically represents about 60% of GDP in Europe, but it is much higher in the US. The investment rate—the ratio of investment expenditures to GDP—amounts to some 20%, with few differences among the developed countries, but it is about twice as much in China. Because investment corresponds to the accumulation of productive equipment, it matters for future economic growth. The table shows that public spending varies quite a bit, but comparisons here can be treacherous. Investment in infrastructure equipment (roads, bridges, public utilities) may be undertaken privately in some countries and publicly in others. In addition, in federal countries, sub-central governments (e.g. the Swiss cantons or the US states) carry a substantial amount of public spending. Much the same concerns many goods and services that are privately produced in some countries while they are delivered freely as public goods in others: these include medical services, schools, child care, and public transport. Finally, the 'size of government' is considerably greater than the share of government expenditures: transfers to firms and households, not reported in Table 2.3, may be as large as direct expenditures. When total spending is considered, which adds transfers to expenditures, the government often 'handles' more than half of GDP.

The flows of incomes and spending captured by Figure 2.3 constitute the real, as opposed to financial, side of an economy. Parts of these flows leak out to the financial side in the form of corporate and household savings; others leak out to the government in the form of tax payments or social security contributions; others to foreigners through imports. To the extent that withdrawals of resources from the circular flow due to a particular sector is not matched exactly by inflows in the form of spending, then that sector's net asset position must be changing, by definition.[12] If savings of the private sector exceed investment spending, for example, this means that net accumulation of assets in the private sector is positive. The same holds for the consolidated government if net taxes exceed government purchases of goods and services, or for the nation if net export of goods and services, broadly defined, is positive. Asset

[12] If the net outflow is positive, net assets owned by the sector must be increasing; if the net outflow is negative, net assets are decreasing. Technically, increasing net assets can occur either by increases in gross financial assets (claims on other sectors), or by reducing gross liabilities (i.e. paying off existing debt to other sectors).

Table 2.4 GDP and Household Disposable Income, 2009

	GDP (billions of €)	Households disposable income	
		Level	% of GDP
Germany	2,395.0	1,554.2	64.9
France	1,907.7	1,293.9	67.8
Sweden	290.9	154.4	53.1
Switzerland	354.5	211.4	59.6
United States	10,122.6	7,911.5	78.2
United Kingdom	1,565.7	1,057.6	67.5

Sources: OECD, *Economic Outlook*; ECB.

accumulation or de-cumulation has economic consequences. How the financial side of the economy functions, and how the real and financial sides are linked, is studied in Part III of this book.

2.3.3 More Detail

While GDP represents the collective income earned within a nation's boundaries, not all of it ends up in the hands of private individuals. What households actually receive to spend or save is called **personal disposable income**. Table 2.4 shows that a big share of GDP does not reach individual households. It either goes to the government (net taxes) or is saved by firms (retained earnings).

Figure 2.4 starts with GDP and, moving right, decomposes it by its ultimate recipient. The first item is **depreciation**: in the process of producing GDP, productive equipment is subjected to wear and tear and obsolescence. Properly measured, this depreciation should be subtracted from GDP to give a clearer picture of the output that is really available as income if we wish to preserve the value of our productive capacities. Subtracting depreciation from GDP gives us the **net domestic product (NDP)**.[13] Moving further to the right, domestic income is what is left for firms once indirect taxes are paid out. Indirect taxes vary

[13] In practice, financial accounting of depreciation is determined by tax regulations. Firms are allowed to subtract from their revenues a given proportion of the book value of equipment for computing taxable profits. It may under- or overstate actual economic depreciation by a wide margin.

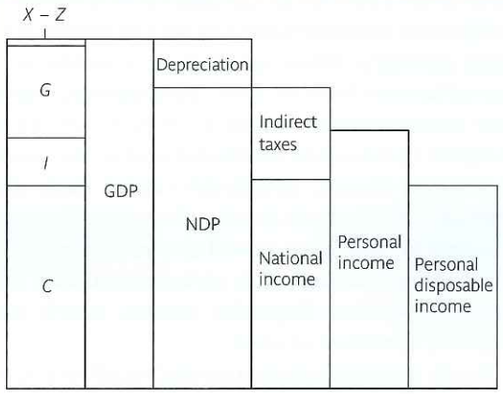

Fig. 2.4 From Expenditure to Income to Personal Disposable Income

Depreciation is stripped away from GDP to obtain net domestic product (NDP). When net factor income from abroad is zero, we can subtract indirect taxes from, and add subsidies of firms to, NDP to obtain domestic income (NI). (If net factor income from abroad is not zero, it must then be added at this stage.) Domestic income can be distributed in a number of ways: firms' savings (retained earnings), taxes on businesses, and contributions to social security are subtracted from domestic income, leaving various forms of income paid to households in the end. The government also transfers income to households (social security, unemployment insurance, etc.). This results in personal income (PI). After income taxes and some miscellaneous fees, we are left with personal disposable income (PDI), that is, resources available to households for spending or saving.

from country to country, and include the value added tax (VAT) and excise taxes (on petrol, tobacco, alcohol). They are collected by sellers on behalf of the government.

After indirect taxes, firms pay out the value added they generate in four primary ways. First, wages and salaries and other compensation to their employees represent the largest component. This includes contributions to social insurance, which is paid to the government. Second, they pay interest to bondholders and banks. Third, they pay corporate or business income taxes. What remains is profits to the firms' owners, or shareholders. These profits are either distributed as dividends or held back as retained earnings, sometimes called net corporate saving.[14]

To summarize, what is not paid as corporate taxes or saved by firms is ultimately paid out to households as the firms' employees, their owners, or indirectly as their creditors. When government transfers (e.g. unemployment benefits, disability payments, health care reimbursements, family allowances) are added to labour incomes and distributed profits, the result is personal income. Households cannot freely dispose of their personal income: they must first pay personal income taxes, as well as non-tax payments like parking fines and other governmental fees. The result is personal disposable income, which can either be consumed or saved.

Finally, economic boundaries can be trickier than it seems. GDP looks at a country as defined by its geographic boundaries. In doing so, foreigners (firms and individuals) who are domestic residents are treated as the national residents: their incomes and productions are part of GDP. Another approach is to look at the nationality of firms and people, independently of where they live. The gross national product (GNP), or gross national income (GNI), measures incomes and outputs of a country's citizens and corporations, no matter where they actually operate. Thus GNP = GDP + net factor incomes, adding incomes of national operating abroad and deducting incomes of foreigners operating at home. The logic of Figure 2.4 remains unchanged: simply we have net national product instead of net domestic product and national income instead of domestic income.

[14] Adding depreciation to net corporate savings gives gross corporate savings. It represents the resources that firms set aside to replace used equipment and generally to strengthen their financial position.

2.3.4 A Key Accounting Identity

The two decompositions of GDP, (2.5) and (2.6), are accounting identities: they hold by definition. Therefore it is always the case that:

$$C + S + T = C + I + G + X - Z.$$

Consumption C appears on both sides of this equality and can be eliminated. When this is done and terms are rearranged, the two accounting identities yield a third one:

$$(S - I) + (T - G) = (X - Z). \tag{2.7}$$

The last term, $X - Z$, is the balance of exports over imports of goods and services, now extended to include the services of factors of production employed outside the national borders. Parentheses highlight the fact that the corresponding expressions appear in Figure 2.3 as net flows of the private sector (household and business), government, and the rest of the world, respectively. Each of the three net flows can be thought of as a form of saving or withdrawal from the circular flow income and expenditure: a leakage if positive, or an injection if negative. If $S > I$, the private sector in the aggregate is a net saver. If $S < I$, the private sector is a net borrower. Similarly, if $T > G$ the government is saving, and if $G > T$ it is borrowing by issuing public debt to domestic or foreign residents. The identity (2.7) shows how these leakages are linked, by definition.

Table 2.5 The Accounting Identity in 2010 (% of GDP)

	S-I	T-G	CA
USA	5.6	–8.8	–3.2
Japan	10.3	–6.7	3.6
Belgium	3.9	–2.6	1.3
Denmark	4.7	0.8	5.5
France	2.6	–4.8	–2.2
Germany	8.1	–2.5	5.6
Italy	–1.3	–2.2	–3.5
Netherlands	11.5	–3.8	7.7
Spain	0.7	–5.2	–4.5
Sweden	4.7	1.6	6.3
UK	5.8	–8.3	–2.5
Euro area	4.1	–3.9	0.2

Source: OECD.

In Italy that year, both private and public sectors were spending more than they took in; the country as a whole, therefore, had to borrow abroad, which explains why they were running sizeable external deficits, as will become clear in Section 2.4. The Eurozone as a whole was running a balanced current account as budget deficits were about matched by private sector savings. Japan, the USA, and the UK were running huge budget deficits but Japan's net exports were in surplus thanks to even larger net private savings, while the US and the UK had to borrow abroad.

2.3.5 Identities versus Economics

Identity (2.7) is a particular way of stating that all goods and services produced (Definition 3 of GDP) must be purchased (Definition 1). For example, if private savings exceed private investment ($S > I$), either net exports must be positive or the government budget must be in deficit, or both. But identities tell us little or nothing about causation. Without more information, it is impossible to know whether (1) the government deficit is at the origin of positive net private savings, (2) high exports are generating income that is simply saved by residents, or (3) low domestic investment spending is coinciding with a domestic recession, in which both imports and tax revenues are low, bringing either current account or government budget or both into deficit. This is the difference between simply collecting data and interpreting them. This is also the difference between accounting and economics. The identity (2.7) is not only a requirement that accounts be correctly measured; we will see later that, as a market equilibrium condition, it also tells us a lot about how adjustment mechanisms work.

2.4 Balance of Payments

The **balance of payments** accounts record all economic transactions between a country and the rest of the world. Most countries have adopted the same classification, which has been designed by the International Monetary Fund. We also follow this classification. The presentation in Table 2.6 separates out international transactions in goods and services in the broadest sense (the upper part I) from financial transactions (the lower part II). Financial transactions imply the purchase and sale of assets such as stocks and bonds, loans and credit, bank deposits and currency, as well as real estate and other forms of wealth.

A simple rule to help understand the meaning of entries is the following: transactions involving *outflows of our money* are recorded as *deficit* (–) items, while those involving inflows of domestic money are considered as surplus (+) items. Box 2.6 offers a number of examples, which will become clear as we move along.

2.4.1 The Current Account and its Components

The first account to consider in Table 2.6 records exports and imports of goods and services. Imports are entered with a minus sign (deficit item), while exports contribute positively to the balance (surplus item). The net result is line IA, the **balance of goods and services**. The balance of trade in goods (line IA1) includes merchandise trade as well as trade in intermediate inputs, goods repair, goods held in ports, and non-monetary gold. The balance of trade in services (line IA2) incorporates a wide and growing variety of invisibles such as transport and travel, communication, insurance, financial, and other services. It also includes royalties and licence fees.

A second account to consider is the **balance of international income** (line IB). This account summarizes the net income of a nation which