Beginners:GDP - Comparing GDP: growth rate and per capita
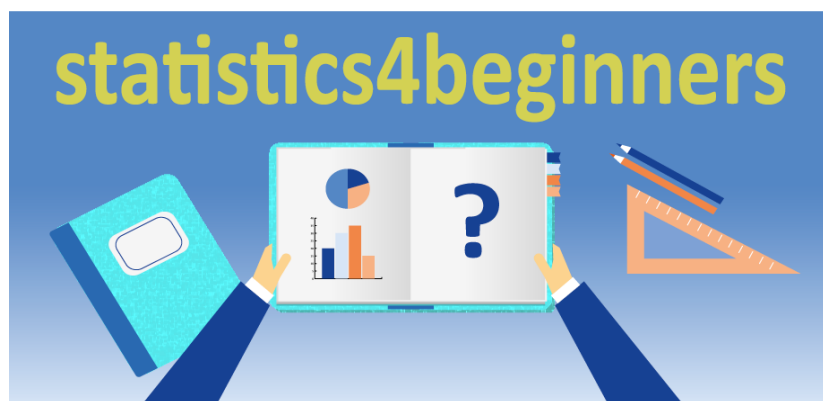
Statistics Explained

This article is part of Statistics 4 beginners , a section in Statistics Explained where statistical indicators and concepts are explained in a simple way to make the world of statistics a bit easier for pupils and students as well as for everyone else with an interest in statistics.

Here we will see how to compare GDP over time and between economies in ways that avoid drawing misleading conclusions because of: different sizes of population, inflation, and price level differences.

GDP gives us an idea about the size — in monetary terms — of an economy.

Example:

At the end of 2022, the GDP in the EU was € 15.8 trillion (that's EUR 15.8 million million or € 15 800 000 000 000).
OK, that's a huge number, but perhaps not very informative.

In fact, like most other statistics, the value of GDP for a particular economy becomes more interesting when we compare it with other values of GDP over time or for other economies.

How can the GDP of countries of different sizes be compared?

One common operation to make the GDP comparable between different regions and countries, is to relate an economy's GDP to the number of all people living in that economy, including men, women and children (see article for more information on population statistics). Thus, by dividing the value of an economy's GDP by the number of its inhabitants, you obtain a ratio which is called GDP per inhabitant or **GDP per capita** . In simple terms, the higher the ratio, the richer the country (in terms of GDP).

Example:

In 2022, the population in the EU was 449 million. Dividing the GDP figure above by the population results in a GDP per inhabitant, or per capita, of around € 35 200.

Now, as the number is not so big anymore, it is a bit easier to understand, and it is possible to think of it in **comparison with an annual salary** , for instance.

How can GDP be analysed over time?

Another way to analyse GDP is to compare the value of GDP in different moments in time, in other words to see how it develops over time. To do this, you calculate a rate of change, which is often simply called a growth rate (as GDP normally goes up), but in spite of this expression, as we see in times of recession or crisis, GDP can also decrease.

We can compare GDP in one year with the GDP of the year before, or even further back, for example, 5, 10, 20 or more years ago. However, when we do this, we face the problem that GDP is measured in money terms (euros in the euro area and national currencies
elsewhere within the EU) and the value of money changes over time, because of inflation (i.e. general price changes).

When we calculate GDP and compare the values between two or more years, we are comparing them using the prices of each of the years (2016 GDP in 2016 prices, 2015 GDP in 2015 prices and so on); this is called **nominal** GDP or GDP in **current prices** .

In fact, GDP is calculated using the prices of that year, but when we compare values between two or more years, we must not forget that each year GDP was measured with its own prices (2023 GDP in 2023 prices, 2022 GDP in 2022 prices and so on). This measure of GDP is called **nominal GDP** or **GDP in current prices** .

Therefore, if we have data for GDP in current prices for a time series (a series of years, for instance), we need to adjust it to know how the economy has **really** changed. To do this, GDP is adapted according to the price changes by using a **price index** . This process is referred to as **deflating the current price data** , and from the deflated data we can calculate the **real rate of change** (also change in the volume of GDP). When we hear or read that GDP grew by a certain amount or a certain percentage, it is nearly always this real change (or volume change).

Example:

The EU's GDP was 16.6 % higher in 2022 compared with 2012 (10 years earlier) in real terms, while over the same period GDP in current prices grew by 39 %. This means that less than half of the growth observed in current prices was due to real economic growth and the rest was simply due to inflation (rising prices).
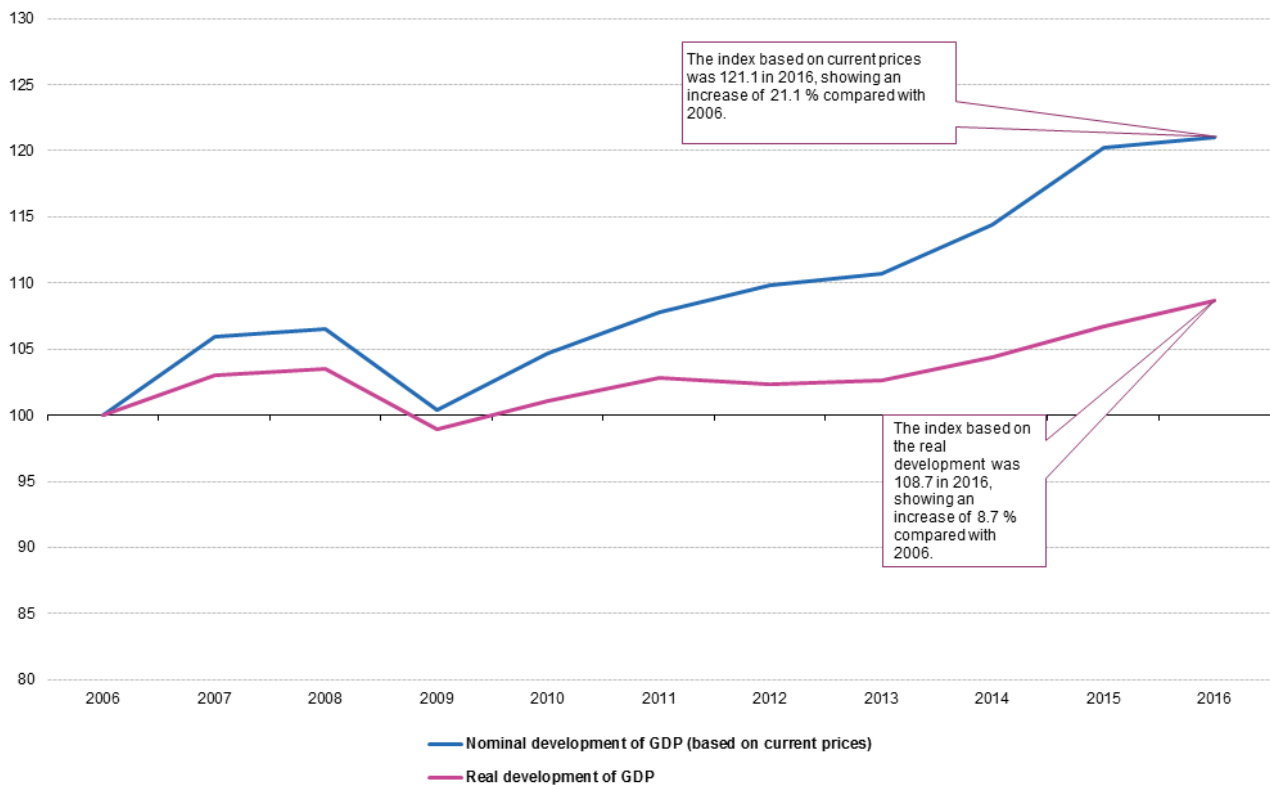
The index based on current prices was 121.1 in 2016, showing an increase of 21.1 % compared with 2006.

The index based on the real development was 108.7 in 2016, showing an increase of 8.7 % compared with 2006.

— Nominal development of GDP (based on current prices)
— Real development of GDP

Figure 1: Real and nominal development of GDP, EU, 2006-2016 (2006 = 100) Source: Eurostat (nama_10_gdp)

How can the GDP of different economies be compared?

How do we compare two economies, for example, Germany and France, the two largest economies within the euro area, based on GDP?

Example:

In 2022, Germany's GDP was € 3.9 trillion while France's was € 2.6 trillion. When we divide the GDP by the population, this gives a GDP per capita of € 46.2 thousand in Germany compared with € 38.6 thousand per inhabitant in France.Similar issues that lead to the above mentioned process of deflating GDP arise when comparing different economies, because price levels may differ from one country (or region) to another.

Indeed, on average, the amount of goods and services that you can buy in Germany is likely to be different from what you can buy in France with the same money, despite these two Member States both use the same currency.

Therefore, just as you need to use a price index to deflate GDP over time to get a real analysis of a time series, you will need a price level index to adjust GDP to improve comparison between countries.

To adjust for price level differences between economies, the value of GDP is converted using the **purchasing power parity (PPP)** , a special exchange rate that takes price level differences into account. After this operation, data are no longer measured in euro, but in an artificial currency called a **purchasing power standard (PPS)** . Using this currency someone could, in theory, buy the same amount of goods and services in any economy.

Example:

By convention, one euro is equal to one PPS on average for the EU as a whole, so the EU's GDP in 2022 was around € 15.8 trillion and PPS around 15.8 trillion as well .

However, because price levels are different in different economies, the conversion to PPS leads to a GDP of PPS of

around 3.5 trillion in Germany and of PPS 2.4 trillion in France; as can be seen, both of these numbers are smaller than the numbers given earlier in euro terms, because prices in Germany and France are, on average, higher than in the EU as a whole.

This means that you can buy less with € 100 in these two Member States than in several other Member States, which have lower price levels.

If we now divide these values by the population, we can calculate GDP per inhabitant in PPS as well. This indicator will therefore take into account not only price level differences between economies, but also differences in the size of their populations.

Example:

In 2022, GDP per inhabitant was PPS 41.2 thousand in Germany, around 15 % higher than the PPS 35.8 thousand in France. As such, adjusting GDP per capita for price level differences decreased the gap in GDP per inhabitant between Germany and France in 2022 from 20% in euro terms to
15 % in PPS terms; this reflects the fact that the average price level in France in 2022 was lower than that in Germany.
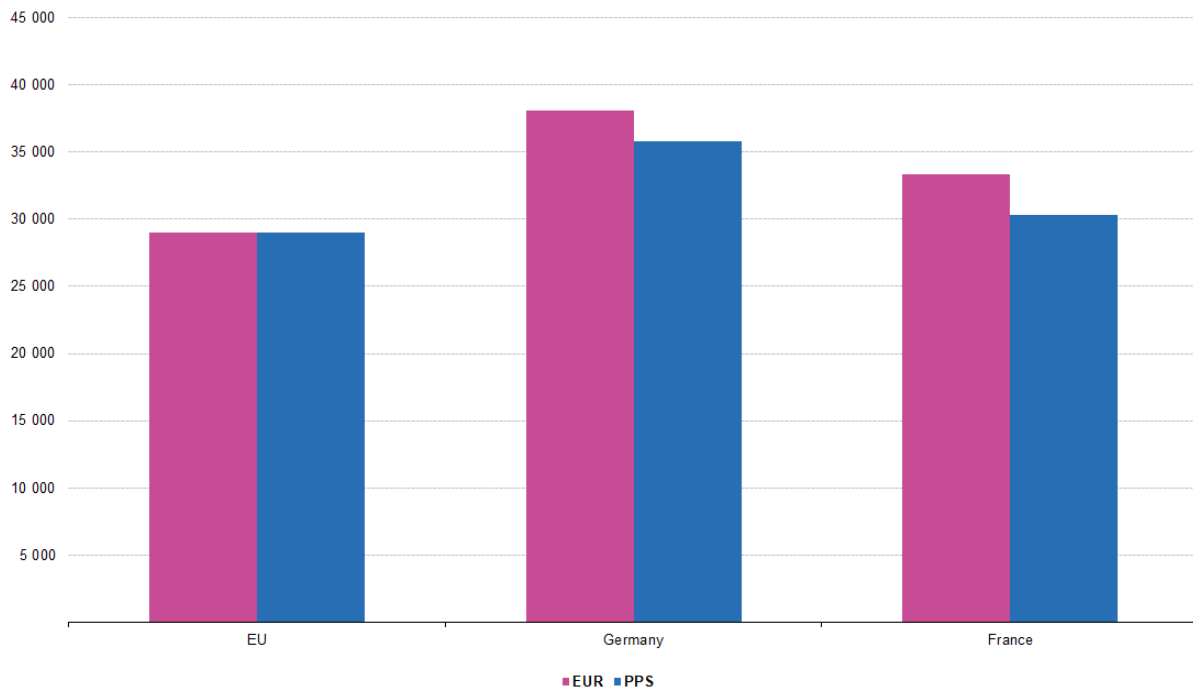
Source: Eurostat (online data code: nama_10_pc)

Figure 2: Gross domestic product (GDP) at market prices per inhabitant, 2016 Source: Eurostat (nama_10_pc)

Back to Statistics 4 beginners — Introduction

Other articles

Related articles in Statistics 4 beginners :

- What is GDP?
- Calculating GDP

Related articles in Statistics Explained :

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- National accounts background
- National accounts — an overview
- Volume measures

Glossary items in Statistics Explained: :

- Gross domestic product (GDP)
- European Union (EU)
- Per capita
- Euro area
- Inflation
- Price
- Time series
- Harmonised index of consumer prices (HICP)
- Constant prices
- Price level
- Purchasing power parity (PPP)
- Exchange rate
- Purchasing power standard (PPS)

External links

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