

Economic & Labour Market Review

Contents

Regulars

In brief	3
GDP and unemployment; Sir Michael Scholar addresses the RSS conference; Increasing employment among older people; Annual Business Inquiry figures – 2007; HICP compliance	
Updates and forthcoming releases	5
Economic review	6
Key indicators	15
Independent forecasts	16

Articles

ICT impact assessment by linking data	18
<i>Mark Franklin, Peter Stam and Tony Clayton</i>	
Assesses the impact of information and communications technologies on productivity across Europe	
Recession and recovery in the OECD	28
<i>Graeme Chamberlin and Linda Yueh</i>	
Compares the economic downturns and future prospects of the major OECD countries	
Quality measures of household labour market indicators	34
<i>Jenny Johnson</i>	
Considers the reliability of the Labour Force Survey and the Annual Population Survey	
Unemployment durations: evidence from the British Household Panel Survey	48
<i>Katy Long</i>	
An econometric study of the re-employment prospects of men aged 18-60 between 1991 and 2006	
An economic approach to the measurement of growth in the output of public services	55
<i>Mark Chandler</i>	
Discusses how economic theory can be used to measure changes in the quality of public services output	
Services Producer Prices Indices (experimental) – second quarter 2009	61
<i>Simon Woodsford</i>	
Reports the latest data on this experimental statistic	
Data and support	64
Key time series	64
National accounts aggregates; Gross domestic product: by category of expenditure; Labour market summary; Prices. Notes to tables; Concepts and definitions	
Directory of online tables	69
Contact points	72
ONS economic and labour market publications	73
Recent and future articles	74

Vol 3 No 10
October 2009 edition

Office for National Statistics

ISBN 978-0-230-23299-0
ISSN 1751-8326 (print)
ISSN 1751-8334 (online)

A National Statistics publication

National Statistics are produced to high professional standards set out in the Code of Practice for Official Statistics. They are produced free from political influence.

Not all the statistics contained within this publication are national statistics because it is a compilation from various sources.

The inclusion of reports on studies by non-governmental bodies does not imply endorsement by the Office for National Statistics or any other government department of the views or opinions expressed, nor of the methodology used.

About us

The Office for National Statistics

The Office for National Statistics (ONS) is the executive office of the UK Statistics Authority, a non-ministerial department which reports directly to Parliament. ONS is the UK government's single largest statistical producer. It compiles information about the UK's society and economy, and provides the evidence-base for policy and decision-making, the allocation of resources, and public accountability. The Director-General of the ONS reports directly to the National Statistician who is the Authority's Chief Executive and Head of the Government Statistical Service.

The Government Statistical Service

The Government Statistical Service (GSS) is a network of professional statisticians and their staff operating both within the Office for National Statistics and across more than 30 other government departments and agencies.

Palgrave Macmillan

This publication first published 2009 by Palgrave Macmillan.

Palgrave Macmillan in the UK is an imprint of Macmillan Publishers Limited, registered in England, company number 785998, of Houndmills, Basingstoke, Hampshire RG21 6XS.

Palgrave Macmillan in the US is a division of St Martin's Press LLC, 175 Fifth Avenue, New York, NY 10010.

Palgrave Macmillan is the global academic imprint of the above companies and has companies and representatives throughout the world.

Palgrave® and Macmillan® are registered trademarks in the United States, the United Kingdom, Europe and other countries.

A catalogue record for this book is available from the British Library.

Contacts

This publication

For information about this publication, contact the editorial team, email: elmr@ons.gsi.gov.uk

Other customer enquiries

ONS Customer Contact Centre
Tel: 0845 601 3034
International: +44 (0)845 601 3034
Minicom: 01633 812399
Email: info@statistics.gsi.gov.uk
Fax: 01633 652747
Post: Room 1015, Government Buildings,
Cardiff Road, Newport, South Wales NP10 8XG

www.ons.gov.uk

You can find a downloadable version of this publication at www.palgrave-journals.com/elmr

Media enquiries

Tel: 0845 604 1858
Email: press.office@ons.gsi.gov.uk

Subscriptions

Annual subscription £224, single issue £40
To subscribe, contact Palgrave Macmillan, tel: 01256 357893,
www.palgrave.com/ons

Copyright and reproduction

© Crown copyright 2009

Published with the permission of the Office of Public Sector Information (OPSI)

You may use this publication (excluding logos) free of charge in any format for research, private study or internal circulation within an organisation providing it is used accurately and not in a misleading context. The material must be acknowledged as Crown copyright and you must give the title of the source publication. Where we have identified any third party copyright material you will need to obtain permission from the copyright holders concerned.

For re-use of this material you must apply for a Click-Use Public Sector Information (PSI) Licence from:

Office of Public Sector Information, Crown Copyright Licensing and Public Sector Information, Kew, Richmond, Surrey TW9 4DU,
tel: 020 8876 3444, www.opsi.gov.uk/click-use/index.htm

Maps reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. ONS GD272183 2009.

Printing

This book is printed on paper suitable for recycling and made from fully managed and sustained forest sources. Logging, pulping and manufacturing processes are expected to conform to the environmental regulations of the country of origin.

Printed and bound in Great Britain by Latimer Trend & Company Ltd, Plymouth, Devon

Typeset by Curran Publishing Services, Norwich

In brief

GDP and unemployment

A new feature showing the paths of output and unemployment in the current recession, compared to previous recessions, can now be viewed on the ONS web site.

Using the index of Gross Domestic Product, it is shown that the fall in UK output has been greater in the current recession than in those of the early 1980s and early 1990s.

This simple analytical tool can also be used to monitor the relative speed and strength of any future recovery.

Data comparing movements in the unemployment rate, based on the Labour Force Survey, are shown in a separate chart. Since the start of the recession in the second quarter of 2008, the rise in unemployment has been similar to the experience of the early 1980s recession. This chart also shows that in previous recessions, unemployment continued to rise for several quarters after positive GDP growth had returned.

More information

www.statistics.gov.uk/cci/nugget.asp?ID=2294

Contact

✉ labour.market@ons.gov.uk

Sir Michael Scholar addresses the RSS conference

The chair of the UK Statistics Authority, Sir Michael Scholar, gave a speech entitled 'UK Statistics Authority: priorities, progress and change' at the annual Royal Statistical Society conference in Edinburgh on 10 September 2009. The event also saw the launch of the Authority's new office in Edinburgh. The speech covered a number of themes.

First the commitment to user engagement was reconfirmed, recognising that statistics have no value unless they can inform decision making and improve knowledge of society and the economy. The new Code of Practice for the Government Statistical Service sets out the principle that producers of statistics should discover and meet user needs and actively engage with them.

Second, the role of the Authority in standing up for statisticians, but also being self-critical when need be, was outlined. Independence from political influence was stated as being of paramount importance for maintaining public trust and confidence in statistics.

Finally, looking ahead, Sir Michael expected statistics to be very much in the public eye during General Election campaigning. He also reiterated his wish that all pre-release access for government ministers and their advisers be abolished.

More information

www.statisticsauthority.gov.uk/news/index.html

Contact

✉ authority.enquiries@statistics.gsi.gov.uk

Increasing employment among older people

An article published by ONS in *Population Trends* on 24 September 2009 looks at economic activity among older people in the UK over the last 12 years. There has been increasing interest in whether people are extending their working lives in response to increasing life expectancy and more years in good health, as well as fears about adequate pension provision.

In the last 12 years there has been an increase in employment rates among adults aged 50 and over – although economic activity varied according to socio-economic status, qualifications, marital status and caring commitments. People aged between 50 and state retirement age, who were in managerial, professional or intermediate occupations, and who had a degree or equivalent qualification, were more likely to be in employment.

Married men aged between 50 and 65, and 65 and 69 who were living with a spouse were more likely to be employed and less likely to be economically inactive due to sickness or disability. Women aged between 60 and 69 who were separated or divorced were more likely to be in employment.

Men aged between 50 and 65 were also more likely to be in employment if they were buying their house with a mortgage

or loan, or if they were living in households with dependent children.

More information

www.statistics.gov.uk/statbase/Product.asp?vlnk=6303

Contact

✉ population.trends@ons.gsi.gov.uk

Annual Business Inquiry figures – 2007

In December 2008 ABI employee figures for the survey period 2007 were released on Nomis. These were, as in previous years, available on a SIC 2003 basis.

Estimates using the new SIC 2007 structure have now been produced and a summary can be found on the Nomis website. Figures have been produced for Great Britain by the new 4-digit (SIC 2007 based) industry, at local authority level by the new 2-digit division and Government Office Region level by the new 2-digit division. These figures are consistent with the figures currently available for the ABI on Nomis. These will be subject to revisions in December 2009 as per the current revisions policy. Total employment has not changed – just the structure of where the businesses have been classified.

The aim of providing these figures is to help users see the impact of the change in classification. The change does not affect the employee estimates regionally – only the industrial split.

On December 16th 2009 the 2008 and revised 2007 ABI employee figures will be made available on Nomis. The figures will be published on both a SIC 2003 and SIC 2007 basis for both years. There are no plans to publish any earlier years' figures on a SIC 2007 basis. The 2008 ABI/1 has been sampled and estimated on the new SIC 2007 basis. These figures will then be converted to a SIC 2003 basis. The 2007 ABI/1 was sampled and estimated on a SIC 2003 basis and these figures converted onto the new SIC 2007 basis.

More information

www.nomisweb.co.uk

Contact

✉ annual.employment.figures@ons.gov.uk

HICP compliance

The Harmonised Index of Consumer Prices (HICP) is one of the most important economic indicators within Europe. It is the inflation measure used by the European Central Bank to assess price stability in the Euro Area and as the inflation measure for the wider European Union (EU). The HICP is known as the Consumer Prices Index (CPI) in the UK.

Eurostat have a Compliance Monitoring Programme where the HICP of all EU member states are assessed against European legislation. This programme is considered important to ensure the

continued credibility of the HICP and is also designed to further improve the quality of the HICP since data and methodological weaknesses are identified and addressed.

Eurostat started the assessment of the UK CPI in autumn 2008. The assessment is a rigorous exercise and includes the provision to Eurostat of details on all aspects of the data sources and methods used to construct the CPI. A Eurostat delegation also visited the UK Prices team to discuss further the methods used to measure the CPI and the improvements planned for the index.

Eurostat has now published their assessment and it is generally positive with

such comments as 'the price statistics unit of the Office for National Statistics follows high technical standards and operates within a formal, quality management system certified to ISO 9001'. The list of issues to review is also relatively short with most already included in the CPI development programme.

More information

<http://epp.eurostat.ec.europa.eu/portal/page/portal/hicp/documents/>

Contact

✉ darren.morgan@ons.gsi.gov.uk

UPDATES

Updates to statistics on www.statistics.gov.uk

8 September

Index of production

Flat for the three months to July

www.statistics.gov.uk/cci/nugget.asp?id=198

9 September

UK Trade

Deficit unchanged at £2.4 billion in July

www.statistics.gov.uk/cci/nugget.asp?id=199

11 September

Producer prices

Factory gate inflation falls 0.4%

www.statistics.gov.uk/cci/nugget.asp?id=248

15 September

Inflation

CPI inflation 1.6%, RPI inflation -1.3%

www.statistics.gov.uk/cci/nugget.asp?id=19

16 September

Average earnings

Regular pay slows in year to July 2009

www.statistics.gov.uk/cci/nugget.asp?id=10

Employment

Rate falls to 72.5%

www.statistics.gov.uk/cci/nugget.asp?id=12

Public sector

Employment increases in Q2 2009

www.statistics.gov.uk/cci/nugget.asp?id=407

17 September

Retail sales

Growth mixed across sectors

www.statistics.gov.uk/cci/nugget.asp?id=256

Travel and tourism

Visits to and from the UK relatively stable

www.statistics.gov.uk/cci/nugget.asp?id=352

18 September

Public sector

£12.8 billion current budget deficit in August

www.statistics.gov.uk/cci/nugget.asp?id=206

25 September

Business investment

10.2% down in second quarter 2009

www.statistics.gov.uk/cci/nugget.asp?id=258

Net investment

Institutional net investment £23.5 billion

www.statistics.gov.uk/cci/nugget.asp?id=396

29 September

Balance of Payments

2009 Q2: UK deficit widens

www.statistics.gov.uk/cci/nugget.asp?id=194

GDP growth

Economy contracts by 0.6% in Q2 2009

www.statistics.gov.uk/cci/nugget.asp?id=192

30 September

Productivity

Fall in Q2 2009

www.statistics.gov.uk/cci/nugget.asp?id=133

Index of services

0.2% three-monthly fall into July

www.statistics.gov.uk/cci/nugget.asp?id=558

FORTHCOMING RELEASES

Future statistical releases on www.statistics.gov.uk

1 October

New orders in the construction industry – August 2009**Distributive and services trade – July 2009**

5 October

Investment by insurance companies, pension funds and trusts – Q2 2009

6 October

Index of production – August 2009

7 October

Profitability of UK companies – Q2 2009

8 October

International comparisons of productivity – new estimates for 2008

9 October

Producer price index – September 2009**UK trade – August 2009****Financial statistics – October 2009**

13 October

Consumer price indices – September 2009

14 October

Labour market statistics – October 2009**Digest of engineering turnover and orders – August 2009****Aerospace and electronic cost indices – July 2009**

15 October

Overseas travel and tourism – Q2 2009**Travelpac – Q2 2009****Overseas travel and tourism – August 2009****Public and private breakdown of labour disputes – October 2009**

20 October

Public sector finances – September 2009

21 October

Average weekly earnings (experimental) – August 2009

22 October

Retail sales – September 2009

23 October

Gross domestic product: preliminary estimate – Q3 2009**Index of services – August 2009**

26 October

Distributive and services trade – August 2009

Economic review

October 2009

Graeme Chamberlin

Office for National Statistics

SUMMARY

The UK economy contracted by a revised 0.6 per cent in the second quarter, due to continuing falls in household consumption and business investment. Despite some impact from the vehicle scrappage scheme, household consumption fell due mainly to lower discretionary spending on services. Business investment is currently the main driver of the recession, and has fallen heavily since the start of 2009 due to the uncertain economic outlook. Weak consumption and investment spending has seen the savings ratio rise, and both the household and corporate sectors become net lenders. Government consumption and investment has continued to rise throughout the recessionary period. However, as fiscal revenues fall, public sector borrowing and debt has risen generating expectations that a period of fiscal austerity will be required. The current account has remained in deficit despite an improvement in the trade balance as net investment income falls. However there is some evidence that the UK economy is undergoing some rebalancing away from domestic to external demand.

The recession continues as investment and consumption continue to fall

The Quarterly National Accounts showed the UK economy contracted by 0.6 per cent in the second quarter of 2009 (see **Figure 1**). This is the third vintage of data on Gross Domestic Product (GDP) published by ONS for this quarter, and marks an upward revision from the

preliminary estimate when a 0.8 per cent fall in output was reported. Revisions generally reflect the incorporation of new information into updated estimates – in this case the outcome of better data on construction output.

Despite this, the performance of the UK economy in the second quarter was generally viewed as disappointing. Business survey data in April and May was fairly robust, leading some commentators to (prematurely) call the end of the recession. The fact that growth returned in other

major economies including Japan, Germany and France, strengthened the perception that the UK was undergoing a particularly severe and prolonged downturn. GDP has now fallen for 5 successive quarters, and in 2009 Q2 was 5.5 per cent lower than the previous year. The pace of contraction though has clearly slowed, raising optimism that the UK will exit from recession in the third quarter of the year.

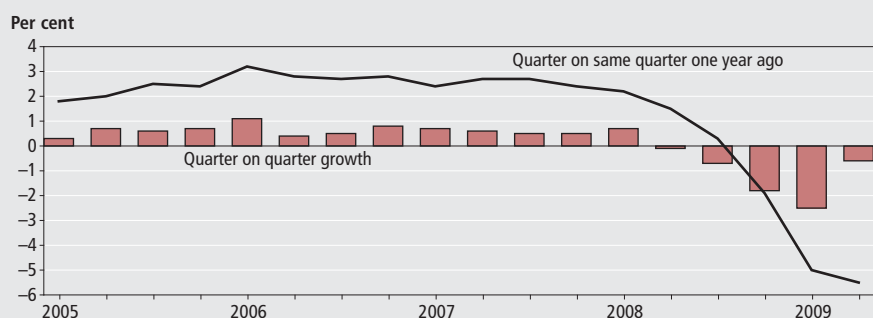
A break down of the quarter on quarter 0.6 per cent fall in GDP by main expenditure components is shown in **Figure 2**. The largest contribution came from fixed investment, which fell by 5.2 per cent on the quarter – this follows a 7.3 per cent in the first quarter of the year. Household consumption also continued to fall, but even though the 0.6 per cent fall was the fifth successive quarter of negative growth it did at least mark an improvement on the larger quarterly falls in 2008 Q4 and 2009 Q1.

While weak consumer spending and investment continue to drive falling output, positive contributions to growth did come from inventories, net trade, government spending, and the 'other' category. Unfortunately a closer look at the data gives little optimism that any of these components though can sustain a recovery on their own.

Inventories refer to the stocks of raw materials, semi-finished and finished goods held by businesses to meet expected future orders or production needs. It is normal for these to fall abruptly in a recession, but also to increase sharply as the economy recovers. So despite accounting for a small proportion of the level of GDP, movements in inventories can be important in explaining changes in GDP. Even though firms are continuing to run down inventories, the rate at which this is being done slowed in the second quarter compared to the first, explaining why the contribution to growth was positive in the quarter on quarter comparison. While the disposal or accumulation of inventories can amplify the magnitude of the economic cycle they in themselves only have a temporary impact on growth – so are unlikely to generate a sustained recovery in output.

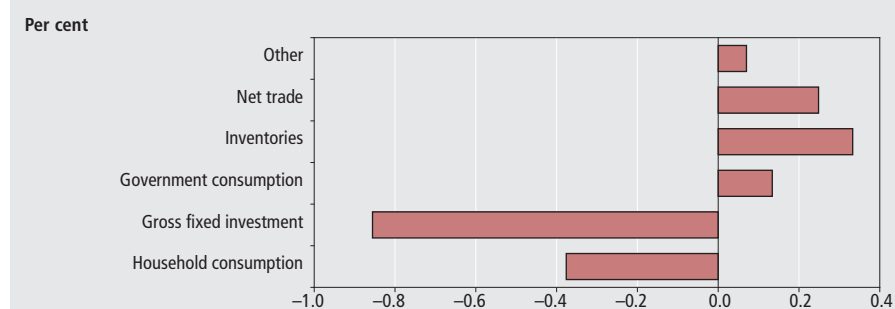
Government consumption expenditure has maintained a steady increase

Figure 1
GDP growth



Source: ONS Quarterly National Accounts

Figure 2
Contributions to quarter on quarter GDP growth, 2009 Q2



Source: ONS Quarterly National Accounts

throughout the recession, growing by a further 0.6 per cent in the second quarter. It is not uncommon for various aspects of government spending to rise as the economy slows – reflecting the operation of automatic stabilizers through the benefits system and the general reluctance to cut spending when demand elsewhere in the economy is fragile. However, due to the recession-hit state of the public finances and rising public sector net debt, it is unlikely that there will be much room for future fiscal stimulus. The policy agenda now appears to be moving towards austerity measures to bring down public sector borrowing.

Net trade, or the difference between exports and imports, also had a positive impact on growth. This is because imports fell at a faster rate of 2.2 per cent over the quarter than exports which fell by 1.4 per cent. So here the positive contribution to growth is simply the outcome of subtractions to GDP (imports) falling faster than additions (exports).

‘Other’ expenditure is the sum of expenditure by non-profit institutions, changes in valuables, and the statistical discrepancy or adjustment that brings expenditure measure of GDP into line with the production-based measure. Even though the combined impact of these was to raise GDP growth, individually each of these components is too small to be a driver of longer term growth.

A longer-term view of expenditure patterns is shown in **Figure 3**, which shows the contributions to the 5.5 per cent fall in GDP between 2008 Q2 and 2009 Q2. Once again the main contributing factors have been fixed investment and household consumption, which have contracted by 17.2 per cent and 3.6 per cent respectively over the period.

In contrast to the latest quarter on quarter data, inventories had a negative impact on growth over the last year. Much of the initial fall in output during

the recession was in the manufacturing and other production sectors, where firms facing up to lower expected future production, rapidly run down their inventories. Looking at the international data, the countries that experienced the largest output falls in the recession were those, such as Japan and Germany, with a relatively large industrial base, hence GDP is more prone to the ‘stocks cycle’. The flipside of this is that recovery may also be faster, both Japan and Germany exited recession in the second quarter with returning growth the result of an inventory bounce. Stockholdings had been run down to such low levels that firms were forced to raise production. As the production sector is a relatively small part of the UK economy any bounce in inventories and its contribution to GDP would be comparatively smaller – perhaps explaining why growth was more lackluster. But as already mentioned, inventories have at most a temporary effect on output, and because consumption and investment continues to fall in Japan and Germany, these countries could be susceptible to a further decline in output, and a W-shaped recession.

Figure 3 also shows that over the last year, government consumption spending and net trade have made positive contributions to UK growth. Government consumption spending has grown in every quarter of the

recession and was 2.2 per cent higher than a year previously. The positive impact of net trade was the consequence of exports falling by a lower 13 per cent over the year compared to the 15.1 per cent fall in imports. There are several reasons which might account for this trend.

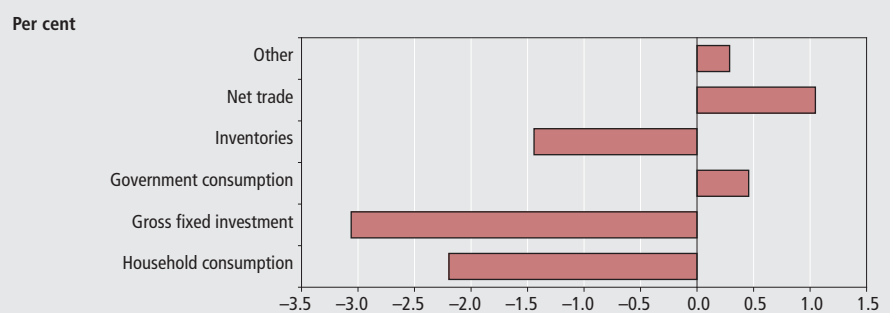
The relative competitiveness of UK goods and services in global markets has been helped by the large depreciation in sterling against the US dollar and the euro since the summer of 2008. Although sterling has recovered from its low point at the end of 2008 it remains below where it was this time last year. It is hard to gauge the importance of this competitiveness effect. Business survey data tends to downplay it – stating that any beneficial effect on exports is tiny when compared to the negative effect of a large fall in global demand. But this does not imply that exports would have contracted even further had it not been for sterling depreciation.

Improvement in net trade may also reflect that domestic spending in the UK has fallen faster than global spending – pulling imports down faster relative to exports. If this were so it’s an indicator that imbalances in the UK prior to recession were greater, hence a greater correction was required – notably a larger rebalancing away from domestic consumption to exports.

Finally, the positive contribution of net trade may just reflect structural factors. Manufacturing output is more heavily traded than services, so has been more adversely affected by the global fall in demand and trade. Given that manufacturing is a relatively small part of the UK economy, the slowdown in manufacturing trade is more likely to have a bigger impact on its imports than its exports.

The continued weakness of household spending and fixed investment as households and firms look to de-leverage – that is reduce debts and rebuild their

Figure 3
Contributions to four-quarter GDP growth, 2009 Q2



Source: ONS Quarterly National Accounts

balance sheets – is a key factor underlying projections of weak output growth in 2010. According to the latest forecast by the Organization for Economic Cooperation and Development (OECD), UK output is expected to be flat in 2010.

Not only is domestic expenditure likely to be weak as households and firms undergo a period of de-leveraging, a number of other factors could also limit growth. A retrenchment in fiscal policy as the government (whoever that may be) tackles the growing budget deficit is very probable. Unemployment is also expected to rise further as firms are reluctant to start recruiting again until they are sure a sustained recovery is underway. And while the financial sector continues to rebuild its balance sheets a cautious approach to lending is likely to be adopted. Therefore, even if the UK economy manages to escape from recession in a technical sense, the recovery may be fragile, and the economy is in danger of a double dip recession should it be hit by a further shock or loss of confidence.

Balance sheet information for the main sectors of the UK economy (households, corporations, government and the rest of the world) are published as part of the Quarterly National Accounts. The rest of this article will focus on recent developments in these, reflecting on how each sector has been affected by the recession thus far, and the issues that may affect its behaviour in the near-term.

Household consumption falls as the saving ratio rises

In the second quarter household consumption fell by 0.6 per cent relative to the first quarter of 2009 and by 3.6 per cent compared to the same quarter in 2008. A break down of each of these figures by the main categories of spending are shown in **Figure 4** and **Figure 5** – showing the short and longer terms drivers behind the decline in household consumption.

As Figure 4 shows, the contraction in household consumption during the latest quarter has been fairly broad-based with most of the different categories registering a fall. The biggest declines were in net-tourism (despite the depreciation of sterling reflecting a fall in visitors from the US), recreation and culture, and hotels and restaurants. These components can be thought of as the more discretionary parts of spending on services – so it is perhaps not surprising that if the household sector

is seeking to make cut backs to spending these items have been hardest hit. Bucking the trend has been spending on clothing and footwear, housing, transport and communications where spending increased.

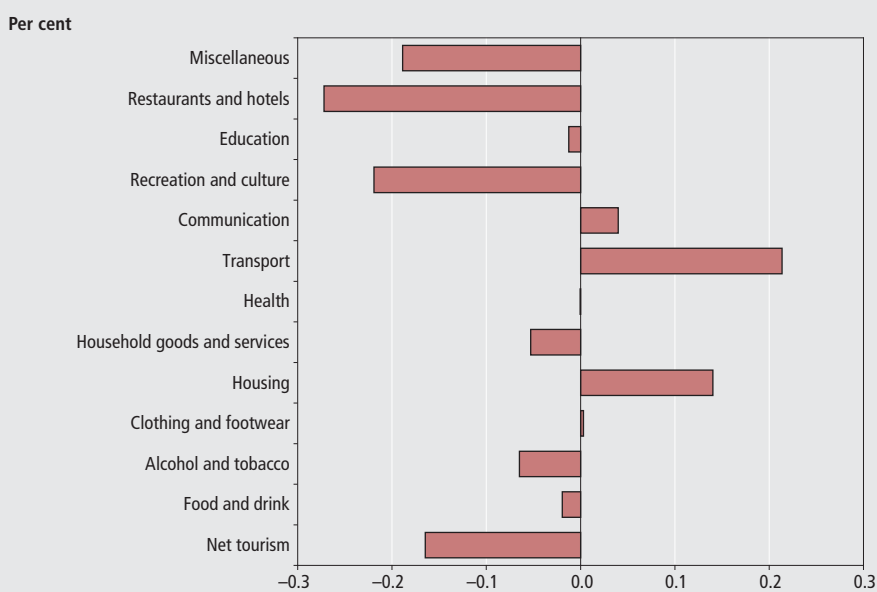
A longer term view of the data on household consumption spending is shown in Figure 5, which shows that the movements in the latest quarter have generally been sustained over the previous year. There were large falls in net tourism, recreation and culture and hotels and restaurants – and also in household goods

and services – due to a fall in spending on bigger ticket items such as furniture and carpets.

Clothing and footwear spending though has continued to grow – this is largely considered to be the result of strong discounting – meaning that volumes have been maintained by falling prices. Housing services, which includes the imputed rents that owner-occupiers pay themselves for living in their own property, along with utilities is a fairly stable part of spending that is unlikely to be significantly affected

Figure 4

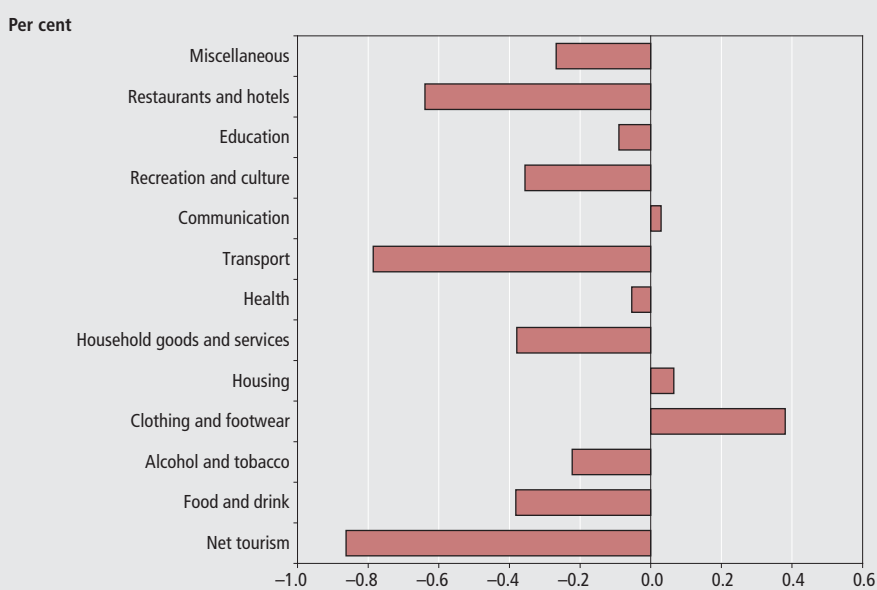
Contributions to quarter on quarter household consumption growth, 2009 Q2



Source: ONS Quarterly National Accounts

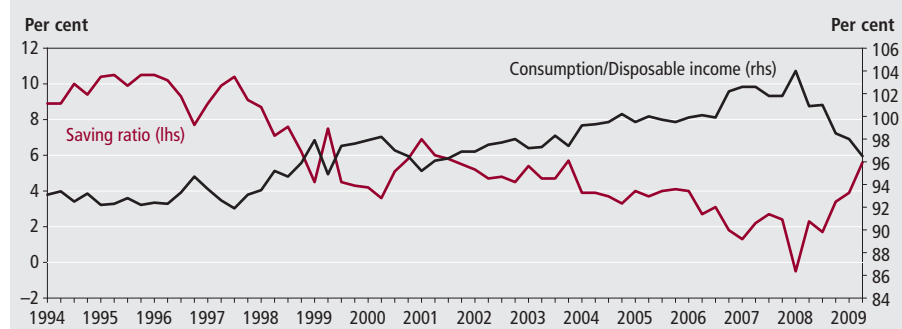
Figure 5

Contributions to four-quarter household consumption growth, 2009 Q2



Source: ONS Quarterly National Accounts

Figure 6
Household saving ratio and consumption as a proportion of disposable income



Source: ONS Quarterly National Accounts

by the recession. Finally, spending on communications equipment (such as mobile phones) has continued to grow, which might reflect the continued product development and falling prices in this category.

The only sector which shows a difference between the short and longer term patterns of spending is transport. Significantly this includes spending on motor vehicles, which for the most part has been severely affected by the squeeze in consumer credit, falling consumer confidence, and pressure on household balance sheets. As a result the purchase of motor vehicles fell heavily between the second and fourth quarters of 2008. In the first quarter of 2009 demand was flat, and then grew on a quarter by quarter basis by 6.4 per cent in the second quarter. This abrupt turnaround is almost certainly down to the vehicle scrappage scheme introduced in May. Without this overall consumer spending would have been weaker still in 2009 Q2.

Evidence of a retrenchment in household activity is shown by the rising saving ratio in **Figure 6**. After steadily falling for a decade between 1998 and 2008, the UK household saving ratio has since increased to 5.6 per cent in the second quarter – although this is still below the long term average of the series which is closer to 8 per cent. There appears to be two factors at play in accounting for the recent rise in the saving ratio.

First, household disposable incomes have not fallen by as much as might have been expected despite the impact of the recession on the labour market. Wages and salaries, and the operating surpluses (profits) of the self-employed and household businesses have weakened, but there have been two moderating effects on aggregate disposable incomes.

Net property income refers to the income received from minus the income paid to

other sectors in the economy due to the ownership of financial assets. For example, if a household owns shares in a company, any dividend payment earned counts as property income. Likewise, if the household sector takes out a loan – then the interest payments on that are property payments. Due to the large rise in house prices between 1998 and 2007, the amount of interest bearing mortgage debt held by the household sector has grown considerably – to the extent that the sector is now an overall net debtor in interest bearing assets. This means that a cut in rates will reduce the property payments of the sector to a greater extent than the property earnings. Therefore, the aggressive cuts in interest rates undertaken by the Bank of England to stimulate the economy has seen net-property income increase for the household sector due to a large reduction in mortgage payments. Of course, should interest rates start to rise this would go into reverse putting downward pressure on net property and disposable incomes.

Falling labour income has also been offset by the workings of the tax and benefits system. As earned income falls and unemployment rises then tax payments will fall and social transfers rise – providing an automatic stabilizer to household disposable incomes.

Therefore, because household incomes are being supported by these factors it has meant that the strong decline in consumption has been allowed to feed through directly into the measurement of the saving ratio. This is clearly evident from **Figure 6** where the rise and fall in consumption as a proportion of disposable incomes almost exactly mirrors the behavior of the saving ratio.

One of the consequences of the rise in household savings has been that the sector has become a net lender of the first time since 2001 (see **Figure 7**). A sector is a net lender if the funds available for investment

exceed the actual level of investment undertaken by the sector. In this case the surplus funds can be lent to other parts of the economy or overseas.

For the household sector the main investment asset is housing – which is treated as a capital asset because it yields the owner a flow of future housing services. Therefore in the National Accounts owner occupiers are treated as individual businesses providing housing services to themselves. Falling house prices and the tighter availability of credit has substantially reduced turnover in the housing market, with the number of transactions falling to currently a third of the peak level in late 2006. Therefore household sector investment has fallen accordingly and when combined with the rise in gross saving net lending has resulted.

Investment falls as the corporate sector increasingly becomes net lender

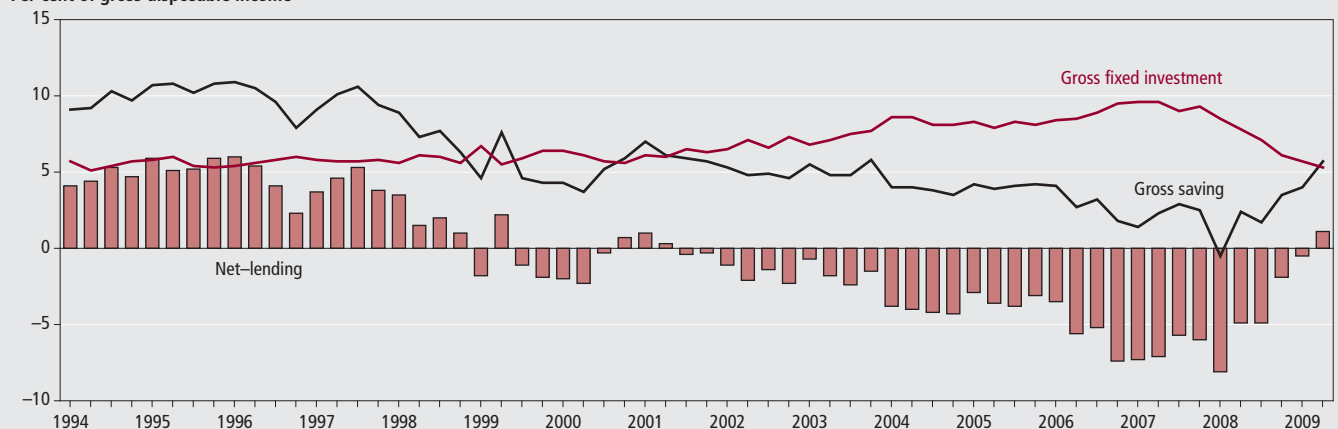
Figures 2 and 3 were clear in showing that gross fixed investment has been the major factor in driving the recession thus far, and also for the fall in output in the latest quarter. Falling investment is obviously a sign of the fragile confidence in the business sector, with few firms willing to make significant commitments to increasing future output while the economic outlook is so uncertain, especially regarding the timing and strength of the recovery.

For the same reasons that firms are cautious about committing to capital spending, they are also cautious about recruiting new staff. One of the dramatic consequences of the recession has been the cessation in annual recruitment schemes – which of course has had a disproportionate impact on younger people who are more reliant on entry-level or graduate schemes. But while firms retain a pessimistic outlook, the potential feedback from the weak labour market is likely to be dampener on demand and economic growth.

Figure 8 shows the contributions to the 5.2 per cent fall in investment in the second quarter of 2009 and business investment has been the major driver. Investment associated with dwellings, be it new dwellings or the transfer of existing ones, has also made a significant contribution to the large contraction in fixed investment. This is certainly consistent with recent developments in the housing market and

Figure 7
Household sector net lending

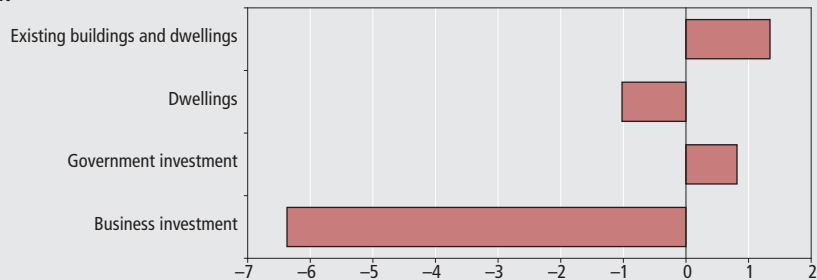
Per cent of gross disposable income



Source: ONS Quarterly National Accounts

Figure 8
Contributions to quarter on quarter growth in gross fixed capital formation, 2009 Q2

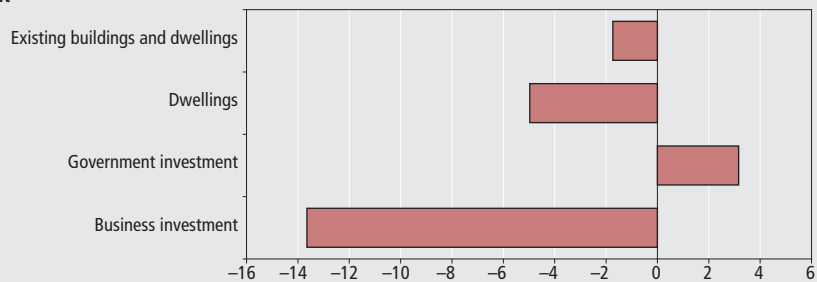
Per cent



Source: ONS Quarterly National Accounts

Figure 9
Contributions to four-quarter growth in gross fixed capital formation, 2009 Q2

Per cent



Source: ONS Quarterly National Accounts

the large fall in private sector new housing orders. Public sector investment though continues to grow.

Looking at a slightly longer term view of investment, that is the contributions to the four-quarter fall of 17.2 per cent in **Figure 9**, shows the same pattern. Most of the fall is accounted for by business investment, which over the year to 2009 Q2 saw a contraction of 21.8 per cent. Furthermore, the fall in investment has accelerated since the start of 2009.

This has clearly been reflected in the balance sheets of private non-financial corporations (PNFC). **Figure 10** shows the main components of the income side of the PNFC balance sheet. Primary incomes from operating surpluses (profits), net property income payments (which includes distributed payments to shareholders) and net taxes and social contributions add up to the gross disposable income of the sector. One of the interesting features is the relative

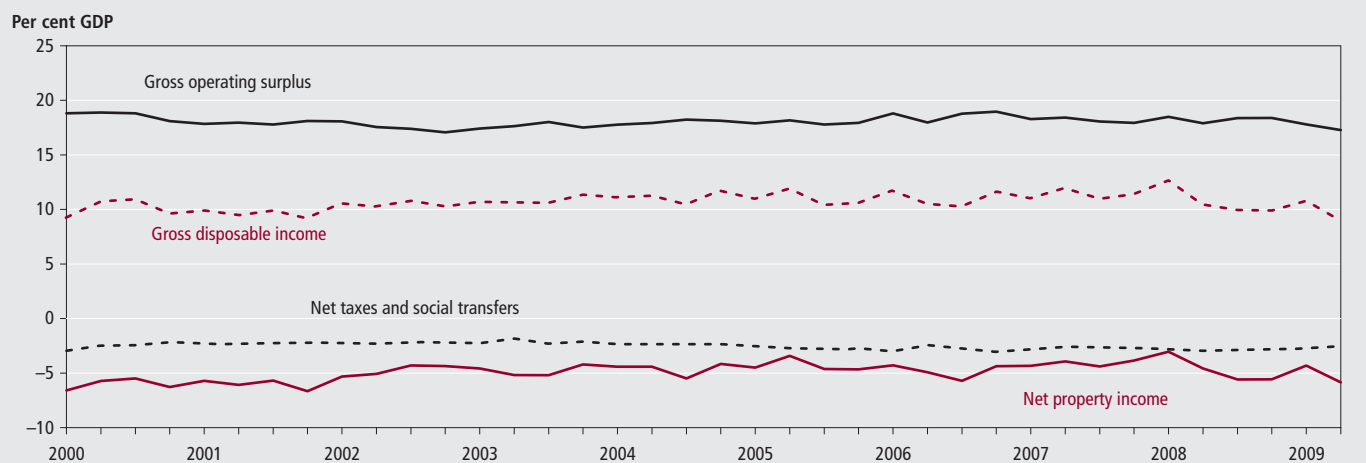
stability of these time-series over recent history as a proportion of GDP. Naturally, because GDP has fallen in the recession, these individual components have also fallen, but they have done so broadly in line with GDP.

Gross disposable income of the PNFC sector essentially represents the internally generated funds available for investment - it could also be thought of as the gross savings of the sector - essentially determining how much can be invested without resorting to outside financing such as bank loans. The net lending position of the sector is therefore determined by how this compares to the actual investment undertaken.

Figure 11 shows that PNFCs have been net lenders to the rest of the economy since 2002, but in the last year this position has been cemented by a sharp fall in gross capital formation (GCF). It should be noted that GCF here consists of both fixed investment and inventories, both of which have declined sharply in the recession as a proportion of GDP (see **Figure 3**). The conclusion is therefore similar for the household sector in that net lending has resulted from a retrenchment in spending.

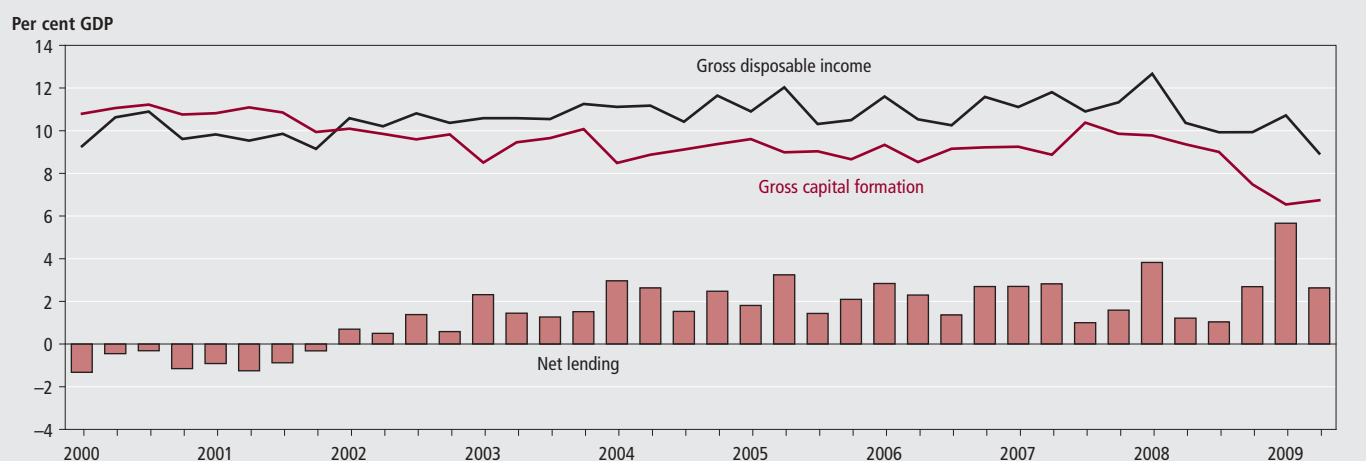
Financial corporations have also been net lenders since 2002, and in the last year the net lending of this sector as a proportion of GDP has grown considerably. The underlying cause here though is different than the fall in investment in the PNFC sector. **Figure 12** shows that although net property income has fallen in the last year, gross disposable income of financial corporation has strengthened due to a significant rise in gross operating surpluses. Then, because the sector as a whole is a relatively low investor, this has fed through

Figure 10
Private non-financial corporations gross disposable income



Source: ONS Quarterly National Accounts

Figure 11
Private non-financial corporations net lending



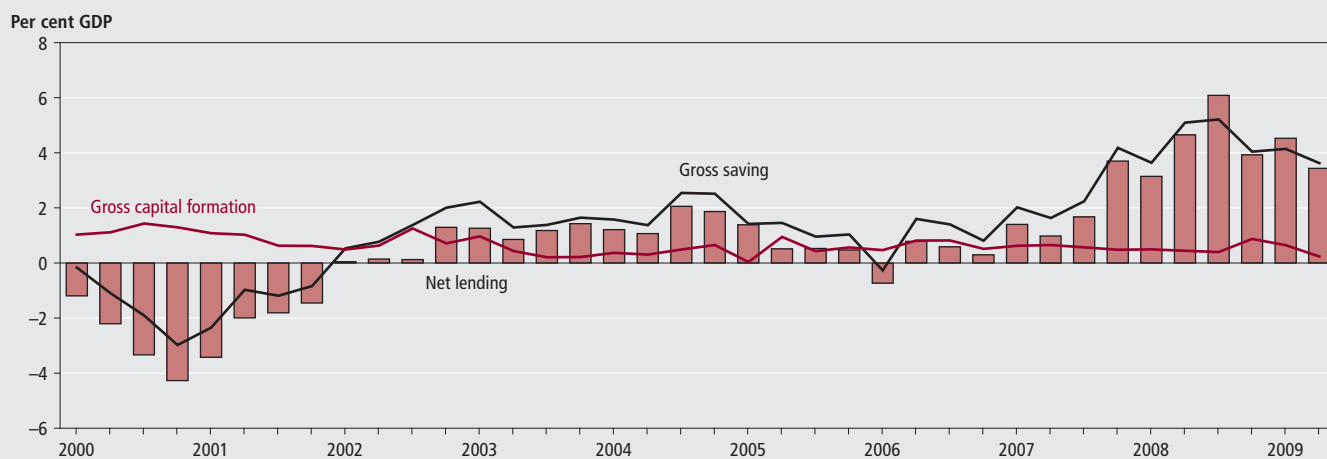
Source: ONS Quarterly National Accounts

Figure 12
Financial corporations gross disposable income



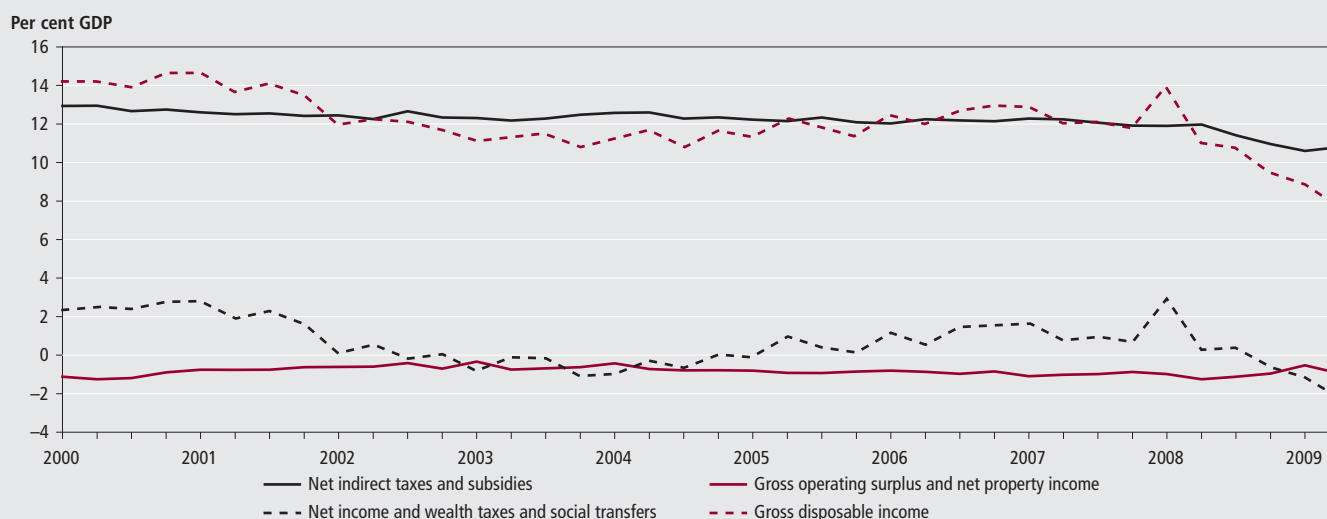
Source: ONS Quarterly National Accounts

Figure 13
Financial corporations net lending



Source: ONS Quarterly National Accounts

Figure 14
Central government gross disposable income



Source: ONS Quarterly National Accounts

directly into the net lending position (see Figure 13).

The key question here is how, despite the recession and financial crisis, the sector has managed to generate larger operating surpluses. One possible explanation is that it reflects an increase in spreads – this is the difference in prices which a financial asset is bought and sold. These have generally widened since the collapse of Lehman Brothers last year, reflecting added risk premiums due to greater volatility and uncertainty in financial markets. An important spread in the financial sector is the difference between lending and deposit rates of interest, which have also risen in the last year. Substantial interest rate cuts have been passed on to a greater extent in saving rates than lending rates, which have fallen less quickly as financial institutions take a more cautious approach to lending. Growing profits may therefore reflect these widening margins.

Central government net borrowing rises sharply

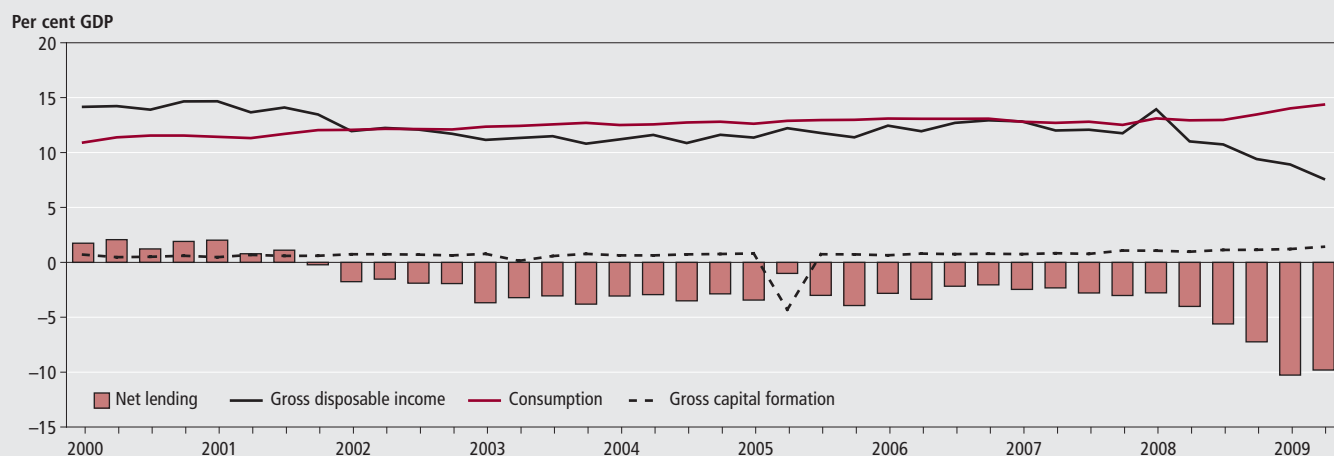
Government consumption spending (see Figure 3) and government investment spending (see Figure 9) have continued to grow despite the recession. This partly reflects the workings of automatic stabilizers, with some components of income rising automatically as the economy slows or goes into reverse. It also reflects discretionary elements – with the government reluctant to reduce spending when private sector demand is weak as well as the effects of stimulus packages.

Despite seeking to maintain public sector demand in the falling economy, the gross disposable income of central government has clearly been recession hit (see Figure 14). First, revenue from net indirect taxes and subsidies has fallen,

the consequence of falling consumption expenditures but also due to the temporary reduction in VAT introduced in last year's Pre-Budget Report. But more dramatically there has been a significant deterioration in net revenues from taxes on income and wealth and social payments. This is of course expected as the economy shrinks and the labour market weakens.

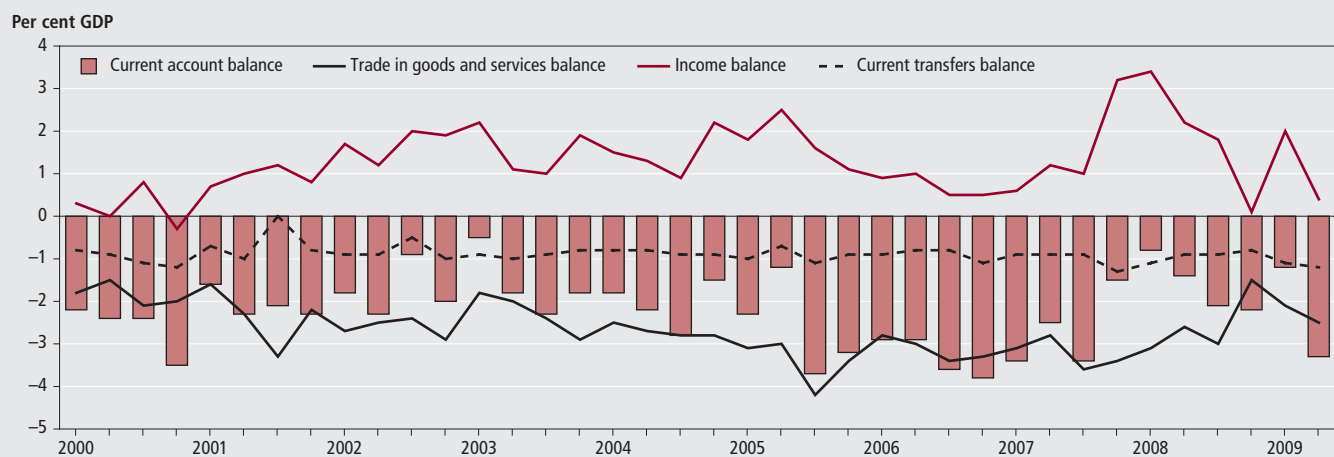
The consequence of falling revenues (gross disposable income), plus growing consumption and investment has been a growing budget deficit and increased public sector borrowing. These developments are clearly visible in Figure 15 showing that since the start of the recession, the central government sector has become a large net borrower. Worries over the sustainability of this borrowing and growing public sector debt has led to strong expectations of fiscal retrenchment once the economy starts to recover.

Figure 15
Central government net lending



Source: ONS Quarterly National Accounts

Figure 16
Balance of payments



Source: ONS Quarterly National Accounts

The UK current account remains in deficit

The Balance of Payments records one nation's transaction with the rest of the world – with international trade and income flows recorded in the current account. Since late 2007 the deficit on the balance of trade in goods and services has fallen, the result of imports falling faster than exports as mentioned earlier in the article. But the overall current account has not shown the same overall improvement (see Figure 16).

The other two parts of the current account reflect income and transfer flows. Current transfers mainly account for international aid payments, and commitments resulting from the membership of supranational organizations – notably the European Union. As a proportion of GDP this spending has been remarkably stable – with the UK registering a persistently small deficit.

Income flows reflect international payments associated with the ownership of the factors of production. A feature of the globalization is that not only has trade in goods and services grown, but the means of production – that is capital and labour – have also become more internationally mobile. A minor part of these income flows are remittances from foreign workers back to their country of origin and from UK residents overseas back to the UK. Investment income flows account for the majority.

Net investment income flows improved markedly in late 2007 and into 2008 which led to a large improvement in the overall current account. This improvement though was largely because outflows of investment income abroad were falling faster than investment income earned overseas. Much of the inward Foreign Direct Investment into the UK is concentrated in the financial sector in the city of London, so once the financial crisis began to take hold it had

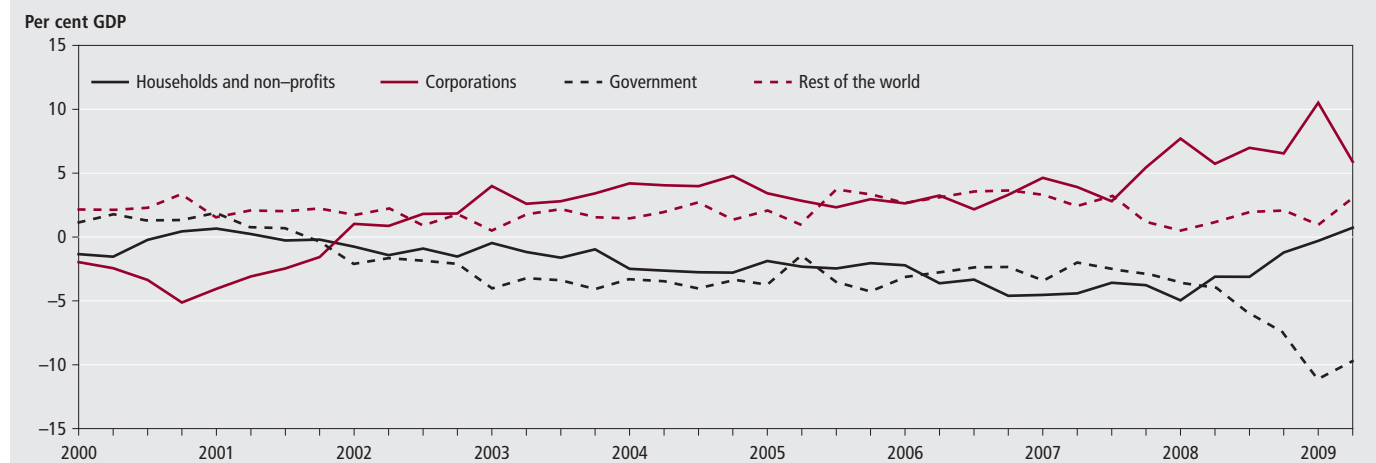
a larger impact on outward investment income flows than inward – given that UK foreign direct investment abroad is more diversified across industry.

However, as the global financial crisis became a global recession profits from the UK's foreign direct investment abroad also began to fall, reducing net investment income flows. This is now offsetting the improvements in the current account coming from the better trade in goods and services balance.

Further retrenchment and de-leveraging to weigh on growth as the economy rebalances?

For each sector of the UK economy the balance between its disposable income and expenditure is reflected in its net lending position. These are shown in Figure 17.

Figure 17
UK net lending by sector



Source: ONS Quarterly National Accounts

The household sector (which includes non-profit institutions serving households) and the corporate sector (consisting of private non-financial, public and financial corporations) have both become increasing net lenders. Although the disposable income of these two sectors has generally moved in line with the fall in GDP there has been a heavy retrenchment in spending. This has been marked by the contraction in consumption and investment due in part to the uncertain economic outlook, and part due to the desire to pay off debts and rebuild balance sheets. By contrast, the government sector has become an increasingly large net-

borrower as the public finances suffer from the recession and the government's fiscal stimulus packages. Due to the impact on public borrowing and debt a period of future fiscal austerity has been dominating the political agenda.

When the expected fiscal retrenchment is added to weak household and business demand, a deteriorating labour market, and a financial sector which is still to fully emerge from the credit crunch – growth prospects have tended to be pessimistic. These are the factors outlined by the OECD and the International Monetary Fund (IMF) in their latest projections for the

UK economy – with both expecting little growth if any in 2010.

Because the net lending/borrowing system is essentially a closed system, meaning it should all add up to zero, one of the implications of a fiscal retrenchment and weak private sector demand should be a reduction in net borrowing from the rest of the world – which will manifest itself in an improving current account. As this has been in deficit for a considerable period of time, the current recession may mark a period whereby the UK economy rebalances away from over reliance on domestic demand to external demand.

Independent forecasts

September 2009

UK forecasts

The tables below supplement the Economic Review by providing a forward-looking view of the UK economy. The tables show the average and range of independent forecasts for 2009 and 2010 and are extracted from HM Treasury's Forecasts for the UK Economy.

2009

	Average	Lowest	Highest
GDP growth (per cent)	-4.3	-4.8	-3.5
Inflation rate (Q4, per cent)			
CPI	1.4	-0.1	2.5
RPI	-0.9	-2.8	0.2
Claimant count (Q4, million)	1.81	1.55	2.24
Current account (£ billion)	-27.6	-38.6	-16.5
Public Sector Net Borrowing (2009–10, £ billion)	182.4	159.4	205.0

2010

	Average	Lowest	Highest
GDP growth (per cent)	0.1	-0.9	2.2
Inflation rate (Q4, per cent)			
CPI	1.7	0.2	3.5
RPI	2.6	0.2	4.1
Claimant count (Q4, million)	2.09	1.57	2.70
Current account (£ billion)	-24.1	-56.6	-1.3
Public Sector Net Borrowing (2010–11, £ billion)	184.3	141.7	240.0

Notes

Forecast for the UK economy gives more detailed forecasts, and is published monthly by HM Treasury. It is available on the Treasury's website at: www.hm-treasury.gov.uk/data_forecasts_index.htm

Selected world forecasts

The tables below supplement the Economic Review by providing a forward-looking view of the world economy. The tables show forecasts for a range of economic indicators taken from *Economic Outlook* (June 2009), published by OECD (Organisation for Economic Co-operation and Development).

2009

	US	Japan	Euro area	Total OECD
Real GDP growth (per cent)	-2.8	-6.8	-4.8	-4.1
Consumer price (percentage change from previous year)	-0.6	-1.4	0.5	..
Unemployment rate (per cent of the labour force)	9.3	5.2	10.0	8.5
Current account (as a percentage of GDP)	..	..	..	..
Fiscal balance (as a percentage of GDP)	-10.2	-7.8	-5.6	-7.7

2010

	US	Japan	Euro area	Total OECD
Real GDP growth (per cent)	0.9	0.7	0.0	0.7
Consumer price (percentage change from previous year)	1.0	-1.4	0.7	..
Unemployment rate (per cent of the labour force)	10.1	5.7	12.0	9.8
Current account (as a percentage of GDP)	..	..	..	..
Fiscal balance (as a percentage of GDP)	-11.2	-8.7	-7.0	-8.8

Notes

The OECD *Economic Outlook* is published bi-annually. Further information about this publication can be found at www.oecd.org/eco/Economic_Outlook

Key indicators

The data in this table support the Economic review by providing some of the latest estimates of Key indicators.

Seasonally adjusted unless otherwise stated									
	Source CDID	2007	2008	2008 Q4	2009 Q1	2009 Q2	2009 Jun	2009 Jul	2009 Aug
GDP growth – chained volume measures (CVM)									
Gross domestic product at market prices	ABMI	2.6	0.6	–1.8	–2.5	–0.6	..	..	..
Output growth – chained volume measures (CVM)									
Gross value added (GVA) at basic prices	ABMM	2.6	0.6	–1.9	–2.5	–0.6	..	..	..
Industrial production	CKYW	0.3	–3.1	–4.5	–5.0	–0.6	0.6	0.6	..
Manufacturing	CKYY	0.6	–2.9	–5.2	–5.3	–0.1	0.6	0.8	..
Construction	GDQB	2.7	–0.4	–4.8	–6.9	–0.8	..	..	..
Services	GDQS	3.5	1.4	–1.1	–1.9	–0.7	..	..	..
Oil and gas extraction	CKZO	–2.2	–5.1	–1.5	–1.8	–0.7	1.5	–1.5	..
Electricity, gas and water supply	CKYZ	0.2	0.0	–1.9	–3.8	–3.6	0.2	–0.1	..
Business services and finance	GDQN	5.6	2.5	–0.7	–2.9	–0.8	..	..	..
Household demand									
Retail sales volume growth	EAPS	4.2	2.6	0.6	0.3	0.8	1.4	0.1	0.0
Household final consumption expenditure growth (CVM)	ABJR	2.5	0.9	–1.2	–1.5	–0.6	..	..	..
GB new registrations of cars (thousands) ¹	BCGT	2,390	2,112	338	472	..	..	..	..
Labour market^{2,3}									
Employment: 16 and over (thousands)	MGRZ	29,222	29,443	29,361	29,204	28,933	28,891	..	..
Employment rate: working age (%)	MGSU	74.6	74.5	74.1	73.6	72.7	72.5	..	..
Workforce jobs (thousands)	DYDC	31,471	31,661	31,286	31,160	30,997	..	..	..
Total actual weekly hours of work: all workers (millions)	YBUS	936.1	940.7	934.0	921.0	917.2	908.7	..	..
Unemployment: 16 and over (thousands)	MGSC	1,653	1,776	1,971	2,215	2,435	2,470	..	..
Unemployment rate: 16 and over (%)	MGSX	5.3	5.7	6.3	7.1	7.8	7.9	..	..
Claimant count (thousands)	BCJD	863.6	905.1	1,091.4	1,366.7	1,533.2	1,557.8	1,583.0	1,607.4
Economically active: 16 and over (thousands)	MGSF	30,875	31,220	31,333	31,419	31,368	31,361	..	..
Economic activity rate: working age (%)	MGSO	78.9	79.1	79.2	79.3	79.0	78.9	..	..
Economically inactive: working age (thousands)	YBSN	7,940	7,872	7,858	7,828	7,955	7,986	..	..
Economic inactivity rate: working age (%)	YBTL	21.1	20.9	20.8	20.7	21.0	21.1	..	..
Vacancies (thousands)	AP2Y	657	618	530	465	434	434	431	434
Redundancies (thousands)	BEAO	127	163	259	286	277	246	..	..
Productivity and earnings annual growth									
GB average earnings (including bonuses) ³	LNNC	..	..	3.0	–0.3	2.5	2.5	1.7	..
GB average earnings (excluding bonuses) ³	JQDY	..	..	3.6	3.0	2.4	2.4	2.2	..
Whole economy productivity (output per worker)	A4YN	..	..	–1.8	–4.2	..	..	..	..
Manufacturing productivity (output per job)	LOUV	..	..	..	..	..	–4.8	–3.4	..
Unit wage costs: whole economy	LOJE	..	..	3.0	3.6	..	..	..	..
Unit wage costs: manufacturing	LOJF	..	..	..	..	..	6.4	4.3	..
Business demand									
Business investment growth (CVM)	NPEL	11.9	1.4	–1.3	–8.9	–10.2	..	..	..
Government demand									
Government final consumption expenditure growth	NMRY	1.2	2.5	1.0	0.1	0.6	..	..	..
Prices (12-monthly percentage change – except oil prices)¹									
Consumer prices index	D7G7	2.3	3.6	3.9	3.0	2.1	1.8	1.8	1.6
Retail prices index	CZBH	4.3	4.0	2.7	–0.1	–1.3	–1.6	–1.4	–1.3
Retail prices index (excluding mortgage interest payments)	CDKQ	3.2	4.3	3.8	2.4	1.4	1.0	1.2	1.4
Producer output prices (excluding FBTP) ^{4,5}	PLLV	1.9	4.7	5.0	3.6	1.3	0.3	0.1	0.7
Producer input prices ⁵	RNNK	3.0	21.6	9.0	0.7	–8.9	–12.0	–12.2	–7.5
Oil price: sterling (£ per barrel)	ETXR	36.11	52.10	35.69	31.33	38.44	42.33	40.16	44.17
Oil price: dollars (\$ per barrel)	ETXQ	72.44	98.37	57.24	44.94	59.82	69.27	65.75	72.99

Seasonally adjusted unless otherwise stated									
	Source CDID	2007	2008	2008 Q4	2009 Q1	2009 Q2	2009 Jun	2009 Jul	2009 Aug

Financial markets¹

Sterling ERI (January 2005=100)	BK67	103.6	90.8	83.4	77.3	80.8	83.7	83.2	83.4
Average exchange rate /US\$	AUSS	2.0018	1.8528	1.5699	1.4346	1.5503	1.6366	1.6366	1.6539
Average exchange rate /Euro	THAP	1.4619	1.2588	1.1957	1.1010	1.1389	1.1682	1.1622	1.1597
3-month inter-bank rate	HSAJ	5.95	2.75	2.75	1.60	1.15	1.15	0.90	0.70
Selected retail banks: base rate	ZCMG						0.50	0.50	0.50
3-month interest rate on US Treasury bills	LUST	3.29	0.11	0.11	0.13	0.20	0.20	0.18	0.17

Trade and the balance of payments

UK balance on trade in goods (£m)	BOKI	-89,754	-93,446	-22,372	-20,796	-19,886	-6,515	-6,479	..
Exports of services (£m)	IKBB	150,645	170,853	45,798	42,329	39,387	13,621	13,539	..
Non-EU balance on trade in goods (£m)	LGDT	-47,768	-53,963	-13,576	-12,531	-10,967	-3,667	-3,925	..
Non-EU exports of goods (excl oil & erratics) ⁶	SHDJ	98.8	105.8	99.5	92.6	92.4	91.3	94.3	..
Non-EU imports of goods (excl oil & erratics) ⁶	SHED	113.3	113.5	109.7	100.8	96.1	93.9	94.9	..
Non-EU import and price index (excl oil) ⁶	LKWQ	102.6	115.3	125.2	130.9	126.3	123.3	122.9	..
Non-EU export and price index (excl oil) ⁶	LKVX	101.8	109.8	115.9	121.5	118.4	116.7	116.6	..

Monetary conditions/government finances

Narrow money: notes and coin (year on year percentage growth) ⁷	VQUU	5.8	7.3	7.3	8.4	8.7	8.7	8.8	8.9
M4 (year on year percentage growth)	VQJW	12.7	12.9	16.4	17.7	13.4	13.4	14.1	12.5
Public sector net borrowing (£m)	-ANNX	33,552	64,158	30,053	22,966	41,177	13,292	7,960	16,119
Net lending to consumers (£m)	RLMH	12,931	11,187	1,570	234	551	78	-217	-309

External indicators – non-ONS statistics

		2009 Feb	2009 Mar	2009 Apr	2009 May	2009 Jun	2009 Jul	2009 Aug	2009 Sep
--	--	-------------	-------------	-------------	-------------	-------------	-------------	-------------	-------------

Activity and expectations

CBI output expectations balance ¹	ETCU	-44	-48	-32	-17	-17	-14	-5	-2
CBI optimism balance ¹	ETBV			-40			-16		
CBI price expectations balance	ETDQ	-12	-12	-19	-14	-8	-13	6	-6

Notes:

Source: Office for National Statistics

1 Not seasonally adjusted.

2 Annual data are the average of the four quarters except for workforce jobs (June).

3 Monthly data for vacancies and average earnings are averages of the three months ending in the month shown. Monthly data for all other series except claimant count are averages of the three months centred on the month shown.

4 FBTP: food, beverages, tobacco and petroleum.

5 Now derived from not seasonally adjusted series.

6 Volumes, 2003 = 100.

7 Replacement for series M0 which has ceased publication.

Further explanatory notes appear at the end of the Key times series section.

ARTICLE

Mark Franklin, Peter Stam
and Tony Clayton

UK Office for National Statistics

ICT impact assessment by linking data

SUMMARY

Between 2006 and 2008 ONS led a research group consisting of representatives from 13 EU statistical offices and a small number of independent academics to:

- develop new indicators on the economic impact of ICT in business, and
- extend consistent analysis of ICT impacts to new countries

The results show beneficial productivity effects associated with ICT. Firm-level analysis in Sweden and Netherlands suggests that this is partly due to ICT being a facilitator of wider innovation.

The results of this study are compared with recent work in the US and a number of other OECD countries. The article concludes by outlining objectives for the next round of research.

Introduction and Background

ICT indicator development for policy

Information Society indicators have a short history in the European Statistical System. Nordic countries, and INSEE, took a significant interest in how information and communication technology (ICT) was being used in industry, and in society, in the mid 1990s, as the use of networks began to impact on more firms and households.

After OECD's 1998 ministerial meeting on e-commerce, member states set out to develop common statistical approaches to measuring the information society, at work, in the home and in the wider community. Initial conceptual work on definition of the ICT industries and of ICT products and services, on e-commerce and measurement of ICT use in business and households was led by a small group of countries, including Canada and Australia.

The approach used to develop metrics focused on understanding the transformation of economic and social relationships by ICTs. A linear model was used, aimed at understanding:

- 'readiness' of economies and institutions, businesses, households and government, to accept or perform electronic transactions of various kinds
- 'use' of ICT, e-commerce and electronic business processes, and
- 'impact' or change in behaviour and performance of economic and social actors.

This 'S curve' approach dominated early years of statistical development. It accompanied policy focus on building the foundations for internet use, through education, familiarisation, infrastructure in terms of equipment and the creation of networks. There was little empirical evidence on gains from the 'impact' of ICT. It was assumed that economic and social benefits of ICT would become evident, and that Solow's Paradox of 1989 "You can see the computer age everywhere but in the productivity statistics" (Solow R M. 1987) would be resolved. This resolution took over a decade.

ICT measurement in the EU was given impetus in 2001 by adoption of the Lisbon strategy to promote Europe as a 'dynamic knowledge based economy'. The Council of Ministers committed to policies through which innovation, including development of ICT use, would break the EU's poor productivity performance compared to the US. A set of policy indicators was created to monitor progress.

Indicators for innovation in the EU's Structural Indicators include ICT investment and e-commerce use. ICT investment is measured by private sector sources, as national accounts estimates were not considered reliable. Consistent measures of use of electronic transactions use official surveys, on business use of computers, networks, internet and e-commerce to more complex questions on e-business processes, barriers and benefits of use, employee engagement, security, and skills.

Eurostat developed a range of indicators

specifically to monitor the 'e-Europe' programme from 2001 to 2005. Most were designed to measure the 'e-readiness' and 'use' stages of ICT development in households, government and business. Attention focused on individual / household measures of IT and internet use, on education and government services, with the largest section on business metrics.

ICT macro impact analysis

Early assessments of the economic impact of ICT on an international scale were largely based on macro economic analysis. An OECD review as late as 2003 concluded that 'evidence on the role of ICT investment is primarily available at the macroeconomic level'. This was aided by the 1993 decision to treat software investment as an asset in the System of National Accounts (SNA), which allowed analysis of the role of ICT investment (hardware and software) in growth accounting across the majority of developed economies.

Comparisons by OECD (OECD 2004) show, for the 1990s, how ICT investment contributed to overall growth across 15 member states, and split out the productivity effects for ICT producing industries, and for ICT using manufacturing and for ICT using services. The study highlights strong ICT investment in service industries – but much early impact analysis focused on manufacturing for measurement reasons. While it showed ICT investment contributing to growth and productivity, differences between countries were striking.

Strong multi-factor productivity growth in the US associated in this study with ICT use was interpreted as a result of the US' early lead in adoption of ICTs, overcoming adjustment costs and benefiting from competitive markets in which entry, exit and adjustment were easier. For a number of EU economies the contribution of ICT use to productivity growth did not grow.

A major difficulty in early assessments of ICT impacts for policymakers was that estimates of ICT investment in macro-economic data were not consistent across countries. Macro estimates through the late 1990s were also complicated by the 'dot com boom' which changed market conditions to such an extent that productivity gains were attributed to this rather than to structural or technological change. Productivity gains could be seen in the (fast growing) ICT producing industries, but benefits for ICT users were less clear.

Industry analysis is the focus of more recent work in the US. Brynjolfsson and colleagues, in 'Scale without Mass' (Brynjolfsson et al, 2006) looked at the

relationships between industry ICT intensity, and the characteristics of competition across US industries and concluded that:

- greater ICT use speeds up experimentation and diffusion of new, successful, business models by 'winning' firms, and is associated with more market share change in industries
- the effect of this process is to encourage increasing supply concentration, as successful firms supported by ICT grow, and others lose market share or exit the market.

This US analysis draws no specific empirical conclusions on productivity or on economic performance associated with technology. However the 'KLEMS' initiative starting in 2004 and funded by the EU was designed to take industry level National Accounts data and develop growth accounting models by industry taking account of capital (K), labour (L), energy (E), materials (M) and services (S). Among inputs identified as part of this programme is ICT capital (as part of K).

KLEMS results show significant differences across countries, and between the EU and the US, in the growth accounting impact of ICT investment. The broad picture demonstrates that: differential gains in productivity in more intensive ICT using industries have been an important part of the US productivity advantage over the decade to 2004, and that distribution and business / financial services show the most substantial gains.

The data shows these differences largely in terms of TFP (i.e. unexplained) growth. This suggests that National Accounts data on ICT investment may not be sufficiently well developed to act as a good explanatory variable – essentially the same conclusion as that reached by the compilers of the EU structural indicators.

ICT investment measurement is explored in work by the UK Office for National Statistics (Chamberlin et al 2006). As the proportion of IT investment is increasingly weighted towards software rather than hardware, and the proportion of software created outside the IT industry grows, official IT investment estimates require more assumptions

An additional factor which affects the pattern of ICT investment, revealed by this project, is the growing importance of IT service outsourcing. Finnish analysis, using survey questions on outsourcing of IT services, shows that productivity incentives for outsourcing IT are strongly positive. This may influence the distribution of IT

investment across industries, and make it unrepresentative of the pattern of ICT use, and so of the impact of ICT on business operations. Direct measures of ICT use may be a better way of assessing this.

Firm level impact analysis

By 2002/3 extensive experience had been gained to build confidence in firm level responses to ICT use surveys. Researchers in the US, France, Nordic countries and the UK started linking these surveys to business output and employment data to test whether productivity differences between firms could be linked to use of information technology or communications.

Use of firm level data to study the relationship between ICT and firm performance spread across a number of countries as consistent surveys became available. Early studies drew on official and private data sources. Examples of the different approaches adopted include:

- inclusion of ICT capital stock at firm level as a separately identified capital input in total factor productivity (TFP) analysis (Brynjolfsson & Hitt, 2001; Hempell, 2002)
- inclusion of ICT capital alongside other measures of ICT use, such as internet use or number of employees using ICT (Maliranta & Rouvinen, 2003)
- inclusion of ICT capital stock with measures of innovation or organisation change (van Leeuwen & van der Wiel 2003)
- inclusion of measures of computer network use (i.e. behaviour) as an additional determinant of TFP in a productivity regression equation (e.g. Atrostic and Nguyen, 2002).

In 2004 OECD published a portfolio of firm level studies, some comparing ICT impact in different countries, and using similar analytical methods, across 13 countries. For some countries comparisons could only be drawn for manufacturing, and in some (e.g. Germany) links could only be made outside the statistical system. EU member states dominated this first major review which also included Japan, the US, Korea, Australia and Canada.

In 2005 the UK ONS published a set of studies (Clayton et al 2005), which took account of:

- firm level data on IT capital stock, both hardware and software
- firm level measures of ICT use by employees, of computers and the internet

- firm level use of e-commerce for both procurement and selling
- firm level use of communications networks.

These studies showed that while IT investment is associated with increased firm productivity, impacts depend on contingent factors, including whether or not the firm is a multinational, whether it has a US home base, its age, and whether it is a manufacturing or service operation. They also showed that:

- greater ICT use by employees has an additional association with higher productivity, over and above the effect of IT investment
- organisational differences associated with US ownership influence productivity returns associated with investment in IT hardware for the UK affiliates of US firms
- returns to IT investment are also influenced positively by firm level possession of skills (measured by employees with degrees) and by investment in fixed capital.

This work was followed by further analysis of investment in high speed internet by firms and the effects of broadband use on productivity (Farooqui S. and Sadun R. 2006). This suggested – using a short time series of firm data – that employee use of fast internet was a useful productivity indicator.

Each of these studies has shown that ICT investment and use by firms has an impact of productivity levels or growth which depends on the sector in which a firm operates, so is business model specific, and which depends on other inputs, related to skills, organisation, or innovation. It is therefore worth considering the work which has been done on ‘complementary investment’ to ICT.

Understanding ‘complementary investment’

For US, UK, and several other economies, new analysis has recast National Accounts to take account of ‘intangible investment’, including software, R&D, expenditure on ‘non technical’ innovation including design, training, organisational change and branding (Hao, Manole and van Ark, 2008). Data is still developing (see EU COINVEST work at www.coinvest.org.uk), but the emerging picture shows that:

- intangible investment is a rising part of activity by firms, and that software

and associated business process/organisation investment have been the fastest growing elements

- intangible investment now rivals investment in fixed assets for the US and the UK
- much of intangible investment is ‘capitalised labour’ and so shows a different picture of relative returns to capital and labour from that in official economic statistics.

To interpret this macro framework in firm level or industry level analysis requires us to treat ICT as one agent of innovation and growth. Applying it at firm or industry level needs links between surveys on innovation, R&D, skills, organisation / e-business, other ‘intangibles’ and business productivity and growth. Our project has set out to do this in countries where data are linkable to the ICT use survey, and to firm output data. A majority of NSIs provide evidence on at least one of these themes.

Approach to analysis

We have been able to build on earlier studies of surveys, undertaken by the EU and others, on the types of indicators which are most valuable in developing measures of ‘impact’ for ICTs. The NESIS project had as one of its key recommendations that ‘more intensity indicators should be developed on the way from readiness to impact indicators’ (Airaksinen A. 2004). The recommendation recognises that intensity of ICT use in firms indicates how far they have changed processes and organisation.

Eurostat’s survey includes questions on the degree to which employees are engaged with ICT, but results for most countries on consistent questions about how far ICT is embedded in business processes and transactions was not available until 2008. Our firm and industry level analyses have used earlier intensity measures as the best starting point, looking for relationships between usage and productivity or growth.

Firm level analysis of the drivers of productivity and growth is the foundation of our economic understanding of firm behaviour and performance, and of the influence of market conditions and technology change on competitive behaviour. Insights gained from firm level analysis benefit from much more exhaustive use of data. The range of experience and performance captured in firm level data is much richer, and contains an additional order of magnitude in degrees of freedom, compared to industry level data. Firm level analysis is where we should first pick up signs of impact from use of a technology,

by comparing successful and unsuccessful firms. However, firm level analysis, of productivity or growth performance of individual units, may not pick up the ‘macro’ effects of resource reallocation as successful firms grow, and unsuccessful firms shrink or exit.

Methods and Data Sources

Overview

The project methodology is illustrated in **Figure 1**. It starts with metadata review, to establish what data are held in each National Statistical Institute (NSI) and to identify core variables. Project data are described in detail in the full report, but the variables include:

- variables on ICT-usage by firms, drawn from the harmonised e-Commerce survey
- variables which describe economic characteristics and performance of firms, drawn largely from countries’ structural business surveys (or Production Surveys)
- information on the population of firms in each project country, from Business Registers.

Firm-level data drawn from all three sources are assembled and processed to create a set of output datasets in each project country. This takes place in a secure environment, reflecting the confidential nature of the firm-level data and is designed to generate non-disclosive statistics, across one or more dimensions such as industry group, size class, year etc.

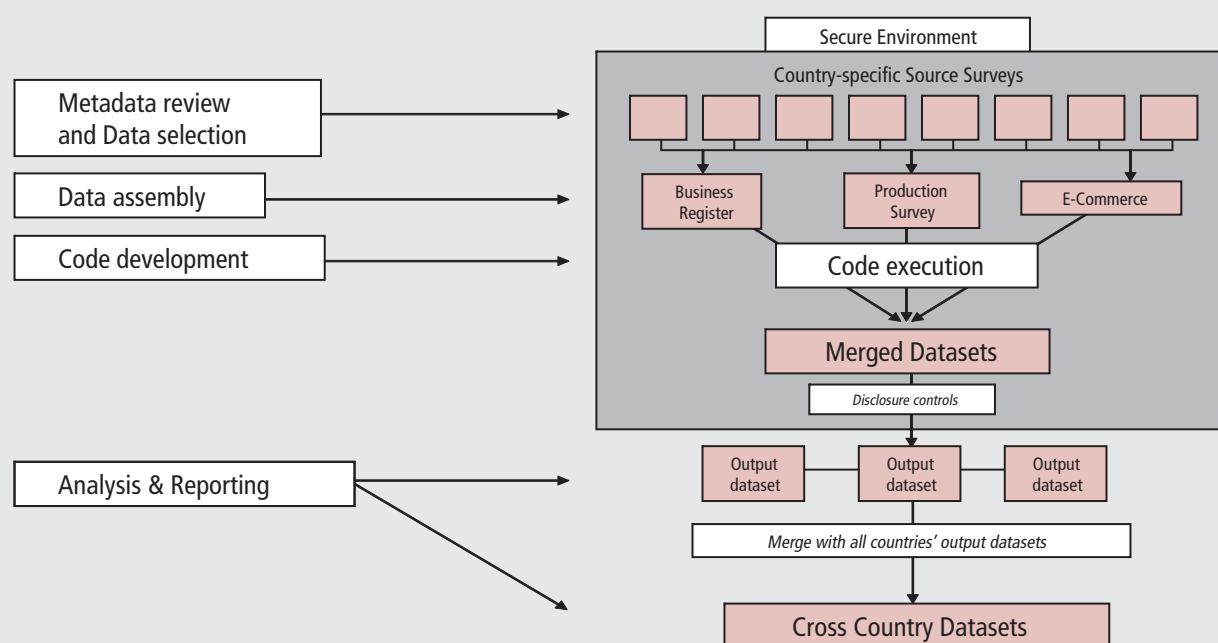
Datasets are checked for disclosure before being released from their secure NSI environments and compiled into multi-country datasets. Under the legal framework in force in 2008, access to the multi-country datasets is confined to a subset of project participants.

Selecting and assembling data

The choice of variables and detailed scope of the analysis has been an iterative process, informed by experience of project members, our metadata survey, the development of the analytical code and investigation of preliminary results, disclosure issues, and other factors. Some examples of issues arising from the metadata phase are as follows:

- ICT investment and capital stocks are highly relevant to analysis of ICT impacts; only two members have firm level ICT investment data, (UK and

Figure 1
Overview of Project Methodology



Source: Office for National Statistics

Netherlands), and they undertook a 'lead country' analysis on this.

- Fast internet capacity and share of broadband enabled workers were added as data showed near saturation of PC-enabled workers; UK research on fast-internet usage also was significant.
- Firm-level data on labour skills, such as share of firm's employees with post-secondary education, exists in only a few countries via survey or administrative data. Wages / employee were used as a proxy for skills in analysis across the wider project group.
- ICT business integration questions from the e-Commerce questionnaire prior to 2007, are included in analysis which has been run by a 'lead' group of 6 project countries.
- The e-Commerce survey is harmonised across countries, but differences exist in implementation. Translation of the model questionnaire can lead to differences in wording of questions; there are differences in coverage frequency and in sampling methodology.

Business registers provide a reference framework for re-weighting of sample variables, as a business register covers the whole population of firms, and all business registers carry basic information such as firm employment. The project design uses business registers as sources of additional information on firm characteristics, such as age, whether the firm is owned by a

multinational, and whether the firm is an exporter. In some countries registers do not contain all these data, and it needs to be added.

NSIs do not hold raw firm-level data in a format that can be addressed directly by the analytical code for this project. A central feature of the project is that *identical* code is run in each NSI. Investment in metadata and code methods has been required to achieve this as coverage and scope of available data varies across project countries.

Although the analytical code is robust to missing variables, certain features of the input data are essential for the code to function properly. These include unique identifiers across all datasets, and consistent assignments to industry classifications

Issues that have arisen in preparing data include:

- Inconsistent variable naming in different vintages of survey data where question numbers change over time. The project code only allows a one-to-one mapping of names, and NSIs must ensure that variables are named consistently.
- Missing variables in some survey years, for example, where new questions have been added to the e-Commerce survey. Users must ensure that all variables that are assigned to project variables are found in every annual input dataset.
- Firm level data in Germany are collected and held at regional (Länder) level. These data have been integrated

into synthetic national firm-level datasets for this project.

Variables used in the project, and data availability across countries are shown in **Annex Table A**.

Code development and operation

Marrying identical code with varying national data availability is achieved by building dynamic flexibility into the code. Apart from a small number of core variables without which analysis cannot proceed, the code is designed to allow flexibility in to data availability. In running the code, each NSI assigns country-specific variable names to each variable, entering a null value if the project variable does not exist in their input datasets. The code then builds dynamic lists of variables that exist.

The outputs of the core project code are:

- A set of industry / country indicators built with identical aggregation methods.
- A set of results from identical regressions on matched firm-level data in each project country.

Once input data have been assembled and checked, NSIs populate the program run file with local parameters to match project variables with local names, and specify which productivity metrics to use:

- LPQ – log of real gross output per employee. Nominal values are deflated

using EU-KLEMS industry level deflators. Since all regressions include time dummies, regression results do not depend on choice of deflator.

- LPV – log of real value-added per employee.
- TFP – a log index of real value added divided by weighted inputs of labour and capital, with weights derived from average factor shares of labour and capital in each industry.
- MFP – a log index of real gross output divided by weighted inputs of labour, intermediate inputs and capital, with weights derived from factor shares of labour, intermediate inputs and capital.

NSIs use as many productivity measures as possible given data available. If source data includes gross output, value added, intermediate inputs and capital stocks, the code generates all four metrics.

Disclosure

The output of the project analysis in each NSI is a set of output files containing statistics derived from the input firm-level data and aggregated over industries, size classes and other categories. The statistics include means and totals, standard deviations, correlations and regression results. Output datasets also include the number of firms represented by each cell. In many cases the number of firms is measured in hundreds or thousands but in some case the number may be quite small.

The process of disclosure control varies across project countries, depending on legal frameworks and local practice. Some countries check outputs and suppress certain results before releasing the outputs to the project co-ordinator. In practice, the number of results suppressed is fairly small.

Once country datasets are approved for release, they are combined with the outputs from other countries and held securely within the project. As some countries reserved their rights to test for disclosure until the project reporting stage, access to the combined datasets is restricted.

Firm and industry level analytical methods

The project has co-ordinated firm-level analysis of productivity and core ICT metrics, building on previous work and exploiting our comparable linked firm-level datasets. Our interest in comparability of firm level relationships between ICT-usage and productivity across different countries, even if the relationships are not stable across countries or over time. The rationale for this line of work is pragmatic

and opportunistic, but built round standard equations of the form

$$tfp_z = b_0 + b_1K + b_2ICT + b_3LNW + dummies$$

where:

tfp_z	total factor productivity for firm z
K	capital stock for firm z
ICT	indicator of ICT usage for firm z
LNW	implied firm-level wage taken from firm employment and wage bill
$dummies$	industry, size-class, year and other dummies such as multinational status.

‘Distributed Micro Data’ (DMD) analysis is the process of compiling conceptually identical indicators at a relatively disaggregated industry level across multiple countries and time periods. Bartelsman and Barnes (2001) provide two arguments for this approach:

- The DMD approach provides improved timeliness and comparability. It is more timely than, say, waiting for Eurostat to harmonise statistics at source, and more comparable than, say, EU-KLEMS data derived from disaggregation of higher level national statistics.
- The DMD approach involves confronting policy questions with data available, and making successive choices regarding the analyses done. This is a subtle but important point. Given limits on data that can be collected, the DMD approach allows an iterative process between policy questions and data realities.

The iterative process is clearly reflected in this project, first in refinement of the scope of the core analysis and analytical sub-themes, and secondly in the development of the set of data to be collected. For example, fast internet usage was not originally included, but was added as the project evolved. Other variables initially viewed as important – such as firm profitability, international engagement and ICT investment – have either been discarded or confined to sub-themes.

The DMD approach is attractive for international policy analysis. In any single country, the impact of a policy event cannot be measured precisely because there is, by definition, only one observation of that policy event. Cross country datasets can help by providing more observations of policy events. In addition, the DMD approach allows summary statistics from

the underlying firm-level data to be captured within the country / industry datasets. For example, the project has generated means data for fast internet usage and productivity metrics by industry, country and year which can be expressed as a scatter plot. Behind each observation in the plot, the DMD dataset contains a suite of variables describing the properties of the firm-level data, such as the variance of the firm-level data, and quartile correlations between each variable and other variables of interest such as wage levels, size of firm etc. This integration of firm-level properties with the richness of comparable data by industry, country and time is a key feature of the approach.

Cross country analysis involves both simple equations of the form shown below, and also two stage estimation systems incorporating selection equations for ICT use.

$$v_{ijt} = a_0 + a_1ICT + a_2k^{IT} + a_3k^N + a_4hrs + dummies$$

where:

v_{ijt}	real value added per employee, in industry i, country j, year t
ICT	indicator of ICT usage for industry i, country j, year t from E-Commerce survey,
k^{IT}, k^N, hrs	IT capital stocks, non-IT capital stocks and hours worked (taken from EU-KLEMS)
$dummies$	2 of industry, country and time dummies.

Summary of Results

Where they come from

Project results come from three main types of analytical work:

- an encouraging range of firm level analysis using common metrics and common analytical code with similar data sources, either carried out by local researchers in countries direct from local datasets, or using the data created for the project, plus centrally written code, to run identical regression analysis, for all countries except Denmark and Slovenia
- groups of countries collaborating on micro data analysis for topics where all have similar firm level data which enable a common analytical framework to be used and compared (eg Netherlands and UK on ICT investment, Sweden, France and Italy on offshoring, Nordic countries on skills, Sweden, Netherlands and UK on

innovation, work from Finland on ICT outsourcing)

- industry / country level analysis of ICT impacts, using the large dataset produced by the distributed microdata (DMD) analysis system, from which we have a highly comparable indicators, with the ability to draw reliable comparisons between industries / countries and over time.

Analysis of the properties of linked datasets in the project, using methodologies developed in earlier studies, shows that sample re-weighting, using metadata and methods included in the project, is capable of dealing with most issues of data 'representativeness'. However this breaks down where overlap between datasets is poor, and we have not advocated modelling in such cases. Linking datasets in many countries, with sampling designs currently in use, leaves the overlap between ICT surveys and firm performance surveys biased towards larger firms. This affects both firm level and the DMD analyses. For impact conclusions to reflect small firms, sampling strategies need to change.

Firm level – all country results

All 13 countries in the study have produced regression and / or correlation results from firm level data, either individually or using the DMD methodology developed in the project – and in most cases both.

The core ICT use metrics (computer use, e-sales, e-purchases, fast internet enabled or internet using employees) show reasonably consistent, positive, labour productivity effects at firm level across manufacturing in all countries, beyond the six covered by earlier studies. This suggests that productivity impacts related to use of ICT in manufacturing are now well established and transferable across countries.

The same core ICT use metrics have much more varied relationships with labour productivity across services at firm level in different countries; for the UK, France, Nordic countries and Netherlands, positive correlations seen in prior studies are confirmed. In other countries productivity effects are insignificant or even, in one or two cases, negative. Given the importance of services in all the EU economies this is an important difference.

Some correlation is apparent between the countries (Nordic states, Netherlands, UK, France) where ICT use by firms is relatively more intensive and communications infrastructure is strong and the strength of the statistical relationship between ICT use and firm level productivity in services.

These differences in impact for services could be explained by a number of factors, including:

- differences in competitive conditions in national services markets,
- productivity gains requiring 'critical mass' in networks and ICT use, and
- measurement difficulties in services which are better tackled in some countries than others.

The common analysis shows limited evidence for productivity impact of e-commerce as a variable on its own, and clear positive relationships between productivity and wages (used later in the analysis programme as an imperfect indicator of skills).

Firm level – lead country results

ICT capital and ICT use

For Netherlands and UK, data are available on firm level IT capital - hardware and software for the UK, hardware only for Netherlands. This makes it possible to test the impact of ICT use over and above IT capital services in productivity models. The results show impacts differentiated by firm type:

- in manufacturing, intensity of e-procurement shows the strongest link to productivity
- in distribution services the largest impact on productivity is related to the intensity of use of e-commerce for selling
- in other, mainly business and financial, service industries the strongest relationship with productivity comes via the proportion of workers with access to high speed internet
- across all three industry types, IT capital (including software) is positively related to productivity levels in the UK, and with a much larger impact in differentiated services
- for all three types in Netherlands analysis IT capital (excluding software) is insignificant.

These differences suggest limits to an analytical approach which treats ICT as a 'general purpose technology'. Impacts in different industries suggest different processes at work, through different effects of information technology (IT) and communications technology (CT).

ICT and skills

Three countries, Finland, Sweden and

Norway, have 'real skills' data available at firm level, derived by linking employer and employee records. In all three there are strong, significant and simultaneous correlations between labour productivity and the proportion of employees with ICT skills, as well as those with other higher education levels. For both types of skill measures the size of productivity impact make a strong case for wider collection of this type of data across other countries.

In Finland and Sweden similarly strong relationships exist between Total Factor Productivity (TFP) and employee skills (both IT and non-IT), and these relationships are significant alongside the 'fast internet enabled employees' measure mentioned above. For the Norwegian analysis fast internet enabled employees appear insignificant in regression analysis together with non-ICT skills, but, paradoxically, ICT skills remain highly significant. General skills appear to have greater impact in TFP analysis, but ICT skills show up as more significant in labour productivity analysis.

In all three countries it is possible to test complementarity of skills and ICT intensity by adding an interaction term (percentage skilled employees x percentage fast internet enabled employees) and only in Sweden does this show up as a significant contributor.

In all three countries wages have a stronger correlation with productivity than do real measures of skills (partly an arithmetic effect as employee compensation is part of value added). The analysis shows that wages have limitations as a direct proxy for skills in productivity analysis, without risk of understating other impacts. However, in analyses where skills data are not available, a proxy based on wages may be useful as a check against overstating ICT impacts due to correlation between ICT use and skills.

ICT and business processes / organisation

Analysis led by UK, Netherlands and Sweden has used measures of ICT business process integration to test methods of combining existing metrics in the Eurostat model ICT use survey in ways which relate effectively to productivity impact.

Swedish analysis, based on a hierarchical specification of business process sophistication, starting with any form of external link working up to use of e-commerce, internet selling and links with suppliers / customers, and also looking at specific types of links, shows that

- the range of indicators linked to productivity has grown through to 2004, and
- evidence in support of positive productivity impacts is strengthening.

However the form of correlation, and electronic links associated with higher productivity, change from year to year.

UK results suggest that the productivity effects of linkages depend on the business type, with manufacturing firms showing stronger correlation coefficients between TFP and the incidence of electronic links to suppliers (associated with supply chain management) and service firms showing stronger productivity effects associated with links to customers.

Regression analysis using firm-level data from UK, Netherlands, Sweden, France, Czech Republic, and Austria suggests that productivity relationships are 'better behaved' for manufacturing, while elsewhere there are signs of positive relationships, but that a hierarchical model is not the best approach. Regressions also show that external e-business links have more explanatory power than process links within firms – suggesting that market dynamics are more important than efficiency gains via process coordination. The new ICT use survey (2007/8) provides new data to explore this.

Data for Finland, which alone among EU countries measures organisational issues, IT mobility and IT services outsourcing, shows significant productivity gains associated with:

- mobile access to ICT by workers (suggesting additional gains from flexible work patterns)
- use of outsourced IT services (suggesting additional gains from specialisation).

ICT and innovation

Despite limits to survey overlap, some progress has been made by Sweden, Netherlands and the UK on the role of ICT in innovation, and the mechanism through which much of the productivity gain associated with ICT may be achieved.

UK analysis linking ICT use surveys to questions in the Community Innovation Survey on sources of innovation shows a strong link between use of high speed internet connections by employees within firms (in the ICT use survey) and the ability to innovate using ideas from outside the firm, and outside the customer / supplier chain. This suggests a link between fast internet network use and ability of firms to acquire and manage knowledge in the

innovation process, to develop higher sales of new goods or services, or more use of new processes.

Evidence from Sweden and Netherlands shows that ICT use – reflected in the proportion of fast internet linked employees and levels of e-commerce – is related to the intensity of firms' new products and services sales. This may reflect network effects in knowledge management, in the effectiveness with which firms are able to convert knowledge into new products and services, and in the speed with which they are able to commercialise them. The impact of e-commerce in Netherlands analysis may show that benefits of e-commerce for innovation (which prior research has missed) is now visible.

Analysis across all participating countries using DMD shows that in industries which have relatively high levels of ICT use on the core metrics, there also tend to be higher absolute amounts of market share change (or 'churn'). This is consistent with the view that ICT intensive industries in Europe show the tendency seen in the US by Brynjolfsson et al, for successful firms to be better able, and quicker, to replicate market share winning innovations across production and distribution networks.

From Sweden and Netherlands there is initial evidence, despite the limits of overlap between production, ICT and innovation surveys, that productivity effects of ICT use are associated more strongly through the 'indirect innovation' effect (percent new products / services) than through ICT use measures directly. The Swedish analysis tests the relative strength of direct and indirect productivity effects and concludes that the ICT => innovation => productivity channel is significantly stronger than the direct ICT => productivity channel for the individual firm. The Swedish evidence is concentrated on larger firms due to sampling effects.

Evidence from Netherlands suggests that ICT use can substitute in productivity equations for the CIS process innovation indicator, indicating that ICT use may be a good proxy for process innovation. This provides statistical evidence for a position argued by researchers, that in service industries particularly ICT introduction is often the embodiment of process change.

As noted above, this analysis has stretched the statistical limits of overlap datasets – showing that the intersection sets of two surveys are often good enough for firm level analysis, but it is much more difficult to achieve significant analysis from matching three or more surveys. This has so far limited the ability of other NSIs to contribute to the ICT / innovation analysis.

Industry/country level results

Analysis across all 13 countries using National Accounts based treatment of productivity (developed by EU KLEMS) shows worthwhile improvement in explanatory power, when including ICT use indicators, constructed using our metadata to ensure comparability rather than 'official' ICT investment data. ICT metrics delivered by our project are more comparable both in source and in compilation.

High speed internet use by workers shows up in cross country regression analysis as a more powerful indicator related to productivity than e-commerce measures, and as the most effective ICT explanatory input for the period 2000/1 – 2004/5 over which most of our international data are available. This relationship (see **Figure 2** where each dot represents an industry, country, year observation on productivity and ICT-usage) is stronger at industry level than at firm level, due to reallocation effects within industries as successful firms grow. However industry analysis by country suggests that the impact of high speed internet use by employees is not uniform. It is positively correlated to productivity in those countries where ICT adoption is highest, but negatively related to labour productivity in Germany, Austria and Italy for 2001-2004. This is consistent with the national results obtained with firm level analysis, and suggests that returns depend on 'critical mass' network effects.

A more advanced approach to analysis is set out below, in a regression which looks simultaneously at adoption of ICT and its impact. In the two equations below, a) models the industry / country output effects associated with ICT use and other inputs, b) models the adoption of ICT use as a function of average skills (reflected by wage levels), the proportion of capital accounted for by ICT, the proportion of high skilled workers, and the 'churn' in firm output within each industry, represented by the difference between the upper and lower quartile firm growth rates.

$$a: v_{ijt} = a_0 + a_1 DSL\% + a_2 k^{IT} + a_3 k^N + a_4 hrs + dummies$$

$$b: DSL\%_{ijt} = b_0 + b_1 w_{-1} + b_2 Cap\%^{IT}_{-1} + b_3 HiSk_{-1} + b_4 Churn + dummies$$

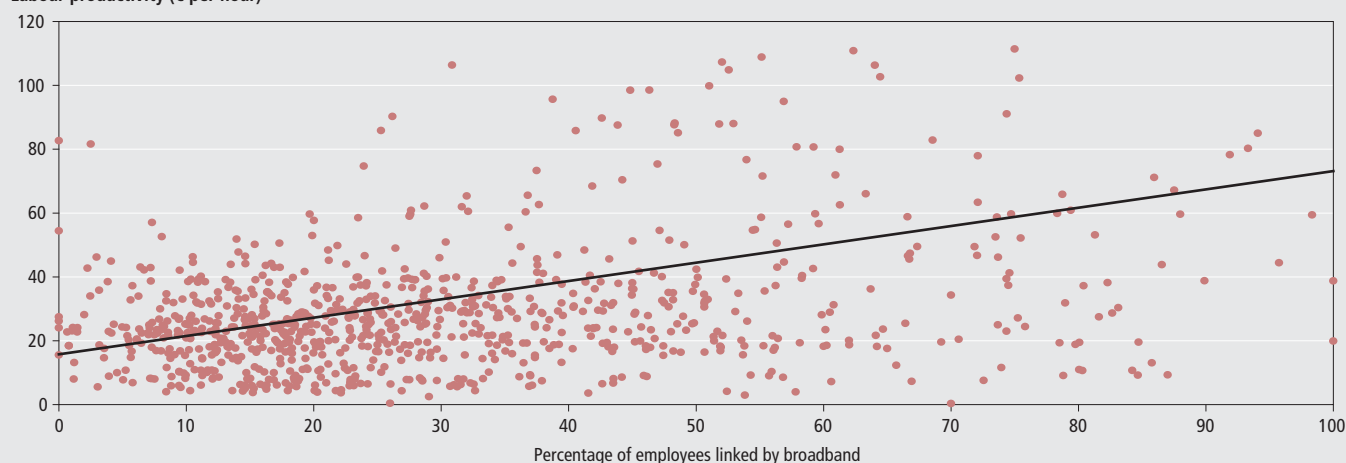
where

v	(log) real value added
k^{IT}	ICT capital service
k^N	Non-IT capital service
hrs	input hours
c, i, t	country, industry, time dummies

Figure 2

Productivity and broadband enabled employees by industry/country/year

Labour productivity (€ per hour)



Source: Office for National Statistics

w	Average wage
Cap^{IT}	ICT-capital as share of cap
$HiSkI$	High skilled worker share
$DSL\%$	Broadband enabled workers
$Churn$	Interquartile range of firm-level growth rate

This analysis takes account not only of the 'within firm' productivity effects on which firm level analysis focuses, but also of the competitive dynamics and reallocation of resources which takes place within industries due to differential growth, and to entry and exit. The analysis is able to combine indicators built using the metadata approach with measures available at industry level from National Accounts and labour market statistics including productivity, growth, and – for most countries – ICT capital.

The ICT indicators (except k^{IT}) are statistically significant in all specifications.

Results of ICT use adoption models using this dataset are consistent between countries / industries, and the adoption rate is usually strongly associated with worker skills (measured by wages). Our firm level productivity regression equations are robust to inclusion of wages as a proxy for skills.

Other, more advanced, analysis combining this work with OECD country measures of labour market flexibility suggests that more intensive ICT using industries make the fastest progress in catching up to the best practice 'productivity frontier' in economies where there is more labour flexibility.

Fit with other new work

The analysis in this project, and detailed in our full report shows that coordinated microdata analysis across countries makes

a valuable addition to our understanding of ICT adoption and its impact on economic performance. We have seen that:

- ICT use is related at firm level to performance in different ways in different industry types.
- In manufacturing the productivity effects seem well established; services show more variation.
- ICT use metrics are, in many cases, more powerful explainers of performance than investment.
- ICT returns are related to 'critical mass' network effects, and these evolve over time.
- ICT use affects, or is affected by, competitive dynamics at firm / industry level.

This last conclusion is entirely supportive of recent work in the US by Eric Brynjolfsson which shows, in a range of cases studies, how ICT and network use enables experimentation and process innovation in network intensive firms. This work shows how successful experimenters, especially in services, use network and ICT based

'enterprise architecture' to scale up their successes and achieve market advantage.

The churn effects, seen in the equations above, suggest that identical dynamic processes are under way in the EU data. Both are also consistent with the relationships seen earlier in the firm level results on ICT enabled processes, which show that customer links in services (through which Brynjolfsson's experimentation often occurs) are most strongly associated with improved performance.

Further work at Statistics Netherlands (van Leeuwen et al 2009) shows that ICT is one of a set of inputs which stimulates product, process and organisational innovation. These modes of innovation, in different combinations in different industries, are associated with productivity gains

The implication is that ICT and networks are bringing important changes in business models and in industry dynamics. The analytical approach we have developed in this project delivers a valuable way of understanding these changes, and is worth pursuing further.

Table 1

Regression results for the ICT adoption and impact models

Coefficient	Variable	DSL%		Internet%	
a1	ICT-indicator:	1.24	.90	1.20	1.05
a2	k^u	.35	.27	.34	.27
a3	k^{IT}	-.07	.05	-.08	.05
a4	hrs	.72	.68	.72	.68
b1	$w(-1)$	.24	.02	.30	.01
b2	Cap^{IT}	.31	.20	.32	.17
b3	$HiSkI$	.18	.38	.19	.33
b4	Churn	.30	.15	.28	.14
	dummies	c,t	i,t	c,t	i,t
	D.F.	659	646	649	646

Source: Office for National Statistics

Where next?

ONS and project partners are in discussion with Eurostat over scope and funding for the next stage of the project. For this, we envisage a broadening and deepening of the work in the first phase.

Broadening

Key priorities for the next stage are:

- to extend the number of countries taking part. So far Eurostat have interest from Austria, Bulgaria, Czech Republic, Germany, Denmark, Finland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Poland, Sweden, and UK. It would be helpful to add further member states to this group to secure comprehensive coverage
- to extend the length of panel data used in the first study and explore different analytical approaches to building panels of linked data to maximise information on firm dynamics
- to make full use of the 2007 e-Commerce survey which has common data across all countries on business process links, building on the indicative conclusions from the first project
- to extend the range of variables to include other measures of, and inputs to, innovation, following what we know from the first study and from the van Leeuwen / Polder work. This will require us to extend the DMD method to innovation surveys, skills measures, and perhaps to measures of organisation change, location, profitability etc.

One important development since the submission of our first project report and recommendations is that EU statistical regulations have been amended to make it easier to share non-disclosive data (on which the project method depends) between statistical offices and researchers. This should extend the range of data sources which can be used, and the number of countries able to take part.

Deepening

Key priorities on this dimension for the next stage are:

- to develop the firm-level analysis, using longer panels, to include testing and controlling for endogeneity
- to search for better evidence - across

more countries - of the differences in ICT impacts in different business types and models. The motivation for this is the hypothesis that ICT and networks transform business models in different ways, depending e.g. on the form of the value chain. It will help to have better analysis of this to construct measures of 'ICT impact'

- to examine what features of ICT make a difference in the economic downturn
- to investigate complementarities between ICT and intangible investments, especially in training and skills, R&D, organisational capital and other inputs to innovation.

We welcome input from all NSI's and potential partners in taking the next steps forward, in what we hope will be a significant step for the statistical system, and the integration of data describing technology and behaviour with economic statistics.

ACKNOWLEDGEMENTS

This project included over 30 researchers from CSO Ireland, Czech Statistical Office, INSEE, ISTAT, German Federal Statistics Office, UK Office for National Statistics, Statistics Austria, Statistics Denmark, Statistics Finland & The Research Institute of the Finnish Economy, Statistics Netherlands, Statistics Norway, Statistics Sweden, Vrije Universiteit Amsterdam, University of Ljubljana, Queen Mary University of London and London School of Economics.

We thank all who have supported and contributed to this project, especially Prof Eric Bartelsman of VUA and the Information Society team at Eurostat. Any errors are the responsibility of the authors.

The full study report (Eurostat 2008) was published in November 2008 by the European Commission on its website at <http://ec.europa.eu/eurostat/ict>, under the heading 'Methodology'.

CONTACT

✉ elmr@ons.gsi.gov.uk

REFERENCES

Airaksinen A.: *Impacts of ICT usage on business organisation and business processes* – Final report. NESIS work package 5.4 2004

Atrostic B K. and Nguyen S V.: *Computer Networks and US Manufacturing Plant*

Productivity: New Evidence from the CNUS Data. CES Working Paper 02-01, Center for Economic Studies 2002

Bartelsman E J. and Barnes M.: *Comparative Analysis of Firm-Level Data: A Low Marginal Cost. Approach* Paper for OECD Workshop on Firm-Level Statistics, 26-27 November 2001

Brynjolfsson E. McAfee A. Zhu F. and Sorell M.: *Scale without Mass: Business Process Replication and Industry Dynamics*. Harvard Business School Technology & Operations Mgt. Unit Research Paper No. 07-016. 2006

Chamberlin G. Chesson A. Clayton T. and Farooqui S.: *Survey-based measures of software investment in the UK*. Economic Trends, No. 627, February 2006

Clayton T. Farooqui S. Gales G. Leaver M. and Sadun R.: *IT investment, ICT Use and UK firm Productivity*. Office for National Statistics / London School of Economics. 2005

Eurostat: *Information Society; ICT impact assessment by linking data from different sources (Final Report)* August 2008

Farooqui S. and Sadun R.: *Broadband Availability, Use, and Impact on Returns to ICT in UK Firms*. OECD paper DSTI/ICCP/UIS 2006(9). 2006

Hao J., Manole V. and van Ark B.: *Intangible Capital and Growth - An International Comparison*, Economics Program Working Paper Series, EPWP #08 - 14, The Conference Board, New York, December 2008

Hempel T.: *Does Experience Matter? Productivity effects of ICT in the German service sector*. Discussion paper 02-43, Centre for European Economic Research, Mannheim. 2002

van Leeuwen G., Mohnen P., Polder M., Raymond W.: *Productivity Effects of Innovation Modes*, Statistics Netherlands paper for ASIGO conference, Nurnberg May 2009

van Leeuwen G., Van der Wiel H.: *ICT, Innovation and Productivity*. CAED Conference, London 2003.

Maliranta M. and Rouvinen P.: *Productivity Effects of ICT in Finnish Business*. Helsinki: ETLA, The Research Institute of the Finnish Economy, Discussion Papers, No. 852 2003

OECD : *The Economic Impact of ICT, measurement, evidence and implications*. 2004

Solow R M.: *We'd better watch out*. NY Times Book Review July 12th. 1987

ANNEX

Table A

Data available for the project by theme and country

	AUT	CZE	DNK	FIN	FRA	GBR	GER	IRE	ITA	NLD	NOR	SLO	SWE	TOT
Firm characteristics														
Employment on BR	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Sample Weight on PS	•	•				•	•		•	•			•	7
Sample Reweighting	•	•			•	•	•		•	•	•		•	9
Multinational flag on PS		•			•	•				•			•	5
Ownership flag on PS		•		•	•	•		•		•		•	•	8
High growth firms	•	•		•	•	•	•	•	•	•	•	•		11
Gazelles (age on PS)				•	•	•			•			•		5
Gross output on PS	•	•	•	•	•	•	•		•	•	•	•	•	12
Value added on PS	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Nominal materials on PS	•			•	•	•	•	•	•	•	•	•	•	10
Payroll (wage) on PS	•	•		•	•	•	•	•	•	•	•	•	•	12
Capital Stock on PS	•	•		•	•	•	•		•	•	•	•	•	11
Productivity Variables														
Productivity LPQ available	•	•	•	•	•	•	•		•	•	•		•	11
Productivity LPV available	•	•	•	•	•	•	•	•	•	•	•		•	12
Productivity MFP available	•		•	•	•	•	•		•	•			•	9
Productivity TFP available	•	•	•	•	•	•	•		•	•	•		•	11
ICT Key Variables														
PC	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Web	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Epurch	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Esales	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Inter	•	•	•	•	•	•	•	•	•	•	•	•	•	13
DSL	•	•	•	•	•	•	•	•	•	•	•	•	•	13
PCpct	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Epurchpct	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Esalespct	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Interpct	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Intrapct	•	•	•	•	•	•	•	•	•	•	•	•	•	13
DSLpct	•	•	•	•	•	•	•	•	•	•	•	•	•	13
ICT Other Variables														
Mobility				•										1
IT Outsourcing				•										1
IT Business Integration Links	•	•			•	•				•			•	6
Other firm-level data														
ICT investment						•				•				2
Trade flows					•				•				•	3
Human capital / Skills				•							•		•	3
Innovation						•				•			•	3

Source: Office for National Statistics

ARTICLE

Graeme Chamberlin
Office for National Statistics

Linda Yueh
University of Oxford

Recession and recovery in the OECD

SUMMARY

During the last year the global economy has experienced its most severe recession since the Great Depression. This article compares the UK experience with that of OECD member countries – a group of the major industrialised economies. While important economies such as Japan and Germany saw a larger fall in output, the depth of the UK recession was larger than the OECD average. Recent data shows the global economy beginning to emerge from recession, but the projections are for a weak and fragile recovery as households, businesses and governments continue to pay off debts and rebuild their balance sheets. In fact, the major economies could be susceptible to a further downturn resulting in a double-dip recession. The second part of this article looks at the factors underlying recent growth forecasts made by the OECD and the IMF.

Introduction

Gross Domestic Product (GDP) in the UK has now fallen for 5 successive quarters. The cumulative loss in output of 5.5 per cent makes this the most severe recession since records began.

Although the latest data shows that the pace of decline moderated in the second quarter of 2009, the number still disappointed for two reasons.

First, several of the business surveys had been more upbeat in April and May, pointing to a return to growth in these months. Some commentators, following these results, had even called the end of recession would be confirmed in the official Q2 data. Although the consensus was that this was premature, there had been a feeling that the downturn would have slowed further than it did. Data revisions though have done this slightly with quarter on quarter growth now showing a 0.6 per cent contraction compared to a preliminary estimate of a 0.8 per cent contraction.

Secondly, many of the major industrialised countries exited recession in the second quarter. Positive growth was recorded in Japan, Germany and France. And in the US, although output continued to fall, the quarterly contraction of 0.25 per cent was far more modest than in the UK. Therefore, official data pointed to a more prolonged fall in output in the UK.

The Organisation for Economic Cooperation and Development (OECD) is a group of 30 wealthy nations from around the world, including the North American Free Trade Association (NAFTA) and Japan,

although membership is biased towards Europe. The first focus of this article is to compare the experiences of the UK with other OECD countries in what has been the first truly global recession since the early 1980s.

However, to a large extent the focus has now moved on. Even in countries where growth is yet to return, such as the UK, attention is turning to the speed and strength of the recovery. Although independent forecasts expect the UK to resume growing in the third quarter, general opinion is that the recovery will be fragile. And should the economy be subject to a further shock or loss of confidence then a double-dip recession cannot be ruled out.

An escape from recession in the second half of 2009 followed by weak growth in 2010 is a general pattern in the growth forecasts of most OECD countries. It is a reflection that many sectors of the economy (households, firms, financial sector and government) are still de-leveraging – that is they are running down their debts and trying to rebuild their balance sheets. While this continues it is unlikely there will be a strong pick up in either consumer spending or firm investment. Rapidly growing public sector debt has also limited the room for further fiscal stimulus. Most countries are now talking about fiscal restraint rather than expansion.

Monetary policy has been loosened considerably. Interest rates have been cut to almost zero, and being unable to lower rates any further, central banks have undertaken programmes of quantitative easing – a technical term for direct cash injections

into the banking system. For those who can obtain it credit is cheap, but the credit system is still impaired. Banks are still unwinding their losses from toxic assets. And while they do so a cautious approach to lending will be adopted in order to protect balance sheets.

As economies 'technically' move out of recession, attention will turn to the labour market. Due to significant costs in adjusting the workforce (hiring and firing costs), it is usual for unemployment to lag output movements, so it is expected that unemployment will keep rising, for several quarters at least, after output passes a turning point. It could well be a jobless recovery in 2010 if firms are reluctant to start hiring again until they are confident a sustained improvement in business conditions. Naturally the depressed jobs market will feed back into demand and dampen growth.

These factors have been reflected in the economic outlooks of both the OECD and the International Monetary Fund (IMF). Therefore, the second focus of this article is to look ahead as the global economy starts picking up – identifying some of the issues behind the projections. There are a number of important issues and developments in the global economy that are important to the UK, not covered in this article, but these will be picked up in two future ELMR articles.

This article, by focussing on the OECD, pays little attention to the growing impact of emerging market economies, China and India in particular. The latest global financial crisis has led many to believe that the US consumer cannot and will not continue to be the sole engine of global growth, a role they will now share with the emerging economies of the Far East. Over reliance on the US consumer was seen as one the causes of the large global imbalances that built up over the preceding decade, and were ultimately the source of global financial crisis as surpluses from oil exporting and emerging market countries flowed into western financial markets. Therefore one article will look at the impact of these growing imbalances and the associated credit boom in the UK during the period of 'The Great Moderation'. A second article will look at the changing patterns of global growth, particularly the effect of emerging Asia on the UK economy.

Tracking the recession in the OECD

Recession trackers, which compare the path of the UK economy in the current with previous recessions, have been widely used to provide a context relative to previous experiences of severe downturns such as the recessions in the early 1980s and early 1990s.

The same tool can be used to compare the UK recession with that elsewhere among the major industrialised countries making up the membership of the OECD.

Figure 1 plots the path of the UK recession relative to the US, Japan and the Euro Area. The tracker works by creating an output index equal to 100 in Q1 2008, which then subsequently reflects the quarter on quarter GDP growth in each country. This means that the recession in each country is monitored from the same starting point and it is easy to see the cumulative output loss in each case.

The UK recession has generally followed the same pattern of the Euro Area. Between Q1 2008 and Q1 2009 output fell by about 4.9 per cent. However, while GDP in the UK fell by a further 0.6 per cent in Q2 2009, only a 0.1 per cent fall was recorded in the Euro Area as a number of major economies moved out of recession. Given the significant trade links between the UK and the Euro Area it is not surprising that experiences in the recession have been similar. Cumulative output losses in the US have been milder with output dropping by a total 3.5 per cent between Q1 2008 and Q2 2009. Japan though has suffered more pain. Output shrunk by 8.4 per cent in the four quarters leading up to Q1 2009, but there was a positive rebound of 0.9 per cent in Q2 2009.

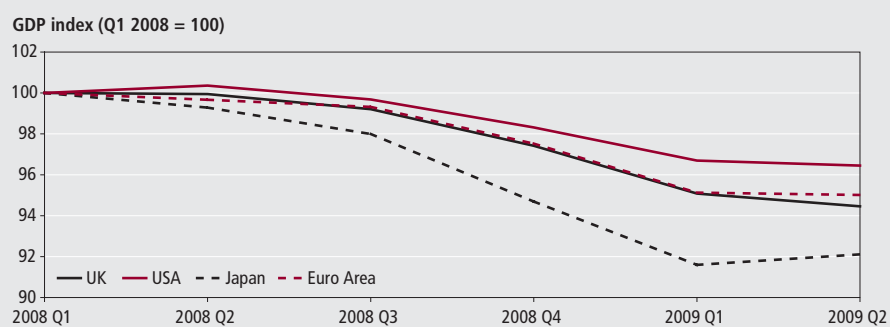
Figure 2 is a similar tracker but compares the UK to the major economies in the Euro zone. Again the UK experience appears to be fairly 'middle of the road', experiencing a larger fall in output than France and Spain, but doing relatively better than Italy and Germany. Both the French and German economies exited recession in Q2 2009 as the same growth of 0.3 per cent was recorded.

The first column in **Table 1** records, in order of size, the cumulative loss of output in each of the 30 OECD member countries during the recession. For those that exited recession in the second quarter of 2009 the output loss is measured between Q1 2008 and Q1 2009. Those economies marked with a * were still contracting right up to the end of the sample period, and here cumulative output losses were measured between Q1 2008 and Q2 2009.

As Table 1 shows, the largest output losses have been recorded in the more emergent economies of Turkey and Mexico. The Mexican economy has also suffered a jolt from the outbreak of swine flu, compounding the effect of the global credit crunch. Relatively large output losses were experienced in Ireland and Iceland – both small countries with a high exposure to losses in the banking sector.

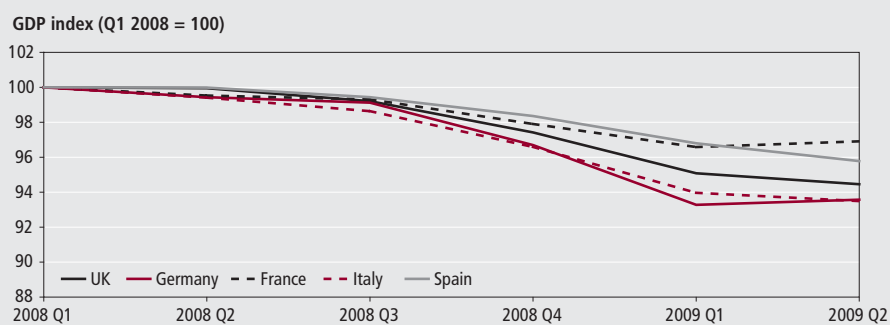
Countries that have performed relatively

Figure 1
Tracking the recession in the UK, US, Japan and Euro Area



Source: OECD Statbase

Figure 2
Tracking the recession in the UK, Germany, France, Italy and Spain



Source: OECD Statbase

Table 1
Output growth in the OECD

		Per cent	
Cumulative output losses in the recession Q1 2008–		Cumulative output gains Q1 1998 to Q1 2008	
Turkey	–13.92	Slovak Republic	62.79
Mexico*	–9.43	Luxembourg	62.73
Finland*	–8.96	Iceland	62.63
Iceland*	–8.96	Turkey	53.15
Ireland	–8.40	Poland	50.91
Japan	–8.40	Hungary	46.68
Hungary*	–7.50	Czech Republic	45.64
Germany	–6.72	Spain	43.35
Italy*	–6.51	Australia	40.75
Sweden	–6.47	Finland	40.36
Slovak Republic	–5.71	New Zealand	39.63
United Kingdom*	–5.54	Sweden	36.44
Luxembourg	–5.44	Canada	35.06
OECD – Europe	–5.14	NAFTA	32.83
Netherlands*	–5.06	United States	32.30
European Union*	–5.00	United Kingdom	31.94
Euro Area*	–4.99	OECD – Total	30.23
G7*	–4.78	Netherlands	29.04
OECD – Total	–4.70	OECD – Europe	28.90
Czech Republic	–4.45	Austria	28.88
Korea	–4.32	European Union	27.34
Austria*	–4.28	G7	26.23
Denmark	–4.26	Belgium	25.01
Spain*	–4.22	France	24.75
NAFTA*	–4.05	Euro Area	24.56
Portugal	–3.96	Switzerland	23.15
United States*	–3.55	Norway	22.91
France	–3.42	Portugal	19.46
Belgium*	–3.35	Denmark	18.37
Canada*	–3.15	Germany	17.18
New Zealand	–2.72	Japan	15.87
Norway*	–1.95	Italy	14.63
Switzerland*	–1.89	Greece	NA
Greece	0.31	Ireland	NA
Australia	0.34	Korea	NA
Poland	1.71	Mexico	NA

Note:

* See main text.

Source: OECD Statbase

well, such as Poland, Greece, Australia, Switzerland and Norway, all have the common trait of being late entrants into recession. In fact the majority of these countries recorded respectable growth in 2008, and it is only latterly in 2009 that output has contracted. Norway and Australia are more unique among the OECD member states in being significant exporters of raw materials. The boom in global commodity prices in 2008 certainly helped these nations avoid a major downturn.

The UK is above average in terms of the severity of the recession it has faced, and output was still falling in the second quarter. Since the first quarter of 2008 total output has fallen by more than the Euro Area, the US, G7 and the OECD average. However, it is also notably that several major economies have performed worse – namely Japan, Germany and Italy.

Japan and Germany both have a large industrial base, and because a relatively high share of manufacturing output is traded internationally, this industry has been

adversely affected by the synchronised fall into recession of the major economies and large slowdown in world trade. Recessions in the manufacturing sector also tend to be more severe because of the rapid disposal of inventories as firms lower expected future production. This is referred to as the ‘stocks cycle’ and can amplify the downturn in an economy. On the upside, recoveries tend to be sharper as well due to restocking. It is likely that an inventory bounce was a significant factor in these two economies returning to positive growth in the latest quarter.

The second column in Table 1 attempts to put these recent output losses in a longer term perspective. For most of the decade preceding the recession the global economy saw a period of rapid growth and unprecedented stability. That is not to say there weren't some sizeable shocks to economic activity – there was the Asian financial crisis, the bursting of the dot com bubble and the terrorist attacks of September 11th – but despite these output and inflation volatility fell to unprecedented levels. The

entire period has been widely referred to as ‘The Great Moderation’.

Even though there was a brief period of global recession in 2001–2002, and a soft patch in growth in late 2005, the UK managed to avoid a downturn altogether. Up until the second quarter of 2008 sixty-four successive quarters of positive growth were recorded – the longest peacetime expansion on record. Looking at the second column in Table 1 the UK performed better than the G7, Euro Area and European averages over this period.

History has shown that it is fairly typical for economies to experience a downturn after a long period of sustained growth. The nature of the cycle this time is somewhat different, in that inflation has largely been kept under control despite some very volatile commodity price movements. But it is clear that during the period of Great Moderation significant imbalances were allowed to build up in the global economy. In the UK the strong rise in house prices, consumer debt, the private equity boom and the sharply deteriorating trade balance were all signs of an unbalanced economy. The current recession is largely the consequence of these imbalances rewinding. A future article will explore this further with a particular emphasis on how the UK was affected by the rise in global imbalances.

Despite the severity of the current recession it has far from wiped out the gains made over the previous decade. It is also clear that previous low growth was not a buffer against the recession. For example, Japan, Germany and Italy have shown long periods of weak growth, but were also subject to among the largest output falls in the recession – and future growth projections aren't particularly rosy either. This highlights the importance of structural factors in driving longer-term or trend growth.

The economic outlook

The summer update of the OECD *Economic Outlook* provides forecasts of annual GDP growth in 2009 and 2010 for member countries. As **Table 2** shows, the UK is expected to contract by 4.3 per cent in 2009 with output flat in 2010. Although projected growth rates vary by country, there is unanimity in the general pattern. Most OECD members are expected to record a large fall in output in GDP during 2009 followed by zero or very modest growth in 2010. For some of the emergent OECD economies, such as Turkey, Mexico, and Korea, growth in 2010 is expected to rebound relatively strongly following large declines in 2009. For the majority of the more advanced countries, including the G7 members, growth

is expected to be modest – regardless of previous growth or the depth of the recession. Output in the Euro Area is projected to be flat, with small growth in Germany, France and Italy offset by continued recession in Spain. Annual growth of 0.7 per cent and 0.9 per cent is forecast for Japan and the US respectively in 2010, which pulls up the expected G7 growth rate to 0.6 per cent. But it must also be accepted that there is considerable uncertainty surrounding these projections, with the balance of risks judged to be towards the downside.

Although there are signs that the major economies are coming out of recession with positive GDP growth in the second quarter in Japan, Germany, and France, with independent forecasters expecting the UK and US expected to follow in quarter three, any recovery is expected to be fragile for a number of reasons. There continues to be tight credit conditions as a result of the credit crunch following from the financial crisis and final consumption demand is weak due to the process of de-leveraging or shedding debt from the balance sheets of homes and businesses.

These are among the key assumptions underlying the latest forecasts for the global economy by the International Monetary Fund (IMF). The IMF predicts that global output will fall by around 1.0 per cent this year and grow by 3.0 per cent in 2010, which means that the world will be in recession once population growth is taken into account. One measure of the weakness of the recovery is the extent of the output gap prevalent in major economies. The output gap (the difference between actual and potential output) is between 5-7 per cent for major economies (and 8 per cent for Japan) in 2009 and 2010, making this the worst instance of excess capacity in the post-war period (see **Figure 3**).

One of the implications of this substantial output gap is a period of slow income growth and below trend income levels. Even though GDP stops falling and the recession is technically over, it could take several years for the economy to recover to the pre-crisis trend level of income. Therefore, the global recession may be over in a technical sense, but the level of income is lower than potential for some years. Of course, if the recovery is U-shaped (rather than the more optimistic V-shape where recovery is rapid), meaning output remains below trend for a longer period of time, then the process of restoring income levels to trend could take even longer.

As this recession is characterized by a financial crisis, the pace of recovery is likely to be slower than the usual dip in the business

Table 2

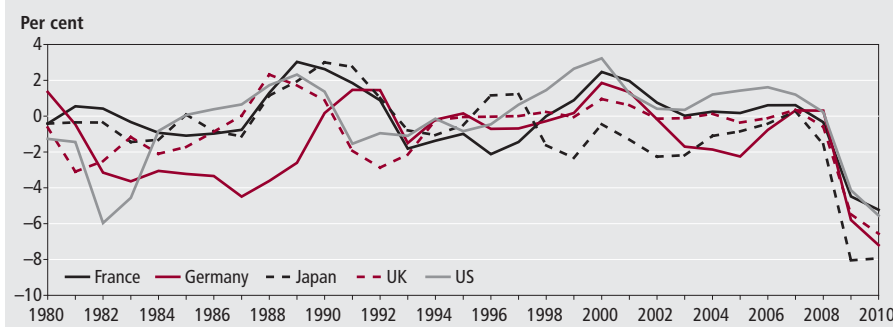
Projections of OECD output growth for 2009 and 2010

	Per cent	
	2009	2010
Australia	-0.4	1.2
Austria	-4.3	-0.1
Belgium	-4.1	-0.5
Canada	-2.6	0.7
Czech Republic	-4.2	1.4
Denmark	-4.0	0.1
Finland	-4.7	0.8
France	-3.0	0.2
Germany	-6.1	0.2
Greece	-1.3	0.3
Hungary	-6.1	-2.2
Iceland	-7.0	-0.8
Ireland	-9.8	-1.5
Italy	-5.5	0.4
Japan	-6.8	0.7
Korea	-2.2	3.5
Luxembourg	-4.0	-0.4
Mexico	-8.0	2.8
Netherlands	-4.9	-0.4
New Zealand	-3.0	0.6
Norway	-1.0	0.8
Poland	-0.4	0.6
Portugal	-4.5	-0.5
Slovak Republic	-5.0	3.1
Spain	-4.2	-0.9
Sweden	-5.5	0.2
Switzerland	-2.7	-0.2
Turkey	-5.9	2.6
United Kingdom	-4.3	0.0
United States	-2.8	0.9
Euro area	-4.8	0.0
G7	-4.0	0.6

Source: OECD Statbase

Figure 3

Output gap as a percentage of potential GDP



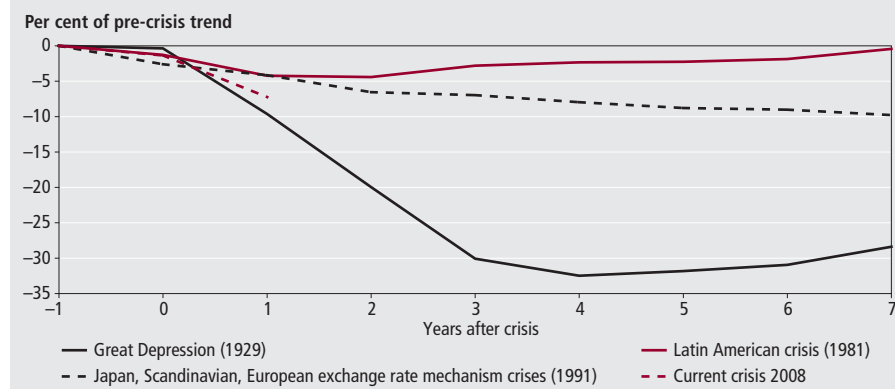
Source: IMF World Economic Outlook

cycle. The IMF's latest World Economic Outlook estimates that it takes an average of seven years to recover after a financial crisis, meaning that it will take the UK until the middle of 2015 to reach its pre-crisis level of income given the recession began in the second quarter of 2008. **Figure 4** shows the evolution of output after previous financial crises reinforces this view whereby the level of income has remained below pre-crisis levels for the better part of a decade.

For specific countries the immediate prospect of recovery is not only dependent on the trajectory of the financial crisis but

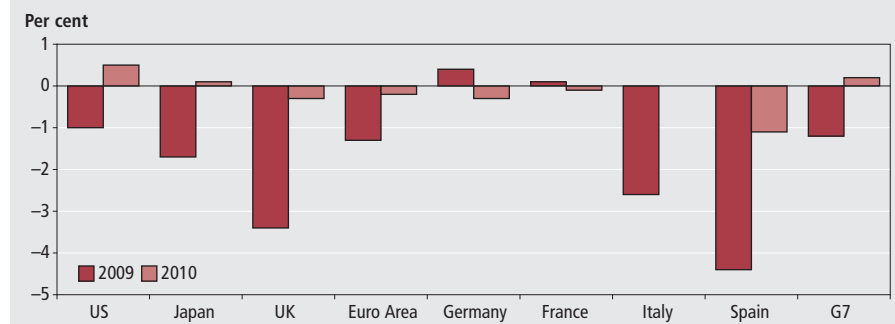
also the strength of demand. This is where economic fortunes appear to diverge quite noticeably for the countries which have had high levels of borrowing leading to highly indebted consumers. **Figure 5** shows OECD projections of personal consumption expenditure growth for 2009 and 2010. Although there has been a considerable slowdown everywhere, the countries which have experienced the sharpest falls are the UK and Spain, which have been subject to a large boom and correction in the housing market, and Italy where consumer confidence has fallen sharply due

Figure 4
Output evolution after financial crises in advanced economies



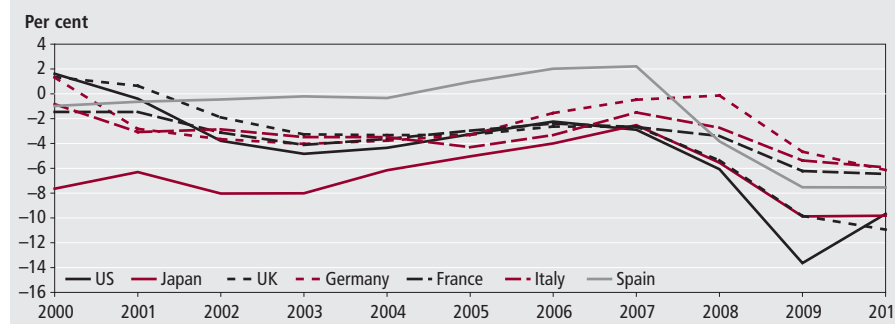
Source: IMF World Economic Outlook

Figure 5
Projections of annual growth in personal consumption expenditure



Source: OECD Statbase

Figure 6
General government balance as a percentage of GDP



Source: IMF World Economic Outlook

to the weakening labour market and credit restrictions. The Euro Area as a whole has had relatively stronger consumption growth, notably in France, Germany, and here the extent of household indebtedness is lower.

De-leveraging means that consumption as a driver will remain weak, particularly in those countries where housing bubbles were the most significant. British households and firms are repaying debt and saving instead. The savings rate in the UK has increased four-fold since the start of the crisis to around 5.6 per cent of disposable income. Though this increased rate of saving and reducing consumer borrowing are necessary

to shed debt and rebuild household balance sheets, the implication is that consumption will remain weak while this process of de-leveraging occurs.

In a recession, public demand can take the place of private demand. **Figure 6** shows the sharp deterioration in the general government balance in all major economies, either through automatic stabilizers or discretionary fiscal spending. The eventual withdrawal of the stimuli, for example the reversal of the VAT cut in Britain in January 2010, will require private demand to take its place or else risk a fall in aggregate demand.

A consequence of public spending is the

increase in government debt. Government debt as a share of GDP will increase to 79 per cent this year and 86 per cent next year in the Euro Area. The UK's debt-to-GDP ratio will increase to 84 per cent in 2010, while Spain's will increase to 61 per cent, Germany to 81 per cent and France to 86 per cent, all considerably above the 40 per cent ceiling in the Maastricht Treaty. This increase in government debt will in turn require austerity measures such as raising taxes and cutting spending, putting more pressure on a fragile and prolonged period of recovery. Premature tightening can worsen a recession as has been seen in Japan in the late 1990s as well as in the Great Depression where the recession ended in 1933 but was followed by a second recession in 1937.

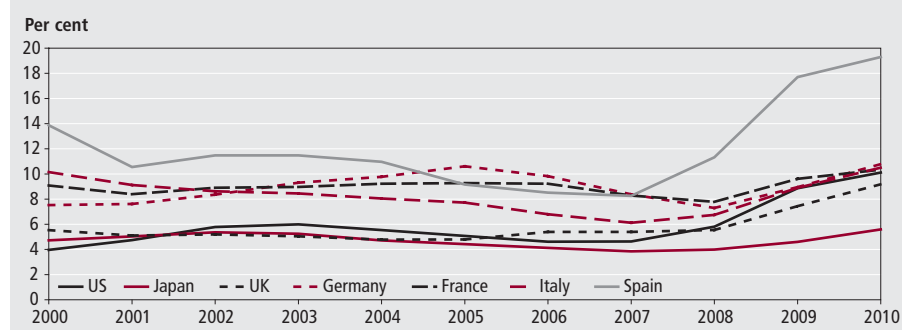
The severity of the recession has driven up unemployment. The unemployment rate in all major economies is expected to rise sharply next year since joblessness follows the real economy with a lag (see **Figure 7**). In the Euro Area, the unemployment rate is predicted to exceed 12 per cent, while the US and the UK face unemployment of around 10 per cent. Spain, one of the worst affected economies, is to experience a jump in the unemployment rate from 11 per cent in 2008 to 18 per cent and nearly 20 per cent in 2009 and 2010, respectively. Rising unemployment along with sluggish wage growth will further dampen consumption since uncertainty in incomes will induce precautionary savings rather than spending.

How sustainable is the recovery?

Although the UK, USA, and perhaps Spain will follow Japan, Germany and France out of recession in this or the next quarter, there is also the prospect of these economies falling back again into recession. De-stocking had been so fierce that re-stocking has bumped up industrial production leading to growth in industrial output in the Euro Area. However, restocking will not have a permanent affect on output and as fixed investment continues to fall sharply weakness in the third quarter could continue. This is particularly significant in Germany and France with large industrial bases. As industry constitutes a third of GDP in those economies, an upturn in industrial output would generate growth. But, by the same token, the downturn may well drag growth down again.

Second, export growth for Germany has resumed at 7 per cent (fastest rate in 3 years) and it has had a current account surplus of around 3 per cent of GDP because imports have fallen more quickly due to a low consumption base. Exports of capital goods

Figure 7
Unemployment rate



Source: IMF World Economic Outlook

are driven by infrastructure spending in the fiscal stimulus spending of America and China. Once those funds end, then export growth may well taper off.

Third, consumption growth looks weak in the recovered economies of Germany and France, more so in the former due to a savings rate exceeding 10 per cent and an economy geared at exports. Where consumption is growing is related to fiscal policy such as the car scrappage scheme in France which has driven household consumption upward by 0.4 per cent. Other countries like Spain and Ireland have to de-leverage or shed debt, offering little in support of consumption growth in the Euro Area. And in Italy low labour productivity growth is likely to suppress income growth and consumption.

Fourth, global re-balancing will involve Germany which had the second highest trade surplus in the world only after China before the crisis. As Americans save, there will be global re-balancing in that consumption will decline and the trade deficit fall which will be matched by shrinking surpluses elsewhere. Without the boost from exports and fiscal stimulus spending, exports will not be much of an engine for sustained recovery.

Fifth, Germany and France both have short-time workers which has staved off unemployment and maintained incomes, particularly as wage compression reins in costs. If final demand does not increase, then these schemes cannot be maintained and a squeeze on income will follow.

Although the Euro Area and Germany in particular have suffered greater contractions in GDP than America and its banks are estimated by the European Central Bank (ECB) to have 800 billion euros of toxic assets, the rebound from recession is sharper than in the US and the UK, both of which contracted in the second quarter.

There are, however, also factors that would point to a sustainable recovery. Although external demand from emerging economies

like China are unlikely to fully offset the fall in consumption in the United States, its growth rate of 7.1 per cent in the first half of the year will boost global growth as the third largest economy in the world. World trade had been predicted to shrink for the first time since World War II this year. But, the injection of funds into trade finance (letters of credit from exporting countries to reassure importers) by the G20 has revitalized world trade and the pace of growth in global exports and imports is at its highest since 2003, albeit from a low level. Finally, although the credit crunch has not concluded, there are signs of stabilization in the banking system. Some US banks are seeking to exit from government schemes as are British ones. The combination of improvements in the financial sector and a source of demand could together support a sustained recovery. This is particularly the case for countries like the UK and USA where weak currencies could bolster net exports both through exporting more competitive goods and services but also through import substitution whereby cheaper non-traded goods/services are substituted for more expensive traded ones. This, of course, is not an option for Spain as the single currency will prevent it from making such adjustments.

Conclusion

The global recovery looks to be on the horizon, but there are a number of reasons as to why it may be too early to call an end to the severest post-War recession. Continued write-downs by banks and weak final private demand due to households and firms de-leveraging their balance sheets point to a fragile resumption of growth. Financial crises, in particular, are associated with prolonged periods of below-trend levels of output with levels of income not expected to recover for at least 7 years.

For the UK and USA, the financial crisis has caused a severe credit crunch while households and firms shed debt. However,

with weakening currencies (the US dollar is at a 13 month low against the euro and sterling is also declining against both the dollar and euro), global demand might cushion some of the impact.

This is not an option for Spain. Although its banks have been less affected by the financial crisis, the housing bubble and level of indebtedness have plunged Spain into a recession with unemployment projected to reach 20 per cent by next year. Without net exports as a driver of growth and high levels of government debt, Spanish demand will need to come from consumers which will make for a weak recovery. Italian banks also avoided large write-downs, but weak consumer demands means the economy is over-dependent on external demand for growth.

In contrast, Germany and France in the Euro Area and Japan have emerged from recession. Although their banks were also affected by the financial crisis, the larger industrial sectors in their economies allowed for a faster recovery than the UK. However, the same inventory cycle could pull these economies into an uneven W-shaped recovery. Also, these countries have savings ratios of above 10 per cent, which means that de-leveraging is not necessary which could point to quicker recovery in consumption. However, by the same token, the lower rates of consumption mean that the pace of growth will not be as fast as when exports and external demand boosted countries like Germany and Japan before the crisis.

Finally, the resumption of world trade and the stronger than expected growth in Asia, particularly China, does offer a source of demand in the global economy. As public sector spending will be hamstrung by rising debts and private consumption is likely to remain weak, external demand by consumers and Asian governments spending on infrastructure will offer a source of growth, particularly for economies with competitive currencies.

Although there is already global re-balancing happening, notably with the US current account deficit halving from 6 per cent to 3 per cent of GDP and Chinese consumption rising from 36 per cent to 41 per cent of GDP, the ensuing structure of global demand and production may well be more sustainable. A more stable global economic structure would benefit all countries during what is likely to be a lengthy recovery period.

CONTACT

✉ elmr@ons.gov.uk

ARTICLE

Jenny Johnson
Office for National Statistics

Quality measures of household labour market indicators

SUMMARY

This article considers the reliability of the two main survey sources for key household labour market indicators, using standard errors to inform users on the accuracy of regular household analysis. It shows the level of detail that provides reliable analysis for different geographies. It will also consider when to use the Annual Population Survey (APS) instead of the Labour Force Survey (LFS, see ONS 2009a).

Introduction

Analysing family and household characteristics complements the wealth of available information on the characteristics of people in the UK. This is done through the LFS with its primary use to produce person-level statistics (such as employment, unemployment and economic inactivity levels and rates) broken down by personal characteristics (such as age, sex and ethnicity). As the survey collects information about each member of participating households, the LFS also provides family and household-level statistics that describe the combined economic activity status of family and household members. This is done using the LFS household dataset and is the principal source of statistics on couples where both partners are working, one partner is working, or neither partner is working. It is also the main source of statistics on 'working' households (where all the adults are working); 'mixed' households (containing both working and non-working adults); and 'workless' households (where none of the adults is working). These statistics are published annually in the Statistical Bulletin, 'Work and Worklessness among households' (see ONS 2009b), using the LFS household data as the source.

Accompanying the LFS is the APS, which is created by combining individuals in waves 1 and 5 from four consecutive LFS quarters with boosts from the English, Welsh and Scottish Local Labour Force Surveys. In autumn 2008, ONS launched APS household datasets (see ONS 2008a), to complement LFS household datasets.

Labour Force Survey

The LFS is a quarterly survey of households living at private addresses in the UK. Individuals are in the survey for five consecutive quarters. The main sampling unit is the household address and therefore if the occupants change, the address remains in the sample and any new occupants interviewed. By collecting information about each member of participating households, the LFS provides family and household-level statistics that describe the combined economic activity status of members.

The LFS household datasets are available, on a consistent calendar quarter basis, for the period April to June from 1997, and for October to December, from 2004. It has a sample size of around 53,000 households each quarter and collects a wide range of information. For some households, one or more members have unknown economic status because they refuse to take part, or no proxy response is available. These members are given the same weight as other members in the household so they retain their correct place within the household structure. This means there will be some 'unknown' households in any weighted analysis of the combined economic status in LFS household datasets.

Annual Population Survey

As the APS household datasets contain results from four different sources, the APS household sample is three times the size of the LFS sample. It contains information collected from a sample of around 160,000

households. They are available for the calendar period of January to December for individual years from 2004. Although there will be individuals with missing economic status within some households, as in the LFS household datasets, a form of 'nearest neighbour' imputation (see Ashton and Kent 2008) is used in the APS. This means that analysis of the combined economic status do not contain any 'unknown' households.

Advantages and Disadvantages of datasets

The advantage of the LFS over the APS is that the household datasets are quarterly and go back to 1997, allowing for a longer time series. Less time-series analysis is available from the APS household datasets because they only go back to 2004. As the APS household datasets are annual and published around six months after the end of the period, they are also less timely than those for the quarterly LFS. However, by covering a whole year, the APS household data gives an annual estimate in comparison to a quarterly estimate from the LFS. The APS is the recommended source for local area data because of the greater sample size. Estimates for lower level geographies are not published regularly from the LFS household data as the smaller sample size results in estimates with wide margins of uncertainty. Another advantage of the APS over the LFS for household analysis is the LFS estimates for sub-groups are not adjusted to compensate for people, families and households with unknown economic activity status, whereas imputation is used in the APS. The LFS estimates for regions, local areas and other sub-groups may therefore underestimate the numbers of people, families and households in each economic activity status category. For more information about the LFS and APS household datasets, see the household user guide (see ONS 2008b) on the National Statistics website.

Reliability measures

As it is costly and time-consuming to collect information from every household in the UK for the LFS and APS, a sample is taken to provide a variety of estimates for variables of interest. Selecting a different sample of households may produce different estimates. The difference between an estimate and its true value is the sampling error. The actual sampling error for any estimate is unknown but we can estimate, from the sample, a typical error, known as the standard error. This provides a means of assessing the precision of an estimate. The lower the standard error, the more

confidence there is that the estimate is close to the true value. Accompanying each estimate is a confidence interval, which means there is 95 per cent certainty that from all samples possible, the estimate will lie within the lower and upper range.

One way to express the standard error is as a percentage of the estimate itself. This is referred to as the relative standard error (RSE) of the estimate. Larger sample sizes represent more of the population and tend to have smaller RSEs, and the smaller the RSE, the more reliable the estimate. As the sample size gets smaller, estimates tend to have higher standard errors and are therefore less reliable. Care must be taken with the accuracy of estimates from small sample sizes. However, it also depends on the use of estimates when deciding how reliable the estimate needs to be, and therefore whether it may be acceptable for a less reliable estimate. Different users have different needs and **Annex Table A** includes a ready reckoner, to allow users to make informed decisions around how precise the data are for their needs.

Estimates with a RSE of 20 per cent or more are not considered reliable for practical purposes. In other words, if a different sample is taken from the same population, there is a good chance the estimate may differ greatly from the estimate of the current sample. Although 20 per cent is quite an arbitrary cut off value for RSEs, it stems from the fact that before 2005, quarterly LFS estimates of fewer than 10,000 were likely to be unreliable and so not published. The 10,000 threshold equates to a sample size of about 25, and as sample sizes decrease below 25 individuals, the standard error increases rapidly, detracting from the value of the estimates. Although the publication policy changed in 2005, the unreliability guidelines for LFS estimates did not. In summary, the larger the sample size used, the more reliable is the estimate from the sample.

Geographical hierarchies

Various geographical breakdowns are possible in the LFS and APS, and it is possible to use a geographical hierarchy to drill down to lower level detail within an area. Geographies include the Countries of the UK, Government Office Region (GOR) in England, Local Authorities (LA) and Nomenclature of Units for Territorial Statistics (NUTS). The latter maintained by Eurostat, the statistical office of the European Communities, as a 3-tier hierarchy used for statistical production across the European Union. The top-level is

equivalent to GOR plus England, Scotland, Wales and Northern Ireland, level 2 (NUTS 2) consists of groups of counties, with 37 in the UK, and level 3 (NUTS 3) consists of groups of local authorities with 133 in the UK. There are a total of 408 local authorities in the UK, each of which is allocated to a group in NUTS 3. The hierarchy used in this article is summarised in the following way:

Country → GOR → NUTS 2 → NUTS 3
→ LA

NUTS areas provide a useful intermediate level in terms of sample size between GOR and LA, when the LA sample sizes are too small for reliable estimates. However, as mentioned above, it also depends on the use of the estimate when deciding how reliable it needs to be.

Results

The following section gives an outline of the reliability of estimates from the APS and LFS. The analysis is based on the proportions of different types of working-age households. No actual estimates or standard errors are given as the aim is purely to assess reliability of estimates and give an idea of which estimates can be used at which geographical level.

There are various household labour market indicators describing the adults and children living in working-age households by the economic status of the household. The key indicators include the number of working, mixed and workless households – see **Box 1**. In addition there is interest in children living in working, mixed and workless households.

Table 1 shows the distribution of the RSEs, for the percentages of working, mixed and workless households for the different levels in the geographical hierarchy. There are a larger percentage of smaller RSEs for the APS data, because of the larger sample size than the LFS. Also as there is a larger number of households for the working household group, the RSEs are smaller for these estimates than for the mixed and workless household groups, which have smaller sample sizes. For example, for NUTS 2 areas from the LFS, 97.3 per cent of RSEs are less than 5 per cent for working households compared with 32.4 per cent for mixed households and 2.7 per cent for workless households. The differences between the LFS and APS become more apparent as you move further down the geographical hierarchy. At country level, all RSEs are less than 5 per cent for both

Box 1**Key definitions**

A **household** is defined as a single person or a group of people living at the same address that have the address as their only or main residence, and either share one main meal a day or share the living accommodation or both.

A **working household** is one that includes at least one person of working age and all individuals aged 16 and over are in employment.

A **mixed household** is one that includes at least two people

of working age and at least one person aged 16 and over is in employment, with at least one other being unemployed or inactive.

A **workless household** is one that includes at least one person of working age and no one aged 16 and over is in employment.

A **relative standard error** (RSE) is the standard error as a percentage of the estimate of that standard error.

Table 1

Percentage of Relative Standard Errors falling within defined bands for LFS and APS by geography, LFS April to June 2008, APS January to December 2007

	Percentages							
	LFS				APS			
	RSE<5	5≤RSE<10	10≤RSE<20	RSE≥20	RSE<5	5≤RSE<10	10≤RSE<20	RSE≥20
Working households								
Country ¹	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
GOR	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
NUTS 2 ²	97.3	2.7	0.0	0.0	100.0	0.0	0.0	0.0
NUTS 3 ³	35.9	53.1	7.8	3.1	95.3	4.7	0.0	0.0
LA	1.0	50.9	45.5	2.7	34.6	53.2	11.3	1.0
Working households								
Country ¹	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
GOR	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
NUTS 2 ²	32.4	59.5	5.4	2.7	86.5	13.5	0.0	0.0
NUTS 3 ³	0.8	29.7	60.2	9.4	25.8	68.8	5.5	0.0
LA	0.0	0.7	46.6	52.7	0.0	39.0	48.8	12.3
Workless households								
Country ¹	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
GOR	90.0	10.0	0.0	0.0	100.0	0.0	0.0	0.0
NUTS 2 ²	2.7	75.7	18.9	2.7	45.9	54.1	0.0	0.0
NUTS 3 ³	0.0	13.3	57.8	28.9	7.0	54.7	34.4	3.9
LA	0.0	1.2	18.4	80.3	0.0	22.3	22.3	55.4

Notes:

Source: Labour Force Survey and Annual Population Survey

1 Country includes UK, England, Wales, Scotland and Northern Ireland.

2 Nomenclature of Units for Territorial Statistics, level 2 (37 in UK).

3 Nomenclature of Units for Territorial Statistics, level 3 (133 in UK).

the LFS and APS, for working, mixed and workless households. At GOR level, for the smaller workless households group, in the LFS, 90.0 per cent of estimates have a RSE of less than 5 per cent, with the remaining GORs having a RSE of less than 10 per cent. Below this geographical hierarchy, the estimates for the LFS quickly become less reliable. For workless households in the LFS, 80.3 per cent at LA level have a RSE greater than 20 per cent and hence not considered reliable for practical purposes compared with 55.4 per cent from the APS. Therefore, the LFS generally provides reliable estimates at GOR level, but below this, the APS is recommended for estimates of workless households.

Table 1 also shows that moving from LA to NUTS 3 for APS, the proportion of estimates for workless households with a

RSE greater than 20 per cent, and hence not considered reliable, drops from 55.4 per cent to 3.9 per cent. Therefore, for practical use, estimates at NUTS 3 level may be a good compromise between the lack of detail in a GOR estimate and LA estimate, where many are not reliable.

Table 2 shows a geographical hierarchy, using APS data, and the reliability of several key household indicators. A full table for all regions in the UK is at Annex A and is on the National Statistics website. Table 2 shows London to illustrate its use. Estimates are scored with a number (1) showing estimates with a RSE of less than 5 per cent. Those coloured numbered (4) are estimates with a RSE of greater than 20 per cent. The 2007 APS household dataset provides the RSEs for this table. Table 2 is useful to assess whether a measure is

reliable at the desired geographical level of the user, and if it is not, it shows whether the next level up the hierarchy provides a reliable estimate for the purpose of their analysis. For example, for the local authority of Bromley, the estimate of the proportion of children in workless households is not reliable as the RSE is greater than 20 per cent, indicated by the number (4). The next level up in the hierarchy is NUTS 3 area, Outer London – South. The estimate for the proportion of children in workless households is scored (3), and therefore acceptable. However, to get a more reliable estimate, use the next level up the hierarchy, that is NUTS 2 area, Outer London, and the RSE for the estimate here is numbered (2), reasonably precise. The final step up the hierarchy takes us to the London GOR, and the

Table 2

Ready Reckoner for reliability of Key household series for London GOR by NUTS 2, NUTS 3 and LA, Annual Population Survey, January to December 2007

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
UK	1	1	1	1	1	1
England	1	1	1	1	1	1
London	1	1	1	1	1	1
Inner London	1	1	1	1	1	1
Inner London - West	1	1	1	2	2	2
Camden	1	2	2	3	3	3
City of London	4	4	4	4	4	4
Hammersmith and Fulham	1	2	3	3	3	3
Kensington and Chelsea	2	2	2	3	3	4
Wandsworth	2	3	3	3	3	4
Westminster	1	2	2	4	3	3
Inner London - East	1	1	1	1	1	2
Hackney	2	2	2	3	3	3
Haringey	2	2	3	3	3	3
Islington	1	2	3	3	3	3
Lambeth	1	2	2	3	3	3
Newham	2	2	2	3	3	3
Southwark	1	2	2	3	3	3
Lewisham	1	2	3	3	3	3
Tower Hamlets	2	2	2	4	3	3
Outer London	1	1	1	1	1	2
Outer London - East and North East	1	1	1	1	2	2
Barking and Dagenham	2	2	3	3	3	3
Bexley	2	2	3	2	3	4
Enfield	2	2	3	3	3	3
Greenwich	2	2	3	3	3	3
Havering	2	2	3	2	3	4
Redbridge	2	2	3	3	3	3
Waltham Forest	2	3	3	3	3	4
Outer London - South	1	1	2	1	2	3
Bromley	1	3	3	2	3	4
Croydon	2	2	3	3	3	4
Kingston upon Thames	2	2	3	2	3	4
Merton	1	2	4	2	3	4
Sutton	2	3	3	3	3	4
Outer London - West and North West	1	1	2	1	1	2
Barnet	2	2	3	3	3	4
Brent	2	2	3	3	3	4
Ealing	2	2	3	3	3	3
Harrow	2	2	3	3	3	4
Hillingdon	2	2	3	3	3	3
Hounslow	2	2	3	3	3	4
Richmond upon Thames	1	2	3	3	3	4

Notes:

- A: Working-age households where all members aged 16 or over are in employment.
 B: Working-age households containing both working and workless members.
 C: Working-age households where no one aged 16 or over is in employment.
 D: Children living in a working-age household where all members aged 16 or over are in employment.
 E: Children living in a working-age household containing both working and workless members.
 F: Children living in a working-age household where no one aged 16 or over is in employment.
 1: $0 \leq \text{RSE} < 5$. Estimates are considered precise.
 2: $5 \leq \text{RSE} < 10$. Estimates are considered reasonably precise.
 3: $10 \leq \text{RSE} < 20$. Estimates are considered acceptable.
 4: $\text{RSE} \geq 20$. Estimates are not considered reliable for practical purposes.

Source: Annual Population Survey

estimate for the proportion of children in workless households at this level is precise as the RSE is less than 5 per cent. Therefore, the most appropriate level in the hierarchy can be chosen so the reliability of the estimate is suitable for its use. Another example is Westminster local authority where the estimate of the proportion of workless households would be reasonably precise as it is scored (2). Only if a very precise estimate is necessary would you need to go up to the next level, NUTS 3 area, Inner London – West. Using Table 2, it is possible to see at a glance whether an estimate is suitable for the desired purpose. For the proportion of workless households, although many estimates at local authority level are not considered reliable, NUTS 3 area estimates are more accurate. ONS will undertake work to provide a ready reckoner for other APS and LFS household datasets on the National Statistics website.

Conclusion

There are advantages and disadvantages of both the APS and LFS when doing household analysis. Although the LFS data is more timely, the larger sample size of the APS results in more reliable estimates. The analysis in this article shows the proportion of estimates classified as precise is much higher in the APS compared to the LFS, and therefore the APS should be used for low-level geographical analysis wherever possible.

CONTACT

✉ elmr@ons.gsi.gov.uk

REFERENCES

Ashton K and Kent K (2008) 'Annual Population Survey household datasets', *Economic and Labour Market Review* 2(10), pp44-51 and at www.statistics.gov.uk/cci/article.asp?ID=2048

Office for National Statistics (2008a) *Annual Population Survey (APS) Household Datasets* at www.statistics.gov.uk/statbase/product.asp?vlnk=15150

Office for National Statistics (2008b) 'Labour Force Survey User Guide Volume 8: Household and Family Data' at www.statistics.gov.uk/downloads/theme_labour/vol8_2008.pdf Office for National Statistics (2009a) 'Labour Force Survey User Guide Volume 1: Background and Methodology' at www.statistics.gov.uk/downloads/theme_labour/Vol1-Final-2009.pdf

Office for National Statistics (2009b) *Work and worklessness among households* at www.statistics.gov.uk/statbase/product.asp?vlnk=8552

ANNEX

Table A

Ready Reckoner for reliability of key household series by country, GOR, NUTS 2, NUTS 3 and LA, Annual Population Survey, January to December 2007

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
UK	1	1	1	1	1	1
England	1	1	1	1	1	1
North East	1	1	1	1	1	2
<i>Tees Valley and Durham</i>	1	1	1	1	2	2
Hartlepool and Stockton-on-Tees	1	2	2	2	2	3
Hartlepool	1	2	2	2	3	3
Stockton-on-Tees	1	2	2	2	3	3
South Teesside	1	1	2	2	2	3
Middlesbrough	1	2	2	2	3	3
Redcar and Cleveland	1	2	2	2	3	3
Darlington	1	2	2	2	3	3
Darlington	1	2	2	2	3	3
Durham CC	1	2	2	2	3	3
Chester-le-Street	2	4	4	3	4	4
Derwentside	2	3	4	2	4	4
Durham	2	3	4	3	4	4
Easington	2	3	3	3	4	4
Sedgefield	3	3	3	3	4	4
Teesdale	4	4	4	4	4	4
Wear Valley	3	4	4	3	4	4
<i>Northumberland and Tyne and Wear</i>	1	1	1	1	2	2
Northumberland	1	2	3	2	3	4
Alnwick	3	4	4	3	4	4
Berwick-upon-Tweed	3	4	4	4	4	4
Blyth Valley	2	3	3	3	4	4
Castle Morpeth	2	3	4	3	4	4
Tynedale	2	3	4	4	4	4
Wansbeck	2	3	4	3	4	4
Tyneside	1	1	1	1	2	2
Gateshead	1	2	2	2	3	3
Newcastle upon Tyne	1	2	2	2	3	3
North Tyneside	1	2	2	2	3	3
South Tyneside	1	2	2	2	3	3
Sunderland	1	2	2	2	3	3
Sunderland	1	2	2	2	3	3
North West	1	1	1	1	1	1
<i>Cumbria</i>	1	2	2	2	3	3
West Cumbria	2	3	3	2	4	4
Allerdale	2	3	4	2	4	4
Barrow-in-Furness	3	4	3	4	4	4
Copeland	3	4	3	3	4	4
East Cumbria	1	3	3	2	4	4
Carlisle	2	4	4	2	4	4
Eden	3	4	4	3	4	4
South Lakeland	2	3	4	3	4	4
<i>Cheshire</i>	1	1	2	1	2	3
Halton and Warrington	1	1	2	1	2	3
Halton	1	2	2	2	3	3
Warrington	1	2	2	1	3	4
Cheshire CC	1	2	3	2	2	4
Chester	2	3	4	3	4	4
Congleton	2	4	4	3	4	4
Crewe and Nantwich	2	3	4	3	3	4
Ellesmere Port and Neston	2	4	4	3	4	4
Macclesfield	2	3	4	3	4	4
Vale Royal	2	3	4	3	4	4
<i>Greater Manchester</i>	1	1	1	1	1	2
Greater Manchester South	1	1	1	1	2	2
Manchester	1	2	2	2	3	3
Salford	1	2	2	2	3	3
Stockport	1	2	3	2	3	4
Tameside	1	2	2	2	2	3
Trafford	1	2	3	2	3	4
Greater Manchester North	1	1	1	1	2	2
Bolton	1	2	2	2	3	3

Table A continued

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
Bury	1	2	3	2	3	4
Oldham	1	2	2	2	2	3
Rochdale	1	2	2	2	3	3
Wigan	1	2	2	2	3	3
<i>Lancashire</i>	1	1	2	1	2	2
Blackburn with Darwen	1	2	2	2	2	3
Blackburn with Darwen	1	2	2	2	2	3
Blackpool	1	2	2	2	3	3
Blackpool	1	2	2	2	3	3
Lancashire CC	1	1	2	1	2	3
Burnley	3	3	4	4	4	4
Chorley	2	3	4	3	4	4
Fylde	2	4	4	3	4	4
Hyndburn	3	3	4	4	4	4
Lancaster	2	3	4	3	4	4
Pendle	3	3	4	4	4	4
Preston	2	3	3	4	3	4
Ribble Valley	2	4	4	3	4	4
Rossendale	2	4	4	3	4	4
South Ribble	2	3	4	3	4	4
West Lancashire	2	3	4	3	4	4
Wyre	2	3	4	3	4	4
<i>Merseyside</i>	1	1	1	1	2	2
East Merseyside	1	1	1	1	2	2
Knowsley	1	2	2	2	3	3
St. Helens	1	2	2	2	3	3
Liverpool	1	2	2	2	3	3
Liverpool	1	2	2	2	3	3
Sefton	1	2	2	2	3	3
Sefton	1	2	2	2	3	3
Wirral	1	2	2	2	3	3
Wirral	1	2	2	2	3	3
Yorkshire and the Humber	1	1	1	1	1	2
<i>East Yorkshire and Northern Lincolnshire</i>	1	1	1	1	2	2
Kingston upon Hull, City of	1	2	2	2	3	3
Kingston upon Hull, City of	1	2	2	2	3	3
East Riding of Yorkshire	1	2	3	2	3	4
East Riding of Yorkshire	1	2	3	2	3	4
North and North East Lincolnshire	1	2	2	2	2	3
North East Lincolnshire	1	2	2	2	3	3
North Lincolnshire	1	2	3	2	3	3
<i>North Yorkshire</i>	1	2	2	2	2	4
York	1	2	3	2	3	4
York	1	2	3	2	3	4
North Yorkshire CC	1	2	3	2	3	4
Craven	3	4	4	4	4	4
Hambleton	3	3	4	4	4	4
Harrogate	2	3	4	3	4	4
Richmondshire	2	4	4	4	4	4
Ryedale	3	4	4	4	4	4
Scarborough	3	3	4	3	4	4
Selby	3	3	4	3	4	4
<i>South Yorkshire</i>	1	1	1	1	2	2
Barnsley, Doncaster and Rotherham	1	1	1	1	2	2
Barnsley	1	2	2	2	3	3
Doncaster	1	2	2	2	3	4
Rotherham	1	2	2	2	3	3
Sheffield	1	2	2	2	3	3
Sheffield	1	2	2	2	3	3
<i>West Yorkshire</i>	1	1	1	1	1	2
Bradford	1	2	2	2	2	3
Bradford	1	2	2	2	2	3
Leeds	1	2	2	2	3	3
Leeds	1	2	2	2	3	3
Calderdale, Kirklees and Wakefield	1	1	2	1	2	3
Calderdale	1	2	2	2	3	3
Kirklees	1	2	3	2	2	4
Wakefield	1	2	2	2	3	4
East Midlands	1	1	1	1	1	2
<i>Derbyshire and Nottinghamshire</i>	1	1	1	1	2	2
Derby	1	2	2	2	3	3

Table A continued

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
Derby	1	2	2	2	2	3
East Derbyshire	2	2	3	2	3	4
Bolsover	3	3	4	4	4	4
Chesterfield	2	3	3	3	4	4
North East Derbyshire	3	3	3	3	4	4
South and West Derbyshire	1	2	3	2	3	4
Amber Valley	2	3	4	3	4	4
Derbyshire Dales	3	3	4	4	4	4
Erewash	2	4	3	3	4	4
High Peak	2	3	4	3	4	4
South Derbyshire	2	3	4	3	4	4
Nottingham	1	2	2	2	3	3
Nottingham	1	2	2	2	3	3
North Nottinghamshire	1	2	3	2	3	4
Ashfield	2	3	4	3	4	4
Bassetlaw	2	3	4	3	4	4
Mansfield	2	3	4	3	4	4
Newark and Sherwood	2	3	4	3	4	4
South Nottinghamshire	1	2	3	2	3	4
Broxtowe	2	3	4	3	4	4
Gedling	2	3	4	3	4	4
Rushcliffe	2	3	4	3	3	4
<i>Leicestershire, Rutland and Northamptonshire</i>	1	1	2	1	2	3
Leicester	1	2	2	2	2	3
Leicester	1	2	2	2	2	3
Leicestershire CC and Rutland	1	2	3	1	3	4
Blaby	2	3	4	3	4	4
Charnwood	2	3	4	2	4	4
Harborough	2	3	4	3	4	4
Hinckley and Bosworth	2	3	4	3	4	4
Melton	3	4	4	3	4	4
North West Leicestershire	2	3	4	3	4	4
Oadby and Wigston	3	3	4	3	4	4
Rutland	2	3	4	3	3	4
Northamptonshire	1	2	3	2	3	3
Corby	3	4	4	3	4	4
Daventry	2	4	4	3	4	4
East Northamptonshire	2	3	4	3	4	4
Kettering	2	4	4	3	4	4
Northampton	1	3	3	3	3	4
South Northamptonshire	2	3	4	3	4	4
Wellingborough	2	4	4	3	4	4
<i>Lincolnshire</i>	1	2	2	2	3	3
Lincolnshire	1	2	2	2	3	3
Boston	3	4	4	3	4	4
East Lindsey	2	3	3	3	4	4
Lincoln	2	3	4	3	4	4
North Kesteven	2	3	4	3	4	4
South Holland	3	3	4	3	4	4
South Kesteven	2	3	4	3	3	4
West Lindsey	2	3	4	4	4	4
West Midlands	1	1	1	1	1	1
<i>Herefordshire, Worcestershire and Warwickshire</i>	1	1	2	1	2	3
Herefordshire, County of	1	2	3	2	3	4
Herefordshire, County of	1	2	3	2	3	4
Worcestershire	1	2	3	2	3	4
Bromsgrove	2	3	4	3	4	4
Malvern Hills	3	3	4	3	4	4
Redditch	2	3	4	3	4	4
Worcester	2	3	4	3	4	4
Wychavon	2	3	4	3	4	4
Wyre Forest	3	3	4	4	4	4
Warwickshire	1	2	3	1	3	4
North Warwickshire	2	3	4	3	4	4
Nuneaton and Bedworth	2	3	4	3	4	4
Rugby	2	3	4	2	4	4
Stratford-on-Avon	2	3	4	3	4	4
Warwick	2	3	4	3	4	4
<i>Shropshire and Staffordshire</i>	1	1	2	1	2	3
Telford and Wrekin	1	2	3	2	3	3
Telford and Wrekin	1	2	3	2	3	3

Table A continued

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
Shropshire CC	1	2	3	2	3	4
Bridgnorth	2	3	4	3	4	4
North Shropshire	2	3	3	3	4	4
Oswestry	2	4	4	3	4	4
Shrewsbury and Atcham	1	3	4	2	4	4
South Shropshire	3	3	4	3	4	4
Stoke-on-Trent	1	2	2	2	3	3
Stoke-on-Trent	1	2	2	2	3	3
Staffordshire CC	1	2	2	2	3	4
Cannock Chase	2	3	4	3	4	4
East Staffordshire	2	3	4	3	4	4
Lichfield	2	3	4	3	4	4
Newcastle-under-Lyme	3	3	3	3	4	4
South Staffordshire	2	3	4	3	4	4
Stafford	2	3	4	3	4	4
Staffordshire Moorlands	2	3	4	2	4	4
Tamworth	3	4	4	4	4	4
<i>West Midlands</i>	1	1	1	1	1	1
Birmingham	1	2	2	2	2	3
Birmingham	1	2	2	2	2	3
Solihull	1	2	3	2	3	4
Solihull	1	2	3	2	3	4
Coventry	1	2	3	2	3	3
Coventry	1	2	3	2	3	3
Dudley and Sandwell	1	1	2	2	2	2
Dudley	1	2	2	2	3	3
Sandwell	1	2	2	2	3	3
Walsall and Wolverhampton	1	1	2	2	2	3
Walsall	1	2	3	2	3	3
Wolverhampton	1	2	2	3	2	3
<i>East of England</i>	1	1	1	1	1	2
<i>East Anglia</i>	1	1	2	1	2	3
Peterborough	1	2	3	2	2	3
Peterborough	1	2	3	2	2	3
Cambridgeshire CC	1	2	3	2	3	4
Cambridge	2	4	4	4	4	4
East Cambridgeshire	2	4	4	3	4	4
Fenland	2	3	4	4	4	4
Huntingdonshire	2	3	4	3	4	4
South Cambridgeshire	2	3	4	3	4	4
Norfolk	1	2	2	2	2	4
Breckland	2	3	4	3	4	4
Broadland	2	3	4	3	4	4
Great Yarmouth	3	3	4	4	4	4
King's Lynn and West Norfolk	2	3	4	3	3	4
North Norfolk	2	3	4	3	4	4
Norwich	2	3	3	4	4	4
South Norfolk	2	3	4	3	4	4
Suffolk	1	2	3	2	3	4
Babergh	2	3	4	3	4	4
Forest Heath	3	4	4	4	4	4
Ipswich	2	3	4	3	4	4
Mid Suffolk	2	3	4	3	4	4
St. Edmundsbury	2	4	4	3	4	4
Suffolk Coastal	2	3	4	3	4	4
Waveney	2	3	4	3	4	4
<i>Bedfordshire and Hertfordshire</i>	1	1	2	1	2	3
Luton	1	2	2	3	2	3
Luton	1	2	2	3	2	3
Bedfordshire CC	1	2	3	2	3	4
Bedford	2	3	4	3	3	4
Mid Bedfordshire	2	3	4	2	4	4
South Bedfordshire	2	3	4	3	4	4
Hertfordshire	1	1	2	1	2	3
Broxbourne	3	3	4	4	4	4
Dacorum	2	3	4	3	4	4
East Hertfordshire	2	3	4	3	4	4
Hertsmere	2	3	4	3	3	4
North Hertfordshire	2	3	4	3	4	4
St. Albans	2	3	4	3	3	4
Stevenage	2	4	4	3	4	4

Table A continued

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
Three Rivers	2	3	4	3	4	4
Watford	2	3	4	3	4	4
Welwyn Hatfield	2	3	3	3	4	4
<i>Essex</i>	1	1	2	1	2	3
Southend-on-Sea	1	2	3	2	3	3
Southend-on-Sea	1	2	3	2	3	3
Thurrock	1	2	3	2	3	3
Thurrock	1	2	3	2	3	3
Essex CC	1	1	2	1	2	3
Basildon	2	3	4	3	4	4
Braintree	2	3	4	3	4	4
Brentwood	3	3	4	4	3	4
Castle Point	3	3	4	4	4	4
Chelmsford	2	3	4	3	4	4
Colchester	2	3	3	3	3	4
Epping Forest	2	3	4	4	4	4
Harlow	2	3	4	4	4	4
Maldon	3	3	4	4	4	4
Rochford	3	3	4	4	4	4
Tendring	2	3	4	3	4	4
Uttlesford	2	4	4	3	4	4
London	1	1	1	1	1	1
<i>Inner London</i>	1	1	1	1	1	1
Inner London - West	1	1	1	2	2	2
Camden	1	2	2	3	3	3
City of London	4	4	4	4	4	4
Hammersmith and Fulham	1	2	3	3	3	3
Kensington and Chelsea	2	2	2	3	3	4
Wandsworth	2	3	3	3	3	4
Westminster	1	2	2	4	3	3
Inner London - East	1	1	1	1	1	2
Hackney	2	2	2	3	3	3
Haringey	2	2	3	3	3	3
Islington	1	2	3	3	3	3
Lambeth	1	2	2	3	3	3
Newham	2	2	2	3	3	3
Southwark	1	2	2	3	3	3
Lewisham	1	2	3	3	3	3
Tower Hamlets	2	2	2	4	3	3
<i>Outer London</i>	1	1	1	1	1	2
Outer London - East and North East	1	1	1	1	2	2
Barking and Dagenham	2	2	3	3	3	3
Bexley	2	2	3	2	3	4
Enfield	2	2	3	3	3	3
Greenwich	2	2	3	3	3	3
Havering	2	2	3	2	3	4
Redbridge	2	2	3	3	3	3
Waltham Forest	2	3	3	3	3	4
Outer London - South	1	1	2	1	2	3
Bromley	1	3	3	2	3	4
Croydon	2	2	3	3	3	4
Kingston upon Thames	2	2	3	2	3	4
Merton	1	2	4	2	3	4
Sutton	2	3	3	3	3	4
Outer London - West and North West	1	1	2	1	1	2
Barnet	2	2	3	3	3	4
Brent	2	2	3	3	3	4
Ealing	2	2	3	3	3	3
Harrow	2	2	3	3	3	4
Hillingdon	2	2	3	3	3	3
Hounslow	2	2	3	3	3	4
Richmond upon Thames	1	2	3	3	3	4
South East	1	1	1	1	1	2
<i>Berkshire, Buckinghamshire and Oxfordshire</i>	1	1	2	1	1	3
Berkshire	1	1	2	1	1	3
Bracknell Forest	1	2	3	2	3	4
Reading	1	2	3	2	3	3
Slough	1	2	3	2	2	3
West Berkshire	1	2	3	2	3	4
Windsor and Maidenhead	1	2	3	2	2	4
Wokingham	1	2	3	2	3	4

Table A continued

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
Milton Keynes	1	2	3	2	3	4
Milton Keynes	1	2	3	2	3	4
Buckinghamshire CC	1	2	3	2	3	4
Aylesbury Vale	2	3	4	3	4	4
Chiltern	2	3	4	3	4	4
South Bucks	3	3	4	4	3	4
Wycombe	2	3	4	3	3	4
Oxfordshire	1	2	3	2	3	4
Cherwell	2	3	4	3	4	4
Oxford	2	3	4	3	4	4
South Oxfordshire	2	3	4	3	3	4
Vale of White Horse	2	3	4	2	4	4
West Oxfordshire	2	3	4	3	4	4
<i>Surrey, East and West Sussex</i>	1	1	2	1	1	3
Brighton and Hove	1	2	2	2	3	3
Brighton and Hove	1	2	2	2	3	3
East Sussex CC	1	2	3	2	2	4
Eastbourne	2	3	4	3	4	4
Hastings	2	3	4	3	4	4
Lewes	2	3	4	3	4	4
Rother	2	4	4	3	4	4
Wealden	2	3	4	3	3	4
Surrey	1	1	2	1	2	3
Elmbridge	2	3	4	3	4	4
Epsom and Ewell	2	3	4	3	4	4
Guildford	2	3	4	3	3	4
Mole Valley	2	3	4	3	4	4
Reigate and Banstead	2	3	4	3	3	4
Runnymede	2	4	4	3	4	4
Spelthorne	2	3	4	3	4	4
Surrey Heath	2	3	4	3	4	4
Tandridge	2	3	4	3	4	4
Waverley	2	3	4	3	4	4
Woking	2	3	4	3	4	4
West Sussex	1	2	2	2	2	4
Adur	2	4	4	3	4	4
Arun	2	3	4	3	3	4
Chichester	2	3	4	3	4	4
Crawley	2	3	4	3	4	4
Horsham	2	3	4	3	4	4
Mid Sussex	2	3	4	2	4	4
Worthing	2	3	4	3	4	4
<i>Hampshire and Isle of Wight</i>	1	1	2	1	2	3
Portsmouth	1	2	2	2	3	4
Portsmouth	1	2	2	2	3	4
Southampton	1	2	2	2	3	3
Southampton	1	2	2	2	3	3
Hampshire CC	1	1	2	1	2	4
Basingstoke and Deane	2	3	4	3	4	4
East Hampshire	2	3	4	4	3	4
Eastleigh	2	3	4	3	4	4
Fareham	2	3	4	3	4	4
Gosport	2	4	4	3	4	4
Hart	2	3	4	3	4	4
Havant	2	3	4	3	3	4
New Forest	2	3	3	3	3	4
Rushmoor	2	3	4	3	4	4
Test Valley	2	3	4	3	4	4
Winchester	2	3	4	3	4	4
Isle of Wight	1	2	2	2	3	4
Isle of Wight	1	2	2	2	3	4
<i>Kent</i>	1	1	2	1	2	3
Medway	1	2	3	2	3	4
Medway	1	2	3	2	3	4
Kent CC	1	1	2	1	2	3
Ashford	2	3	4	3	4	4
Canterbury	2	3	4	3	4	4
Dartford	2	3	4	4	4	4
Dover	2	3	4	3	4	4
Gravesham	3	3	4	3	4	4
Maidstone	2	3	4	3	4	4

Table A continued

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
Sevenoaks	2	3	4	3	4	4
Shepway	2	3	4	3	4	4
Swale	2	3	3	3	3	4
Thanet	2	3	3	3	4	4
Tonbridge and Malling	2	3	4	3	4	4
Tunbridge Wells	2	3	4	3	4	4
South West	1	1	1	1	1	2
<i>Gloucestershire, Wiltshire and Bristol/Bath area</i>	1	1	1	1	2	2
Bristol, City of	1	2	2	2	3	3
Bristol, City of	1	2	2	2	3	3
North and North East Somerset, South Gloucestershire	1	1	2	1	2	3
Bath and North East Somerset	1	2	3	2	3	4
North Somerset	1	2	3	2	3	4
South Gloucestershire	1	2	3	2	3	4
Gloucestershire	1	2	3	2	3	4
Cheltenham	2	3	4	3	4	4
Cotswold	2	4	4	4	4	4
Forest of Dean	3	3	4	3	4	4
Gloucester	2	3	4	3	4	4
Stroud	2	3	4	2	4	4
Tewkesbury	2	4	4	3	4	4
Swindon	1	2	3	2	3	4
Swindon	1	2	3	2	3	4
Wiltshire CC	1	2	3	2	3	4
Kenet	2	3	4	3	4	4
North Wiltshire	2	3	4	3	4	4
Salisbury	2	3	4	3	4	4
West Wiltshire	2	3	4	3	4	4
<i>Dorset and Somerset</i>	1	1	2	1	2	3
Bournemouth and Poole	1	2	2	1	2	3
Bournemouth	1	2	3	2	3	4
Poole	1	2	3	2	3	4
Dorset CC	1	2	3	2	3	4
Christchurch	3	4	4	4	4	4
East Dorset	2	3	4	3	4	4
North Dorset	2	4	4	3	4	4
Purbeck	3	4	4	3	4	4
West Dorset	2	3	4	3	4	4
Weymouth and Portland	3	4	4	3	4	4
Somerset	1	2	3	2	3	4
Mendip	2	3	4	3	4	4
Sedgemoor	2	3	4	4	4	4
South Somerset	2	3	4	3	4	4
Taunton Deane	2	3	4	3	4	4
West Somerset	4	4	4	4	4	4
<i>Cornwall and Isles of Scilly</i>	1	2	2	2	3	4
Cornwall and Isles of Scilly	1	2	2	2	3	4
Caradon	3	3	4	4	3	4
Carrick	2	3	4	3	4	4
Kerrier	2	3	4	3	4	4
North Cornwall	3	4	4	4	4	4
Penwith	3	4	4	3	4	4
Restormel	2	3	4	3	4	4
Isles of Scilly	4	4	4	4	4	4
<i>Devon</i>	1	1	2	1	2	3
Plymouth	1	2	3	2	3	4
Plymouth	1	2	3	2	3	4
Torbay	1	2	2	2	3	3
Torbay	1	2	2	2	3	3
Devon CC	1	2	3	2	3	4
East Devon	2	3	4	3	4	4
Exeter	2	3	4	3	4	4
Mid Devon	2	4	4	3	4	4
North Devon	2	3	4	3	4	4
South Hams	2	4	4	3	4	4
Teignbridge	2	3	4	3	4	4
Torridge	3	3	4	4	4	4
West Devon	3	4	4	4	4	4
Wales	1	1	1	1	1	1
<i>East Wales</i>	1	1	1	1	2	2
Monmouthshire and Newport	1	1	2	2	2	3

Table A continued

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
Monmouthshire	1	2	3	2	3	4
Newport	1	2	2	2	3	3
Cardiff and Vale of Glamorgan	1	2	2	2	3	3
Cardiff	1	2	2	2	3	3
Vale of Glamorgan, The	1	2	2	2	3	3
Flintshire and Wrexham	1	1	2	1	2	3
Flintshire	1	2	3	2	3	4
Wrexham	1	2	2	2	3	3
Powys	1	2	3	2	3	4
Powys	1	2	3	2	3	4
<i>West Wales and The Valleys</i>	1	1	1	1	1	1
Isle of Anglesey	1	2	2	2	3	3
Anglesey, Isle of	1	2	2	2	3	3
Gwynedd	1	2	2	2	3	3
Gwynedd	1	2	2	2	3	3
Conwy and Denbighshire	1	1	2	2	2	3
Conwy	1	2	2	2	3	3
Denbighshire	1	2	2	2	3	3
South West Wales	1	1	2	1	2	3
Carmarthenshire	1	2	2	2	3	3
Ceredigion	1	2	2	2	3	4
Pembrokeshire	1	2	2	2	3	3
Central Valleys	1	2	2	2	2	3
Merthyr Tydfil	2	2	2	2	3	3
Rhondda, Cynon, Taff	1	2	2	2	3	3
Gwent Valleys	1	1	1	1	2	2
Blaenau Gwent	2	2	2	2	3	3
Caerphilly	1	2	2	2	3	3
Torfaen	1	2	2	2	3	3
Bridgend and Neath Port Talbot	1	1	2	1	2	3
Bridgend	1	2	2	2	3	3
Neath Port Talbot	1	2	2	2	3	3
Swansea	1	2	2	2	3	3
Swansea	1	2	2	2	3	3
Northern Ireland	1	1	1	1	1	2
Scotland*	1	1	1	1	1	1
<i>Eastern Scotland</i>	1	1	1	1	1	2
Angus and Dundee City	1	2	2	1	2	3
Clackmannanshire and Fife	1	2	2	2	3	3
East Lothian and Midlothian	1	2	2	1	2	3
Scottish Borders	1	2	3	2	3	4
Edinburgh, City of	1	2	3	2	3	3
Falkirk	1	2	3	2	3	4
Perth & Kinross and Stirling	1	2	2	1	2	3
West Lothian	1	2	3	2	3	3
<i>Highlands and Islands</i>	1	2	2	1	3	4
Caithness and Sutherland and Ross and Cromarty	2	3	4	3	4	4
Inverness and Nairn and Moray, Badenoch and Strathspey	1	3	4	2	4	4
Lochaber, Skye and Lochalsh and Argyll and the Islands	1	2	3	2	3	4
Eilean Siar (Western Isles)	2	3	4	3	4	4
Orkney Islands	2	3	4	2	4	4
Shetland Islands	2	3	4	2	4	4
<i>North Eastern Scotland</i>	1	1	2	1	2	3
Aberdeen City, Aberdeenshire and North East Moray	1	1	2	1	2	3
<i>South Western Scotland</i>	1	1	1	1	1	2
Dumfries & Galloway	1	2	2	2	3	4
East and West Dunbartonshire, Helensburgh and Lomond	1	1	2	1	2	3
East Ayrshire and North Ayrshire mainland	1	1	2	1	2	3
Glasgow City	1	2	2	2	3	3
Inverclyde, East Renfrewshire and Renfrewshire	1	1	2	1	2	3
North Lanarkshire	1	2	2	2	3	3
South Ayrshire	1	2	2	2	3	4
South Lanarkshire	1	2	2	2	3	4
Aberdeen City	1	2	3	2	3	4
Aberdeenshire	1	2	3	2	3	4
Angus	1	2	2	2	3	3
Argyll & Bute	1	2	3	2	3	4
Clackmannanshire	2	3	3	3	4	4
Dumfries & Galloway	1	2	2	2	3	4
Dundee City	1	2	2	2	3	3
East Ayrshire	1	2	2	2	3	3

Table A continued

	A (Working)	B (Mixed)	C (Workless)	D (Children in working)	E (Children in Mixed)	F (Children in workless)
East Dunbartonshire	1	2	3	1	3	4
East Lothian	1	2	3	2	3	4
East Renfrewshire	1	2	3	2	3	4
Edinburgh, City of	1	2	3	2	3	3
Eilean Siar (Western Isles)	2	3	4	3	4	4
Falkirk	1	2	3	2	3	4
Fife	1	2	2	2	3	3
Glasgow City	1	2	2	2	3	3
Highland	1	2	3	2	3	4
Inverclyde	1	2	2	2	3	3
Midlothian	1	2	3	2	3	4
Moray	1	2	3	2	2	4
North Ayrshire	1	2	2	2	3	3
North Lanarkshire	1	2	2	2	3	3
Orkney Isles	2	3	4	2	4	4
Perth & Kinross	1	2	3	2	3	4
Renfrewshire	1	2	2	2	3	3
Scottish Borders	1	2	3	2	3	4
Shetland Isles	2	3	4	2	4	4
South Ayrshire	1	2	2	2	3	4
South Lanarkshire	1	2	2	2	3	4
Stirling	1	2	3	2	3	4
West Dunbartonshire	1	2	2	2	3	3
West Lothian	1	2	3	2	3	3

Notes:

Source: APS household datasets

A: Working-age households where all members aged 16 or over are in employment.

B: Working-age households containing both working and workless members.

C: Working-age households where no one aged 16 or over is in employment.

D: Children living in a working-age household where all members aged 16 or over are in employment.

E: Children living in a working-age household containing both working and workless members.

F: Children living in a working-age household where no one aged 16 or over is in employment.

1: $0 \leq RSE < 5$. Estimates are considered precise.2: $5 \leq RSE < 10$. Estimates are considered reasonably precise.3: $10 \leq RSE < 20$. Estimates are considered acceptable.4: $RSE \geq 20$. Estimates are not considered reliable for practical purposes.

* Local authorities in Scotland cannot be mapped directly to NUTS 3 areas and so LAs are shown below the rest of the Scottish areas.

ARTICLE

Katy Long
Office for National Statistics

Unemployment durations: evidence from the British Household Panel Survey

SUMMARY

This article uses data from the British Household Panel Survey (BHPS), over the period 1991 to 2006, to examine the factors affecting the length of unemployment spells. The analysis is carried out with particular interest in the effect of regional labour market conditions on an individual's conditional probability of leaving unemployment. A discrete time proportional hazards model is estimated, controlling for a range of demographic, educational, occupational and regional characteristics.

Introduction

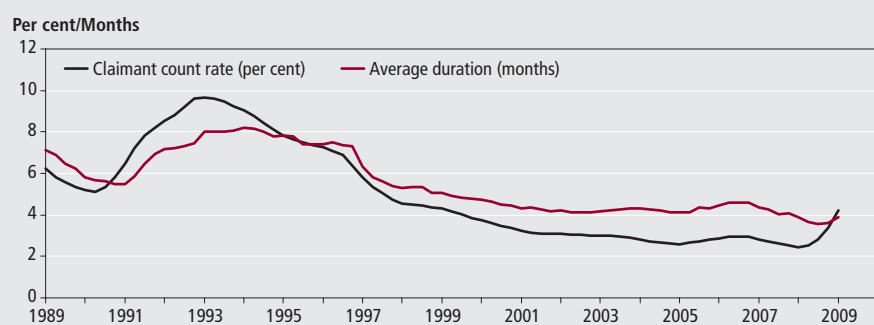
In the current economic climate, there is a heightened interest in the effect of the recession on the labour market. The downturn in the economy has led to an increase in unemployment. Of particular concern is the increase in long-term unemployment which is associated not only with a loss of current income but also inflicts longer term effects through increased future incidence of unemployment, lower job tenure and reduced earnings (Arulampalam (2001) and Gregory and Jukes (2001)). These 'scarring effects' can occur where the skills of unemployed individuals depreciate whilst they are unemployed or where potential employers view long spells of unemployment as a signal of a low quality worker.

Changes in the stock of unemployed workers are determined by the relative flows of individuals into and out of unemployment. Thus an increase in the

number unemployed workers can be attributed to either an increase in the rate that individuals become unemployed or a decrease in the rate that they leave unemployment. A lower outflow than inflow rate will mean that on average people remain in unemployment for longer.

Figure 1 illustrates the relationship between the stock and steady state average duration of the claimant count in the UK (which measures the number of people claiming unemployment related benefit). The steady state average duration of claimants in the UK was calculated using the method of Layard (2005). Over the past 20 years, the aggregate claimant count has shown substantial variability. The average duration of claims has followed a similar path, but lagged peaks and troughs of the aggregate count. This suggests that changes in the average duration of claimants contribute to explaining the claimant rate.

Figure 1
UK claimant count rate and average duration¹



Note:

Source: Office for National Statistics

¹ Claimant count rate = claimant count / (claimant count + workforce jobs). The average duration is calculated using ONS source data

Although the unemployment rate measured using International Labour Organisation (ILO) is different to the claimant count, the average duration of unemployment will influence the unemployment level and rate in a similar way.

It is therefore useful for policy design purposes to analyse the factors influencing the length of unemployment spells. For example, if individuals with specific characteristics are associated with longer unemployment durations, policy could be targeted at assisting these groups with job search. However, if wider macroeconomic conditions are found to be more relevant in explaining re-employment probabilities, the targeting policy described above, whilst changing the position of individuals in the conceptual queue of jobseekers, will have limited impact on the aggregate unemployment rate (Imbens and Lynch (2006)). The analysis used in this article controls for the effect of macroeconomic conditions using the regional claimant count rate (which is different but related to the unemployment rate) and furthermore investigates changes in the magnitude of any such effects over a spell of unemployment (as measured by the BHPS).

Theoretical background

Job search theory is the primary theoretical framework used by economists for analysing the determinants of unemployment durations. At the most basic level job search theory holds that, when an individual becomes unemployed, their probability of re-employment is equal to their probability of receiving a job offer multiplied by the probability of the individual accepting it. Factors likely to determine the offer of a job include an individual's education and skills, search intensity and the demand conditions in the appropriate labour market they are searching in. The probability that an individual accepts a job offer is determined by their reservation wage. This is the minimum wage at which an individual is willing to supply their labour. Factors likely to affect this include the expected wage distribution in their segment of the labour market, family composition (i.e. whether they have children or their spouse works), unemployment income, for example job seekers allowance and job search costs.

The effect of the unemployment rate on the probability of re-employment is theoretically ambiguous. Whilst an increase in aggregate unemployment is likely to reduce an individual's probability

of receiving a job offer, it is also likely to reduce their reservation wage by lowering their expectation of the wage distribution. Determining the net effect is, therefore, a matter of empirical investigation.

An important feature of interest when analysing unemployment experiences is the nature of duration dependence. That is, how the probability of exiting unemployment changes over the length of an unemployment spell. Negative duration dependence occurs when the probability of exiting unemployment falls as the duration of the spell increases. The model developed for this article was primarily constructed to investigate this relationship.

The ranking model of Blanchard and Diamond (1994) predicts negative dependence duration. In this model, when firms receive multiple applications for a vacancy, they use the workers' unemployment spell length to rank individuals, assuming that it is a good proxy for unobserved differences in skills between individuals. In a depressed labour market, when the number of applications per vacancy is high, there is a greater likelihood of there being someone with a shorter spell length applying for the same job. Conversely, when the labour market is relatively tight, the likelihood of there being an individual applying for the same job with a shorter duration is lower. This generates the empirical prediction that individuals with long unemployment spells are more affected by an increase in the unemployment rate than those with relatively shorter durations. Put another way, those with lengthy unemployment durations are damaged more by an increase in the unemployment rate than those with relatively short unemployment spells.

Description of the data

The primary data source used in this analysis is the British Household Panel Survey (BHPS). This, nationally representative sample, is a rich panel dataset of approximately 10,000 households, comprising 17 waves of information at both individual and household level. For more information on this source see Taylor et al (2009). The sample used in this study spans the period January 1991 to January 2006 and contains information on 3,959 spells of unemployment for 2,368 individuals. Additionally, for the relevant period, RPI and regional monthly claimant count data are used.

Only males are considered in this analysis due to the difficulties in constructing accurate work life histories for women. The

sample is further restricted to exclude males under the age of 18 and males who turn 60 during the sample period. This is because attachment to the labour market is typically weak for those aged below 18 and the need to abstract from the retirement decision, which may play a role for individuals turning 60. To illustrate the first of these points, consider the case of a 16 year old male that has recently left school. It is not clear to the researcher whether he has started his job search activity, is having a gap year or is living at home with his parents.

Alternative data sources on unemployment spells such as the Joint Unemployment and Vacancy Operating System used to produce the claimant count (JUVOS) and the Labour Force Survey (LFS) are also available. Both of these are preferable to the BHPS in terms of sample size. Additionally JUVOS, in being an administrative data source, provides more reliable data on income and industry variables. However, these alternative sources have their own drawbacks. The LFS lacks information on individuals' income whilst unemployed, and JUVOS lacks detailed information on individual characteristics such as educational attainment and housing tenure. Since survival analysis models are particularly sensitive to unobserved differences in individuals' characteristics, the BHPS is the preferred data source for this study.

A flow sample selection was used, so that an individual enters the sample when they become unemployed and remain in the sample until they exit to employment. This means that unemployment spells resulting in exit to inactivity, retirement or self-employment are not considered in this study. A weakness of the BHPS is that it is not administrative in nature. This means that the information gathered is based largely on self reporting. Since the definition of unemployment used in this study is based on the BHPS and a different subset of the male population to the LFS, it is not consistent with that of the International Labour Organisation (ILO). In addition, the regional rather than national claimant count rate is used to control for cyclical labour market effects. This is because it may not be possible to distinguish between the effect of the national claimant count rate and dependence duration.

A preliminary examination of the data reveals that of those individuals who entered unemployment over the period 1991 to 1992, 23 per cent remained unemployed after 12 months. In contrast,

the corresponding figure for those who entered unemployment between 2004 and 2005 is just 5 per cent. This is suggestive of a marked disparity in the unemployment experience of those who become unemployed in a recession and those who become unemployed during an economic upturn

Modelling the unemployment durations

Central to modelling the determinants of the length of unemployment spells is the estimation of the conditional probability of an individual exiting unemployment. This is the probability that an individual will exit unemployment in the next period, conditional on being unemployed up until that period. This is commonly referred to as the hazard function. This is estimated using techniques from a branch of statistical methods known as survival analysis. Readers are referred to the technical note for a detailed exposition of this modelling technique.

Whilst other forms of the hazard function exist, this study adopts the discrete time proportional hazards model of Cox (1972) because of the flexibility and convenience of interpretation that it offers. The analogous continuous time hazard function for the i^{th} individual is parameterised as:

$$\theta_{it} = \lambda_t \exp[X_{it}'\beta] \quad (1)$$

where θ_{it} is the conditional hazard, λ_t is the baseline hazard, X_{it} is a vector of individual specific explanatory variables (some of which may vary over time e.g. regional unemployment rate, marital status) and β is a vector of parameters to be estimated.

The baseline hazard is a function of the elapsed spell duration alone and can be thought of as the hazard function in the case where there are no covariates. Its parameter characterises the pattern of dependence duration i.e. how the conditional probability of exit changes with the elapsed length of the spell. A more detailed exposition of the model can be found in the technical note.

A proportionality assumption implies that the hazard function is multiplicatively separable in elapsed duration and the group of covariates. This essentially amounts to the assumption that the conditional hazard function is proportional to the baseline hazard by a scaling factor, $\exp[X_{it}'\beta]$. This representation is convenient since the estimated coefficients give the proportional change in the hazard associated with an absolute change in the corresponding

covariate. This proportional change is independent of time.

A further benefit of the proportional hazards model is that its consistent estimation does not require the parametric specification of a baseline hazard. Inconsistent parameter estimates may arise from a fully parametric model if any part of it is misspecified. Instead this study allows for a more flexible specification of the baseline hazard. Specifically, it takes a piecewise constant form so that the baseline hazard is assumed constant during each interval, but is allowed to vary between them. This allows for observation of the shape of the baseline hazard without constraining it to a specific functional form.

Unobserved differences between individuals pose a problem in survival modelling. If ignored, they can bias the results towards negative duration dependence. This is due to a composition effect. As an example consider a group of individuals who have a characteristic which lowers their employment probability. On average this group will have a lower probability of exit, relative to the rest the sample. As time goes on the sample will increasingly consist of individuals from this group and so the average probability of re-employment for the whole sample will diminish with time. If the characteristic is unobservable it will erroneously appear to the researcher that the probability of exit for a given individual is declining in the length of their unemployment spell. Additionally, Lancaster & Nickell (1980) showed that the presence of unobserved differences between individuals will artificially reduce the proportional effect of a change in a covariate. Moreover, the proportional effect will no longer be constant or independent of time. The model used in this study assumes unobserved differences can be represented using a normally distributed error term, the effects of which are

integrated out. Readers are directed to the technical note for a more thorough explanation of this technique.

Results

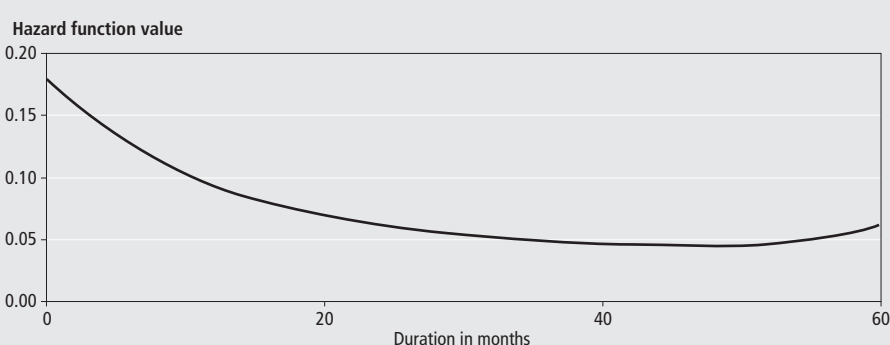
The results of the estimation are summarised in **Table 1** and the estimated baseline hazard function is illustrated in **Figure 2**. The hazard function shows probability of exit without taking into account the effect of any variables other than elapsed duration and for which no parametric form has been specified. Figure 2 shows a hazard function which is decreasing in elapsed spell duration until approximately the 50th month, after which the conditional probability of exiting unemployment is gently increasing in duration. The estimated hazard function is consistent with the hypothesis of duration dependence whereby the probability of exiting unemployment falls as the unemployment spell gets longer. The increasing probability of exit after the 50th month may be due to discouraged workers leaving the labour market, moving from unemployment to inactivity – the ‘discouraged worker’ effect.

Table 1 presents the results of the discrete-time analogue Cox’s proportional hazard model described. The coefficients associated with the explanatory variables are listed along with their degrees of significance and standard errors. It is mainly the statistically significant results at the one and five per cent level that are discussed in the section that follows.

Personal characteristics

Age is found to have a negative effect on the conditional probability of leaving unemployment. When all other things are held equal, married men are 33 per cent more likely to exit unemployment than unmarried men. This could be rationalised in the context of job search theory as increasing an individual’s probability

Figure 2
Lowest smoothed estimate of interval hazard function



Source: Author's estimates

Table 1
Results of discrete-time analogue Cox's proportional hazard model

	Coefficient ¹	Standard Error
Elapsed Duration (months) < 7	0.353**	0.329
6 < Elapsed duration (months) < 13	0.522	0.343
12 < Elapsed duration (months) < 19	0.634	0.377
18 < Elapsed duration (months) < 25	0.981	0.412
24 < Elapsed duration (months) < 31	1.634	0.492
30 < Elapsed duration (months) < 37	0.840	0.527
36 < Elapsed duration (months) < 43	0.982	0.531
42 < Elapsed duration (months) < 49	1.022	0.542
48 < Elapsed duration (months) < 55	1.072	0.570
54 < Elapsed duration (months) < 60	1.330	0.599
² Regional claimant count rate × (13 > elapsed duration > 6 months)	0.929**	0.019
Regional claimant count rate × (19 > elapsed duration > 12 months)	0.905**	0.029
Regional claimant count rate × (25 > elapsed duration > 18 months)	0.878**	0.039
Regional claimant count rate × (31 > elapsed duration > 24 months)	0.805**	0.058
Regional claimant count rate × (elapsed duration > 30 months)	0.885*	0.056
Regional claimant count rate	0.993	0.023
Age (in months at start of spell)	0.998**	0.000
Married	1.327**	0.075
Has dependent children	0.877	0.069
Member of ethnic minority	1.028	(0.101)
Post introduction of New Deal	0.624**	0.131
Post introduction of National Minimum Wage	0.642**	0.132
No. of previous unemployment spells	1.025	0.017
Replacement ratio	0.670**	0.127
Highest Educational Qualification:		
A Level	1.215**	0.075
Further education	1.037	0.150
Degree (or higher)	1.266*	0.102
Housing tenure:		
Home owned outright	1.117	0.257
Home owned with mortgage	1.273**	0.001
Council rented	0.682**	0.000
Occupational Group of Previous Job:		
Managers & administrators	1.275*	0.115
Professional occupations	1.268	0.152
Associate professional & technical occupations	1.152	0.133
Clerical & secretarial occupations	1.215*	0.095
Craft & related occupations	1.144	0.076
Personal & protective service occupations	1.280*	0.098
Sales occupations	1.156	0.104
Plant and machine operatives	1.154	0.077
Father's Occupational Group:		
Managers & administrators	0.937	0.659
Professional occupations	0.955	0.827
Associate professional & technical occupations	1.245	0.358
Clerical & secretarial occupations	1.319	0.245
Craft & related occupations	0.790*	0.029
Personal & protective service occupations	0.813	0.370
Sales occupations	1.240	0.441
Plant and machine operatives	0.900	0.399
Region:		
Inner & Outer London	0.956	0.137
South West	0.817	0.131
East Anglia	0.723*	0.161
East Midlands	0.852	0.119
West Midlands	0.889	0.132
Tyne & Wear	0.764	0.182
North West	0.673**	0.120
Yorkshire & Humberside	0.908	0.131
Region of the North	0.810	0.182
Wales	0.547**	0.120
Scotland	0.655**	0.113
Northern Ireland	0.337**	0.170

Notes:

1 Exponentiated coefficients are reported with standard errors in parentheses.

2 Elasticities are calculated using the logged values of these coefficients.

* Denotes significance at the 5% level.

** Denotes significance at the 1% level.

Source: Author's estimates

of receiving an offer, insofar as positive attributes such as reliability are associated with being married. All other things equal, those with A Levels as their highest educational qualification have a hazard that is 22 per cent higher than those who left school aged 16. The corresponding figure for those with a degree is 27 per cent. This is unsurprising in light of the existence of positive returns to education and training. Ethnicity and the number of dependant children are not found to have a statistically significant effect. This latter result may be explained by the fact that unemployment benefits are generally adjusted for family size.

Labour market policy

When all other factors are kept equal, having an unemployment spell after the introduction of the national minimum wage is associated with a hazard that is 36 per cent lower than that of individuals who experience an unemployment spell before its introduction. Whilst this is consistent with the economic theory of a perfectly competitive labour market model, caution should be applied when interpreting this result. The variable used to control for the national minimum wage is relatively crude in its design and is merely comparing the labour market between two, approximately, eight year time spans. The New Deal was introduced just a year earlier and the variable which controls for it is constructed in the same way. These variables are therefore likely to be capturing wider structural changes in the UK labour market. To identify the true effect of the national minimum wage on re-employment probabilities a difference-in-difference approach such as that in Stewart (2004) would be more appropriate. A further point to consider is that the approach used in the current study only considers transitions from unemployment to employment. Where the effect of the minimum wage is concerned, analysing transitions between states such as low pay employment, high pay employment, unemployment and inactivity would be a more instructive exercise. For example, it may well be that the introduction of the national minimum wage has resulted in individuals who were previously discouraged re-entering the labour market. Analysis of this type is carried out using competing risks models.

An incremental previous unemployment spell is found to increase the hazard of leaving unemployment by three per cent, all other things equal. This previous unemployment spell variable is likely to be

capturing attachment to the labour market. For example, individuals who have just left education, and therefore have no previous unemployment spells, are likely to have lower attachment than those individuals who have 20 years work experience and, therefore, have likely experienced a spell of unemployment before.

A person's income whilst unemployed as a proportion of their income whilst in employment is defined as their replacement ratio. The results show that a unit increase in the replacement ratio is associated with a hazard rate that is 33 per cent lower than its previous value. Evaluated at its mean, a 10 per cent increase in the replacement ratio is associated with a 3.5 per cent decrease in the probability of exiting unemployment. To help conceptualise this, when all variables are at their means a £3 increase in income whilst unemployed is associated with a decrease in the hazard of 0.35 units. Therefore, whilst there is a negative impact associated with unemployment income (which includes benefits, investments and pensions income), the probability of exit is relatively inelastic to it. This is likely to be reflecting that fact that the replacement ratio does not take account of sources of wealth such as savings which an individual may live off whilst unemployed.

Region and access

When all other factors are held equal, those residing in the East Anglia, the North West, Wales, Scotland and Northern Ireland are all found to have a significantly lower hazard relative to those living in the South East. The greatest of these effects is for those people living in Northern Ireland who have a hazard rate that is just 34 per cent of that of identical individuals living in the South East. For Wales and Scotland the corresponding figures are 55 and 66 per cent, respectively. Living in local authority accommodation is associated with a hazard that is 32 per cent lower than that of individuals living in privately rented accommodation, all other things equal. Conversely owning a home with a mortgage is associated with a hazard 27 per cent higher than that of private renters, all else equal.

Occupation

Individuals whose previous job was in "Managers and Administrators", "Personal and Protective Services" and "Clerical and Secretarial" occupations all have a hazard that is higher than the lowest skilled occupational group and

statistically significant at the 5 per cent level. Individuals who work in "Personal and Protective Services" and "Managers and Administrators" have a hazard rate 28 per cent higher than individuals in the lowest skilled group with the same characteristics.

An individual's father's occupation is not found to have a statistically significant effect, with the exception of those individuals whose father's were in the "Craft and Related" occupations. These individuals, all other things equal, have a hazard that is 21 per cent lower than that of individual's whose fathers were in the lowest skilled occupational group.

Labour market conditions

Looking at the labour market variables, the regional claimant count rate is found to have a negative effect on the conditional probability of exit that is increasing in magnitude with elapsed duration. The response of the conditional probability of exit to a proportionate change in the regional claimant count rate is given by the elasticity of the hazard to the regional claimant count rate. When the regional claimant count rate is at its mean value, the elasticity of the hazard is constructed as follows: the logged value of the regional claimant count coefficient is added to the logged value of the coefficient variable for the relevant months of duration. This is then multiplied by the mean value of the regional claimant count to get the corresponding elasticity.

The results from this analysis show that when the regional claimant count is at its mean level, all other things equal, a 10 per cent increase in the regional claimant count rate is associated with a 2.1 per cent decrease in the hazard for individuals with durations between 7 and 12 months. In contrast for those with durations between 13 and 18 months, the corresponding reduction is 2.7 percent. The corresponding figures for those with elapsed durations between 19 and 24 months and 25 and 30 months are 3.5 per cent and 5.7 per cent respectively.

The implication of this result is that, all other things equal, individuals with long spells of unemployment are damaged more by increases in the claimant count rate than individuals with shorter spells. This is consistent with the ranking model in which potential employers rank applicants by their elapsed duration. Hence, for a given individual, an increase in the claimant count rate (as would an increase in the unemployment rate) increases

the likelihood that someone else applies for the same job. As stated previously, a rival applicant is more likely to have a shorter unemployment duration when the reference individual is in a long spell of unemployment than when they are in a relatively short one. In this way the reference individual is damaged more by an increase in the claimant rate when they are in a long term spell of unemployment. These results echo the empirical findings of Dynarski and Sheffrin (1990) for the US labour market.

Conclusions

The results of this study indicate that re-employment prospects are positively influenced by: being married, having A Levels or a degree, and owning a home with a mortgage. This is shown by the higher conditional probabilities of re-employment associated with these factors.

In contrast, living in Scotland, Wales, Northern Ireland, the North West and East Anglia is associated with a lower hazard of exit from unemployment, relative to those in the South East. Those in local authority accommodation also experience a lower conditional probability of exit.

The effect of a labour market downturn is not found to affect all individuals symmetrically. Specifically, the negative effect of an increase in the unemployment rate is amplified as the length of an individual's unemployment duration increases. This suggests a role for government policy in preventing individuals from losing contact with the labour market. This is because it is these long term unemployed individuals whose re-employment prospects suffer most from a labour market downturn.

ACKNOWLEDGEMENTS

The author would like Richard Jones for his help and advice.

CONTACT

✉ elmr@ons.gsi.gov.uk

REFERENCES

- Arulampalam, W. (2001), "Is Unemployment Really Scarring? Effects of Unemployment Experiences on Wages", *Economic Journal*, 111 (475), pp.F585-F606.
- Blanchard, O. J. and Diamond, P. (1994), "Ranking, Unemployment Duration and Wages", *Review of Economic Studies*, vol. 61, no. 3, pp. 417-434.

Cox, D., R. (1972), "Regression Models and Life-Tables", *Journal of the Royal Statistical Society, Series B*, vol. 34, no. 2, pp. 187-220.

Dynarski, M. and Sheffrin, S. M. (1990), "The Behaviour of Unemployment Durations over the Cycle", *The Review of Economics and Statistics*, vol. 72, pp. 350-356.

Gregory, M. and R. Jukes (2001), "Unemployment and Subsequent Earnings: Estimating Scarring among British Men 1984-1994", *Economic Journal*, 111 (475), pp. F607-F625.

Imbens, G. W. and Lynch, L. M. (2006), "Re-employment Probabilities over the Business Cycle", *Portuguese Economic Journal*, vol. 5, pp. 111-134.

Jenkins, S., P. (1998), "Discrete Time Proportional Hazards Regression", *Stata Technical Bulletin*, vol. 7, no. 39, pp. 22-32.

Lancaster, T. (1979), "Econometric Methods for the Duration of Unemployment", *Econometrica*, vol. 47, no. 4, pp. 940-956.

Layard, R., Nickell, S. and Jackman, R. (2005), *Unemployment: Macroeconomic Performance and the Labour Market*, Oxford University Press, New York.

Lancaster, T. and Nickell, S. (1980), "The Analysis of Re-employment Probabilities for the unemployed", *Journal of the Royal Statistical Society, Series A*, vol. 143, part. 2, pp. 141-165.

Stewart, M. B. (2004). "The Impact of the Introduction of the U.K Minimum Wage on the Employment Probabilities of Low Wage Workers", *Journal of the European Economic Association*, volume 2, no. 1, pp.67-97.

Taylor, Marcia Freed (ed). with John Brice, Nick Buck and Elaine Prentice-Lane (2009) *British Household Panel Survey User Manual Volume A: Introduction, Technical Report and Appendices*. Colchester: University of Essex.

TECHNICAL NOTE

Survival analysis

The statistical technique of survival analysis is used to model individuals' conditional probability of exit to employment. The approach was originally developed in the biomedical literature and was used to measure a patient's probability of survival, conditional on their treatment type and other individual specific factors. It has since been adapted to many other contexts in which the probability of transitions between states is analysed.

The model used in this study is the discrete time analogue of the continuous time proportional hazards model. The discrete time version is adopted owing to the inability to observe the exact time of exit for the individuals in the sample. Instead unemployment durations are measured in terms of the month the spell began and the month in which the spell ended.

The following specification of the continuous time model is based on that of Jenkins (1998). In the basic model the continuous time hazard rate, at time $t > 0$ for the i^{th} individual is parameterised as:

$$\theta_{it} = \lambda_t \exp[X_{it}'\beta]$$

where $i = 1, \dots, N$ indexes individuals who enter the state of unemployment at time $t=0$, λ_t denotes the baseline hazard at time t , β is a vector of parameters to be estimated and X_{it} is a vector of explanatory variables for the i^{th} individual, some of which are time variant. The corresponding survivor function is given by:

$$S(t | X_{it}) = \exp\{-\exp[X_{it}'\beta + \rho_t]\}$$

where $\rho_t = \ln \int_0^t \lambda(u) du$ (which is the integrated baseline hazard at time t).

Unobserved heterogeneity

As mentioned in the main body of this article, unobserved differences between individuals, if left unaccounted for, can bias results. Lancaster (1979) provides a full exposition of these effects. In order to guard against this, the hazard rate in the continuous time context is altered as follows. Unobserved heterogeneity is assumed to be analogous to omitted variables and is represented by a multiplicative random error term, v . This is assumed to take on only positive values, have finite variance σ^2 and, for identification purposes, have a mean normalised to unity. We additionally require v to be independent of both x_i and t . In this case the parameterisation of the continuous time hazard for the i^{th} individual is given by:

$$\begin{aligned}\Omega_{it} &= \lambda_t \exp[X_{it}'\beta]v_i \\ &= \lambda_t \exp[X_{it}'\beta + \varepsilon_i]\end{aligned}$$

where $\varepsilon = \ln(v)$ is a random error term with mean zero.

We are unable to write down the likelihood contribution of each individual because v is, by definition, unobservable. In order to estimate the model it is therefore necessary to specify a form for the distribution of v in terms of parameters to be estimated. This allows the survival and density functions to be written in a way that doesn't condition on ε . Theoretically, any distribution with a positive support, finite variance and unit mean is appropriate (Jenkins (1998)). In this study it is assumed that v is normally distributed. Since there is no closed form expression available for the survivor and density functions and, therefore, the likelihood contributions the effects of unobserved heterogeneity are integrated out using numerical quadrature techniques.

ARTICLE

Mark Chandler
Office for National Statistics

An economic approach to the measurement of growth in the output of public services

SUMMARY

This article explores the application of economic theory to the measurement of growth in public service output. This approach is designed to take account of changes in the quality of the output. The article discusses two alternative economic approaches; the basic expenditure determinants approach and the use of outcome production functions. The article demonstrates how the approaches could work in practice with a hypothetical example of expenditure and outcome production functions for police services. The findings of the article will be discussed further with stakeholders before being taken forward for use in UKCeMGA's work on the productivity of public services.

Introduction

This article explores the application of economic theory to the measurement of growth in public service output. This approach is designed to take account of changes in the quality of the output.

The Atkinson Review (Atkinson 2005) argued that public service output should “be measured in a way that is adjusted for quality, taking account of the attributable incremental contribution of the service to the outcome”.

In 2007 UKCeMGA set out a more detailed strategy for the implementation of the Atkinson recommendations (ONS 2007). This discussed two key dimensions of quality; the extent to which the service succeeds in delivering outcomes and the extent to which the service is responsive to users' needs. It pointed to ‘capacity to benefit’ as a useful way of taking account of users' needs. However, it also called for further work to establish “a set of robust methodological principles”.

This agenda was taken further forward in 2008 with the publication of *Adjusting Measures of Public Service Output for Quality of Service* (ONS 2008). This paper described the variety of statistical techniques available for quality adjusting output measures. It pointed to the necessity to decide on weights to combine different elements of quality together with activity measures and noted the need for more work on the attribution issue raised by Atkinson.

This article aims to explore the attribution issue by demonstrating how economic theory deals with it and suggesting how

this theory can be deployed in practice to provide quality adjusted output measures. The initial goal is measures that are appropriate for use in estimates of public service productivity. This could eventually lead to their inclusion as part of national accounts volume measures of expenditure and output. The article discusses two alternative economic approaches; the basic expenditure determinants approach and the use of outcome production functions.

The cost-weighted activity index

Economic theory evaluates a change in the volume of output by the change in expenditure required to purchase it, removing the effect of price changes. Following this principle, growth in the volume of output in national accounts is currently calculated based on a Laspeyres index. The Laspeyres quantity index is the total cost of achieving current outputs at prices of the previous period divided by the total cost of outputs in the previous period. Algebraically the Laspeyres index gives the growth factor between year 0 and year 1 as

$$L = \frac{\sum_i p_i^0 q_i^1}{\sum_i p_i^0 q_i^0}$$

where p are prices, q are outputs, the i subscript refers to the good or service and superscripts refer to the time period.

One problem with implementing this in practice is that it requires price and

quantity information from every vendor. To overcome this in the market sector the Laspeyres quantity index is calculated indirectly by deflating expenditure growth by a price index based on a survey. Another problem is that it requires price and quantity information about every differentiated product or service in the economy. Therefore normally, as an approximation, goods are grouped into categories with a quantity and average price for each. However, this creates an error if within categories the mix of products with different characteristics and prices changes from one period to the next. One method used to overcome this is hedonic regression (Triplett 2004, Ball and Allen 2003).

When the standard national accounts methodology is applied to public sector services there are no market prices and not even any well defined outputs. Hence, national statistical institutes have turned to counts of activities, such as surgical procedures in healthcare, to proxy outputs and to unit costs to proxy prices. The resulting index of public service volume is therefore a cost-weighted activity index. The use of unit costs as weights is logically consistent if marginal benefits from public services are proportional to unit costs just as economic theory predicts marginal benefits of goods and services are proportional to prices in the market sector. This proportionality will be maintained only if the distortion caused by the difference between the level of service provided by the public sector and the consumption optimum is constant across services. A further problem with this type of index is that it falls when quality improvement reduces the amount of activity necessary to achieve a given outcome (Eurostat 2001). Hence it may both under record output growth and fail to capture a potentially significant driver of productivity change.

The basic expenditure determinants approach

Hedonic regression equations have been used in the market sector as a way to take account of shifts in the mix of products contained within product categories without needing to disaggregate the categories further. Where there are a sufficient number of varieties of a product sold in a market at the same time, data on the characteristics and price of each variety can be used to estimate the relationship between them. The estimated equation can then be used to predict how much price changes as a result of variation in any of the characteristics. The proportionate difference

between the prices of two items from the same product line that is due to differences in their mix of characteristics can then be taken to be the proportionate difference in volume of output represented by a unit of each of the two items.

The hedonic approach has been used in the national accounts of various countries. Salient examples of past applications include personal computers and housing. For example the price of personal computers may depend on the size of their hard drive, the size of their RAM and the types of input and output devices built in to them. If the estimated equation predicts that computer A's price is 20 per cent higher than computer B's due to computer A's superior mix of characteristics, then a unit of computer A is counted as 1.2 units of computer B when estimating growth in the volume of output for national accounts. In practice this is done by adjusting the price deflators used to deflate expenditure growth.

In *A Review of the Atkinson Review* (Murray 2005) Richard Murray proposed applying hedonic regression to the cost of public services as a way to capture quality change. If a public service's unit costs increase by 20 per cent between two years solely due to increases in quality characteristics it may be considered that a unit of public service in the second year is equivalent to 1.2 units of public service from the first year. This approach makes the assumption that the differences in expenditure reflect the willingness to pay of the legislature or of wider society. The problem is how to measure the quality characteristics and how to estimate how much extra they 'ought' to cost.

One difficulty with making this application to the public sector stems from the data available (OECD 2008). Typically, measured variations in expenditure across public sector production will pertain to geographically defined delivery units. As a result we can only observe regional bundles of activity and unpicking how much of the variation in expenditure is due to different quality characteristics and how much to regional cost variables is not straightforward. Hence, estimation of expenditure determination for the public sector is more complicated than for the private sector and needs to take account of the supply side determinants of cost. These can be further divided into those that affect

- i. input costs, e.g. regional variations in average wage;

- ii. the ability to achieve the measured quality characteristics, e.g. rurality and capacity to benefit;
- iii. the degree to which the level of public service provided differs from that demanded.

The method has the following steps:

- i. Obtain the regression coefficients from regressions of expenditure on quantity and quality characteristics of the public service and control variables to reflect needs or other environmental factors using cross sectional data.
- ii. The percentage change in quality adjusted output is found by a Laspeyres index in which the quantity and quality public service variables from each period are weighted by the cost weights from the base period expenditure function.

Example: police service quality

- i. Obtain the regression coefficients from regressions of police authority expenditure per head of police authority population on data for service indicators such as person-hours of police time on patrol per head of police authority population, quality indicators such as the proportion of emergency calls attended to in less than 5 minutes and other socio-economic characteristics of the police authority areas. Suppose the coefficient on police patrol is 40, i.e. a one hour per head increase in police patrol time increased police authority expenditure by £40 per head on average and the coefficient on the speed of response variable is 50 so that a one percentage point increase in the proportion of emergency calls answered in under 5 minutes increases expenditure per head by £50.
- ii. Suppose from year 1 to year 2 the average person-hours of police time on patrol per head of population rises from 20 to 21 and the proportion of emergency calls attended to in less than 5 minutes rises from 70 per cent to 72 per cent. The increase in the two public service parameters combined with the cost weights gives a Laspeyres index of 1.033. Hence the estimate of quality adjusted output growth is 3.3 per cent.

A more detailed explanation of the calculations involved both for this example and the example in the next section is given in the technical annex.

Outcome production functions

The basic expenditure determinants approach can work well when there are quality indicators that are direct characteristics of the service received. However, other aspects of quality are less directly measured and only show up in indicators of outcomes such as life expectancy. Those outcomes will typically be influenced by other factors and the challenge becomes to attribute what part of recorded changes in outcome is due to changes in the quality of the public service received. This attribution can be done by estimating an outcome production function from a regression equation showing the relationship between an outcome and its determinants.

If direct quality characteristics of output are not observable it may be necessary to estimate a production function linking data on service inputs or processes to outcomes. This would enable use of richer data on the characteristics of services. Since outcomes can only be affected by inputs if they are contributing to output, this approach, while using input data, would still be measuring output.

Another reason for estimating outcome production functions, even if data on output characteristics is available, is that expenditure by the public sector service may not be at the minimum cost to achieve a certain outcome level. Economic theory predicts that consumers will spend as little as possible to achieve a certain level of satisfaction. However, households have no direct control over the level of public service outputs (Lynch 2008). Governments may be forced to pay more for outcomes than is technically feasible due to the bilateral monopoly nature of the supply-demand relationship. Public sector service delivery units vary both in their productive efficiency and in terms of the prices they pay for inputs. The range of efficiency in healthcare and education has been demonstrated by data envelopment analysis (Joumard et al 2008, Jacobs 2000, Sutherland et al 2007). Public sector bureaux may also be able to use their information advantage to obtain funding for activity with low marginal impact on outcomes (Niskanen 1971). This means that even increases in expenditure driven by higher levels of activity can lead to lower outcomes.

The above considerations mean that for public sector services it may be preferable to obtain the base period expenditure used in the output index by deriving the minimum expenditure required to achieve base period outcome rather than using

actual expenditure (Powell 2008). To derive this minimum expenditure we would need to estimate the outcome production function. In the numerator of the index instead of the combination of characteristics actually observed we would use the optimal combination of characteristics to achieve the predicted outcome in period 2, and find the expenditure implied by this combination at base period costs.

So the steps of this approach are:

- i. Obtain the regression coefficients from regressions of expenditure on quality characteristics of the public service and control variables to reflect needs or other environmental factors using cross sectional data.
- ii. Obtain the regression coefficients from regressions of the outcome indicator on its determinants, including public service activity levels, direct quality characteristics, inputs and environmental factors using cross sectional data.
- iii. Use the above two equations, estimated for year 1, to find the expenditure minimising combination of public service activity and characteristics to produce the outcome level predicted for period 1, given the levels of other determinants of outcome in year 1.
- iv. Use the above two equations, estimated for year 2, to find the expenditure minimising combination of public service activity and characteristics to produce the outcome level predicted for year 2, given the levels of other determinants of outcome in year 2.
- v. Use the optimal public service levels for year 1 and year 2, found in iii. and iv. above, together with their respective cost weights from the expenditure function estimated for year 1, to calculate a Laspeyres index for quality adjusted public service output.

Example: police service quality

- i. Let us continue with the same example as previously using the same expenditure function.
- ii. Suppose the prime outcome measure for police services is the proportion of reported crimes resulting in arrest. We now also use the regression coefficients from regressions of police authority data on the proportion of reported crimes resulting in arrest on the same public service variables as above and other relevant socio-economic characteristics of the police authority

areas. It will be useful to have results from logarithmic equations so that coefficients represent elasticities. Suppose the coefficient on police patrol is 0.3 so that a ten per cent increase in person-hours on patrol per head of population increases the arrest ratio by 3 per cent and the coefficient on speed of response is 0.6 so that a 10 per cent increase in the proportion of calls attended in under 5 minutes increases the arrest ratio by 6 per cent.

- iii. Given the initial public service levels of police patrol and 5 minute response are 20 hours and 70 per cent, respectively, we can find from the outcome production function there is an impact on outcome equivalent to a factor of 31.43. Running the Lagrangian optimisation procedure on the functions from i. and ii. in order to maintain this predicted impact on outcome, we can derive the optimal level of police patrol and 5 minute response in year 1 as 33.7 hours and 53.9 per cent, respectively.
- iv. In order to keep the example simple let us suppose in period 2 the expenditure and outcome production functions are unchanged from period 1. So, in this example, we can use the functions given in i. and ii. for period 2 as well as period 1. In year 2 the actual public service levels are 21 hours and 72 per cent and thus the predicted impact of public service on outcome is a factor of 32.44. Given this the optimal combination of public service levels in year 2 is 34.9 hours and 55.8 per cent.
- v. In the Laspeyres index we substitute the optimal values of police patrol and response time found in iii. and iv. together with the cost weights of 40 and 50, respectively, from the expenditure function. Thus the estimate of the growth of quality adjusted output is 3.6 per cent.

Implementation

The previous section describes an ideal estimate of quality adjusted output growth where the data available facilitates estimation in line with that called for by economic theory. In practice the feasibility of this approach rests upon identification of the relevant service characteristics and outcomes. This is not straightforward and thus judgements will have to be made about different specifications and the robustness of the results before they can be used in ONS measures of public service productivity. In addition stability across time and space of the expenditure

regressions and estimated outcome production functions will be important. If sufficiently stable, estimates of the required regression coefficients could be obtained from already existing literature rather than from new estimates generated specifically for this purpose. Preferably the literature would be surveyed in order to arrive at consensus estimates of the coefficients and to test their robustness across specifications. In practice there are likely to be a number of difficulties which appear individually or in combination across the different services.

It will usually be necessary for the estimates of the expenditure and outcome production functions to take account of the reverse causality relationship that typically exists between outcomes and the policy levers used to promote them. For example, a policy response may be to increase police patrol time in areas with low arrest rates. This may be taken account of through standard econometric approaches using instrumental variables or through experimental design (Heckman 2008). An alternative methodology would be to identify the minimum combinations of activities, characteristics and inputs required to achieve outcome levels through stochastic frontier analysis.

Another likely difficulty concerns the functional form of estimates of the expenditure function and of the outcome production function. In the examples above a linear estimate of the expenditure function was combined with a logarithmic estimate of the outcome production function and combining these gave rise to a well defined optimal level of public service. If the results available estimated both functions linearly the outcome production function coefficients would have to be converted to elasticities in order to find the optimal output levels for public service. In practice this is not difficult for point estimates and the method can proceed as above once this is done.

In some cases estimates of expenditure functions may be available but not estimates of outcome production functions. In this case the best that can be achieved is to use the estimated expenditure function to revert to the basic expenditure determinants approach. In other cases estimates of an outcome production function may be available but no estimate of an expenditure function. In this case it may be possible to make an assumption about the relationship between outcome and the minimum expenditure required to achieve it. If not then the best that will be available is to

revert to the current Laspeyres index based on observed activity levels.

It should be noted that the method may not require annual estimation of the outcome and expenditure functions. If sufficiently stable it may be sufficient to only update the coefficients periodically. The method does require annual observations of the variables that feed into the outcome and expenditure functions.

Most public services impact more than one outcome (Gueye and Malherbe 2008). There are two possible ways of handling this. The first is to disaggregate services into activities that only impact one outcome each. Then cost of changes in outcome can be combined additively like any other money measure. If it is not possible to separate out effects in this way data can be sought that reveals the consumers' trade-off between the different outcomes.

Some public services have important insurance or capability aspects or other significant outcomes that are difficult to measure (Anagboso and Spence 2009). And specifying the determination of outcomes may be very problematic in areas where the strategies of opposing combatants come into play. These areas will continue to be particularly challenging but the approaches suggested above may contribute to progress on measuring output for at least a portion of their expenditure.

Next steps

This article has set out an economic approach to quality adjustment of public service output growth data. It has demonstrated that it is possible to base quality adjusted output growth measures on a framework consistent with economic theory. Hence this article argues for the use of outcome production functions and expenditure functions estimated in the economic evaluation and other literature in order to provide robust estimates of quality adjusted output.

ONS will consult with stakeholders and all interested parties on the findings of this article and seek to build a consensus on appropriate applications of the methodology. Given that consensus it will experiment with quality adjustment based on the principles set out here for the purposes of developing measures that can be used in its work on the productivity of public services.

As part of the consultation this article will be presented at the ONS UKCeMGA and NIESR 'International Conference on Public Service Measurement' in Cardiff in November 2009.

ACKNOWLEDGEMENTS

The author is grateful for comments and discussion from Steve Almond, Tim Butler, Lewis Conn, Karen Hancock, Ilyas Malek, Richard Murray, Helen Patterson, Mike Phelps, Geoffrey Reed, Aileen Simkins, Peter Smith, Jack Triplett, Martin Weale, and John Wood. All remaining errors are the sole responsibility of the author.

CONTACT

✉ elmr@ons.gsi.gov.uk

REFERENCES

- Anagboso M and Spence A (2009). 'Measuring defence', *Economic and Labour Market Review* 3(1), January, p. 49 available at: <http://nswebcopy/cci/article.asp?ID=2104>
- Atkinson T (2005). 'Atkinson Review: Final Report. Measurement of Government Output and Productivity for the National Accounts', Palgrave Macmillan: Basingstoke, p. 55, available at: www.statistics.gov.uk/about/data/methodology/specific/PublicSector/atkinson/downloads/Atkinson_Report_Full.pdf
- Ball A and Allen A (2003). *The Introduction of Hedonic Regression Techniques for the Quality Adjustment of Computing Equipment in the Producer Prices Index (PPI) and Harmonised Index of Consumer Prices (HICP)*, Economic Trends 592: 30-36, available at: www.statistics.gov.uk/cci/article.asp?ID=290
- Eurostat (2001). *Handbook on Price and Volume Measures in National Accounts*, 2001 edition, Luxembourg, p 32, available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-41-01-543
- Gueye G and F Malherbe (2008): Harmonising volume measures for non-market services in the EU – lessons learned from the past and challenges ahead. Paper presented at the 30th general conference of the IARIW, Slovenia, 24-30 August 2008, p 7, available at: www.iariw.org/c2008.php
- Heckman J (2008). *Econometric Causality*, CEMMAP Working Paper CWP1/08, February, available at: www.cemmap.ac.uk/publications.php
- Jacobs R (2000). *Alternative Methods to Examine Hospital Efficiency: Data Envelopment Analysis and Stochastic Frontier Analysis*, Centre for Health Economics

Discussion Paper 177, available at:
www.york.ac.uk/inst/che/pdf/DP177.pdf

Journard I, Andre C, Nicq C and O Chatal (2008). *Health Status Determinants: Lifestyle, Environment, Health Care Resources and Efficiency*, OECD Economics Department Working Paper 627, available at:
<http://oberon.sourceoecd.org/vl=36556890/cl=18/nw=1/rpsv/workingpapers/18151973.htm>

Lynch R (2008): Measuring non-market activity in the national accounts – who is the customer? Paper presented at the 30th general conference of the IARIW, Slovenia, 24-30 August 2008, available at:
www.iariw.org/c2008.php

Murray R (2005). *A Review of the Atkinson Review*, Swedish Network for European Studies in Economics and Business Discussion Paper, p. 9, available at:
www.snee.org/publikationer_show_eng.asp?id=329

Niskanen W (1971). *Bureaucracy and Representative Government* (Chicago: Aldine-Atherton)

OECD (2008). *Toward Measuring the Volume of Health and Education Services*, 10 October, p 17, available at
[www.oilis.oecd.org/oilis/2008doc.nsf/linkTo/std-cstat-wpna\(2008\)12](http://www.oilis.oecd.org/oilis/2008doc.nsf/linkTo/std-cstat-wpna(2008)12)

ONS (2007). *Measuring Quality as Part of Public Service Output*, July, available at:
www.statistics.gov.uk/cci/article.asp?id=1831

ONS (2008). *Adjusting Measures of Public Service Output for Quality of Service*, June, available at:
www.statistics.gov.uk/cci/article.asp?ID=2018

Powell M (2008): Non-Market Hedonics for Measuring and Modelling: Applying Lessons from Price Statistics to Measuring and Monitoring Government Activity. Paper

presented at the 30th General Conference of the IARIW, Slovenia, 24-30 August, available at:
www.iariw.org/c2008.php

Sutherland D, Price R, Journard I and C Nicq (2007). *Performance Indicators for Public Spending Efficiency in Primary and Secondary Education*, OECD Economics Department Working Paper 546, available at:
<http://oberon.sourceoecd.org/vl=36556890/cl=18/nw=1/rpsv/workingpapers/18151973.htm>

Triplett J (2004). *Handbook on Hedonic Indexes and Quality Adjustments in Price Indexes: Special Application to Information Technology Products*, OECD Science, Technology and Industry Working Papers 2004/9, October, available at:
<http://oberon.sourceoecd.org/vl=36556890/cl=18/nw=1/rpsv/workingpapers/18151965.htm>

TECHNICAL NOTE:

Detailed explanation of calculations used in the examples

Basic expenditure determinants approach example

i. The cost of one hour of police patrol per head of police authority population was estimated as £40 and the cost of a one percentage point rise in the proportion of emergency calls attended to in less than 5 minutes was estimated as £50.

Hence, these are the base period weights for the Laspeyres index.

ii. In this example, patrol time rose from 20 to 21 and 5 minute response rose from 70 per cent to 72 per cent.

Hence the Laspeyres index is

$$L = \frac{40(21) + 50(72)}{40(20) + 50(70)} = 1.033$$

Hence the estimate of public service output growth is 3.3%.

Outcome production function example

i. Using the same expenditure function as above, total expenditure on policing is $40P + 50R$

where

P = hours of police patrol per head of police authority population

R = percentage of emergency calls attended to in less than 5 minutes.

ii. The estimated coefficients on the outcome production function are 0.3 for P and 0.6 for R . This implies an overall outcome equation given by

$$\log A = \beta_0 + \sum_{i=1}^n \beta_i \log S_i + 0.3 \log P + 0.6 \log R$$

where

A = proportion of reported crimes resulting in arrest

S_i = socio-economic control variables in the outcome production function

and the betas are estimated regression coefficients.

This can be expressed as

$$A = KP^{0.3}R^{0.6} \quad (1)$$

$$\text{where } K = e^{\beta_0} \prod_{i=1}^n S_i^{\beta_i}$$

iii. Given the expenditure and outcome functions in i. and ii. the Lagrangian function to minimise expenditure subject to outcome becomes

$$L = 40P + 50R + \lambda(\bar{A} - KP^{0.3}R^{0.6})$$

$$\frac{\partial L}{\partial P} = 40 - 0.3\lambda KP^{-0.7}R^{0.6} = 0 \quad (2)$$

$$\frac{\partial L}{\partial R} = 50 - 0.6\lambda KP^{0.3}R^{-0.4} = 0 \quad (3)$$

$$\frac{\partial L}{\partial \lambda} = \bar{A} - KP^{0.3}R^{0.6} = 0 \quad (4)$$

Dividing (2) by (3)

$$\frac{R}{2P} = \frac{4}{5} \Rightarrow R = 1.6P \quad (5)$$

Substituting into (4)

$$KP^{0.3}(1.6P)^{0.6} = \bar{A} \Rightarrow P = \left(\frac{\bar{A}}{1.6^{0.6}K} \right)^{1/0.9} \quad (6)$$

Initial outcome is given by

$$A = K20^{0.3}70^{0.6} = 31.432K \quad (7)$$

Thus the expenditure minimising levels of P and R in the initial period can now be found.

Substituting (7) into (6)

$$P = \left(\frac{31.432}{1.6^{0.6}} \right)^{1/0.9} = 33.70$$

And so from (5)

$$R = 53.92$$

Hence cost of delivering the same outcome in the initial period could have been reduced to

$$33.7 \times £40 + 53.9 \times £50 = £4,044$$

$$\text{iv. In year 2, } A = K21^{0.3}72^{0.6} = 32.439K$$

Given that the underlying expenditure and outcome production functions have not changed, in period 2 we can find the new optimal level of P by substituting the new predicted arrest rate into (6). Thus in period 2 we have

$$P = \left(\frac{32.439}{1.6^{0.6}} \right)^{1/0.9} = 34.90$$

And, from (5), $R = 55.85$.

v. Thus the Laspeyres index for the public service consisting of these two elements becomes

$$L = \frac{40(34.9) + 50(55.8)}{40(33.7) + 50(53.9)} = 1.036$$

And the growth rate of quality adjusted public service output is 3.6 per cent.

ARTICLE

Simon Woodsford
Office for National Statistics

Services Producer Price Indices (experimental) – Second quarter 2009

SUMMARY

The experimental Services Producer Price Indices (SPPI) are primarily a suite of individual price indices that provide information on price change for a limited range of service industries. Each SPPI captures quarterly changes in the price received for services provided by UK businesses to other UK businesses and Government. These individual price indices are also aggregated together to create a service industry (top-level) SPPI with limited coverage. This article shows the effects some industries are having on the top-level SPPI. The data produced are used internally by the Office for National Statistics as a deflator for the Index of Services and the quarterly measurement of gross domestic product. The index is also used by HM Treasury and the Bank of England to help monitor inflation in the economy.

Prices of business-to-business services fell 0.4 per cent in the year to the second quarter of 2009. This is based on a comparison of the change in the top-level Services Producer Price Index on the net sector basis.

Figure 1 shows how the percentage change for the top-level SPPI (net sector) compares with the retail prices index (RPI) all services sector, and the producer price index (PPI) for all manufactured goods (net sector).

The top-level results, on both gross and net sector bases, are shown in Table 1. In 2009 Q2, the top-level SPPI (net sector) rose by 0.1 per cent compared with the previous quarter.

Figure 2 depicts the SPPI annual percentage change for both the net and gross sector time series. The net SPPI fell 0.4 per cent in 2009 Q2, compared with a rise of 0.8 per cent in 2009 Q1. The gross SPPI fell 0.1

per cent in 2009 Q2, compared with a rise of 0.7 per cent in the previous quarter.

Industry-specific indices

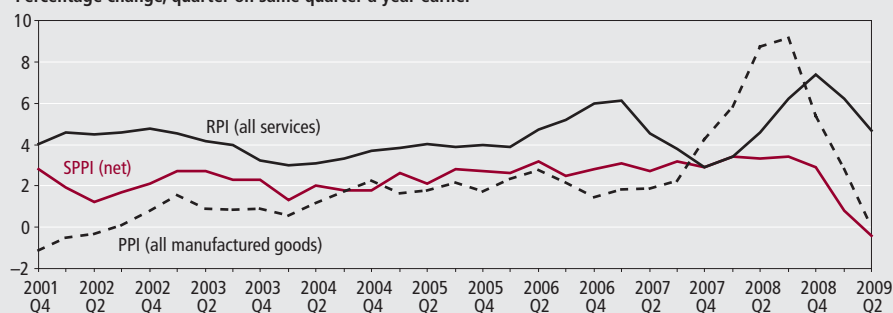
Tables available on the ONS website contain the data for the 31 industries for which indices of services producer prices are currently available. The weights for each industry index are shown at both gross and net sector levels. Comparing 2009 Q2 net sector price indices with 2009 Q1 the key points to note are:

- Freight forwarding fell 6.5 per cent, largely due to a fall in fuel cost compared to 12 months ago.
- Construction Plant Hire fell 5.2 per cent, mainly due to the current competitive market conditions.
- Sea and Coastal Freight fell 15.7 per cent, due to the current competitive market conditions.

Figure 1

Experimental top-level SPPI compared with the RPI and PPI

Percentage change, quarter on same quarter a year earlier



Source: Office for National Statistics

Table 1
SPPI results

	SPPI quarterly index values, 2005=100		Percentage change, quarter on same quarter a year earlier	
	Gross sector	Net sector	Gross sector	Net sector
2000 Q1	91.6	89.3	-0.9	1.0
2000 Q2	91.4	89.4	-0.1	1.4
2000 Q3	91.5	89.7	0.4	1.8
2000 Q4	91.6	90.0	0.4	1.6
2001 Q1	92.1	90.8	0.5	1.7
2001 Q2	93.6	92.2	2.4	3.1
2001 Q3	94.0	92.3	2.7	2.9
2001 Q4	94.2	92.5	2.8	2.8
2002 Q1	94.3	92.5	2.4	1.9
2002 Q2	95.2	93.3	1.7	1.2
2002 Q3	95.9	93.9	2.0	1.7
2002 Q4	96.1	94.4	2.0	2.1
2003 Q1	96.4	95.0	2.2	2.7
2003 Q2	97.1	95.8	2.0	2.7
2003 Q3	97.4	96.1	1.6	2.3
2003 Q4	97.9	96.6	1.9	2.3
2004 Q1	97.2	96.2	0.8	1.3
2004 Q2	98.6	97.7	1.5	2.0
2004 Q3	98.5	97.8	1.1	1.8
2004 Q4	98.8	98.3	0.9	1.8
2005 Q1	98.9	98.7	1.7	2.6
2005 Q2	99.8	99.8	1.2	2.1
2005 Q3	100.4	100.5	1.9	2.8
2005 Q4	100.9	101.0	2.1	2.7
2006 Q1	101.4	101.3	2.5	2.6
2006 Q2	102.7	103.0	2.9	3.2
2006 Q3	102.7	103.0	2.3	2.5
2006 Q4	103.1	103.8	2.2	2.8
2007 Q1	103.9	104.4	2.5	3.1
2007 Q2	105.3	105.8	2.5	2.7
2007 Q3	105.6	106.3	2.8	3.2
2007 Q4	106.0	106.8	2.8	2.9
2008 Q1	107.3	107.9	3.3	3.4
2008 Q2	108.3	109.3	2.8	3.3
2008 Q3	108.7	109.9	2.9	3.4
2008 Q4	108.7	109.9	2.5	2.9
2009 Q1	108.0	108.8	0.7	0.8
2009 Q2	108.2	108.9	-0.1	-0.4

Source: Office for National Statistics

These downward movements were partially offset by upward contributions, especially from Sewerage Services as reported by the Office of Water Services (Ofwat).

Next results

The next set of SPPI results will be published on 25 November 2009 on the National Statistics website at www.statistics.gov.uk/sppi

Further information

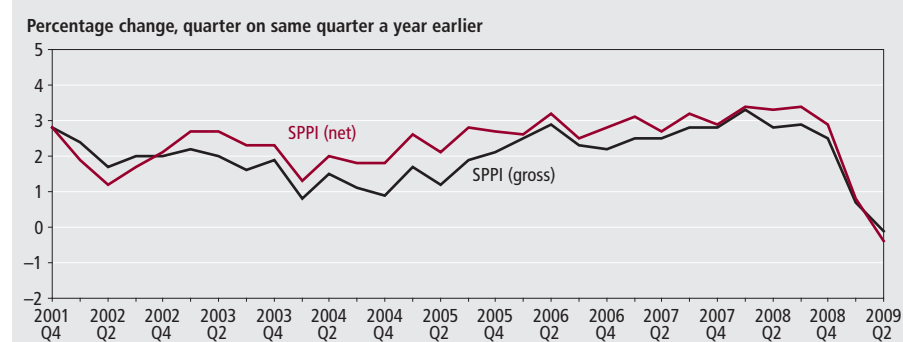
All SPPI tables and articles on the methodology and impact of rebasing the SPPI and the re-development of an index for business telecommunications (together with more general information on the SPPI) are available at www.statistics.gov.uk/sppi.

A Summary Quality Report for the SPPI can be found at: www.statistics.gov.uk/about/data/methodology/quality/information_business_statistics.asp

CONTACT

✉ elmr@ons.gsi.gov.uk

Figure 2
Experimental top-level SPPI



Source: Office for National Statistics

TECHNICAL NOTE

- 1 The experimental Services Producer Price Indices (SPPI) replaced the former Corporate Services Price Index (CSPI). The SPPIs are primarily a suite of individual price indices that provide information on price change for a limited range of service industries. Each SPPI captures quarterly changes in the price received for services provided by UK businesses to other UK businesses and Government. These individual price indices are also aggregated together to create a 'service industry' SPPI with limited coverage. It is not classified as a National Statistic.
- 2 Unless otherwise stated, index numbers shown in the main text are on a net sector basis. These relate only to transactions between the corporate services sector and other sectors. Detailed tables available on the ONS website also contain gross sector indices which include transactions within the corporate services sector.
- 3 Indices relate to average prices per quarter. The full effect of a price change occurring within a quarter will only be reflected in the index for the following quarter. All index numbers exclude VAT and are not seasonally adjusted.
- 4 SPPI inflation is the percentage change in the net sector index for the latest quarter compared with the corresponding quarter in the previous year.
- 5 Grants from the European Commission helped ONS to begin developing the SPPI. Funding of approximately 600,000 euros was awarded between 2002 and 2005. This has now ceased.
- 6 A number of external data sources are currently used in the compilation of the SPPI, as follows:
 - Investment Property Database (IPD) – property rental payments
 - Office of Communications (Ofcom) – business telecommunications
 - Office of Water Services (OFWAT) – sewerage services (prices are updated annually at quarter 2)
 - Parcelforce – national post parcels (prices are updated annually at quarter 2)
 - Office of Rail Regulation (ORR) – business rail fares (prices are updated annually at quarter 1)
 - Bank of England (BOE) – financial intermediation (Banks)
- 7 Following a quality review by ONS in January 2007 a decision was made to withdraw the Banking SPPI from publication. As a result the index has been re-developed and was re-introduced in Q3 2008. Under the re-development, the quality of the data collection and processing has been improved and the number of products included in the index has increased. However, the new index is not regarded as proxy for all Financial Intermediation services within the Standard Industrial Classification (SIC) 65. It has not therefore been included in the top-level SPPI. The services measured are classified to SIC 65.12/1, and are published as a separate index known as the "SPPI for Financial Intermediation (Banks)".
- 8 SPPI policy is to show significant revisions, but to suppress minor changes to avoid unnecessary inconvenience to users. Indices for the most recent two quarters are regarded as provisional and can be changed as later data become available. The National Statistics website contains information on the SPPI revisions policy:
www.statistics.gov.uk/about/methodology_by_theme/revisions_policies/default.asp.

Key time series

1 National accounts aggregates

Last updated: 29/09/09

Seasonally adjusted

	£ million		Indices (2005 = 100)						
	At current prices		Value indices at current prices		Chained volume indices			Implied deflators ³	
	Gross domestic product (GDP) at market prices	Gross value added (GVA) at basic prices	GDP at market prices ¹	GVA at basic prices	Gross national disposable income at market prices ²	GDP at market prices	GVA at basic prices	GDP at market prices	GVA at basic prices
	YBHA	ABML	YBEU	YBEX	YBFP	YBEZ	CGCE	YBGB	CGBV
2004	1,202,956	1,070,951	95.9	95.9	98.4	97.9	97.7	98.0	98.2
2005	1,254,058	1,116,648	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2006	1,325,795	1,181,141	105.7	105.8	101.7	102.9	103.0	102.8	102.7
2007	1,398,882	1,245,735	111.5	111.6	105.4	105.5	105.7	105.7	105.6
2008	1,448,054	1,298,497	115.5	116.3	106.7	106.1	106.3	108.9	109.4
2004 Q1	294,112	261,280	93.8	93.6	97.9	97.2	96.9	96.5	96.5
2004 Q2	299,142	265,977	95.4	95.3	98.0	97.8	97.6	97.6	97.6
2004 Q3	302,115	269,503	96.4	96.5	97.8	97.9	97.7	98.5	98.8
2004 Q4	307,587	274,191	98.1	98.2	100.0	98.7	98.5	99.5	99.7
2005 Q1	308,723	274,756	98.5	98.4	99.6	99.0	99.0	99.5	99.4
2005 Q2	313,479	279,258	100.0	100.0	101.1	99.7	99.7	100.3	100.3
2005 Q3	313,378	278,669	100.0	99.8	99.2	100.3	100.3	99.6	99.6
2005 Q4	318,478	283,965	101.6	101.7	100.0	101.0	101.0	100.6	100.7
2006 Q1	326,085	291,002	104.0	104.2	101.2	102.1	102.2	101.9	102.0
2006 Q2	327,836	291,886	104.6	104.6	101.5	102.5	102.6	102.0	101.9
2006 Q3	333,542	297,046	106.4	106.4	101.8	103.0	103.1	103.3	103.2
2006 Q4	338,332	301,207	107.9	107.9	102.3	103.8	104.0	103.9	103.8
2007 Q1	344,238	306,154	109.8	109.7	103.6	104.6	104.7	105.0	104.7
2007 Q2	348,010	309,585	111.0	110.9	104.7	105.2	105.4	105.5	105.2
2007 Q3	351,635	313,159	112.2	112.2	105.1	105.8	106.0	106.0	105.8
2007 Q4	354,999	316,837	113.2	113.5	108.0	106.3	106.6	106.5	106.5
2008 Q1	363,091	324,131	115.8	116.1	109.0	107.0	107.4	108.3	108.1
2008 Q2	363,228	323,898	115.9	116.0	107.9	106.9	107.3	108.4	108.1
2008 Q3	362,061	325,405	115.5	116.6	106.4	106.1	106.3	108.8	109.7
2008 Q4	359,674	325,063	114.7	116.4	103.7	104.2	104.3	110.1	111.6
2009 Q1	348,971	316,345	111.3	113.3	102.1	101.6	101.7	109.5	111.4
2009 Q2	346,951	314,330	110.7	112.6	99.2	101.0	101.1	109.5	111.4

Percentage change, quarter on corresponding quarter of previous year

			IHYO	ABML ⁴	YBGO ⁴	IHYR	ABMM ⁴	IHYU	ABML/ABMM ⁴
2004 Q1	5.7	5.4	5.7	5.4	3.0	3.6	3.4	2.0	1.9
2004 Q2	5.6	5.3	5.6	5.3	3.4	3.2	3.2	2.3	2.1
2004 Q3	5.2	5.4	5.2	5.4	2.5	2.6	2.6	2.6	2.8
2004 Q4	5.7	5.9	5.7	5.9	3.0	2.4	2.4	3.1	3.4
2005 Q1	5.0	5.2	5.0	5.2	1.8	1.8	2.1	3.1	3.0
2005 Q2	4.8	5.0	4.8	5.0	3.2	2.0	2.2	2.8	2.7
2005 Q3	3.7	3.4	3.7	3.4	1.4	2.5	2.6	1.2	0.7
2005 Q4	3.5	3.6	3.5	3.6	0.0	2.4	2.6	1.1	1.0
2006 Q1	5.6	5.9	5.6	5.9	1.6	3.2	3.2	2.4	2.6
2006 Q2	4.6	4.5	4.6	4.5	0.4	2.8	2.9	1.7	1.5
2006 Q3	6.4	6.6	6.4	6.6	2.6	2.7	2.9	3.7	3.6
2006 Q4	6.2	6.1	6.2	6.1	2.3	2.8	2.9	3.3	3.1
2007 Q1	5.6	5.2	5.6	5.2	2.3	2.4	2.5	3.1	2.7
2007 Q2	6.2	6.1	6.2	6.1	3.1	2.7	2.7	3.4	3.3
2007 Q3	5.4	5.4	5.4	5.4	3.3	2.7	2.8	2.6	2.5
2007 Q4	4.9	5.2	4.9	5.2	5.6	2.4	2.6	2.5	2.6
2008 Q1	5.5	5.9	5.4	5.9	5.3	2.2	2.6	3.1	3.2
2008 Q2	4.4	4.6	4.3	4.6	3.0	1.5	1.8	2.8	2.8
2008 Q3	3.0	3.9	3.0	3.9	1.2	0.3	0.3	2.6	3.6
2008 Q4	1.3	2.6	1.4	2.6	-4.0	-1.9	-2.2	3.4	4.9
2009 Q1	-3.9	-2.4	-3.9	-2.4	-6.3	-5.0	-5.3	1.2	3.0
2009 Q2	-4.5	-3.0	-4.5	-3.0	-8.1	-5.5	-5.8	1.1	3.0

Notes:

1 "Money GDP".

2 This series is only updated once a quarter, in line with the full quarterly national accounts data set.

3 Based on chained volume measures and current price estimates of expenditure components of GDP.

4 Derived from these identification (CDID) codes.

Source: Office for National Statistics

2 Gross domestic product: by category of expenditure

Last updated: 29/09/09

£ million, chained volume measures, reference year 2005, seasonally adjusted

	Domestic expenditure on goods and services at market prices											Gross domestic at product market prices
	Final consumption expenditure			Gross capital formation				Exports of goods and services	Gross final expenditure	less imports of goods and services	Statistical discrepancy (expenditure)	
	Households	Non-profit institutions ¹	General government	Gross fixed capital formation	Changes in inventories ²	Acquisitions less disposals of valuables	Total					
	ABJR	HAYO	NMRY	NPQT	CAFU	NPJR	YBIM	IKBK	ABMG	IKBL	GIXS	ABMI
2004	766,856	30,827	262,917	204,756	4,843	-39	1,270,173	306,582	1,576,497	348,894	0	1,227,387
2005	784,140	30,824	268,088	209,758	4,472	-377	1,296,905	330,794	1,627,699	373,641	0	1,254,058
2006	795,595	31,868	272,271	223,305	4,789	304	1,328,132	368,076	1,696,207	406,374	0	1,289,833
2007	815,157	30,040	275,488	240,613	6,646	562	1,368,506	357,677	1,726,183	403,341	0	1,322,842
2008	822,335	30,941	282,333	232,660	866	1,295	1,370,430	361,149	1,731,578	400,033	-1,428	1,330,118
2004 Q1	189,235	7,875	65,615	50,706	515	-113	314,855	74,389	389,121	84,284	0	304,784
2004 Q2	191,672	7,737	65,323	51,680	294	65	316,727	76,058	392,705	86,139	0	306,510
2004 Q3	192,642	7,664	65,746	51,351	953	8	317,863	76,895	394,700	87,840	0	306,806
2004 Q4	193,307	7,551	66,233	51,019	3,081	1	320,728	79,240	399,971	90,631	0	309,287
2005 Q1	194,294	7,745	66,418	51,092	2,978	-45	322,029	77,762	399,757	89,398	0	310,313
2005 Q2	195,610	7,676	66,986	51,273	2,025	90	323,588	80,830	404,405	91,846	0	312,550
2005 Q3	196,450	7,687	67,265	53,964	-251	-292	325,046	84,250	409,304	94,834	0	314,490
2005 Q4	197,786	7,716	67,419	53,429	-280	-130	326,242	87,952	414,233	97,563	0	316,705
2006 Q1	197,278	7,941	67,862	53,372	2,346	106	328,906	95,835	424,741	104,616	0	320,125
2006 Q2	199,392	8,025	67,692	54,499	63	241	329,912	97,932	427,844	106,555	0	321,289
2006 Q3	198,692	8,012	68,232	56,780	1,679	-30	333,365	86,854	420,220	97,364	0	322,855
2006 Q4	200,233	7,890	68,485	58,654	701	-13	335,949	87,455	423,402	97,839	0	325,564
2007 Q1	202,299	7,447	68,394	59,659	928	76	338,804	88,279	427,083	99,211	0	327,872
2007 Q2	203,492	7,413	68,650	59,620	-12	348	339,510	88,650	428,160	98,193	0	329,967
2007 Q3	204,321	7,471	69,165	59,777	3,130	45	343,909	90,348	434,256	102,647	0	331,609
2007 Q4	205,045	7,709	69,279	61,557	2,600	93	346,283	90,400	436,684	103,290	0	333,394
2008 Q1	206,760	7,721	69,838	59,347	3,390	212	347,268	91,126	438,394	102,734	-247	335,412
2008 Q2	206,485	7,815	70,365	59,635	725	436	345,462	91,839	437,302	101,811	-328	335,163
2008 Q3	205,766	7,752	70,714	57,462	640	366	342,701	90,933	433,635	100,503	-398	332,733
2008 Q4	203,324	7,653	71,416	56,216	-3,889	281	334,999	87,251	422,247	94,985	-455	326,810
2009 Q1	200,326	7,411	71,470	52,105	-5,171	279	326,421	81,065	407,485	88,320	-507	318,659
2009 Q2	199,128	7,223	71,896	49,378	-4,110	280	323,796	79,935	403,731	86,398	-543	316,790

Percentage change, quarter on corresponding quarter of previous year

	IHYR										
2004 Q1	3.4	1.6	4.7	3.8			4.4	0.2	3.5	3.3	3.6
2004 Q2	3.3	0.7	3.2	7.4			3.9	5.3	4.2	7.6	3.2
2004 Q3	3.2	-0.6	2.6	7.1			3.1	6.8	3.8	8.5	2.6
2004 Q4	3.0	-2.1	1.7	2.3			2.7	7.9	3.7	8.4	2.4
2005 Q1	2.7	-1.7	1.2	0.8			2.3	4.5	2.7	6.1	1.8
2005 Q2	2.1	-0.8	2.5	-0.8			2.2	6.3	3.0	6.6	2
2005 Q3	2.0	0.3	2.3	5.1			2.3	9.6	3.7	8.0	2.5
2005 Q4	2.3	2.2	1.8	4.7			1.7	11.0	3.6	7.6	2.4
2006 Q1	1.5	2.5	2.2	4.5			2.1	23.2	6.2	17.0	3.2
2006 Q2	1.9	4.5	1.1	6.3			2.0	21.2	5.8	16.0	2.8
2006 Q3	1.1	4.2	1.4	5.2			2.6	3.1	2.7	2.7	2.7
2006 Q4	1.2	2.3	1.6	9.8			3.0	-0.6	2.2	0.3	2.8
2007 Q1	2.5	-6.2	0.8	11.8			3.0	-7.9	0.6	-5.2	2.4
2007 Q2	2.1	-7.6	1.4	9.4			2.9	-9.5	0.1	-7.8	2.7
2007 Q3	2.8	-6.8	1.4	5.3			3.2	4.0	3.3	5.4	2.7
2007 Q4	2.4	-2.3	1.2	4.9			3.1	3.4	3.1	5.6	2.4
2008 Q1	2.2	3.7	2.1	-0.5			2.5	3.2	2.6	3.6	2.3
2008 Q2	1.5	5.4	2.5	0.0			1.8	3.6	2.1	3.7	1.6
2008 Q3	0.7	3.8	2.2	-3.9			-0.4	0.6	-0.1	-2.1	0.3
2008 Q4	-0.8	-0.7	3.1	-8.7			-3.3	-3.5	-3.3	-8.0	-2
2009 Q1	-3.1	-4.0	2.3	-12.2			-6.0	-11.0	-7.1	-14.0	-5
2009 Q2	-3.6	-7.6	2.2	-17.2			-6.3	-13.0	-7.7	-15.1	-5.5

Notes:

- 1 Non-profit institutions serving households (NPISH).
- 2 This series includes a quarterly alignment adjustment.

Source: Office for National Statistics

3 Labour market summary

Last updated: 16/09/09

United Kingdom (thousands), seasonally adjusted

All aged 16 and over									
	All	Total economically active	Total in employment	Unemployed	Economically inactive	Economic activity rate (%)	Employment rate (%)	Unemployment rate (%)	Economic inactivity rate (%)
	1	2	3	4	5	6	7	8	9
All persons	MGSL	MGSF	MGRZ	MGSC	MGSI	MGWG	MGSR	MGSX	YBTC
May-Jul 2007	48,654	30,845	29,199	1,646	17,810	63.4	60.0	5.3	36.6
May-Jul 2008	49,039	31,219	29,491	1,727	17,820	63.7	60.1	5.5	36.3
Aug-Oct 2008	49,141	31,241	29,377	1,864	17,900	63.6	59.8	6.0	36.4
Nov-Jan 2008	49,244	31,408	29,379	2,029	17,836	63.8	59.7	6.5	36.2
Feb-Apr 2009	49,347	31,369	29,108	2,261	17,978	63.6	59.0	7.2	36.4
May-Jul 2009	49,449	31,361	28,891	2,470	18,088	63.4	58.4	7.9	36.6
Male	MGSM	MMSG	MGSA	MGSD	MGSJ	MGWH	MGSS	MGSY	YBTD
May-Jul 2007	23,660	16,747	15,804	943	6,913	70.8	66.8	5.6	29.2
May-Jul 2008	23,881	16,940	15,920	1,019	6,941	70.9	66.7	6.0	29.1
Aug-Oct 2008	23,938	16,932	15,828	1,104	7,006	70.7	66.1	6.5	29.3
Nov-Jan 2008	23,995	17,034	15,816	1,218	6,961	71.0	65.9	7.1	29.0
Feb-Apr 2009	24,052	17,021	15,645	1,376	7,032	70.8	65.0	8.1	29.2
May-Jul 2009	24,109	16,987	15,461	1,526	7,123	70.5	64.1	9.0	29.5
Female	MGSN	MGSH	MGSB	MGSE	MGSK	MGWI	MGST	MGSZ	YBTE
May-Jul 2007	24,995	14,098	13,394	703	10,897	56.4	53.6	5.0	43.6
May-Jul 2008	25,158	14,279	13,571	708	10,879	56.8	53.9	5.0	43.2
Aug-Oct 2008	25,203	14,309	13,549	760	10,895	56.8	53.8	5.3	43.2
Nov-Jan 2008	25,249	14,374	13,563	811	10,875	56.9	53.7	5.6	43.1
Feb-Apr 2009	25,294	14,348	13,463	885	10,946	56.7	53.2	6.2	43.3
May-Jul 2009	25,340	14,375	13,430	945	10,965	56.7	53.0	6.6	43.3
All aged 16 to 59/64									
	All	Total economically active	Total in employment	Unemployed	Economically inactive	Economic activity rate (%)	Employment rate (%)	Unemployment rate (%)	Economic inactivity rate (%)
	10	11	12	13	14	15	16	17	18
All persons	YBTF	YBSK	YBSE	YBSH	YBSN	MGSO	MGSU	YBTI	YBTL
May-Jul 2007	37,560	29,601	27,981	1,620	7,959	78.8	74.5	5.5	21.2
May-Jul 2008	37,731	29,870	28,165	1,705	7,860	79.2	74.6	5.7	20.8
Aug-Oct 2008	37,782	29,883	28,047	1,836	7,899	79.1	74.2	6.1	20.9
Nov-Jan 2008	37,833	30,036	28,039	1,997	7,797	79.4	74.1	6.6	20.6
Feb-Apr 2009	37,884	29,995	27,766	2,229	7,889	79.2	73.3	7.4	20.8
May-Jul 2009	37,935	29,950	27,513	2,437	7,986	78.9	72.5	8.1	21.1
Male	YBTG	YBSL	YBSF	YBSI	YBSO	MGSP	MGSV	YBTJ	YBTM
May-Jul 2007	19,547	16,327	15,395	932	3,220	83.5	78.8	5.7	16.5
May-Jul 2008	19,684	16,486	15,476	1,010	3,198	83.8	78.6	6.1	16.2
Aug-Oct 2008	19,716	16,478	15,389	1,090	3,238	83.6	78.1	6.6	16.4
Nov-Jan 2008	19,748	16,575	15,368	1,206	3,173	83.9	77.8	7.3	16.1
Feb-Apr 2009	19,780	16,576	15,213	1,364	3,204	83.8	76.9	8.2	16.2
May-Jul 2009	19,813	16,532	15,023	1,509	3,281	83.4	75.8	9.1	16.6
Female	YBTH	YBSM	YBSG	YBSJ	YBSP	MGSQ	MGSW	YBTK	YBTN
May-Jul 2007	18,013	13,274	12,586	688	4,739	73.7	69.9	5.2	26.3
May-Jul 2008	18,047	13,384	12,689	696	4,663	74.2	70.3	5.2	25.8
Aug-Oct 2008	18,066	13,404	12,658	746	4,661	74.2	70.1	5.6	25.8
Nov-Jan 2008	18,085	13,461	12,671	790	4,624	74.4	70.1	5.9	25.6
Feb-Apr 2009	18,104	13,419	12,554	865	4,685	74.1	69.3	6.4	25.9
May-Jul 2009	18,123	13,418	12,489	929	4,705	74.0	68.9	6.9	26.0

Notes:

Relationship between columns: 1 = 2 + 5; 2 = 3 + 4; 6 = 2/1; 7 = 3/1; 8 = 4/2; 9 = 5/1; 10 = 11 + 14; 11 = 12 + 13; 15 = 11/10; 16 = 12/10; 17 = 13/11; 18 = 14/10
 The Labour Force Survey is a survey of the population of private households, student halls of residence and NHS accommodation.

Source: Labour Force Survey, Office for National Statistics
 Labour Market Statistics Helpline: 01633 456901

4 Prices

Last updated: 15/09/09

Percentage change over 12 months

Not seasonally adjusted

	Consumer prices						Producer prices			
	Consumer prices index (CPI)			Retail prices index (RPI)			Output prices		Input prices	
	All items	CPI excluding indirect taxes (CPIY) ¹	CPI at constant tax rates (CPI-CT)	All items	All items excluding mortgage interest payments (RPIX)	All items excluding mortgage interest payments and indirect taxes (RPIY) ²	All manufactured products	Excluding food, beverages, tobacco and petroleum products	Materials and fuels purchased by manufacturing industry	Excluding food, beverages, tobacco and petroleum products
	D7G7	EL25	EAD6	CZBH	CDKQ	CBZX	PLLU ³	PLL ^{3,4}	RNNK ^{3,4}	RNNQ ^{3,4}
2006 Jan	1.9	2.1	1.9	2.4	2.3	2.3	2.5	1.4	15.8	10.1
2006 Feb	2.0	2.1	2.0	2.4	2.3	2.3	2.3	1.4	15.2	10.1
2006 Mar	1.8	1.9	1.7	2.4	2.1	2.2	2.2	1.5	13.1	9.2
2006 Apr	2.0	2.1	2.0	2.6	2.4	2.3	2.3	1.9	15.6	9.8
2006 May	2.2	2.3	2.2	3.0	2.9	2.8	2.9	2.0	13.7	8.4
2006 Jun	2.5	2.6	2.4	3.3	3.1	3.2	3.1	2.5	11.3	8.1
2006 Jul	2.4	2.4	2.3	3.3	3.1	3.2	2.6	2.1	10.6	7.7
2006 Aug	2.5	2.6	2.4	3.4	3.3	3.4	2.3	1.7	8.4	6.7
2006 Sep	2.4	2.6	2.3	3.6	3.2	3.3	1.6	1.7	5.4	5.5
2006 Oct	2.4	2.7	2.3	3.7	3.2	3.3	1.3	2.0	3.9	4.5
2006 Nov	2.7	3.0	2.6	3.9	3.4	3.6	1.4	1.9	2.3	2.8
2006 Dec	3.0	3.2	2.9	4.4	3.8	3.9	1.7	1.6	1.7	1.5
2007 Jan	2.7	2.9	2.6	4.2	3.5	3.7	1.5	1.6	-3.4	-0.5
2007 Feb	2.8	2.9	2.6	4.6	3.7	3.9	1.9	2.0	-2.1	-0.2
2007 Mar	3.1	3.1	2.9	4.8	3.9	4.0	2.2	2.2	-0.3	1.0
2007 Apr	2.8	2.9	2.6	4.5	3.6	3.7	1.8	1.8	-1.5	0.0
2007 May	2.5	2.6	2.3	4.3	3.3	3.4	1.9	1.9	0.6	1.9
2007 Jun	2.4	2.5	2.2	4.4	3.3	3.3	1.9	1.7	1.7	2.2
2007 Jul	1.9	2.0	1.7	3.8	2.7	2.6	2.0	1.8	0.3	0.6
2007 Aug	1.8	1.9	1.6	4.1	2.7	2.6	2.1	2.0	-0.2	1.0
2007 Sep	1.8	1.7	1.6	3.9	2.8	2.8	2.6	1.9	6.0	3.6
2007 Oct	2.1	1.9	1.8	4.2	3.1	3.0	3.6	1.8	9.4	4.6
2007 Nov	2.1	1.9	1.8	4.3	3.2	3.0	4.5	1.9	12.1	5.6
2007 Dec	2.1	2.0	1.9	4.0	3.1	3.1	4.7	2.2	13.2	6.9
2008 Jan	2.2	2.1	2.0	4.1	3.4	3.3	5.7	3.0	20.4	11.0
2008 Feb	2.5	2.5	2.3	4.1	3.7	3.6	5.7	2.8	20.9	11.9
2008 Mar	2.5	2.6	2.3	3.8	3.5	3.6	6.2	2.9	20.8	12.7
2008 Apr	3.0	3.0	2.7	4.2	4.0	3.9	7.4	4.1	25.3	16.6
2008 May	3.3	3.3	3.1	4.3	4.4	4.4	9.1	5.6	30.2	18.9
2008 Jun	3.8	3.9	3.6	4.6	4.8	4.9	9.8	5.9	34.1	21.1
2008 Jul	4.4	4.5	4.2	5.0	5.3	5.4	10.0	6.3	31.3	21.3
2008 Aug	4.7	4.9	4.5	4.8	5.2	5.4	9.1	5.7	29.0	20.8
2008 Sep	5.2	5.4	5.0	5.0	5.5	5.6	8.5	5.6	24.1	19.5
2008 Oct	4.5	4.7	4.3	4.2	4.7	4.9	6.7	5.0	16.0	16.9
2008 Nov	4.1	4.3	3.9	3.0	3.9	3.9	5.0	5.0	8.1	14.1
2008 Dec	3.1	4.6	4.1	0.9	2.8	3.9	4.6	5.0	3.2	12.6
2009 Jan	3.0	4.5	4.1	0.1	2.4	3.4	3.5	4.0	1.7	10.8
2009 Feb	3.2	4.6	4.2	0.0	2.5	3.5	3.0	3.7	0.8	8.9
2009 Mar	2.9	4.3	3.9	-0.4	2.2	3.2	2.0	3.2	-0.4	7.5
2009 Apr	2.3	3.8	3.4	-1.2	1.7	2.7	1.3	2.5	-5.8	2.6
2009 May	2.2	3.6	3.3	-1.1	1.6	2.6	-0.3	1.2	-8.8	0.2
2009 Jun	1.8	3.1	2.9	-1.6	1.0	1.9	-1.0	0.3	-12.0	-2.9
2009 Jul	1.8	3.1	2.8	-1.4	1.2	2.1	-1.3	0.1	-12.2	-3.4
2009 Aug	1.6	2.9	2.7	-1.3	1.4	2.3	-0.4	0.7	-7.5	-1.8

Notes:

Source: Office for National Statistics

1 The taxes excluded are VAT, duties, insurance premium tax, air passenger duty and stamp duty on share transactions.

2 The taxes excluded are council tax, VAT, duties, vehicle excise duty, insurance premium tax and air passenger duty.

3 Derived from these identification (CDID) codes.

4 These derived series replace those previously shown.

NOTES TO TABLES

Identification (CDID) codes

The four-character identification code at the top of each alpha column of data is the ONS reference for that series of data on our time series database. Please quote the relevant code if you contact us about the data.

Conventions

Where figures have been rounded to the final digit, there may be an apparent slight discrepancy between the sum of the constituent items and the total shown. Although figures may be given in unrounded form to facilitate readers' calculation of percentage changes, rates of change, etc, this does not imply that the figures can be estimated to this degree of precision as they may be affected by sampling variability or imprecision in estimation methods.

The following standard symbols are used:

- .. not available
- nil or negligible
- P provisional
- break in series
- R revised
- r series revised from indicated entry onwards

CONCEPTS AND DEFINITIONS

Labour Force Survey 'monthly' estimates

Labour Force Survey (LFS) results are three-monthly averages, so consecutive months' results overlap. Comparing estimates for overlapping three-month periods can produce more volatile results, which can be difficult to interpret.

Labour market summary**Economically active**

People aged 16 and over who are either in employment or unemployed.

Economically inactive

People who are neither in employment nor unemployed. This includes those who want a job but have not been seeking work in the last four weeks, those who want a job and are seeking work but not available to start work, and those who do not want a job.

Employment and jobs

There are two ways of looking at employment: the number of people with jobs, or the number of jobs. The two concepts are not the same as one person can have more than one job. The number of people with jobs is measured by the Labour Force Survey (LFS) and includes people aged 16 or over who do paid work (as an employee or self-employed), those who have a job that they are temporarily away from, those on government-supported training and employment programmes, and those doing unpaid family work. The number of jobs is measured by workforce jobs and is the sum of employee jobs (as measured by surveys of employers), self-employment jobs from the LFS, people in HM Forces, and government-supported trainees. Vacant jobs are not included.

Unemployment

The number of unemployed people in the UK is measured through the Labour Force Survey following the internationally agreed definition recommended by the ILO (International Labour Organisation) – an agency of the United Nations.

Unemployed people:

- are without a job, want a job, have actively sought work in the last four weeks and are available to start work in the next two weeks, or
- are out of work, have found a job and are waiting to start it in the next two weeks

Other key indicators**Claimant count**

The number of people claiming Jobseeker's Allowance benefits.

Earnings

A measure of the money people receive in return for work done, gross of tax. It includes salaries and, unless otherwise stated, bonuses but not unearned income, benefits in kind or arrears of pay.

Productivity

Whole economy output per worker is the ratio of Gross Value Added (GVA) at basic prices and Labour Force Survey (LFS) total employment. Manufacturing output per filled job is the ratio of manufacturing output (from the Index of Production) and productivity jobs for manufacturing (constrained to LFS jobs at the whole economy level).

Redundancies

The number of people, whether working or not working, who reported that they had been made redundant or taken voluntary redundancy in the month of the reference week or in the two calendar months prior to this.

Unit wage costs

A measure of the cost of wages and salaries per unit of output.

Vacancies

The statistics are based on ONS's Vacancy Survey of businesses. The survey is designed to provide comprehensive estimates of the stock of vacancies across the economy, excluding those in agriculture, forestry and fishing. Vacancies are defined as positions for which employers are actively seeking recruits from outside their business or organisation. More information on labour market concepts, sources and methods is available in the *Guide to Labour Market Statistics* at www.statistics.gov.uk/about/data/guides/LabourMarket/default.asp

Directory of online tables

The tables listed below are available as Excel spreadsheets via weblinks accessible from the main *Economic & Labour Market Review* (ELMR) page of the National Statistics website. Tables in sections 1, 3, 4 and 5 replace equivalent ones formerly published in *Economic Trends*, although there are one or two new tables here; others have been expanded to include, as appropriate, both unadjusted/seasonally adjusted, and current price/chained volume measure variants. Tables in sections 2 and 6 were formerly in *Labour Market Trends*. The opportunity has also been taken to extend the range of dates shown in many cases, as the online tables are not constrained by page size.

In the online tables, the four-character identification codes at the top of each data column correspond to the ONS reference for that series on our time series database. The latest data sets for the Labour Market Statistics First Release tables are still available on this database via the 'Time Series Data' link on the National Statistics main web page. These data sets can also be accessed from links at the bottom of each section's table listings via the 'Data tables' link in the individual ELMR edition pages on the website. The old *Economic Trends* tables are no longer being updated with effect from January 2009.

Weblink: www.statistics.gov.uk/elmr/10_09/data_page.asp

Title	Frequency of update
UK economic accounts	
1.01 National accounts aggregates	M
1.02 Gross domestic product and gross national income	M
1.03 Gross domestic product, by category of expenditure	M
1.04 Gross domestic product, by category of income	M
1.05 Gross domestic product and shares of income and expenditure	M
1.06 Income, product and spending per head	Q
1.07 Households' disposable income and consumption	M
1.08 Household final consumption expenditure	M
1.09 Gross fixed capital formation	M
1.10 Gross value added, by category of output	M
1.11 Gross value added, by category of output: service industries	M
1.12 Summary capital accounts and net lending/net borrowing	Q
1.13 Private non-financial corporations: allocation of primary income account ¹	Q
1.14 Private non-financial corporations: secondary distribution of income account and capital account ¹	Q
1.15 Balance of payments: current account	M
1.16 Trade in goods (on a balance of payments basis)	M
1.17 Measures of variability of selected economic series	Q
1.18 Index of services	M

Selected labour market statistics

2.01 Summary of Labour Force Survey data	M
2.02 Employment by age	M
2.03 Full-time, part-time and temporary workers	M
2.04 Public and private sector employment	Q
2.05 Workforce jobs	Q
2.06 Workforce jobs by industry	Q
2.07 Actual weekly hours of work	M
2.08 Usual weekly hours of work	M
2.09 Unemployment by age and duration	M
2.10 Claimant count levels and rates	M
2.11 Claimant count by age and duration	M
2.12 Economic activity by age	M
2.13 Economic inactivity by age	M
2.14 Economic inactivity: reasons	M
2.15 Educational status, economic activity and inactivity of young people	M
2.16 Average earnings – including bonuses	M
2.17 Average earnings – excluding bonuses	M
2.18 Productivity and unit wage costs	M
2.19 Regional labour market summary	M

Weblink: www.statistics.gov.uk/elmr/10_09/data_page.asp

2.20	International comparisons	M
2.21	Labour disputes	M
2.22	Vacancies	M
2.23	Vacancies by industry	M
2.24	Redundancies: levels and rates	M
2.25	Redundancies: by industry	Q
2.26	Sampling variability for headline labour market statistics	M

Prices

3.01	Producer and consumer prices	M
3.02	Harmonised Indices of Consumer Prices: EU comparisons	M

Selected output and demand indicators

4.01	Output of the production industries	M
4.02	Engineering and construction: output and orders	M
4.03	Motor vehicle and steel production ¹	M
4.04	Indicators of fixed investment in dwellings	M
4.05	Number of property transactions	M
4.06	Change in inventories ¹	Q
4.07	Inventory ratios ¹	Q
4.08	Retail sales, new registrations of cars and credit business	M
4.09	Inland energy consumption: primary fuel input basis ¹	M

Selected financial statistics

5.01	Sterling exchange rates and UK reserves	M
5.02	Monetary aggregates	M
5.03	Counterparts to changes in money stock M4 ¹	M
5.04	Public sector receipts and expenditure	Q
5.05	Public sector key fiscal indicators	M
5.06	Consumer credit and other household sector borrowing	M
5.07	Analysis of bank lending to UK residents	M
5.08	Interest rates and yields	M
5.09	A selection of asset prices	M

Further labour market statistics

6.01	Working-age households	A
6.02	Local labour market indicators by unitary and local authority	Q
6.03	Employment by occupation	Q
6.04	Employee jobs by industry	M
6.05	Employee jobs by industry division, class or group	Q
6.06	Employee jobs by region and industry	Q
6.07	Key productivity measures by industry	M
6.08	Total workforce hours worked per week	Q
6.09	Total workforce hours worked per week by region and industry group	Q
6.10	Job-related training received by employees	Q
6.11	Unemployment rates by previous occupation	Q
6.12	Average Earnings Index by industry: excluding and including bonuses	M

Weblink: www.statistics.gov.uk/elmr/10_09/data_page.asp

6.13	Average Earnings Index: effect of bonus payments by main industrial sector	M
6.14	Median earnings and hours by main industrial sector	A
6.15	Median earnings and hours by industry section	A
6.16	Index of wages per head: international comparisons	M
6.17	Regional Jobseeker's Allowance claimant count rates	M
6.18	Claimant count area statistics: counties, unitary and local authorities	M
6.19	Claimant count area statistics: UK parliamentary constituencies	M
6.20	Claimant count area statistics: constituencies of the Scottish Parliament	M
6.21	Jobseeker's Allowance claimant count flows	M
6.22	Number of previous Jobseeker's Allowance claims	Q
6.23	Interval between Jobseeker's Allowance claims	Q
6.24	Average duration of Jobseeker's Allowance claims by age	Q
6.25	Vacancies by size of enterprise	M
6.26	Redundancies: re-employment rates	Q
6.27	Redundancies by Government Office Region	Q
6.28	Redundancy rates by industry	Q
6.29	Labour disputes: summary	M
6.30	Labour disputes: stoppages in progress	M

Notes:

1 These tables, though still accessible, are no longer being updated.

A Annually

Q Quarterly

M Monthly

More information

Time series are available from www.statistics.gov.uk/statbase/tsdintro.asp

Subnational labour market data are available from www.statistics.gov.uk/statbase/product.asp?vlnk=14160 and www.nomisweb.co.uk

Labour Force Survey tables are available from www.statistics.gov.uk/statbase/product.asp?vlnk=14365

Annual Survey of Hours and Earnings data are available from www.statistics.gov.uk/statbase/product.asp?vlnk=13101

Contact points

Recorded announcement of latest RPI

☎ 01633 456961
✉ rpi@ons.gsi.gov.uk

Labour Market Statistics Helpline

☎ 01633 456901
✉ labour.market@ons.gsi.gov.uk

Earnings Customer Helpline

☎ 01633 819024
✉ earnings@ons.gsi.gov.uk

National Statistics Customer Contact Centre

☎ 0845 601 3034
✉ info@statistics.gsi.gov.uk

Skills and Education Network

☎ 024 7682 3439
✉ senet@isc.gov.uk

Department for Children, Schools and Families Public Enquiry Unit

☎ 0870 000 2288

For statistical information on

Average Earnings Index (monthly)

☎ 01633 819024

Claimant count

☎ 01633 456901

Consumer Prices Index

☎ 01633 456900
✉ cpi@ons.gsi.gov.uk

Earnings

Annual Survey of Hours and Earnings
☎ 01633 456120

Basic wage rates and hours for manual workers with a collective agreement

☎ 01633 819008

Low-paid workers

☎ 01633 819024
✉ lowpay@ons.gsi.gov.uk

Labour Force Survey

☎ 01633 456901
✉ labour.market@ons.gsi.gov.uk

Economic activity and inactivity

☎ 01633 456901

Employment

Labour Force Survey
☎ 01633 456901
✉ labour.market@ons.gsi.gov.uk

Employee jobs by industry

☎ 01633 456776

Total workforce hours worked per week

☎ 01633 456720
✉ productivity@ons.gsi.gov.uk

Workforce jobs series – short-term estimates

☎ 01633 456776
✉ workforce.jobs@ons.gsi.gov.uk

Labour costs

☎ 01633 819024

Labour disputes

☎ 01633 456721

Labour Force Survey

☎ 01633 456901
✉ labour.market@ons.gsi.gov.uk

Labour Force Survey Data Service

☎ 01633 455732
✉ lfs.dataservice@ons.gsi.gov.uk

New Deal

☎ 0114 209 8228

Productivity and unit wage costs

☎ 01633 456720

Public sector employment

General enquiries
☎ 01633 455889

Source and methodology enquiries

☎ 01633 812865

Qualifications (Department for Children, Schools and Families)

☎ 0870 000 2288

Redundancy statistics

☎ 01633 456901

Retail Prices Index

☎ 01633 456900
✉ rpi@ons.gsi.gov.uk

Skills (Department for Innovation, Universities & Skills)

☎ 0870 001 0336

Skill needs surveys and research into skill shortages

☎ 0870 001 0336

Small firms (BERR)

Enterprise Directorate
☎ 0114 279 4439

Subregional estimates

☎ 01633 812038

Annual employment statistics

✉ annual.employment.figures@ons.gsi.gov.uk

Annual Population Survey, local area statistics

☎ 01633 455070

Trade unions (BERR) Employment relations

☎ 020 7215 5934

Training

Adult learning – work-based training (DWP)
☎ 0114 209 8236

Employer-provided training (Department for Innovation, Universities & Skills)

☎ 0870 001 0336

Travel-to-Work Areas Composition and review

☎ 01329 813054

Unemployment

☎ 01633 456901

Vacancies

Vacancy Survey: total stocks of vacancies
☎ 01633 455070

ONS economic and labour market publications

ANNUAL

Financial Statistics Explanatory Handbook

2009 edition. Palgrave Macmillan, ISBN 978-0-230-52583-2. Price £47.50.

www.statistics.gov.uk/StatBase/Product.asp?vlnk=4861

Foreign Direct Investment (MA4)

2007 edition

www.statistics.gov.uk/StatBase/Product.asp?vlnk=9614

Input-Output analyses for the United Kingdom

2006 edition

www.statistics.gov.uk/StatBase/Product.asp?vlnk=7640

Research and development in UK businesses (MA14)

2006 edition

www.statistics.gov.uk/StatBase/Product.asp?vlnk=165

Share Ownership

2006 edition

www.statistics.gov.uk/StatBase/Product.asp?vlnk=930

United Kingdom Balance of Payments (Pink Book)

2009 edition. Palgrave Macmillan, ISBN 978-0-230-57610-0. Price £52.00.

www.statistics.gov.uk/StatBase/Product.asp?vlnk=1140

United Kingdom National Accounts (Blue Book)

2009 edition. Palgrave Macmillan, ISBN 978-0-230-57611-7. Price £52.00.

www.statistics.gov.uk/StatBase/Product.asp?vlnk=1143

Statistical Bulletins

- Annual survey of hours and earnings
- Foreign direct investment
- Gross domestic expenditure on research and development
- Low pay estimates
- Regional gross value added
- Share ownership
- UK Business enterprise research and development
- Work and worklessness among households

QUARTERLY

Consumer Trends

2009 quarter 2

www.statistics.gov.uk/StatBase/Product.asp?vlnk=242

United Kingdom Economic Accounts

2009 quarter 2. Palgrave Macmillan, ISBN 978-0-230-23488-8. Price £37.50.

www.statistics.gov.uk/StatBase/Product.asp?vlnk=1904

UK trade in goods analysed in terms of industry (MQ10)

2009 quarter 2

www.statistics.gov.uk/StatBase/Product.asp?vlnk=731

Statistical Bulletins

- Balance of payments
- Business investment
- GDP preliminary estimate
- Government deficit and debt under the Maastricht Treaty (six-monthly)
- International comparisons of productivity (six-monthly)
- Internet connectivity
- Investment by insurance companies, pension funds and trusts
- Productivity
- Profitability of UK companies
- Public sector employment
- Quarterly National Accounts
- UK output, income and expenditure

MONTHLY

Financial Statistics

September 2009. Palgrave Macmillan, ISBN 978-0-230-23602-8. Price £50.00.

www.statistics.gov.uk/StatBase/Product.asp?vlnk=376

Focus on Consumer Price Indices

August 2009

www.statistics.gov.uk/StatBase/Product.asp?vlnk=867

Monthly review of external trade statistics (MM24)

July 2009

www.statistics.gov.uk/StatBase/Product.asp?vlnk=613

Producer Price Indices (MM22)

August 2009

www.statistics.gov.uk/StatBase/Product.asp?vlnk=2208

Statistical Bulletins

- Consumer price Indices
- Index of production
- Index of services
- Labour market statistics
- Labour market statistics: regional
- Producer prices
- Public sector finances
- Retail sales
- UK trade

OTHER

The ONS Productivity Handbook: a statistical overview and guide

Palgrave Macmillan, ISBN 978-0-230-57301-7. Price £55.

www.statistics.gov.uk/about/data/guides/productivity/default.asp

Labour Market Review

2006 edition. Palgrave Macmillan, ISBN 1-4039-9735-7. Price £40.

www.statistics.gov.uk/StatBase/Product.asp?vlnk=14315

National Accounts Concepts, Sources and Methods

www.statistics.gov.uk/StatBase/Product.asp?vlnk=1144

Sector classification guide (MA23)

www.statistics.gov.uk/StatBase/Product.asp?vlnk=7163

Recent articles

APRIL 2009

Young people and the labour market
Catherine Barham, Annette Walling, Gareth Clancy, Stephen Hicks and Sarah Conn

Employment of the older generation
Kamran Khan

CPI and RPI: the 2009 basket of goods and services
Philip Gooding

Revisions to quarterly GDP growth and its components
Jason Murphy

Labour inputs in public sector productivity: methods, issues and data
Kato Kimbugwe, Rhys Lewis and Nicola James

Services producer price index (experimental) – fourth quarter 2008
Ian Richardson

MAY 2009

Households, families and work
Katherine Kent

Identifying shortage occupations in the UK
Anna Downs

Civil Service Statistics 2008: a focus on gross annual earnings
David Matthews and Andrew Taylor

Firm-level estimates of capital stock and productivity
Bob Gilhooly

Regional gross value added
Jayne White

Regional economic indicators with a focus on household income
Alex Turvey, Jonathan Knight and Birgit Wosnitza

JUNE 2009

The impact of the economic downturn on productivity growth
Malindi Myers

Labour disputes in 2008
Dominic Hale

Performance and employment characteristics of UK service industries, 1990-2008
Keith Brook

Developing a unit labour costs indicator for the UK
Alex Turvey

Regional Gross Disposable Household Income
Charlotte Richards and Wayne Roberts

Changes to the retail sales methodology
Craig McLaren

Methods Explained: Business Structure Database
Peter Evans and Richard Welpton

JULY 2009

Special edition: Developing financial statistics for policy

Output and employment in the financial sector
Barry Williams, Valerie Fender and Steve Drew

Corporate sector balance sheets and crisis transmission
Christopher Davies

Improving measurement of household savings and wealth
Chris Daffin, Sarah Levy and Andrew Walton

The public sector balance sheet
Jim O'Donoghue

Government financial liabilities beyond public sector net debt
Fenella Maitland-Smith

Regular quarterly feature
Services producer price index (experimental) – first quarter 2009
Pam Davies

AUGUST 2009

Impact of the VAT reduction on consumer price indices
Rob Pike, Mark Lewis and Daniel Turner

The impact of the recession on retail sales volumes
Mavis Anagboso and Craig McLaren

Recent developments in the UK housing market
Graeme Chamberlin

Progress in implementing the Atkinson review recommendations
Helen Patterson

Total public sector output and productivity
Mike Phelps and Fraser Munro

Effects of taxes and benefits on household income, 2007/08
Andrew Barnard

Implementation of SIC 2007 across the Government Statistical Service
John Hughes and Keith Brook

SEPTEMBER 2009

Capitalising research and development: towards the new System of National Accounts
Lars Wenzel, M. Khalid Nadeem Khan and Peter Evans

The housing market and household balance sheets
Graeme Chamberlin

Update on ONS's plans for improving the UK's National Accounts
Robin Youll

Regional analysis of public sector employment
Nicola James

Methods Explained: The Balance of Payments
Graeme Chamberlin

Regional Economic Indicators with a focus on rural and urban productivity in the English regions
Pippa Gibson, Sebnem Oguz and Jonathan Knight

Future articles

List is provisional and subject to change.

NOVEMBER 2009

Gross domestic product in real time

Parents in the labour market

The great moderation and global imbalances

Regional economic indicators

Coordinated portfolio investment survey