

- 2 What are PPPs?**
- 2 Main uses of PPPs**
 - Size of economies
 - Consumption per capita
- 4 Measuring and comparing non-market services**
 - Education
 - Health
- 5 PPP results over time**
 - Current PPPs and expenditures
 - Constant PPPs and expenditures
 - GDP per capita over time
 - Comparing price levels over time
- 8 Further reading**

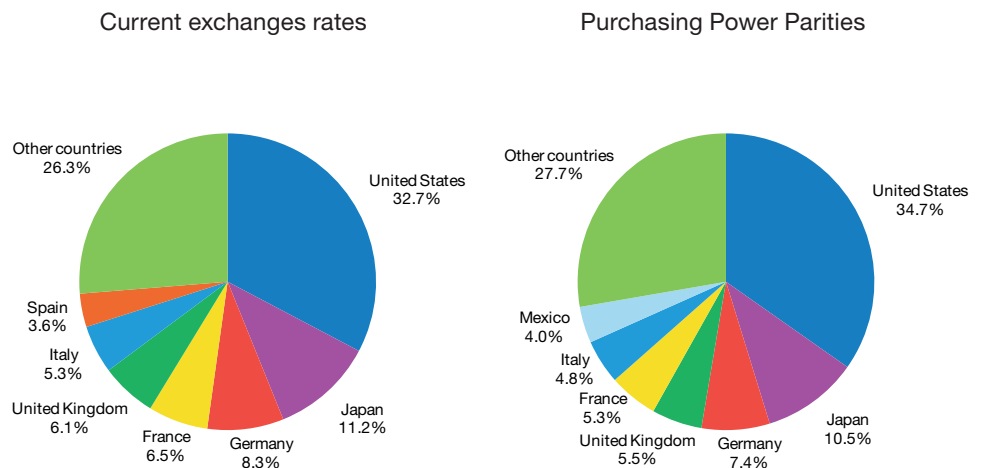
2008 Benchmark PPPs Measurement and Uses

by Sophie Bournot, Francette Koechlin and Paul Schreyer

Cross-country comparisons of economic data are often based on market exchange rates. While the calculation is straightforward, the results can be misleading in particular analyses; such as those that relate to material well-being, consumption or volumes of economic activity. For meaningful comparisons, Purchasing Power Parities (PPPs) are needed.

This Statistics Brief provides some background on PPPs, including their construction and application, and presents the new benchmark PPPs for 2008, produced as part of the Eurostat-OECD PPP programme. The Brief also describes some methodological changes that have been introduced since the last benchmark PPPs in 2005 regarding the measurement of health and education services. Finally the Brief presents some information on PPPs in a temporal context, in particular how PPP converted series behaved during the recent crisis.

Figure 1. The seven largest economies in the OECD
Percentage of OECD total, 2008



What are PPPs?

In their simplest form, PPPs are price relatives that show the ratio of the prices in national currencies of the same good or service in different countries. The Big Mac currency index from The Economist magazine is a well-known example of a one-product PPP. The Big Mac index is “the exchange rate that would mean that hamburgers cost the same in America as abroad”. For example, if the price of a hamburger in the UK is 2.29£ and in the US, it is \$3.54, the PPP for hamburgers between the UK and the US is 2.29£ to \$3.54 or 0.65 pounds to the dollar. In other words, for every dollar spent on hamburgers in the United States, 0.65 pounds would have to be spent in the UK. OECD-Eurostat PPPs create similar comparisons but, unlike the Big Mac index, the OECD-Eurostat PPPs relate to a basket of about 3000 products and are calculated for aggregated product groups, all the way to GDP and its main components such as consumption or investment.

PPPs are spatial price comparisons and share many similarities, and challenges, with the better-known price comparisons over time. For example, comparisons over time are often complicated by changing products and consumption patterns, especially when the years of comparison are remote. Furthermore, spatial comparisons are

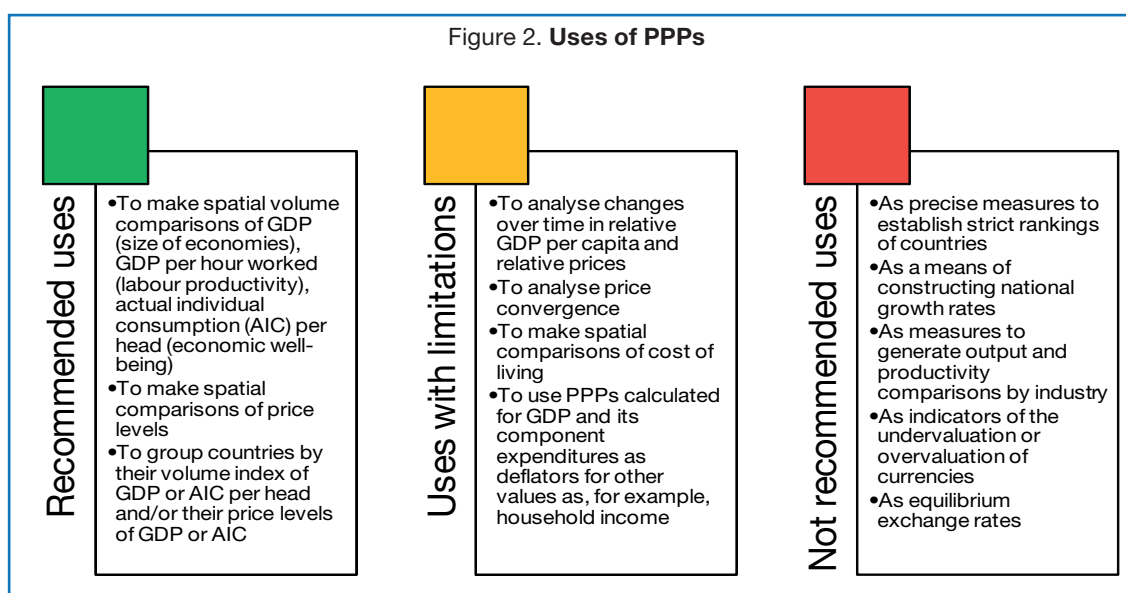
often complicated by the fact that products that are characteristic in one country may be uncharacteristic in another, and yet means must be found to make meaningful comparisons.

Main uses of PPPs

Although PPPs are widely used, the way they are constructed is not always widely understood. Nor is their usage always commensurate with the purpose for which PPPs have been constructed (Figure 2). Two common recommended uses are: volume comparisons of GDP to assess the size of economies (in absolute terms and per capita) or to measure labour productivity and volume comparisons of consumption to assess an important aspect of material well-being. In what follows, these uses are described in greater detail.

Size of economies

Levels of GDP, when converted with PPPs, measure the size of economies in volume terms and so provide a more meaningful measure of the relative size of countries than simple exchange-rate based comparisons. For 2008, the seven largest OECD economies are the United States, Japan, Germany, the United Kingdom, France, Italy and Spain. However, using PPPs, the order changes



2008 benchmark PPP results and Eurostat-OECD PPP programme

Thirty three OECD Member countries and 13 additional countries were covered by the latest benchmark results for 2008, which reflect a series of price quotations for a basket of about 3000 comparable and representative goods and services. Eurostat (the Statistical Office of the European Commission) were responsible for data for the 27 EU Member states, Iceland, Norway, Switzerland, Turkey and six Western Balkan countries. The OECD had responsibility for data for Australia, Canada, Israel¹, Korea, Japan, Mexico, New Zealand, the United States and the Russian Federation. Data for Chile, a new OECD member, will be collected in the next PPP Round.

The calculation of PPPs is undertaken in three stages: first, at the product level, then, at the product group level, where the price relatives are averaged to obtain unweighted PPPs for the group, and finally, at the aggregation levels, where the PPPs are weighted and averaged. The weights used in this last stage are the expenditures on the product groups. Complete methodological information can be found in the Eurostat-OECD Manual on Purchasing Power Parities at www.oecd.org/std/ppp/manual.

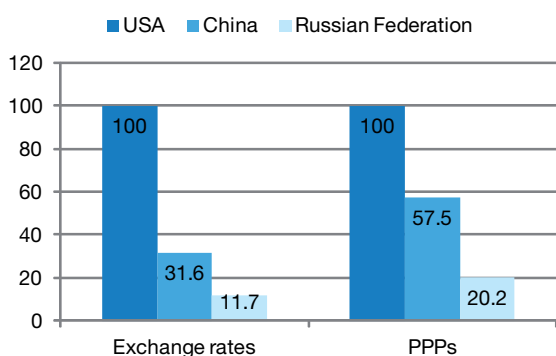
Detailed 2008 benchmark results are available on the OECD website at <http://stats.oecd.org/Index.aspx?DataSetCode=PPP2008>. They include PPPs and associated estimates of real expenditures on GDP for some 50 analytical categories. Results are also shown for the 5 countries which participated in the 2008 Community of Independent States (CIS) comparison (Armenia, Belarus, Kazakhstan, Kirghizstan and Russian federation). The Russian Federation provided the link between the two comparisons.

¹ The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

and Mexico shows up as a larger economy than Spain (Figure 1).

Generally, the GDP gap between high-income and low-income countries narrows when PPPs are used rather than exchange rates. This reflects relatively

Figure 3. **Size of China, Russian Federation and United States (USA=100), 2008**



Source: International Monetary Fund, World Economic Outlook Database, October 2010

lower price levels in lower income countries. Figure 3 illustrates this with the United States, China and the Russian Federation. Note that the results for China have been taken from the International Comparison Programme (see Box “The International Comparison Program (ICP): the 2011 Round”). Using exchange rates, China’s economy is less than one third the size of the U.S. economy. But with PPPs, this figure increases to nearly 60%. Similarly, for Russia, the measure of relative size increases from 12% to 20%.

Consumption per capita

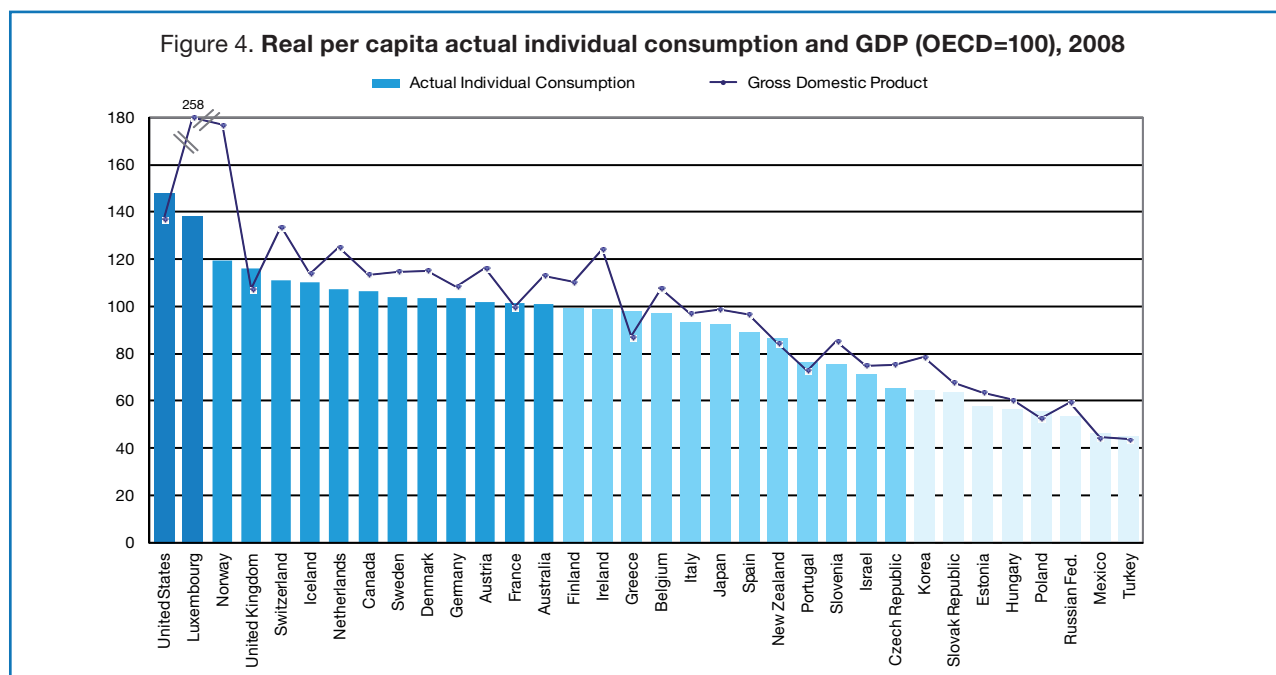
High levels of GDP per capita do not necessarily mean high levels of household consumption, a key measure of average material well-being. The set of benchmark results for 2008 therefore includes PPPs for consumption expenditure. However, simple comparisons of household expenditure on goods and services can be misleading if

government services such as health or education are provided to different degrees in different countries. The relative levels of consumption shown in the graph below control for these differences and include all types of individual consumption, whether purchased by households or provided by government. Thus, they measure what households actually consume ('actual individual consumption') as opposed to what they purchase. It is important to note that the figures do not include estimates of household consumption related to non-market services (other than dwelling services) produced and consumed by the same household, see Box "Production and well-being".

Figure 4 below shows that measures of real actual individual consumption per capita can differ significantly from GDP per capita measures. In the United Kingdom for example, GDP per capita is about 7% above the OECD average but individual consumption per capita is 16% above the OECD average. In Luxembourg, Norway, Switzerland and in the Netherlands, on the other hand, GDP per capita is significantly higher than consumption per capita. Often this reflects a relatively high volume of net exports.

Measuring and comparing non-market services (education and health)

Shares of health and education in actual individual consumption are particularly high: on average, they represent about 20% in the OECD area. Their measurement has been a major research area in the National Accounts and in PPPs in recent years, reflecting the fact that when provided by government as non-market services, their value in volume terms has traditionally been measured by the volume of inputs (labour, capital, etc.) used in producing them, and not by the volume of the outputs (health and education services) that are actually provided. Implicit in the measurement via inputs is an assumption of uniform productivity in the provision of these services across countries. This is obviously an unsatisfactory solution. A new methodology for education was implemented in 2008 and a methodology for health is currently being developed with the aim of implementation during the new 2011 Round of benchmark PPPs. Methodological information is presented in "Towards measuring the volume output of education and health services: a handbook", P. Schreyer (OECD, 2010).



Production and well-being

While GDP is a useful variable to monitor production and the delivery of final products to the economy, it does not fare very well as a measure of the material well-being that people derive from it. There are three main reasons for this. The first is that some of the activities included in GDP correspond to a reduction in peoples' well-being (as in the case of higher transport costs due to higher congestion and longer commuting) or to activities aimed at remedying some of the social and the environmental costs associated to production (as in the case of environmental protection expenditures). The second reason is that some economic activities that undoubtedly contribute to people's material well-being such as household production of non-market services (child care, care of the elderly by their children, neighbourly help etc.) are not captured by GDP. The third reason is that the evolution of GDP does not correlate very well with the evolution of economic resources that are available to the typical household.

These deficiencies suggest that other measures are needed alongside GDP to capture material well-being and living standards, such as those that focus on overall household consumption; including consumption of non-market services produced by households. Meaningful cross-country comparisons of overall consumption depend critically on PPPs.

Education

In the Eurostat-OECD PPP work, education services (public and private) are viewed as the transfer of knowledge from teachers to students. The amount of knowledge is approximated by the number of student hours of teaching. Because different levels and areas of education constitute different types of teaching services, the information on student hours is stratified into homogeneous groups and quality-adjusted using OECD PISA exam scores for primary and secondary education. Overall, the method is a quantity approach with an element of explicit quality adjustment.

The method has been implemented for the first time for all OECD countries and shows results that are more stable and more intuitive than results based on "inputs". There remains scope for improvement however. For instance, there is no adjustment for tertiary education. In addition, PISA scores only cover certain types of student skills.

Health

Health expenditures (public and private) account for a significant share of GDP and that share varies significantly between countries (ranging from 7%

in Mexico to 18% in the United States). These differences reflect not only differences in quantities of health goods and services but also differences in prices. Output-based PPPs allow to show how much of these differences between countries reflect quantity rather than price effects. For the past two years, the OECD has been working on a new methodology for PPPs to move towards an output approach. The work has focused so far on hospital services which constitute the bulk of health expenditure (around 40%) in most countries. A full description of the new methodology can be found in "Comparing price levels of hospital services across countries: results of pilot study", F. Koechlin, L. Lorenzoni and P. Schreyer (OECD, 2010). The new methodology is scheduled for implementation in the 2011 PPP Round.

PPP results over time

GDP and its components, converted using PPPs, provide a snapshot of relative volumes in a particular year. For many analytical purposes, the interest is in the evolution of GDP volumes between countries and over time, particularly during periods of crises. There are at least two ways of setting up such a comparison, each with its specific interpretation and use.

The International Comparison Program (ICP): the 2011 Round

The International Comparison Program (ICP) is a global partnership to collect comparative price data, to compile detailed GDP expenditure values and to estimate PPPs of the world's economies.

The 2011 ICP is organized by region. There are six regions, five of which are overseen by the ICP Global Office in the World Bank. In each of the five regions - Africa, Asia, the Commonwealth of Independent States, Latin America and Western Asia, regional coordinating agencies take responsibility for the implementation of the Program. The sixth region is under the responsibility of Eurostat and the OECD which work closely with the Global Office to ensure that their 47 countries can be combined with more than 140 other countries into a single global comparison.

Responsibility for the ICP within regions is shared between national and regional agencies. National statistical offices carry out data collection; regional agencies provide guidance and coordinate data collection and validation. They also assemble and finalize the regional comparisons. The Global Office ensures that the regional comparisons can be combined in a world comparison.

The 2011 ICP is being implemented in stages. Early stages covering administrative and institutional arrangements, as well as methodological preparations, were completed at the end of 2010. Price data are collected in the third stage, to be completed by the third quarter of 2013. The main price survey on household goods and services will take place in the majority of countries in 2011. Other price surveys (education, health, compensation of government employees, equipment, and construction) will be carried out at the same time as the compilation of relevant expenditure data, during 2011-12. The fourth stage consists of the preparation of preliminary and final reports. Final global results are expected in December 2013, with a release about 2-6 months later.

Calculation of PPPs at the world level is a challenging and complex exercise – 6 regions and nearly 180 participating countries with different consumption patterns, levels of development, systems of health and education, and very different sizes need to be brought together in one comparison.

The ICP website: www.worldbank.org/data/icp

Current PPPs and expenditures

One approach for combining spatial and temporal observations is to use a sequence of current PPPs, i.e., a new set of price data for every period, compiled, weighted and aggregated. With current PPPs, prices and price structures are allowed to vary over time. Volume levels of GDP are then obtained by applying these current PPPs, for every period, to GDP measures at current national prices. For a given year, (spatial) comparisons between countries are straightforward – volumes are measured with the same price structure. Comparisons of the resulting series over time, however, incorporate

several effects: relative volume changes, changes in relative prices between countries and, possibly, changes in definitions and methodologies. The approach can also be described as comparisons at current international prices.

Constant PPPs and expenditures

A second approach is to generate time series at constant prices and PPPs. With constant PPPs, a single year is chosen for the comparison of GDP levels and all other observations are obtained by applying relative rates of GDP growth, consistent with those derived in national currencies. This

procedure ensures transitivity over space and time. The approach can also be described as comparisons at constant international prices.

The key conceptual difference between using current and constant PPPs is that the former capture changes in volume as well as changes in weights, whereas the latter only capture volume changes. Put differently, 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. Ignoring such shifts over longer periods can generate a biased picture of economic developments. This factor comes into play when some countries are large producers and exporters of products with marked price changes, for example Norway, which is an important oil exporter. Another consequence of fixing price structures to a base year is the sensitivity of results to the choice of base year.

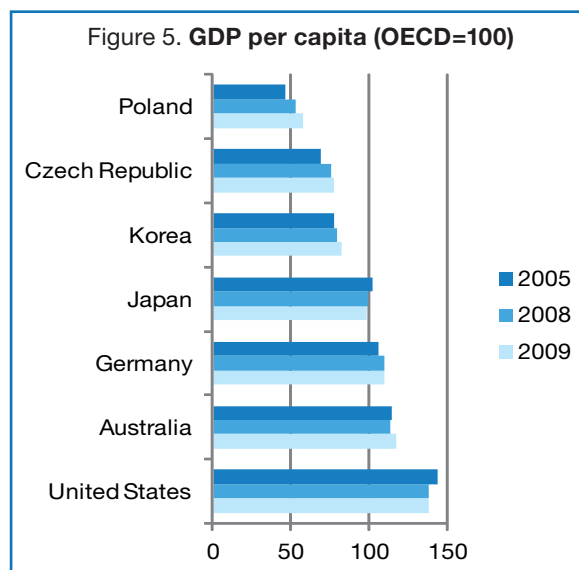
GDP per capita over time

A comparison of the 2008 results with the last benchmark results for 2005 shows that relative positions of OECD countries have been fairly stable. There are exceptions, however. For example the positions of the Czech Republic and Poland improved considerably relative to other OECD economies. GDP per capita for Poland rose from 47% of the OECD average in 2005 to 53% in 2008.

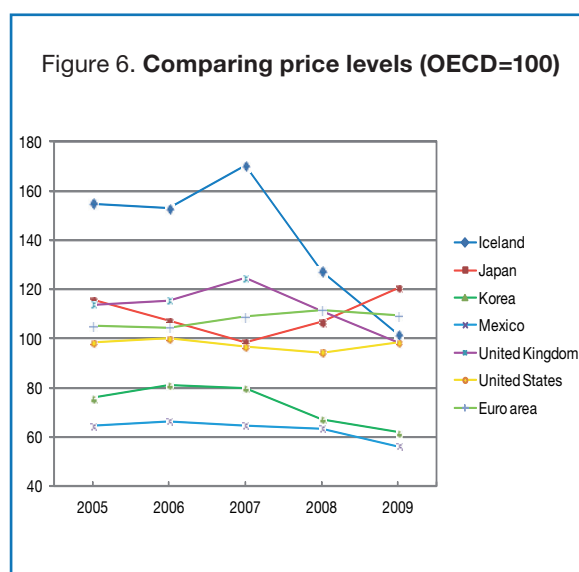
Preliminary figures for 2009 indicate that the relative positions of most OECD countries remained largely unaffected by the current economic crisis but naturally those countries whose GDP was less affected by the crisis fared relatively better. For example in 2009, Australia's GDP per capita was 18% above the OECD average compared with 14% at the time of the 2008 comparison.

Comparing price levels over time

When PPPs, the “exchange rate that means hamburgers cost the same in America as abroad” (see above) are equal to market exchange rates,



it can be said that the price level for hamburgers is equal in two countries. The same holds for the economy as a whole – the comparison between PPPs and market exchange rates provides an indication of a country's comparative price level. Because comparative price levels depend on market exchange rates, they tend to vary over time. A telling example is Iceland's comparative price level that fell steeply during the financial crisis, reflecting the rapid depreciation of the Icelandic currency, thereby rendering Icelandic products relatively cheaper. The graph below illustrates well the volatility of currencies during the crisis.



Further reading

- » F. Koechlin, L. Lorenzoni and P. Schreyer, *Comparing price levels of hospital services across countries: results of pilot study*, OECD Statistics Working Paper No. 32 - 2010/3 [www.oecd.org/officialdocuments/displaydocumentpdf?cote=std/doc\(2010\)3&doclanguage=en](http://www.oecd.org/officialdocuments/displaydocumentpdf?cote=std/doc(2010)3&doclanguage=en)
- » P. Schreyer, *Towards measuring the volume output of education and health services: a handbook*, OECD Statistics Working Paper No. 31 - 2010/2, [www.oecd.org/officialdocuments/displaydocumentpdf?cote=std/doc\(2010\)2&doclanguage=en](http://www.oecd.org/officialdocuments/displaydocumentpdf?cote=std/doc(2010)2&doclanguage=en)
- » Deaton, Angus. 2010, *Price Indexes, Inequality, and the Measurement of World Poverty*, American Economic Review, 100(1): 5–34. www.aeaweb.org/articles.php?doi=10.1257/aer.100.1.5
- » R. Boarini, A. Johansson and M. Mira d'Ercole, *Alternative Measures of Well-being*, OECD Statistics Brief No. 11, May 2006, www.oecd.org/dataoecd/26/61/36967254.pdf
- » *EUROSTAT-OECD Methodological manual on purchasing power parities (PPPs)*, www.oecd.org/std/ppp/manual
- » *OECD Purchasing Power Parities, 2008 Benchmark Results*, <http://stats.oecd.org/Index.aspx?DataSetCode=PPP2008>
- » *National Accounts at a Glance*, OECD 2011, <http://stats.oecd.org/Index.aspx?DataSetCode=NAAG>
- » OECD, Purchasing Power Parities (PPP), www.oecd.org/std/ppp
- » The World Bank, The International Comparison Program (ICP), www.worldbank.org/data/icp



- » Eurostat, Purchasing Power Parities, http://epp.eurostat.ec.europa.eu/portal/page/portal/purchasing_power_parities/introduction



STATISTICS BRIEF

The Statistics Brief is published by the OECD Statistics Directorate.

This issue and previous issues can be downloaded from the OECD website at: www.oecd.org/std/statisticsbrief

Editor in chief: Martine Durand

Editor: Tim Davis

Editorial Team: Sophie Bournot, Francette Koechlin and Paul Schreyer

Technical assistant: Sonia Primot

For further information contact the Editor at std.statbrief@oecd.org