

Output is normally measured by Gross Domestic Product (GDP), defined as the total market value of all final goods and services produced within an economy in a given period.

Output is normally measured by the **aggregate** Gross Domestic Product, or GDP. When people talk about the size of the economy – for instance, “the economy grew by 3 percent last year,” or “the US economy is twice the size of the UK” – they are usually referring to GDP.

GDP is defined as the total market value of all final goods and services produced for sale on organized markets in a given geographic area within a given period, usually one year. This means:

1. GDP includes only sales of good and services to the **final** purchaser. That is, it includes only things that people or businesses buy for their own use, as opposed to for resale or for use in producing something else. That means **consumption** and **investment** – *housing investment* by households, and **fixed investment** and **emphinventory** investment by businesses. Most investment by businesses is *fixed investment* in buildings, machinery, research and development, etc., but *inventories* are a special kind of business investment – unsold finished goods, goods in process and unused stocks of raw materials. Final purchases also includes direct expenditure by government on the military, infrastructure, law enforcement, education, and so on, but not **transfers** to individuals like Social Security or Medicare.
2. GDP includes only goods that are bought and sold on markets, and counts them at the price they actually sell at. (There are some exceptions to this rule.) So it does not include anything people produce for their own use, or that is exchanged outside of organized markets. In particular, it does not include domestic labor like childcare, home cooking, etc., and it does not include black markets and other illegal activity.
3. GDP only includes newly produced goods and services. Sales of existing goods or of new or existing **financial assets** are not counted in GDP.
4. GDP includes all production within a geographic area, regardless of who carries it out.
5. GDP is defined for a given period, usually a year but sometimes a quarter (three months).

Gross domestic product (GDP). The most common measure of total output of an economy. It is defined as final goods produced for the market within the borders of the country in a given period.

Aggregate. A variable measured at the level of the economy as a whole. Common aggregates include GDP, the consumer price index (CPI), and the unemployment rate.

Final goods. Newly produced goods purchased to be used by the purchaser, as opposed to goods purchased to be resold or used as inputs to make something else. Includes all spending by households on new goods and services (including houses), investment spending by businesses, and spending by government on the direct provision of public services.

Consumption. Spending on goods and services that are used directly to meet people’s needs. Includes all spending by households on newly produced goods and services (except new houses), as well as spending by nonprofits and government on services used by households.

Investment. The production of new long-lived means of production like buildings, machines, software, and so on. Unlike in everyday use, “investment” in macroeconomics does not include the purchase of existing real or financial assets.

Fixed investment. Production of new buildings, machinery or other lasting means of production. Includes all investment except for inventory investment.

Transfers. Payments that are made without any good or service being received in return. Transfers include payments through government programs like Social Security and unemployment insurance, as well as private gifts.

Financial asset. An asset like a stock, bond, or loan that does not involve ownership of any concrete object, but instead is a promise of future payment by someone else.

Output may also be measured net rather than gross, national rather than domestic, or as income rather than as product.

GDP is the most common measure of the size of the economy, but it is only one possible way to add up all the flows of money associated with economic activity. There are many debates about what exactly should be counted as final expenditure. In addition, each of the three terms – gross, domestic, and product – reflect choices that could be made the other way.

Gross or net? In economics, the term **net** means that something has been subtracted (or sometimes added) to the original number, while **gross** means that it has not been subtracted. In the case of GDP, we are not subtracting **depreciation**. Depreciation (or capital consumption) refers to the productive resources that were used up during the course of the year – machines that wore out, trees that were cut down, and so on. In principle, it might make sense to subtract depreciation, and the BEA does produce numbers for Net Domestic Product (NDP) with depreciation subtracted. But depreciation is hard to measure accurately, so for most purposes we use Gross Domestic Product instead.

Domestic or national? *Domestic* product includes all economic activity that takes place within the borders of the country, regardless of who carries it out. *National* product includes all economic activity carried out by a country's citizens and businesses, regardless of where it takes place. For example, the whole output of a Japanese auto factory located in the United States is counted in US GDP, but only the part of it "credited" to the American workers would be counted in GNP. The part of the factory's output attributable to the Japanese capital would be counted in Japan's GNP instead. For most countries, GDP and GNP are very similar, but for countries where foreign investment is important, they can look quite different.

Product or income? In principle, the total amount of spending on final goods and services should be exactly equal to the total income received from producing those goods and services. That is the logic of the circular flow. But in practice, some payments are always missed or mismeasured, so the two aggregates will turn out to be different, and we have to decide which one to trust. For most purposes, measurement of products is considered more reliable than measurement of income, but income measures are also reported.

Net. A number from which something has been subtracted. For example, net income for a business means revenue after costs are subtracted, net exports of a country means exports after imports are subtracted, and so on. What a particular net figure is net of depends on context.

Gross. A number from which something has not been subtracted. For example, gross income for a person means income before taxes are subtracted, gross domestic product of a country means that depreciation is not subtracted, and so on. What a particular gross figure is gross of depends on context.

Depreciation. The decline in value of real assets like buildings and machinery, whether from wearing out or from obsolescence.

In macroeconomics, investment means the production of new tools or resources that will be used for production in future periods.

Investment has a different meaning in macroeconomics than in everyday life. For an individual, investment might mean setting aside money with the hope of getting an income from it, for instance by buying shares in a mutual fund. But in macroeconomics, investment refers only to the production of new goods that will contribute to output in future years. That includes:

- New buildings (“plant”) and equipment purchased by businesses.
- *Research and development* and other **intellectual property (IP)** spending by business, such as development of a new drug by a pharmaceutical company, or production of a new movie by a studio. This is an important recent change in the definition of investment. This kind of spending was not considered investment before 2012; instead, it was considered a cost of production and was not counted in GDP.

Plant, equipment and IP investment are grouped together as *fixed investment*.

- Purchases of new houses by people, or *residential investment*. In standard macroeconomic accounting, households do not invest in anything except housing.
- Additions to stockpiles of raw materials and finished goods. When a company produces something and doesn’t sell it, that is called **inventory investment**. It might seem strange to call an unsold good an investment, but it makes sense when you consider that the good will contribute to output when it is finally sold. It also makes sense, given that the logic of the accounts requires total spending to be equal to total income. Since the people who produced the unsold goods received incomes, someone must have spent an equivalent amount of money. So we say that the business itself spent the money, by purchasing its own products. Note that only the *change* in inventories is counted as investment. This means that inventory investment is the one kind of investment that can be negative.

In a closed economy, total production equals total spending equals total income. output can be measured as any of these.

In a **closed economy** total production must equal total spending on final goods and services, since goods are counted in GDP only when they are sold, and for every sale there must be a purchase. Similarly,

Intellectual property (IP). Patents, copyrights, and similar legal claims on creative works and scientific discoveries. In the national accounts, creation of new IP is counted as a form of investment.

Inventories. Unsold finished goods, goods in process, and stocks of raw materials. In the national accounts, the change in inventories is counted as a form of investment.

Closed economy. An economy with no trade or financial links to other economies. No economy in reality is perfectly closed (except for the world as a whole), but it is often useful to think about how an economy would behave in isolation.

total production must equal total income, since every dollar of spending is received by someone. In an **open economy** this is no longer true: Production will be different from spending if the country unless the country's **trade balance** is exactly zero, and production will be different from income if some production is carried out using **factors** – labor or capital – of other countries. No economy is completely closed, but it is still useful to think about the closed economy case as a first approximation. In that case, the fundamental rule of national income accounting is:

$$\text{Total spending} = \text{total income} = \text{total output}$$

For an individual person or business, the income they receive is not necessarily equal to the value of the output they produce, and the amount they spend probably will not be equal to either. But for an economy as a whole, if everything is counted correctly, these three values will always be the same. When we are talking about an economy as a whole, we can use the terms “income” and “output” interchangeably.

There are some important exceptions to the general rules for what gets counted in GDP.

It's important to understand the basic concepts behind aggregate accounting, and the standard definition of GDP. But you should realize that these numbers do not always mean what they seem to. Here are a few odd rules of the national accounts that many people – even many economists – are not aware of.

“Households” include nonprofits. The **household** sector in the national accounts consists mostly of individuals and families earning income and spending money on their own needs. Every dollar you earn shows up as household income in the national accounts, and every dollar you spend on goods and services shows up as household consumption, except for a purchase of a new home, which shows up as household residential investment. But the household sector also includes nonprofit institutions like churches, charities, and nonprofit hospitals and universities. Any income these institutions receive is counted as household income, and any money they spend is counted as household consumption. Because the output of nonprofits is not sold in markets, it can't be measured like the output of a business. So instead, the value of “consumption” by nonprofits is measured as their total costs – including intermediate goods – minus any revenue from sales. In recent years, consumption by nonprofit institutions comes to about \$300 billion, or 2.5% of official household consumption.

Open economy. An economy connected by trade or financial links to other economies. In reality every economy (except for the world as a whole) is at least somewhat open; we use the term “open economy” to mean cases where the links to the external world are important.

Trade balance. The difference between a country's exports and its imports. If exports are greater than imports, it has a trade surplus; if exports are less than imports, it has a trade deficit.

Factors. Labor, capital and others who must be paid for their contributions to production.

Household. People when they are acting on their own behalf, rather than as part of businesses or governments. A household may be an individual or a family or other group of people who pool their incomes and make decisions about earning and spending together.

Homeowners are considered to rent to themselves. In general, the national income and product accounts only count goods and services that are sold in markets. The big exception is the “services” people produce for themselves as homeowners. By the standard conventions of the national accounts, anyone who owns their own home is considered to be renting that home to themselves. The BEA **imputes** (estimates) the value of that rent, and counts it as both income and spending for the household sector – even though no money changes hands. These *owner equivalent rents* currently total \$1.2 trillion, accounting for a bit over 10% of official household consumption. Again, this is not actual rental payments, but the BEA’s estimate of the value of the “housing services” that people receive from their own homes each year.

Imputation. A variable in the national accounts that can’t be measured directly, but has to be estimated based on other variables.

Health insurance payments are considered household consumption. All spending on health care for individuals is counted as income and consumption for the household sector, no matter who pays for it. Health benefits you receive from your employer are counted as household income just the same as wages and salaries. More surprisingly, spending through government health insurance programs is also considered income and consumption for the household sector. As far as the BEA is concerned, if your grandmother gets medical treatment and Medicare pays for it, that is exactly the same as if the federal government sent her a check and she decided to buy medical care with it. Employer-provided health insurance plans currently pay for about \$600 billion of medical care each year and public health insurance programs (Medicare and Medicaid) pay for about \$950 billion. Together, these account for a bit under 15% of total measured consumption.

There are large imputed financial services. Another exception to the rule that only services sold in the market count in GDP, is the “services” people are assumed to receive when they hold assets that pay less than the market interest rate, or borrow money at more than the market interest rate. For example, many people have checking accounts, despite the fact that checking accounts pay little or no interest. The BEA assumes that people are receiving some financial service from the bank that is equal in value to the interest they could otherwise get. These “imputed financial services” are currently estimated at \$450 billion per year, or about 4% of total household consumption.

Adding up these four items, you can see that about a third of what the BEA calls household consumption is not what we normally think of as consumption – money people spend on their own needs. (Non-profit spending is 2.5% of reported consumption, owners’ equivalent

rent is 10%, third-party health spending 15%, and imputed financial services are 4%, for 31% in total.) Either no actual money is spent, as with owners equivalent rent and imputed financial services. (These are exceptions to the normal rule that only market transactions are recorded in GDP.) Or money is being spent, but for some social purpose, not people's private needs, in the case of nonprofits. Or money is spent on people's private needs, but not by people themselves, as with third-party health spending. (Third-party education spending – when government pays students' tuition – also falls in this category.) How we count this spending has important implications. By the conventional measure, consumption by households has shown a big increase over the past 50 years, from around 60 percent of GDP in the mid-1960s to over 70 percent today. But it turns out that this increase is entirely due to the four factors described above. If we count as consumption only money actually spent by households on their own needs, there is no long-term increase in consumption spending at all. The two public health programs Medicaid and Medicare alone account for about three quarters of the apparent increase in household consumption as a share of total spending. The figure shows household consumption by the official measure and limited to actual spending by households both as a share of GDP. (Third-party spending (as on healthcare) is still included in GDP; noncash items like owners equivalent rent and imputed financial services are excluded from GDP as well.)

A recent discussion of these issues can be found in "Household Income, Demand, and Saving: Deriving Macro Data with Micro Data Concepts," a working paper by Barry Cynamon and Steve Fazzari.

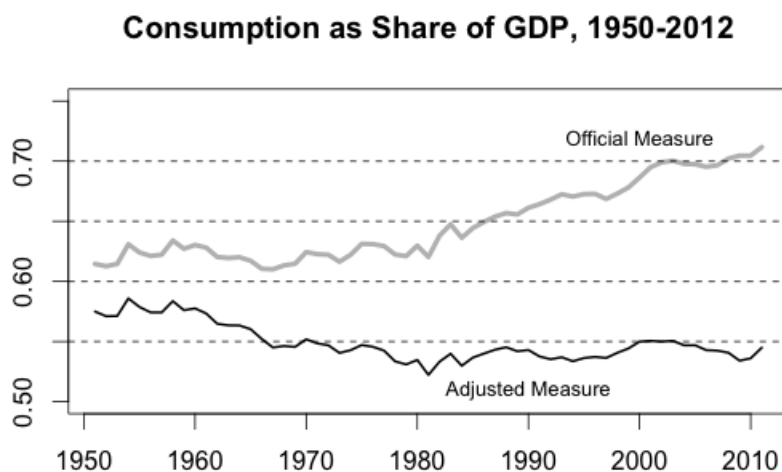


Figure 1: The official measure is the standard definition of consumption. The adjusted measure is limited to money actually spent by households.

Government output is valued at cost. Like nonprofits, governments carry out productive activity but they do not generally sell the goods and services they produce in the market. So their output

cannot be measured by its sale price, the way the output of private businesses is. Instead, the value of government services are computed as the total cost of producing them, including wages and intermediate goods. This means that if labor and other inputs are used as efficiently by government as by business, the value of government services will be underestimated, since the cost of goods produced by private businesses reflect not only labor and other costs, but also profit for the business owners. So if we assumed that government is on average as productive as the private sector, we would have to raise the estimated value of government services by 10 percent or more. Note that this does not say anything about the social value of government spending; it just says that if we estimated a market value for government services the same way we calculate the output of private businesses, the number would be somewhat higher than the official measure. The most important thing for the purpose of this class is simply to know that the value of government output in the national accounts is computed by adding up all the costs of government production.

The national income identity says that total income must be equal to the sum of the various components of GDP.

The **national income identity** states that all spending in the economy can be split into four categories: consumption, investment, final government spending, and net exports – that is, exports minus imports. Or:

$$Y = C + I + G + (X - M)$$

Because this is an **accounting identity**, it always holds exactly. So if we know all but one of the terms in the equation, we can calculate the remaining one. For example, in 2014, US GDP was \$17 trillion. Consumption spending totaled \$12 trillion, final government spending totaled \$3 trillion, exports were \$2 trillion, and imports were \$3 trillion. Knowing this, we can calculate investment spending:

$$17 = 12 + I + 3 + (2 - 3)$$

$$I = 17 - 12 - 3 - 2 + 3 = 3$$

Investment must have been \$3 trillion. And in fact it was.

Note that imports are a subtraction from GDP. This makes sense, since they represent domestic spending that does not fall on domestically produced goods.

National income identity. A fundamental accounting identity that says that total output equals the sum of consumption, investment, final government spending and net exports: $Y = C + I + G + (X - M)$.

Accounting identity. An equation that must always be true, because of how the terms are defined.

The identity also applies to changes in GDP. So it can be used to tell us what kinds of macroeconomic developments are possible.

By itself, the identity is not very useful, since you are unlikely to be in a situation where you know some of the components of GDP but not others. It becomes more interesting when we think about changes in GDP rather than its current level.

Any accounting identity also holds for changes in the variables. If investment spending rises by one dollar, and no other expenditure changes, then GDP must also rise by one dollar. So any change in GDP must involve changes in the various components that add up to the overall change.

Usually, we measure changes in the components in *percent of GDP*, rather than dollars. Note that to say that investment rose by one percent of GDP, is different from saying that it rose by one percent. Using the numbers above, a one percent of GDP increase in investment would be an increase of \$170 billion; a one percent increase in investment would be only \$30 billion.

If we think that spending determines output – as almost all economists do for short-run changes – then we can say that the changes in the various components explain the change in total GDP. For example, we might say that an economy grew by 1 percent because households increased investment spending by two percent of GDP, while businesses reduced investment spending by one percent of GDP.

The BEA produces tables exactly like this, reporting “Contributions to Percent Change in GDP” by various expenditure categories. For example, in the third quarter of 2015, real GDP grew at a 2 percent annual rate. Of this, consumption contributed 2, investment -0.1, exports 0.1, imports -0.4, and final government spending 0.3. (The numbers don’t quite add up because of rounding.) Note that the negative contribution of investment means that investment spending was falling, while the negative contribution of imports means that imports were rising.

This is useful: It tells us that growth in output is currently based on households’ willingness to increase consumption relative to their incomes.

The same kind of analysis is also useful when we want to ask what is possible in terms of economic growth. For example, during 2007-2009, residential investment fell by a total of 3 points as the housing bubble collapsed. This decline was partly, but not entirely, offset by an increase in final government spending. Some people argue that this increase in government spending was not needed to maintain demand. But in that case, we can ask, what other component of demand could have increased to make up for the fall in residential

investment? It does not seem plausible that households would have increased consumption expenditure sharply as the value of homes was falling, and household debt was already at high levels. (In fact, real consumption spending was flat during those three years.) It's hard to see how there could have been an increase in investment spending if businesses were seeing falling sales and many were having trouble getting loans. (In fact, business investment fell by 1.2 points.) So someone who claims that additional government spending was not required to maintain demand during 2007-2009 should have some explanation of how US exports might have grown, and/or imports fallen, by an additional 3 percent of GDP during this period.

Similarly, there is concern now in China that high growth has been driven by very high business investment, much of which may turn out to be wasteful or unprofitable. The national income identity reminds us that for investment growth to slow without pulling down GDP growth, some other component of demand must grow faster. Again, to use the national income identity to analyze these issues, we simply recall that $Y = C + I + G + (X - M)$ whether measured in dollars or percentage points of GDP. Suppose that Chinese investment must fall by, say, 5 percent of GDP to get back to a sustainable level. As Martin Wolf discusses in a recent column in the *Financial Times*, there are serious challenges to faster growth of consumption by Chinese households, larger Chinese trade surpluses, or big increases in government spending. But we know that for GDP growth to be sustained, some combination of consumption, government spending and net exports must increase by 5 points.

The national income identity can be rearranged to show that the difference between private saving and investment, plus the government budget balance, must be equal to the trade balance.

Another way of using the national income identity is to introduce taxes, government transfers, disposable income and private savings. We will need to introduce some new variables for this. **Disposable income** is the flow of money available to households. So it includes both current income (that is, wages and profits from the business sector) and *transfers*, less tax payments. So if we write Y_D for disposable income, T for tax payments, and TR for transfers, then:

$$Y_D = Y - T + TR$$

In macroeconomics, savings simply means that part of total income that is not used for consumption. In other words,

$$S = Y - C$$

Disposable income. Income available to households after transfers and tax payments.

In the same way, *private saving* is that part of disposable income that is not used for consumption. Note that private savings includes **retained earnings** of corporations as well as saving by households. So, writing S_P for private saving,

$$S_P = Y_D - C = Y - T + TR - C$$

Or equivalently, consumption is equal to disposable income minus private saving:

$$C = Y_D - S_P = Y - T + TR - S_P$$

We will ignore private transfers and assume all transfers are from government to households. Then total government spending is equal to G (purchases of goods and services for public purposes) plus TR . So the government budget surplus (positive) or deficit (negative) is equal to $T - (G + TR)$.

Now we combine the previous equation for consumption with the national income identity and rearrange the terms:

$$Y = C + I + G + (X - M)$$

$$Y = (Y - T + TR - S_P) + I + G + (X - M)$$

$$0 = (I - S_P) + (G + TR - T) + (X - M)$$

$$(M - X) = (I - S_P) + (G + TR - T)$$

This says that the trade deficit must equal the excess of private investment over private saving, plus the government budget deficit. The excess of private saving over private investment is also called the **private balance**; in effect, it is the amount of income the private sector (households and business together) has left over after paying for all desired investment. If the private balance is negative, that means that there is more investment taking place than there is private savings to pay for it. Since savings always equals investment, the remaining saving must come from somewhere else – either the government (via a budget surplus) or the rest of the world (via a trade deficit.)

We could just as easily reverse all the terms (that is, multiply both sides of the equation by negative one). Then it says that the trade surplus must be equal to the excess of private savings over private investment, plus the government budget surplus:

$$(X - M) = (S_P - I) + (T - G - TR)$$

Retained earnings. Profits that are kept by the business that earned them, rather than paid out to shareholders. Retained earnings are an important form of saving in the economy. Historically, corporations paid out about half their profits and retained about half.

Private balance. The difference between private saving and private investment.

The previous equation is an *accounting identity*; it is always exactly true. But that raises the question – what if something happens that changes just one of the terms in the equation – how does it balance? Which of the terms in the equation “call the shots’,” and which are passive? For example, in the 1980s, many people believed in the idea of “dual deficits” – that the large budget deficits under the Reagan administration were responsible for the large trade deficits that began around the same time. Later, in the 1990s, the federal government moved back toward budget surpluses, but the trade deficits continued. This made the dual deficits idea less attractive. It remains true, however, that if the government budget deficit increases, either the private sector must be saving more or investing less, or else the trade deficit must increase as well.

Another example: Suppose you think that China ought to have a smaller trade surplus. The national income identity shows us that this is possible only if Chinese households reduce their savings, or Chinese businesses increase their investment, or the Chinese government moves toward a budget deficit. Any successful effort to reduce the Chinese trade surplus must somehow bring about at least one of these outcomes.

In general, classical economists believe that savings calls the tune – that an increase in P_S will lead to an increase in I . They therefore favor measures to discourage consumption and to redistribute income to the rich, who tend to save more. Keynesian economists, on the other hand, believe that investment calls the tune and private savings adjusts in reaction. In this view, an increase in I is more likely to lead to an increase in P_S than the reverse. (This is because not all of the the new income created by increased private investment is consumed.) So Keynesians are more likely to see higher consumption as good for the economy, and to favor redistribution to the poor.

“Keynes’s intellectual revolution was to shift economists from thinking in terms of a model in which a dog called savings wagged his tail labelled investment, to thinking in terms of a model in which a dog called investment wagged his tail labelled savings.” – James Meade