

Economic & Labour Market Review

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The Director of ONS is also the National Statistician.

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In brief

Local area labour markets

The latest local area labour market data show that the area with the highest employment rate was the City of London with 88.7 per cent (note that this estimate is based on a very small sample). Excluding the City of London, the highest employment rate was Test Valley, Hampshire (88.5 per cent), while the lowest rate was in Tower Hamlets (56.9 per cent). There is a considerable variation within each region. For example, in the region with the highest average rate, the South East (78.4 per cent), employment varies between 88.5 per cent in the Test Valley and 66.0 per cent in Oxford.

The area with the highest unemployment rate in the twelve months ending December 2007 was Tower Hamlets (11.7 per cent), while the lowest rate was in four areas, Aberdeenshire, Cotswold (Gloucestershire), Mole Valley (Surrey) and Vale of White Horse (Oxfordshire), all at 2.4 per cent. Again, there were considerable variations within regions. In the region with the lowest average rate, the South West (3.9 per cent), unemployment varied between Plymouth (6.3 per cent) and Cotswold (2.4 per cent). London had the highest average rate (6.8 per cent), but individual boroughs varied between Tower Hamlets (11.7 per cent) and Richmond upon Thames (3.6 per cent).

The latest estimates of jobs density (2006) show that there were 0.90 jobs per working-age resident in the UK. London had the highest jobs density at 1.05 compared with 0.80 in the lowest region, Northern Ireland. The local area with the highest jobs density was the City of London, with over 100 jobs per working-age resident, while the lowest was in Carrickfergus, Northern Ireland, with 0.39 jobs per resident.

People who work in the City of London had the highest earnings, with median full-time gross pay of £834 a week as at April 2007. The lowest pay was for people who work in Torridge, South West, at £313 a week.

The report, 'Local area labour markets: Statistical indicators July 2008', was published on the National Statistics website on 31 July 2008. It also contains sections looking at economic inactivity, ethnicity and the labour market, claimants of Jobseeker's Allowance (the claimant count), and earnings by place of residence. It brings

together data from a number of different sources – the Annual Population Survey, Annual Business Inquiry, Annual Survey of Hours and Earnings, and administrative data on benefits from the Department for Work and Pensions – to give an overall picture of the labour market, looking at both labour supply and demand in each area.

Also available are spreadsheets giving data for key indicators such as employment, unemployment, economic inactivity, claimant count and jobs for both local authorities and parliamentary constituencies.

More information

www.statistics.gov.uk/statbase/product.asp?vlnk=14160

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Reclassifications and the effect on public sector employment

The reclassification of institutional units, while infrequent, can have a significant effect on public sector employment estimates. The National Accounts provide a framework for describing what is happening in national economies. All institutional units operating within an economy are classified to an institutional sector and all transactions between the sectors of the economy are categorised. Work on classification of entities to sectors and of economic transactions is a key input in the production of National Accounts and employment figures alike.

Changes to the classification of individual institutional units, known as reclassification, can have a noticeable effect on employment statistics at a sector level. The most significant reclassification to take place recently saw Northern Rock plc being reclassified from the private to the public sector. This reclassification took effect from 9 October 2007 and was therefore incorporated in the public sector employment estimates for December 2007 (published on 19 March 2008). An article

explaining this reclassification decision is available on the National Statistics website.

The effect of this reclassification was noticeable on the overall public sector employment estimates as well the sector and industry breakdowns. For instance, whereas in central government and local government, employment figures decreased by 1,000 and 9,000, respectively, employment by public corporations increased by 17,000 which was partly influenced by the reclassification of Northern Rock. At an industry level, the largest increase in the Q4 2007 estimates was for 'other public sector' (18,000, 2.6 per cent) which again reflected the Northern Rock reclassification.

Due to interdependencies from a National Accounts perspective, at the same time as the reclassification of Northern Rock plc to the public sector, a decision was made to incorporate the Bank of England in public sector statistics, therefore necessitating a further change to estimates of public sector employment. An article explaining this decision is available on the National Statistics website.

The decision to include the Bank of England in public sector employment necessitates revisions to public sector employment estimates published back to the start of the series in 1991. In line with the revisions policy, these revisions will be implemented in the September 2008 First Release (to be published in December 2008). Based on published accounts, it is expected that the upward revisions to public sector employment will be approximately 2,000.

It is vitally important that users of public sector employment estimates are aware of reclassifications as and when they occur. As mentioned, although reclassifications of institutional units are infrequent, they can have a significant effect on employment estimates on a quarterly basis. Users should check to ensure that, when comparing quarterly figures, the figures they are comparing are directly comparable and have not been influenced by a large-scale reclassification. The Public Sector Employment First Release provides information about reclassifications and strives to keep users updated with all current movements and how they have been incorporated within the published estimates.

More information*Public sector employment*

www.statistics.gov.uk/statbase/product.asp?vlnk=13615

Classification of Northern Rock

www.statistics.gov.uk/cci/article.asp?id=1938

Bank of England in public sector finances

www.statistics.gov.uk/cci/article.asp?id=1939

Public Sector Employment First Release

www.statistics.gov.uk/pfd/psr0608.pdf

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Labour Market Review 2009

In 2006, the Office for National Statistics (ONS) published the *Labour Market Review* 2006. In February 2009, ONS will update this publication to incorporate more recent labour market statistics and reweighted data that was issued in May 2008. The February edition of *Economic & Labour Market Review* will incorporate this update with accompanying tables to support the publication available on the National Statistics website.

The edition will include chapters on the following areas:

- the labour market and the wider economy – comparing the United Kingdom with other areas of the world
- labour demand – hours worked, jobs, vacancies, job separations, skills and productivity
- labour supply – demographic trends, employment, families and work, qualifications, occupations, self-employed, unemployment, inactivity and sickness absence
- labour costs – non-wage costs, earnings, gender pay gap and estimates of jobs paid below the National Minimum Wage

More information

www.statistics.gov.uk/labourmarketreview

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International Association for Research on Income and Wealth

The measurement of non-market output raises distinct challenges compared with the measurement of market output. Given that there is no market, it means that it is not possible to directly observe the value that people using a service place on particular public service activities. Prices provide this mechanism for the market sector.

In 2002, the European System of Accounts required all member states to move to direct measurement of individual services by the time the accounts covered 2006 (with the exclusion of Denmark, who have until 2012). From 1998, the Office for National Statistics (ONS) started to measure public service output by direct measures, and most individual services are now covered by direct measures.

ONS contributed to international thinking in this area at the International Association for Research on Income and Wealth 2008 conference in Slovenia in August. UKCeMGA presented a paper, *Developments in the measurement of government output and productivity in the UK*, which highlights developments since the Atkinson review (2005) and outlined the areas that the UK is driving forward as a world leader in the field.

ONS now has direct output measures of healthcare, education, adult social care, part of children's social care, social security administration, part of criminal justice system and the fire and rescue services. Defence and police are currently still measured using the 'output = input' convention which preceded the new approach. UKCeMGA is working not only to improve these input measures, but also to scope the possibilities for the direct measurement of part of collective services output.

Conference papers can be found at the address given below.

More information

www.iariw.org/c2008.asp

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UPDATES

Updates to statistics on www.statistics.gov.uk

5 August

Index of production

Manufacturing: 0.8% quarterly fall in Q2
www.statistics.gov.uk/cci/nugget.asp?id=198

11 August

Producer prices

Factory gate inflation rises to 10.2% in July
www.statistics.gov.uk/cci/nugget.asp?id=248

UK trade

Deficit widened to £4.4 billion in June
www.statistics.gov.uk/cci/nugget.asp?id=199

12 August

Inflation

July: CPI up to 4.4%; RPI up to 5.0%
www.statistics.gov.uk/cci/nugget.asp?id=19

13 August

Average earnings

Pay growth slows in the year to June
www.statistics.gov.uk/cci/nugget.asp?id=10

Unemployment

Rate at 5.4% for three months to June
www.statistics.gov.uk/cci/nugget.asp?id=12

20 August

Public sector

July: £6.6 billion current budget surplus
www.statistics.gov.uk/cci/nugget.asp?id=206

21 August

Business investment

1.9% fall in Q2 2008
www.statistics.gov.uk/cci/nugget.asp?id=258

Retail sales

Underlying growth remains positive
www.statistics.gov.uk/cci/nugget.asp?id=256

22 August

GDP growth

Economic growth was zero in Q2 2008
www.statistics.gov.uk/cci/nugget.asp?id=192

Index of services

0.2% three-monthly rise into June
www.statistics.gov.uk/cci/nugget.asp?id=558

Total market sector gross value added

Zero growth in Q2 2008
www.statistics.gov.uk/cci/nugget.asp?id=201

27 August

Lone parents in employment

Rate at 56.3% in three month to June 2008
www.statistics.gov.uk/cci/nugget.asp?id=409

Service prices

SPPI inflation at 3.8% in Q2 2008
www.statistics.gov.uk/cci/nugget.asp?id=253

FORTHCOMING RELEASES

Future statistical releases on www.statistics.gov.uk

2 September

Consumer credit business – July 2008

Mergers and acquisitions involving UK companies – Q2 2008

5 September

Output and employment in the construction industry – Q2 2008

8 September

Producer prices – August 2008

9 September

Index of production – July 2008**MM22: Producer prices – August 2008**

10 September

MM19: Aerospace and electronics cost indices – June 2008**UK trade – July 2008**

11 September

New construction orders – July 2008

15 September

MM17: Price Index Numbers for Current Cost Accounting (PINCCA) – August 2008

16 September

Consumer price indices – June 2008**Digest of engineering turnover and orders – July 2008****Monthly review of external trade statistics – July 2008****MQ10: UK trade in goods analysed in terms of industry – Q2 2008**

17 September

Labour market statistics – September 2008**Public sector employment – Q2 2008**

18 September

New construction orders: additional monthly data – July 2008**Public sector finances – August 2008****Retail sales – August 2008****SDM28: Retail sales – August 2008**

22 September

Focus on consumer price indices – August 2008

23 September

Public sector finances: supplementary (quarterly) data

24 September

Average weekly earnings – August 2008

30 September

Balance of payments – Q2 2008**Business investment revised results – Q2 2008****Consumer credit business – August 2008****Government deficit and debt under the Maastricht Treaty****Quarterly national accounts – Q2 2008****United Kingdom Economic Accounts – Q2 2008 (web version)**

1 October

Index of services – July 2008**Productivity – Q2 2008****Profitability of UK companies – Q2 2008**

Economic review

September 2008

Anis Chowdhury
Office for National Statistics

SUMMARY

GDP output slowed in 2008 quarter two compared with the previous quarter – driven by slowing and subdued service sector output, together with a weakening in total production growth. Manufacturing output contracted sharply in the latest quarter following positive growth in the previous quarter. On the expenditure side, both household spending and business investment weakened in quarter two compared with the previous quarter. The current account deficit narrowed in quarter one. The goods trade deficit narrowed in the latest quarter. The labour market showed further signs of weakening in 2008 quarter two; average earnings remain relatively subdued. Public sector finances deteriorated in July 2008. Consumer price inflation accelerated further in July 2008 and was considerably above the Government's inflation target. Producer output and input price inflation accelerated in 2008 quarter two and remained buoyant in July 2008.

GROSS DOMESTIC PRODUCT

Second quarter growth of zero per cent

GDP growth for the second quarter of 2008 is estimated to have weakened compared with the previous quarter. GDP growth was flat, a downward revision from the 0.2 per cent initial estimate and a deceleration from 0.3 per cent growth in the previous quarter. The estimate for the annual rate of growth was 1.4 per cent, down from 2.3 per cent growth in the previous quarter (Figure 1).

The latest month two GDP release for 2008 quarter two contains more information than that contained in the preliminary estimate. It gives first estimates for the main expenditure categories and more complete information on the output side. It is still, however, based on as yet incomplete information.

The stagnant growth rate in the UK economy in quarter two was largely due to subdued service sector output. Industrial production growth continued to display weakness for the fourth successive quarter, with a deeper deceleration in

output in quarter two. The fragility in total production was driven by a sharp contraction in manufacturing output growth and also by a fall in the output of the electricity, gas and water supply industries. This was offset by an acceleration in mining and quarrying (including oil and gas) output. The slowdown in GDP growth was also led by the contraction in the output of the construction sector after showing positive growth in the previous quarter.

OTHER MAJOR ECONOMIES

Global growth showed mixed fortunes in quarter two

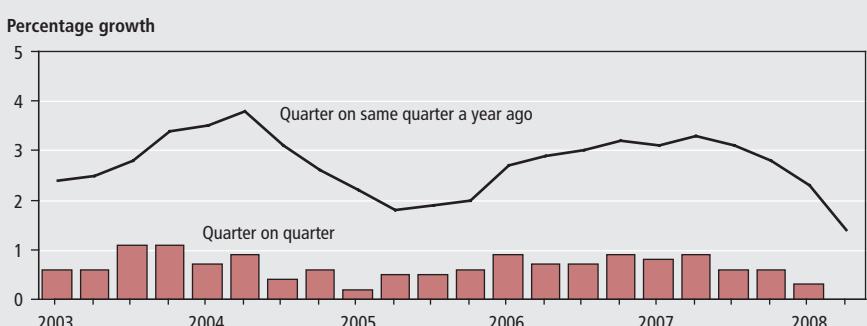
Preliminary data for 2008 quarter two for the other major OECD countries are now available. Performance appears to be somewhat mixed, although overall the picture is of weakening global growth compared with the previous quarter.

US GDP growth accelerated in 2008 quarter two achieving a rate of 0.5 per cent compared to 0.2 per cent in the previous quarter. The improvement in GDP growth was largely driven by increased consumer spending and which may partly be attributed to the government fiscal stimulus plan between late April and early July. Net exports also contributed to growth for the fifth consecutive quarter helped by a weak dollar and imports contracting sharply. Government spending also boosted growth as well as non-residential investment. Residential investment on the other hand continued to contract – for the tenth consecutive quarter.

Japan's GDP weakened in the latest quarter. Growth contracted by 0.6 per cent in quarter two compared to an increase of 0.8 per cent in the previous quarter. Most components of GDP decreased. Lower growth was primarily led by contraction in private consumption. Residential investment also decreased in the latest quarter after having posted positive growth in the previous quarter. Business investment recorded virtually flat growth. Net exports also subtracted from growth in the second quarter – for the first time since 2004 quarter four.

Euro-zone growth deteriorated in the latest quarter. According to Eurostat's

Figure 1
Gross Domestic Product



estimate, euro area GDP growth contracted by 0.2 per cent after increasing by 0.7 per cent in quarter one – the first contraction since the early 1990s. Growth for the three big mainland EU economies – Germany, France and Italy – also showed a weakening picture compared with the previous quarter.

German GDP contracted by 0.5 per cent in 2008 quarter two – for the first time in four years. This follows growth of 1.5 per cent in quarter one. The detailed breakdown of growth was not available at the time of writing, although initial indications suggest a construction slump as a major factor.

French GDP growth contracted by 0.3 per cent in quarter two; the first decline since 2002 quarter four. Private consumption recorded virtually flat growth. Overall investment contracted markedly, led by a fall in household investment. Exports also subtracted from growth with exports registering the sharpest fall since 2001 quarter four.

Italian GDP fell by 0.3 per cent in the latest quarter following growth of 0.5 per cent in quarter one. The breakdown of growth was not available at the time of writing.

FINANCIAL MARKETS

Share prices rally; pound depreciates

Equity performance has displayed volatility over the last couple of years. In recent quarters, equity growth has been particularly weak. In the latest quarter, however, there appeared signs of a modest rebound in equity prices, after having fallen substantially in 2008 quarter one. In 2008 quarter two, the FTSE All-Share index rose by 1.7 per cent. This follows a decrease of 9.1 per cent in the previous quarter. The rise was partly driven by the purchase of stocks in the heavily-weighted mining and energy sectors. However, the FTSE All-Share index still remains low compared to the peaks seen in the second quarter

of 2007 – and may be attributed to global growth concerns, particularly regarding the US economy, brought on by financial uncertainty and continued problems regarding the credit squeeze. According to the latest figures in July, the FTSE All-Share index reverted back to negative territory by dropping around 7 per cent.

In the currency markets, 2008 quarter two saw sterling's broad average value continuing to depreciate but at a lesser rate compared with the first quarter. The pound's value against the dollar fell by around 0.5 per cent compared to a depreciation of around 3 per cent in the previous quarter. Against the euro, sterling's value depreciated by approximately 4 per cent in the second quarter, following depreciation of around 7 per cent in the previous quarter. Overall, the quarterly effective exchange rate depreciated by approximately 3 per cent in 2008 quarter two after depreciating by approximately 6 per cent in the previous quarter (Figure 2). According to the latest figures in July, the pound appreciated against the dollar by around 1 per cent. Against the euro, the pound's value was virtually flat. The overall effective exchange rate was flat.

The recent movements in the exchange rate might be linked to interest rate and growth factors. Exchange rate movements can be related to the perceptions of the relative strengths of the US, the euro and UK economy. The depreciation of the pound against both the dollar and euro in quarter one may have come in response to fears about lower growth in the UK economy and therefore prospects of lower interest rates to stimulate the economy. Indeed, the Bank of England reduced interest rates by 0.25 basis points in April 2008 to 5 per cent, the third cut in interest rates since December 2007 and was mainly in response to the effects of the sub-prime crisis in terms of downward risks to growth and inflation. These interest rate reductions may have made the pound less appealing to investors compared to other currencies.

The lower rate of depreciation of the pound against the dollar in the latest quarter may have been partly a result of expectations amongst investors that the Bank of England was unlikely to cut interest rates further in the short to medium term given the current inflationary pressures facing the UK economy. This perception coincided with US interest rates being lowered by a further 0.25 percentage points in April 2008 to 2 per cent following a 0.75 percentage points reduction in March.

In contrast in the euro area, the further depreciation of the pound against the euro in the second quarter of 2008 may have come in response to greater expectations of interest rates being raised by the European Central Bank (ECB). In fact, interest rates were increased by 0.25 percentage points in July 2008 to 4.25 per cent after having been at 4 per cent since June 2007. The main factor cited by the ECB for the rise was a perception of deteriorating inflationary expectations over the coming months and the need in particular to manage and anchor those expectations.

OUTPUT

Stagnant growth from falling services, construction and industrial output

DP growth in 2008 quarter two was estimated to have grown at zero per cent, a deceleration from 0.3 per cent growth in the previous quarter. On an annual basis growth was 1.4 per cent, down from 2.3 per cent in the previous quarter.

Construction activity weakened in the latest quarter compared with the previous quarter. Construction output is estimated to have fallen by 1.1 per cent, after increasing by 0.4 per cent growth in the previous quarter. Comparing the quarter on the same quarter a year ago, construction output rose by 0.5 per cent, a slowdown from 2.4 per cent growth in quarter one (Figure 3).

External surveys pointed to sharp declines in housing activity in the latest quarter – attributing this to a combination of a slowing housing market and lack of availability of debt finance. The CIPS/Markit UK construction PMI (Purchasing Managers Index) reported that total construction contracted at record pace in the second quarter to a headline balance of 42.9 from 51.2 in the first quarter. In July 2008, the headline index deteriorated further to 36.7. The Royal Institute of Chartered Surveyors (RICS) construction

Figure 2
Exchange rates

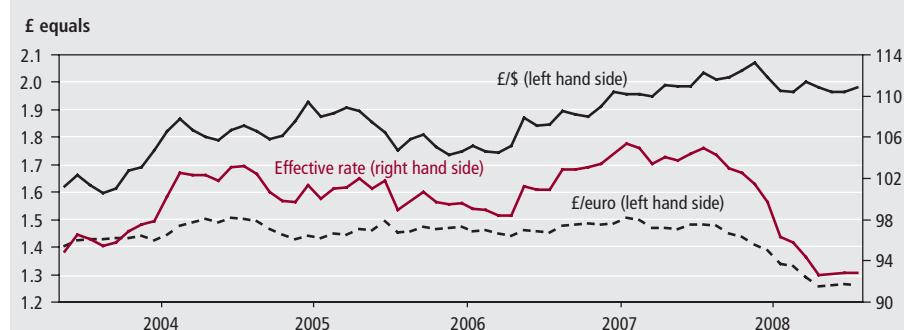


Figure 3
Construction output

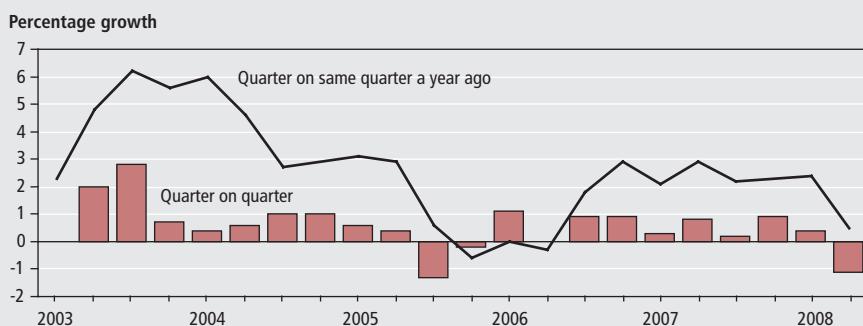
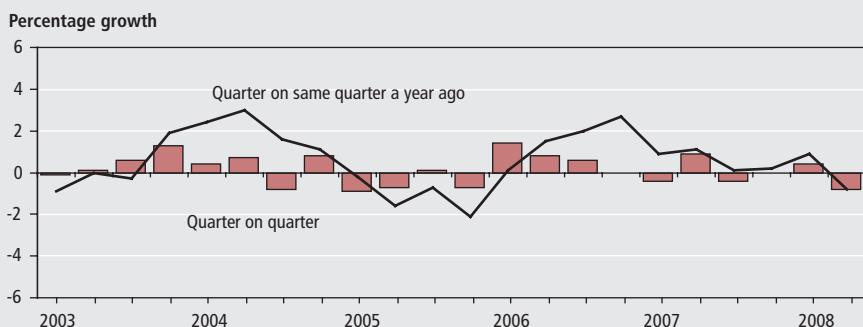


Figure 4
Manufacturing output



survey for 2008 quarter two reported that workloads broke more than 11 years of uninterrupted growth to decline at the fastest pace since 1995 quarter three; the workload balance was at minus 19 in the second quarter from plus 1 in the previous quarter.

Total output from the production industries decelerated further in the latest quarter. Output fell by 0.8 per cent following a decrease of 0.2 per cent in quarter one. On an annual basis, output contracted by 1.1 per cent, down from 0.4 per cent growth in the previous quarter.

The weakness in total production was driven by a contraction in the output of the manufacturing industries. Manufacturing output fell by 0.8 per cent in the second quarter reversing positive growth of 0.4 per cent in the previous quarter. On an annual basis, manufacturing output fell by 0.8 per cent, after having increased by 0.9 per cent in quarter one (Figure 4).

The weakness in total production in quarter two compared with the previous quarter was also to a lesser extent driven by a fall in the output of the electricity, gas and water supply industries. Output fell by 1.9 per cent compared with a fall of 1.3 per cent in the previous quarter. On an annual basis, output grew by 0.4 per cent down from 1.4 per cent growth in quarter one.

In contrast, the output of the mining and quarrying (including oil and gas)

industries strengthened in the latest quarter. Output increased by 0.6 per cent in the latest quarter, reversing the contraction of 4.7 per cent in quarter one. On an annual basis, output contracted by 5.4 per cent, a deceleration from a 4.9 per cent reduction in growth in quarter one.

Production growth has generally been slow since the third quarter of 2007 due to weakness in manufacturing for most of that period, and a contraction in mining and quarrying output, offset through some of this period by relatively strong electricity, gas and water supplies industry output. There was a modest pick up in manufacturing output in the first quarter of 2008 but this appears not to have been sustained into the latest quarter. It should be noted that manufacturing output has displayed volatility in the recent past.

The output of the agriculture, forestry and fishing industries was virtually flat in the latest quarter compared with 0.6 per cent growth in the previous quarter. On an annual basis growth was 0.9 per cent, down from 1 per cent growth in the previous quarter.

External surveys of manufacturing for 2008 quarter two showed a deteriorating picture compared with the previous quarter with weaker domestic demand cited as a major factor, broadly in line with official figures (Figure 5). In the past, it has not been unusual for the path of business indicators and official data to diverge over the short term. These differences happen partly because the series are not measuring exactly the same thing. External surveys measure the direction rather than the magnitude of a change in output and often inquire into expectations rather than actual activity.

The CIPS/ Markit manufacturing PMI indicated a slight contraction in the latest quarter; the headline index fell below the no change 50.0 mark to 48.5 from 51.0 in quarter one. In July, the headline index decreased further to 44.3. The CBI in its 2008 quarter two Industrial Trends survey reported continued weakness in total order books with the balance at minus 8 in the second quarter, compared with minus 13 in the previous quarter. In August 2008, the total order books balance was at minus 13. The BCC in its 2008 quarter two survey reported ominous results which highlighted serious risks of UK recession; the balances for home sales dropped by 15 points to minus 3 and the balance for home orders fell by 13 points to minus 5.

The service sector, the largest part of the UK economy, which has in the past driven UK economic expansion has somewhat made a negligible contribution to growth in the latest quarter. Services output growth showed below trend growth in the last couple of quarters compared to 2007.

Services output grew by 0.2 per cent in

Figure 5
External manufacturing

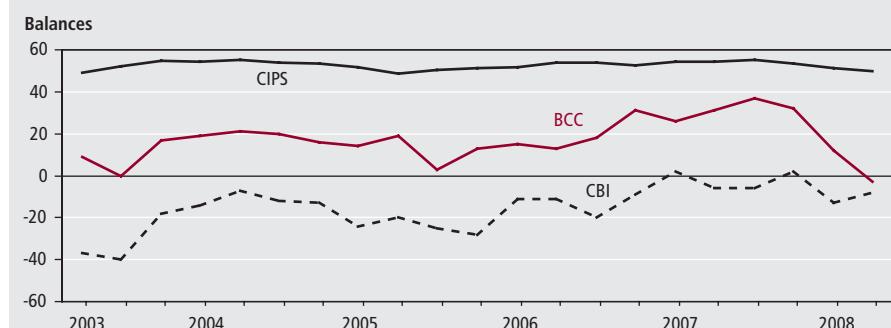


Figure 6
Services output

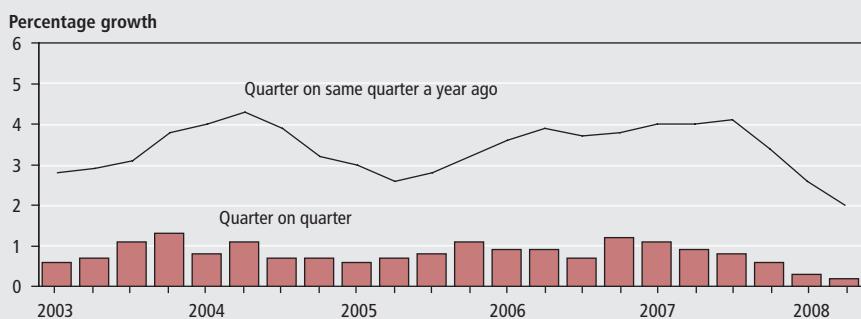


Figure 7
External services

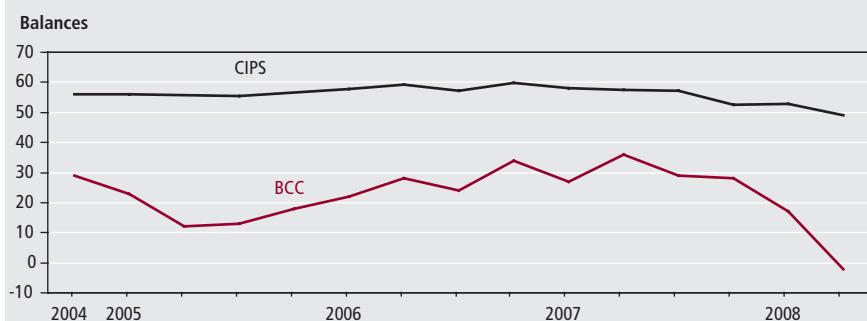
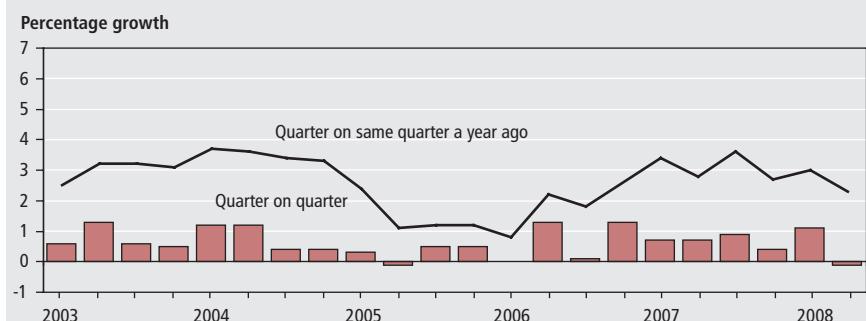


Figure 8
Household demand



2008 quarter two, a marginal deceleration from growth of 0.3 per cent in the previous quarter but a marked slowdown from a recent high of 1.1 per cent recorded in 2007 quarter one (Figure 6). On an annual basis, services output expanded by 2 per cent, down from 2.6 per cent in the previous quarter.

Growth was recorded in varying degrees across all four broad sectors. The main contribution to the increase in services output growth came from transport, storage and communication where output growth rose to 1.1 per cent from 0.7 per cent in the previous quarter. On an annual basis, growth was 3.5 per cent, up from 2.5 per cent in the previous quarter. Total services output was also driven by fairly modest growth in government and other services output of 0.3 per cent down slightly from

0.4 per cent growth in the previous quarter. On an annual basis, growth was 1.9 per cent, unchanged from the previous quarter. This was offset by virtually flat growth in the distribution, hotels and catering and business services and finance sectors. Distribution, hotels and catering output grew by 0.1 per cent, a slowdown from growth of 0.3 per cent in the previous quarter. On an annual basis, growth was 1.4 per cent, down from 2.4 per cent in the previous quarter. Business services and finance output also grew by 0.1 per cent, down from 0.2 per cent growth in the previous quarter. On an annual basis, output decelerated to 2 per cent from 3.4 per cent in the previous quarter.

The external surveys on services showed a bleaker picture of service sector activity in 2008 quarter two. The CIPS/Markit services

PMI survey pointed to a deteriorating picture of service sector activity. The average headline index in 2008 quarter two fell to 49.1, below the no change 50.0 mark, from 52.9 in the previous quarter. In July 2008, the headline index weakened further to 47.4. It should be noted that the CIPS survey has a narrow coverage of the distribution and government sectors.

The CBI and BCC also reported a generally weakening picture of service sector activity (Figure 7). The latest CBI service sector survey in June reported weakness as a whole in the sector and in line with the February survey. For consumer services, volume of business fell sharply with the balance at minus 44 per cent, the lowest since November 2001. For business and professional services, the balance was at plus 10, but still below the long-term average of plus 19. The BCC survey for 2008 quarter two highlighted alarming falls in the domestic sector's services balances. The net balance for home sales declined 19 points to minus 2 and the net balance for home orders fell 21 points to minus 7.

EXPENDITURE

Consumers' spending contracts

Household consumption expenditure decelerated markedly in 2008 quarter two from the previous quarter. Growth fell by 0.1 per cent compared to an increase of 1.1 per cent in the previous quarter. Compared with the same quarter a year ago, growth was 2.3 per cent, down from 3 per cent in the previous quarter (Figure 8). Lower spending was primarily driven by a fall in durable and semi-durable goods expenditure. This was offset by modest growth in services expenditure.

The weakening in consumer expenditure in the latest quarter appears mainly to reflect the continued impact of the financial turbulence in the UK economy and the intensifying pressures on real disposable income arising from modest wage growth coupled with higher inflation, particularly from higher fuel, utility and food prices.

One key indicator of household expenditure is retail sales. Retail sales growth weakened in 2008 quarter two compared with the previous quarter – driven by a sharp fall in June from strong growth in May. Retail sales volumes slowed to 0.6 per cent in quarter two, a marked deceleration from growth of 1.7 per cent in the previous quarter. One reason perhaps for the slower growth in retail sales may have been due to the price deflator (that

is, shop prices) where discounting appears not to be prevalent or widespread as was the case in quarter one. The price deflator fell on average by 0.2 per cent in quarter two compared with an average fall of 0.8 per cent in the previous quarter. In June, the price deflator increased by 0.6 per cent. This possibly suggests that the underlying picture regarding consumer finances is in a far weaker position than retail sales volume growth of the previous quarter indicated, with retail sales growth being discount as opposed to being income led. In July the price deflator increased further by 1.6 per cent.

Retail sales figures are published on a monthly basis and the latest available figures for July 2008 showed a rather resilient picture (**Figure 9**). In the three months to July the volume of retail sales increased by 0.7 per cent compared with an increase of 0.6 per cent in the three months to June. On an annual basis in July, the latest three months growth compared with the same three months a year ago recorded fairly strong growth of 3.9 per cent, although a slow down from 4.4 per cent growth in June.

Retail sales can be disaggregated into 'predominantly food' and 'predominantly non-food' sectors. In the three months to July 2008 retail sales growth in volume terms was driven, by the 'predominantly non-food stores' offset by virtually flat growth in the 'predominantly food stores' sector. The 'predominantly non-food stores' sector grew by 1.2 per cent, up from 1 per cent in the previous month. Within this sector there was a strengthening in the 'textile, clothing and footwear stores' where growth jumped sharply to 3.1 per cent following growth of 1.4 per cent in the previous month. There was a rebound in 'household good stores' with growth of 0.4 per cent, reversing a contraction of 0.4 per cent in the previous month. This was offset by slower growth in a number of stores. The 'non-specialised stores' grew modestly at 0.6 per cent, although slowing sharply from 2.3 per cent growth in the previous month. There was also a weakening in 'other stores' with growth of 0.3 per cent, down from 1.3 per cent in the previous month and 'non-store retailing and repair' also rising by 0.3 per cent but down from a 0.9 per cent increase in the previous month. The 'predominantly food stores' sector in contrast recorded virtually flat growth of 0.1 per cent in the three months to July, compared to a stagnant position in the previous month.

External surveys for retail sales presented

a slowing picture of growth in 2008 quarter two compared to the previous quarter. The CBI reported an average balance of minus 16 in the latest quarter, down from plus 1 in the previous quarter. According to CBI's monthly distributive trades' survey, the sales volume balance had deteriorated further to minus 36 in July 2008. The BRC reported average growth of 2.6 per cent in 2008 quarter two on a total sales basis, down from 3.3 per cent in 2008 quarter one. In July, growth had fallen further to 1.7 per cent (**Figure 10**).

Another indicator of household consumption expenditure is borrowing. Household consumption has risen faster than disposable income in recent years as the household sector has become a considerable net borrower and therefore accumulated high debt levels. Bank of England data on stocks of household debt outstanding to banks and building societies shows household debt at unprecedented levels relative to disposable income. Until recently, this borrowing has fuelled consumption, but this appears to be less the case in the latest quarter.

There are two channels of borrowing available to households: i) secured lending, usually on homes; and ii) unsecured lending, for example on credit cards. The impact of the credit squeeze may have intensified in the latest quarter. According to the Bank of England's Credit Conditions

Survey, lending conditions were tightened in quarter two, that is, by applying stringent credit-scoring criteria and by decreasing maximum loan-to-value (LTV) ratios – with lenders reporting that they had reduced the availability of both secured and unsecured lending to households. The tightening was driven by the slowdown in the housing market, the reduced appetite for risk and the worsening economic climate.

The Bank of England reported that total net lending slowed in 2008 quarter two to around £16 billion from around £25 billion in the previous quarter. Lending secured on dwellings fell to around £13 billion from £20 billion in the previous quarter. Unsecured lending also decreased to around £3 billion from around £4 billion in quarter one.

The slowdown in secured lending may have impacted on house prices in terms of lower growth. Nationwide and Halifax reported house prices falling by 8.1 per cent and 8.8 per cent respectively in July 2008. The housing market plays a major influence on consumer expenditure patterns. Firstly, as a barometer of confidence in the economy and therefore a willingness to spend; secondly, in terms of demand it creates for household goods via house purchases; and thirdly, household expenditure may be linked to household equity withdrawal (HEW) – slower house

Figure 9
Retail sales

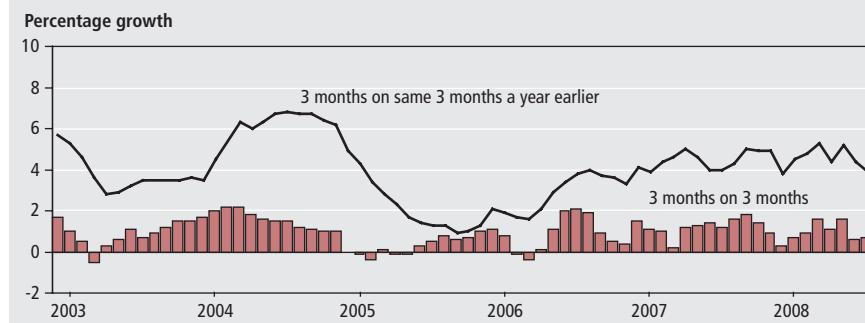
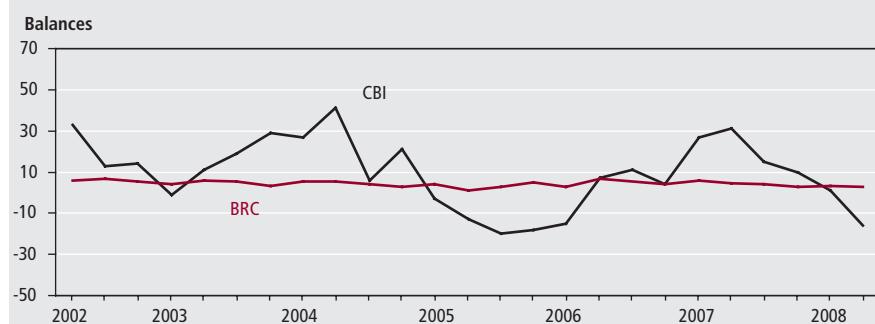


Figure 10
External retailing



price growth can signify lower equity growth and therefore decreasing purchasing power. The recent slowdown in house prices and the housing market generally may have affected all three of the above, compounded by the credit squeeze.

One uncertainty in the latest quarter is the savings ratio. In 2008 quarter one household's resorted to a draw-down in their savings to fund consumption. There is a question whether households will dip further into their savings or choose to retrench; all this may be determined by their outlook with regard to confidence in the economy and labour market conditions.

BUSINESS DEMAND

Business investment weakens

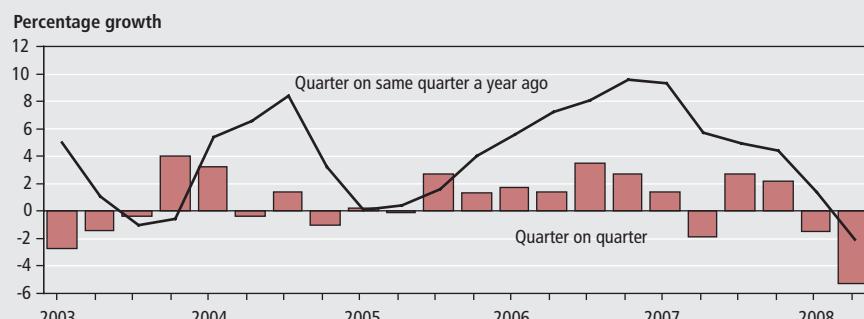
Total investment fell by 5.3 per cent in 2008 quarter two decelerating further from the fall of 1.5 per cent in quarter one. On an annual basis, total investment fell by 2.1 per cent, reversing positive growth of 1.4 per cent in the previous quarter. The decrease in total investment was due to both business and dwelling investment falling over the quarter (Figure 11).

Business investment continued to contract in the latest quarter. Growth decreased by 1.9 per cent in the latest quarter, roughly similar to the fall of 1.8 per cent in the previous quarter. On an annual basis, business investment grew by 1.9 per cent, a slowdown from 4.5 per cent growth in 2008 quarter one.

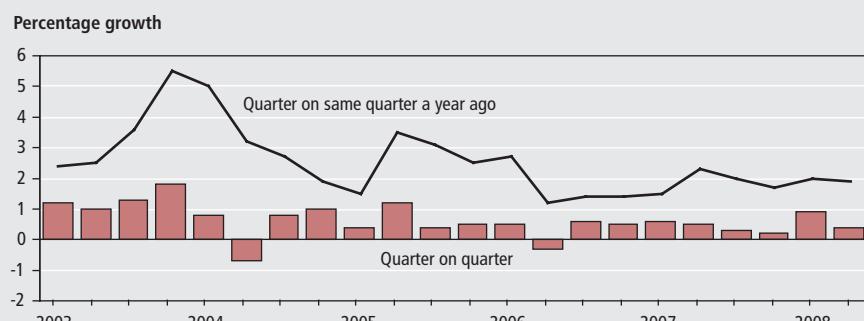
Business investment could have decreased for a number of reasons. Firstly, increased uncertainty and pessimism in regards to global and domestic demand, may have deterred investment; secondly, the downturn in investment could have come on the back of lower corporate profits; thirdly, the weakness in the equity market in recent quarters may have constrained revenue generation and hence investment; and last but not least, the general weakness in the property market in terms of lower price growth may have inhibited investment spending.

Evidence on investment intentions from the latest BCC and CBI surveys painted a picture of weakness. According to the latest quarterly BCC survey, the balance of manufacturing firms planning to increase investment in plant and machinery plummeted by 10 points to plus 2. The CBI's Quarterly Industrial Survey in 2008 quarter two also reported a bleaker investment picture, with the investment balance of plant and machinery weakening

**Figure 11
Total fixed investment**



**Figure 12
Government spending**



to minus 24 from minus 18 in the previous quarter.

GOVERNMENT DEMAND

Government expenditure moderates

Government final consumption expenditure slowed in 2008 quarter two. Growth registered a modest 0.4 per cent compared with growth of 0.9 per cent in the previous quarter. On an annual basis, growth was 1.9 per cent, down slightly from 2 per cent growth in the previous quarter (Figure 12).

Public sector finances deteriorate

The latest figures on the public sector finances to July 2008 continued to illustrate a relatively weak position. The figures showed a higher current budget deficit together with an increased net borrowing situation – reflecting government expenditure continuing to exceed revenues. In the financial year 2008/09 to date, the current budget was in deficit by £13.3 billion; this compares with a budget deficit of £4 billion in the same period of 2007/08. Public sector net borrowing in the financial year 2008/09 to date was £19.1 billion; this compares with net borrowing of £8.4 billion in the

same period of 2007/08. Slower growth in current receipts were exceeded by a larger increase in the rate of current expenditure, particularly on capital projects – resulting in both a higher budget deficit and net borrowing.

Since net borrowing became positive in 2002, following the current budget moving from surplus into deficit, net debt as a proportion of annual GDP has risen steadily. Public sector net debt in July 2008 was 37.3 per cent of GDP, up from 36.1 per cent in July 2008. In the full financial year 2006/07, net debt as a percentage of GDP was 36.9 per cent.

TRADE AND THE BALANCE OF PAYMENTS

Current account deficit narrows; goods trade deficit narrows in quarter two

The publication of the latest quarterly balance of payments figures shows that the current account deficit narrowed in 2008 quarter one to £8.4 billion, from a revised deficit of £12.2 billion in the previous quarter (Figure 13). As a proportion of GDP, the deficit fell to 2.4 per cent of GDP from 3.5 per cent in 2007 quarter four. The narrowing in the current account deficit in 2008 quarter one was due to a higher surplus on income, together

with lower deficits on trade in goods and on current transfers, partially offset by a fall in the surplus on trade in services. The surplus on income increased by £2.2 billion to £9 billion. The deficit in current transfers narrowed to £3.9 billion, while the surplus on trade in services fell to £9.2 billion. The deficit on trade in goods fell by £1.4 billion to £22.7 billion.

The run of current account deficits since 1998 reflects the sustained deterioration in the trade balance. The UK has traditionally run a surplus on the trade in services, complemented by a surplus in investment income, but this has been more than offset by the growing deficit in trade in goods partly due to the UK's appetite for cheaper imports.

The figures in 2008 quarter two showed a continuation in the goods trade deficit but a slight narrowing from quarter one. The goods trade deficit was £22.6 billion in 2008 quarter one, down from a deficit of £22.6 billion in the previous quarter. Overall, there was a fall in imports which outstripped the fall in exports – leading to a fall in the total trade balance to £12.6 billion in 2008 quarter two from £13.4 billion in quarter one. Over the quarter, in terms of growth, total exports fell by 0.5 per cent and total imports fell by 1.4 per cent. Exports of goods grew by 1 per cent while goods imports fell by 0.8 per cent. Services exports fell by 2.7 per cent and services imports decreased by 3.3 per cent.

External surveys on exports reported a mixed picture for the latest quarter. The BCC reported that the export sales net balance rose by 12 points to plus 28. The latest CBI quarterly survey reported a weak picture. The export orders balance was minus 7 in 2008 quarter two, from minus 12 in the previous quarter. According to the latest monthly figures, the export balance was minus 9 in August.

LABOUR MARKET

Labour market activity weakens

The labour market in the latest reference period showed further signs of softening, but overall, still reflected a fairly buoyant picture – with relatively high levels of employment and low levels of unemployment seen throughout 2006 and in 2007. The weakening in certain indicators of the labour market in the latest period may reflect the lagged effect of the slowdown in the economy which began in the third quarter of 2007 and which has quickened in the last two quarters, starting

to feed through into a deeper and probably an extended period of weakness in labour market activity.

The latest figures from the Labour Force Survey (LFS) pertain to the three-month period up to June 2008. On the upside, the number of people in employment rose. The number of inactive people of working age fell slightly. On the downside, the employment rate fell. The number of unemployed people and the unemployment rate increased. The claimant count increased. The number of vacancies fell. Average earnings, including and excluding bonuses decreased. Overall, average earnings remain subdued with weak real-wage growth.

Near record levels of employment continue despite the pace of employment increase slowing in the current period, compared with the previous quarter – suggesting that lower GDP growth is starting to impact on lower employment growth. The number of people in employment rose by 20,000 in the three months to June and by 384,000 on a year earlier; this compares with respective increases of 61,000 and 413,000 on the three months to May 2008. The current working-age employment rate was 74.8 per cent in the three months to June 2008, down 0.1 percentage points from the three months to March 2008 but up 0.3 percentage points from a year earlier – leaving the employment level at 29.56

million. Unemployment levels on the other hand rose and for a fourth month in a row. The number of unemployed people increased by 60,000 in the three months to June 2008, a steeper increase compared to previous months and was up 15,000 from a year earlier, leaving the unemployment level at 1.67 million. The unemployment rate also rose, to 5.4 per cent in the three months to June 2008, up 0.2 percentage points in the three months to March 2008 but unchanged from a year earlier (Figure 14).

Looking at a detailed level, the increase in the employment level was mainly driven by employees and full-time employment offset by decreases in self-employment and part-time employment. Employees rose by 35,000 while the self-employed decreased by 15,000, continuing the trend from earlier months. In terms of full- and part-time workers, the numbers of people in full-time employment rose by 26,000 while the number of people in part-time employment fell by 7,000.

Workforce jobs increases

According to employer surveys, there was an increase of 30,000 jobs in March 2008. The largest quarterly contribution to the increase came from other services (up 27,000), followed by agriculture, forestry and fishing (up 18,000). This was offset by decreases across a number of sectors with the largest decrease in business services and finance (down

Figure 13
Balance of payments

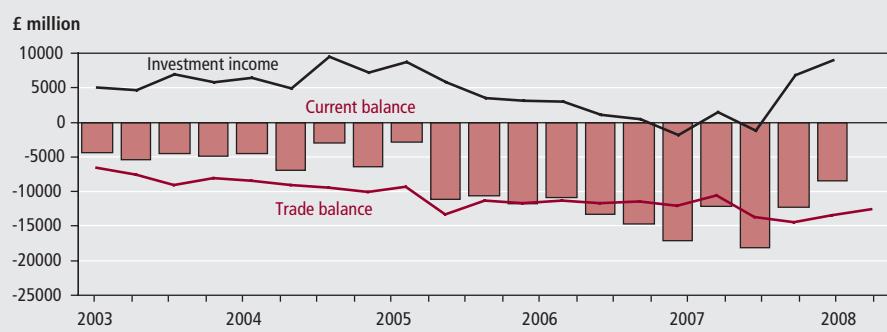
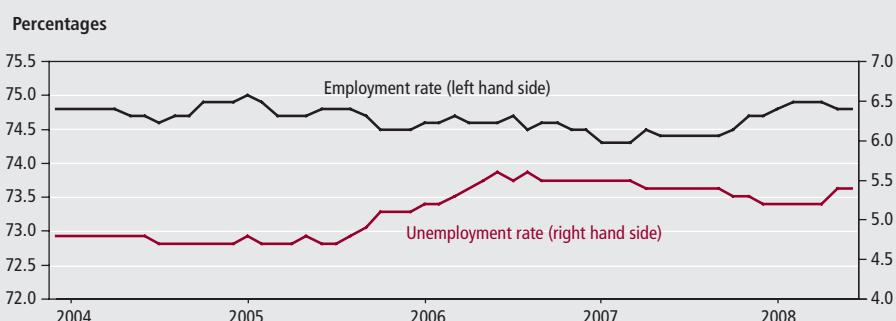


Figure 14
Employment and unemployment



20,000) followed by manufacturing (down 11,000). Over the year, total workforce jobs increased by 209,000. Of the total, the largest contribution to the increase over the year came from finance and business services (up 84,000) followed by distribution, hotels and restaurants (up 83,000). The manufacturing sector, in contrast, was the only sector to lose jobs on the year (down 52,000).

Claimant count level increases

The claimant count measures the number of people claiming the Jobseeker's Allowance. The latest figures for July 2008 showed the claimant count level rose by 20,100 – the sixth consecutive monthly increase and was up 10,900 on a year earlier to reach a level of 864,700. The claimant count rate in July 2008 was 2.7 per cent, up 0.1 percentage point on the previous month but virtually unchanged on a year earlier.

Vacancies fall

The number of vacancies was down compared to the previous month which may reflect weaker demand conditions in the UK economy. There were 634,900 job vacancies in the three months to July 2008, down 47,400 from the previous three months and down 23,200 from the same period a year earlier.

Inactivity level falls slightly

The working-age inactivity rate was 20.9 per cent in the three months to June 2008, unchanged on the three months to March 2008 but down 0.3 percentage points from a year earlier. In level terms, the number of economically inactive people of working age decreased by 3,000 over the quarter and by 84,000 over the year to reach a level of 7.88 million in the three months to June 2008. The largest fall in level of inactivity was recorded for those categorised as 'long-term sick' (down 35,000). This was partially offset by a number of increases, with the largest rise in inactivity amongst those categorised as 'looking after family/home' (up 29,000).

Average earnings decrease

Growth in whole-economy average earnings showed a relatively subdued picture in the three months

to June 2008. Average earnings including bonuses increased by 3.4 per cent, down 0.4 percentage points from the previous month. Average earnings excluding bonuses also rose by 3.7 per cent, down 0.1 percentage points from the previous month. Public and private sector earnings growth slowed in the latest month. In terms of the public and private sector split, the gap in average earnings (excluding bonuses) maintained the parity of the previous month with a difference of 0.1 percentage point. Public sector earnings growth was 3.8 per cent, down 0.1 percentage points from the previous month. Private sector earnings grew by 3.7 per cent, also falling by 0.1 percentage point from May 2008.

Overall, the numbers still point to a fairly buoyant labour market, with employment at high levels and unemployment at a fairly stable level. However, the slowing economy may have begun to show signs of a deeper turning point in labour market activity, particularly in terms of slower employment growth and larger increases in unemployment levels. Average earnings show stable but fairly modest growth, consistent with softening in labour market activity and increase in supply in the labour force.

PRICES

Producer output and input prices accelerate

Industrial input and output prices are an indication of inflationary pressures in the economy. During the second quarter of 2008, output and input prices accelerated further from 2008 quarter one – another sign that a rise in world commodity prices was continuing to exert considerable influence in generating UK inflation through higher product prices. The rise in output prices suggests that firms were attempting to maintain their profit margins by passing on the higher costs of inputs to customers. However, the slower rate of growth of output inflation in the latest quarter compared to faster input price growth may suggest that firms have been tempered, in part, from passing on higher input price rises to customers due to spending pressures faced by households – with a possible impact on firms' profits.

Input prices on average rose by around 28 per cent in 2008 quarter two. This compares with around 20 per cent in 2008 quarter one. On the core measure, which strips out the effect of food, beverages, tobacco and petroleum prices, input prices rose by an average of around 14 per cent in 2008

quarter two (12 month non-seasonally adjusted growth), an acceleration from growth of around 9 per cent in the previous quarter. The sharp rise in input prices came mainly on the back of rising crude oil and home food materials prices. According to the latest monthly figures, the annual rate of input price inflation rose by 30.1 per cent in the twelve months to July 2008, down slightly from 30.8 in June – driven by a 79.3 per cent increase in the price of crude oil on the year.

Output prices grew on average by around 9 per cent in 2008 quarter one, an acceleration from growth of around 6 per cent in the previous quarter. The underlying picture also suggests inflationary pressures. On the core measure which excludes food, beverages, tobacco and petroleum, producer output prices rose on average by around 6 per cent in 2008 quarter one, up from around 3 per cent in the previous quarter. The main contributions to the increase in output prices were provided by rises in petroleum products and food prices. According to the latest monthly figures, annual output price inflation rose by 10.2 per cent in the 12 months to July, up from 10 per cent in June – mainly driven by petroleum products which rose 35.2 per cent on the year. Higher output and input prices appear to be fuelling consumer price inflation.

Consumer prices accelerates further and above target

Growth in the consumer prices index (CPI) – the Government's target measure of inflation – accelerated further in July to 4.4 per cent in July, up from 3.8 per cent in June 2008, and considerably above the Government's 2 per cent inflation target (Figure 15).

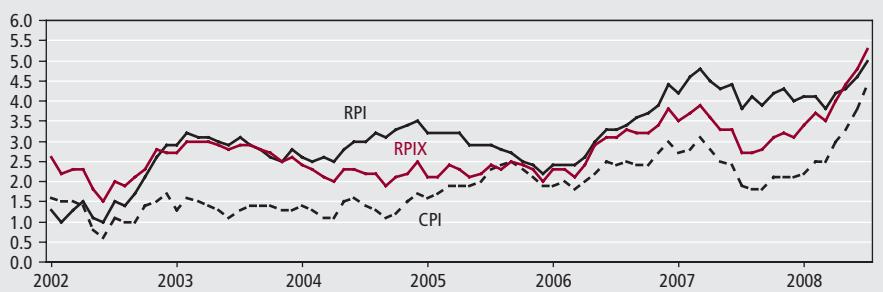
The largest upward pressure came from food and non-alcoholic beverages where prices rose this year but fell a year ago. Within this division, there were large upward effects from meat, bread and cereals, and vegetables.

There were further large upward pressures from:

- transport costs, mainly due to the price of fuels and air transport. The average price of petrol increased by 1.2 pence per litre between June and July this year, to stand at 118.8 pence, compared with a fall of 0.4 pence last year. The other large upward effect came from passenger air transport where fares rose by more than last year particularly on European routes

Figure 15**Inflation**

Percentage change over 12 months



- housing and household services due to gas and electricity bills which were unchanged this year but fell a year ago
- furniture, household equipment and maintenance where overall price discounting was not as great as last year, particularly for furniture and furnishings
- clothing and footwear, where falls in price due to sales were not as large as last year, particularly for women's outerwear

A small downward pressure came from recreation and culture, where the price of computer games fell this year but rose a year ago and the price of pre-recorded DVDs fell by more than a year ago.

Retail Prices Index (RPI) inflation rose to 5.0 per cent in July, up from 4.6 per cent in June. The main factors affecting the CPI also affected the RPI. Additionally, there was a large downward contribution from housing with the main effect coming from house depreciation.

RPIX inflation – the all items RPI excluding mortgage interest payments – was 5.3 per cent in July, up from 4.8 per cent in June.

Independent forecasts

August 2008

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 2008 and 2009 and are extracted from HM Treasury's Forecasts for the UK Economy.

2008

	Average	Lowest	Highest
GDP growth (per cent)	1.4	0.8	1.8
Inflation rate (Q4, per cent)			
CPI	4.2	2.9	4.9
RPI	4.6	2.7	5.9
Claimant count (Q4, million)	0.92	0.79	1.00
Current account (£ billion)	-48.8	-67.4	-23.5
Public Sector Net Borrowing (2007–08, £ billion)	46.7	31.0	53.8

2009

	Average	Lowest	Highest
GDP growth (per cent)	0.9	-1.8	2.8
Inflation rate (Q4, per cent)			
CPI	2.2	0.9	4.0
RPI	2.3	0.4	4.5
Claimant count (Q4, million)	1.10	0.77	1.31
Current account (£ billion)	-47.2	-90.8	-17.4
Public Sector Net Borrowing (2009–10, £ billion)	49.5	30.0	62.0

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/economic_data_and_tools/data_index.cfm

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 2008), published by OECD (Organisation for Economic Co-operation and Development).

2008

	US	Japan	Euro area	Total OECD
Real GDP growth (per cent)	1.2	1.7	1.7	1.8
Consumer price (percentage change from previous year)	3.2	0.9	3.4	3.0
Unemployment rate (per cent of the labour force)	5.4	3.8	7.2	5.7
Current account (as a percentage of GDP)	-5.0	4.4	0.1	-1.3
Fiscal balance (as a percentage of GDP)	-5.2	-1.6	-1.0	-2.8

2009

	US	Japan	Euro area	Total OECD
Real GDP growth (per cent)	1.1	1.5	1.4	1.7
Consumer price (percentage change from previous year)	2.0	0.4	2.4	2.1
Unemployment rate (per cent of the labour force)	6.1	3.8	7.4	6.0
Current account (as a percentage of GDP)	-4.4	4.4	0.0	-1.1
Fiscal balance (as a percentage of GDP)	-4.4	-2.5	-0.8	-2.5

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.

	Source	2006	2007	2007 Q4	2008 Q1	2008 Q2	2008 May	2008 Jun	2008 Jul	Seasonally adjusted unless otherwise stated
GDP growth - chained volume measures (CVM)										
Gross domestic product at market prices	ABMI	2.9	3.1	0.6	0.3	0.0	..	..	..	..
Output growth - chained volume measures (CVM)										
Gross value added (GVA) at basic prices	ABMM	3.0	3.0	0.6	0.3	0.0	..	..	..	..
Industrial production	CKYW	0.3	0.3	0.2	-0.2	-0.8	-0.8	-0.2	..	..
Manufacturing	CKYY	1.6	0.6	0.1	0.3	-0.8	-0.6	-0.5	..	..
Construction	GDQB	1.0	2.3	0.9	0.5	-1.1	..	..	..	..
Services	GDQS	3.6	3.9	0.6	0.3	0.2	..	..	..	..
Oil and gas extraction	CKZO	-9.4	-2.4	0.8	-3.6	0.3	1.9	0.7	..	..
Electricity, gas and water supply	CKYZ	-2.0	0.1	2.9	-1.3	-1.9	-5.4	2.1	..	..
Business services and finance	GDQN	5.4	5.3	0.4	0.2	0.1	..	..	..	..
Household demand										
Retail sales volume growth	EAPS	3.2	4.3	0.3	1.7	0.6	4.0	-4.3	0.8	..
Household final consumption expenditure growth (CVM)	ABJR	1.9	3.1	0.4	1.1	-0.1	..	..	..	..
GB new registrations of cars (thousands) ¹	BCGT	2,340	2,390	468	675	557	177	207	..	..
Labour market^{2,3}										
Employment: 16 and over (thousands)	MGRZ	29,027	29,233	29,421	29,538	29,558	29,558	..	..	..
Employment rate: working age (%)	MGSU	74.6	74.5	74.8	74.9	74.8	74.8	..	..	..
Workforce jobs (thousands)	DYDC	31,294	31,536	31,611	31,640	..	..	..	..	..
Total actual weekly hours of work: all workers (millions)	YBUS	928.6	936.3	937.0	948.4	942.0	942.0	..	..	..
Unemployment: 16 and over (thousands)	MGSC	1,671	1,652	1,599	1,612	1,672	1,672	..	..	..
Unemployment rate: 16 and over (%)	MGSX	5.4	5.4	5.2	5.2	5.4	5.4	..	..	..
Claimant count (thousands)	BCJD	944.7	863.3	816.1	796.5	826.5	824.6	844.6	864.7	..
Economically active: 16 and over (thousands)	MGSF	30,698	30,885	31,020	31,151	31,231	31,231	..	..	..
Economic activity rate: working age (%)	MGSO	78.9	78.9	79.0	79.1	79.1	79.1	..	..	..
Economically inactive: working age (thousands)	YBSN	7,861	7,946	7,911	7,878	7,876	7,876	..	..	..
Economic inactivity rate: working age (%)	YBTL	21.0	21.1	21.0	20.9	20.9	20.9	..	..	..
Vacancies (thousands)	AP2Y	597.1	656.6	675.6	687.3	652.9	672.5	652.9	634.9	..
Redundancies (thousands)	BEAO	139	128	111	111	126	126	..	..	..
Productivity and earnings annual growth										
GB average earnings (including bonuses) ³	LNNC	..	..	3.8	4.0	3.4	3.8	3.4	..	..
GB average earnings (excluding bonuses) ³	JQDY	..	..	3.7	3.8	3.7	3.8	3.7	..	..
Whole economy productivity (output per worker)	A4YN	..	..	1.6	0.6	..	..	..	..	..
Manufacturing productivity (output per job)	LOUV	..	..	..	..	..	1.7	1.3	..	..
Unit wage costs: whole economy	LOJE	..	..	2.1	2.6	..	..	..	..	..
Unit wage costs: manufacturing	LOJF	..	..	..	..	..	1.9	1.6	..	..
Business demand										
Business investment growth (CVM)	NPEL	-4.6	8.3	3.1	-1.8	-1.9	..	..	..	..
Government demand										
Government final consumption expenditure growth	NMRY	1.7	1.9	0.2	0.9	0.4	..	..	..	..
Prices (12-monthly percentage change – except oil prices)										
Consumer prices index ¹	D7G7	2.3	2.3	2.1	2.4	3.4	3.3	3.8	4.4	..
Retail prices index ¹	CZBH	3.2	4.3	4.2	4.0	4.4	4.3	4.6	5.0	..
Retail prices index (excluding mortgage interest payments)	CDKQ	2.9	3.2	3.1	3.5	4.4	4.4	4.8	5.3	..
Producer output prices (excluding FBTP) ⁴	EUAA	2.3	2.3	2.5	3.5	5.8	6.0	6.5	6.6	..
Producer input prices	EUAB	9.7	3.2	11.4	20.8	28.1	28.2	30.8	30.1	..
Oil price: sterling (£ per barrel)	ETXR	35.93	36.11	43.51	48.72	62.35	63.32	68.02	67.65	..
Oil price: dollars (\$) per barrel)	ETXQ	66.11	72.44	88.91	96.47	122.87	124.48	133.78	134.52	..

		Seasonally adjusted unless otherwise stated							
	Source CDID	2006	2007	2007 Q4	2008 Q1	2008 Q2	2008 May	2008 Jun	2008 Jul
Financial markets									
Sterling ERI (January 2005=100)	BK67	101.2	103.5	101.2	95.5	92.7	92.7	92.8	92.8
Average exchange rate /US\$	AUSS	1.8429	2.0018	2.0444	1.9789	1.9705	1.9641	1.9658	1.9827
Average exchange rate /Euro	THAP	1.4670	1.4619	1.4129	1.3212	1.2615	1.2633	1.2636	1.2615
3-month inter-bank rate	HSAJ	5.26	5.95	5.95	5.95	5.88	5.80	5.88	5.75
Selected retail banks: base rate	ZCMG						5.00	5.00	5.00
3-month interest rate on US Treasury bills	LUST	4.89	3.29	3.29	1.36	1.87	1.85	1.87	1.67
Trade and the balance of payments									
UK balance on trade in goods (£m)	BOKI	-77,555	-89,515	-24,143	-22,720	-22,545	-7,399	-7,684	..
Exports of services (£m)	IKBB	127,157	139,156	35,342	36,194	35,781	11,974	11,815	..
Non-EU balance on trade in goods (£m)	LGDT	-45,468	-47,691	-13,121	-12,111	-12,917	-4,042	-4,744	..
Non-EU exports of goods (excl oil & erratics) ⁵	SHDJ	118.0	116.5	116.0	122.7	124.2	127.5	121.5	..
Non-EU imports of goods (excl oil & erratics) ⁵	SHED	124.5	131.6	134.4	131.0	129.4	130.4	129.9	..
Non-EU import and price index (excl oil) ⁵	LWKQ	103.9	104.2	104.1	109.6	113.2	113.4	113.6	..
Non-EU export and price index (excl oil) ⁵	LKVX	101.5	102.5	104.0	106.6	108.1	108.3	108.4	..
Monetary conditions/government finances									
Narrow money: notes and coin (year on year percentage growth) ⁶	VQUU	5.1	5.8	5.8	6.8	5.7	5.9	5.7	5.8
M4 (year on year percentage growth)	VQJW	13.0	12.7	12.4	11.7	11.3	10.0	11.3	11.2
Public sector net borrowing (£m)	-ANNX	29,123	36,221	17,034	-3,518	23,932	12,461	9,585	-4,835
Net lending to consumers (£m)	RLMH	13,272	12,973	3,385	4,360	3,375	1,422	906	1,090

External indicators – non-ONS statistics

	2008 Jan	2008 Feb	2008 Mar	2008 Apr	2008 May	2008 Jun	2008 Jul	2008 Aug	
Activity and expectations									
CBI output expectations balance	ETCU	9	11	18	0	0	2	-7	-13
CBI optimism balance	ETBV	-18			-23			-40	
CBI price expectations balance	ETDQ	15	19	22	23	30	30	39	..

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 Volumes, 2003 = 100.
- 6 Replacement for series M0 which has ceased publication.

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

FEATURE

*Rob Pike, Catherine Marks and
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Office for National Statistics

Measuring UK inflation

SUMMARY

The Office for National Statistics collects a large number of prices every month to produce the retail prices index (RPI). Some perceive that consumer inflation is higher than the official measure. This article looks at the variations in price change for goods and services and the relative proportions consumers spend on them and suggests why some people think inflation is higher.

Households with different levels of income have different spending patterns, and these spending patterns affect each household's experience of inflation. For example, households with the lowest level of income spend a greater proportion on food whereas households with higher income spend more on petrol.

The retail prices index (RPI) is an important measure of inflation. It is used for the indexation of various incomes and prices and the uprating of pensions, benefits and index-linked gilts. Currently, some people perceive that consumer inflation is higher than the official measure; some believe that particular groups of households have higher inflation rates than others.

This article provides a short explanation of the processes involved in calculating the RPI and then examines perceptions of the rate of inflation and the contributions of different goods and services to the headline rates of inflation. It explains which ones are pushing up inflation and which are having a downward impact on the inflation rate. It looks at households' spending patterns and how they vary by income group and household composition.

The article draws on an analysis of individual households' inflation rates to obtain estimates of price inflation for particular household groups. The analysis uses details of 6,000 households from the Office for National Statistics (ONS) Expenditure and Food Survey (EFS). The EFS asks households to complete a two-week diary of expenditure and collects additional information about major purchases over a longer period (such as furniture over the past three months) and regular payments that are made (such as energy bills). For the analysis, an inflation rate was calculated for each household record from the EFS. The calculation is based on the RPI, rather

than the consumer prices index (CPI), as the RPI weights are derived largely from the EFS data on households' expenditure, whereas CPI weights are derived from the National Accounts estimate of household expenditure, which is not available on an individual household basis.

The article comprises six sections, which are outlined below.

How is the rate of inflation calculated and used?

The RPI measures the change in price of a fixed basket of representative goods and services, through the collection of over 120,000 prices every month. The resulting inflation estimates are an average of the change in price for goods and services. It is not an average measure of price changes experienced by each household. This section explains how the RPI is compiled and explains the differences between the RPI and CPI.

Why do people think inflation is higher than estimates published by ONS?

A common perception is that inflation is higher than the RPI estimates. Perceptions are influenced by many factors including the price of frequently purchased goods and services and media reports. For example, some media reports have been suggesting that the cost of living is higher than the official consumer inflation figures; in particular, they have quoted their own or unofficial cost of living indices. This section explores these issues.

What is pushing inflation up and pulling it down?

This section of the article shows which goods and services are having the largest upward pressures on the RPI, and which goods and services are having a downward pull.

Household spending patterns

This section provides an analysis of household spending patterns for some of the goods and services that are having the largest upward and downward effects on the RPI. It shows how the proportion spent on these particular items varies for households of different levels of total expenditure.

Price changes experienced by income group and household type

This part of the article draws on the analysis using data from the EFS to calculate the price change experienced by different income groups and household types.

Conclusions

This section draws the conclusions of the article.

How is the rate of inflation calculated and used?

This section gives a brief overview of the processes involved in producing the headline RPI estimate.

How is the RPI calculated?

The RPI and CPI both measure the changing cost of a fixed basket of goods and services, ensuring that the indices capture price changes rather than changes in consumers' expenditure patterns. An explanation of why ONS publishes two estimates of consumer inflation and the main differences between these two measures is provided in **Box 1**.

ONS collects 120,000 separate price quotations every month from randomly selected outlets, including those in shopping centres, out-of-town retail outlets, supermarkets, corner shops and the internet. Price collectors visit shops in 141 locations across the UK to collect over 100,000 prices of around 600 representative goods and services typically bought by UK households. The large number of locations ensures that variations in price change across the UK are captured. For some goods and services, the same price is charged throughout the country, for example, TV licences, newspapers and purchases from catalogues. These prices are collected centrally and account for over 12,000 prices. The large number of prices collected for each item in the sample means that there is a broad representation of brands. For example, over 130 prices are collected for a box of 80 tea bags, including all the main brands as well as supermarkets' own brands.

The items included for price collection

are referred to as the basket of goods and services. This basket contains a sample of representative consumer goods and services on which households typically spend their money. The prices of these goods and services are used to give a reliable measure of price movements for a broader range of items. The number of items chosen to represent each product group depends on the expenditure on the group and the variability of price changes. This information comes from the EFS and other sources, such as information from market research.

Households spend more on some items than others, and the amount they spend on an item influences the sensitivity of the index to price changes for that item. For example, a 10 per cent rise in the price of petrol should have a larger impact on the RPI than a 10 per cent rise in the price of tea. To reflect this, products are grouped together, and a weight is allocated to represent the appropriate share of household expenditure. The weights for the RPI are derived mainly from the EFS; this covers UK private households only, and their expenditure in the UK. For more information on the construction of weights, see Baran (2008). It is important to bear in mind that the RPI basket of goods and services represents all goods and services bought by households. As not all people smoke, drink, drive, own their own home,

Box 1

The two measures of inflation

Why does the ONS publish two measures of inflation?

A single measure of inflation would not be able to meet all users' needs.

The RPI is the older and more familiar measure of inflation. It is used for the indexation of various incomes and prices and the uprating of pensions, benefits and index-linked gilts. The RPI provides a consistent series back to 1947, allowing analysis of price change over time. In contrast, the CPI is available back to 1997.

The CPI is the main measure of consumer price inflation for macroeconomic purposes in the UK. It uses methods that are consistent across the European Union, allowing comparisons of the rate of inflation across European countries. It forms the basis for the Government's inflation target that the Bank of England's Monetary Policy Committee is required to achieve.

Key differences between the CPI and RPI

There are differences in the goods and services represented in the basket:

- the CPI excludes a number of items included in the RPI mainly relating to housing costs, for example council tax, mortgage interest payments and depreciation (major repairs)
- the CPI includes some charges for financial services, for example, stockbrokers' charges, which are excluded from the RPI

The way prices are combined using people's spending patterns are different:

- the CPI represents a broader population than the RPI. The RPI excludes households with the top 4 per cent of income and excludes around 20 per cent of pensioner households – those that derive at least three-quarters of their income from state pension or benefits. All other pensioner households are included
- the CPI produces weights for items in the basket using a breakdown of household expenditure taken from National Accounts. The RPI largely uses the EFS to calculate weights

Different mathematical formulae are used for combining the prices collected for each item in the basket.

For more information on the methodological differences, see ONS (2003, 2007).

and have dependants, by definition the headline rates of inflation will include the price changes of items which are not necessarily bought by every household.

Why do people think inflation is higher than estimates published by ONS?

The common perception is that inflation is higher than the RPI estimate. Perceptions are influenced by many factors, including the price of frequently purchased goods and services and media reports.

People tend to notice when prices increase: if a price is unchanged or has fallen, it leaves less of an impression. This can lead to the view that prices are increasing even if it only applies to a small number of items. This is particularly the case when the price of goods and services bought regularly and often, such as food and petrol, increase, while the price of items bought infrequently, such as televisions, computers and clothing, decrease. Households notice that the cost of purchasing their weekly shopping has increased but are less inclined to notice that the price of an item bought once every few years has fallen or has stayed the same. Recently, there have been large increases in petrol and food prices but decreases in the price of leisure goods and electrical equipment. The change in the price of clothing is less obvious, as consumers may not purchase directly comparable items at regular intervals.

The media also have an influence: there is a tendency to report increasing prices rather than decreasing prices. Some media reports are suggesting that the cost of living is higher than the official inflation figures, in particular they have quoted their own or unofficial cost of living indices. These indices typically use a small number of items, collecting only a few prices for each item and the brands selected are not necessarily representative of the average price moves for the item. For example, in one index, the price of tea bags was estimated to be rising by 67 per cent, whereas the official data, which is based on 130 price quotes covering 20 different brands, showed a rise of less than 5 per cent.

The RPI measures the average change in prices by calculating the change in price of a fixed basket of goods and services bought by UK households. This is not the same as measuring the individual rate of inflation for each UK household and taking an average. Every household is different, spending different amounts of money on a different basket of goods and

services, impacting on the rate of inflation experienced by that particular household. Households which spend relatively more on items with larger increases in prices will have a higher personal inflation rate; those who spend more on items with lower price increases or falls will experience a lower rate of inflation.

An analysis of 6,000 households from the EFS, for the 12 months to April 2008, shows the diversity of expenditure patterns. This analysis suggests that 80 per cent of households experienced average price changes of between 2.7 per cent and 6.1 per cent, and that the price changes experienced by 50 per cent of households were in the range 3.7 to 5.3 per cent. These ranges compare with the estimate for the average of all households (that is, including the top 4 per cent of earners and all pensioners) of 4.5 per cent and the published RPI for April of 4.2 per cent. The ranges for 80 per cent and 50 per cent of households may seem narrower than expected, but it should be noted that the approach used only reflects the variation in the spending pattern of each household. It does not account for price change differentials arising because different household groups purchase items from different regions, from different types of outlets, nor from the purchasing of different brands or types of items. If these other variations could be incorporated into the calculation, there might be greater differences in the individual inflation rates (see section on 'Price changes experienced by income group and household type' and the technical note for an explanation of the methodology used and limitations of the approach).

ONS has produced a personal inflation

calculator allowing individuals to calculate their personal inflation rate. The calculator uses the individual's expenditure patterns on the main categories of goods and services in a similar way to the RPI to estimate a personal inflation rate. For an introduction to the personal inflation calculator, see Powell and O'Donoghue (2007). The personal inflation calculator can be accessed on the ONS website.

What is pushing inflation up and pulling it down?

The discussion of public perceptions of the rate of inflation concluded that they are affected by several different factors, including the rising prices of some frequently purchased goods and services. The following section examines the movements of various groups of goods and services within the RPI.

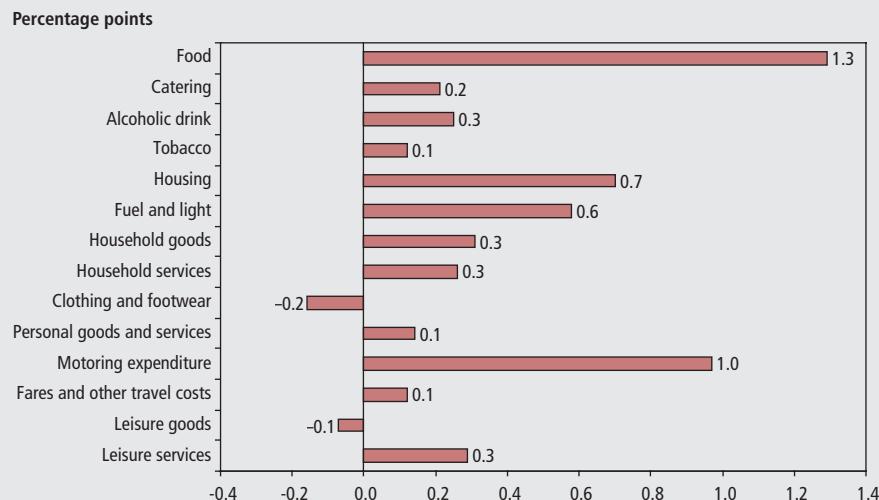
Variations in the rate of inflation for different goods and services

In the year to July 2008, the RPI rose by 5.0 per cent. This increase takes into account the weight of each component as well as its movement.

The contribution of each division to the RPI growth rate is shown in **Figure 1**. Food recorded the largest upward contribution to the RPI in July, contributing 1.3 percentage points to the RPI figure for the year to July, the largest contribution from any component. Motoring expenditure, housing, and fuel and light also had large positive impacts. Downward contributions came from clothing and footwear and leisure goods.

The price rises for the key drivers to the RPI (food, housing, petrol and energy) are mostly driven by international rather than

Figure 1
Contribution to the RPI all items 12-month rate, 12 months ending July 2008



domestic pressures. The price of oil has soared due to global demand and supply pressures, continuously breaking record highs, leading to high fuel prices. Large increases in the price of wholesale gas have impacted on retail gas and electricity prices in the UK. World food prices have risen over the last year as increased demand and poor harvests led to sharp rises in the wholesale price of wheat, soya, rice and corn.

As suggested in the previous section, the components with the largest positive contributions, such as food and petrol, are the goods that people buy on a regular basis. In contrast, those components that are bought on a less regular basis, such as clothing and footwear, have experienced smaller price increases or in some cases price falls. This is likely to have contributed to the public perception that inflation is higher than the official estimates suggest.

The components with the largest positive and negative contributions to the RPI (food and clothing and footwear) can be split down further into subgroups.

The rate of inflation has been increasing since summer 2007 for many sections within the food group. Products such as butter and eggs have experienced large price increases: in the year to July, prices

have increased by 37 and 36 per cent, respectively. Other products have also experienced an increase in the rate of price inflation: poultry increased by 24 per cent in the year to July, bread by 20 per cent and cereals by 18 per cent (**Figure 2**).

Within housing, all components contribute to the upward effect. These include rent, house depreciation (major repairs) council tax/rates and mortgage interest payments.

While some product groups have been experiencing strong positive inflation, others have been recording lower rates of inflation, or even price cuts. **Figure 3** shows the components of the clothing group. The price of women's outerwear fell by the greatest amount, recording a fall of 8 per cent in the year to July. Prices also fell for men's outerwear and children's outerwear.

Household spending patterns

This section provides an analysis of household spending patterns for some of the goods and services that are having the largest upward and downward effects on the RPI. It shows how the proportion spent on these particular items varies according to the level of household expenditure. Housing costs are not included, as expenditure on housing in the RPI is not derived from the EFS.

How are household spending patterns used?

Household spending patterns are used to determine the weights of the goods and services that are in the RPI basket. Each item in the basket is given a weight to reflect the proportion of household expenditure spent on the item. For example, an average household spends about ten times as much on sweets and chocolate as it does on postal services; therefore, a 5 per cent increase in the price of sweets and chocolates would have ten times as much effect on the total cost of the basket when compared with a 5 per cent increase in postal charges. The weights are updated at the beginning of each year to ensure that they reflect the latest available information on household spending.

Why are these spending patterns important?

The spending patterns are important as their key use is to ensure that the price change of each good and service in the RPI basket is allocated the correct weight in the calculation of the RPI headline rate. They also help in determining the content of the RPI basket of goods and services, which is updated annually to ensure that it remains representative of the goods and services which households actually buy.

They are also important to individual households. Every household is different and spends money on different goods and services, and this expenditure pattern is a key determinant of the inflation rate experienced by individual households. For example, take households which spend a large proportion of their total expenditure on items that are significantly increasing in price. These households are likely to experience a higher inflation rate than those which spend relatively more on items which have lower price increases, or are even decreasing in price.

Analyses of household spending patterns

The EFS is the key data source used in the calculation of the RPI weights. The data used to calculate the 2008 RPI weights have been used to analyse how the spending patterns of different types of household groups vary. Using households' average weekly expenditure, the households have been grouped into:

- top decile: the top 10 per cent
- upper quartile: the top 25 per cent
- lower quartile: the bottom 25 per cent
- bottom decile: the bottom 10 per cent

Figure 2
Selected RPI food components

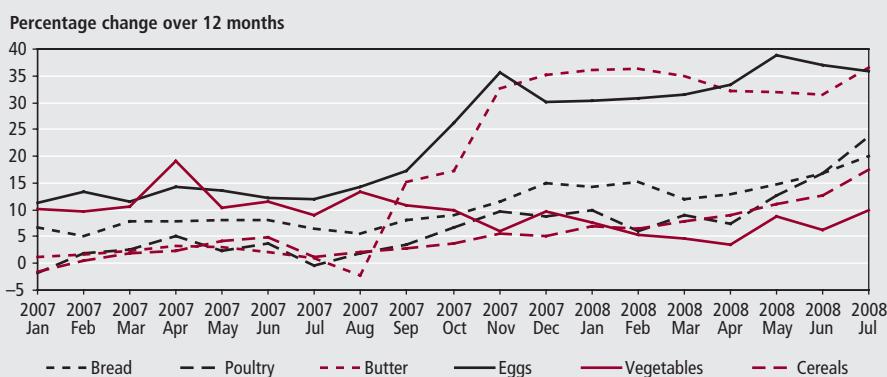
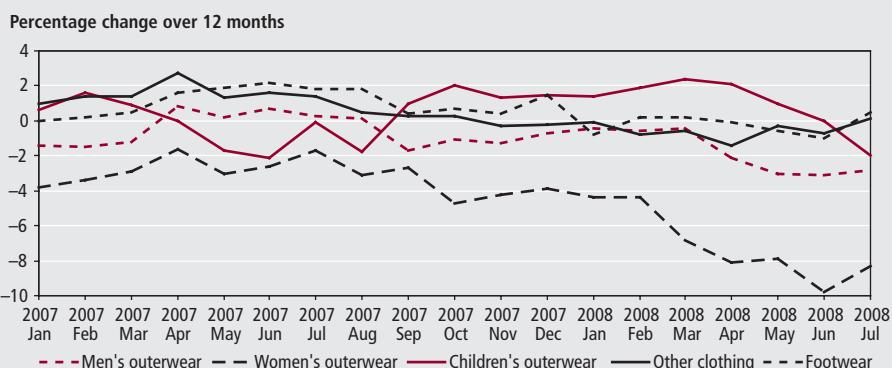


Figure 3
RPI clothing components



The analyses have studied the average weekly expenditure of the household groupings on a particular good or service as a percentage of the total average weekly expenditure of the household grouping.

The goods and services that have been analysed are:

- food, fuel and light, and petrol: these items have recently been significant contributors to the upward pressure to the RPI headline rate
- clothing and footwear: these products have recently been a significant contributor to the downward pressure to the RPI headline rate
- telecommunications and 'furniture, furnishing and electrical appliances': these products have not recently been significant contributors to the RPI headline rate; nevertheless they have attracted media and public interest

Figure 4 shows the proportion spent on each of these goods and services by each of the expenditure groups listed above.

Results

It can be seen from Figure 4 that the households which have the lowest level of total expenditure spend the highest proportion of their expenditure on food and fuel and light whereas those with the highest expenditure spend the lowest proportion on food and fuel and light. This means that the recent price increases for these products will have had a greater impact on the households which

have the lowest level of total expenditure. However, the recent increases in petrol prices will have had a smaller impact on those with the lowest total expenditure, but broadly similar effects for others.

Households which have the highest level of total expenditure spend a higher proportion of this expenditure on clothing and footwear than those which have the lower level of total expenditure. This means that the recent price decreases for these products will have had a more significant impact on the households which have the highest level of total expenditure.

The households with a high level of total expenditure spend a far higher proportion of this on furniture, furnishings and electrical appliances than those with lower total expenditure. The opposite is true, though, for telecommunications, where the households with the lowest total expenditure spend a higher proportion of that expenditure than those households which have a higher level of total expenditure.

Price changes experienced by income group and household type

Many commentators have suggested that different types of households experience different inflation rates.

This section describes the results of a study of the price changes experienced by households with different incomes and types of household composition over the 12 months to April 2008.

Measuring price changes experienced by different household groups

The RPI gives the rate of inflation for all households. For this article, the EFS has been used to estimate price inflation for particular household groups. These price estimates give an indication of the rate of inflation experienced by each group.

The method used to produce the price inflation rates is comparable with that used in the personal inflation calculator. The 2006/07 EFS contains expenditure data for 6,000 UK households. The spending pattern of each of these households was used to create 6,000 different sets of weights. Each of these was used within a calculation similar to the RPI to arrive at an estimate of each household's expenditure in April 2007 and April 2008. The price change was then determined over the 12 months for each individual household. The individual households were then grouped together for analysing the average rates of, and contributions to, price inflation.

This approach calculates the average change in expenditure using a 'democratic' price measure, where each household is given an equal weight irrespective of expenditure. The CPI and RPI use a 'plutocratic' price index which measures the change in average expenditure, effectively giving households with greater expenditure a greater weight. Rates of price inflation are shown for income deciles and household composition.

For a more detailed description of the methodology, see the technical note.

Households grouped by income

When the households were grouped by income deciles, there was little variation in the average price change experienced by different income groups. From **Table 1** it can be seen that the average price change experienced ranges from 4.3 to 4.6 per cent in the 12 months to April. However, as explained earlier, the approach used only reflects the variation in the spending pattern of each household. It does not account for price change differentials arising because different household groups purchase items from different regions, from different types of outlets, nor from the purchasing of different brands or types of items. If these other variations could be incorporated into the calculation, there might be greater differences between the inflation rates of these household groups.

Although different income groups experience different inflation rates, the results from this analysis by household income show less variation in the overall

Figure 4
Average household weekly spend on item as a percentage of total average weekly spend

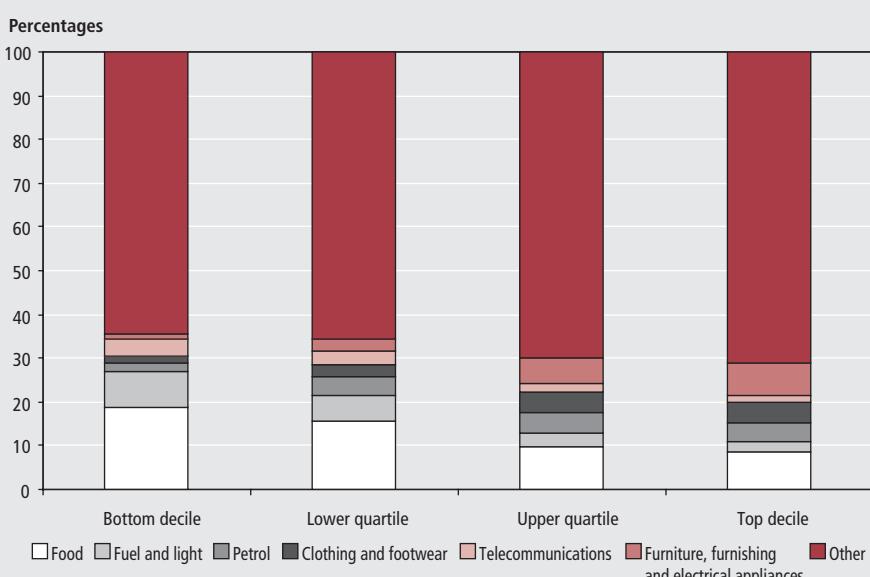


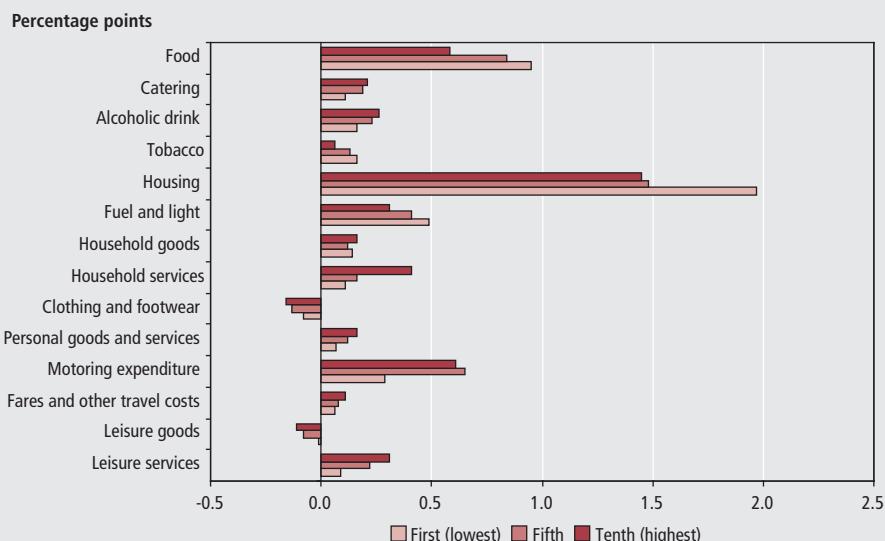
Table 1

Estimates of average price changes experienced by households grouped by income decile, 12 months ending April 2008

Income decile	Average price change experienced (%)
1st (lowest)	4.5
2nd	4.6
3rd	4.5
4th	4.5
5th	4.4
6th	4.4
7th	4.5
8th	4.4
9th	4.3
10th (highest)	4.4
All households	4.5

Figure 5

Contribution to price change experienced for certain income deciles, 12 months ending April 2008¹



Note:

- 1 Percentage change for each decile: tenth decile 4.4 per cent, fifth decile 4.4 per cent, first decile 4.5 per cent

price change experienced by different household groups than might be expected. The results do show differences in the extent to which particular goods and services contribute to the inflation rate for households in different household income groups, but these are largely offsetting. **Figure 5** shows the percentage points contribution to price change experienced for the lowest (first), near-middle (fifth) and highest (tenth) decile. Comparing the lowest and near-middle income groups, housing costs made a greater contribution to the inflation rate of the lowest group, but this is largely offset by motoring expenditure which made a greater contribution to the inflation rate of the near-middle group. Comparing the highest and near-middle income groups, household services (including fees and subscriptions) make a greater contribution to the highest group, but this is largely offset by food,

which makes a greater contribution to the inflation rate of the near-middle group.

Comparing the three income groups together, it can be seen that housing had the greatest impact on the lowest income group. Food had a higher contribution for the lowest and near-middle income groups than the highest group. For the highest income group, a greater contribution came from motoring expenditure than from food. Fuel and light had a positive impact on the price change for all income deciles; the impact was greatest for the lowest income group. The largest positive impact from leisure services (including holidays) and household services (including fees and subscriptions) was for the highest income decile. Clothing and footwear and leisure goods had a negative contribution to the price change for all income deciles, offsetting a small part of the positive contributions. This negative contribution was smallest for the lowest

income group.

The results of the analysis conform to expectations as the items that make up the largest part of a household's expenditure are likely to have the largest influence on the price change they experience. If lower income households spend relatively more of their income on necessities such as housing and food, then it would be expected that these components make a greater contribution to the price change they experience than to higher income households. Conversely, higher income households are likely to spend relatively more on luxuries such as leisure goods and services, so that these items contribute more to the price change they experience.

Households grouped by composition

Table 2 shows the average price change of households grouped by household composition for the 12 months to April 2008. Households comprising two adults and two children experienced the lowest average household price change of 4.3 per cent. Pensioner households relying on income from state pension or benefits for 75 per cent of their income had the highest household percentage change, 5.1 per cent. Again it must be stressed that the approach used only reflects the variation in the spending pattern of each household. It does not account for price change differentials arising because different household groups purchase items from different regions, from different types of outlets, nor from the purchasing of different brands or types of items.

From the contribution of each household group (**Figure 6**) it can be seen that single households experienced a larger contribution from housing costs than any other type. However, single-person households experienced the lowest contribution of all types from motoring expenditure. Pensioners reliant on state pension and benefits experienced a larger contribution than any other type for food and 'fuel and light'.

Conclusions

The CPI and RPI measure the average change in prices by calculating the change in price of a fixed basket of goods and services representing the items bought by all UK households. Importantly, this measure is not the same as the average of all individual inflation rates experienced by all households in the UK.

Every household has a different expenditure pattern, spending varying amounts of money on different items.

Table 2

Estimates of average price change experienced by households grouped by household composition, 12 months ending April 2008

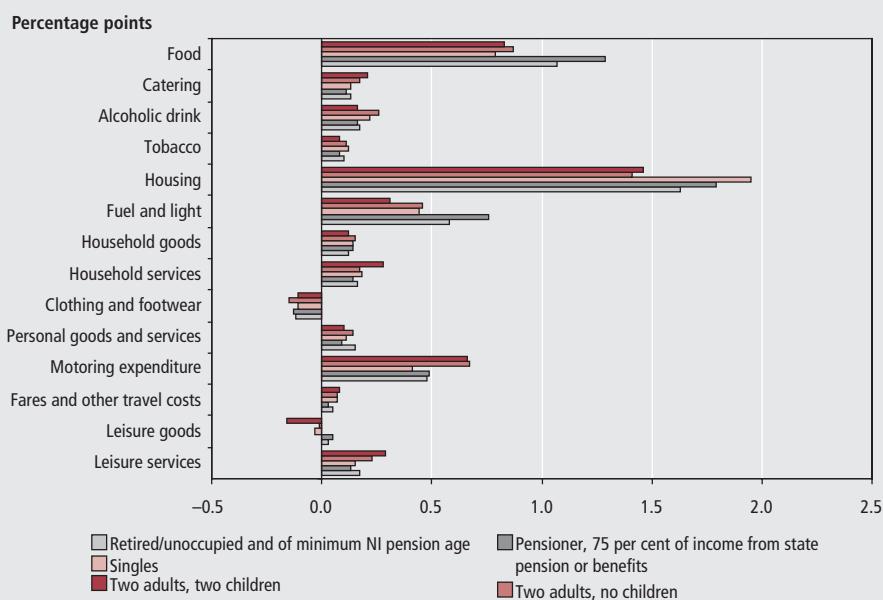
Household composition	Average price change experienced (%)
Two adults, two children	4.3
Two adults, no children	4.5
Singles	4.6
Pensioner, 75 per cent of income from state pensions or benefits	5.1
Retired/unoccupied and of minimum NI pension age ¹	4.7
All households	4.5

Note:

1 Includes those 20% of pensioner households where 75% of income is from state pension or benefits.

Figure 6

Contribution to price change experienced by households grouped by composition, 12 months ending April 2008



Therefore, every household will experience a different rate of inflation. Households which spend a larger proportion of their total expenditure on items experiencing the largest price increases over the past year, such as food and fuel, would be expected to have a higher individual rate of inflation than those spending a higher proportion of their expenditure on clothing and electrical equipment, which have seen small price increases or price decreases.

Households with the lowest level of total expenditure spend a higher proportion on food and 'fuel and light' than those with the highest level of total expenditure. Conversely, households with the highest level of expenditure spend a relatively higher proportion on items such as petrol and 'clothing and footwear'. This suggests that rising food and energy prices will have a greater influence over the personal inflation rate of households with the lowest level of expenditure.

Analyses using EFS data and a process similar to that used to produce the RPI

found that, for the 12 months to April 2008, the average price change experienced varied little when households were grouped by income deciles. There were substantial differences in the expenditure patterns of households in the different income groups. The different inflation rates for the RPI groups of goods and services interact with these differences in expenditure patterns so that they approximately cancel out (for example, the difference between first and fifth income deciles in the contribution of housing costs to the inflation rate was approximately offset by the difference in motoring inflation). Consequently, there were only small differences in average inflation by income group. However, the approach used only reflects the variation in the spending pattern of each household. It does not account for price change differentials arising because different household groups purchase items from different regions, from different types of outlets, nor from the purchasing of different brands or types of items. If these

other variations could be incorporated into the calculation, there might be greater differences between the inflation rates of these household groups.

Analysis by household composition shows that, for the 12 months to April 2008, households comprising two adults and two children experienced the lowest average household price change of 4.3 per cent. Pensioner households relying on state pensions or benefits for 75 per cent of their income had the highest household percentage change, 5.1 per cent. Again, it must be stressed that the approach used only reflects the variation in the spending pattern of each household. It does not account for price change differentials arising because different household groups purchase items from different regions, from different types of outlets, nor from the purchasing of different brands or types of items.

Single households experienced a larger contribution from housing costs than any other group. However, single-person households experienced the lowest contribution of all types from motoring expenditure. Pensioners reliant on state pension and benefits had the largest contribution from food and 'fuel and light'.

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TECHNICAL NOTE**Method for producing estimates of consumer inflation for particular household groups**

ONS used expenditure data for 6,000 households from the EFS to obtain estimates of price inflation for particular household groups. This technical note explains the approach adopted.

The estimates give an indication of the rate of inflation experienced by each group, but they are not precise. The method used only reflects the variation in the spending pattern of each household, and there are other limitations, as explained in this note.

The process adopted for each individual household was:

- assign expenditure (from 2006/07 EFS) to each of the 85 'RPI Sections' – a classification that breaks each household's expenditure into 85 mutually exclusive and exhaustive groups
- obtain average house prices for each Government Office Region (GOR) from Land Registry offices (and then apply the UK average depreciation rate to obtain average depreciation expenditure for each GOR) and assign this average expenditure if the household owns (or is purchasing) a dwelling (depreciation is applied to RPI on a national basis – this approach takes account of the variation in regional house prices but does not take account of other factors such as the size of the household's dwelling)
- adjust expenditure for known under-reporting using the same process as for the RPI (for example, expenditure on alcohol tends to be under-reported)
- by using RPI price changes at the RPI Section level for all Sections except mortgage interest payments, council tax and depreciation, separately revalue expenditure for each of the 85 Sections in terms of prices from January 2008 (this process is used to calibrate the breakdown with the RPI)
- for any given period (in this case April 2008), separately revalue each Section level expenditure in terms of prices for the period of interest (April 2008), and the same period 12 months earlier (here, April 2007)
- for each individual household, add the section level expenditure to arrive at the total expenditure in April 2008, and the total expenditure in April 2007. Determine for each household the price change over the 12 months (ignoring sources of variability from different outlets, regions and detailed item choices)
- for any particular group of households, determine the average of the rates of price change (this is a 'democratic' measure)

Following such a process produces a useful measure illustrating the different price changes experienced by different types of households (and as such, it is very similar to the broad level approach utilised by the personal inflation calculator on the ONS website). In using such measures, it is important to note the following:

- these measures are produced across all households covered by the EFS and, as such, the scope is wider than that of the RPI which excludes:
 - pensioner households which derive at least three-quarters of their total income from basic state pension and benefits, and
 - high-income households, defined as those households whose total household income lies within the top 4 per cent of all households
- these measures fail to account for different sources of price variation that individual households may face. This method does not take account of any regional variation in the change in price of the goods and services, nor does it reflect the fact that individuals may purchase one particular brand of a good or service and the price movement for that particular brand will differ from the average price movement for the particular item. Any variation due to different types of outlets is also ignored. For example, the level of detail used in this process has an RPI Section 'Purchase of motor vehicles'; this process does not allow for variation in price-change experiences arising because different household groups buy different types of cars, or purchase from different types of dealers, and instead applies the average price change for the purchase of motor vehicles to all household types
- the expenditure data for each sampled household is determined from a two-week window, with some supplementation from a questionnaire to capture regular payments such as energy bills and large, less regular, purchases such as furniture
- the process differs from the RPI itself as it does not allow for annual updating of expenditure, nor annual changes to the basket of goods and services – that is, where the RPI is annually chain-linked to account for evolving consumption patterns, this measure assumes fixed expenditure
- the RPI itself is measuring change in average expenditure (a plutocratic measure) and not average change in expenditure (a democratic measure), as calculated here

FEATURE

Graeme Chamberlin
Office for National Statistics

Command GDP: the purchasing power of UK output

SUMMARY

Gross domestic product (GDP) measures the volume of goods and services produced by a nation. By adjusting this measure to reflect movements in the terms of trade, command GDP describes the purchasing power of a nation's output. For an open economy such as the UK, and given recent developments in the global economy such as the introduction of low-cost emerging market producers, large increases in commodity prices and exchange rate volatility, it could be a relevant statistic. This article develops an estimate of command GDP for the UK and discusses recent trends.

The UK is an open economy, with imports and exports together representing close to 60 per cent of gross domestic product (GDP). Therefore, overseas factors represent an important determinant of economic activity. One aspect of this, which has been paid relatively little attention, is the impact of the terms of trade on domestic demand.

The terms of trade is simply a ratio of export prices to import prices. An improvement in the terms of trade stems from export prices growing faster than import prices; a deterioration in the terms of trade arises from the opposite case. As a statistic, it simply captures the rate of exchange between the globally traded goods and services produced by one country relative to its trading partners.

Movement in the terms of trade has an obvious bearing on international competitiveness. If export prices are growing more strongly than import prices, it may encourage substitution away from domestic to foreign producers. In this case, an improvement in the terms of trade may not necessarily be a good thing. Naturally, the extent to which this may influence demand depends on the price sensitivity or, as economists say, price elasticity of exports and imports. Goods and services that are fairly standardised and produced in globally competitive markets are more likely to be price elastic. A nation that trades proportionately high levels of these products may suffer from an improvement in its terms of trade because foreign products become more attractive. However,

those producing less price-elastic goods and services, perhaps more specialised and high-technology products or natural resources, are less likely to be competitively disadvantaged by an improvement in the terms of trade.

Changes in international relative prices attract attention for their possible impact on trade flows, that is, the pattern of international demand. The effect on purchasing power is more neglected, but still important, especially in open economies like the UK. An improvement in the terms of trade means that the price the UK achieves for its exports has risen relative to that which it pays for its imports, implying that every good or service exported can be exchanged for a greater volume of imports. This is essentially a positive income effect, hence the terms of trade is an important determinant of the purchasing power of domestic output.

Whereas GDP measures what a country produces, command GDP is a measure that aims to capture the purchasing power of that output over goods and services in world markets. This statistic is regularly published in the US by the Bureau of Economic Analysis, but not in the UK, where it might actually be a more relevant concept due to the openness of the economy.

Recent developments in the UK and global economies have also increased the possible significance of the command GDP measure. Low-cost producers in emerging markets, particularly China, have been

increasingly integrated into world trade. Recent increases in oil, commodity and food prices have been dramatic. And there have been significant movements in exchange rates such as the current fall in the US dollar. All of these factors may have been influential in driving the terms of trade over the last decade.

Command GDP is simply calculated by deflating exports with import prices. When the terms of trade move in favour of the UK, it implies that export prices are increasing relative to import prices. Command GDP will then rise relative to conventional GDP, reflecting the improvement in the purchasing power of domestic output. Vice versa, the opposite is true; a deteriorating terms of trade suggests that import price inflation is greater than that for exports, and command GDP will then fall relative to conventional GDP.

Figure 1 plots a recent history of the UK terms of trade and the ratio of command GDP to conventional GDP. Three things are evident. The first is that movements in the terms of trade are clearly correlated with the ratio of command GDP to conventional GDP. This would be expected given how the data are constructed.

Second, movements in the ratio of command GDP to GDP are dampened relative to more volatile changes in the terms of trade. This is mainly because exports

represent about 25 per cent of total GDP, so the majority of command GDP is invariant to the terms of trade. Furthermore, part of the effect on command GDP could be offset by volume movements. If an improvement in the terms of trade generates substitution away from exports to imports, command GDP will not increase as strongly as in the absence of volume effects. Likewise, the effect of a fall in the terms of trade on command GDP could be offset by a relative shift from imports to exports.

Third, the terms of trade, and hence command GDP, although volatile, appears to exhibit a longer term upward trend. In fact, if Figure 1 were extended back to the late 1970s to just after the twin oil-price shocks, these trends would be even more evident. Nor is it simply because the UK was generally a net exporter of oil over this period, as the non-oil terms of trade has shown a similar upward path. This is an important finding, because it suggests that the purchasing power of UK output has tended to grow faster than that output, which may have welfare considerations. The next section will discuss in more detail the factors driving recent movements in the UK terms of trade (see also Dury *et al* 2003 for a review of recent evidence).

Figure 2 plots the growth in command GDP relative to GDP and reflects the trends in the ratio shown in Figure 1. For the most

part, the two series move together, but there are some periods of divergence. Command GDP grew faster than conventional GDP between 1996 and 1999 and also between 2002 and 2003. Growth was correspondingly slower in the periods 1994 to 1996 and also in 2005.

The UK terms of trade

Given that the terms of trade is the ratio of export to import prices, its trends are simply determined by the relationship of export and import price inflation. These are plotted in **Figure 3**. It is noticeable that the periods previously identified where command GDP growth differed from actual GDP growth correspond to respective differences in the inflation figures.

One of the key drivers of the terms of trade is the exchange rate which determines the rate at which one currency is traded for another. The exact feed through from changes in sterling to the UK terms of trade depends on a number of factors, but **Figure 4** tends to suggest it is nonetheless important, especially between 1993 and 1999.

If foreign firms set prices in their own currency, then sterling appreciation will see the sterling cost of imports fall. Were the same companies to set prices in sterling, then of course sterling appreciation would see foreign companies enjoy higher margins rather than there be a fall in UK import prices. This is often known as 'pricing to market', where a firm recognises the strategic importance of setting a certain price in a certain market. For example, if a foreign firm had invested heavily in establishing themselves in the UK market, they might not wish to be made uncompetitive by a sterling depreciation and opt to allow the currency movement to adversely impact on margins rather than prices in sterling to rise.

The same reasoning applies to domestic firms. If they price in sterling, then exchange rate movements will have limited effects on the UK terms of trade; export prices in sterling remain stable. Instead, the only impact will be on the price in terms of foreign currency. However, pricing to market behaviour would see the sterling value of exports adjusted as the effect of currency movements are offset by margins and in this case the terms of trade are affected. So, overall, it depends on the relative proportions of firms pursuing different pricing strategies.

The large fall in the sterling effective exchange rate in late-1992 as the UK left the European Exchange Rate Mechanism, followed by its subsequent appreciation

Figure 1
UK terms of trade and the ratio of command to normal GDP



Figure 2
Economic growth of command GDP and GDP

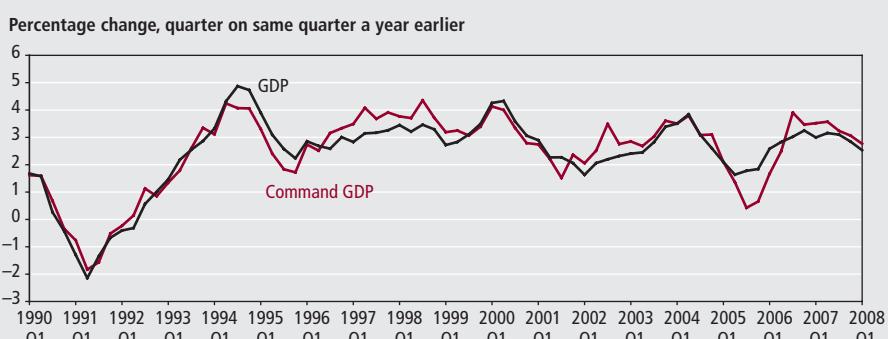
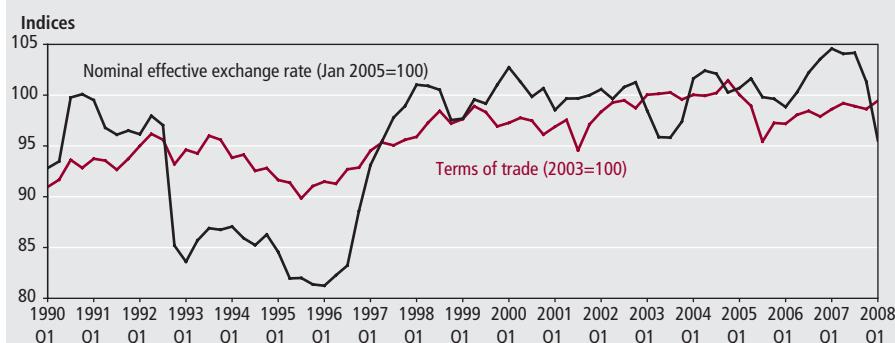


Figure 3
UK import and export price inflation (implied deflators)



Figure 4
UK terms of trade and the nominal effective sterling exchange rate



through 1999, does seem to account for import and export price inflation and hence the terms of trade over this period. Movements in the terms of trade appear less volatile and more gradual than those in the exchange rate, implying that pricing to market behaviour is important. As Chamberlin and Henry (2002) suggest, the incomplete pass through may also reflect costs of physically adjusting prices known as menu costs. Also, firms tend to delay reacting to volatile economic data such as exchange rates while they consider the relative importance of permanent and transitory shocks to the economy.

Looking at disaggregated information on the terms of trade may also be informative. Movements in the terms of trade may be driven by particular commodity types or even simply be accounted for by changes in the composition of trade. **Figure 5** shows the Michaely indices for the main components of the trade in goods and services in the UK. A Michaely index is simply the proportion of total exports minus the proportion of total imports for each product type and is a simple device for monitoring the changing composition of trade (see Michaely 1962).

Food and basic materials have represented a fairly constant proportion of trade. The index for oil and fuels has not changed much, but recently made the

headline change from positive to negative territory as the UK became a net importer of oil for the first time since the first half of 1980. Despite this, and the dramatic

increases in oil prices in the last few years, the effect on the terms of trade has been fairly muted, as shown in **Figure 6**. The terms of trade excluding oil and fuel has not differed that much from the total index. Over the last 15 years, the UK has neither been a big net exporter nor net importer of oil, so the terms of trade is relatively immune from oil price changes. For example, in Figure 3, the recent episode of oil price inflation is observed in both import and export prices, and in Figure 6 the overall downward effect on the terms of trade has not been large.

Outside oil and fuel, it is more interesting to look at the Michaely indices for manufacturing and services. The share of services in total exports has risen substantially as has the share of manufactures in imports. Taken together, the evidence could be interpreted as the UK increasingly specialising in services in line with its comparative advantage. However, it should also be considered that the UK trade balance has deteriorated significantly over the period, so the two are not offsetting in that the net deficit in manufacturing trade is matched by the growing net surplus in services.

Figure 7 plots the terms of trade for the UK manufacturing and services sector. The increase in the Michaely index for services has occurred at the same time

Figure 5
Michaely indices for UK trade

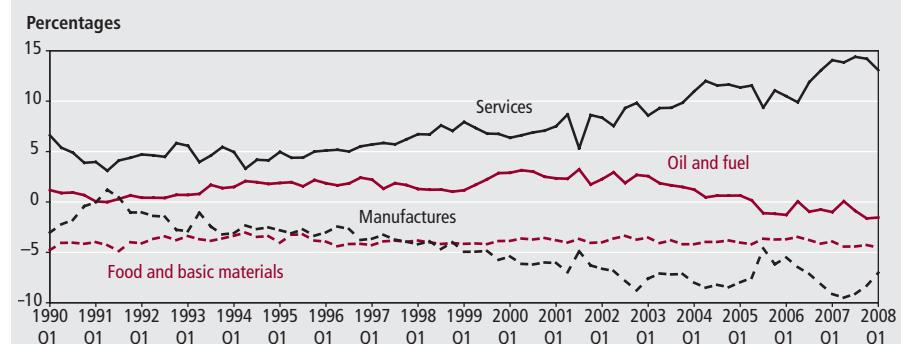


Figure 6
Impact of oil prices on the terms of trade

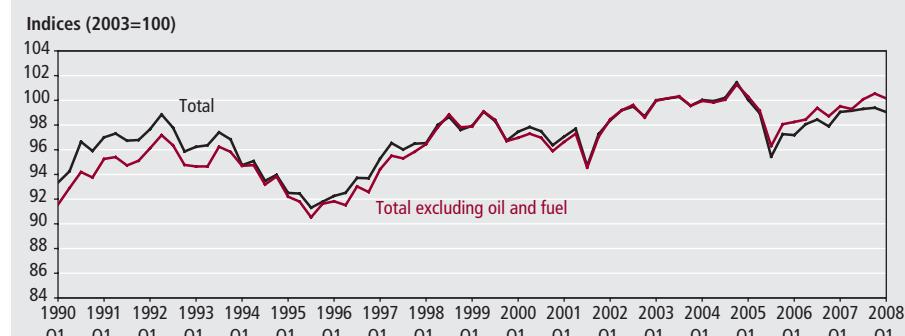


Figure 7**Terms of trade in manufacturing and services**

as an improvement in the terms of trade, suggesting that the reorientation of UK trade to this sector has been beneficial. The sharp improvement in services terms of trade between 1996 and 2001 coincided with the strong appreciation of sterling, but did not adversely affect services trade volumes.

The two sharp downward spikes in 2001Q3 and 2005Q3 reflect insurance claims banked to these quarters from the 11 September terrorist attacks and Hurricane Katrina, respectively. Because volumes of insurance services output (the difference between premiums and claims) are treated as constant, the volatility in values is then reflected in the export deflator.

Because manufacturing trade represents the majority of total trade, it is not surprising that the total terms of trade is similar to that of this sector. The improvement in the terms of trade between 1996 and 1999 could well reflect the appreciation of sterling, and at the same time the Michaely index started to fall, implying the substitution effects of this were strong. An alternative hypothesis is that the trends represent the growing participation of low-cost emerging market producers in the global economy (see MacCoille 2008 for some recent analysis of the impact of low-cost producers on UK import prices).

Within the manufacturing sector, the experiences of different industries have also varied. Buisan *et al* (2006) show that certain UK industries such as medical and pharmaceuticals; radio, television and communications equipment; and office machinery and computers increased their share of global exports. However, the bulk of UK manufacturing industry, including material manufacturers; motor vehicles; and clothing and footwear saw its

global market share fall over the period. These trends may lend further weight to the idea that globalisation has prompted the UK economy towards its comparative advantage, not just in services, but also more specialised manufactures.

Therefore, the longer-run trend in the UK terms of trade and the ratio of command GDP to actual GDP seems to be connected with structural developments in the economy. The terms of trade have improved in both services and manufacturing, but with opposite effects on volumes. Net exports of services have grown alongside an improvement in the terms of trade, suggesting that demand for UK services is price inelastic. At the same time, improving terms of trade in manufactures have been associated with a growing deficit. The implication is that UK manufacturing trade is more price elastic and there has been substitution to lower-cost foreign producers, particularly in less specialised and lower-technology goods.

Conclusion

This article has introduced the concept of command GDP and attempted to demonstrate its potential significance in economies where trade is a significant share of GDP. Actual GDP is simply a measure of the output of an economy, so terms of trade movements are only captured to the extent that they alter patterns of exports and imports. The command GDP statistic acknowledges that terms of trade movements have income as well as substitution effects which are reflected in the purchasing power of output. Given that the recent history of the ratio of command GDP to actual GDP shows an upward trend for the UK, it is suggestive of a positive welfare effect from trade.

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FEATURE

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The impact of the 2006 National Minimum Wage rise on employment

SUMMARY

The National Minimum Wage (NMW) has risen ahead of earnings since its introduction in 1999. In October 2006, with coverage at its highest level ever, the adult NMW increased by 5.9 per cent, to £5.35 per hour, the largest proportionate rise since 2004. While previous assessments have failed to find any clear evidence of a negative impact on employment, it is of interest to see whether more recent NMW rises have reduced employment.

This analysis evaluates the impact of the October 2006 rise in the NMW on the rate at which people leave employment. Results show no evidence of an increased job exit rate among those directly affected by the rise. Indeed, there is some indication of a positive effect on job retention for men. The analysis therefore provides no reason to think that the minimum wage rise in October 2006 caused employees to be made redundant.

Since 1999, when it was introduced at £3.60 per hour, the National Minimum Wage (NMW) for adults aged 22 and over has risen by around 49 per cent, to £5.35, in October 2006. Had it grown in line with average earnings, NMW would, by then, have been £4.88.¹

Assessments of the impact of the introduction of the minimum wage have found no firm evidence that it had a negative effect on participation (Metcalf 2007). Since 1999 however, the NMW has risen as a proportion of mean hourly wages – a measure known as the ‘bite’ of the minimum wage – from around 45 per cent to over 50 per cent in 2006 (BERR 2006). It may be the case that any labour market impact is more likely to be seen as the bite increases, since this measure gives an estimate of the proportion of workers covered by the NMW (BERR 2006). As a result of the consistent increases in the NMW above average earnings growth over the past nine years, it is reasonable to ask whether the minimum wage is starting to have an adverse effect on employment. Despite being, at 5.9 per cent, only the fourth largest increase over the nine years since the introduction of the minimum wage, it is the largest recent increase by some margin. This historical context provides a compelling reason to evaluate the labour market impact of the 2006 increase in the NMW.

This analysis focuses on the impact of the 2006 minimum wage increase on the probability of leaving employment for those directly affected, and compares it

with transitions made by those in a control group. The approach taken here draws on two papers: one by Dickens and Draca (2005), examining the employment effects of the October 2003 increase in the NMW; and another by Stewart (2003), evaluating the introduction, and 2000 and 2001 upratings of the NMW.

The results of this analysis show no evidence of an increased job exit rate among those directly affected by the rise. One explanation for this is that a higher minimum wage may be reducing staff turnover among those affected. Indeed, there is some indication of a positive effect on job retention for men. This analysis therefore provides no reason to think that the minimum wage rise in October 2006 caused employees to be made redundant.

Basic theory of the impact of a minimum wage increase

On the standard assumption of perfectly competitive labour markets, the theoretical story told about the impact of the minimum wage is simple. Where the minimum wage is set above the market clearing wage level, the effect is to increase the supply of labour and simultaneously to reduce demand for labour. The result is to lower employment levels and increase unemployment (which, in the perfectly competitive world, did not exist before the minimum wage was introduced).

The impact of a rise in the minimum wage is qualitatively the same and is represented in **Figure 1**. Increasing NMW from NMW_t to NMW_{t+1} reduces labour

demand from Q_t to Q_{t+1} and increases labour supply by P_t to P_{t+1} . The result is that unemployment rises from U_t to U_{t+1} .

There are many reasons why this simple view of the world may not give the whole story. For example, labour is not only supplied in discrete units of employees, but also as an amount of time per worker. It is possible that a rise in the minimum wage could leave the number of employees unchanged while reducing the number of hours worked (Stewart and Swaffield 2008). Indeed, the relative effect of a higher minimum wage on variable costs (hourly wage rates) as opposed to fixed costs of employment (for example, hiring and training) implies that, other things being equal, firms might even employ more people for fewer hours per person than before.

In areas where a firm is the only employer in a local area, monopsony power can be held by employers over employees. Monopsony power is an example of where the perfect competition assumption is inadequate and under certain conditions the minimum wage can actually increase employment. For these reasons, the theoretical effect of a minimum

wage increase on employment levels is ambiguous.²

Impact of the NMW on wages in 2006 and 2004

In order to be able to attribute changes in employment transitions to the minimum wage rise, there must be evidence of a clear impact of the NMW rise on the wages of some employees over the time period of its introduction. If this impact is absent or weak, there is almost nobody affected by the minimum wage rise, and hence no employment impact can be expected to result from it.

Figure 2 uses data from the five-quarter longitudinal Labour Force Survey (LFS) to show the number of employees reporting being paid an hourly wage below the incoming, higher NMW levels for both October 2006 and the earlier increase in October 2004. It shows a substantial reduction in the number of employees in jobs that pay below the incoming NMW, over the period of its introduction.

It is important to note that the chart shows only those people who report an actual hourly wage. It excludes many people

who may be paid on a weekly or monthly basis, and therefore do not report their hourly wage, but who are, nonetheless, being paid less than the impending minimum. This means that the estimate of just under 150,000 people being paid below £5.35 in April 2006, for example, is much lower than the actual number of people in the country on wages below that level. The Office for National Statistics uses data from the Annual Survey of Hours and Earnings (ASHE) to estimate the number of jobs that pay below the NMW. In spring 2006, for example, 274,000 jobs filled by employees aged 22 and over paid below the 2005–06 NMW level. The reason for using only the directly reported hourly wage rates in the longitudinal LFS for this analysis is discussed further in **Box 1**.

From Figure 2 it is evident that the number of people reporting hourly pay rates below the impending NMW trended steadily down, from around 150,000 in September 2005 to 110,000 one year later. The pre-rise group (individuals whose employment status was observed in the first and second grey zones in the figure) clearly saw little or no impact of the impending rise on their wages.

In the two months after September 2006, the number dropped very sharply, by 65 per cent, to under 40,000. The group straddling the rise (whose employment status was observed in the second and third grey zones) clearly saw a substantial impact from the rise in a very short timescale. So while there may have been some employer anticipation of the NMW rise, there was clearly a substantial and sudden impact of the minimum wage rise on pay rates, making it amenable to non-experimental evaluation, as discussed below.

The October 2004 rise to £4.85 per hour represented a 7.7 per cent increase, while the increase to the minimum in October 2006, a 5.9 per cent rise. Figure 2 shows that the impact of the later rise was at least as large, in terms of the number of people directly affected, as that of the 2004 rise. This gives cause for concern that there may be an accompanying employment effect of the 2006 rise, despite its being more modest in proportionate terms than that of 2004.

Methodology

In assessing the impact of the minimum wage on employment, the group of interest is those who are directly affected by wage regulation. It is reasonable to assume that this consists of people who are paid (or who would be paid) less than the incoming minimum, since these are the people whose

Figure 1
A rise in the minimum wage under perfect competition

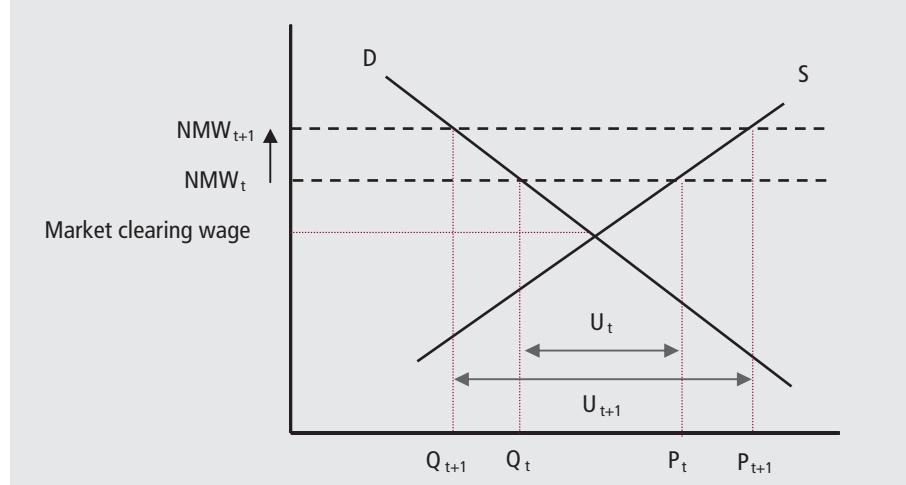


Figure 2
Number of employees in main jobs paid below new NMW rate: by months before/after rate increase



Box 1**Data**

The analysis presented in this article makes use of the longitudinal LFS. The LFS is a large continuous quarterly survey of households, covering around 53,000 private households in the UK. The questionnaire covers a range of issues, including labour market behaviour and household characteristics. Participants are interviewed for five consecutive quarters. Tracking their responses over time in this way allows analysis of their transitions in and out of employment.

ASHE is the preferred source for earnings estimates. The data are considered more reliable than the LFS because they are provided by employers from the payroll. However, ASHE does not contain data on the broader range of individual characteristics covered by the LFS, which in this case allows a richer regression model for the evaluation. Secondly, and more importantly, ASHE is a panel data set that observes individuals once a year in April. This analysis compares the changes in employment status of individuals over a time period where no minimum wage increase took place, to those changes over a time period where such an increase did occur. Since the NMW has risen in each year following its introduction, the annual nature of the ASHE panel does not lend itself to this approach because it is impossible to find a comparison group of people who did not experience a minimum wage change. For this reason, the quarterly nature of the longitudinal LFS is more appropriate.

There are a few limitations to using the longitudinal LFS in this way. First, LFS earnings data are only collected in the first and fifth waves of interviewing, substantially reducing the sample to two-fifths of its normal size. This problem is compounded by the fact that many people choose not to answer income questions. Finally, high attrition rates (the gradual decrease in the workforce by natural wastage) across the waves further reduce the number of observations when using the longitudinal data sets for analysis.³

The extent to which sample attrition may distort the results of the analysis if certain groups systematically drop out of the survey while others do not need to be considered. If, by contrast, observations are missing at random, then sample

attrition will not adversely affect the results. It is difficult to check which of these situations prevails. However, looking at the distribution of characteristics in one representative quarter of the LFS and comparing it with respondents that stay in for five quarters used in this analysis gives some clues as to its reliability. On a range of variables such as the marital status, ethnicity, country of birth and qualifications of respondents, there does not appear to be any substantial difference in the composition of the two samples. This implies that the attrition rate in the panel sample does not jeopardise the results.

In the LFS, the derived variable 'hourpay' has been shown to be unreliable for measuring the extent of low pay (Dickens and Manning 2004) since it is calculated from reports of weekly gross income and usual hours, rather than being directly reported. There are good reasons, therefore, to believe that the directly reported hourly pay rate variable, 'hrrate', is more accurate than the derived wage variable for measuring the extent of low pay (Skinner *et al* 2002).

For this reason, and in line with the approach of other literature in this field (Dickens and Draca 2005), the analysis relies on the directly reported hourly pay variable. Using the variable 'hrrate' tends to limit the sample and exclude a large group of potentially affected people, since many people are not paid by the hour and therefore do not report an hourly rate.

At the low pay levels considered here, however, the need for accuracy in the wage variable, in order to prevent contamination of the treatment and control groups with people whose wages are inaccurately recorded, outweighs concerns over sample size. Aside from reducing the sample size, this does not pose a major problem for the evaluation, since capturing the full number of people paid below the incoming NMW is not necessary. Rather, changes in the probability of people leaving work, rather than the absolute numbers, reveal the impact of the NMW rise on employment.

Due to the ambiguous effects of the adult minimum on younger workers through substitution effects, the analysis here is conducted for adults aged 22 and over, only.

wages would need to rise in order to comply with the law. This group is referred to as the 'treatment' group.

One way to estimate whether the 2006 NMW rise had an impact on employment of the treatment group would be to examine employment rates for low-wage people, before and after the rise. There are two fundamental difficulties with this approach. The first relates to the problems with using an employment rate, and the second to the shortcomings of the simple before and after approach.

Employment transitions rather than employment rates

It is impossible to define an employment rate for people of a given wage level since

one cannot know the wage level at which people out of work might join the labour market. One way around this problem is to look instead at the probability of people, initially employed (at time t) being out of work some time later (at time t+1). This is, in other words, the probability of making a transition out of employment. If this probability changes between a group of people who experienced the minimum wage rise between periods t and t+1, and a group for whom no minimum wage increase occurred in that time period, then that change might be attributable to the rise in NMW.

The time period between time t and t+1 must be less than a year, so that it is possible

to identify a group whose employment transition probability was unaffected by the increase in the NMW. But the interval must also be large enough to take account of the fact that different employers may increase their wages at different times, over a period of months, around the time of the October NMW change. For this analysis, therefore, each group's employment status is observed at six-month intervals.

For this analysis, two groups of people are identified:

- the 'pre-rise' group contains those who did not experience a minimum wage increase. It is constructed from people who were first interviewed between

- November 2005 and March 2006. This group's employment status is then observed again six months later (at their third interview) between May and September 2006, just before the October rise becomes statutory
- the 'post-rise' group straddles the October NMW rise. This group's first wave interviews are conducted between May and September 2006, and their employment status is observed six months later between November 2006 and March 2007

Reported hourly pay rates from the longitudinal LFS (see Box 1) are used to assign people into the group affected by the NMW increase and the comparison group who were unaffected. Employment status observed in waves one and three for each individual is then used to create a variable to indicate each person's employment status after six months, given that they were employed in wave one. This employment transition indicator is the dependent variable in the regression model used. The variable takes a value of 1 if an individual was employed at time t and workless at time $t+1$, six months later, and 0 if they were employed at both t and $t+1$.

If employers raise wages to comply with the new minimum well in advance of the October deadline, those changes might affect the wages and employment chances of people classified as being interviewed in the pre-rise time period. It would therefore contaminate the 'before' group with wage changes expected to happen 'after' October 2006.

It is likely that some employer anticipation of the new rate does occur, particularly in large companies that settle their wage levels for all employees at the same time of year. To the extent that this happens, estimates of the probability of employment transition will be biased downwards. However, as Figure 2 shows, many employers only adjust their wages to comply with the new minimum close to the October deadline.

Difference-in-difference evaluation

The second problem is that, even using such a transition variable, the before and after comparison of transition probability alone is unreliable as an evaluation technique. It implicitly assumes that, in the absence of a change in the minimum wage, the probability of transition would have been the same as before. This is a very strong assumption to make, not least because seasonal labour demand patterns may cause transition probabilities to vary through the year.

To avoid making such an implausible assumption, the trend in transition probabilities for a similar but unaffected (control) group can be taken as the counterfactual for the (treatment) group who were affected by the change. This approach requires far weaker assumptions than those relied upon for a simple before and after analysis. Taking the difference between the before and after changes of treatment and control groups, is known as difference-in-difference (DiD) evaluation.

In an experimental setting, the minimum wage rise would apply to some people, but not all employees. A low-wage control group could then be monitored to demonstrate what would have happened to low-paid workers who were affected by the rise had they not been. Since the minimum wage is a legal requirement on all employers, however, no such experimental control group exists. It is therefore necessary to look elsewhere for an appropriate substitute. An obvious candidate group is those employees who were paid at, or just above, the new minimum before the rise. How can one know whether the behaviour of this control group adequately reflects what would have happened to the treatment group in the absence of the NMW rise?

Two key assumptions about the control group are necessary for DiD analysis to be appropriate:

- the first required for the difference-in-difference technique to yield accurate results is the 'common trend' assumption. For NMW analysis, this requires that, in the absence of the minimum wage rise, the transition probabilities of both the treatment and control groups would have moved together over time. This assumption means that the DiD methodology, unlike a before and after approach, strips out any macroeconomic trends or seasonal fluctuations that might affect transition probabilities, but which are unrelated to the NMW change itself, and
- the second required for the application of DiD in this case, is that the wage changes experienced by the treatment group should have no impact on the employment transitions of the control group. This is known as the assumption of 'no spillover effects'

Together, the common trend and spillover assumptions allow DiD to isolate the impact of the NMW rise on transitions of the treatment group.

Choosing a control group for which these assumptions hold is therefore central to the analysis. Unfortunately, the demands of each assumption tend to pull in opposite directions. For example, an attempt to minimise any spillover effects would, in this case, involve choosing a control group further away from the treatment group in wage terms (for example, a control group paid between one-and-a-half and twice the NMW). But these employees are less likely to be in similar employment to those in the treatment group. They are therefore less likely to face the same seasonal or macroeconomic fluctuations. The result is that the common trend assumption becomes harder to sustain: cleaners, for example, face a very different labour market from investment bankers, and therefore do not face common employment trends.

In view of the need for a credible common trend assumption, it is sensible to limit the wage range of the control group. In line with the literature, the control group for the central results of this analysis is taken as people earning between the new NMW level of £5.35 per hour and 10 per cent higher than the incoming level, or £5.89 per hour. Implicitly, it is therefore assumed that there is no spillover effect of the rising NMW on this control group. This assumption is supported by the findings of Dickens and Manning (2003). To ensure that the transition rates for the treatment group are compared with those for people in this wage band only, the model is adjusted to control for people with wage rates higher than NMW + 10 per cent.

To avoid reporting error contaminating the treatment group, the model is adjusted to exclude from it those people who report being paid less than the previous year's minimum wage (£5.05). This is done on the grounds that these observations are either erroneous, or evidence of non-complying employers. Either way, these employees would not be expected to benefit from the NMW increase.

To control for the changing composition of the sample over time, a vector of individual characteristics is included in the model. A wide range of individual characteristics are included in this control vector including, but not restricted to, age group, whether in full or part-time work, sex, qualification level and whether in temporary employment. A full list of control variables is available in the technical note.

However, using a binary indicator to show whether a person is directly affected is a relatively blunt tool to analyse the

impact of the NMW rise. Theory suggests that those paid substantially below the new minimum would be more likely to be laid off in the face of a 30p NMW increase than those just below the new minimum rate. Therefore, one might expect employment effects to be concentrated among those people facing the biggest wage rises, and to be proportional to the wage increase necessary to comply with the incoming minimum.

It is possible to exploit this idea by including a measure of the 'wage gap' for each treated individual, measured as NMW_{t+1} minus $wage_{it}$. This variable takes a (positive) value only for people in the treatment group, creating a continuous variable that measures the extent of the necessary pay rise for the employer to comply with the new minimum for that individual. Obviously, the maximum wage rise required by the NMW increase is 30p, from £5.05 to £5.35. Using this continuous wage gap variable, in place of the treatment binary, it is possible to measure the marginal effect on employment transitions for people facing a notional £1 rise in wages.

Results

Across all adults, the results indicate that the minimum wage rise had no impact on the probability of leaving work of those directly affected. Among males, the

results suggest that the change caused the probability of leaving employment to fall by 4 percentage points over the period of the rise, for the treated group. This compares to a pre-rise exit rate of 11.7 per cent for the treatment and control groups. None of the other results are significantly different from zero at the usual levels, however.

As discussed above, the possibility of spillover effects of the minimum wage rise on employees at or just above £5.35 is something that makes choosing these people as a control group problematic. As a robustness test, **Table 1** shows the results of using people paid between 10 and 20 per cent above the new NMW as the control group. Here, all results are insignificantly different from zero and similar to those for the lower-wage control group.

The wage gap estimator results are shown in **Table 2**. These marginal effects show the impact of raising wages by £1 per hour on transition rates among the treated group. None of the results are statistically significant at the usual levels, indicating that no transition rate effect was detected. Again, the sign for the male results is not what might be expected from basic theory.

Discussion

In common with Dickens and Draca (2005), which looked at the impact of the minimum wage increase in 2003, these results show

no evidence of an adverse employment impact from the 2006 change. But, unlike those results, there is some suggestion of a positive impact on retention for men. This result should be treated with some caution since there are only 117 observations for the post-rise male treatment group.

One reason for these benign results may relate to the fact that this analysis has only looked at outward transition probabilities: it could be the case that rather than laying off workers in the face of a rising minimum wage, employers choose to hire fewer people. In this case, an employment effect would not show up in analysis of employment exit rates.

It is necessary to consider the reliability of the identifying assumptions of the analysis to assess the validity of the results. First, it may be that the common trend assumption of DiD analysis is untenable, and that the employment transition chances of the treatment and control groups do not move together over time. Second, and perhaps more likely, it may be that positive effects on wages from the increasing minimum reach further up the wage distribution, thus violating the spillover assumption. This might occur if wage differentials, between employees with different levels of experience, are restored by the employer raising everyone's wages by the same proportion.

The common trend assumption is ultimately not testable given national implementation of the NMW rise. However, if those in the control group are in different industries or job types to the treated, the assumption may be unsound. This could be because different sectors (for example, manufacturing versus retail) are subject to different macroeconomic, and therefore employment, trends. Including control variables for industry type might be expected to limit the impact of differential trend, although doing so makes very little difference to the reported results.

Lam *et al* (2006) have suggested some effect of the minimum wage on the pay rates of workers who do not benefit from it directly. Restoration of pay differentials within firms may make the 'no spillover' assumption hard to sustain. If this is the case, the actual impact of the increase on transition rates might be bigger than the one estimated here.

The impact of changes in NMW on the wages of those affected occurs almost immediately (see Figure 2). Much of the work on spillover effects seems to suggest that restoration of pay differentials, by contrast, takes place over a relatively long

Table 1
Difference-in-difference estimates of transition probability

Treatment binary	Control group	All adults	Females	Males
Raw difference-in-difference	NMW to NMW+10 per cent	-0.009 (0.59)	0.010 (0.64)	-0.043* (0.08)
	NMW+10 per cent to NMW+20 per cent	0.005 (0.78)	0.026 (0.22)	-0.037 (0.17)
Control vector	NMW to NMW+10 per cent	-0.017 (0.22)	-0.003 (0.87)	-0.040** (0.02)
	NMW+10 per cent to NMW+20 per cent	-0.005 (0.72)	0.011 (0.52)	-0.035* (0.06)

Notes:

Negative numbers indicate reduced probability of transition; P-values in brackets.

* and ** indicate statistical significance at the 90 per cent and 95 per cent levels, respectively.

Table 2
Wage gap estimates of transition probability

Wage gap	Control group	All Adults	Females	Males
Raw difference-in-difference	NMW to NMW+10 per cent	-0.008 (0.91)	0.054 (0.48)	-0.191 (0.2)
	NMW+10 per cent to NMW+20 per cent	0.043 (0.54)	0.102 (0.17)	-0.138 (0.35)
Control vector	NMW to NMW+10 per cent	-0.043 (0.50)	0.009 (0.90)	-0.219* (0.09)
	NMW+10 per cent to NMW+20 per cent	0.006 (0.92)	0.052 (0.41)	-0.164 (0.20)

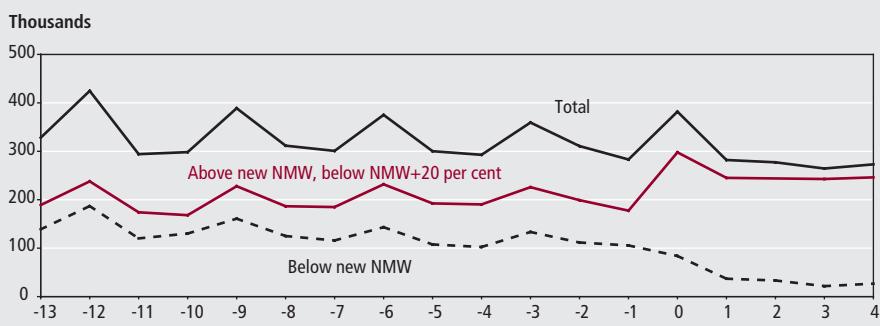
Notes:

Negative numbers indicate reduced probability of transition; P-values in brackets.

* indicates statistical significance at the 90 per cent level.

Figure 3

Number of employees paid below NMW + 20 per cent: by months before/after NMW change in October 2006



time period. This difference in timing should mean that the 'no spillover' assumption is reasonable given the time periods under observation here. Furthermore, the estimated spillover effects here appear modest relative to the direct impact of the minimum wage increase for those directly affected.

Figure 3 shows the number of people paid less than NMW + 20 per cent. Although the data are noisy, there is no sign of a dramatic drop in that number around the time of the NMW rise. This suggests that spillover effects were not large within three months of the NMW rise. It therefore supports the idea that spillover does not present a huge problem for this type of analysis, although it may reduce the measured impact of the change.

Although it should be treated with some caution due to the small sample sizes involved, the most intriguing aspect of the results is that the NMW rise appears to have improved job retention among men who were directly affected. This may seem counterintuitive, given the standard approach to considering the impact of a minimum wage increase. However, it is also a common observation that employment retention rates improve in firms that pay higher wages.

One study, looking at recruitment and retention in lower-paying labour markets estimated that firms that raised their wages relative to competitors by 10 per cent saw staff turnover rates fall by 15 percentage points to 23 per cent (Brown *et al* 2001). This particular study related to employment paying above the minimum wage, where a pay rise relative to the wages of other firms has the effect of making those jobs clearly more valuable than their employees' alternative, outside, option. Such a change would be expected to reduce turnover.

While the minimum wage cannot in itself make one minimum wage job more attractive than another, it does still raise the

value of employment relative to not being in employment. To the extent that being out of work is an employee's alternative option, therefore, an NMW increase would also be anticipated to reduce turnover and therefore transition probabilities. A further explanation for the results for men is that, in increasing the coverage of the single minimum pay rate, the minimum wage increase reduces opportunities for employees to achieve higher wages by moving from job to job, and hence reduces staff turnover.

These results therefore suggest no evidence that the 2006 minimum wage increase had an adverse effect on employees' chances of remaining in work. Indeed, for men, the impact on retention may, in fact, have been positive.

Notes

- See Low Pay Commission website at www.lowpay.gov.uk/lowpay/index.shtml
- For a textbook guide on monopsony, see Manning A (2003) *Monopsony in Motion*, Princeton University Press.
- It is only possible to match 60 per cent of the people who appear in wave one with their wave five responses one year later.

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TECHNICAL NOTE

Difference-in-difference methodology

Formally, the DiD method can be derived as follows. Mean employment in each (treatment and control) group g at time t can be denoted as:

$$\bar{E}_t^g = \alpha_g + \phi_t$$

where α_g is a group-specific effect and ϕ_t is a time effect common across all groups. Assuming that the NMW rise then has a constant effect Ψ on employment for the treated group and no effect on the untreated (no spillover assumption), mean employment rates for each group can be denoted as shown below:

$$\bar{E}_t^g = \alpha_g + \phi_t + \Psi \quad \text{if } g = \text{treatment}$$

$$\bar{E}_t^g = \alpha_g + \phi_t \quad \text{if } g = \text{control}$$

The difference-in-difference estimator is then given by:

$$\Psi = (\bar{E}_A^T - \bar{E}_B^T) - (\bar{E}_A^C - \bar{E}_B^C)$$

where \bar{E} is the mean employment outcome for the treatment (T) and control (C) groups in the time period before (B) and after (A) the NMW increase.

As explained above, however, it is not possible to derive employment rates for the treatment and control groups. Rather, it is necessary to consider labour market transitions, and construct the difference-in-difference estimator as:

$$\Psi = (\bar{P}_A^T - \bar{P}_B^T) - (\bar{P}_A^C - \bar{P}_B^C)$$

where \bar{P} is the mean probability that someone employed in period 0 remains employed in period 1, that is, $P[E_{it1}=1 | E_{it0}=1]$. This is calculated for treatment (T) and control (C) groups, both before (B) and after (A) the minimum wage increase.

An alternative way of finding Ψ , the impact on transition probability of the NMW rise, is to estimate the following regression model:

$$P[e_{it+1}=1 | e_{it}=1] = \alpha_g + \phi_t + \Psi g_{it} d_{t+1}$$

where α_g is a group specific effect, ϕ_t is a time effect common to all groups, g_{it} is a dummy variable denoting whether an individual belongs to the treatment group, and d_{t+1} is a dummy taking the value 1 when the new rate of the NMW is in force.

In order to avoid the reporting error contaminating the treatment group, a dummy variable (shown as g_1 below) is introduced to the model. This excludes those people reporting being paid less than the previous year's minimum wage (£5.05) from the treatment group. The treatment group is represented as g_2 and the control group (dummy variable excluded from the model as the baseline) as g_3 .

Finally, a vector of individual characteristics, X , is included in the model to control for changing composition of the sample over time. A wide range of individual characteristics are included in this control vector, including sex, a cubic function of age, qualification levels, type of housing tenure, whether in social housing, past employment experience, whether in full or part-time work, whether in public sector employment, whether job is temporary, region of residence, ethnicity, and whether a couple or single. The basic probit model to be estimated therefore becomes:

$$P[e_{it+1}=1 | e_{it}=1] = X_{it}\beta + \alpha_1 g_{1it} + \alpha_2 g_{2it} + \alpha_4 g_{4it} + \phi_t + \gamma g_{1it} d_{t+1} + \psi g_{2it} d_{t+1} + \varphi g_{4it} d_{t+1}$$

where X is the vector of individual characteristics, and the impact estimator is the marginal effect captured by ψ .

As in Stewart (2003), the model also includes a polynomial in the wage rate. This controls for the fact that those in lower-paid work are less likely to remain in employment over a given time period than higher-paid people. Controlling for this effect strengthens the claim of a credible common trend assumption.

FEATURE

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The preliminary R&D satellite account for the UK: a sensitivity analysis

SUMMARY

This article builds on previous work in *Economic & Labour Market Review* which treated expenditure on research and development as investment in an intangible scientific asset, in line with proposed revisions to the System of National Accounts (SNA). The purpose of the analysis is to communicate to users the degree of sensitivity of the results previously presented to changes in the key assumptions. The analysis is part of a wider Office for National Statistics contribution to Organisation for Economic Co-operation and Development work updating the 1993 SNA, and was presented at the International Association for Research on Income and Wealth conference in Slovenia in August 2008.

One of the major recommended changes to the 1993 System of National Accounts (1993 SNA) is that research and development (R&D) expenditure should be treated as investment in an intangible scientific asset, with its definition following the Organisation for Economic Co-operation and Development's Frascati Manual (OECD 2002). As a precursor to incorporation into countries' national accounts, the recommended changes are to be documented in experimental R&D satellite accounts. While the revision timetable spans a number of years, many statistical agencies, including the Office for National Statistics, have already conducted preliminary assessments to communicate the potential impacts to users.

In a previous issue of *Economic & Labour Market Review*, Galindo-Rueda (2007) presented preliminary analysis for the UK treating R&D as a capital asset. Capitalising R&D would raise UK gross domestic product (GDP) by approximately 1.5 per cent, have non-trivial impacts on R&D intensity indicators and key economic ratios, but limited effect on estimates of recent GDP growth. The treatment of R&D as a capital asset also has impacts on the goods and services account (GSA).

In this article, a sensitivity analysis on Galindo-Rueda's preliminary results is carried out. The areas investigated are: the GSA impacts, GDP and net domestic product (NDP) estimates, R&D intensity indicators, key economic ratios and growth-accounting results. The focus of the analysis is the assumptions made with respect to depreciation rates for R&D and fixed assets,

the inclusion of software, and the funding and ownership assumptions regarding R&D across various sectors.¹ The aim of the article is to communicate to users the degree of sensitivity of the results previously presented to changes in the key assumptions.

The key assumptions**Depreciation rates****R&D stocks**

Treating R&D as an asset requires a number of assumptions, one of the most important of which is the rate of depreciation. Using a constant price series for R&D gross fixed capital formation (GFCF), end-of-period R&D stocks were calculated using a perpetual inventory model (PIM), which adds new investment to capital stock, and subtracts depreciation. In the original benchmark analysis by Galindo-Rueda (2007), a depreciation rate of 20 per cent was applied to the business sector's R&D stock, while a 5 per cent rate was applied to the government and non-profit institutions serving households (NPISH) sectors.

The 20 per cent business sector rate is consistent with a ten-year service life under a double-declining balance rate, and close to the 24 per cent estimated for the UK by Schankerman and Pakes (1986) using patent renewal methods. In the empirical literature, it has been estimated that business sector R&D capital depreciates at two to seven times the rate of physical capital, with estimates ranging from 10 to 25 per cent depending on the sector considered (Edworthy and Wallis 2007). The government and NPISH depreciation rates of 5 per cent are outside this range,

reflecting the likelihood of slower depreciation of knowledge produced for more general applications.

A comparison of depreciation rates used in international R&D satellite accounts is given in **Table 1**.² On the basis of these rates and estimates in the literature, three scenarios for the business sector are considered: 15 per cent, 20 per cent (original) and 25 per cent,³ and three scenarios for the government and NPISH sectors: 2.5 per cent per cent, 5 per cent (original) and 7.5 per cent. It is assumed that the same depreciation rate always applies in the government and NPISH sectors.

Fixed assets stocks

In the benchmark analysis, stocks of fixed assets used for R&D for the two separate categories in the Business Enterprise Research and Development survey (land and buildings and plant, machinery and equipment) depreciate geometrically according to the PIM, with capital services for the use of both stocks calculated assuming a net rate of return (ROR) of 7 per cent. A 1.5 per cent depreciation rate was applied to land and buildings, and 15 per cent for machinery and equipment.

These rates are consistent with the finding that physical capital depreciates more slowly than business sector R&D capital,

though the latter is only slightly below the business sector's R&D capital depreciation rate of 20 per cent. In this analysis, three scenarios are considered: 0.5 per cent, 1.5 per cent (original) and 2.5 per cent for land and buildings, and 10 per cent, 15 per cent (original) and 20 per cent for plant, machinery and equipment. The net ROR of 7 per cent is applied in each case.

Software estimates

To avoid double counting of software, which is currently recognised as a produced asset in the National Accounts (NA), and scientific originals (R&D) which are not, 50 per cent of total R&D in the computer services industry was deducted in the benchmark analysis (it is assumed this proportion is already correctly accounted for in software estimates). In addition, 60 and 40 per cent deductions are considered.

Performance, funding and ownership of R&D

In the benchmark analysis, a number of assumptions are made about the share of each sector's R&D that is funded and owned by another sector. The sensitivity to changes in some of these assumed shares is also investigated, again using three scenarios. The assumptions used in the sensitivity analysis are presented in **Table 2**, with the original assumptions labelled.

Results

Impacts on the goods and services account

The goods and services account (GSA) balances total resources (supply), from output and imports, against possible uses (demand). Like Galindo-Rueda, concentration is on the impacts of R&D capitalisation. The figures presented therefore reflect the changes relative to NA values for the 2004 reference year. The sensitivity with respect to depreciation rates is considered first.

Depreciation rates

NPISH and government R&D capital The changes, which are documented in **Table 3**, are non-trivial. The impact on total demand rises by approximately 19 per cent if the depreciation rate is increased from the original 5 per cent value to 7.5 per cent. However, this does result only from increases in final consumption of services from R&D capital by the NPISH and government sectors, which increase by 65 and 12 per cent, respectively. Reducing the depreciation rate from 5 to 2.5 per cent reduces total demand through the same channels but, interestingly, the effect is less marked. Thus, while the total demand impact shows significant sensitivity to even small changes in these depreciation rates, it is more sensitive to an increase from the benchmark value.

Business R&D capital

Changing the business R&D capital depreciation rate has no effect on the GSA. This result follows from the elimination of the channels discussed above via the imposed constraint, used to estimate adjustments to other goods and services on the supply and use sides, that non-market gross value added (GVA) increases only by the value of R&D capital consumption in the government and NPISH sectors.

Land and buildings

Changing the depreciation rate leads to changes in almost all the components of total demand, but the overall impact is small. Increasing the rate from the original value of 1.5 per cent to 2.5 per cent reduces total demand impact by 1.3 per cent, resulting mainly from a reduction in the capitalisation of R&D investment (that is, R&D GFCCF) from £19.407 billion to £19.213 billion. For such a small change in the depreciation rate, this is certainly non-trivial, but reducing the depreciation rate by 1 percentage point to 0.5 per cent produces an even greater effect. The total demand

Table 1

Comparison of service lives and depreciation rates in international R&D satellite accounts

Country	Average service life (years)	Annual depreciation rate (%)	Comments
Australia	5, 10 and 20	NA	Three scenarios
Canada	NA	5, 10 and 15	Three scenarios
Israel	NA	15	None
Netherlands	9.5 to 15.5	NA	Vary across industry groups
UK	NA	20 (business) 5 (government and NPISH)	None
US	NA	11–18 (business) 15 (government and NPISH)	Vary across four industry groups

Source: OECD (2008)

Table 2

Funding-ownership assumptions in the sensitivity analysis

Funder (i)	Share of sector i's R&D funded by sector j that is owned by sector j						
	Business enterprise	General government		NPISH	Rest of World		
		Original	0.40		Original	0.85	Original
Performer (j)	Original	1.00	0.40	Original	1.00	0.85	Original
Business enterprise	1.00	0.40	0.50	0.60	1.00	0.85	0.90
General government	1.00	1.00	1.00	1.00	1.00	0.85	0.90
NPISH	1.00	0.05	0.10	0.15	1.00	0.85	0.90
Rest of World	0.90	1.00	1.00	1.00	0.76	0.22	0.22

Table 3

Sensitivity of GSA impacts to NPISH and government R&D capital depreciation rates, 2004

	£ million, current prices		
Resources			
Depreciation rate	2.5%	5% (original)	7.5%
R&D output	Unchanged	12,403	Unchanged
Output of other goods and services (OGS)	Unchanged	-9,089	Unchanged
Output of OGS from other non-market consumption of R&D capital services	3,219	4,216	5,671
R&D imports	Unchanged	197	Unchanged
Total supply of R&D	Unchanged	12,600	Unchanged
Total supply of OGS	-5,870	-4,873	-3,418
Total supply	6,730	7,727	9,182
Uses			
R&D intermediate consumption	Unchanged	-5,274	Unchanged
Intermediate consumption OGS	Unchanged	-1,363	Unchanged
R&D gross fixed capital formation	Unchanged	19,407	Unchanged
Gross fixed capital formation other assets	Unchanged	0	Unchanged
Changes in inventories	Unchanged	12	Unchanged
Final consumption of R&D by NPISH	Unchanged	-325	Unchanged
Final consumption of OGS by NPISH	Unchanged	-5,084	Unchanged
Final consumption of services from R&D capital by NPISH	1,124	1,776	2,939
Final consumption of OGS by government	Unchanged	-2,641	Unchanged
Final consumption of services from R&D capital by government	2,095	2,440	2,732
R&D exports	Unchanged	-1,219	Unchanged
Total demand of R&D	Unchanged	12,600	Unchanged
Total demand of OGS	-5,870	-4,873	-3,418
Total demand	6,730	7,727	9,182

Source: Office for National Statistics

Table 4

Sensitivity of GSA impacts to the land and buildings depreciation rate, 2004

	£ million, current prices		
Resources			
Depreciation rate	0.5%	1.5% (original)	2.5%
R&D output	12,988	12,403	12,151
Output of other goods and services (OGS)	-9,006	-9,089	-9,124
Output of OGS from other non-market consumption of R&D capital services	3,828	4,216	4,402
R&D imports	Unchanged	197	Unchanged
Total supply of R&D	13,185	12,600	12,348
Total supply of OGS	-5,178	-4,873	-4,722
Total supply	8,007	7,727	7,627
Uses			
R&D intermediate consumption	-5,272	-5,274	-5,275
Intermediate consumption OGS	-1,351	-1,363	-1,369
R&D gross fixed capital formation	19,856	19,407	19,213
Gross fixed capital formation other assets	0	0	0
Changes in inventories	Unchanged	12	Unchanged
Final consumption of R&D by NPISH	Unchanged	-325	Unchanged
Final consumption of OGS by NPISH	-5,034	-5,084	-5,105
Final consumption of services from R&D capital by NPISH	1,612	1,776	1,854
Final consumption of OGS by government	-2,621	-2,641	-2,650
Final consumption of services from R&D capital by government	2,216	2,440	2,548
R&D exports	-1,086	-1,219	-1,277
Total demand of R&D	13,185	12,600	12,348
Total demand of OGS	-5,178	-4,873	-4,722
Total demand	8,007	7,727	7,627

Source: Office for National Statistics

impact increases by almost 4 per cent, again resulting mainly from the effect on R&D investment (see **Table 4**).

Plant, machinery and equipment

The total demand impacts of increasing or reducing the depreciation rate are insignificant at less than 1 per cent. Inspection of **Table 5** shows that this does not result from offsetting elements within demand, but rather because the effects on all elements are quite small. These results stand in contrast to the changes produced by altering the land and buildings depreciation rate.

Software estimates

Table 6 shows that the total demand impacts of the software deduction assumption are not particularly large. As expected, increasing (decreasing) the percentage deduction of R&D in the computer services industry decreases (increases) the impact of R&D capitalisation on total demand, primarily through its effect on R&D investment. Changing the software deduction by 10 percentage points leads to approximately a 1.6 per cent change in the total demand impact and around a 0.5 per cent change in R&D investment.⁴

Performance, funding and ownership of R&D

The changes in the GSA impacts differ depending on the funding share considered, but the general result is that there are only small changes in total demand and its individual components. The greatest sensitivity is with respect to the share of government-funded and -owned R&D performed by business enterprise, with changes in the GSA shown in **Table 7**. The total demand impact changes by 1.25 per cent.

GDP and NDP estimates

The capitalised estimates as well as their percentage changes relative to the benchmark estimates of Galindo-Rueda (2007) are given in next three tables. The satellite account GDP and NDP estimates refer to all sectors. **Table 8** refers to depreciation rates, **Table 9** to the software deduction and **Table 10** to the assumed funding-ownership shares.

Depreciation rates

NPISH and government R&D capital
There is no change in the NDP estimate from changing the depreciation rates from the benchmark of 5 per cent. However, there are changes to GDP estimates because, for the government and NPISH sectors,

Table 5
Sensitivity of GSA impacts to the plant, machinery and equipment depreciation rate, 2004

	£ million, current prices		
Resources			
Depreciation rate	10%	15% (original)	20%
R&D output	Unchanged	12,403	Unchanged
Output of other goods and services (OGS)	-9,034	-9,089	-9,122
Output of OGS from other non-market consumption of R&D capital services	4,204	4,216	4,225
R&D imports	Unchanged	197	Unchanged
Total supply of R&D	Unchanged	12,600	Unchanged
Total supply of OGS	-4,830	-4,873	-4,897
Total supply	7,770	7,727	7,703
Uses			
R&D intermediate consumption	Unchanged	-5,274	Unchanged
Intermediate consumption OGS	-1,355	-1,363	-1,368
R&D gross fixed capital formation	19,400	19,407	19,411
Gross fixed capital formation other assets	Unchanged	0	Unchanged
Changes in inventories	Unchanged	12	Unchanged
Final consumption of R&D by NPISH	Unchanged	-325	Unchanged
Final consumption of OGS by NPISH	-5,051	-5,084	-5,104
Final consumption of services from R&D capital by NPISH	1,768	1,776	1,781
Final consumption of OGS by government	-2,628	-2,641	-2,650
Final consumption of services from R&D capital by government	2,435	2,440	2,444
R&D exports	-1,212	-1,219	-1,224
Total demand of R&D	Unchanged	12,600	Unchanged
Total demand of OGS	-4,830	-4,873	-4,897
Total demand	7,770	7,727	7,703

Source: Office for National Statistics

Table 6
Sensitivity of GSA impacts to the software estimates deduction, 2004

	£ million, current prices		
Resources			
Software deduction	40%	50% (original)	60%
R&D output	12,525	12,403	12,281
Output of other goods and services (OGS)	Unchanged	-9,089	Unchanged
Output of OGS from other non-market consumption of R&D capital services	4,220	4,216	4,213
R&D imports	Unchanged	197	Unchanged
Total supply of R&D	12,722	12,600	12,478
Total supply of OGS	-4,869	-4,873	-4,881
Total supply	7,852	7,727	7,602
Uses			
R&D intermediate consumption	Unchanged	-5,274	Unchanged
Intermediate consumption OGS	Unchanged	-1,363	Unchanged
R&D gross fixed capital formation	19,503	19,407	19,311
Gross fixed capital formation other assets	Unchanged	0	Unchanged
Changes in inventories	Unchanged	12	Unchanged
Final consumption of R&D by NPISH	Unchanged	-325	Unchanged
Final consumption of OGS by NPISH	Unchanged	-5,084	Unchanged
Final consumption of services from R&D capital by NPISH	Unchanged	1,776	Unchanged
Final consumption of OGS by government	Unchanged	-2,641	Unchanged
Final consumption of services from R&D capital by government	2,444	2,440	2,437
R&D exports	-1,194	-1,219	-1,245
Total demand of R&D	12,722	12,600	12,478
Total demand of OGS	-4,869	-4,873	-4,876
Total demand	7,852	7,727	7,602

Source: Office for National Statistics

the amount of consumption of fixed capital attributable to R&D is added to both income and expenditure, thereby increasing factor incomes, final expenditure and value added in these sectors. With a 7.5 per cent depreciation rate, GDP increases by 0.05 per cent relative to the preliminary case. If the depreciation rate is reduced to 2.5 per cent instead, the GDP estimate falls by almost one-tenth of a percentage point. GDP estimates are therefore also rather insensitive to the NPISH and government R&D capital depreciation rates.

Business sector R&D capital

In this case, it is the NDP estimates that change while the GDP estimates stay constant. The reason for this result is that the consumption of fixed capital that occurs with the depreciation of R&D assets used in a production process is a portion of total operating surplus. Thus, when business capital is depreciated, the depreciation rate used affects the composition between capital consumption and net operating surplus (and thus NDP), but does not affect GDP. The changes in NDP are rather insignificant: if the depreciation rate is reduced by 5 percentage points to 15 per cent, then there is 0.01 per cent increase in NDP, while an increase up to 25 per cent reduces NDP by 0.02 per cent.

Land and buildings

Both NDP and GDP estimates change relative to the benchmark analysis. Increasing the depreciation rate from 1.5 per cent to 2.5 per cent reduces NDP by 0.1 per cent compared with only a 0.01 per cent reduction in GDP. The corresponding changes for a 1 percentage point reduction in the depreciation rate to 0.5 per cent are similar quantitatively, with the proviso that the directions of change are reversed. Thus, while NDP estimates are more variable than GDP estimates, both sets are rather robust.

Plant, machinery and equipment

Both GDP and NDP estimates show little variability to the assumed depreciation rate for plant, machinery and equipment. The changes for GDP and NDP are the same in percentage terms, but an increase in the depreciation rate reduces GDP and increases NDP (and vice versa for a decrease in the depreciation rate). Changes in the plant, machinery and equipment depreciation rate also had only minor impacts on the goods and services account, despite the relatively wide range of values considered.

Software estimates

A 10 percentage point change in the original software deduction figure of 50

Table 7

Sensitivity of GSA impacts to the share of government-funded R&D performed by business enterprise and owned by government, 2004

	£ million, current prices		
Resources			
Funding share	40%	50% (original)	60%
R&D output	12,399	12,403	12,406
Output of other goods and services (OGS)	Unchanged	-9,089	Unchanged
Output of OGS from other non-market consumption of R&D capital services	4,123	4,216	4,309
R&D imports	Unchanged	197	Unchanged
Total supply of R&D	12,597	12,600	12,603
Total supply of OGS	-4,966	-4,873	-4,966
Total supply	7,631	7,727	7,824
Uses			
R&D intermediate consumption	-5,278	-5,274	-5,271
Intermediate consumption OGS	Unchanged	-1,363	Unchanged
R&D gross fixed capital formation	Unchanged	19,407	Unchanged
Gross fixed capital formation other assets	Unchanged	0	Unchanged
Changes in inventories	Unchanged	12	Unchanged
Final consumption of R&D by NPISH	Unchanged	-325	Unchanged
Final consumption of OGS by NPISH	Unchanged	-5,084	Unchanged
Final consumption of services from R&D capital by NPISH	Unchanged	1,776	Unchanged
Final consumption of OGS by government	Unchanged	-2,641	Unchanged
Final consumption of services from R&D capital by government	2,347	2,440	2,533
R&D exports	Unchanged	-1,219	Unchanged
Total demand of R&D	12,597	12,600	12,603
Total demand of OGS	-4,966	-4,873	-4,780
Total demand	7,631	7,727	7,824

Source: Office for National Statistics

Table 8

Sensitivity of GDP and NDP estimates to depreciation rates, 2004

	£ million, current prices				
	Depreciation rate (%)	Gross domestic product (GDP)	% change from the benchmark analysis	Net domestic product (NDP)	% change from the benchmark analysis
Land and buildings					
Original	0.5	1,190,960	0.02	1,049,071	0.1
Original	1.5	1,190,695		1,047,990	
Original	2.5	1,190,600	-0.01	1,047,507	-0.1
Plant, machinery and equipment					
Original	10	1,190,729	0.003	1,047,954	-0.003
Original	15	1,190,695		1,047,990	
Original	20	1,190,675	-0.002	1,048,009	0.002
Business sector R&D stocks					
Original	15	1,190,695	Unchanged	1,048,361	0.01
Original	20	1,190,695		1,047,990	
Original	25	1,190,695	Unchanged	1,047,748	-0.02
Government and NPISH R&D stocks					
Original	2.5	1,189,698	-0.08	1,047,990	Unchanged
Original	5.0	1,190,695		1,047,990	
Original	7.5	1,191,266	0.05	1,047,990	Unchanged

Source: Office for National Statistics

per cent causes a change in GDP of only 0.01 per cent. As expected, increasing the software deduction reduces GDP (as it reduces the potential for double-counting), while a reduction in the software deduction increases GDP. NDP changes in the same direction and by equal magnitude in percentage terms (see Table 9).

Performance, funding and ownership of R&D

The effects on NDP and GDP are small. The greatest sensitivity is again with respect to the share of R&D funded and owned by general government but performed by business enterprise. GDP and NDP rise by only 0.01 per cent if the share is reduced to

40 per cent and fall by 0.01 per cent if the share is increased to 60 per cent. The results for each share are presented in Table 10.

Sensitivity of R&D intensity indicators and key economic ratios

Sensitivity with respect to two indicators of R&D intensity is considered – the GERD/GDP ratio and R&D GFCF/GDP – and two key economic ratios – the gross operating surplus (GOS) to GDP ratio and the gross saving to gross national disposable income ratio.

Depreciation rates

The GERD/GDP ratio, the headline R&D intensity indicator, does not change at all to three decimal places for the depreciation rate scenarios considered. The R&D GFCF/GDP ratio is similarly insensitive, but does increase by 0.001 (one-tenth of a percentage point) when the land and buildings depreciation rate is reduced to 0.5 per cent. Key economic ratios (the last two columns of Table 11) are also insensitive. There is only a change to the third decimal place in the ratio of gross saving to gross national domestic income ratio, which rises by one-tenth of a percentage point, again for a 1 percentage point reduction in the land and buildings depreciation rate to 0.5 per cent.

Software estimates

There are no changes in the key economic ratios or R&D intensity indicators to three decimal places. The effects of changing the software deduction assumption are therefore minimal across the three key areas of the satellite account on which the sensitivity analysis focuses.

Performance, funding and ownership of R&D

The R&D intensity indicators and key economic ratios are also unchanged to three decimal places with respect to the assumed funding-ownership shares. This gives some justification to the original assumptions used in preliminary analysis since both the GDP and NDP estimates are robust, while the effects on the GSA were also small.

Growth accounting

Growth accounting is a technique used to attribute changes in the volume of output to changes in the volume of inputs – labour (quality-adjusted), non-R&D capital and R&D capital – based on the assumption that contributions of each input are proportional to their share in national income.

The benchmark results of Galindo-

Table 9

Sensitivity of GDP and NDP to the software deduction assumption, 2004

	Software deduction (%)	Gross domestic product (GDP)	% change from the benchmark analysis	Net domestic product (NDP)	% change from the benchmark analysis
Software deduction (removing double counting)					
Original	40	1,190,820	0.01	1,048,047	0.01
	50	1,190,695		1,047,990	
	60	1,190,382	-0.01	1,047,933	-0.01

Source: Office for National Statistics

Table 10

Sensitivity of GDP and NDP to funding share assumptions, 2004

	Funding share (%)	Gross domestic product (GDP)	% change from the benchmark analysis	Net domestic product (NDP)	% change from the benchmark analysis
R&D funded and owned by general government, performed by business enterprise					
Original	40	1,190,462	-0.01	1,047,720	-0.01
	50	1,190,695		1,047,990	
	60	1,190,788	0.01	1,048,098	0.01
R&D owned and funded by general government, performed by NPISH					
Original	5	1,190,668	-0.002	1,047,990	Unchanged
	10	1,190,695		1,047,990	
	15	1,190,722	0.002	1,047,990	Unchanged
R&D owned and funded by the Rest of the World, performed by business enterprise					
Original	85	1,190,695	Unchanged	1,047,841	-0.01
	90	1,190,695		1,047,990	
	95	1,190,695	Unchanged	1,048,139	0.01
R&D owned and funded by the Rest of the World, performed by general government					
Original	85	1,190,697	0.0002	1,047,990	Unchanged
	90	1,190,695		1,047,990	
	95	1,190,692	-0.0003	1,047,990	Unchanged
R&D owned and funded by the Rest of the World, performed by NPISH					
Original	85	1,190,704	0.0008	1,047,990	Unchanged
	90	1,190,695		1,047,990	
	95	1,190,686	-0.0008	1,047,990	Unchanged

Source: Office for National Statistics

Rueda (2007) suggest that, over the 1997 to 2004 period, R&D made only a small contribution of 0.05 per cent to observed GVA growth of 2.8 per cent. By comparison, the contributions of non-R&D capital and quality-adjusted labour were 1.45 and 0.8 per cent, respectively. The inclusion of R&D therefore had little impact on the unexplained Solow residual, reducing its value from 0.55 (2.8 – 1.45 – 0.8) per cent to 0.50 per cent via its 0.05 per cent contribution. An interesting question is whether this conclusion is sensitive to changes in key assumptions. This question is addressed in this section using the same scenarios, and the same 1997 to 2004 period used by Galindo-Rueda (2007).

Depreciation rates

The results for the four depreciation rates are given in **Table 12**. GVA growth sometimes changes slightly, but the contribution of R&D capital to growth (and thus the reduction in the Solow residual) remains in the

range 0.04 to 0.06 per cent. The role of R&D in explaining growth therefore remains rather small, and similar to the benchmark value of 0.05 per cent found by Galindo-Rueda (2007). This result is also consistent with earlier work by Edworthy and Wallis (2007), though users should note that this growth-accounting exercise captures only the direct contribution from 'owned' R&D knowledge. The limited contribution of R&D to growth is the result of the low income share of R&D accumulation remaining relatively constant with respect to changes in depreciation rates.

Software and funding-ownership assumptions

Both GVA and the contributions to growth of R&D capital are unaffected to two decimal places by changes in the assumed shares of R&D funded and owned by a given sector (but performed by a different sector) or the software deduction assumption. Further, for all these

assumptions, this result is robust to the use of more extreme scenarios.⁵

Conclusion

This article has built upon previous work in *Economic & Labour Market Review*, treating expenditure on research and development as investment in an intangible scientific asset. The sensitivity of the impacts of R&D capitalisation previously quantified have been investigated via a sensitivity analysis on the key assumptions.

Taking 2004 as the reference year, the sensitivity of goods and services account impacts, GDP and NDP estimates, R&D intensity indicators and key economic ratios have been examined. These results are rather robust to changes in key assumptions, with only goods and services account impacts showing significant sensitivity vis-à-vis the depreciation rates of R&D capital in the government and NPISH sectors.

In addition, growth-accounting results show a small but robust contribution of R&D to growth in recent years, consistent with previous work.

A key finding is that uncertainty regarding the correct depreciation rates in the government and NPISH sectors is important for R&D capitalisation, but only at a relatively disaggregated – supply and demand – level.

Notes

- 1 The sensitivity analysis is carried out holding all other variables at their values in the benchmark analysis of Galindo-Rueda (2007).
- 2 This table is based on 'Methods for obtaining R&D service lives', prepared for the OECD Task Force on R&D and other Intellectual Property Products, 24–25 April 2008.
- 3 It is worth noting that Edworthy and Wallis (2007) have estimated the UK business sector R&D depreciation rate at 50 per cent. Results here are robust to the use of a 50 per cent depreciation rate. The GSA, GDP estimates and the R&D intensity indicators and key economic ratios are left unchanged. The NDP estimate does change, but the impact is relatively small; NDP is only 0.07 per cent below the original estimate for a 20 per cent depreciation rate.
- 4 To produce relatively large changes in the total demand impact of around 4 per cent, a 25 percentage point change is required.
- 5 For example, using software deductions of 25 and 75 per cent does not change this conclusion.

Table 11

Sensitivity of R&D intensity indicators and key economic ratios to depreciation rates, 2004

Depreciation rate (%)	GERD/GDP		R&D GFCF/GDP		Gross operating surplus/GDP		Gross saving/gross national disposable income		Ratios
			Satellite						
	BB06	Satellite	Satellite	BB06	Satellite	BB06	Satellite		
Depreciation of land and buildings									
0.5	0.017	Unchanged to three decimal places		0.017		0.322	Unchanged to three decimal places	0.151	0.165
Original	1.5	0.017	0.017	0.016		0.322	0.330	0.151	0.164
	2.5	←			Unchanged to three decimal places		→		
Depreciation of plant and machinery									
20	20	←			Unchanged to three decimal places		→		
Original	15	0.017	0.017	0.016		0.322	0.330	0.151	0.164
	10	←			Unchanged to three decimal places		→		
Depreciation of R&D stocks for the business sector									
15	15	←			Unchanged to three decimal places		→		
Original	20	0.017	0.017	0.016		0.322	0.330	0.151	0.164
	25	←			Unchanged to three decimal places		→		
Depreciation of R&D stocks for the government and NPI SH sectors									
2.5	2.5	←			Unchanged to three decimal places		→		
Original	5.0	0.017	0.017	0.016		0.322	0.330	0.151	0.164
	7.5	←			Unchanged to three decimal places		→		

Source: Office for National Statistics

Table 12

Sensitivity of the impact of R&D stock accumulation on economic growth to depreciation rates, 1997 to 2004

Depreciation rate	Percentages											
	Land and buildings			Plant, machinery and equipment			Business sector R&D			Government and NPI SH R&D		
	Original	1.5	2.5	10.0	Original	15.0	20.0	Original	20.0	25.0	Original	5.0	7.5
GVA growth	2.82	2.80	2.79	↑	2.80	↑	↑	2.80	↑	2.79	2.80	↑
Contributions to growth												
Other assets	1.45	1.45	1.45		1.45			1.45		1.45	1.45	
R&D assets	0.06	0.05	0.04	Unchanged to two decimal places	0.05	Unchanged to two decimal places	Unchanged to two decimal places	0.05	Unchanged to two decimal places	0.04	0.05	Unchanged to two decimal places
QALI	0.80	0.80	0.80		0.80			0.80		0.80	0.80	
Multifactor productivity growth												
MFP excluding R&D	2.25	2.25	2.25		2.25			2.25		2.25	2.25	
MFP including R&D	2.31	2.30	2.29		2.30			2.30		2.29	2.30	
Residual excluding R&D	0.57	0.55	0.54	↓	0.55	↓	↓	0.55	↓	0.54	0.55	↓
Residual including R&D	0.51	0.50	0.50		0.50			0.50		0.50	0.50	

Note:

GVA excludes dwellings.

Source: Authors' calculations on a number of ONS sources

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FEATURE

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Job separations in the UK

SUMMARY

This article provides the latest estimates, for the period 1996 to 2007, of total job separations, defined as the end of the employment relationship between employer and employee. This can happen for many reasons. For example, the employee could choose to leave to have a child or for a better-paid job; conversely, they could be forced to leave at the end of a temporary contract, or be made redundant by their employer.

The article is the latest in a series produced by the Office for National Statistics. Earlier *Labour Market Trends* articles by Weir (2003) and Heap (2005) analysed job separations and the links with the economic climate. This article updates some of the key tables on job separations and uses longitudinal analysis to give more details on previous jobs.

Analysing job separations can help assess the current economic climate, as they are indicators of employment turnover. However, a higher level of job separations can indicate both growth and decline in the economy. High labour demand can create jobs, so more people leave existing jobs for better ones, whereas when labour demand is low, the employer may not readvertise once a job is left, or has to make employees redundant.

Labour Force Survey

The Labour Force Survey (LFS) is a quarterly household survey covering 53,000 households in the UK. The LFS is one of the principal sources for key information on the state of the labour market. It provides information on an employee's reason for leaving their last job, as well as more detailed characteristics about the respondent.

The LFS structure enables the linking of individuals over two or five quarters. The longitudinal data sets cover the working-age population. This data set will be used to analyse previous job characteristics not covered by the quarterly LFS.

Job separations

The level of job separations is defined as the number of people who left their main paid job in the previous three months. The main reason for leaving their job is captured in the LFS question, 'What was the reason why you left your last job?' (see Box 1). There are nine possible reasons for leaving, of which three describe involuntary separations and six voluntary separations. An involuntary job separation is where the employer decides to terminate the employment. Voluntary separations are where the employee decides to leave their job. It

Box 1**Full LFS question on reason left last job, and classification of involuntary and voluntary separations**

Could you tell me the reason why you left your last job?

- | | | |
|---|---|-------------|
| 1 Dismissed
2 You were made redundant/took voluntary redundancy
3 It was a temporary job which came to an end | } | Involuntary |
| 4 You resigned
5 You gave up for health reasons
6 You took early retirement
7 You retired (at or above state pension age)
8 You gave up work for family or personal reasons
9 You left for some other reason | } | Voluntary |

should be noted that those people who have experienced a job separation in the previous three months may have had more than one job separation.

The number of job separations fluctuates throughout the year. They are lowest in the first quarter (January to March) and highest in the final quarter (October to December). Combining data for four calendar quarters and presenting a yearly average smoothes these fluctuations. The question on job separations was introduced in the LFS in quarter two of 1995 and so data are presented from 1996 (the first full year's worth of data) for all people aged 16 and over. In 1996, there were 1.15 million job separations, reaching a high of 1.30 million in 1998 before falling to 1.04 million in 2007. One-quarter of job separations are involuntary and three-quarters are voluntary.

Job separation rates

Comparing the number of job separations over time is influenced by the number of people who are in employment. Using a job separation rate factors this in. It is calculated as the number of working-age

people separated from a paid job in the three months before interview, divided by the number of people who said they were in employment for more than three months, plus those separated from a paid job. The population is restricted to working-age, which is men aged 16 to 64 and women aged 16 to 59. For further information on calculating job separation rates, see the Technical Note.

Figure 1 shows job separation rates for 1996 to 2007. Between 1996 and 2007, the total job separation rate fell from 4.4 per cent to 3.6 per cent. The involuntary separation rate fell from 1.6 per cent in 1996 to 1.0 per cent in 2007. The voluntary separation rate in 1996 was 2.9 per cent, rising to 3.3 per cent in 1998 before falling back to 2.5 per cent in 2007, with the biggest drop between 2004 and 2005.

Job separation rates by sex

Figure 2 shows the involuntary and voluntary separation rates of men and women for the period 1996 to 2007. Overall, women have higher total separation rates than men. Women have the lowest involuntary separation rates and the

highest voluntary separation rates. In 2007, these rates were 0.9 per cent and 2.8 per cent, respectively; for men, the respective rates were 1.1 per cent and 2.4 per cent. The voluntary separation rate was lowest in 2006 for men, at 2.3 per cent. The difference in voluntary separation among men and women has narrowed since 1995.

Job separation rates by age

Table 1 shows the job separation rates by four age bands in 1996 and 2007. In both years, 16 to 24 year olds have the highest job separation rates, representing the fact that they move jobs more frequently. They are in the early stages of their careers and possibly looking to progress, or could be students with casual jobs. In 1996, their rate was 10.2 per cent, falling to 8.5 per cent by 2007. Compared with 4.0 per cent of those aged 25 to 34, 2.5 per cent aged 35 to 49 and also 2.5 per cent aged 50 to retirement age left their jobs in 2007.

Reason for leaving

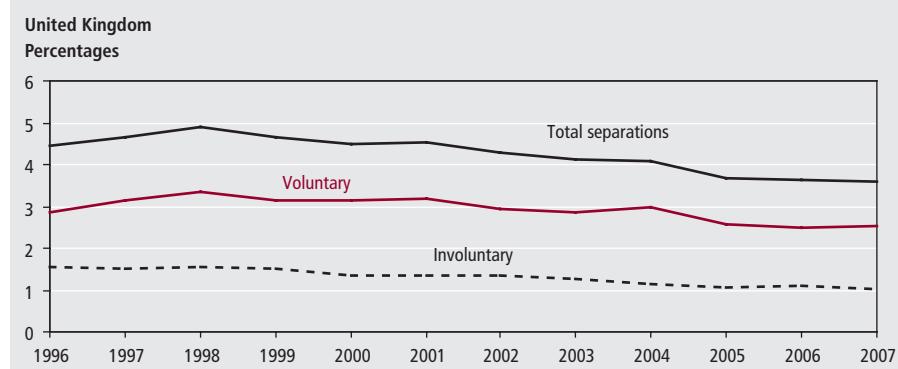
Table 2 shows the reasons for leaving a job, for people of working age who separated from their job in the previous three months, with early retirement and retirement combined into one group. For around one in five people, 'left for some other reason' is given as the reason for leaving their last job. In 2007, the most common reason was resignation, accounting for 38.4 per cent. A temporary job ending accounted for 13.9 per cent of job separations and 'made redundant/voluntary redundancy' accounted for a further 12.1 per cent. Since 1996, the proportion leaving because of resignation has increased, with falls among most of the other groups.

It should be noted that there could be reporting errors with the reason for the job separation: for example, dismissals may be under-reported. Also, in proxy responses (where someone responds on behalf of someone else), the real reason for leaving may not be accurate.

Economic activity status following a job separation

Table 3 shows the current economic activity status for working-age people who separated from a job in the previous three months. Re-employment rates show the proportion of people separated from their main job in the three months before their interview who were in employment again at their next interview. The re-employment rate for all separations was 57.7 per cent in 2007, but this varies among the reasons for leaving. Approximately three-quarters

Figure 1
Total, involuntary and voluntary separation rates, 1996 to 2007¹

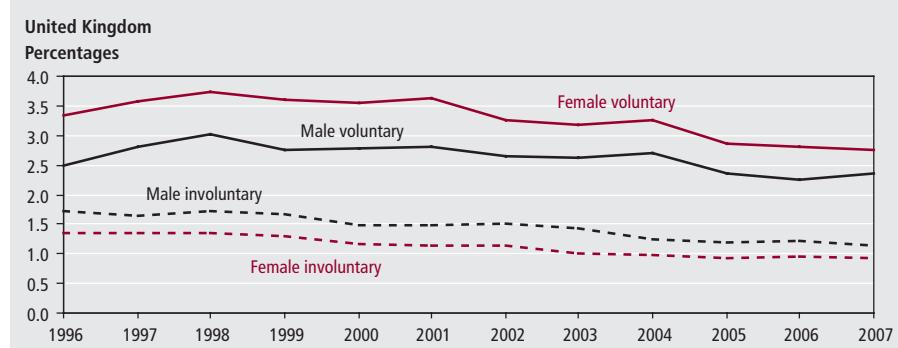


Note:

1 Four-quarter average of Q1, Q2, Q3 and Q4 of each year.

Source: Labour Force Survey

Figure 2
Involuntary and voluntary separation rates: by sex, 1996 to 2007¹



Note:

1 Four-quarter average of Q1, Q2, Q3 and Q4 of each year.

Source: Labour Force Survey

Table 1**Total job separations rates: by age**

United Kingdom	Percentages			
	16–24	25–34	35–49	50–59/64
1996 ¹	10.2	4.7	2.8	2.5
2007 ¹	8.5	4.0	2.5	2.5

Note:

1 Four-quarter average of Q1, Q2, Q3 and Q4 of each year.

Source: Labour Force Survey

Table 2**Job separations, working-age people:¹ by reason for leaving²**

United Kingdom	Percentages	
	1996 ³	2007 ³
Dismissed	3.2	2.9
Made redundant/voluntary redundancy	14.2	12.1
Temporary job ended	17.8	13.9
Involuntary	35.2	28.9
Resigned	25.3	38.4
Gave up work for health reasons	4.5	3.2
Took early retirement/retired	2.1	2.2
Gave up work for family, personal reason	10.1	7.6
Left for some other reason	22.9	19.6
Voluntary	64.8	71.1
All separations	100.0	100.0

Notes:

1 Working-age men aged 16–64 and women aged 16–59.

2 Excludes those who did not state a reason.

3 Four-quarter average of Q1, Q2, Q3 and Q4 of each year.

Source: Labour Force Survey

Table 3**Economic status of working-age¹ people who have separated² from a job: by reason for leaving, 2007³**

United Kingdom	Percentages		
	Employed	Unemployed	Inactive
Dismissed	31.8	51.4	16.8
Made redundant/voluntary redundancy	41.6	40.8	17.6
Temporary job ended	48.7	31.1	20.1
Involuntary	44.0	37.2	18.7
Resigned	73.7	14.9	11.4
Gave up work for health reasons	17.4	18.2	64.4
Took early retirement/retired	9.2	6.7	84.1
Gave up work for family, personal reason	6.6	10.3	83.0
Left for some other reason	35.6	19.8	44.6
Voluntary	63.4	15.1	21.5
All separations ⁴	57.7	21.5	20.8

Notes:

1 Working-age men aged 16–64 and women aged 16–59.

2 Separated from a job in the three months before interview.

3 Four-quarter average of Q1, Q2, Q3 and Q4 2007.

4 Includes those who did not state a reason for leaving.

Source: Labour Force Survey

of those resigning were in employment, these people more likely to have already had jobs lined up before resigning. Among people who had been dismissed, 51.4 per cent were unemployed; of those made redundant/voluntary redundancy, 40.8 per cent were unemployed and 41.6 per cent were employed.

Longitudinal analysis

Apart from redundancies, there is no information on the previous job if a respondent is in a new job at interview. Using longitudinal analysis examines

characteristics of the job left, including occupation and job tenure. For this analysis, two-quarter longitudinal data sets are used, taking those people who had separated from a job in the previous three months up to wave two and assuming that these people would have recorded details of their job in the first wave. This gives a range of characteristics about the job from which they separated.

Table 4 uses the longitudinal data sets to give the characteristics of the job in wave one of those who had left by wave two. This table uses an average of four longitudinal

data sets for 2007 to overcome seasonality and increase the sample size.

Working patterns and job type

Table 4 shows that the total job separation rate in 2007 among full-time jobs was 3.2 per cent, compared with 4.9 for those whose main job was part-time. Non-permanent jobs have a total job separation rate of 13.5 per cent compared with 3.4 for permanent jobs.

Job tenure and occupation

The job separation rates are higher among people who have held their job for the least amount of time. The separation rate is 12.0 per cent among people who had been in the job for less than three months (5.3 per cent for involuntary separations and 7.4 per cent for voluntary separations) compared with 1.7 per cent (0.5 per cent involuntary and 1.2 per cent voluntary separations) for those in the job for more than five years. This indicates that the first three months are critical in determining the suitability of both the job and employee.

The private sector has higher job separation rates than the public sector (4.1 per cent compared with 2.1 per cent). The LFS is not the most reliable source for measuring public sector employment, as sometimes people are unsure to which sector they belong.

By occupation, 'sales and customer service occupations' have the highest job separation rate in 2007, at 6.6 per cent, with the lowest separation rate being 2.3 per cent in professional occupations. This fits in with the perception that sales occupations are high pressure and that those who invest time in becoming professionals are less likely to change their jobs; likewise, employers who invest in their staff to become a professional are less likely to terminate contracts once they reach their professional status.

Conclusion

In 2007, there were approximately 1 million job separations and the job separation rate was 3.6 per cent. There are twice as many voluntary separations as involuntary separations. Men have more involuntary job separations than women; one-third of job separations among men are involuntary. Women have more voluntary separations; three-quarters of job separations among women are voluntary. The highest job separation rates are among 16 to 24 year olds. The re-employment rate for voluntary separations is 63.4 per cent, driven by a high re-employment rate among those

Table 4

Job separation rates: by previous job characteristics,^{1,2,3} 2007⁴

United Kingdom

	Involuntary separations	Voluntary separations	Total job separations
Working pattern			
Full-time	1.0	2.3	3.2
Part-time	1.2	3.8	4.9
Job type⁵			
Permanent	0.8	2.7	3.4
Non-permanent	8.0	6.4	13.5
Job tenure			
Less than three months	5.3	7.4	12.0
Three months to one year	2.4	5.2	7.4
One to two years	1.0	4.0	5.0
Two to five years	0.7	2.5	3.1
Five years or more	0.5	1.2	1.7
Public or private sector⁵			
Public	0.6	1.5	2.1
Private	1.2	3.0	4.1
Occupation			
Managers and senior officials	0.7	2.0	2.7
Professional occupations	0.8	1.6	2.3
Associate professional and technical	0.7	1.9	2.6
Administrative and secretarial	0.9	2.6	3.9
Skilled trades occupations	1.1	2.1	3.2
Personal service occupations	0.6	2.9	3.4
Sales and customer service occupations	1.2	5.1	6.6
Process, plant and machine operatives	1.2	2.4	3.5
Elementary occupations	1.7	4.6	6.2

Notes:

Source: Longitudinal Labour Force Survey

1 All characteristics are based on self-classification.

2 Base for percentages excludes unknowns.

3 Assumes that job at wave one was the last job: this may or may not be the case.

4 Average of four longitudinal data sets Q4 2006 to Q1 2007, Q1 to Q2 2007, Q2 to Q3 2007 and Q3 to Q4 2007.

5 Applies to employees only.

TECHNICAL NOTE**Job separation rate construction method**

Job separations can be expressed as quarterly rates. These are derived from a count of the number of people who have left a paid job, not the total number of job separations, as a small number of people may have left more than one paid job in the three months before interview. However, because respondents are not asked what their economic activity status was three months ago, the denominator for the rate has to be constructed by adding the number of people who have been employed for more than three months to the number of people who separated from a job in the three months prior to interview. Quarterly job separation rates can be expressed as follows:

$$\frac{\Sigma \text{ working-age people to separate from paid job (per quarter)}}{\Sigma \text{ working-age people to separate from paid job (per quarter)} + \text{employed for more than three months}} \times 100$$

In Figures 1 and 2 and Tables 1 and 2, job separation rates are expressed as four-quarter averages. In this case, the separation rate is constructed as:

$$\frac{\Sigma \text{ working-age people to separate from paid job (from all four quarters)}}{\Sigma \text{ working-age people to separate from paid job (from all four quarters)} + \text{employed for more than three months}} \times 100$$

who resigned, but is only 44.0 per cent for involuntary separations.

Additional analysis using the longitudinal data sets gives more information on the job separated from. Among these findings, the job separation rate is 4.9 per cent for part-time jobs, and 12.0 per cent for people who have been in the job for less than three months.

Job separations can also indicate a mismatch of skills, for example, employees outperforming their role; this is supported by a high proportion of resignations. Unfortunately, the LFS does not find out the details of why these jobs were left and cannot find out what happens to the job once someone has left.

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Methods explained

Methods explained is a quarterly series of short articles explaining statistical issues and methodologies relevant to ONS and other data. As well as defining the topic areas, the notes explain why and how these methodologies are used. Where relevant, the reader is also pointed to further sources of information.

Perpetual inventory method

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SUMMARY

This article outlines where the perpetual inventory method (PIM) is used within the Office for National Statistics and discusses in detail the key parameters of a PIM; the asset service life, the retirement distribution and the depreciation function. It covers why these parameters are of importance in the application of a PIM and also highlights some of the key related conceptual issues. The article then concludes with an example illustrating how a PIM can be used to estimate gross capital stock, consumption of fixed capital and net capital stock, which are the principal uses of a PIM.

The perpetual inventory method (PIM) is an economic model that enables balance sheets (or stocks) to be calculated from the associated investment flows. It does this by accumulating past purchases of assets over their estimated service lives to estimate a gross capital stock measure. The main source of input data for the PIM is capital investment data (in constant price terms). Data are also required on the service life of the asset to ensure that the resultant gross capital stock measure does not include the stock of an asset that is no longer of any economic use.

In order to calculate estimates of consumption of fixed capital and net capital stock, it is also necessary to specify a depreciation function to account for the fact that assets lose value over time as a result of being subject to wear and tear as the asset ages.

Within the Office for National Statistics (ONS) a PIM is predominantly used to estimate gross capital stock, consumption of fixed capital and net capital stock for the UK National Accounts. Direct measurement of these series would be almost unwieldy, but efforts are now under way to pilot the future use of Whole of Government Accounts to measure the central government sector directly, with plans to extend this to local government.

These series (which are broken down by asset type, sector and industry) can be found in the *Capital Stocks, Capital Consumption and Non-Financial Balance Sheets* publication, which is produced on an annual basis. These data also form part of the non-financial balance sheet and can traditionally be found in Chapter 10 of the *Blue Book*. The tables include estimates of the market value of non-financial assets in the UK. Where market valuations are not available, net capital stocks are modelled using a PIM as a proxy.

This article primarily discusses the parameters that are central to the application of a PIM:

- the asset service life
- the retirement distribution, and
- the depreciation function

Asset service life

The *National Accounts Concepts, Sources and Methods* publication states that the most important assumption for a PIM is the estimated life length of an asset. This refers to the length of time, on average, that an asset is expected to be economically useful as it does not have an infinite lifespan. The life length of an asset captures how long the investment in a given asset remains in the capital stock measure.

Life-length means vary by asset type: for example, some buildings are estimated to have a life-length mean of 100 years whereas information and communications technology (ICT) assets, such as computers, are estimated to have a life-length mean of five years. There are also variations in mean life length within these broad asset types reflecting the heterogeneity of assets and the differing uses. For example, computer hardware is currently measured within the broad asset category 'plant and machinery'. Wallis (2005) showed that, when modelling capital services, it is important to treat computers as a separate asset because of the significantly shorter life length (five years) they have relative to the life lengths of other plant and machinery assets. This is because of the effect there is when modelling asset rental prices.

Estimates of assets life-length mean also depend on the year of purchase. Over a long time period it is observed that, in general, some life-length means have fallen. This may reflect technical progress.

These estimates of asset service lives relate to normal wear and tear and planned (or foreseeable) obsolescence. An asset is said to be made obsolete when it is no longer used in production, despite the fact that the asset could still be economically used. This is best illustrated with ICT assets where there is rapid technological change. A piece of computer hardware, which is a few years old, may not be able to support newly developed computer software, meaning that the computer hardware is obsolete. This leads to that asset being withdrawn from the production process, despite still being of economic use in its own right. A relatively large range of assets incorporate ICT-based assets when being used for production. In recent times, there has been a shift to investment in ICT assets, which are more susceptible to higher rates of obsolescence.

In practice, it is very difficult to accurately estimate asset life-length

means because directly observed data on life-length means are not readily available. Instead, a combination of administrative data and expert opinion are used as the basis of these estimates. The Organisation of Economic Co-operation and Development Manual on Measuring Capital identifies the following as the main sources for estimating life-length means:

- asset lives prescribed by tax authorities
- company accounts
- statistical surveys
- administrative records
- expert advice, and
- other countries' estimates

The sources used to compile the estimates within UK National Accounts have changed over time. For some buildings, estimates of life-length means are available dating back to 1828. These first sets of estimates were produced by unofficial compilers based on external sources. More recently, other sources have been used, including information on depreciation allowances from HM Revenue & Customs, which was then known as the Inland Revenue. The Inland Revenue specified the time period over which depreciation could be deducted from profits before calculating tax liabilities, forming the basis of life-length mean estimates.

The most recent set of UK estimates makes use of more direct estimates, based on a study undertaken by the National Institute of Economic and Social Research (NIESR) in 1993 at the request of ONS. One of the main findings was that life-length means were previously overestimated. As a result of this overestimate, published net capital stock was artificially high, as the total amount of depreciation was spread out over a longer life length. ONS recognises this area as one of the most problematic in terms of measurement and it is currently under review.

Retirement distribution

Asset service lives are an estimate of how long an asset is expected to be of economic use on average. However, in practice, assets will not be available for use for this exact period of time: some assets will not last as long, others will last longer. To account for this, the PIM assumes that there is a retirement distribution around the estimated life-length mean, which can also be referred to as the discard pattern.

The retirement distribution shows the probability of the asset being retired/discharged around the life-length mean. There are several different distributions that can be modelled within the PIM. For example, some countries model a retirement distribution that is normally distributed. In the UK, the current approach is to model a uniform retirement distribution, also referred to as a linear distribution. This approach allocates equal probabilities to the asset being retired from the moment when it is first purchased, to twice its average life length. This is illustrated in **Figure 1**, where it is assumed that the asset has a life length of ten years.

The NIESR study showed that the estimates of capital stock and capital consumption were not very sensitive to the choice of retirement distribution used. Therefore, it is generally considered that this is the least important of the three parameters that are used in a PIM. However, a report by Meinen, Verbiest and de Wolf (1998) concluded that retirement patterns should not be treated as insignificant and

they can have notable effects on the resultant capital stock and capital consumption estimates. They recommend that a delayed-linear distribution should be used. As shown in Figure 1, the problem with assuming a linear retirement distribution is that it states that an asset can be retired immediately after purchase, which is somewhat unrealistic. A delayed-linear retirement distribution addresses this by assuming that the period of potential retirement is shorter than this, which is symmetric around the life-length mean. There is no single defined delayed-linear distribution, but as shown in **Figure 2**, this period is symmetric around the life-length mean. In this example, it is assumed that the retirement period is between 75 per cent and 125 per cent of the life-length mean, which is again assumed to be ten years.

The PIM uses gross fixed capital formation data, producer price indices (to deflate the current price capital investment and other surviving past capital stocks data), life lengths and patterns of retirement distributions to model estimates of gross capital stock at a particular point in time.

Depreciation function

According to the *System of National Accounts 1993*, consumption of fixed capital

represents the amount of fixed assets used up, during the period under consideration, as a result of normal wear and tear and

Figure 1
Linear retirement distribution

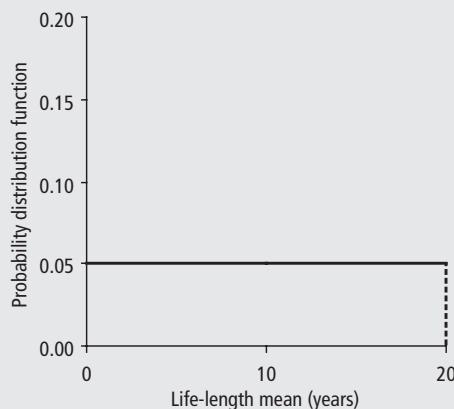
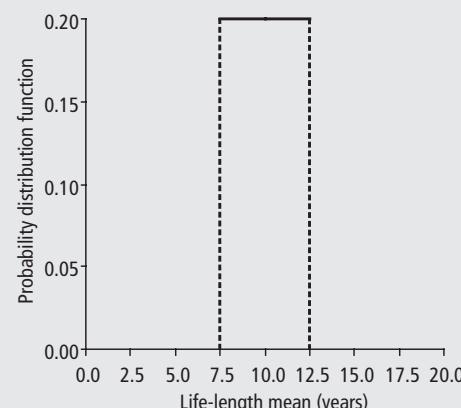


Figure 2
Delayed-linear retirement distribution



foreseeable obsolescence, including a provision for losses of fixed assets as a result of accidental damage which can be insured against

and must be calculated for all asset types (see **Box 1** for details). This is essentially the loss in value of an asset as it ages, although it is not exactly the same as depreciation – the latter is measured at historical cost (that is, based on the value of the asset when it was first purchased) whereas capital consumption is based on current replacement values. This means that it is based on the current value of an asset, not when it was first purchased.

Within ONS, there are three main uses of the estimates of consumption of fixed capital:

- to convert gross based estimates into the net estimates (such as gross operating surplus), for all sectors of the UK economy
- application to non-market sectors, where capital consumption forms the only component of gross operating surplus. By definition, this means that the estimate of net operating surplus is zero, which is consistent with the concept of zero profit in these sectors, and
- to estimate the input of capital into the production process for government sectors by the UK Centre for the Measurement of Government Activity

In order to calculate estimates of consumption of fixed capital, it is necessary to specify a depreciation function within the PIM. Depreciation measures the loss in economic value of an asset as it ages, due to that asset being subject to wear and tear. In terms of investment, depreciation can be thought of in two ways:

- the fall in the value of capital stock if there were no further gross investment at the whole economy level, or
- the amount of investment needed to maintain the value of the capital stock at its current level

The rate of depreciation varies by asset type and can also change over time (reflecting the fact that estimates of asset service lives can vary

over time). The concept can be illustrated by producing the age-price profile of an asset, showing the relationship between the age of an asset and its value.

There are two commonly used depreciation functions that can be applied in a PIM: arithmetic (straight-line method) or geometric (reducing-balance method). An arithmetic depreciation function is based on a constant amount of depreciation over that asset's life length, with the market value of the asset falling to zero at the end of the asset's service life. A geometric depreciation function is based on a constant annual rate of depreciation over the asset life. This is shown in **Table 1**.

Assuming asset A has a life length of ten years, it can be seen that it is subject to an arithmetic depreciation rate. The market value of asset A when it was first purchased was £100. An arithmetic depreciation function means that there is a constant amount of depreciation over that asset's life. In this example, this results in the asset losing £10 of its market value on an annual basis until it reaches a market value of zero at the end of its life.

The market value of asset B when it was first purchased was also £100, but a geometric depreciation rate of 10 per cent is assumed.

Table 1
The effect of different depreciation methods

Year	£	
	Market value of asset A Arithmetic depreciation	Market value of asset B Geometric depreciation
0	100	100
1	90	90
2	80	81
3	70	73
4	60	66
5	50	59
6	40	53
7	30	48
8	20	43
9	10	39
10	0	35

Box 1

Fixed assets

The *National Accounts Concepts, Sources and Methods* manual explains that there are two types of fixed assets in the UK National Accounts: tangible and intangible. Estimates of gross capital stock, consumption of fixed capital and net capital stock are available at this level of asset breakdown.

Tangible fixed assets:

- dwellings: refers to all types of housing as well as the expenditure on the construction of new dwellings and improvements to existing ones
- other buildings and structures: covers all buildings (other than dwellings) and most civil engineering and construction work. This also includes machinery and equipment that form a key part of buildings (for example, lifts)
- plant and machinery: tends to refer to traditional plant and machinery as identified in commercial accounts
- vehicles, ships and aircraft: covers vehicles that are intended for use on public roads and ships and aircraft that are owned by registered UK companies

Intangible fixed assets:

- mineral exploration: covers the costs of drilling and all related activities (for example, the costs of relevant surveys). The investment in this knowledge asset is independent of whether the outcome of drilling is successful or not
- own-account software: refers to software that is developed in-house and not intended for final sale, but for internal use. This is unlike purchased software, for which there is a market transaction. It also includes the creation of software originals intended for subsequent reproduction. Revised estimates of own-account software were included in the UK National Accounts in *Blue Book 2007*
- copyright and license costs for artistic and literary originals: refer to artistic output that is recorded, which encompasses, for example, expenditure on original films, sound recordings, and manuscripts. This expenditure relates to both the physical original and the copyright attached to it

This means that one year after the asset was first purchased, 90 per cent of the asset's market value will remain, 81 per cent after the second year, 72.9 per cent after the third year, and so on. Table 1 shows the market value of both assets at the end of each year. By definition, assuming a geometric depreciation rate means that the market value will never technically reach zero. However, the asset can be thought to be of no 'real' value (to zero decimal places) at the end of year 51.

The UK National Accounts apply an arithmetic rate of depreciation to a PIM for the estimates of fixed consumption and net capital stock. This approach is simpler and tends to be the preferred method internationally.

One application of a geometric depreciation function within ONS is in the annual estimates of capital services. Capital services are the measure of capital input that is suitable for modelling productivity, as they measure the flow of services from capital assets that are more suitable for reflecting the input of capital into the production process. There are four main stages in the estimation of capital services, the first of which is to calculate a productive capital stock measure. Although in theory this differs from a net capital stock measure (because of the conceptual difference between depreciation and decay), it can be shown that by assuming a geometric depreciation rate in the PIM, this difference disappears (ONS 2007).

In the above example, asset A was assumed to have a life length of ten years. As a result of assuming a geometric depreciation rate of 10 per cent, asset B ended up having a life length of 51 years. There is a clear inconsistency in the service lives of these assets. However, in deriving which rate to apply to model the net (productive) capital stock for capital services, the geometric rate is a function of the life-length mean (see Wallis 2005). This means that the same life lengths are used for the capital stock measures and for modelling capital services. In terms of the above example, this would mean that asset B would have to be subject to an annual geometric depreciation rate of 42 per cent (as shown in the age-price profiles illustrated in Figure 3).

It should be noted that ONS also takes into account the premature scrapping of plant and machinery in their PIM models (with the exception of modelling the net (productive) capital stock in the estimation of capital services). It can be argued that, when an economy experiences a recession, firms are more likely to scrap their plant and machinery as they are unable to sell these assets for further use. Therefore, these assets are removed from the production process

before the end of their asset service life. It is assumed that premature scrapping would not affect assets such as vehicles and buildings as second-hand markets for these assets are more prevalent. This results in the asset remaining in the stock measure for the whole economy.

Gross capital stock, consumption of fixed capital and net capital stock

Using capital investment data and making assumptions on the life length, the retirement distribution and the method of depreciation, the PIM can be used to model estimates of capital stock and capital consumption. This article concludes with a simple example illustrating how estimates of gross capital stock, consumption of fixed capital and net capital stock are derived using a PIM.

In practice, these estimates are produced on an industry, sector and asset-type basis, and aggregated up to form whole economy estimates. For simplicity, the example assumes that there is only one industry. Also, for simplicity, the retirement distribution is not modelled here, but is discussed at the end of this section in terms of how it would be accounted for in practice.

Assume that there are three assets, A, B and C, which have life-length means of 50 years, ten years and five years, respectively, and that the following one-off investments are made:

- £200 in asset A in year 1
- £50 in asset B in year 3
- £10 in asset C in year 5

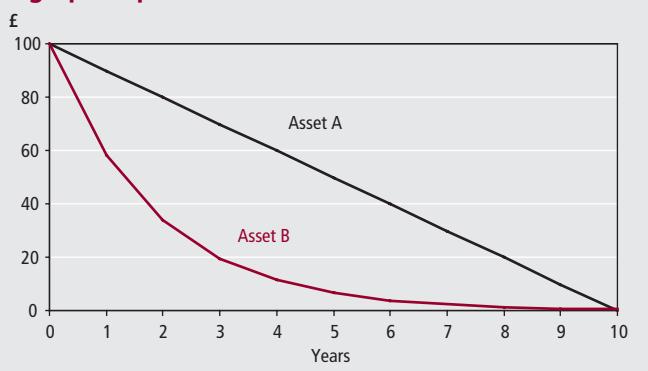
Gross capital stock is calculated as the sum of past purchases of fixed assets excluding assets that are no longer of economic use (in other words, have reached the end of their service life). By the end of year 10, assets A and B are still of economic use. Asset A will have reached the end of its service life in year 50 while asset B is no longer of economic use in year 13, ten years after being first purchased. For asset C, as the service life is assumed to be only five years, it is no longer included in the gross capital stock estimate for year 10. This is shown in Table 2.

To estimate consumption of fixed capital, a depreciation function needs to be modelled within the PIM. Assuming an arithmetic depreciation function, it can be worked out that consumption of fixed capital is £4, £5 and £2 for assets A, B and C, respectively, on an annual basis. This measures the amount of capital that is used up in production that year. This is calculated by taking the initial market value of the investment in the asset and dividing it by its corresponding life-length mean.

Table 2
Gross capital stock

Year	Market value of asset A	Market value of asset B	Market value of asset C	Total market value
1	200	0	0	200
2	200	0	0	200
3	200	50	0	250
4	200	50	0	250
5	200	50	10	260
6	200	50	10	260
7	200	50	10	260
8	200	50	10	260
9	200	50	10	260
10	200	50	0	250

Figure 3
Age-price profiles: market value over time



The net capital stock measure is derived by subtracting the estimates of consumption of fixed capital from the gross capital stock measure. The estimates of net capital stock are shown in **Table 3**.

Although ONS models an arithmetic depreciation rate in estimating consumption of fixed capital and net capital stock, it is also possible to calculate these using a geometric depreciation rate. To be consistent with the assumed life-length means stated above, assets A, B and C would have to be subject to annual depreciation rates of 12, 37 and 46 per cent, respectively. The estimates of net capital stock using a geometric depreciation rate are shown in **Table 4**.

Modelling a geometric depreciation rate in a PIM means that the net capital stock is calculated as:

$$K_{at}^i = \sum_{\tau=0}^{\infty} (1 - \delta_{a,t-\tau}^i)^{\tau} \cdot I_{a,t-\tau}^i$$

where K is the volume of net stock for a particular asset a in industry i at the end of period t (beginning of period $t+1$), I is investment in a particular asset a in industry i and δ is the rate of depreciation for an asset purchased in a particular year.

Comparing Table 3 and Table 4, it can be seen that consumption of fixed capital is much higher when assuming a geometric depreciation rate. As shown in Figure 3, the age-price profile of an asset when assuming a geometric depreciation rate is concave relative to the straight line profile that is seen when an arithmetic depreciation function is used. This illustrates the fact that the amount of depreciation is much higher (relative to modelling an arithmetic rate) in the first few years of the asset life when assuming a geometric rate, before slowing in latter years. Hence, the age-price profile will

always be concave to the origin, explaining the estimates of net capital stock presented in Table 3 and Table 4.

In practice, the PIM also takes into account the retirement distribution of assets which has not been modelled in the above example. If an asset is assumed to have a life length of ten years, a delayed-linear distribution means that the asset may be retired symmetrically around the life length, for example between eight and 12 years. Since the area under the retirement profile is known to sum to one, it is possible to calculate the probability of when the asset will no longer be of economic use. In this example, the probability of the asset being retired between eight and nine years is 25 per cent, and the same between nine and ten years (this is a feature of modelling a uniform distribution). Since life lengths and retirement distributions are asset and industry specific, the modelling of retirement distributions are of importance.

Conclusion

This article has summarised the main areas within ONS where PIM models are utilised, principally in the estimation of gross capital stock, consumption of fixed capital and net capital stock. These estimates are published in the annual publication *Capital Stocks, Capital Consumption and Non-Financial Balance Sheets*. The key parameters of a PIM, asset service life, retirement distribution and the depreciation function, are discussed in detail in terms of their role within the PIM and with regard to some of the key related conceptual issues. The article then concludes with a theoretical example of how the PIM is used in practice within the UK National Accounts.

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Table 3

Net capital stock – arithmetic depreciation rate

Year	Market value of asset A	Market value of asset B	Market value of asset C	Total market value
1	200	0	0	200
2	196	0	0	196
3	192	50	0	242
4	188	45	0	233
5	184	40	10	234
6	180	35	8	223
7	176	30	6	212
8	172	25	4	201
9	168	20	2	190
10	164	15	0	179

Table 4

Net capital stock – geometric depreciation rate

Year	Market value of asset A	Market value of asset B	Market value of asset C	Total market value
1	200	0	0	200
2	176	0	0	176
3	155	50	0	205
4	136	32	0	168
5	120	20	10	150
6	106	13	5	124
7	93	8	3	104
8	82	5	2	89
9	72	3	1	76
10	63	2	0	65

Key time series

1 National accounts aggregates

Last updated: 22/08/08

Seasonally adjusted

	£ million		Indices (2003 = 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	
2002	1,055,793	937,323	94.4	94.3	97.1	97.3	97.3	97.0	97.0	
2003	1,118,245	993,507	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
2004	1,184,296	1,051,934	105.9	105.9	103.4	103.3	103.3	102.6	102.5	
2005	1,233,976	1,096,629	110.3	110.4	104.2	105.2	105.2	104.9	104.9	
2006	1,303,915	1,159,257	116.6	116.7	105.7	108.2	108.4	107.7	107.7	
2007	1,381,565	1,228,681	123.5	123.7	109.1	111.5	111.6	110.8	110.8	
2002 Q1	259,054	229,737	92.7	92.5	95.9	96.4	96.5	96.1	95.9	
2002 Q2	262,774	233,372	94.0	94.0	96.2	97.0	96.9	96.9	97.0	
2002 Q3	265,836	236,103	95.1	95.1	98.3	97.7	97.6	97.4	97.4	
2002 Q4	268,129	238,111	95.9	95.9	98.2	98.2	98.1	97.7	97.7	
2003 Q1	272,953	242,612	97.6	97.7	99.4	98.8	98.8	98.9	98.9	
2003 Q2	277,119	246,427	99.1	99.2	98.9	99.3	99.3	99.8	99.9	
2003 Q3	281,996	250,492	100.9	100.9	100.0	100.4	100.4	100.4	100.5	
2003 Q4	286,177	253,976	102.4	102.3	101.7	101.5	101.6	100.9	100.7	
2004 Q1	288,912	256,106	103.3	103.1	101.9	102.2	102.2	101.1	100.9	
2004 Q2	295,066	262,094	105.5	105.5	103.2	103.1	103.2	102.3	102.3	
2004 Q3	297,941	264,732	106.6	106.6	103.0	103.5	103.5	102.9	103.0	
2004 Q4	302,377	269,002	108.2	108.3	105.4	104.1	104.2	103.9	104.0	
2005 Q1	303,996	270,082	108.7	108.7	104.2	104.4	104.4	104.2	104.1	
2005 Q2	307,306	273,158	109.9	110.0	105.3	104.8	104.9	104.9	104.8	
2005 Q3	308,515	273,676	110.4	110.2	103.4	105.4	105.4	104.7	104.5	
2005 Q4	314,159	279,713	112.4	112.6	104.1	106.1	106.2	106.0	106.1	
2006 Q1	319,265	284,197	114.2	114.4	104.6	107.1	107.2	106.7	106.7	
2006 Q2	322,340	286,413	115.3	115.3	105.8	107.8	107.9	107.0	106.8	
2006 Q3	329,094	292,535	117.7	117.8	106.2	108.6	108.7	108.4	108.4	
2006 Q4	333,216	296,112	119.2	119.2	106.4	109.5	109.6	108.9	108.8	
2007 Q1	337,647	299,660	120.8	120.6	106.9	110.4	110.5	109.4	109.2	
2007 Q2	344,014	305,650	123.1	123.1	109.0	111.3	111.4	110.6	110.5	
2007 Q3	348,174	309,763	124.5	124.7	108.8	111.9	112.0	111.3	111.4	
2007 Q4	351,730	313,608	125.8	126.3	111.6	112.6	112.6	111.8	112.1	
2008 Q1	355,669	316,768	127.2	127.5	112.7	112.9	112.9	112.7	113.0	
2008 Q2	357,887	319,200	128.0	128.5	112.7	112.9	112.9	113.4	113.8	

Percentage change, quarter on corresponding quarter of previous year

	IHYO	ABML ⁴	YBGO ⁴	IHYR	ABMM ⁴	IHYU ABML/ABMM ⁴
2002 Q1	4.5	4.6	4.5	2.9	1.6	2.8
2002 Q2	5.3	5.6	5.3	3.1	2.1	3.2
2002 Q3	5.9	6.1	5.9	4.2	2.2	3.6
2002 Q4	5.2	5.3	5.2	4.3	2.3	2.9
2003 Q1	5.4	5.6	5.4	3.7	2.4	2.9
2003 Q2	5.5	5.6	5.5	2.7	2.5	2.9
2003 Q3	6.1	6.1	6.1	1.7	2.8	3.2
2003 Q4	6.7	6.7	6.7	3.6	3.4	3.2
2004 Q1	5.8	5.6	5.8	2.5	3.5	2.3
2004 Q2	6.5	6.4	6.5	4.4	3.8	2.5
2004 Q3	5.7	5.7	5.7	3.0	3.1	2.5
2004 Q4	5.7	5.9	5.7	3.7	2.6	3.0
2005 Q1	5.2	5.5	5.2	2.2	2.1	3.1
2005 Q2	4.1	4.2	4.1	2.1	1.6	2.5
2005 Q3	3.5	3.4	3.5	0.4	1.8	1.7
2005 Q4	3.9	4.0	3.9	-1.3	1.8	2.0
2006 Q1	5.0	5.2	5.0	0.4	2.6	2.4
2006 Q2	4.9	4.9	4.9	0.5	2.8	2.0
2006 Q3	6.7	6.9	6.7	2.7	3.0	3.5
2006 Q4	6.1	5.9	6.1	2.2	3.2	2.7
2007 Q1	5.8	5.4	5.8	2.2	3.1	2.6
2007 Q2	6.7	6.7	6.7	2.9	3.2	3.4
2007 Q3	5.8	5.9	5.8	2.5	3.1	2.6
2007 Q4	5.6	5.9	5.6	4.9	2.8	2.7
2008 Q1	5.3	5.7	5.3	5.4	2.3	3.0
2008 Q2	4.0	4.4	4.0	4.4	1.4	2.6

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: 22/08/08

£ million, chained volume measures, reference year 2003, seasonally adjusted

	Domestic expenditure on goods and services at market prices											
	Final consumption expenditure			Gross capital formation								
	Households	Non-profit institutions ¹	General government	Gross fixed capital formation	Changes in inventories ²	Acquisitions less disposals of valuables	Total	Exports of goods and services	Gross final expenditure	less imports of goods and services	Statistical discrepancy (expenditure)	Gross domestic product at market prices
	ABJR	HAYO	NMRY	NPQT	CAFU	NPJR	YBIM	IKBK	ABMG	IKBL	GIXS	ABMI
2002	676,833	27,130	224,868	184,701	2,289	183	1,116,239	280,593	1,396,862	308,706	0	1,088,108
2003	697,160	27,185	232,699	186,700	3,983	-37	1,147,690	285,397	1,433,087	314,842	0	1,118,245
2004	721,434	27,327	240,129	197,655	4,597	-42	1,191,099	299,289	1,490,388	335,703	0	1,154,685
2005	732,005	28,167	246,527	200,654	3,611	-354	1,210,610	323,749	1,534,359	359,626	1,183	1,175,916
2006	745,737	29,858	250,630	215,985	2,416	290	1,244,916	358,356	1,603,272	394,789	1,805	1,210,288
2007	769,046	31,007	255,351	228,993	6,887	538	1,291,822	340,157	1,631,979	385,484	790	1,247,285
2002 Q1	167,588	6,762	55,756	44,562	1,059	66	275,814	69,440	345,256	75,709	0	269,595
2002 Q2	168,803	6,756	56,288	45,610	409	48	277,926	71,533	349,504	78,367	0	271,044
2002 Q3	169,715	6,793	56,429	46,422	520	62	280,004	71,056	351,089	78,006	0	273,034
2002 Q4	170,727	6,819	56,395	48,107	301	7	282,495	68,564	351,013	76,624	0	274,435
2003 Q1	171,828	6,843	57,099	46,805	-477	-8	282,249	72,662	354,921	78,836	0	276,082
2003 Q2	174,146	6,779	57,684	46,131	-635	94	284,342	70,610	354,945	77,283	0	277,686
2003 Q3	175,140	6,790	58,445	45,964	2,223	-68	288,498	70,334	358,825	78,089	0	280,743
2003 Q4	176,046	6,773	59,471	47,800	2,872	-55	292,601	71,791	364,396	80,634	0	283,734
2004 Q1	178,197	6,830	59,969	49,353	-439	112	294,023	73,389	367,412	81,648	0	285,764
2004 Q2	180,362	6,805	59,530	49,159	1,042	-90	296,808	74,861	371,670	83,313	0	288,357
2004 Q3	181,032	6,826	60,002	49,832	1,047	-96	298,644	75,097	373,741	84,300	0	289,441
2004 Q4	181,843	6,866	60,628	49,311	2,947	32	301,624	75,942	377,565	86,442	0	291,123
2005 Q1	182,466	7,005	60,858	49,393	1,894	-158	301,458	75,952	377,410	85,898	253	291,764
2005 Q2	182,306	6,987	61,613	49,334	797	86	301,122	79,576	380,698	87,920	300	293,078
2005 Q3	183,174	7,042	61,885	50,642	853	-201	303,394	82,357	385,751	91,483	320	294,588
2005 Q4	184,059	7,133	62,171	51,285	67	-81	304,636	85,864	390,500	94,325	310	296,486
2006 Q1	183,985	7,347	62,511	52,156	1,202	101	307,301	93,512	400,814	102,028	515	299,301
2006 Q2	186,369	7,428	62,342	52,872	564	229	309,804	95,747	405,551	104,683	503	301,371
2006 Q3	186,487	7,507	62,734	54,737	1,396	-28	312,833	84,334	397,167	94,116	445	303,495
2006 Q4	188,896	7,576	63,043	56,220	-746	-12	314,978	84,763	399,740	93,962	342	306,121
2007 Q1	190,272	7,640	63,445	57,006	708	73	319,144	84,165	403,308	95,034	253	308,527
2007 Q2	191,590	7,720	63,775	55,901	899	328	320,213	84,972	405,185	94,221	206	311,170
2007 Q3	193,224	7,783	63,990	57,417	2,680	47	325,141	86,075	411,216	98,462	173	312,926
2007 Q4	193,960	7,864	64,141	58,669	2,600	90	327,324	84,945	412,270	97,767	158	314,662
2008 Q1	196,034	7,999	64,722	57,813	-391	220	326,396	85,495	411,891	96,581	200	315,510
2008 Q2	195,910	8,075	64,981	54,751	1,377	429	325,523	85,101	410,624	95,195	200	315,629

Percentage change, quarter on corresponding quarter of previous year

2002 Q1	4.0	-1.6	4.0	0.9		3.1	-2.6	1.8	2.5		1.6
2002 Q2	4.0	-0.5	4.4	1.6		2.9	3.2	3.0	6.0		2.1
2002 Q3	3.3	0.5	3.3	3.1		2.8	4.6	3.2	6.4		2.2
2002 Q4	3.1	1.3	2.1	9.0		3.8	-0.8	2.8	4.5		2.3
2003 Q1	2.5	1.2	2.4	5.0		2.3	4.6	2.8	4.1		2.4
2003 Q2	3.2	0.3	2.5	1.1		2.3	-1.3	1.6	-1.4		2.5
2003 Q3	3.2	0.0	3.6	-1.0		3.0	-1.0	2.2	0.1		2.8
2003 Q4	3.1	-0.7	5.5	-0.6		3.6	4.7	3.8	5.2		3.4
2004 Q1	3.7	-0.2	5.0	5.4		4.2	1.0	3.5	3.6		3.5
2004 Q2	3.6	0.4	3.2	6.6		4.4	6.0	4.7	7.8		3.8
2004 Q3	3.4	0.5	2.7	8.4		3.5	6.8	4.2	8.0		3.1
2004 Q4	3.3	1.4	1.9	3.2		3.1	5.8	3.6	7.2		2.6
2005 Q1	2.4	2.6	1.5	0.1		2.5	3.5	2.7	5.2		2.1
2005 Q2	1.1	2.7	3.5	0.4		1.5	6.3	2.4	5.5		1.6
2005 Q3	1.2	3.2	3.1	1.6		1.6	9.7	3.2	8.5		1.8
2005 Q4	1.2	3.9	2.5	4.0		1.0	13.1	3.4	9.1		1.8
2006 Q1	0.8	4.9	2.7	5.6		1.9	23.1	6.2	18.8		2.6
2006 Q2	2.2	6.3	1.2	7.2		2.9	20.3	6.5	19.1		2.8
2006 Q3	1.8	6.6	1.4	8.1		3.1	2.4	3.0	2.9		3.0
2006 Q4	2.6	6.2	1.4	9.6		3.4	-1.3	2.4	-0.4		3.2
2007 Q1	3.4	4.0	1.5	9.3		3.9	-10.0	0.6	-6.9		3.1
2007 Q2	2.8	3.9	2.3	5.7		3.4	-11.3	-0.1	-10.0		3.3
2007 Q3	3.6	3.7	2.0	4.9		3.9	2.1	3.5	4.6		3.1
2007 Q4	2.7	3.8	1.7	4.4		3.9	0.2	3.1	4.0		2.8
2008 Q1	3.0	4.7	2.0	1.4		2.3	1.6	2.1	1.6		2.3
2008 Q2	2.3	4.6	1.9	-2.1		1.7	0.2	1.3	1.0		1.4

Notes:

Source: Office for National Statistics

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

3 Labour market summary

Last updated: 13/08/08

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 (%)
All persons	1 MGSL	2 MGSF	3 MGRZ	4 MGSC	5 MGSI	6 MGWG	7 MGSR	8 MGSX	9 YBTC
Apr-Jun 2006	48,217	30,686	28,998	1,687	17,531	63.6	60.1	5.5	36.4
Apr-Jun 2007	48,624	30,832	29,174	1,658	17,792	63.4	60.0	5.4	36.6
Jul-Sep 2007	48,731	30,919	29,262	1,656	17,812	63.4	60.0	5.4	36.6
Oct-Dec 2007	48,839	31,020	29,421	1,599	17,819	63.5	60.2	5.2	36.5
Jan-Mar 2008	48,948	31,151	29,538	1,612	17,797	63.6	60.3	5.2	36.4
Apr-Jun 2008	49,056	31,231	29,558	1,672	17,825	63.7	60.3	5.4	36.3
Male	MGSM	MGSG	MGSA	MGSD	MGSJ	MGWH	MGSS	MGSY	YBTD
Apr-Jun 2006	23,409	16,606	15,628	978	6,804	70.9	66.8	5.9	29.1
Apr-Jun 2007	23,637	16,747	15,799	948	6,890	70.8	66.8	5.7	29.2
Jul-Sep 2007	23,696	16,776	15,831	945	6,920	70.8	66.8	5.6	29.2
Oct-Dec 2007	23,755	16,806	15,897	909	6,948	70.8	66.9	5.4	29.2
Jan-Mar 2008	23,814	16,896	15,963	933	6,918	71.0	67.0	5.5	29.0
Apr-Jun 2008	23,873	16,940	15,960	980	6,933	71.0	66.9	5.8	29.0
Female	MGSN	MGSF	MGSB	MGSE	MGSK	MGWI	MGST	MGSZ	YBTE
Apr-Jun 2006	24,808	14,080	13,371	709	10,728	56.8	53.9	5.0	43.2
Apr-Jun 2007	24,986	14,085	13,375	710	10,901	56.4	53.5	5.0	43.6
Jul-Sep 2007	25,035	14,143	13,431	712	10,892	56.5	53.7	5.0	43.5
Oct-Dec 2007	25,084	14,213	13,524	690	10,870	56.7	53.9	4.9	43.3
Jan-Mar 2008	25,134	14,255	13,576	679	10,879	56.7	54.0	4.8	43.3
Apr-Jun 2008	25,183	14,291	13,598	692	10,892	56.7	54.0	4.8	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 (%)
All persons	10 YBTF	11 YBSK	12 YBSE	13 YBSH	14 YBSN	15 MGSO	16 MGSU	17 YBTI	18 YBTL
Apr-Jun 2006	37,342	29,507	27,846	1,661	7,836	79.0	74.6	5.6	21.0
Apr-Jun 2007	37,556	29,597	27,967	1,630	7,960	78.8	74.5	5.5	21.2
Jul-Sep 2007	37,608	29,655	28,022	1,632	7,953	78.9	74.5	5.5	21.1
Oct-Dec 2007	37,657	29,746	28,165	1,581	7,911	79.0	74.8	5.3	21.0
Jan-Mar 2008	37,708	29,830	28,237	1,593	7,878	79.1	74.9	5.3	20.9
Apr-Jun 2008	37,758	29,882	28,232	1,650	7,876	79.1	74.8	5.5	20.9
Male	YBTG	YBSL	YBSF	YBSI	YBSO	MGSP	MGSV	YBTJ	YBTM
Apr-Jun 2006	19,358	16,206	15,238	967	3,152	83.7	78.7	6.0	16.3
Apr-Jun 2007	19,534	16,334	15,399	935	3,201	83.6	78.8	5.7	16.4
Jul-Sep 2007	19,573	16,350	15,413	936	3,223	83.5	78.8	5.7	16.5
Oct-Dec 2007	19,608	16,390	15,486	904	3,218	83.6	79.0	5.5	16.4
Jan-Mar 2008	19,643	16,447	15,523	924	3,197	83.7	79.0	5.6	16.3
Apr-Jun 2008	19,679	16,482	15,512	970	3,196	83.8	78.8	5.9	16.2
Female	YBTH	YBSM	YBSG	YBSJ	YBSP	MGSQ	MGSW	YBTK	YBTN
Apr-Jun 2006	17,984	13,301	12,607	693	4,683	74.0	70.1	5.2	26.0
Apr-Jun 2007	18,022	13,263	12,568	695	4,759	73.6	69.7	5.2	26.4
Jul-Sep 2007	18,035	13,305	12,609	696	4,730	73.8	69.9	5.2	26.2
Oct-Dec 2007	18,050	13,356	12,678	678	4,694	74.0	70.2	5.1	26.0
Jan-Mar 2008	18,065	13,383	12,714	669	4,682	74.1	70.4	5.0	25.9
Apr-Jun 2008	18,079	13,400	12,720	680	4,679	74.1	70.4	5.1	25.9

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: 12/08/08

Percentage change over 12 months

Consumer prices										Not seasonally adjusted, except for series PLLW, RNPE and RNPF			
Consumer prices index (CPI)			Retail prices index (RPI)				Output prices			Producer 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 purchased by manufacturing industry	Excluding food, beverages, tobacco and petroleum products				
D7G7	EL2S	EAD6	CZBH	CDKQ	CBZX	PLLU ³	PLLW ³	RNPE ³	RNPF ³				
2004 Jan	1.4	1.5	1.3	2.6	2.4	2.0	1.6	1.4	-0.3	0.0			
2004 Feb	1.3	1.3	1.1	2.5	2.3	1.9	1.6	1.5	-0.8	-0.4			
2004 Mar	1.1	1.1	1.0	2.6	2.1	1.7	1.4	1.5	0.8	-0.1			
2004 Apr	1.1	1.1	1.0	2.5	2.0	1.8	1.8	1.3	2.9	-0.1			
2004 May	1.5	1.4	1.3	2.8	2.3	2.2	2.5	1.4	5.6	0.6			
2004 Jun	1.6	1.5	1.4	3.0	2.3	2.3	2.6	1.4	3.8	1.3			
2004 Jul	1.4	1.4	1.2	3.0	2.2	2.0	2.6	1.7	3.9	1.8			
2004 Aug	1.3	1.3	1.1	3.2	2.2	2.0	2.8	2.2	4.6	2.4			
2004 Sep	1.1	1.0	0.9	3.1	1.9	1.7	3.1	2.3	8.1	3.6			
2004 Oct	1.2	1.2	1.1	3.3	2.1	2.0	3.5	2.9	9.0	4.6			
2004 Nov	1.5	1.4	1.4	3.4	2.2	2.2	3.5	3.0	6.4	4.5			
2004 Dec	1.7	1.7	1.6	3.5	2.5	2.5	2.9	2.5	4.0	4.0			
2005 Jan	1.6	1.7	1.5	3.2	2.1	2.0	2.6	2.6	9.7	7.5			
2005 Feb	1.7	1.7	1.6	3.2	2.1	2.0	2.7	2.5	11.0	8.2			
2005 Mar	1.9	2.0	1.8	3.2	2.4	2.3	2.9	2.4	11.1	7.4			
2005 Apr	1.9	2.0	1.9	3.2	2.3	2.3	3.3	2.6	10.1	7.0			
2005 May	1.9	2.0	1.8	2.9	2.1	2.2	2.7	2.5	7.6	6.7			
2005 Jun	2.0	2.2	1.9	2.9	2.2	2.2	2.5	2.2	11.8	7.4			
2005 Jul	2.3	2.5	2.3	2.9	2.4	2.5	3.1	2.2	14.1	8.7			
2005 Aug	2.4	2.6	2.3	2.8	2.3	2.3	3.0	1.9	13.0	7.6			
2005 Sep	2.5	2.6	2.4	2.7	2.5	2.5	3.3	2.1	10.6	5.6			
2005 Oct	2.3	2.5	2.3	2.5	2.4	2.3	2.6	1.4	8.8	7.0			
2005 Nov	2.1	2.3	2.1	2.4	2.3	2.3	2.3	1.3	13.5	9.6			
2005 Dec	1.9	2.1	1.8	2.2	2.0	2.0	2.4	1.8	17.9	12.0			
2006 Jan	1.9	2.1	1.9	2.4	2.3	2.3	2.9	1.7	15.8	10.2			
2006 Feb	2.0	2.1	2.0	2.4	2.3	2.3	2.9	1.7	15.0	10.6			
2006 Mar	1.8	1.9	1.7	2.4	2.1	2.2	2.5	1.9	13.0	10.0			
2006 Apr	2.0	2.1	2.0	2.6	2.4	2.3	2.5	2.2	15.3	10.0			
2006 May	2.2	2.3	2.2	3.0	2.9	2.8	3.1	2.4	13.6	8.6			
2006 Jun	2.5	2.6	2.4	3.3	3.1	3.2	3.4	2.9	11.1	8.7			
2006 Jul	2.4	2.4	2.3	3.3	3.1	3.2	2.9	2.5	10.6	8.3			
2006 Aug	2.5	2.6	2.4	3.4	3.3	3.4	2.7	2.3	8.0	7.9			
2006 Sep	2.4	2.6	2.3	3.6	3.2	3.3	1.9	2.2	5.4	7.4			
2006 Oct	2.4	2.7	2.3	3.7	3.2	3.3	1.6	2.6	4.6	6.3			
2006 Nov	2.7	3.0	2.6	3.9	3.4	3.6	1.8	2.5	3.4	4.9			
2006 Dec	3.0	3.2	2.9	4.4	3.8	3.9	2.2	2.4	2.1	3.0			
2007 Jan	2.7	2.9	2.6	4.2	3.5	3.7	2.2	2.5	-2.8	1.5			
2007 Feb	2.8	2.9	2.6	4.6	3.7	3.9	2.3	2.7	-1.7	1.0			
2007 Mar	3.1	3.1	2.9	4.8	3.9	4.0	2.7	2.7	0.2	2.0			
2007 Apr	2.8	2.9	2.6	4.5	3.6	3.7	2.4	2.3	-1.5	1.4			
2007 May	2.5	2.6	2.3	4.3	3.3	3.4	2.4	2.2	0.6	3.1			
2007 Jun	2.4	2.5	2.2	4.4	3.3	3.3	2.5	2.0	1.6	2.7			
2007 Jul	1.9	2.0	1.7	3.8	2.7	2.6	2.5	2.1	-0.3	1.1			
2007 Aug	1.8	1.9	1.6	4.1	2.7	2.6	2.4	2.4	1.1	2.1			
2007 Sep	1.8	1.7	1.6	3.9	2.8	2.8	2.9	2.3	7.5	3.7			
2007 Oct	2.1	1.9	1.8	4.2	3.1	3.0	4.0	2.4	9.7	3.2			
2007 Nov	2.1	1.9	1.8	4.3	3.2	3.0	4.7	2.4	11.5	2.7			
2007 Dec	2.1	2.0	1.9	4.0	3.1	3.1	5.0	2.7	13.0	4.5			
2008 Jan	2.2	2.1	2.0	4.1	3.4	3.3	5.8	3.5	19.8	7.6			
2008 Feb	2.5	2.5	2.3	4.1	3.7	3.6	5.9	3.5	21.1	9.4			
2008 Mar	2.5	2.6	2.3	3.8	3.5	3.6	6.5	3.6	21.4	10.2			
2008 Apr	3.0	3.0	2.7	4.2	4.0	3.9	7.6	4.7	25.0	13.5			
2008 May	3.3	3.3	3.1	4.3	4.4	4.4	9.4	6.0	28.2	14.5			
2008 Jun	3.8	3.9	3.6	4.6	4.8	4.9	10.0	6.5	30.8	15.8			
2008 Jul	4.4	4.5	4.2	5.0	5.3	5.4	10.2	6.6	30.1	16.6			

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.

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 who:

- were not in employment during the reference week, and
- reported that they had been made redundant in the month of, or the two calendar months prior to, the reference week

plus the number of people who:

- were in employment during the reference week, and
- started their job in the same calendar month as, or the two calendar months prior to, the reference week, and
- reported that they had been made redundant in the month of, or the two calendar months prior to, the reference week

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 old *Economic Trends* tables and 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.

Weblink: www.statistics.gov.uk/elmr/09_08/data_page.asp

Title	Frequency of update	Updated since last month
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	Q	•
1.14 Private non-financial corporations: secondary distribution of income account and capital account	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/09_08/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	M	✓
4.04 Indicators of fixed investment in dwellings	M	✓
4.05 Number of property transactions	M	•
4.06 Change in inventories	Q	✓
4.08 Retail sales, new registrations of cars and credit business	M	✓
4.09 Inland energy consumption: primary fuel input basis	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	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/09_08/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

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

Earnings Customer Helpline

01633 819024
 earnings@ons.gsi.gov.uk

Skills and Education Network

024 7682 3439
 senet@lsc.gov.uk

Labour Market Statistics Helpline

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

National Statistics Customer Contact Centre

0845 601 3034
 info@statistics.gsi.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

2008 edition. Palgrave Macmillan, ISBN 0-230-52583-2. Price £47.50.

www.statistics.gov.uk/products/p4861.asp

Foreign Direct Investment (MA4)

2006 edition

www.statistics.gov.uk/products/p9614.asp

Input-Output analyses for the United Kingdom

2006 edition

www.statistics.gov.uk/products/p7640.asp

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/products/p930.asp

United Kingdom Balance of Payments (Pink Book)

2007 edition. Palgrave Macmillan, ISBN 978-1-4039-9397-7. Price £49.50.

www.statistics.gov.uk/products/p1140.asp

United Kingdom National Accounts (Blue Book)

2007 edition. Palgrave Macmillan, ISBN 978-1-4039-9398-4. Price £49.50.

www.statistics.gov.uk/products/p1143.asp

First releases

- 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

First releases

- 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

July 2008. Palgrave Macmillan, ISBN 978-0-230-21741-6. Price £47.50.

www.statistics.gov.uk/products/p376.asp

Focus on Consumer Price Indices

June 2008

www.statistics.gov.uk/products/p867.asp

Monthly review of external trade statistics (MM24)

May 2008

www.statistics.gov.uk/products/p613.asp

Producer Price Indices (MM22)

June 2008

www.statistics.gov.uk/products/p2208.asp

First releases

- 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/products/p4315.asp

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