# International Comparisons of Productivity – An update on developments

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**Overview**

This paper looks at measures of productivity of the UK relative to other countries. This is an area of great policy interest and the paper gives the latest measures produced by the Department of Trade and Industry. It then outlines the methodology used in the current measures, detailing some of the measurement issues in making international comparisons. Work in this area is due to be handed over to the Office for National Statistics.

## Introduction

The January 1998 edition of Economic Trends contained an article by Ed Harley and James Owen, then both of the Department of Trade and Industry (DTI), on the international comparisons of productivity. This article will give an update on developments in this area and present details of future work in the field. The paper will describe the methods used in comparing productivity measures across countries.

Elsewhere in this issue of *Economic Trends*, Chris Daffin outlines how the results of the Annual Business Inquiry (ABI) have been integrated into the UK productivity measures, improving the consistency of the labour input numbers to the output numerator. He notes that the level rise in the workforce jobs does not in itself affect the UK's productivity growth because growth rates of employment are unaffected by the rise. One common misconception is that the levels change in the workforce jobs series would affect the UK's productivity performance relative to other countries. As this paper indicates in its second section, international comparisons of productivity generally use employment figures based on household surveys, not enterprise surveys such as the ABI. Thus, the UK's international standing on productivity remains unchanged after ABI.

This paper will firstly consider the context and importance of the international measurement of productivity. The paper then turns to how the indicators are currently produced, covering issues such as the problem of calculating a consistent hours worked series. The paper then considers some of the other measures currently published. The paper then sets out the areas of current and future research. This includes a project sponsored by the DTI, HM Treasury and ONS at the National Institute for Economic and Social Research (NIESR); the OECD initiatives in productivity measurement; and Eurostat's recent Structural Indicators programme, part of a European leaders' initiative. Finally, the paper offers some conclusions and invites comments.

## Policy context of international measurement of productivity

A number of papers, such as the recent HM Treasury (2001) 'Productivity in the UK: Progress Towards a Productive Economy', explain that productivity growth is expected to be a major contributor to long term GDP growth. In order to benchmark the UK against its main competitors, DTI's Competitiveness Indicators use two measures of labour productivity: output per worker and output per hour worked. The calculation show that the UK's performance is significantly lower than most of its major competitors.

This highlights the importance of improving the UK's productivity performance. International comparisons of productivity also form the basis for measuring a joint DTI and HM Treasury Public Service Agreement (PSA). The target set out in the agreement is to narrow the productivity gap, agreed as part of the last Spending Review. While it is important to monitor performance on both measures outlined above, output per worker is the most straightforward to measure and also has the advantage of being consistent with the government's broader objective of raising trend growth.

This objective was expressed in the 1999 Pre-Budget Report, which sets the Government a goal that UK productivity would, over the next decade, rise faster than that of its major competitors. Various documents have detailed Government strategies to improve investment, skills, innovation, enterprise and competition, seen as the drivers of productivity growth.

The most recent calculations of the productivity gap were used in the 2001 Budget Report. The table (table 1) below shows the size of this gap in 1999 (the most recently available data), both in terms of GDP per worker and GDP per hour. Both of these series have been produced until now by the DTI; the output per hour series uses the Harley/Owen methodology outlined in the 1998 article.

International productivity comparisons are also coming into the fore at European level, as part of the Lisbon process on structural indicators. In

## Table 1 - International comparisons of productivity

| Country | GDP per worker (UK=100) | GDP per hour (UK=100) |
|---|---|---|
| Italy | 130 | 132 |
| US | 145 | 126 |
| France | 119 | 123 |
| Germany | 107 | 114 |
| Canada | 118 | 114* |
| Japan | 100 | 93* |
| UK | 100 | 100 |

Source: Department of Trade and Industry; 1999 figures except * where 1998

the March 2000 meeting, European leaders agreed a programme of economic reform. In order to produce a 'road-map' for the reforms, as well as showing the degree of progress in achieving these reforms, a list of structural indicators was drawn up relating to employment, innovation, economic reform and social cohesion. These indicators have been designed, as far as possible in the limited time available, with data compatible between the various European Member States, as well as with other leading economies (notably the US and Japan). The UK played a leading role in the development of these indicators. The first set of indicators was published by the European Commission on 7 February 2001, along with a synthesis report on progress for the Stockholm European Council in March 2001. The list of indicators includes: labour productivity and the level of hourly productivity per hour worked.

**Current UK methodology**

The 1998 *Economic Trends* article provides an outline of the methodology for the hours worked series, but it is worth providing some more detail here on how the data for both series are derived (Harley and Owen, 1998). The current UK methodology draws heavily on data produced by the Organisation for Economic Co-operation and Development (OECD), who have themselves undertaken considerable work in the area of productivity measurement across countries (Schreyer and Pilat, 2001).

**Output measures**

The first element in calculating any productivity measure based on output is to have a harmonised measure of output (i.e. GDP). For these calculations, data are taken for each country from the *Economic Outlook* database of the OECD. Most OECD countries have implemented the System of National Accounts (1993 revision) or the similar European System of Accounts (1995 revision) so the output measures are consistent across the countries.[1] The data are converted to a single currency basis using Purchasing Power Parity (PPP) rates calculated by the OECD. The OECD is one of a number of international agencies calculating PPP's on a regular basis – Eurostat, the United Nations and the World Bank have published their findings in this area. There are a number of standard methods to calculate the PPP and some differences arise due to methodology. Scarpetta et al. (2000) found the impact of different calculation methods to be modest for comparisons between OECD member countries. They considered the two most common methods of calculation – Geary-Khamis and EKS (OECD, 1999).

A further issue is the year to which the PPP is benchmarked. Benchmarking updates the basket used to calculate PPP's, reflecting the differing patterns across countries. A general rule is to use the most up-to-date benchmark, and Schreyer and Pilat (2001) find the sensitivity of comparisons to the base year to be generally low, except when the 1985 base year is used.

**GDP per worker**

Two data sources are available for the employment series required for the denominator in this productivity measure: household data and establishment data. Household data count the number of employed people, while the establishment surveys focus on the number of jobs. Differences in the two series arise from a number of sources, for example due to the treatment of people with more than one job, or due to the calculation of the number of self-employed.

As noted in Chris Daffin's earlier paper, establishment employment surveys have the advantage of being consistent with output data, which is also collected from establishments. However, for the purposes of making international productivity comparisons, establishment data (i.e. from employers) may not be sufficient on their own. This is due to a number of reasons. Firstly, the surveys only collect from a subset of people in employment, covering wage and salary workers. The most notable omission is the self-employed, although agricultural workers and unpaid-family workers are also often omitted. Secondly, not all countries have a time series from establishment surveys that can be combined with an appropriate hours worked measure.

An additional consideration is comparability of surveys. All countries undertake their household labour force surveys but differ in terms of frequency, sampling and coverage. One attempt at standardisation across a subset of countries (the European Union) is the European Labour Force Survey (ELFS). The UK meets this EU initiative by providing the data from the ONS spring Labour Force Survey. The availability of this reasonably consistent household-based dataset for all EU countries argues strongly for it forming the basis of international comparisons. For these reasons, the Harley/Owen methodology has been based (for the EU comparison element) on the ELFS. In some distinct areas, this has been supplemented with establishment data where appropriate.

[1] SNA93/ESA95 adoption has generally added to national GDP's – see Scarpetta et al. (2000, p.94) for the impact.

A second attempt at standardisation of total employment data based on household surveys is the OECD Quarterly Labour Force Statistics (QLFS). This covers all employment: i.e. "all persons who during the reference week did any work for pay or profit, or were not working but had jobs from which they were temporarily absent. Family workers are also included". The OECD dataset covers non-EU countries, such as the USA. The added advantage of the QLFS is that it is more frequent than the ELFS, although it is restricted in its coverage of EU countries. The data are on a per person basis, and are consistent with the hours worked methodology outlined below.

**GDP per hour worked**

Most international comparisons of labour productivity focus on output per person employed. However, this does not allow for differences in hours worked across countries. Hours worked can vary significantly with differences in holiday entitlements, legal working times, and the composition of the labour force. For example, differences in female participation rates across countries could lead to differences in the average numbers of hours worked because of the higher propensity for female part-time working and flexible working arrangements (such as job-sharing).

The various country labour force surveys ask about hours worked. The first problem is that the ELFS data only covers the spring of each year (March to May), although some Member States (such as the UK) conduct their own Labour Force Survey at other times of the year as well. This leads to a seasonality issue if the spring data are simply grossed up to an annualised equivalent. Most paid leave is taken at certain times of the year and the pattern of public holidays is such that some countries (e.g. the UK's two May bank holidays) have them concentrated in the spring quarter. Using the results for actual hours worked from the Spring ELFS alone could bias annualised estimates of working time. For this reason, the methodology takes usual hours worked and adjusts for time off due to sickness, training, industrial disputes, and other non-holiday reasons for time-off. A further adjustment is then made on the amount of holiday taken by employees using information available from Eurostat. For non-EU countries, the OECD's QLFS is used, which does not suffer so much from seasonality due to its frequency.

Furthermore, there are some inconsistencies between the UK data contained in the ELFS and the results of the domestic Labour Force Survey (LFS). When these are found, the current methodology adjusts to use the domestic LFS data, as this has been considered the most appropriate representation of the UK domestic situation. The reasons for these inconsistencies are thought to include realignment differences in calendar data and seasonal adjustment methods.

Other adjustments made at this stage include:

- accounting for people who hold more than one job. This issue is not always considered in other methodologies, which may only pick up the hours worked in the primary job. This issue could become more relevant during different phases of the economic cycle; for example when there is a relatively tight labour market. The data required for this adjustment are provided by the ELFS, which gives the number of people holding more than one job, and the hours they work in those jobs;

- the incorporation of "zero hours" into the hours worked series. This refers to people who are in employment but who worked zero hours in the reference week. These people are not included when the average hours per week are calculated, although conceptually these should be included. An adjustment is made based on the proportion of employed people with zero hours; and

- allowing for people in employment who work different hours from usual hours in the reference week.

**Methodology of Other Studies**

The OECD has undertaken a significant amount of work to refine a methodology for looking at relative productivity between countries (see Schreyer and Pilat, 2001). The OECD uses household survey data to assess the hours worked and the employment numbers used in the productivity denominator for the UK. However, in some countries, labour measures combine household surveys with enterprise surveys to arrive at labour input measures. The GDP output measures are made comparable using their purchasing power parity measures. Some adjustments of the GDP output measures are made to account for the differences across countries in adoption of ESA95/SNA93. The aim of the OECD research is also to establish what factors determine international productivity differences, incorporating activity and unemployment rates, as well as working hours. Work is underway in the ONS and DTI to reconcile the OECD figures with the UK produced estimates.

Eurostat (2001) gives regular measures of productivity to compare across the European Union members. The data for GDP per person employed are calculated using national GDP data converted using PPP's in the standard fashion (EKS, 1996 weights), divided by the number of persons employed. Persons employed covers both employees and the self employed. It also covers persons temporarily not at work because of illness, injury, holiday or vacation, strike or training.

For the hours worked calculation, Eurostat have used national estimates provided to the OECD. Eurostat data on actual hours worked will not be

available until 2003.

A recent study by Crafts and O'Mahony (2001) presents 1999 figures calculated for five countries. The study updates O'Mahony (1999). OECD PPP's are employed in the conversion of the aggregate country GDP's to be comparable across countries, with the benchmark year being 1993 in the more recent calculations. In looking at the labour inputs for each country, the study considers the data available from each of the five countries, combining enterprise and household survey data to give hourly productivity measure. In the case of the UK, labour input figures make greater use of enterprise survey data.

**Comparison of methodological results**

We can compare the published UK data with that of different methodologies outlined above. Tables 2 and 3 highlight the different results. Table 2 shows that there is little difference in the output per worker measures using the UK and OECD methods. As noted above, the UK methodology has been based on OECD data so this result is unsurprising. In the case of Japan, the OECD results presented include the changes occurring through the adoption of SNA93. The more current DTI measures do not include this, since the data has not yet been published by the OECD. The results of the Eurostat analysis show more of a difference across countries. The methodology and core dataset used for the Eurostat analysis is somewhat different to the UK and OECD figures, and this may explain the divergence.

Table 3 indicates more divergence in the output per hour results of the different studies. It has generally been acknowledged that an internationally comparable measure of hours worked presents the most difficulties in calculation. It can be surmised that differences in hourly productivity measures come from the average hours worked as calculated by the different methods.

## Table 2 - GDP per worker in 1999 (UK=100)

| Country | GDP per worker (UK=100) | GDP per worker (UK=100) | GDP per worker (UK=100) |
|---|---|---|---|
| | UK methodology | OECD methodology | EU |
| Italy | 130 | 128 | 117 |
| US | 145 | 141 | .. |
| France | 119 | 116 | 114 |
| Germany | 107 | 107 | 105 |
| Canada | 118 | 113 | .. |
| Japan | 100 | 107 | 93 |
| UK | 100 | 100 | 100 |

Source: UK – DTI; OECD — Schreyer and Pialt (2001) ; EU – Eurostat (2001)

## Table 3 - GDP per hour in 1999 (UK=100)

| Country | GDP per hour (UK=100) | GDP per hour (UK=100) | GDP per hour (UK=100) | GDP per hour (UK=100) |
|---|---|---|---|---|
| | UK methodology | OC | OECD methodology | EU methodology |
| Italy | 132 | .. | 123 | .. |
| US | 126 | 126 | 118 | 123 |
| France | 123 | 133 | 113 | .. |
| Germany | 114 | 128† | 107 | 116 |
| Canada | 114* | .. | 99* | .. |
| Japan | 93* | 88 | 91* | .. |
| UK | 100 | 100 | 100 | 100 |

Source: UK – DTI; OC – O'Mahony and Crafts; OECD – Schreyer and Pilat (2001); EU – Eurostat (2001) †West Germany * 1998

Tables 2 and 3 indicate the differences of results due to differences in methods. Nonetheless, both output per worker and per hour show the UK to have a significant productivity gap with its major competitors.

**Current and future areas of productivity work**

The data on the international comparisons of productivity are currently produced by the DTI. With the advent of National Statistics, as these data are not only used by HM Treasury in the Budget, but also form the indicator for a joint PSA target between DTI and HM Treasury to close the productivity gap with the UK's major competitors, it was agreed that these data should be produced by the ONS. This will allow the results to become part of the standard ONS outputs, and will bring the methodology within the scope of National Statistics. The ONS has therefore agreed to produce quality assured international comparisons of productivity for the 2001 Pre-Budget Report. This will allow the economic statisticians producing the comparisons to reappraise the methodology, which is now over 3 years old, and to allow for new sources where these have come on stream. To achieve this, the ONS is planning to review and quality assure the existing methodological framework set out above, and to develop an appropriate system for their calculation in future. For at least the first year, this will be undertaken in parallel with the DTI system, so that the consistency of the results is assured. These data should then be published on at least a twice-yearly basis, at a convenient time for the Pre-Budget and Budget Reports, as well as the DTI Competitiveness Indicators Reports. The exact timing of the publication will continue to be dependent on the availability of data from external sources, notably the OECD and Eurostat.

The ONS is undertaking research in a number of areas related to productivity. The results of this are detailed in other articles in this edition of *Economic Trends*, notably the implications of the new ABI series. The transfer of international comparisons from DTI to ONS will allow for the results of these projects, and the methodologies underlying these results,

to be considered when refining the Harley/Owen methodology for new sources.

The DTI, HM Treasury and ONS are also co-sponsoring research by the National Institute for Economic and Social Research (NIESR) on Britain's relative productivity performance, updating previous work by NIESR in this area (O'Mahony, 1999). The project also includes research on the importance of the new economy, the measurement of new economy inputs and the links between ICT activities and UK productivity gaps. Relative productivity will be measured at the sector level to enable estimates of the contribution of specific sectors to the aggregate UK productivity gap.

The project will also extend NIESR's sectoral database to include more variables (including new economy indicators) and more countries. This should lead to a paper on Britain's relative productivity performance. Again, the ONS will be considering the implications of this work in the refinement of the current methodology.

The ONS will also be looking to play a leading role in the development of the European Statistical Indicators, and where there are relevant developments, these will be considered in terms of the data produced for DTI's Competitiveness Indicators and for the Pre-Budget and Budget Reports. Similarly, the work of the OECD will continue to be monitored in this regard.

**Conclusions**

This article has highlighted the importance of high quality indicators of relative productivity for analytical and policy making purposes. The UK has a good track record of producing such indicators, both in terms of official statistics and through NIESR. The transfer of responsibility for production of official indicators from the DTI to the ONS is a suitable point to review the methodology to ensure that it continues to use the most appropriate data sources, and to produce consistent series that meet National Statistics quality standards.

The ONS will be working to ensure this review produces the most appropriate system for measuring the UK's competitiveness, and would welcome the views and inputs of users and producers of such indicators. The ONS intends to gradually expand the range of international comparison data to cover other key indicators relevant to the government's policy agenda, such as investment. Comments should be addressed to:

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