GDP per capita volume indices based on constant and on current PPPs in OECD's *Main Economic Indicators*

Why two alternative measures?

For many analytical purposes, it is of interest to observe the evolution of volume GDP between countries *and* over time. There are at least two ways of setting up such a comparison, each with its specific interpretation and use.

Until now the MEI table presented only one option: per capita volume indices using current PPPs. However, it was felt that, for analytical purposes and for a better comprehension of published data both options should be shown. This follows the practice in other OECD statistical publications, in particular Volume I of the *Annual National Accounts*.

GDP comparisons based on *current PPPs*

They are the appropriate tool to answer the question: 'What is a country's position in terms of GDP (per capita), given the set of international prices of the year considered?'

The first possibility of combining spatial and temporal observations is by using a sequence of current or 'benchmark' PPPs, i.e., a new set of price data compiled in Member countries, weighted and aggregated to yield rates of currency conversion for total GDP and its expenditure components. This means that prices and price structures are allowed to vary over time. One can also say that by carrying out this calculation for every period, GDP comparisons across countries are based on *current international prices*. Comparable volume levels of GDP are obtained by applying these current PPPs to GDP measures at current national prices. Within a given year, (spatial) comparisons between countries are straightforward – volumes are measured with the same price structure. Comparisons over time, however, incorporate several effects: relative volume changes, changes in relative prices between countries and changes in definitions and methodologies.

GDP comparisons based on *constant PPPs*

They are the appropriate tool to answer the question: 'How has the relative position of a country's GDP (per capita) changed over time, given its measured growth performance?'

This second approach to generate time series of PPPs is to fix a 'base' year and to extrapolate PPPs for other years. Extrapolation is done by applying the relative rates of inflation observed in different countries to the base year PPPs. GDP series in national currency and at current prices can now be converted with these PPPs to yield volume measures that are comparable across countries. The resulting measures of GDP comparisons are volume indices at *constant prices and PPPs*. The same result would have been achieved by applying volume growth rates of GDP to the comparative GDP levels of the base year.

Whichever way they are calculated, these time series have a very convenient property: they replicate exactly the relative movements of volume GDP growth of each country. While such a characteristic facilitates the use and interpretation of PPPs over time, it shares an important drawback with other indices that use a fixed base: the assumption that price *structures* do not change over time. Economic reality has it, however, that *relative* prices do change over time and it is well known that ignoring these shifts over longer periods can generate a biased picture of economic developments. Another consequence of fixing

price structures at a base year is the dependence of results on the choice of the base year. However, the advantage is that the resulting series is unaffected by methodological changes relating to the calculation of PPPs.

To sum up, the key conceptual difference between using current and constant PPPs is that the former capture changes in volume as well as changes in relative prices, whereas the latter only capture volume changes. Even if the volumes of goods and services remain identical over time, a GDP comparison based on current PPPs may change over time if prices and price structures shift. This factor comes into play when some countries are large producers and exporters of products with marked price changes, as has been the case for Norway as an important exporter of oil.

Further methodological differences

Another source of differences between the GDP comparisons based on current and on constant PPPs is methodological changes between successive rounds of price collection. For example, the introduction of the 1993 System of National Accounts brought with it changes in product classification that affected PPP computations. While such changes help to improve comparability across countries once they are put in place, they also reduce comparability with observations before their introduction and a break in series occurs. Sometimes, simple changes in price collection methodologies have similar effects and reduce inter-temporal comparability. The OECD is currently analysing the impact of certain breaks in series on overall results.

There may also be differences in the ways in which statistical offices construct implicit price indices for their GDP series. Such differences will directly influence the extrapolated PPP measures and so account for some of the observed differences between GDP based on current and constant PPPs.

Conclusion

Overall, the OECD recommends indices based on constant PPPs for the analysis of relative growth performance between countries and over time and indices based on current (benchmark) PPPs for the latest ‘snapshot’ comparisons of the GDP and GDP per capita.

ANNEX

Why do 'estimated' per capita volume indices at current PPPs coincide with per capita indices at constant PPPs?

There are two cases in which OECD has to produce estimates for GDP comparisons at current PPPs: i) PPPs for non-EU countries are only available every three years and intermediate years have to be estimated; ii) PPPs for the most recent year are often unavailable for all countries and estimates have to be put in place. As the method of estimation is identical to the method by which GDP at constant (national) prices and PPPs are compared, the results coincide. For added clarity, methods of estimation and their results are described more formally below.

When current PPPs are unavailable, they are estimated by applying the relative rates of inflation between the country under consideration and the base country to the PPP of the latest available year. More specifically, suppose that the PPP of country k compared to a base country (e.g., the United States) is known for the year t but not for the year t+1. However, for both the United States and country k, national inflation rates are known in the form of implicit deflators for GDP. An estimate for country k's 'current' PPP in period t+1 is then obtained from the following calculation:

$$PPP_{t+1}^{k} = PPP_{t}^{k} * \left(IPD_{t+1}^{k} \Big/ IPD_{t+1}^{US} \right), \text{ where:}$$

PPP_t^k: PPP for country k's GDP in year t ($PPP_t^{US} = 1.00$ for the United States);

IPD_{t+1}^k: implicit price index for country k's GDP, between years t+1 and t.

One further notation is needed that links GDP at current and constant (national) prices. Let $GDPC_{t+1}^k$ be country k's GDP at current national prices in year t+1 and let $GDPV_{t+1}^k$ be country k's volume GDP in period t+1, expressed in constant (national) prices of period t. Then, the implicit price index of country k is defined as $IPD_{t+1}^k = GDPC_{t+1}^k \Big/ GDPV_{t+1}^k$.

Next, apply the estimated 'current' PPP for country k and period t+1 to its GDP at current (national) prices in period t+1 and make use of the link between current and constant price GDP:

$$\frac{GDPC_{t+1}^{k}}{PPP_{t+1}^{k}} = \frac{GDPC_{t+1}^{k}}{IPD_{t+1}^{k} \times PPP_{t}^{k}} \times IPD_{t+1}^{US} = \frac{GDPV_{t+1}^{k}}{PPP_{t}^{k}} \times IPD_{t+1}^{US}$$

The same operation for the United States yields:

$$\frac{GDPC_{t+1}^{US}}{PPP_{t+1}^{US}} = \frac{GDPC_{t+1}^{US}}{1.00} = GDPV_{t+1}^{US} \times IPD_{t+1}^{US}$$

Finally, divide the expressions for the two countries to obtain an index:

$$\frac{GDPC_{t+1}^{k} \Big/ PPP_{t+1}^{k}}{GDPC_{t+1}^{US} \Big/ PPP_{t+1}^{US}} = \frac{GDPV_{t+1}^{k} \times IPD_{t+1}^{US}}{GDPV_{t+1}^{US} \times PPP_{t}^{k} \times IPD_{t+1}^{US}} = \frac{GDPV_{t+1}^{k}}{GDPV_{t+1}^{US} \times PPP_{t}^{k}}$$

This index is exactly the GDP comparison between country k and the United States for the year t+1 at constant (national) prices and constant PPPs. Thus, the estimation method for current PPPs and their application to current GDP levels yields identical results to the alternative method by which GDP at constant prices and PPPs are compared. This explains identical results from the two methods for certain years and/or countries.