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OECD PRODUCTIVITY DATABASE

MEASURING MULTI-FACTOR PRODUCTIVITY BY INDUSTRY: METHODOLOGY AND FIRST RESULTS FROM THE OECD PRODUCTIVITY DATABASE

Benoit Arnaud, Julien Dupont, Seung-Hee Koh and Paul Schreyer, OECD Statistics Directorate

Since 2003, the OECD Productivity Database (PDB) has provided time series of productivity measures and their components for international comparisons and productivity analysis. In particular, the PDB offers measures of Multi-factor productivity (MFP) that compares the evolution of output with the evolution of combined labour and capital inputs. These MFP series have been constructed at the total economy level. While useful for many purposes, there has also been increasing interest in industry-level MFP measures.

The new Productivity Database by Industry (PDBi) is a result of a joint project between the OECD Directorate for Science, Technology and Industry and the OECD Statistics Directorate. PDBi data are fully compatible with the industry-level data that the OECD compiles in its STructural ANalysis database (STAN), from which measures of output and labour input required to construct industry-level MFP series are directly sourced.

This article describes the methodology and data sources used in PDBi to compile MFP by industry and its components. It also provides some results, illustrating possible uses of PDBi. Finally, a description of the database coverage and indications on how to access PDB and PDBi series are given.

Measuring labour and capital inputs and multi-factor productivity at the industry level

MFP for a given industry is compiled as the difference between the growth rate of output and the weighted average of labour and capital inputs. Ideally, in order to be consistent with the recommendations followed for the productivity measures at the total economy level in PDB, the methodology for PDBi series should reflect the standards put forward in the OECD Manuals on Measuring Productivity (2001) and Measuring Capital (2009). However, data constraints imposed a deviation from recommended practice: information on investment by industry and by type of asset is not generally available and a simplified method had to be used to measure capital inputs. In essence, capital stocks were measured rather than capital services. The former take no account of differences in the relative productivity of different types of assets, the latter do and constitute the conceptually preferable measure of capital input. This deficiency will be rectified as more detailed industry level source data becomes available. For the time being, however, PDBi measures have to rely on the simplified stock approach.

One consequence of this simplification is that industry-level data are not directly comparable with the economy-wide MFP data that are based on a measure of capital services. However, within PDBi, consistent aggregate productivity measures are being presented allowing for instance for a de-composition of aggregate productivity growth into contributions by different industries.

Labour input

Hours actually worked by all persons engaged is the conceptually preferred measure of labour input for estimating productivity. When total hours worked are missing, the hours worked of employees are used as proxy and in the absence of information about hours worked by industry, hours worked at the level of the total economy (from PDB) were allocated to industries using the structure of the following variables (by order of priority): full-time equivalent jobs, full-time equivalent employees, total employment and number of employees.

National accounts provide information on the remuneration of employees. Labour income of the self-employed is approximated as the average remuneration per employee multiplied by the number of self-employed.

Changes in labour composition or labour quality, usually measured by adjusting labour input for skills, education, gender, age over time, are not estimated in PDBi.

Capital input

The OECD computes a series of net capital stocks by industry, using the same assumptions across countries about depreciation patterns. Again, it should be kept in mind that this is a second-best measure of capital...
input and that using the net capital stock as a substitute for a measure of capital services is likely to entail an underestimation of contribution of capital to economic growth, and by implication an overestimation of MFP, since measures of capital services tend to grow quicker than the net capital stock.

Net capital stock is estimated by cumulating gross fixed capital formation (GFCF) year by year and netting out depreciation and retirement. This is the Perpetual Inventory Method (PIM). Net capital stocks by industry are computed with geometric rates. Geometric rates encompass both depreciation and retirement.

In using the PIM, an initial capital stock has to be measured, relying as far as possible on national information on net capital stocks for early years as available in the STAN database. When this information is missing, the initial capital stock is approximated following a simple procedure based on the average growth of volume investment over the period 1960-1983.

The measurement of capital remuneration in PDBi is based on a similar framework as the one used in PDB: it measures the user cost of capital in each industry as the product of unit user cost and the net capital stock. Unit user costs are composed of a real rate of return and the rate of depreciation. The real rate of return has been chosen in its ex ante formulation, as a long-run constant rate that is country specific and sourced from PDB.

Estimating multi-factor productivity growth

The simplified multi-factor productivity measures for each industry \( i \) were computed as follows:

\[
\text{MFP}_i = \Delta \ln(Q_i) - \alpha_i \Delta \ln(L_i) - (1- \alpha_i) \Delta \ln(K_i)
\]

where \( \alpha_i = \frac{w_i^t L_i^t}{w_i^t L_i^t + u_i^t K_i^t} \) is the share of labour in total costs in industry \( i \),

\( \alpha_i = 0.5(\alpha_{i-1}^t + \alpha_i^t) \) its average over two periods,

\( (1-\alpha_i^t) \) is the share of capital in total costs,

\( Q_i^t \) is value added at constant prices from STAN,

\( L_i^t \) the labour input from STAN,

\( K_i^t \) the capital input computed as described,

\( w_i^t \) is the remuneration of labour,

\( u_i^t \) is the user cost of capital.

Using cost shares rather than revenue shares corrects for a possible mark-up of prices over marginal costs. In a further stage, mark-ups and returns to scale can be computed in PDBi although these require parametric methods.

First results and possible uses of PDBi

Value added based multi-factor productivity changes are presented in Table 1. This table illustrates the comparison of productivity as average annual growth rates over the period from 1990 to 2009, productivity growth across countries and across industries: overall, the change in productivity is higher in manufacturing than in financial and business services. Most countries show negative or slow productivity in construction and in the hotels and restaurant sectors.

Descriptive growth accounts

The MFP equation can be turned around to account for the contributions of output growth from labour, capital and MFP. Figure 1 presents growth accounting components in manufacturing industries across countries. It suggests a negative contribution of labour input to the growth in value...
The public release of PDBi covers 14 industries selected from the current version of STAN based on ISIC Rev. 3. Finally, PDBi will move to ISIC Rev. 4 as countries progressively switch over to the new classification.

Feedback is most welcome at: productivity.contact@oecd.org

More methodological information as well as links to reference methodological papers can be found on the OECD productivity web page: www.oecd.org/statistics/productivity

### PDBi dissemination

#### Data coverage

The PDBi contains six variables at the industry level for 20 OECD countries from 1990 onwards:

- productivity: MFP and labour productivity, rate of growth between consecutive years
- output: real value added, rate of growth between consecutive years
- inputs: labour input and capital input, rate of growth between consecutive years
- relative importance of inputs: labour share in total cost

Looking for possible explanations of these trends in productivity would also require more detailed information, in particular on quality changes in inputs and outputs. In the absence of such adjustments, as this is the case at this stage for the series available in PDBi, more rapid growth in value added due to a rise in skills of the labour force or due to the rise in efficiency of capital input is captured by the MFP residual and not attributed to the contribution of the corresponding factor, labour or capital. This should be kept in mind when interpreting components of growth in value added from PDBi. However, the PDBi allows international comparisons of productivity by industry and a preliminary identification of productivity trends by industry.

### Table 1. Multi-factor productivity, average annual percent change, 1990-2009 (or closest years available)

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<thead>
<tr>
<th>Industry</th>
<th>AUT</th>
<th>BEL</th>
<th>CAN</th>
<th>CZE</th>
<th>DEU</th>
<th>DNK</th>
<th>ESP</th>
<th>FIN</th>
<th>FRA</th>
<th>GBR</th>
<th>GRC</th>
<th>IRL</th>
<th>ISL</th>
<th>ITA</th>
<th>KOR</th>
<th>NLD</th>
<th>NOR</th>
<th>POL</th>
<th>SWE</th>
<th>USA</th>
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</thead>
<tbody>
<tr>
<td>TOTAL (excluding real estate activities)</td>
<td>1.2</td>
<td>1.0</td>
<td>4.1</td>
<td>1.2</td>
<td>0.7</td>
<td>0.3</td>
<td>1.8</td>
<td>1.2</td>
<td>2.0</td>
<td>4.0</td>
<td>1.6</td>
<td>1.9</td>
<td>2.2</td>
<td>1.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGRICULTURE, HUNTING, FORESTRY AND FISHING</td>
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<td>-1.9</td>
<td>2.3</td>
<td>2.8</td>
<td>3.0</td>
<td>0.0</td>
<td>2.4</td>
<td>3.2</td>
<td>2.3</td>
<td>0.2</td>
<td>0.0</td>
<td>-5.1</td>
<td>2.5</td>
<td>2.3</td>
<td>4.0</td>
<td>2.0</td>
<td>0.6</td>
<td>5.3</td>
<td>4.2</td>
<td>4.3</td>
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<td>MINING AND QUARRYING</td>
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<td>-1.7</td>
<td>0.1</td>
<td>-3.3</td>
<td>1.8</td>
<td>1.5</td>
<td>1.0</td>
<td>0.8</td>
<td>-0.6</td>
<td>5.9</td>
<td>0.3</td>
<td>0.6</td>
<td>-3.3</td>
<td>-3.6</td>
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<td>1.8</td>
<td>6.3</td>
<td>1.2</td>
<td>2.1</td>
<td>0.7</td>
<td>4.3</td>
<td>2.8</td>
<td>3.5</td>
<td>1.4</td>
<td>5.2</td>
<td>3.1</td>
<td>0.7</td>
<td>6.9</td>
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<td>1.4</td>
<td>5.3</td>
<td>4.8</td>
<td>3.5</td>
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<tr>
<td>Machinery and equipment</td>
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<td>2.0</td>
<td>2.6</td>
<td>8.4</td>
<td>3.9</td>
<td>3.0</td>
<td>1.0</td>
<td>7.1</td>
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<td>Transport equipment</td>
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<td>9.9</td>
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<td>1.2</td>
<td>0.6</td>
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<td>1.5</td>
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<td>2.8</td>
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<td>0.3</td>
<td>2.0</td>
<td>3.0</td>
<td>1.0</td>
<td>1.7</td>
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<td>0.3</td>
<td>-0.1</td>
<td>-2.0</td>
<td>-1.7</td>
<td>0.0</td>
<td>-1.4</td>
<td>2.1</td>
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<td>-1.2</td>
<td>0.1</td>
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<td>1.3</td>
<td>4.3</td>
<td>1.0</td>
<td>0.9</td>
<td>-0.3</td>
<td>0.5</td>
<td>1.2</td>
<td>2.4</td>
<td>1.7</td>
<td>4.8</td>
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<td>5.8</td>
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<td>2.1</td>
<td>4.9</td>
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<td>5.9</td>
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<td>-0.5</td>
<td>-1.1</td>
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<td>INDUSTRY INCLUDING ENERGY</td>
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<td>1.8</td>
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<td>1.7</td>
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AUT BEL CAN CZE DEU DNK ESP FIN FRA GBR GRC IRL ISL ITA KOR NLD NOR POL SWE USA
The financial crisis has highlighted a number of data gaps in information available to policy makers, including information on credit risk transfer and securitisation. In order to improve the coverage of these activities, the European Central Bank (ECB) and the European System of Central Banks (ESCB) updated the statistical framework in this area. The new requirements are set out in two statistical regulations: ECB/2008/30 and ECB/2008/32 – www.ecb.europa.eu/stats/money/fvc/html/index.en.html.

This article presents the enhanced statistics which were released for the first time in June 2011. They provide fully harmonised, complete and timely information at a monthly frequency on securitisations carried out by euro area banks – classified as the «monetary financial institutions» (MFIs) sector in euro area statistics – and new data at a quarterly frequency on the assets and liabilities of «financial vehicle corporations» (FVCs) set up to carry out securitisations. The total assets of the euro area FVCs stood at €2,200 billion at end-September 2011 – around one tenth of the non-bank financial sector.

Background

The increasing use of securitisation over the past two decades allowed banks to transform their illiquid, long-term loan assets into more liquid securities which could be sold to investors. This freed up capital for more lending, and provided banks with the possibility to better manage their concentrations of exposures to specific sectors or asset classes. This meant a transfer of some financial intermediation activity from the traditional banking sector into what has been called the “shadow banking” sector. Securitisation uses specially created vehicles (FVCs) to hold the assets so that they are bankruptcy remote from the originating bank which had transferred the loans. This allows investors to gain exposure to the credit risk of the underlying asset portfolio, but not the risk of bankruptcy of the originator itself. However, following years of growing securitisation activities, the financial crisis caused a sharp decline in investor demand in late 2007 for asset backed securities (ABS), caused in part by the degree of complexity and lack of transparency of these products.

Despite the impact of securitisation for monetary analysis by the ECB and, in particular, the analysis of credit developments, bank financing, and financial stability, these activities were not well covered in the statistical reporting requirements. An overview of the new MFI securitisation and FVC data which aims to address these data gaps is provided in the following section. These new data are timely in that they have been able to capture significant shifts in the balance sheets of MFIs and FVCs as a result of the financial crisis.

Overview of the New Statistics on Securitisations from Euro Area MFIs

On the side of the MFI statistics, the new reporting includes net flows (disposals minus acquisitions) of loans securitised or otherwise transferred. Breakdowns are provided in terms of the (loan) borrowing sector and residency at a monthly frequency, supplemented by quarterly breakdowns on the purpose of loans to households (house purchase, consumer credit or other purposes) and the original maturity of loans to non-financial corporations.

Prior to the new data requirements, only limited and non-harmonised data were available. Loans removed from the bank balance sheet (i.e. “derecognised”) due to securitisations could send a confusing signal on lending, as MFIs’ loans would appear to decrease, while the position of borrowers would not change. The securitisation volumes now reported may be used to adjust the flows and growth rates in lending to reflect the underlying provision of credit by the banking sector to the real economy. Since the beginning of 2010, securitisation net flows have typically been relatively small compared to other loan transactions (i.e. repayments of loans and new loans granted), as can be seen from Figure 1. However, in a number of months securitisations have contributed significantly in the transactions. For instance in July 2011, the total transactions in loans amounted to €4 billion, although net flows of derecognised securitisations during the month amounted to €11 billion. This means that the total MFI lending, looked at from the borrowers’ perspective, increased a total of €15 billion during that month.

Outstanding amounts and net flows of loans which are securitised but
are not derecognised from the MFI balance sheet, under the applicable accounting rules, are also reported. As a result of the crisis, many securitisations have been carried out and the resulting securities “retained” by banks and used as collateral in Eurosystem refinancing operations. Holdings of euro area FVC securities are also part of the new reporting requirements. Approximately half of all FVC debt securities in issue at end-September 2011 were held on the balance sheets of MFIs, and are largely related to retained securitisations.

Overview of the New Statistics on Securitisations from Euro Area FVCs

Euro area FVCs are identified as the counterparties of securitisations or other loan transfers from bank balance sheets, so that comparisons with FVC data can be made, or so the data from the two sectors can be combined in an integrated reporting system. Overall, two-thirds of FVC assets are securitised loans (€1,470 billion), of which 81% (€1,196 billion) have been originated by euro area MFIs (Figures 2 and 3). Most of these loans are to households (e.g. residential mortgages, and to a much lesser extent, auto loans or credit card receivables), or to non-financial corporations.

Other major asset categories include deposits and loans claims (including deposits between FVCs that are common in more complex securitisation structures which often involve a number of vehicles), and securities other than shares.

The latter comprise some holdings of collateralised debt obligations (CDOs) which may repackage debt securities (including FVC securities) into new instruments. In “synthetic” securitisations – i.e. where the transfer of credit risk is achieved through guarantees or financial derivatives, rather than the transfer of loans – the underlying collateral may be placed on deposit at an MFI or held in safe assets. Synthetic FVCs make up only about 5% of total assets of the FVC sector, however.

As would be expected, the vast majority of the liabilities of euro area FVCs are debt securities issued, which amounted to €1,825 billion at end-September 2011.

FVCs are not always resident in the same country as the originating bank, and therefore securitisations may lead to large cross-border transactions. Currently, only ten out of 17 countries in the euro area have resident FVCs (Figure 4), and these are rather concentrated: Spain, Ireland, the Netherlands, and Italy make up almost 80% (€1,412 billion) of total debt issuance by euro area FVCs. The FVC activity of Spain and Italy are mainly related to securitisations of domestic banks. However, Ireland, the Netherlands and Luxembourg have relatively large FVC populations for their size as many MFIs use these locations
for setting up FVCs due to their favourable legal environments.

Dissemination of ECB Securitisation Statistics

The ECB publishes MFI securitisation data on a monthly basis for the euro area. The press release “Monetary developments in the euro area” presents the euro area aggregated MFI loan flows and growth rates adjusted for the effects of securitisation and other loan transfers, together with the unadjusted figures.

The euro area aggregated FVC statistics are published in quarterly ECB statistical press release. It contains detailed information on the assets held and liabilities issued by FVCs, including outstanding amounts and financial transactions. The updated statistics are also published in the ECB’s Monthly Bulletin, table 2.10 in the “Euro area statistics” section.

A more detailed set of euro area data, as well as national data on MFI loans adjusted for securitisations, is released in the “Statistics” section of the ECB’s website: www.ecb.europa.eu/stats/money/fvc/html/index.en.html. Explanatory notes on FVC statistics have also been made available on the website. The Statistical Data Warehouse (SDW) – the ECB’s online data delivery service for statistics – can be consulted on the website http://sdw.ecb.europa.eu/.

The publication of results for FVC statistics for individual euro area countries is planned for the future. However, some euro area national central banks are already publishing national data on resident FVCs.

The concept

For major economic indicators, such as real gross domestic product (GDP) and the consumer price index (CPI), annual growth is a baseline measure of how the economy is performing and how prices are changing. The annual average growth rate answers the question of what happened during one year relative to the year before. It is calculated as the percentage change between two consecutive annual levels. These annual levels are the sum of the four quarterly levels of the two adjacent years, or the average if the data has been annualized.

A hypothetical example can outline some of the basic principles of how annual average growth rates are determined. Figure 1 shows sales in a hypothetical industry rising steadily through year 1, from $100 million (at annual rates) in the first quarter to $106 million in the fourth quarter. The quarterly levels throughout year 2 remain unchanged, at $106 million. This demonstrates the difference between annual average growth and fourth-quarter-over-fourth-quarter growth rates: there is zero growth between the fourth quarter of year 1 and the fourth quarter of year 2, but the annual average level of sales of $106 million in year 2 is 2.9% above their average level of $103 million in how the economy is performing in a particular year without having complete data for that year, and understand why a particularly weak or strong first quarter of the year has a disproportionate impact on that year’s annual growth rate. It can also help analysts break down economic forecasts or the impact of a revision of a quarterly data point on annual growth. The principles of growth rate relationships conceptually and mathematically are explained here by examining the relationship between quarterly growth rates and annual average growth rates.

Figure 4. Euro Area FVC Debt Securities Issued by Country of Residency

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year 1. This is because the above-average level at the end of year 1 was maintained throughout year 2.

Figure 1 was a hypothetical example contrived to demonstrate how developments during a calendar year relate to the annual average for that year. Figure 2 shows these features in actual Canadian GDP data. Real GDP rose steadily throughout the four quarters of 2007. Output then levelled off in the first three quarters of 2008, before a large drop in the fourth quarter of the year, which left it 0.7% below the level of the fourth quarter of 2007. Even though there were only two quarters during 2008 that posted a gain (totalling 0.3%), the average level of GDP in 2008 was $1,320 billion, or 0.7% above its average level of $1,311 billion in 2007. This was the result of the relatively high level of output reached late in 2007 being sustained through most of 2008.

Two basic principles are introduced by the examples of annual average growth in Figures 1 and 2. The first, and most important, is that annual growth rates reflect the pattern of growth in both the year being studied (year 2, or 2008 in the examples) and the previous year (year 1, or 2007, in the examples). As a result, in order to understand the annual average growth rate, the quarterly growth rates of the previous year can be as important as those of the current year.

The second principle is that individual quarterly growth rates do not have an equal impact on the annual average growth rate; there is a hierarchy for which quarters have the most impact on annual average growth. The growth rate of the first quarter of the more current year, or year 2, for example, has the largest impact on the annual average growth rate.

The hierarchy of the impact of quarterly growth rates on the annual average growth rate is a characteristic of growth rate dynamics. When an increase (or decrease) occurs in a quarter in either year 1 or 2, it raises (or lowers) the level on which all future increases (or decreases) are based. The growth rate of the first quarter of year 1 has no effect on the annual growth rate between years 1 and 2 because it affects the levels in both years equally. A change in the first quarter of year 2 has the largest impact on annual growth, as it raises (or lowers) the level on which all future changes within year 2 are based, while having no effect whatsoever on the level in year 1. Next to the first quarter of year 2, the growth rates of the two quarters adjacent to the first quarter of year 2 have the second-largest impact. The impact of quarters on annual average growth declines as they move away from the first quarter of year 2 until the second quarter of year 1 and the final quarter of year 2, which have the smallest impact.

**The Math**

The relationship between quarterly and annual average growth is mathematically demonstrated in this section. The annual growth rate of year 2 is calculated as the ratio between the sum of the four most recent quarterly levels and the sum of the previous four quarterly levels. The four quarterly levels of year 1 are Q1, Q2, Q3, and Q4; the four quarterly levels of year 2 are Q5, Q6, Q7, and Q8.

\[
\frac{Q_5 + Q_6 + Q_7 + Q_8}{Q_1 + Q_2 + Q_3 + Q_4} - 1
\]

The level in the first quarter of year 1 (Q1) can be calculated by multiplying its growth rate (g1) by the quarterly level that preceded it, referred to as Q0. The level Q2 can be calculated by multiplying its growth rate (g2) and the growth rate in the first quarter of year 1 (g1) by the base level (Q0). Each quarterly level can therefore be expressed in terms of quarterly growth rates multiplied by the level in the base quarter (Q0). The quarterly growth rates of year 1 are referred to as g1, g2, g3, and g4, while the four quarters of year 2 are labelled g5, g6, g7, and g8 and the quarterly levels...
levels Q1 thru Q8 can be expressed as:

Q1 = Q0 x g1
Q2 = Q0 x g1 x g2
Q3 = Q0 x g1 x g2 x g3
Q4 = Q0 x g1 x g2 x g3 x g4
Q5 = Q0 x g1 x g2 x g3 x g4 x g5
Q6 = Q0 x g1 x g2 x g3 x g4 x g5 x g6
Q7 = Q0 x g1 x g2 x g3 x g4 x g5 x g6 x g7
Q8 = Q0 x g1 x g2 x g3 x g4 x g5 x g6 x g7 x g8

After factoring out and cancelling the term Q0g1 (as it appears in each quarterly expression), the final equation shows the make-up of the four quarterly levels of year 2 in the numerator and the three relevant quarterly levels of year 1 in the denominator expressed as growth rates:

\[
\text{Annual average growth rate} = \frac{g_1 g_2 g_3 + g_1 g_2 g_3 g_4 + g_1 g_2 g_3 g_4 g_5 + g_1 g_2 g_3 g_4 g_5 g_6}{1 + g_1 + g_2 + g_3 + g_4 + g_5 + g_6 + g_7 + g_8}.
\]

The hierarchy in which quarterly growth rates contribute to annual average growth is apparent in this equation. In particular, the growth rate of the first quarter of the first year (g1) has no effect on the annual average growth rate in year 2, as shown by its disappearance from the equation. The recurrence of the first quarter of year 2 (g5) four times in the numerator reflects its primary importance in determining the annual average growth rate, as higher (or lower) growth in this quarter compounds throughout year 2. The impact on annual average growth diminishes according to the distance a quarter is from the first quarter of year 2 (g5); this impact is reflected in either the quarters’ increased appearance in the denominator (as occurs for g2, g3, and g4) or their decreased recurrence in the numerator (g6, g7, and g8).

The equation highlights that there is a hierarchy to the impact of the quarterly growth rate on annual average growth, but it does not show the specific impact that each quarter has on the annual average growth rate. This impact can vary widely depending on the magnitude of changes in a particular data series, however, a simplified demonstration of the impact of each quarter is shown in Figure 3. This figure shows the pyramid-shaped hierarchy of the impact of quarterly growth on the annual growth rate and highlights the rate at which growth is passed through from the individual quarters to the annual growth rate.

A 1% increase is sequentially inputted into the equation, with the change in the annual average growth rate noted for each quarter’s 1% gain; this pass-through rate determines the quarter’s impact. A 1% increase in the first quarter of year 1 results in annual average growth in year 2 remaining at zero; there is no impact on the annual growth rate in year 2. If the 1% increase occurs in the first and second quarter of year 1, the difference in the annual growth rate in year 2 is 0.25%, indicating that one-quarter of the 1% gain was passed on to the annual growth rate. Of the 1% increase in the third quarter of year 1, 0.5% or 50% of the increase is passed along to the annual growth rate in year 2. This continues to increase each quarter by increments of 25% until the maximum pass-through of just over 100% (just over as a result of compounding) is attained in the first quarter of year 2, g5. The pass-through then falls by roughly 25% increments until the fourth quarter of year 2.

An implication of this analysis is also that, in this 1% example, at the end of the second quarter of year 2, 81% of the annual average growth rate has been determined. After the third quarter of year 2, 94% of the annual growth rate is known. Therefore, only a large change in growth in the final quarter of year 2 will significantly alter annual average growth (although the change in this quarter does help set the table for growth in the next year).

**Conclusion**

The same basic principles that have applied to quarterly and annual average growth rates apply to a variety of other frequencies, such as monthly and quarterly growth rates, monthly and annual average growth rates, as well as that of average annual growth and the growth between two adjacent decades. Moreover, this paper has focused on economic indicators, but the dynamic of growth rates can be extrapolated to all other types of data.

The original text of this article can be found on the Statistics Canada website at: www.statcan.gc.ca/pub/11-010-x/2011006/part-partie3-eng.htm.
In response to the changes in the global economic environment, international organisations including the UN, IMF and OECD jointly established new global statistics standards including the 2008 System of National Accounts (SNA08) and the Balance of Payments Manual 6th Edition (BPM6), and they recommended their implementation. The Bank of Korea, the institution responsible for compiling Korean national accounts, held an international seminar on the new framework for economic statistics which was attended by international experts from various international organisations. The seminar dealt with topics including current issues and challenges in economic statistics after the global financial crisis, major changes in the SNA08 and experience in its implementation, and a roadmap for implementation in Korea.

Content and Organisation of the Presentations

Session 1: Macroeconomic Statistics after the Global Financial Crisis: Current Issues and Challenges

The seminar commenced with an opening address by Byung Wha Jang, Deputy Governor of Bank of Korea, and a keynote speech delivered by Jae Chang Lee, President of the International Statistical Institute. Young Bae Kim, Director-General of Economic Statistics Department at Bank of Korea, chaired the session with Dennis Fixler, Chief Statistician of the US Bureau of Economic Analysis (BEA), and Paul Schreyer, Deputy Director of OECD Statistics Directorate, giving presentations.

Dennis Fixler shared his thoughts on challenges in economic statistics after the global financial crisis and on the importance of data sharing in a decentralised statistical system. He outlined various challenges in economic statistics after the crisis and introduced Integrated Macroeconomic Accounts (IMA) that the BEA and US Federal Reserve Board had jointly compiled in response to the crisis. This proposed integrating flow of funds statistics and the National Income and Product Accounts (NIPA). He also emphasised the necessity of new statistics relating to the distribution of income and consumption and social welfare in line with the increased interest in statistics concerning the household and financial sectors. In addition, he explained the United States experience of a decentralised statistical system and efforts to eliminate inconsistencies within source data and the institutional basis for data sharing.

Paul Schreyer gave a presentation entitled “From Productivity to Material Well-Being: National Accounts Measurement Agenda for the OECD.” He explained the advantages of GDP but also its shortcomings as a measure of well-being that comprises material well-being, quality of life and sustainability. The OECD’s measurement agenda in the area of material well-being consists in the improvement of measures of household income, wealth and consumption, in particular supplementing them with indicators of distribution of these measures across household. He also discussed dynamic measures of material well-being and showed how real national net income and productivity growth both need considering in this context.

Session 2: Major Changes in the 2008 SNA and Implementation Experience

In Session 2 on the second day, Ivo Havinga, Chief of the Economic Statistics Branch at the United Nation’s Statistics Department, and Michael Davies, Head of the Macroeconomic and Integration Division at the Australian Bureau of Statistics (ABS) gave presentations. Yung Taek Jung, Director of National Accounts Division at Bank of Korea chaired the session.

Ivo Havinga presented “2008 SNA - Main Changes from 1993 SNA”. The presentation grouped the main changes into six categories, and explained the detailed content and background of the changes by group and their impact on GDP. The categories included further specifications of statistical units and revisions in institutional sectoring; further specifications of scope of transactions including the production boundary; extension and further specification of concept of assets, capital formation and consumption of fixed capital; refinement of treatment and definition of financial instruments and assets; scope of
transactions concerning government and public sector; and harmonisation with BPM6. His presentation helped members of the general public to familiarise themselves with the SNA08 and experts to deepen their understanding of it.

Michael Davies shared Australia's experience in implementing SNA08. He started with the statistics environment in Australia, moved to principles such as standards and timing of implementation, and mentioned the efforts that ABS made in order to reduce confusion on the part of users that might be caused by innovations in the statistics. The impacts from implementing new standards in Australia included a level shift in the GDP aggregate but minimal changes to growth rates, the current account balance, the international investment position and net foreign debt. Also, a good communication plan ensured little user response. His presentation was well received by many attendees as it dealt with technical concerns that they may face in the future.

Session 3: Roadmap for the Implementation of 2008 SNA in Korea
Chang Sik Shin, Head of the Bank of Korea's National Accounts Coordination Team presented session 3. He talked about the time schedule for SNA08 implementation; planned for completion in 2014 with a 2010 base year revision also being implemented. The SNA08 has been translated into Korean in 2009 and resource planning was completed in 2010. This international seminar was held as a part of the implementation roadmap. A successful SNA08 implementation is confidently expected by Bank of Korea, and the implementation plans for related economic statistics such as the Balance of Payments and Input / Output tables are making favourable progress.

Outcomes
This successful seminar was attended by a large number of people from academia, research institutions, National Statistical Office of Korea staff, International Organisations and the general public. It provided ideal for Korea, which has a decentralised statistical system like the US, in seeking out ways to maximize the strengths of the system and incorporate rapid changes in economic conditions at the same time. Additionally, it was an excellent opportunity to review the roadmap for the implementation of the SNA08 in Korea by learning about the major changes in the new manual and the implementation experience of other countries. On top of this, during the closed session, international experts gave technical and detailed advice on revisions to quarterly GDP and FISIM calculations, expected to be

![Figure 1. Time table for 2008 SNA implementation in Korea](image-url)
On 7th December 2011 the “OECD Factbook 2011-2012” was released.

The Factbook is a comprehensive and dynamic statistical annual from the OECD. The 50th Anniversary Edition includes a special chapter with data covering the 50 years of OECD statistics. The OECD Factbook shows a wide range of key statistics for member countries and the major other economies. For the over 100 indicators presented, there is explanatory text including a definition, explanation of long-term trends and references. The publication also includes a table showing the indicator over a significant time span for all countries covered, and graphics showing the key messages contained in the data.


Next Steps

The Bank of Korea will strive to take advantage of this seminar to provide momentum for the further development of national accounts statistics. It also plans to co-host a seminar with the UN Statistical Institute for Asia and the Pacific on SNA08 implementation issues. It will provide an excellent opportunity to discuss technical problems in compiling national accounts statistics with staff from Asian countries responsible for SNA08 implementation; international experts will be invited. This will be a valuable chance for participants to share ideas on Asian national accounts with international experts.

To view the seminar program and presentation material: www.bok.or.kr/contents/total/eng/boardView.action?menuNavId=634&boardBean.brdid=9734&boardBean.menuid=634
Non-bank financial intermediaries have substantially grown in the euro area over the past two decades in terms of financial assets. Their role in the funding of non-financial corporations is also increasing. As a consequence, non-bank financial intermediaries’ balance sheet statistics are becoming more relevant for monetary analysis and the other tasks of the European System of Central Banks (ESCB), such as those relating to financial stability or financial integration in Europe. This is also true in view of the steadily growing inter-linkages between the various financial intermediaries.

The European Central Bank (ECB) and the ESCB have developed three sets of statistics for some of the most important sub-sectors of non-bank financial intermediaries (i.e. investment funds, insurance corporations and pension funds, and financial vehicle corporations engaged in securitisation transactions) in order to improve their statistical coverage. The euro area insurance corporations and pension funds (ICPF) sector represents a significant share of non-bank financial intermediaries (35%) and the total financial sector’s financial assets (14%).

This article presents the new statistics on the assets and liabilities of ICPF resident in the euro area, which the ECB released for the first time in June 2011: www.ecb.int/press/pr/date/2011/html/pr110627.en.html. The new quarterly ECB data are currently based on the best available existing (often supervisory) national sources. It is expected that the initial set of ICPF statistics will improve over time, and that more complete and more detailed data will gradually become available. Furthermore, in the longer run, the new supervisory Solvency II requirements for insurance corporations, which are being developed by the European Insurance and Occupational Pensions Authority (EIOPA) may eventually also be used as a basis for macroeconomic statistics. In addition, similar supervisory reporting to be developed for pension funds is expected to deliver new information that can also be used to gradually improve the macroeconomic statistics compiled by the ECB.

**Overview of the New Euro Area Insurance Corporations and Pension Fund Statistics**

The statistics are compiled according to international statistical standards (System of National Accounts and European System of Accounts), and the institutional units and residency criteria laid down in the standards. Accordingly, the statistics cover ICPFs resident in the euro area, including those managed from outside the euro area. Conversely, the statistics do not cover ICPFs established outside the euro area. Apart from insurers (insurance and reinsurance) the enhanced statistics cover autonomous pension funds, i.e. funds that have autonomy of decision and keep a complete set of accounts. Non-autonomous pension funds set up by, for example, credit institutions or non-financial corporations are not covered since they are not separate institutional units. Furthermore, social security schemes are not included in this definition.

National central banks (NCBs) compile nationally aggregated statistics by exploiting all available national data sources and send country results to the ECB. This implies that the new statistics are not fully harmonised across countries, and estimates replace or complete statistical information that is missing or not available on a sufficiently timely basis. The ECB then produces euro area aggregates. The data published by the ECB consist of statistics on various categories of assets held and liabilities issued by ICPFs resident in the euro area, broken down by residency and economic sector of the counterpart and by maturity.

Data cover key balance sheet variables at a quarterly frequency, while some more detailed breakdowns and national data are provided at an annual frequency. In particular, the quarterly dataset contains mainly stock data; transactions are only available for insurance technical reserves of ICPFs, the most important liability of the ICPF sector. Further data, such as more detailed quarterly transaction data, may become available in the future.

Table 1 summarises the euro area aggregates that are published on a quarterly and annual basis, including the share of each instrument in respect of the total.

The new ECB statistics complement results published by the ECB as part of the integrated euro area accounts by institutional sector and provide
more detailed and more timely results. Besides data for the ICPF sector as a whole, supplementary data are published separately for insurance corporations and pension funds. Data are published by the ECB three months after the end of the reference quarter.

Characteristics of the Euro Area Insurance Corporations and (Autonomous) Pension Funds Sector

The enhanced statistics allow an investigation of the structural developments and trends in the ICPF sector in the euro area. As the data are available from the first quarter of 2008, they also provide some information on the impact of the financial crisis on the sector. While there was a reported decline of the value of total financial assets of euro area ICPFs just after the collapse of Lehman Brothers in 2008 (Figure 1), their financial position improved in 2009 and stabilised in 2010 and 2011. In particular, the value of euro area ICPFs’ total outstanding financial assets stood at €6,931 billion in the second quarter of 2011, up 2.8% from a year earlier when it stood at €6,741 billion. This development reflects both increases in the prices of assets held by euro area ICPFs, and net acquisitions of financial assets. The data do not show significant changes in the securities and equities portfolio allocations across euro area countries, as the sector remains predominantly home-oriented.

The euro area countries with the largest ICPF sector, in terms of total financial assets outstanding, are Germany, France and the Netherlands, which together accounted for 72% of the euro area total at the end of 2010 (Figure 2). They are followed by Italy and Spain, adding a further 13% and bringing these five countries to 85% of the euro area total.

The ICPF sector in the euro area is dominated by insurance corporations, which account for around 80% of the total financial assets; with the total financial assets of pension funds representing the remaining 20%. However, the contributions of insurance corporations and pension funds vary from country to country (Figure 3), largely reflecting institutional differences. Indeed, the enhanced statistics cover only autonomous pension funds, which means that countries in which

Table 1. Summary of Published Euro Area Aggregates for ICPF Statistics

<table>
<thead>
<tr>
<th>Assets</th>
<th>% of total</th>
<th>Liabilities</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assets</td>
<td>Q 100</td>
<td>Total Liabilities</td>
<td>Q 100</td>
</tr>
<tr>
<td>Currency</td>
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<td>Securities other than shares</td>
<td>Q 1</td>
</tr>
<tr>
<td>Deposit</td>
<td>Q 11</td>
<td>Loans received</td>
<td>Q 4</td>
</tr>
<tr>
<td>maturities</td>
<td>Q</td>
<td>sector breakdown</td>
<td></td>
</tr>
<tr>
<td>Loans</td>
<td>Q 8</td>
<td>Shares and other equity (quoted/unquoted)</td>
<td>Q 7</td>
</tr>
<tr>
<td>sector breakdown and maturities</td>
<td>Q</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Securities other than shares</td>
<td>Q 38</td>
<td>Net equity of households in life insurance reserves (*)</td>
<td>Q 50</td>
</tr>
<tr>
<td>sector breakdown and maturities</td>
<td>Q</td>
<td>unit linked</td>
<td>A 10</td>
</tr>
<tr>
<td>Shares and other equity (quoted/unquoted)</td>
<td>Q 12</td>
<td>non-unit linked</td>
<td>A 40</td>
</tr>
<tr>
<td>Investment fund shares</td>
<td>Q 22</td>
<td>defined contribution</td>
<td></td>
</tr>
<tr>
<td>MMF shares</td>
<td>Q 1</td>
<td>defined benefit</td>
<td>A 18</td>
</tr>
<tr>
<td>Prepayments of insurance premiums and reserves for outstanding claims</td>
<td>Q 4</td>
<td>hybrid schemes</td>
<td>A 1</td>
</tr>
<tr>
<td>Non-financial assets</td>
<td>Q 1</td>
<td>sector breakdown</td>
<td></td>
</tr>
<tr>
<td>Other assets (including financial derivatives)</td>
<td>Q 3</td>
<td>Other liabilities (incl. financial derivatives)</td>
<td>Q 3</td>
</tr>
</tbody>
</table>

Note: Outstanding amounts (unless marked with “(*)”, in which case transactions data are also released); quarterly (Q) or annual (A) frequency.

Figure 1. Euro area ICPFs total financial assets. EUR billion

![Graph showing total financial assets from 2008 Q1 to 2011 Q2](image-url)
Private pension schemes are mainly provided through non-autonomous pension funds (i.e. not separate institutional units), linked in particular to non-financial corporations and Monetary Financial Institutions (MFIs), have a smaller autonomous pension fund sub-sector.

Euro area ICPFs play an important role in providing financing for other sectors: for example, ICPFs hold around 21% of total debt securities issued by euro area governments, 57% of the mutual fund shares issued by euro area investment funds and about 9% of the total amount outstanding of debt securities issued by euro area MFIs. Figure 4 shows in more detail the euro area ICPF holdings of debt securities by issuing sector, representing around 40% of the total investments by ICPFs. In the case of debt securities, 84% of those held by euro area ICPFs were issued by euro area residents. Approximately half were government bonds and around a quarter were bank bonds. Bonds issued by other financial institutions and non-financial corporations accounted for around 15%. Investment fund and money market fund shares/units represent about 23% of total ICPFs’ financial assets, of which 93% are issued by euro area residents (Figure 5).

Regarding the main investments, insurance corporations invest mostly in securities (42% of total financial assets), followed by mutual funds shares (19% of total financial assets) (Figure 6). However, for pension funds, mutual fund shares represent the largest investment class (42% of total financial assets), partly reflecting the fact that pension funds may use mutual funds to manage their portfolios (see Figure 7).

Insurance technical reserves, the main liabilities of insurance corporations and pension funds, amounted to €6 trillion. Life insurance reserves represent more than two-thirds of it (84% of which are non-unit linked contracts and 16% are unit-linked contracts), pension funds around a quarter (77% of which are defined benefit schemes, with shares of 18% and 5% for defined contribution and hybrid schemes, respectively) and non-life and reinsurance reserves around 10%.
Dissemination of Insurance Corporations and Pension Fund Statistics


A more detailed set of euro area data, together with explanatory notes, is published in the “Statistics” section of the ECB’s website. The Statistical Data Warehouse, the ECB’s online data delivery service for statistics, is available at: http://sdw.ecb.europa.eu/. The updated statistics are also published in Table 2.11 of the “Euro area statistics” section of the ECB’s Monthly Bulletin. In addition to the euro area aggregates, national data on ICPF balance sheets broken down by maturity and sector counterpart are available on the ECB’s website www.ecb.europa.eu/stats/money/icpf/html/pension_funds_2010.en.html.

OECD

GOVERNMENTS MUST TACKLE RECORD GAP BETWEEN RICH AND POOR, SAYS OECD

The gap between rich and poor in OECD countries has reached its highest level for over over 30 years, and governments must act quickly to tackle inequality, according to a new OECD report.

Divided We Stand: Why Inequality Keeps Rising finds that the average income of the richest 10% is now about nine times that of the poorest 10% across the OECD.

The income gap has risen even in traditionally egalitarian countries, such as Germany, Denmark and Sweden, from 5 to 1 in the 1980s to 6 to 1 today. The gap is 10 to 1 in Italy, Japan, Korea and the United Kingdom, and higher still, at 14 to 1 in Israel, Turkey and the United States.

In Chile and Mexico, the incomes of the richest are still more than 25 times those of the poorest, the highest in the OECD, but have finally started dropping.

Income inequality is much higher in some major emerging economies outside the OECD area. At 50 to 1, Brazil’s income gap remains much higher than in many other countries, although it has been falling significantly over the past decade.

The main driver behind rising income gaps has been greater inequality in wages and salaries, as the high-skilled have benefitted more from technological progress than the low-skilled. Reforms to boost competition and to make labour markets more adaptable, for example by promoting part-time work or more flexible hours, have promoted productivity and brought more people into work, especially women and low-paid workers. But the rise in part-time and low-paid work also extended the wage gap.

Tax and benefit systems play a major role in reducing market-driven inequality, but have become less effective at redistributing income since the mid-1990s. The main reason lies on the benefits side: benefits levels fell in nearly all OECD countries, eligibility rules were tightened to contain spending on social protection, and transfers to the poorest failed to keep pace with earnings growth.

As a result, the benefit system in most countries has become less effective in reducing inequalities over the past 15 years.

Another factor has been a cut in top tax rates for high-earners.

The OECD underlines the need for governments to review their tax systems to ensure that wealthier individuals contribute their fair share of the tax burden. This can be achieved by raising marginal tax rates on the rich but also improving tax compliance, eliminating tax deductions, and reassessing the role of taxes in all forms of property and wealth, the report says.

OECD (2011), Divided We Stand: Why Inequality Keeps Rising, OECD Publishing.

www.oecd.org/els/social/inequality

Figure 1. Income inequality increased in most, but not all OECD countries
Gini coefficients of income inequality, mid-1980s and late 2000s

Source: OECD Database on Household Income Distribution and Poverty
OECD Economic Outlook, Volume 2011 Issue 2

Decisive policies must be urgently put in place to stop the euro area sovereign debt crisis from spreading and to put weakening global activity back on track, says the OECD’s latest Economic Outlook.

The euro area crisis remains the key risk to the world economy, the Outlook says. Concerns about sovereign debt sustainability are becoming increasingly widespread. If not addressed, recent contagion to countries thought to have relatively solid public finances could massively escalate economic disruption. Pressures on bank funding and balance sheets increase the risk of a credit crunch.

www.oecd.org/oecdEconomicOutlook

World Energy Outlook 2011

The 2011 edition of the World Energy Outlook brings together the latest data, policy developments, and the experience of another year to provide robust analysis and insight into global energy markets, today and for the next 25 years. This edition of the International Energy Agency’s flagship WEO publication gives the latest energy demand and supply projections for different future scenarios, broken down by country, fuel and sector.

It also gives special focus to such topical energy sector issues as Russia’s energy prospects and their implications for global markets; the role of coal in driving economic growth in an emissions-constrained world; how high-carbon infrastructure “lock-in” is making the 2°C climate change goal more challenging and expensive to meet; the scale of fossil fuel subsidies and support for renewable energy and their impact on energy, economic and environmental trends; or the scale and type of investment needed to provide modern energy to the billions of the world’s poor that do not have it.

www.iea.org/weo

OECD Regional Outlook 2011

Building Resilient Regions for Stronger Economies

Huge regional variations in economic and social conditions within a country require a rethink of the way governments design policies to boost growth and jobs, says this new OECD report.

The economic crisis has hit some areas far harder than others. The OECD’s first Regional Outlook calls on policy makers to pay greater attention to regional factors such as amenities, accessibility, size, infrastructure and demographics, as well as industry specialisations and networks.

www.oecd.org/regional/outlook
AGENDA

FORTHCOMING MEETINGS

OECOD

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<th>Date</th>
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<tr>
<td>7-8 Feb. 2012</td>
<td>Capital Market Reform in Asia, Twelfth Roundtable, jointly organised and sponsored by the Asian Development Bank Institute (ADBI) and the OECD, in cooperation with the Government of Japan. Tokyo, Japan [<a href="http://www.oecd.org/document/16/0,3746,en_2649_34849_46419408_1_1_1_1,00.html">www.oecd.org/document/16/0,3746,en_2649_34849_46419408_1_1_1_1,00.html</a>]</td>
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<tr>
<td>19-21 April 2012</td>
<td>African Conference on Measuring Well-Being and Fostering the Progress of Societies, OECD Development Center. Rabat, Morocco</td>
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<tr>
<td>4-6 June 2012</td>
<td>Working Party of National Experts on Science and Technology Indicators (NESTI), OECD Directorate for Science, Technology and Industry. OECD, Paris, France</td>
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<tr>
<td>4-8 June 2012</td>
<td>Committee on Statistics (CSTAT), OECD Statistics Directorate. OECD, Paris, France</td>
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<tr>
<td>11 June 2012</td>
<td>Working Party on Territorial Indicators - 23rd Session, OECD Directorate for Public Governance and Territorial Development. OECD, Paris, France</td>
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<tr>
<td>26-28 June 2012</td>
<td>European Conference on Measuring Well-Being and Fostering the Progress in Societies, OECD Statistics Directorate. OECD, Paris France</td>
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Other meetings

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Unless otherwise indicated attendance at OECD meetings and working parties is by invitation only.