

Evidence on the economic cycle

November 2008



HM TREASURY



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Contents

		Page
Chapter 1	Introduction	3
Chapter 2	Evidence from the cyclical indicators and assessment of the output gap	7
Chapter 3	Alternative approaches to assessing the output gap	17
Chapter 4	Conclusion	23
Annex A	Technical material on the cyclical indicators	25

1

Introduction

Summary

This paper recounts the Treasury's approach to measuring the economic cycle, and draws on evidence from the economic indicators monitored by the Treasury to inform the latest assessment of the cyclical position of the economy.

The latest evidence from the cyclical indicators suggests that the economy moved up through trend during the second half of 2006 and that the economy subsequently remained above trend throughout the course of 2007. In particular:

- private sector business surveys of capacity utilisation picked up during the second half of 2006 to levels close to or above their long-term averages, and in a number of cases had moved to levels seen at the last point when the economy clearly moved upwards through trend (1997H1);
- labour market data, taken together with business survey evidence, suggest that the slack in the labour market evident towards the end of 2006 diminished over subsequent quarters. Taking into account the lags between output and the labour market, this is consistent with output moving upwards through trend at some point during the second half of 2006; and
- annual CPI inflation excluding energy and seasonal food, a proxy for domestically generated inflation, rose steadily from 1.3 per cent in 2006Q2 to 2.2 per cent in 2007Q2, although official earnings data remained relatively subdued over this period.

In Budget 2008 it was assumed that, on average, the economy was on trend during the second half of 2006. Budget 2008 also stated that it remained too soon to assess whether the apparent move through trend in the second half of 2006 marked the end of the economic cycle judged to have started in the first half of 1997, not least because of prospective National Accounts revisions. Blue Book 2008 revisions to National Accounts data published since Budget 2008 indicate below-trend non-oil GVA growth of 0.4 per cent in 2006Q3, followed by above-trend growth of 0.9 per cent in 2006Q4 and continued above-trend growth to 2007Q3. Evidence from the cyclical indicators suggests that the economy was close to trend during 2006H2 but does not unambiguously discriminate between the third and fourth quarters of 2006 as on-trend points. Taken together with the latest National Accounts data, the evidence from the range of cyclical indicators supports the assessment that the economic cycle judged to have started in 1997H1 ended during the second half of 2006. Uncertainties continue to surround this assessment, in particular those relating to further possible revisions to National Accounts data. The Chancellor of the Exchequer has asked the National Audit Office (NAO) to audit this judgement. The NAO is publishing its report alongside the 2008 Pre-Budget Report.

1.1 This paper builds on previous analysis published by the Treasury, in particular the 2005 publications *Evidence on the UK economic cycle* (July 2005) and the *Technical note on cyclical indicators* (December 2005),¹ which supported the NAO's first audit of the dating of the economic cycle, concluding that it was reasonable and cautious that the economic cycle ended in 1997H1.²

1.2 Business cycles are fluctuations in economic activity that abstract from both trend and very short-term irregular movements. Cyclical fluctuations are characterised by successive and distinct up and down phases, and are driven by demand or supply-side shocks that are propagated through the economy and eventually damped as market price and quantity adjustments run their course. The cyclical evolution of the economy is influenced by changes in the nature of shocks, the structure of the economy, and in the behaviour of households and companies, which vary through time. So unsurprisingly no two cycles are ever exactly alike.

1.3 The Treasury's approach to measuring the economic cycle starts by identifying the points in the cycle when the economy is judged to be 'on-trend'. When the economy is on trend, implying a zero output gap, its factors of production are employed at normal rates of utilisation and there is no change in the degree of inflationary pressure in the economy. This paper recaps on previous papers³ explaining the Treasury's approach to measuring the economic cycle, and draws on evidence from the economic indicators monitored by the Treasury to inform the latest assessment of the cyclical position of the economy.

1.4 This paper also briefly reports on alternative estimates of the output gap, using a range of different methods for decomposing the level of output into trend and cyclical components. These approaches include pure statistical filtering as well as more explicit economic model-based methods. The advantage of the Treasury's approach to dating on-trend points compared to many other approaches is that it tends to give greater stability to estimates of past trend output growth. This is because the approach is based on analysis of a much wider range of indicators and is less susceptible to data revisions. A further advantage of economic-based approaches, such as the Treasury's, is that they can explicitly allow for particular factors affecting trend output in the latest cycle and beyond, for example demographic trends.

HM Treasury approach to measuring the economic cycle

1.5 The Treasury's approach to decomposing output into trend and cyclical components starts by identifying the points in the cycle when the economy is judged to be 'on-trend'. When the economy is on trend, its factors of production are employed at 'normal' rates of utilisation. On-trend points are therefore identified by looking at a wide range of cyclical indicators of factor utilisation in the economy (see Annex A for more details). These indicators consist mainly of data from private-sector business surveys and the Office for National Statistics.

1.6 Having identified comparable on-trend points in the cycle, the permanent component of output is assumed to follow a deterministic linear trend between these points i.e. trend output is a linear function of time between two on-trend points. So for past cycles the trend rate of output growth is estimated as the average rate of growth between adjudged on-trend points.

1.7 Going forward, the Treasury projections for trend growth from the latest on-trend point have been built up from the projections of each of the four components of trend growth: labour productivity (output per hour), average hours worked, the employment rate and the adult

¹ Available from the Treasury website: www.hm-treasury.gov.uk.

² See *National Audit Office: Audit of Assumptions for 2005 Pre-Budget Report*, available from the Treasury website: www.hm-treasury.gov.uk.

³ In particular *Evidence on the UK economic cycle*, HM Treasury, July 2005, available from the Treasury website: www.hm-treasury.gov.uk.

population. As a measure of the cyclical position of the economy, the output gap can be broken down into its four components in a similar fashion to the decomposition of trend growth.^{4,5}

1.8 The cyclical indicators used to identify on-trend points relate either to the whole of the output gap or to a component of it. A general classification of the indicators with respect to the output gap component they relate to is given in Table 1.A.

Table 1.A: Classification of cyclical indicators with respect to the output gap components

Component of output gap	Corroborative indicators
Productivity and average hours (output per worker):	Business surveys of capacity utilisation
Employment:	Business surveys of labour constraints/recruitment difficulties Vacancies
Output gap-overall:	Price inflation: CPI, RPIX Wage inflation: Average earnings, unit wage costs Labour share of GVA

The cyclical indicators used to identify on-trend points include:

- business surveys of capacity utilisation, such as those from the Confederation of British Industry (CBI), British Chambers of Commerce (BCC) and the Bank of England’s Regional Agents, which reflect firms’ assessments of their utilisation of capital and workers. Variations tend to reflect fluctuations in output per worker around trend, hence business survey capacity utilisation indicators provide information mainly on the output per worker component of the output gap (output per hour and average hours components together);
- business survey indicators of recruitment difficulties, which relate to companies’ experiences in recruiting in the external labour market, and hence are informative about the employment rate component of the output gap;
- other labour utilisation indicators such as average hours worked, unemployment and vacancy rates;
- turning points in the labour share, which have previously been shown to exhibit a close correlation with on-trend points as identified by the Treasury⁶; and
- indicators of inflationary pressure such as average earnings, unit labour costs and the Consumer Prices Index (CPI).

1.9 As discussed in previous Treasury publications,⁷ dating on-trend points is not an exact science; and a degree of informed economic judgement is exercised when dating the economic cycle. For example, sometimes the use of cyclical indicators to date on-trend points, and in particular the end or start of the cycle, does not give clear-cut signals. All of the different

⁴ Previous discussion of the Treasury’s trend growth and cycle-dating approaches is set out in the following Treasury publications: *Fiscal Policy: Public Finances and the Cycle* (HMT, 1999, <http://archive.treasury.gov.uk/budget/1999/cycles/cycle.htm>), *Trend Growth: Prospects and Implications for Policy* (HMT, 1999, <http://archive.treasury.gov.uk/pdf/1999/trendgrowth.pdf>), *Trend Growth: Recent Developments and Prospects* (HMT, 2002, <http://www.hm-treasury.gov.uk/media/D6678/ACF521.pdf>) and *Evidence on the UK economic cycle* (HMT, 2005, http://www.hm-treasury.gov.uk/media/2E6/A5/economic_cycles190705.pdf).

⁵ Latest estimates of trend output growth and its decomposition are set out in Annex A of the 2008 Pre-Budget Report.

⁶ See *Evidence on the UK economic cycle*, HM Treasury, July 2005, available from the Treasury website: www.hm-treasury.gov.uk

⁷ *ibid.*

methods used to estimate the output gap can imply that sometimes output reaches an on-trend point without decisively passing through trend. In such cases on-trend points need not necessarily coincide with either the beginning or end of a cycle, because they do not mark an end or start date for a distinct phase of the cycle. For example, if output heads towards trend from above but only touches its trend level before moving back above trend, then the on-trend point may be considered to be within the up-phase of the cycle rather than marking its end. Similarly a short-lived period either above or below trend could not reasonably be regarded as a distinct phase of the cycle.

1.10 Nevertheless, in circumstances where output returned to trend and then remained close to trend for a protracted period, without passing decisively through trend, it would be reasonable to regard the point at which the economy got back to trend as signifying the end of a distinct phase of the cycle. Such circumstances would, however, be unusual.

1.11 When the economy is close to trend any ambiguities can be resolved if National Accounts output data suggest that the economy was decisively passing through trend. In such circumstances, cyclical indicators and output data are likely to corroborate each other. In contrast, if the economy is hovering relatively close to trend, the judgement on on-trend points is likely to be more uncertain. This is why GDP data and revisions are relevant to the Treasury's assessment of whether on-trend points signify the end or start of cycles.

2

Evidence from the cyclical indicators and assessment of the output gap

2.1 This section sets out the latest evidence on the cyclical position of the economy, drawing on information provided by the cyclical indicators monitored by the Treasury. Further detail on the data and sources is set out in Annex A.

Capacity utilisation

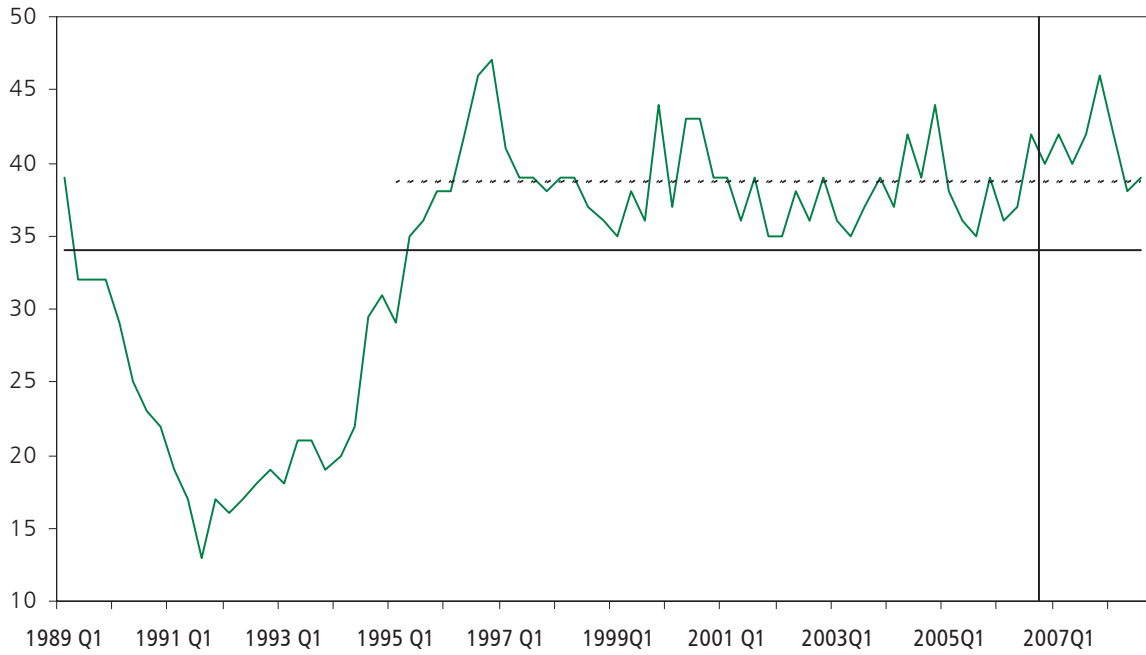
2.2 Business survey indicators of capacity utilisation measure firms' assessments of their utilisation rates of capital and workers. Variations in their assessments tend to reflect fluctuations in output per worker around trend. At on-trend points for the economy when output is passing down through trend, as in 2001Q3, we might expect output per worker to be somewhat below trend, reflecting the lagged response of the employment rate to below-trend output growth. Conversely when output is passing up through trend, as in 1997H1, we might expect utilisation to be somewhat above trend, reflecting the lag before the employment rate catches up with above-trend output growth. This suggests that capacity utilisation rates consistent with on-trend points may tend to be higher when output is passing up through trend than when it is passing down through trend.

2.3 The **British Chambers of Commerce (BCC) Quarterly Economic Survey** suggests that capacity utilisation in the service sector picked up around the second half of 2006, and subsequently remained at or above levels similar to those recorded in 1997H1 (when the economy last moved up through trend), falling back slightly in 2008Q2 and 2008Q3 (Chart 2.A). The **CBI/PWC Report on Financial Services** suggests that capacity utilisation in the financial services sector increased further above its long-term average during the course of 2006, moving up towards the levels seen in 1997H1, before declining sharply from the second half of 2007.¹

2.4 In the manufacturing sector, the **BCC survey** indicates that capacity utilisation increased steadily between the second half of 2006 and second half of 2007 (chart 2.B), moving above the levels seen at the last on-trend point (2001Q3). The indicator fell back in the first three quarters of 2008 from the elevated levels seen in the second half of 2007. The **CBI Industrial Trends Survey** also suggests that manufacturing capacity rose from the second half of 2006, remaining relatively elevated in 2007 before falling back in the first three quarters of 2008 (chart 2.B).

¹ This series has tended to exhibit significant fluctuations, making quarter-on-quarter changes difficult to interpret.

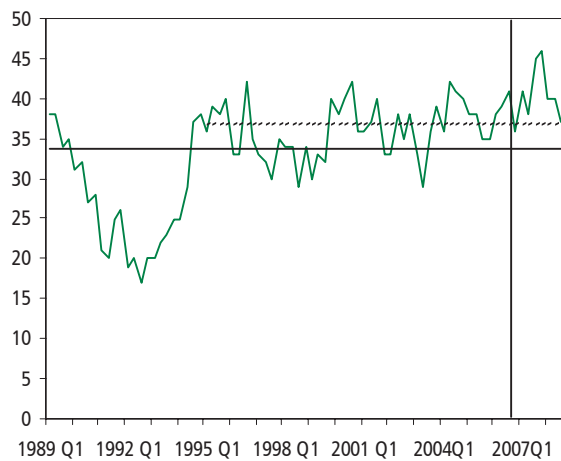
Chart 2.A: Capacity utilisation indicators: services, BCC Quarterly Economic Survey



Horizontal solid line is the average since 1989Q1; dashed line is the average since 1995Q1. Vertical line marks 2006H2.
 Source: BCC Quarterly Economic Survey.

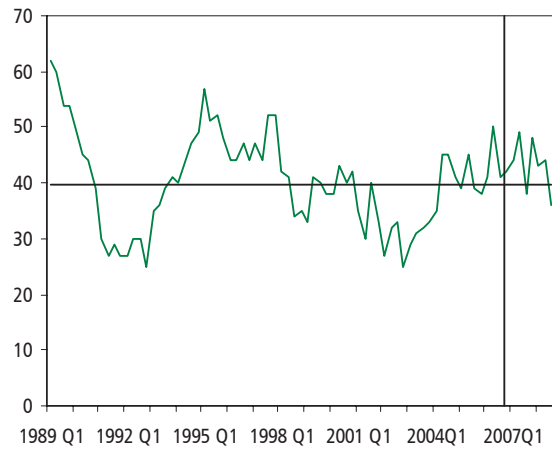
Chart 2.B: Capacity utilisation indicators: manufacturing

Figure 1: BCC Quarterly Economic Survey



Horizontal solid line is the average since 1989Q1; dashed line is the average since 1995Q1. Vertical line marks 2006H2.

Figure 2: CBI Industrial Trends Survey



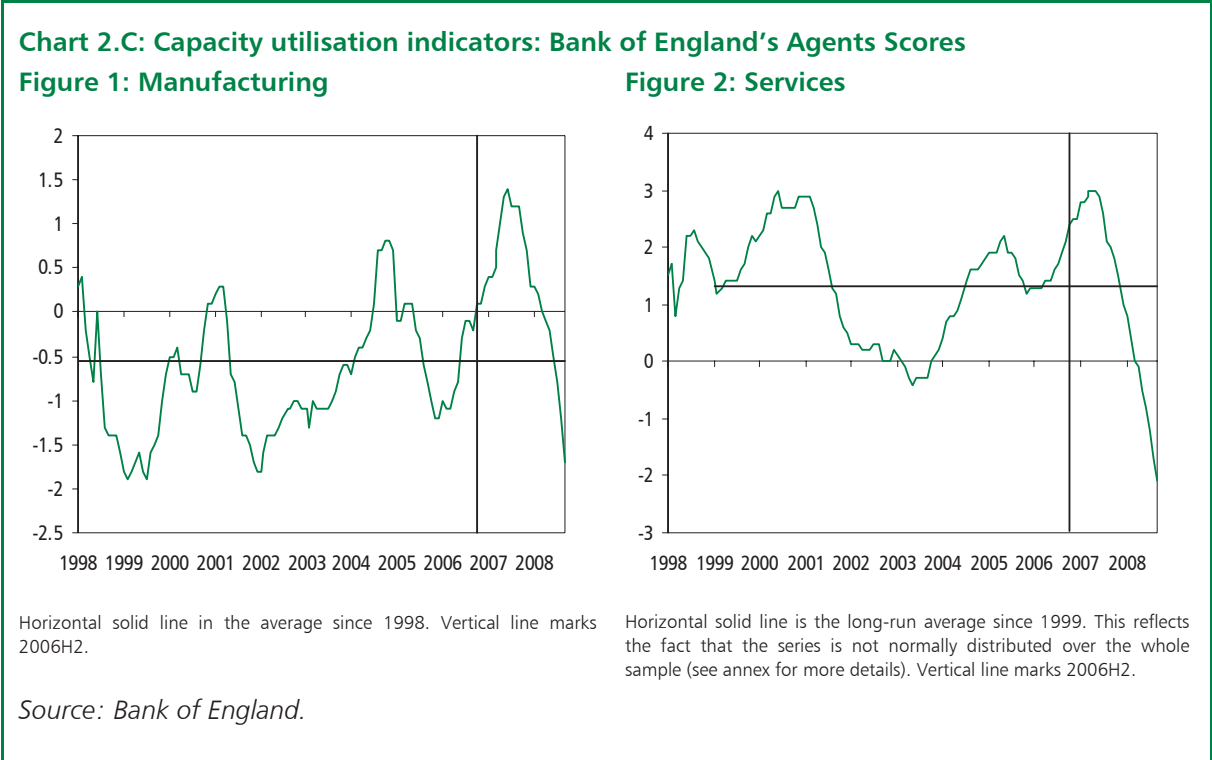
Horizontal solid line is the long-run average since 1972Q1. Vertical line marks 2006H2.

Source: BCC Quarterly Economic Survey, CBI Industrial Trends Survey.

2.5 The Bank of England's Agents Scores provide a number of indicators of current economic conditions, including capacity utilisation scores that provide similar information to those produced by the CBI and BCC. In Budget 2007 the Treasury reported that this information would be used to inform subsequent judgements about the cyclical position of the economy.¹

¹ Budget 2007, HM Treasury, March 2007, pages 250-251.

2.6 The Agents' capacity scores for both manufacturing and services picked up noticeably in 2006, moving above their long-term averages during 2006Q2 and remaining above this level in 2007. Both series declined sharply towards their long-term averages from mid-2007. The latest scores for manufacturing fell below their long-term average in August 2008 and continued to fall in September and October 2008 (Chart 2.C).



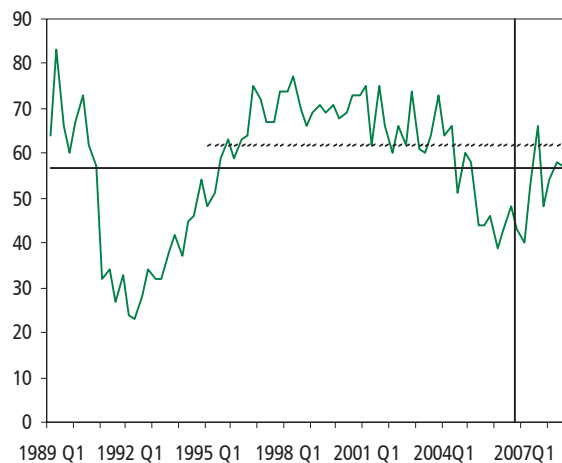
2.7 Overall, during the second half of 2006 the range of capacity utilisation indicators provided by the BCC, CBI and the Bank of England's Regional Agents were at or above their long-term averages, and in a number of cases had moved to levels seen at the last point when the economy moved upwards through trend (1997H1). On this evidence, it would be reasonable to infer that capacity utilisation moved up in 2006H2 towards levels consistent with output passing up through trend from below.

Recruitment difficulties and other labour market indicators

2.8 At on-trend points for the economy when output is passing down through trend, as in 2001Q3, we might expect employment to be above trend, reflecting the lagged response of the employment rate to below-trend output growth. Conversely when output is passing up through trend, as in 1997H1, we might expect some degree of slack in the labour market, reflecting the lag before employment catches up with above-trend output growth. A tightening of labour market conditions over subsequent quarters would be expected as the remaining slack is taken up.

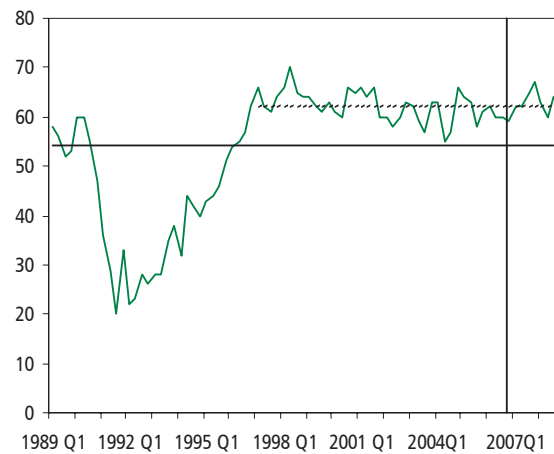
Chart 2.D: Recruitment difficulties indicators, BCC Quarterly Economic Survey

Figure 1: Manufacturing



Horizontal solid line in the average since 1989Q1; dashed line is the average since 1995Q1. Vertical line marks 2006H2.

Figure 2: Services



Horizontal solid line in the average since 1989Q1; dashed line is the average since 1997Q1. Vertical line marks 2006H2.

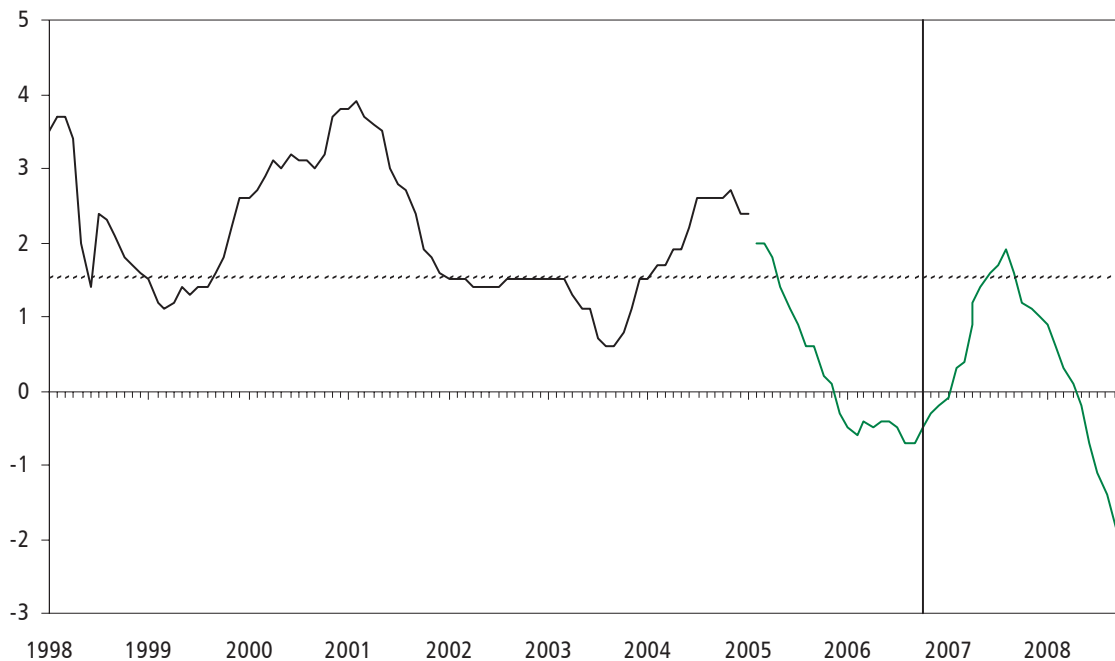
Source: BCC Quarterly Economic Survey.

2.9 Business survey indicators of recruitment difficulties relate to companies' experiences in recruiting in the external labour market. The **BCC Quarterly Economic Survey** suggests that recruitment difficulties in the services sector in 2007Q3 moved up towards levels consistent with previous on-trend points. The BCC indicator reached its highest level since 1998 in 2007Q4 before falling in the first two quarters of 2008 (Chart 2.D). This tends to suggest that the slack in the labour market evident towards the end of 2006 diminished over subsequent quarters, consistent with employment lagging changes in output. The detailed breakdown of recruitment difficulties suggests there is excess demand for skilled and professional labour, with little evidence of slack relative to the post-1995 and post-1997 long-run averages and previous on-trend points. Conditions in the first half of 2008 appeared easier for recruiting clerical and unskilled labour, with most of the indicators running below their averages.

2.10 In the manufacturing sector, the BCC survey suggests that recruitment difficulties increased over the first half of 2007, moving firmly above the long-term average by 2007Q3 before falling back notably in 2007Q4. Despite picking up slightly in 2008Q2, the indicator remains firmly below the levels seen at previous on-trend points, in 1997H1 and 2001Q3, suggesting a degree of slack at the overall level. In line with the service sector, the pick-up in recruitment difficulties for professional labour was particularly marked.

2.11 The **Bank of England's Agents Scores** also provide evidence of the degree of slack in the labour market (Chart 2.E). The latest Agents Scores on recruitment difficulties indicate that labour market conditions progressively tightened in the first half of 2007 before easing to levels well below their long-run average. This broadly corroborates evidence of diminishing labour market slack from other private sector business surveys.

Chart 2.E: Recruitment difficulties indicators: Bank of England's Agents Scores



Dashed line is the average taken over both series as a whole from July 1997 when the series began. In its description of the Agents' scores, the Bank advises that the skills shortages and recruitment difficulties indicators are comparable. See Ellis, C. and Pike, T. *Introducing the Agents' scores*, Bank of England Quarterly Bulletin, Winter 2005.

Source: Bank of England.

2.12 The available evidence from official labour market data suggests that labour market slack, evident at the end of 2006, diminished over 2007 and in 2008Q1. This trend appeared to reverse slightly in 2008Q2. Claimant count unemployment fell steadily through the course of 2007, before rising slightly in 2008Q2. The Labour Force Survey measure of the unemployment rate edged down to 5.2 per cent by 2008Q1 before picking up to 5.4 per cent in 2008Q2. Other indicators provide further evidence of diminishing labour market slack over 2007. The overall level of vacancies grew consistently over the course of 2007, reaching 672,700 in the final quarter and rising further to 680,633 in 2008Q1 before falling back slightly in 2008Q2. The stock of vacancies per 100 employee jobs moved up from 2.5 to 2.6 in 2007Q4, edging down in July and August 2008.

2.13 Overall, labour market data, taken together with business survey evidence, suggest that the slack in the labour market evident towards the end of 2006 diminished over subsequent quarters, with recruitment difficulties peaking around 2007Q3. There has been a significant weakening of the labour market outlook in the early part of 2008. Labour market developments typically lag changes in output, so signs of labour market tightening through 2007 are consistent with output moving upwards through trend at some point during the second half of 2006.

Price and wage indicators

2.14 Indicators of price and wage inflation provide indirect evidence on the overall position of the economy relative to trend. However, inflation dynamics and the closer relationship between the output gap and domestically-generated rather than overall inflationary pressures mean that inflation developments do not necessarily give a straightforward reading of the economy's cyclical position. The Treasury's approach is to compare the rate of inflation with its target rate, keeping these important caveats in mind. Data on wage inflation are compared to the rate

considered to be broadly consistent with the Bank of England's inflation target in the medium term.

2.15 Indicators of domestically generated inflation appear consistent with the economy operating close to trend over the course of 2006 and 2007, with fluctuations in headline CPI inflation over this period largely driven by factors not directly related to the economic cycle. CPI inflation has increased sharply since 2007Q4, reflecting upward contributions from food and energy prices. Annual CPI inflation excluding energy and seasonal food rose steadily from 2006Q2, reaching 2.2 per cent in 2007Q2 before moderating in the second half of 2007. This measure is somewhat more closely related to developments in the domestic economy, despite still having a large import content, so upward movement would be in line with the economy gaining momentum and moving up towards trend.

2.16 Average earnings growth has remained subdued. Private sector average earnings growth (excluding bonuses) has remained broadly stable at around 3.75 per cent over the past two years. Earnings growth during this period has been somewhat more marked in the services sector, consistent with the pattern of labour demand implied by indicators of recruitment difficulties. The experimental Average Weekly Earnings (AWE) series produced by the Office for National Statistics (ONS), however, points to a greater pick-up in wage pressures towards the end of 2007, with private sector average weekly earnings growth (excluding bonuses and arrears) climbing to 5.6 per cent by 2007Q3, before falling in early 2008.¹ Box 2.A provides more information on the development of the AWE measure.

2.17 Whole economy unit wage cost growth edged downwards through 2006, picking up towards the end of 2007 and 2008Q1, before falling to 2.4 per cent 2008Q2. Real unit wage costs (estimated using RPIX) declined from the start of 2006, reflecting strong productivity growth, subdued growth in wages and rising RPIX inflation, before recovering slightly in 2007Q3 as RPIX inflation fell back. It remained at around this level during 2008Q1, falling again in 2008Q2.

2.18 Overall, there is some limited evidence that domestic inflation pressures may have risen during the course of 2006 and in the early part of 2007, consistent with the economy gaining momentum and moving up towards trend. Wage indicators suggest that there was some degree of slack in the labour market towards the end of 2006 and throughout the course of 2007. This is somewhat at odds with the evidence from other labour market data, although the experimental AWE series points to a greater pick-up in wage pressures towards the end of 2007, before falling back during 2008.

¹ It should be noted that Average Weekly Earnings (AWE) is an experimental measure and not a National Statistic.

Box 2.A: Development of the Average Weekly Earnings (AWE) measure

The Average Earnings Index (AEI) is the current National Statistic used to measure short-term movements in earnings. The Turnbull and King (1999)^a review concluded that the AEI was not necessarily a good measure of the average wage per person employed because a shift in the composition of employment from a low-paying industry to a high-paying industry, or vice versa, would not affect the index. The review recommended that the Office for National Statistics (ONS) “investigates the production of an index which reflects more closely movements in true average earnings”. In August 2005 the ONS introduced the experimental monthly measure, Average Weekly Earnings (AWE), which represents average weekly earnings per employee. Like the AEI, it is based on data from the Monthly Wages and Salaries Survey.

The advantages of using the AWE are that it is a measure of the average wage in the economy and that it better reflects the impact of changes in employment patterns. Previous Treasury analysis of the economic cycle has focused on the AEI indicator, as the AWE is an experimental statistic.

At the time of the launch of the AWE, it was recognised further work was needed before the AWE could be launched as a National Statistic including, for example, consideration of the treatment of outliers and missing observations. The Weale Review (June 2008) investigated the developmental work that had taken place on the AWE. In particular the review focused on the ONS’s methodology for AWE, whether AWE is a better measure of short-term changes in earnings than the AEI, which AWE measure (in terms of fixed or current weights) should be used in which circumstance and whether the AEI could be withdrawn after a transitional period.

The report concluded that the AWE “offers in principle a better measure than the AEI of changes in the average wage in the economy. However, subsequent findings indicate that more work is desirable to ensure that it is also in practice a better measure.” The Weale review^b made eight recommendations including further work on the treatment of outliers, the linking of the AWE across substantial employment reclassifications so that the effects of reclassifications do not affect the estimated rate of growth of the average wage, and an increase in the sample size of the financial sector. The report recommended that AWE should replace the AEI once the AWE has been introduced as a National Statistic, but that both should be published in parallel for 12 months and that the AWE data should be made available back to at least 2001. The ONS has subsequently accepted all of the review’s eight recommendations and has indicated that it will continue to publish the experimental AWE series, but that the development work will lead to future revisions to the AWE estimates.

^a See *Review of the Revisions to the Average Earnings Index*, Turnbull, A and. King M, 1999.

^b See *The Average Earnings Index and Average Weekly Earnings*, Weale, M.R., June 2008.

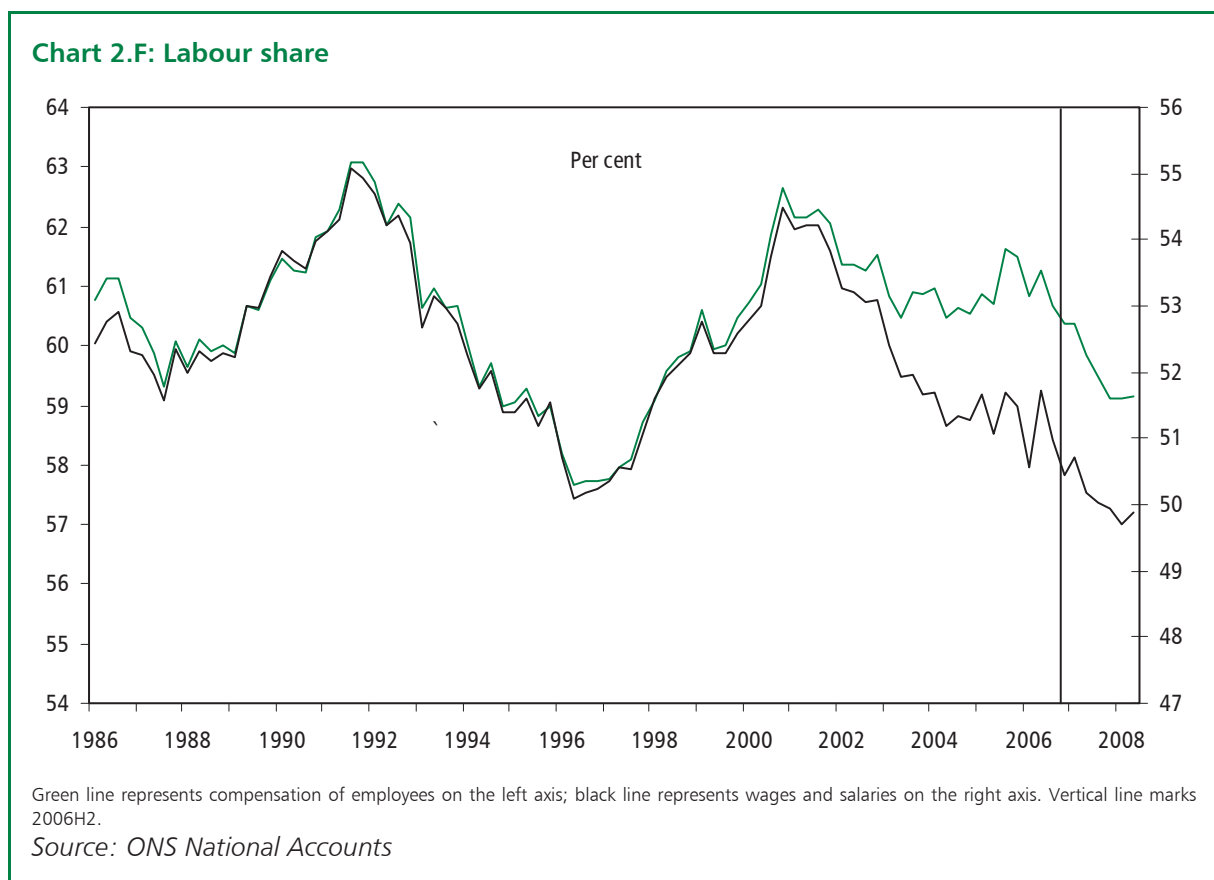
Labour share

2.19 Turning points in the labour share (or real unit labour costs) also provide evidence of start and end points of distinct phases of the cycle. The labour share data are derived using ONS data. Peaks in the labour share are usually associated with the economy moving down through trend, while troughs in the labour share are associated with the economy moving up through trend. The relationship between on-trend points and the labour share data is discussed in more detail in the July 2005 paper *Evidence on the UK economic cycle*.²

² Available from the Treasury website: www.hm-treasury.gov.uk.

2.20 Chart 2.F illustrates recent movements in the labour share. It shows that the labour share measured in terms of compensation of employees declined steadily from 2006. However, recent increases in employers' social contributions, including payments to reduce pension fund deficits, may have affected movements in the compensation of employees' measure of the labour share. An alternative measure of the labour share based on wages and salaries - which may be less affected by the recent increase in employers' social contributions - showed an overall decrease over the same period, although this series has remained broadly stable since the second quarter of 2007.

2.21 As yet, there is no conclusive evidence of any turning point in the labour share over the past few years. However, interpretation of the data over this period has been complicated by the effects of employers attempting to reduce employee pension scheme deficits; and there are significant uncertainties relating to latest National Accounts data for wages and salaries growth over the recent past.



Summary of cyclical indicators

2.22 Overall, an analysis of the range of cyclical indicators monitored by the Treasury indicates that:

- during the second half of 2006 the range of capacity utilisation indicators provided by the BCC, CBI and the Bank of England's Regional Agents were at or above their long-term averages, and in a number of cases had moved to levels seen at the last point when the economy clearly moved upwards through trend (1997H1). On this evidence, it would be reasonable to infer that capacity utilisation moved up in 2006H2 towards levels consistent with output passing up through trend from below;
- labour market data, taken together with business survey evidence, suggests that the slack in the labour market evident towards the end of 2006 diminished over

subsequent quarters, with recruitment difficulties peaking around 2007Q3. Labour market developments typically lag changes in output, so signs of labour market tightening through 2007 are consistent with output moving upwards through trend at some point towards the end of 2006;

- annual CPI inflation excluding energy and seasonal food, a proxy for domestically generated inflation, rose steadily from 2006Q2, reaching 2.2 per cent in 2007Q2. This is consistent with the economy gaining momentum and moving up towards trend. Wage indicators suggest that there was some degree of slack in the labour market towards the end of 2006 and throughout the course of 2007. This is somewhat at odds with the evidence from other labour market data over this period, suggesting that wage indicators may not necessarily provide a straightforward signal of the position of the economy relative to trend; and
- as yet, there is no conclusive evidence of any turning point in the labour share over the past few years. However, interpretation of the data over this period has been complicated by the effects of employers attempting to reduce employee pension scheme deficits; and there are significant uncertainties relating to latest National Accounts data for wages and salaries growth over the recent past.

2.23 On balance, this evidence would tend to support the assessment that the economy moved up through trend towards the end of 2006 and that the economy subsequently remained above trend throughout the course of 2007.

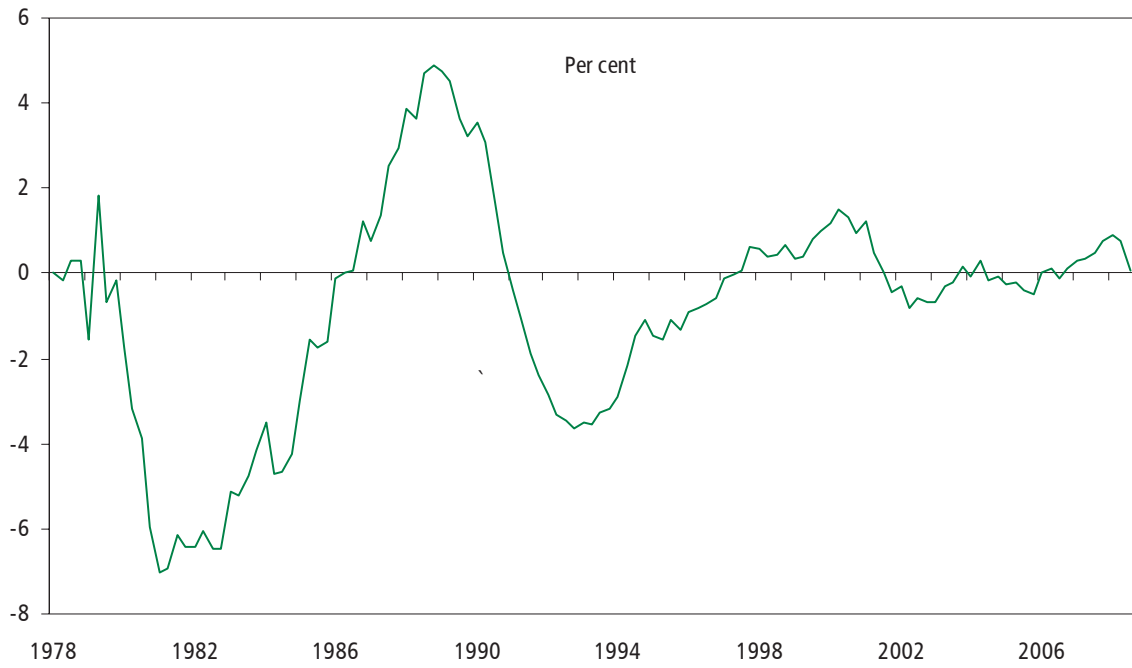
Assessment of the output gap

2.24 The Blue Book 2008 revisions to National Accounts data³ indicate stronger growth in the late 1990s, with an upward revision to the growth of non-oil GVA of 0.5 percentage point in 1999. Revisions over the past few years have generally been downwards: estimates of non-oil GVA growth in 2006 and 2007 are little changed but the ONS' latest estimate of growth in 2004 is now substantially lower. Growth of non-oil GVA in 2005 is higher, at 2.3 per cent, compared with the previous estimate of 2.1 per cent.

2.25 The evidence from the cyclical indicators suggests that the economy was close to trend during 2006H2 but does not unambiguously discriminate between the third and fourth quarters of 2006 as on-trend points. Taken together with the latest National Accounts data, this evidence supports the assessment that the economic cycle judged to have started in 1997H1 ended during the second half of 2006 (Chart 2.G). Uncertainties continue to surround this assessment, in particular those relating to further possible revisions to National Accounts data.

³ Revisions to National accounts in Blue Book 2008, in comparison to Blue Book 2007 partly reflect methodological improvements, moving towards the Office for National Statistics' (ONS) full modernisation of the National Accounts. Evidence presented in Blue Book 2007 showed only marginal revisions to non-oil GVA growth. See *Measuring the UK economy 2008: the National Statistician's perspective*; available at the ONS website, <http://www.statistics.gov.uk>.

Chart 2.G: The output gap



Source: HM Treasury estimates of the output gap using ONS National Accounts data.

3

Alternative approaches to assessing the output gap

3.1 The Treasury approach to assessing the economic cycle is based on identifying on-trend points and estimating the trend growth rate over the past by assuming it is constant between on-trend points. Projections of trend growth looking forward have then been built up from analysis of the components – labour productivity (output per hour), average hours worked, the employment rate and the adult population. The output gap is then estimated as the deviation of actual output from trend.

3.2 However, the Treasury’s method for estimating the output gap is only one of several methods that could be used. Other methods include the use of statistical filtering techniques, or methods based on more explicit production function approaches. This section takes a closer look at these alternative methods and the results they generate. It shows that the results from these different methods depend fundamentally upon the assumptions on which they are based and it discusses the main assumptions which need to be made in each method. It suggests that estimates of the output gap based on alternative methods are in general consistent with the Treasury’s assessment of the economic cycle.

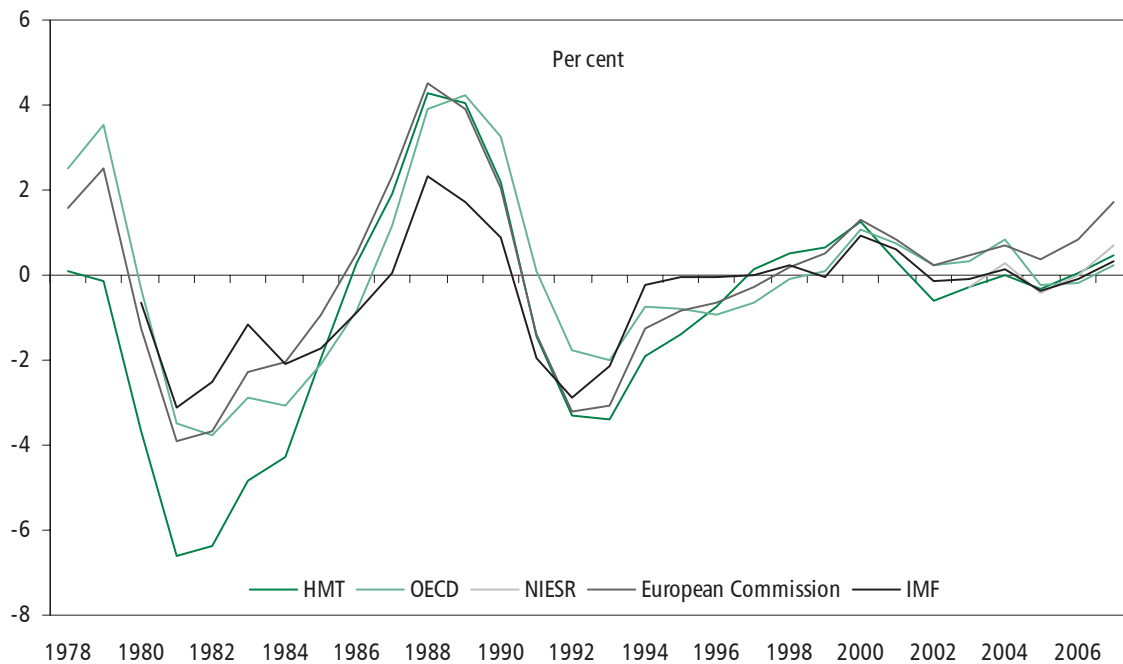
3.3 Methods such as the production function approach, or statistical filters, are also used by other organisations to construct estimates of the output gap. Chart 3.A compares Treasury output gap estimates with output gap estimates produced by the OECD, EC, IMF and NIESR.¹ It suggests that external estimates of the output gap broadly corroborate the Treasury’s assessment that the economy was close to trend in 2006 and was above trend in 2007, although only the IMF, the EC and Treasury estimates take account of the latest 2008 Blue Book revisions.

3.4 The advantage of the Treasury’s approach to dating on-trend points compared to many other approaches is that it tends to give greater stability to estimates of past trend output growth.² This is because the approach is based on analysis of a much wider range of indicators and is less susceptible to data revisions. A further advantage of economic-based approaches, such as the Treasury’s, is that they can explicitly allow for particular factors affecting trend output in the latest cycle and beyond.

¹ Estimates shown on an annual basis.

² See *Evidence on the UK economic cycle*, July 2005, available from the Treasury website: www.hm-treasury.gov.uk

Chart 3.A Comparisons of output gap estimates



Source: HMT: Output gap implied by latest National Accounts data. European Commission: Autumn Forecast, European Commission, October 2008. NIESR: National Institute Economic Review, NIESR, July 2008. IMF: World Economic Outlook, IMF, October 2008. OECD: Economic Outlook, No.83, OECD, June 2008. Note that NIESR and OECD estimates were published prior to the release of the latest National Accounts data and will not therefore have taken into account revisions to National Accounts data associated with the 2008 Blue Book.

Statistical filters

3.5 Statistical filtering techniques are a common method used to derive estimates of the output gap because they are relatively simple to apply and easily replicated. They are used both to estimate the output gap itself, by fitting a trend through the series for actual output, and to smooth the variables used within a production function framework.

Hodrick-Prescott filter

3.6 The Hodrick-Prescott filter (HP) is a statistical method to decompose time-series into a growth component and a cyclical component. The HP filter works by minimising the sum of two components, the deviation from trend and the smoothness of the growth component. The relative weight given to the components is represented by a parameter 'lambda', the signal-to-noise ratio. In practice, the parameter lambda is chosen arbitrarily, and most studies use the values of 100 for annual data and 1600 for quarterly data as set out in Hodrick and Prescott's (1980) original paper.³

Baxter-King filter

3.7 Time series can be viewed as comprising high frequency (irregular or noise), medium frequency (cyclical) and low frequency (trend) components. The filter proposed by Baxter and King (1995)⁴ is one of a more general class of band-pass filters that aim to identify the cyclical components by filtering out trend and irregular components that do not fall within the cyclical

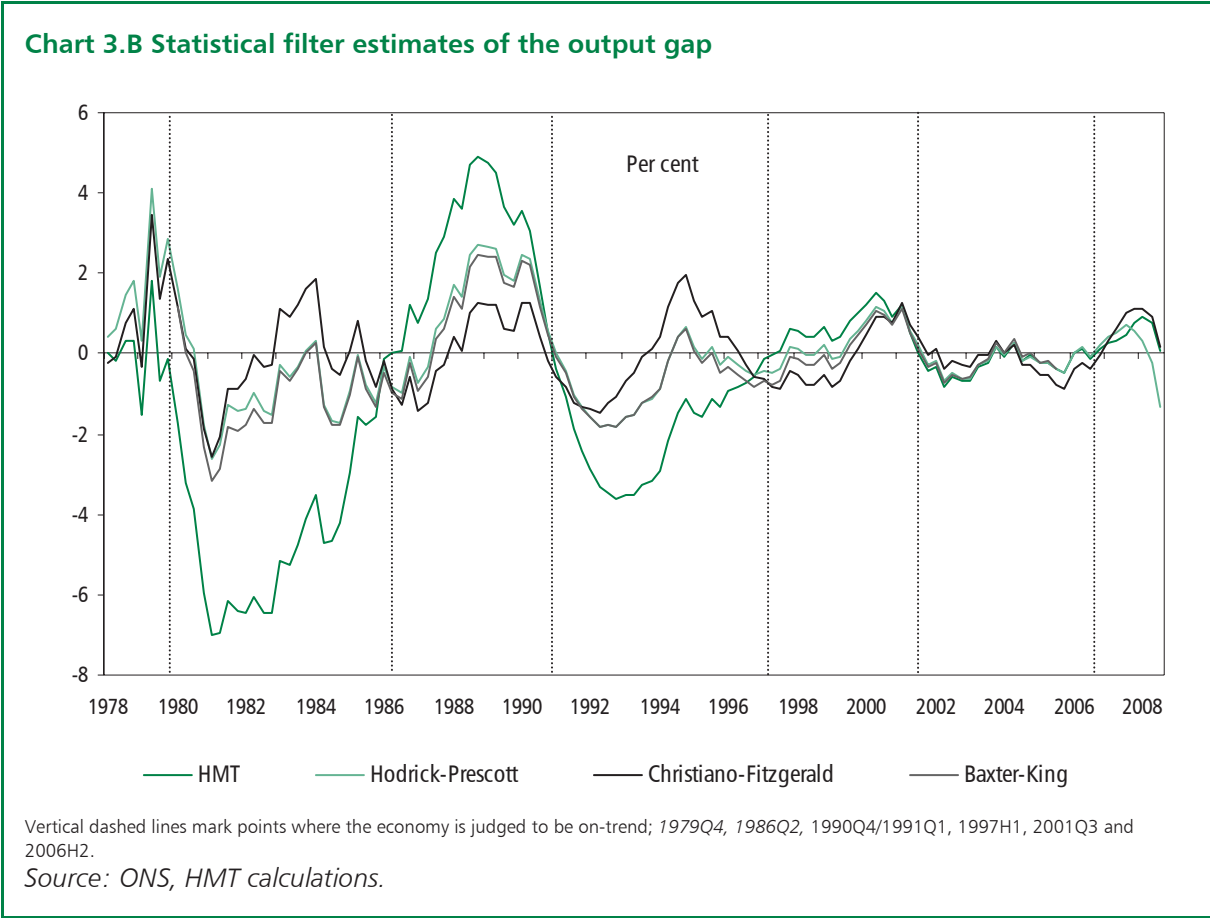
³ Postwar US business cycles: an empirical investigation, Hodrick, R. and Prescott, E., Carnegie-Mellon University discussion paper no.451.

⁴ Measuring business cycles: approximate band-pass filters for economic time series, Baxter, A. and King, R., NBER Working Paper 5022, 1995.

frequency 'band'. So in order to extract the cyclical component of a time-series, it is necessary to specify the frequencies that are to be scored as cyclical. Baxter and King defined the cyclical components of output as those persisting for between 6 – 32 quarters, as originally put forward in Burns and Mitchell (1946).⁵ The Baxter-King (BK) filter takes the form of a centred moving average which sacrifices quarters at the beginning and end of the time-series.

Christiano-Fitzgerald filter

3.8 The Christiano-Fitzgerald (2003)⁶ (CF) filter is a recent innovation to the band pass filter. Unlike the Baxter-King filter, the Christiano-Fitzgerald filter uses the whole time-series to construct an estimate the output gap. To do this, the filter assumes that observations beyond the end of a series follows a standard statistical pattern called a random walk. The authors show this has been a good approximation to US macroeconomic time-series and the filter has gained increasing acceptance among practitioners.



3.9 Estimates of the output gap based on the BK and HP filters generally imply a much lower amplitude than estimates based on the Treasury’s on-trend point approach (Chart 3.B). All the filter estimates of the output gap have tended to move broadly in line with the Treasury’s estimates since 2001. Statistical filter estimates of the output gap broadly corroborate the view from the cyclical indicators that the economy passed up through trend during the second half of 2006 and remained above trend during 2007.

3.10 While statistical filters are simple to apply and easy to update, in practice they are subject to a number of drawbacks. Statistical filters:

⁵ *Measuring business cycles*, Burns, A.E. and Mitchell, W.C., NBER, 1946.
⁶ *The band pass filter*, Christiano, L.J. and Fitzgerald, T.J., *International Economic Review*, 2003, 44(2), 435-465.

- take no account of information from data series other than output in identifying the trend and cyclical components of growth. For example, they ignore changes in inflation that might help to identify whether output was above or below trend⁷;
- cannot detect structural breaks in trends, but rather spread the effect of any break over periods both before and after the break. This may generate misleading estimates of the output gap;
- are unreliable at estimating the output gap at the end of the sample, as it is unduly influenced by the latest data points. This limits their usefulness for policymakers, as the recent past is the part of the sample that is of most interest;⁸ and
- require arbitrary parameters to be assigned to the cycle and trend parameters, which will in turn depend upon a priori judgements on the decomposition of output into cyclical and trend components.

Economic based approaches

3.11 Economic based approaches, such as the Treasury's, differ from statistical filtering in bringing economic knowledge and analytical techniques to bear in the assessment of the economic cycle.

The production function approach

3.12 The production function approach to trend growth estimation relates the level of output to a combination of the factor inputs and level of technology used to produce it. The most widely used functional form in the economic literature is the Cobb-Douglas production function. Potential output is defined by:

$$Y=AL^{\alpha}K^{(1-\alpha)}$$

where Y is the level of output at full potential, L is labour input, K the capital input, and A total factor productivity (TFP), all at potential levels. The functional form imposes constant returns to scale, and α is the elasticity of output with respect to labour and $(1-\alpha)$ is the elasticity of output with respect to capital.

3.13 The parameter α of the Cobb-Douglas production function can be interpreted as the share of output going to labour in the form of wages.⁹ Data for the share of wages in total income are readily available, and suggest that the labour share has averaged around two-thirds over the past three decades.¹⁰

3.14 Judgements on potential labour input are generally based on estimates of the NAIRU, the trend participation rate and trend average hours (which are unobservable). Trend values of these components are often obtained using statistical filters, although opinions typically differ on the appropriate methodology to adopt.¹¹

3.15 Wealth measures of capital stock are often used to estimate the contribution of capital input in the production process. However, capital services are a better measure of capital's contribution to output than conventional asset type value measures because they measure the stream of services generated by the capital stock.¹² Indeed, there can be sizeable differences

⁷ Multivariate statistical techniques can be used to overcome this problem, although this comes at the cost of being less straightforward to implement.

⁸ A common approach to deal with this problem is to add forecasts of output to the historical data. But this just turns the end-point problem into a forecast error problem. Moreover, the forecasts themselves may be dependent upon an assumed trend growth rate (at least when forecasting into the medium term), which leads to an element of circularity.

⁹ This assumption holds under perfect competition, where the marginal product of labour is equated with the wage rate.

¹⁰ Based on total compensation of employees adjusted for mixed income.

¹¹ The OECD and EC use a Kalman filter while the IMF uses a HP filter to estimate the NAIRU.

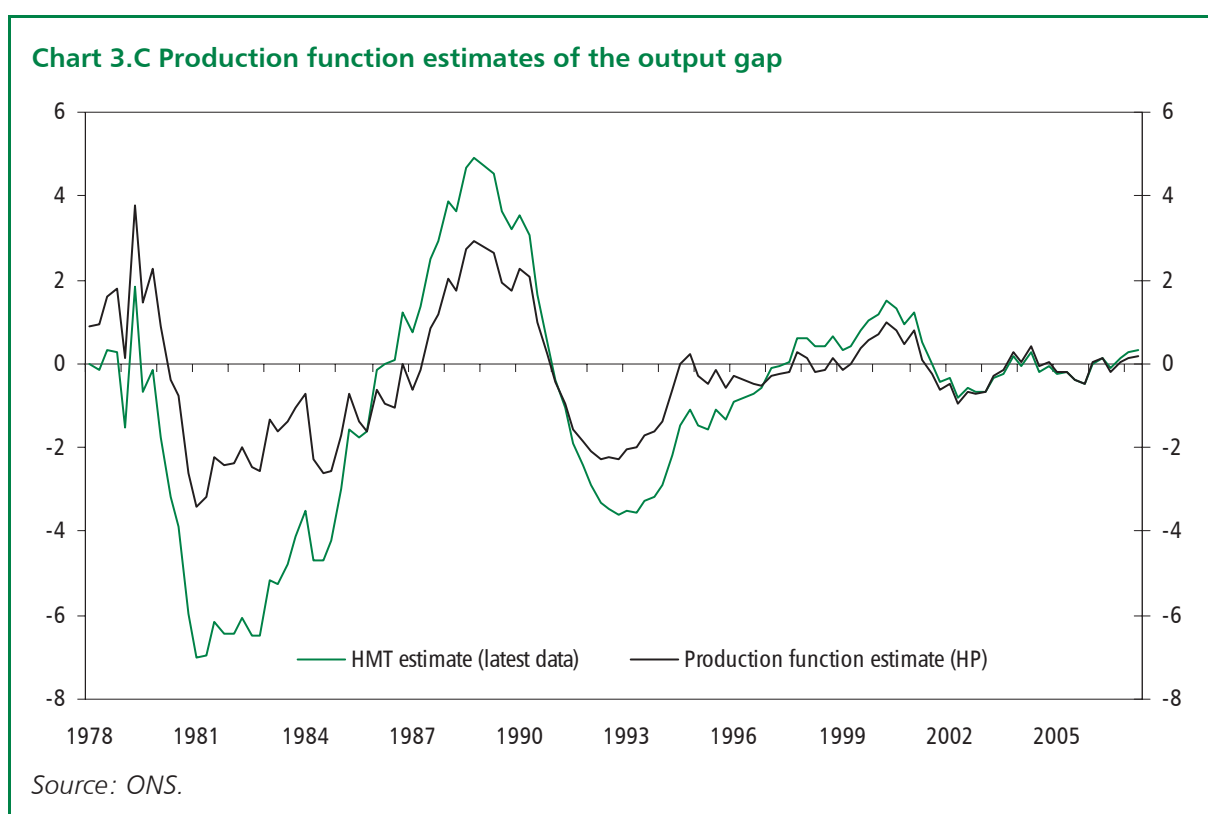
¹² See *Volume of capital services: estimates for 1950 to 2005*, Wallis, G., Economic and Labour Market Review, July 2007.

between wealth measures of capital stock and capital services because the former does not adequately reflect a shift towards shorter-life and more productive investment goods.

3.16 Estimates of the trend rate of technological progress are often derived using statistical filtering techniques. A series for TFP is obtained by assessing how much actual factor inputs can explain movements in actual output. The residual, or the component in the series that is unaccounted for by factor inputs, is then assumed to represent TFP. This residual is then statistically filtered to extract an estimate of trend TFP.

3.17 Chart 3.C shows production function estimates based on trend extraction methods using a Hodrick Prescott (HP) filter. The resulting cycle generally displays a much lower amplitude than the HM Treasury estimates. This reflects the typical finding that trends generated by the production function approach tend to exhibit a pro-cyclical component (i.e. the cycle does not get fully filtered out), with the result that trend growth estimates display significant changes over relatively short periods. Nevertheless, from 2001 onwards, the production function estimates are very close to estimates of the output gap based on the Treasury's approach.

3.18 Thus the production function estimates tend to corroborate the view from the cyclical indicators that the economy passed up through trend in 2006 and subsequently remained above trend in 2007.



3.19 The main benefit of the production function approach is that it provides a transparent framework to account for growth in terms of the contributions of factor inputs and total factor productivity. However, while theoretically attractive, the production function approach is prone to estimation problems. Judgements need to be made on the functional form and estimation of the parameters of the production function. Moreover, the use of statistical filtering techniques to estimate trend levels of potential employment and TFP means that the output gap assessment is dependent on a judgement about the degree to which the filter should smooth the data. In addition, as discussed in the previous section, statistical filters can be unduly sensitive to the last data points and introduce a pro-cyclical bias. Compared to production function approaches, the Treasury's on-trend point approach is less susceptible to picking up spurious cyclical

components, as it measures a constant potential growth rate over a period of time (along with its determinants).

Conclusions

3.20 The Treasury's approach to assessing the economic cycle is based on identifying on-trend points and then estimating the trend growth rate assuming trend growth is constant between on-trend points. However, the Treasury's method for estimating the output gap is only one of several methods that could be used. Other methods include the use of statistical filtering techniques, or methods based on explicit production functions. Estimates of the output gap based on these alternative approaches are in general consistent with the Treasury's assessment of the cycle, and broadly corroborate the view from the cyclical indicators that the economy passed up through trend during the second half of 2006 and remained above trend in 2007.

3.21 The advantage of the Treasury's approach to dating on-trend points compared to many other approaches is that it tends to give greater stability to estimates of past trend output growth. This is because the approach is based on analysis of a much wider range of indicators and is less susceptible to data revisions. A further advantage of economic-based approaches, such as HM Treasury's, is that they can explicitly allow for particular factors affecting trend output in the latest cycle and beyond (such as demographic change).

3.22 Moreover, when identifying complete past cycles, latest on-trend points and the starting point of the latest cycle, the Treasury's approach brings a much wider range of indicators to bear on the assessment than the production function approach and especially statistical filters.

4

Conclusion

4.1 The Treasury's approach to measuring the economic cycle starts by identifying the points in the cycle when the economy is judged to be 'on-trend'. When the economy is on-trend, implying a zero output gap, its factors of production are employed at normal rates of utilisation and there is no change in the degree of inflationary pressure in the economy. This paper recaps on previous papers explaining the Treasury's approach to measuring the economic cycle, and draws on evidence from the economic indicators monitored by the Treasury to inform the latest assessment of the cyclical position of the economy.

4.2 The evidence from the cyclical indicators suggests that the economy moved up through trend during the second half of 2006 and that the economy subsequently remained above trend throughout the course of 2007. Taken together with the latest National Accounts data, this supports the assessment that the economic cycle judged to have started in 1997H1 ended during the second half of 2006. Uncertainties continue to surround this assessment, in particular those relating to further possible revisions to National Accounts data.

4.3 In addition to the Treasury's approach, there are a wide variety of alternative methods available for decomposing the level of output into trend and cyclical components. Estimates based on statistical filter and production function approaches corroborate the view from the cyclical indicators that the economy moved up towards trend during the course of 2006 and was above trend in 2007.

A Technical material on the cyclical indicators

A.1 In addition to evidence from the economic indicators based on National Accounts data, the Treasury uses a wide range of survey-based cyclical indicators to identify on-trend points. These indicators contain useful information about the cyclical position of the economy. This section sets out details of the cyclical indicators used to date 2006H2 as an on-trend point. These indicators consist mainly of data from private-sector business surveys and the Office for National Statistics. A total of 24 indicators under 3 headings, (output per worker, employment and general indicators of the output gap), are presented individually in graphical form along with relevant information including definitions and sources. There is also a brief interpretation of each indicator with respect to 2006H2 being an on-trend point that marked the end of the previous economic cycle.¹

Private sector business surveys

A.2 The data series from private sector business surveys are compared with their respective long-run averages to gauge the degree of slack or inflationary pressure implied by each indicator. However, an important caveat is that the long-run average over the whole span of a data series may not be a good indicator of its 'normal' level if the relationship between the indicator and the economic cycle changes, for example due to structural reasons. Therefore, consideration of the period over which the average is calculated to measure the 'normal' level is important. Charts in this Annex compare the survey indicators to (a) their averages calculated over the whole span of the data series and, in certain cases, to (b) the averages calculated over more recent periods. The selection of the more recent periods used in the calculation of averages is made to ensure that the periods are kept as long as possible to benefit from more survey information, and that the selected periods contain data with no discernible cyclical bias. The way in which the data periods are tested for cyclical bias is explained below.

A.3 One of the necessary, but not sufficient conditions for the suitability of a time period for the calculation of the normal level, is that the series should be symmetrically distributed over that period.² However a normal distribution of observations does not on its own justify the selection of a period. Ideally, the output gap over the selected period should average out at close to zero, thus ruling out cyclical bias. This is tested for all the periods over which the averages are calculated for the purposes of this paper. To avoid circularity with the Treasury approach, the output gap estimates used in this test are derived using a Hodrick-Prescott filter. The averages of the output gap estimates over the selected periods are all reasonably close to zero.³ However, any conclusion regarding cyclical bias must be treated with caution given the uncertain nature of the output gap estimates.

A.4 If a business survey indicator deviates from its long-run average during a particular time period, it may be interpreted as evidence of either inflationary pressure in that period or as

¹ This follows the same presentation as the *Technical note on the cyclical indicators*, December 2005, which presents the evidence on the cyclical indicators used by HM Treasury to date 1997H1 as an on-trend point. Available from the Treasury website: www.hm-treasury.gov.uk.

² All of the business survey data series presented in this paper are tested for normal distribution using a Jarque-Bera test; and the results are presented individually for each series.

³ These range from 0.02 per cent to 0.06 per cent.

evidence of slack. However, if the normal level is uncertain (i.e. there is uncertainty regarding the choice of the period over which the long-run average should be calculated), then the indicator can be compared with the values it took at recent on-trend points.

A.5 It is possible that the degree of inflationary pressure in the economy depends on the rate of change, as well as the level, of the indicators. If the economy is growing rapidly at a rate that is significantly above the trend growth rate, short-term supply bottlenecks may lead to increased inflationary pressure despite the level of output being below its trend. Such effects are commonly known as the 'speed limits'. Although a possibility, these effects are not considered a material factor in the use of cyclical indicators to date recent on-trend points.

A.6 Private sector business survey indicators are not formally seasonally adjusted. However, to a degree, it is likely that seasonal factors are taken into account by respondents when answering the survey questions. Indeed some survey questions (e.g. CBI capacity utilisation) explicitly ask respondents to discount seasonal variation.

British Chamber of Commerce (BCC) Quarterly Economic Survey

A.7 This quarterly survey covers both manufacturing and service sector indicators of capacity utilisation and recruitment difficulties. The data series are available on a quarterly basis since 1989Q1. The survey covers close to 5000 companies spread throughout the UK, employing over half a million workers. These companies are typically much smaller than those covered by the CBI Industrial Trends Survey. Manufacturing firms make up approximately a quarter of the total; and the data are presented separately for each sector.

A.8 For most of the early period of the British Chamber of Commerce (BCC) data series (which started in 1989), the economy was in a deep and protracted down-phase of the cycle, which is likely to impart a downward bias to the long-run average. The majority of the indicators sourced from this survey have broadly remained above their respective long-run averages (calculated over the 1989 to 2008 period) since the mid-1990s. This lends support to the view that the averages calculated over this period are likely to understate 'normal' levels. Furthermore, the distributions of the majority of the BCC data series since 1989 are negatively skewed i.e. not symmetric. They generally become symmetric after the mid-1990s. This would suggest that the appropriate 'normal' level is probably better reflected in the average since the mid-1990s, as opposed to the average over the whole span of the series. In previous published assessments of the cyclical indicators, averages since 1995 have been used as well as the averages over the whole period in gauging 'normal' levels for BCC series. This procedure is repeated in the present analysis. In addition, when the post-1995 data distribution is not symmetric, the post-1997 averages have also been considered.

Confederation of British Industry (CBI) surveys

- Industrial Trends Survey: This survey covers the manufacturing sector, and provides quarterly data on capacity utilisation and factors limiting output starting from 1972Q1.⁴ The number of firms responding to the survey questionnaire varies: for example, it was 466 in 2008Q1 and 525 in 2008Q2. Firms participating in the survey account for approximately one third of UK manufacturing employment, representing close to one million workers. Averages calculated over the whole period are unlikely to suffer from significant cyclical bias, because the data series are long enough to span a number of cycles.

⁴ Data are also available on a tri-annual basis (June, October and February) between 1958 and 1972.

- CBI/PricewaterhouseCoopers Financial Services Survey: The coverage of this survey is smaller than the coverage of the CBI's Industrial Trends Survey. For example in March and June 2008, the total number of responses was only 79 and 87 respectively. Nevertheless, the survey can cast useful light on factors such as capacity utilisation in the financial services sector. The data series are only available from 1989Q4, and so the long-run average over the whole period is affected by end points, i.e. depressed by the deep down-phase in the economic cycle during the early 1990s.

Bank of England Agents' scores

A.9 The Bank of England's Regional Agents provide a number of indicators of current economic conditions, including scores relating to capacity utilisation and recruitment difficulties. In Budget 2007 the Treasury reported that this information would be used to inform subsequent judgements about the cyclical position of the economy.⁵

A.10 The Agents' scores on capacity constraints in the manufacturing and service sectors were first compiled in January 1998. In terms of labour market slack, an Agents' score on skills shortages was reported between July 1997 and December 2004, and one on recruitment difficulties since then. In its description of the Agents' scores, the Bank advises that the skills shortages and recruitment difficulties indicators are comparable.⁶ At just over a decade, the time-series for the Agents' scores are shorter than most of the other cyclical indicators the Treasury currently monitors. As such, a degree of caution should be exercised in drawing conclusions from the evidence they present.

Data from the Office for National Statistics

A.11 In addition to the private sector business survey indicators, the Treasury's cyclical indicators include measures of price and wage inflation, the vacancy ratio and labour's share of national income. The data series for these indicators are sourced from the ONS.

A.12 The relationship between inflation and the output gap is not simple, as the inflation rate depends on a number of other factors such as movements in world prices, the exchange rate and inflation expectations. The Treasury's approach is to compare the rate of inflation with its target rate, keeping these important caveats in mind:

- Data on wage inflation are compared to the rate considered to be broadly consistent with the Bank of England's inflation target in the medium term.
- The vacancy ratio data are compared to the average over the whole period for which the data are available.
- The relationship between on-trend points and the labour share data is explained in the July 2005 paper *Evidence on the UK economic cycle*.⁷

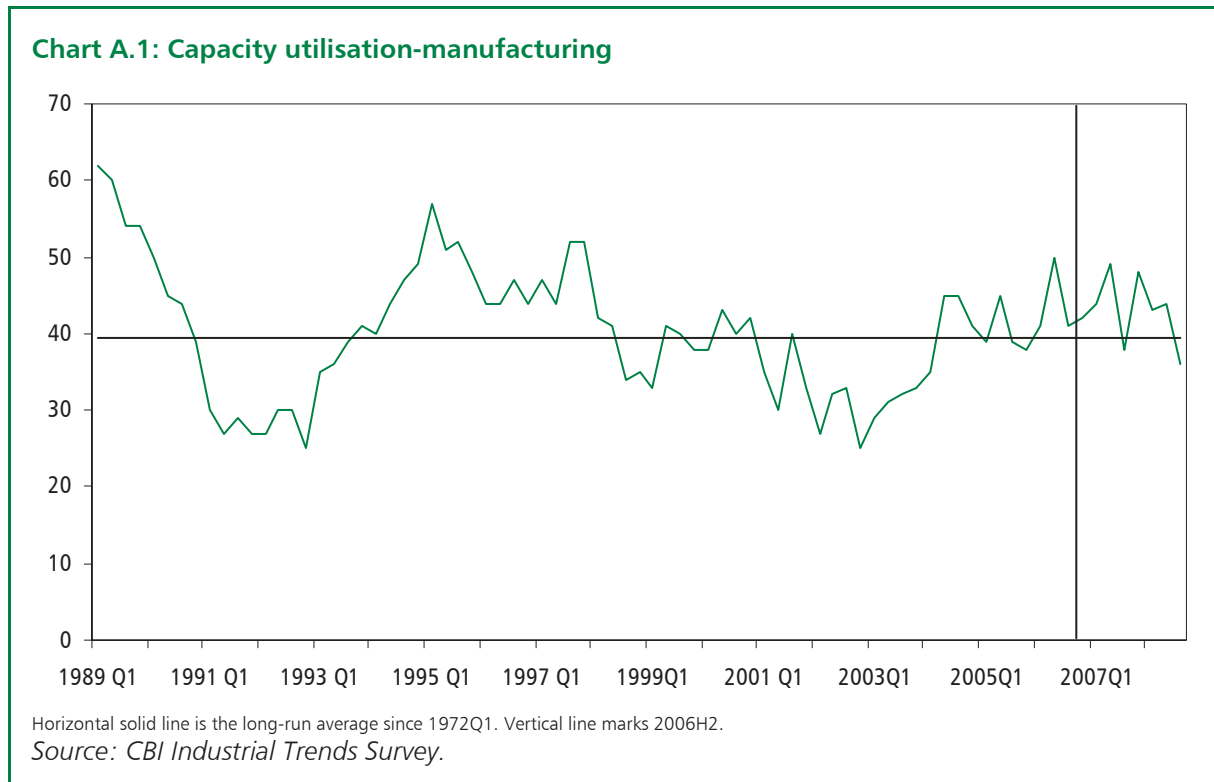
⁵ *Budget 2007*, HM Treasury, March 2007, pages 250-251.

⁶ See Ellis, C. and Pike, T. *Introducing the Agents' scores*, Bank of England Quarterly Bulletin, Winter 2005.

⁷ Available from the Treasury website: www.hm-treasury.gov.uk.

Output per worker

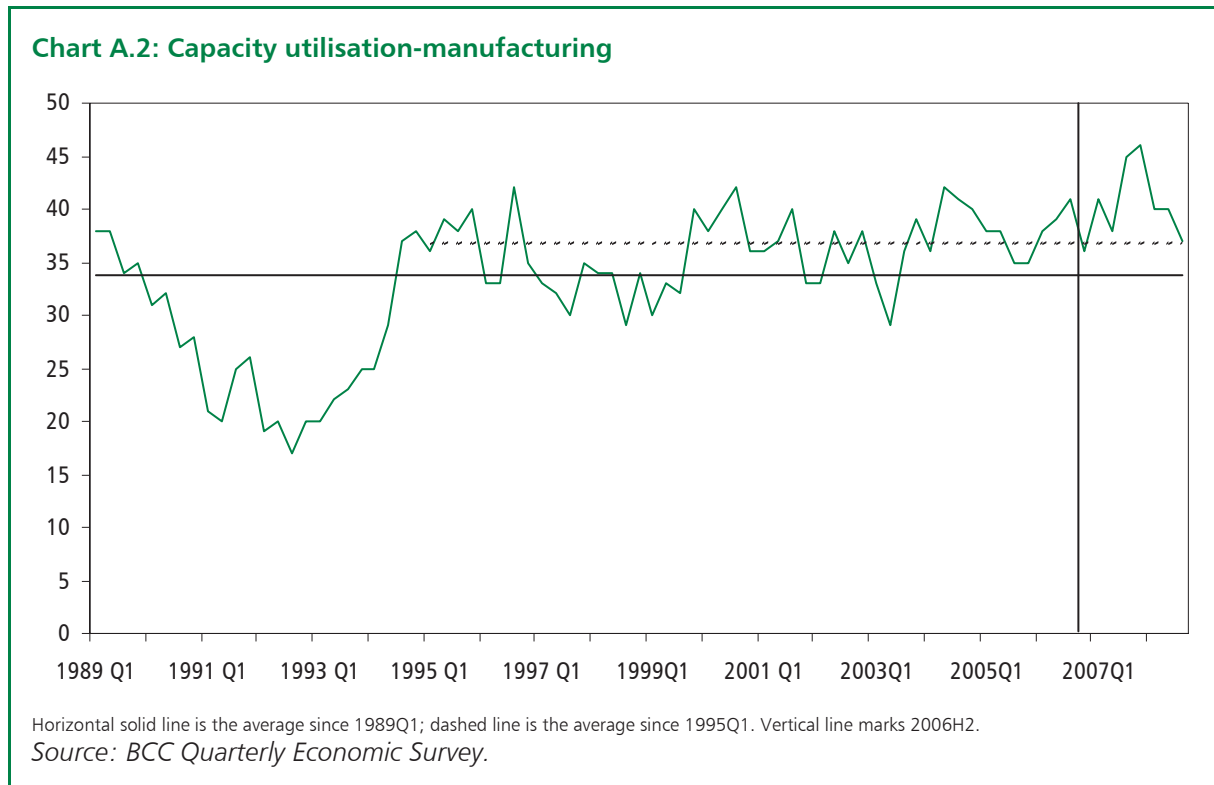
- 1 Indicator: Capacity utilisation
- 2 Sector: Manufacturing
- 3 Source: CBI
- 4 Definition: Percentage of firms operating at full capacity. The survey question is "Is your present level of output below capacity (i.e. are you working below a satisfactory full rate of operation)?" The data series reflects the percentage of firms operating at, or above, full capacity.



- 5 Comments:
 - The average calculated over the length of the series is thought to be free from cyclical end-point bias, given the length of the period. Indeed, the data series since 1972 appears normally distributed at the 5 per cent significance level with a Jarque-Bera (J-B) test probability of 0.44.
 - The proportion of manufacturing firms operating at or above full capacity during 2006 was close to the long-run average over the whole period, rising in 2006Q2 and again in 2007Q2. In the second half of 2006 the indicator remained above the levels seen at the on-trend point in 2001Q3 but below the level seen at the on-trend point in 1997H1. The series has been broadly operating above its long-run average since 2004Q2 (except 2005Q1, 2005H2, 2007Q3 and 2008Q3), with some suggestion of relative strength in 2006 and 2007.

Output per worker

- 1 Indicator: Capacity utilisation
- 2 Sector: Manufacturing
- 3 Source: BCC
- 4 Definition: Percentage of firms operating at or below full capacity. The survey question is "Are you currently operating: at full capacity / below full capacity?" The data series reflects the percentage of firms operating at full capacity.

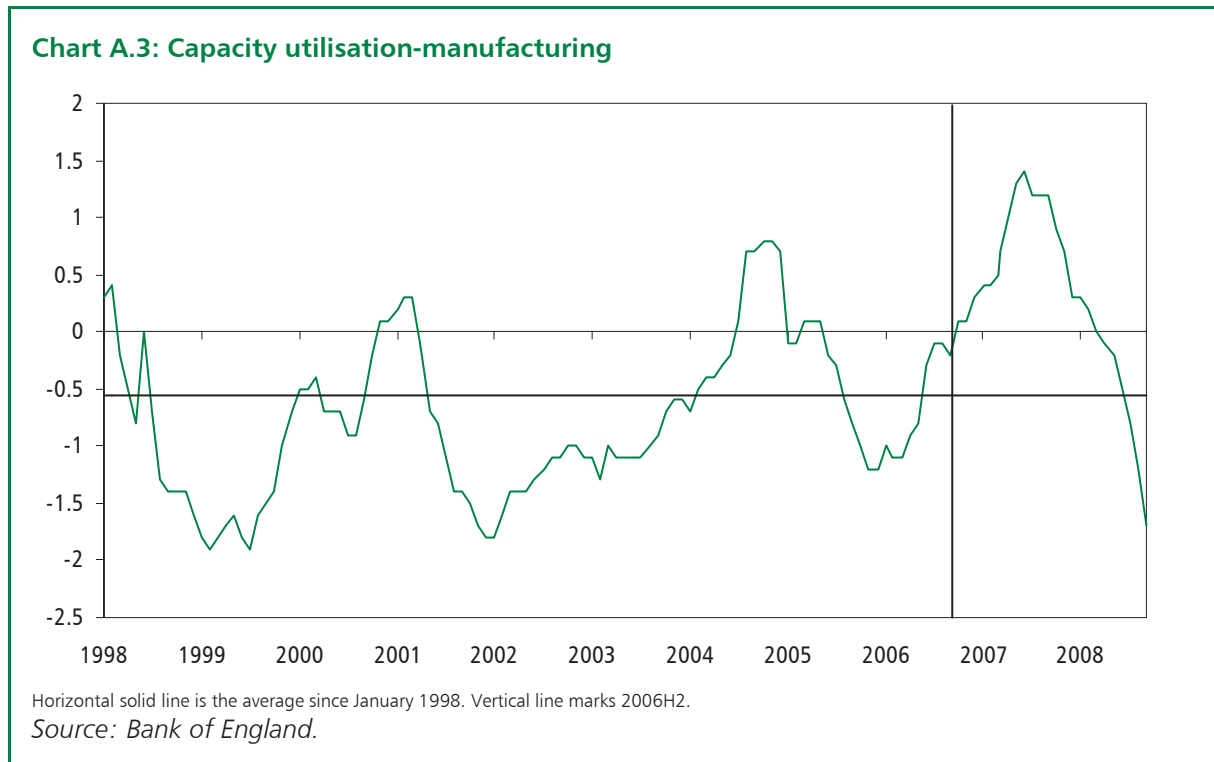


- 5 Comments:
 - As noted earlier, the average over the whole period (since 1989) is likely to suffer from bias reflecting the cyclical position of the economy at the start of the series. To overcome this bias, the average since 1995 is also used in the analysis on the grounds that it is probably a better indicator of the 'normal' level of the series.
 - The distribution of this data series between 1989 and 2008 is negatively skewed and not normal at the 5 per cent significance level (J-B test probability is 0.02). The series appears normally distributed between 1995 and 2008 with a J-B test probability of 0.87. The chart shows averages over both periods.
 - During 2006, the series was above its long-run average (since 1989Q1) and close to its average since 1995, passing up through the latter in 2006Q1. In the second half of 2006 the indicator was above the level observed at the previous on-trend point in 1997H1. It moved above the previous 2001Q3 on-trend point level in 2006Q3, reaching a record high in 2007Q4. During 2007 and the first part of 2008 the indicator remained above its average since 1995, before falling back towards this average in 2008Q3.

This evidence appears consistent with a move up through trend sometime during 2006.

Output per worker

- 1 Indicator: Capacity utilisation
- 2 Sector: Manufacturing
- 3 Source: Bank of England
- 4 Definition: The score reflects a quantitative judgement on expected capacity constraints over the next six months. Before January 2005 the score was based on companies' current situation, rather than being forward-looking.⁸

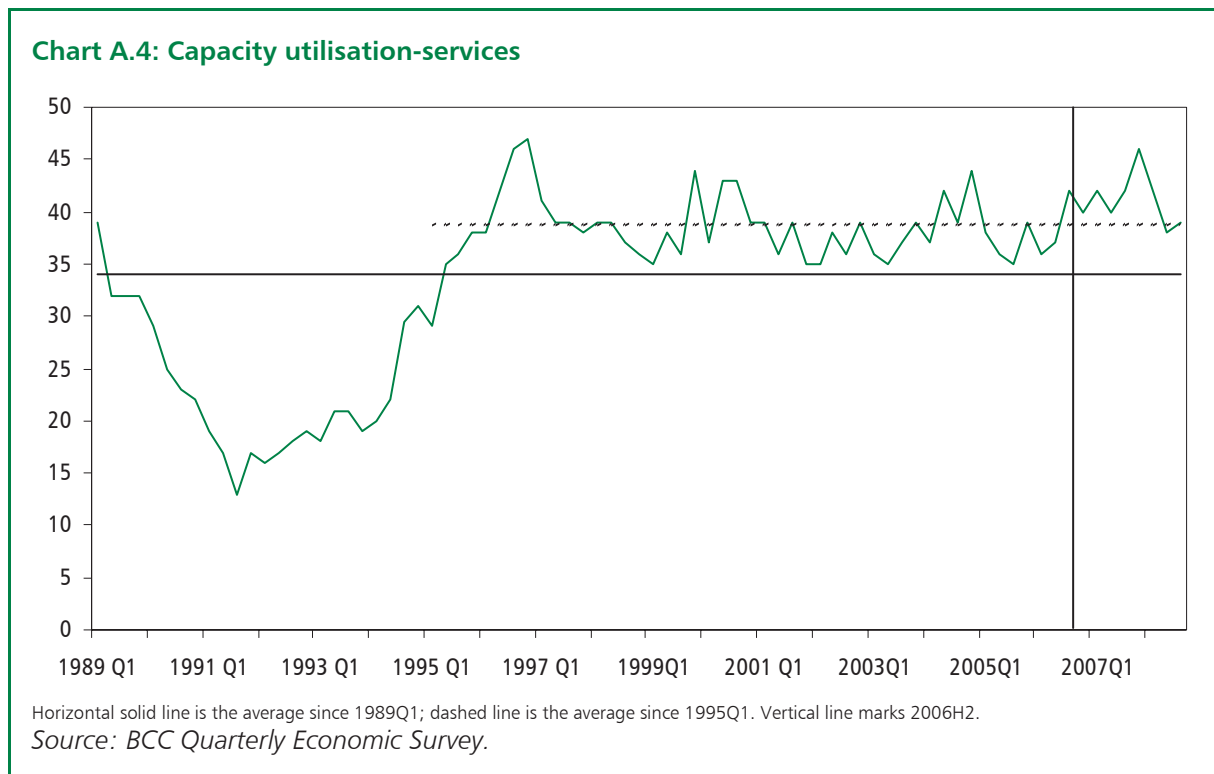


- 5 Comments:
 - The distribution of the data series over the 1998-2008 period appears normal at the 5 per cent significance level (J-B test probability is 0.06). The chart shows the average since 1998.
 - The indicator moved above its average since 1998 in 2006Q2, remaining above this level in 2007 and falling below its long-term average in August 2008. This is consistent with an on-trend point during 2006.

⁸ See *Definitions for the Agents' Scores*, Bank of England, available at <http://www.bankofengland.co.uk/publications/agentssummary/definitions.pdf>

Output per worker

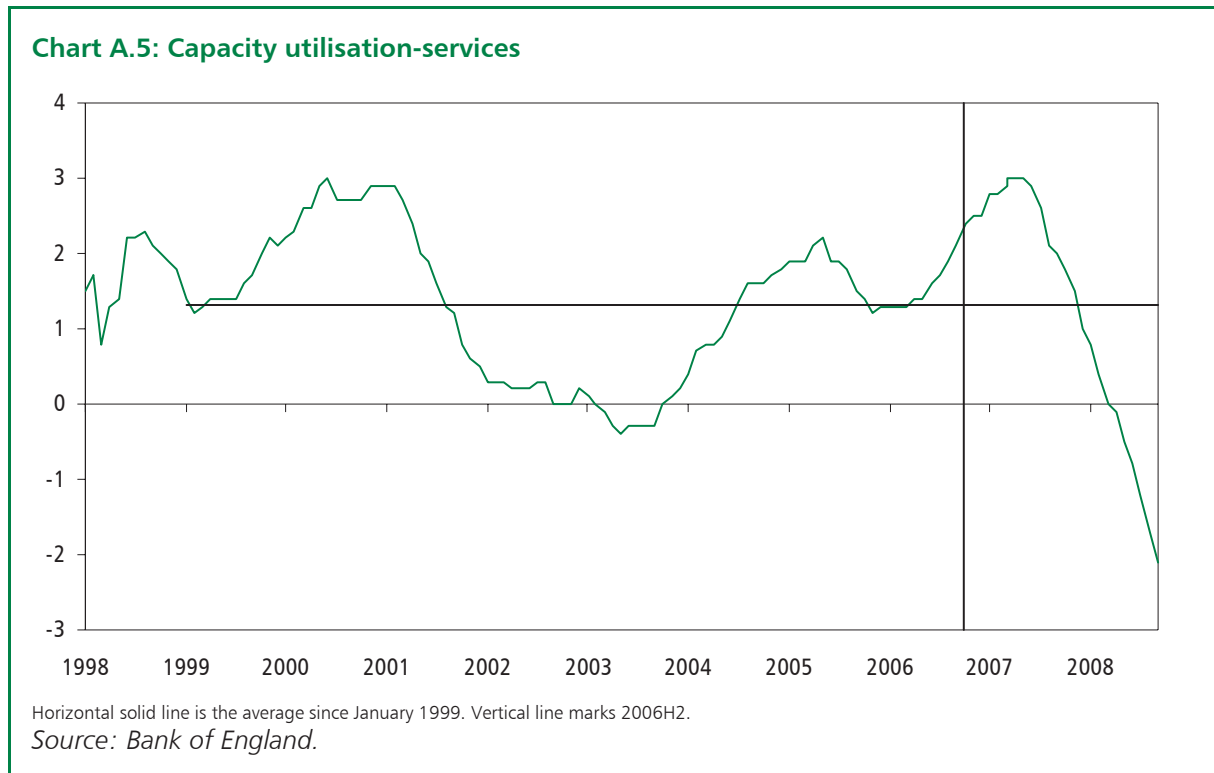
- 1 Indicator: Capacity utilisation
- 2 Sector: Services
- 3 Source: BCC
- 4 Definition: Percentage of services firms operating at or below full capacity. The survey question is "Are you currently operating: at full capacity / below full capacity?" The data series reflects the percentage of firms operating at full capacity.



- 5 Comments:
 - The distribution of the data series over the 1989-2008 period is negatively skewed and not normal at the 5 per cent significance level (J-B test probability is 0.003). The series appears normally distributed between 1995 and 2008 with a J-B test probability of 0.43. The chart shows averages over both periods.
 - In the second half of 2006, the data series was above both the long-run average and the average since 1995, passing through the latter in 2006Q3. Since the mid-1990s the series has been consistently above its average over the whole period, suggesting that the longer-run average understates the normal level of capacity utilisation. The indicator has been at or above levels consistent with previous on-trend points since 2006Q3, falling back in 2008Q2 before rising slightly in 2008Q3.
 - The evidence from this data series is therefore consistent with the economy moving up through trend during the second half of 2006 and running close to or above trend thereafter.

Output per worker

- 1 Indicator: Capacity utilisation
- 2 Sector: Services
- 3 Source: Bank of England
- 4 Definition: The score reflects a quantitative judgement on expected capacity constraints over the next six months. Before January 2005 the score was based on companies' current situation, rather than being forward-looking.⁹

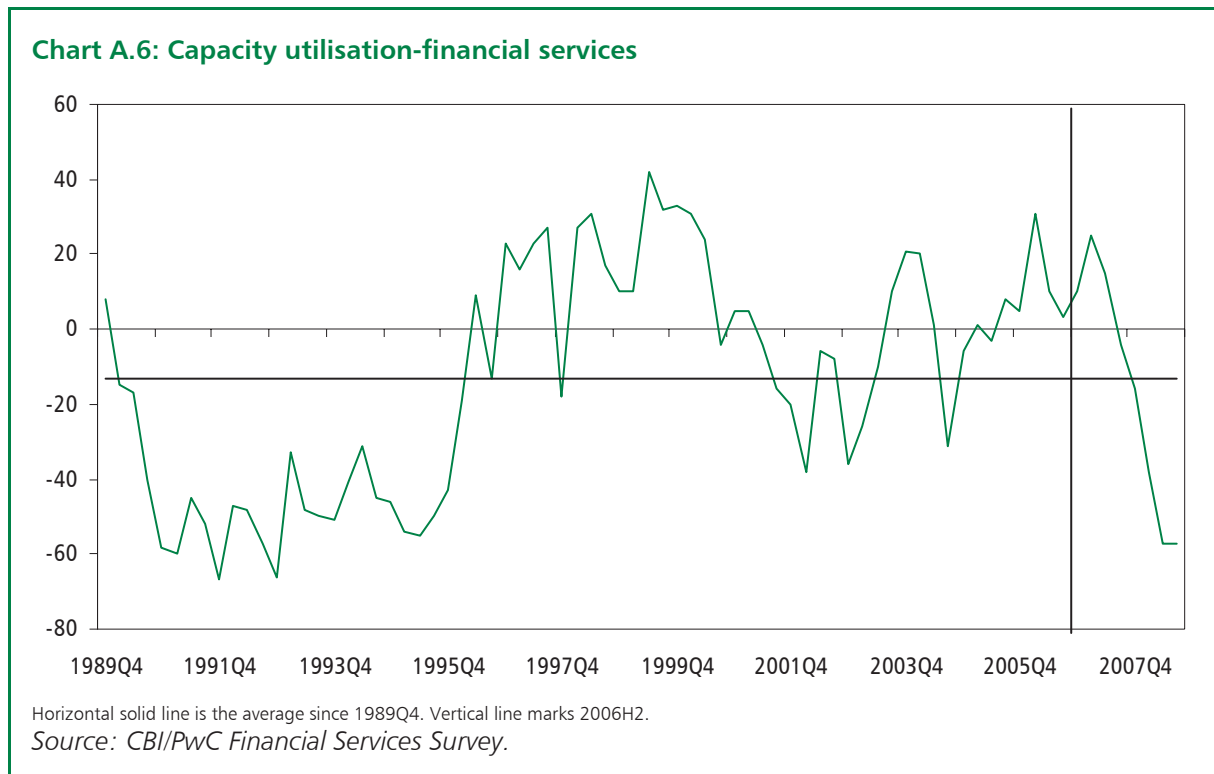


- 5 Comments:
 - The series is not normally distributed at the 5 per cent significance level over the period 1998-2008, with J-B test probability of 0.03, but appears normally distributed over the 1999-2008 period with J-B test probability of 0.09. The chart shows the average since 1999.
 - In 2006Q2 the indicator moved up through its long-run average since 1999, remaining above this level during 2007, before falling in 2008. This is consistent with the Bank of England's capacity utilisation indicator for the manufacturing sector, suggesting the economy was on trend at some point in 2006.

⁹ See *Definitions for the Agents' Scores*, Bank of England, available at <http://www.bankofengland.co.uk/publications/agentssummary/definitions.pdf>.

Output per worker

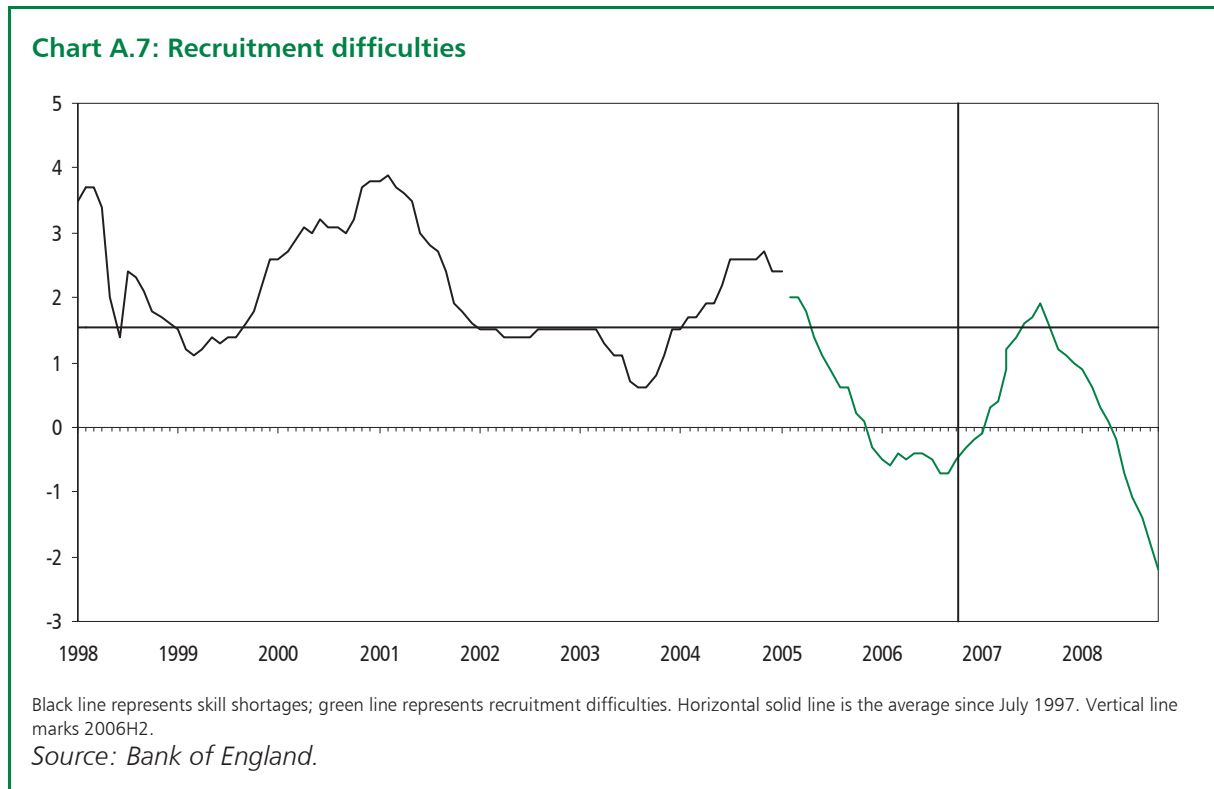
- 1 Indicator: Capacity utilisation
- 2 Sector: Financial services
- 3 Source: CBI
- 4 Definition: Percentage balance of financial services firms with levels of business above/below normal. The survey question is "Excluding seasonal variations, do you consider that in levels terms, your present level of business is above/below normal?" The data series reflects the percentage point difference between firms operating at above and below normal levels.



- 5 Comments:
 - The data series appears normally distributed at the 5 per cent significance level over the 1989Q4 to 2008Q3 and 1995Q1 to 2008Q3 periods with J-B test probabilities of 0.07 and 0.16 respectively. The chart above shows the average over the whole period. The average since 1995 is -2 ; and it is excluded from the chart for clarity.
 - This series has broadly been above the long-run average from 2003Q2 to 2007Q3 (except 2004Q3), falling to levels seen in the early 1990s in the first three quarters of 2008.
 - The indicator was above both averages throughout 2006 suggesting that the financial services sector was broadly operating at an above trend level. From 2006Q1 it moved up towards levels seen at the previous on-trend point in 1997H1; although the volatility of the series makes quarter-to-quarter changes difficult to interpret.

Employment

- 1 Indicator: Overall recruitment difficulties
- 2 Sector: Whole economy
- 3 Source: Bank of England
- 4 Definition: The score reflects a quantitative judgement on the scale of general recruitment difficulties across the economy. Before January 2005 the score reflected skill shortages.¹⁰

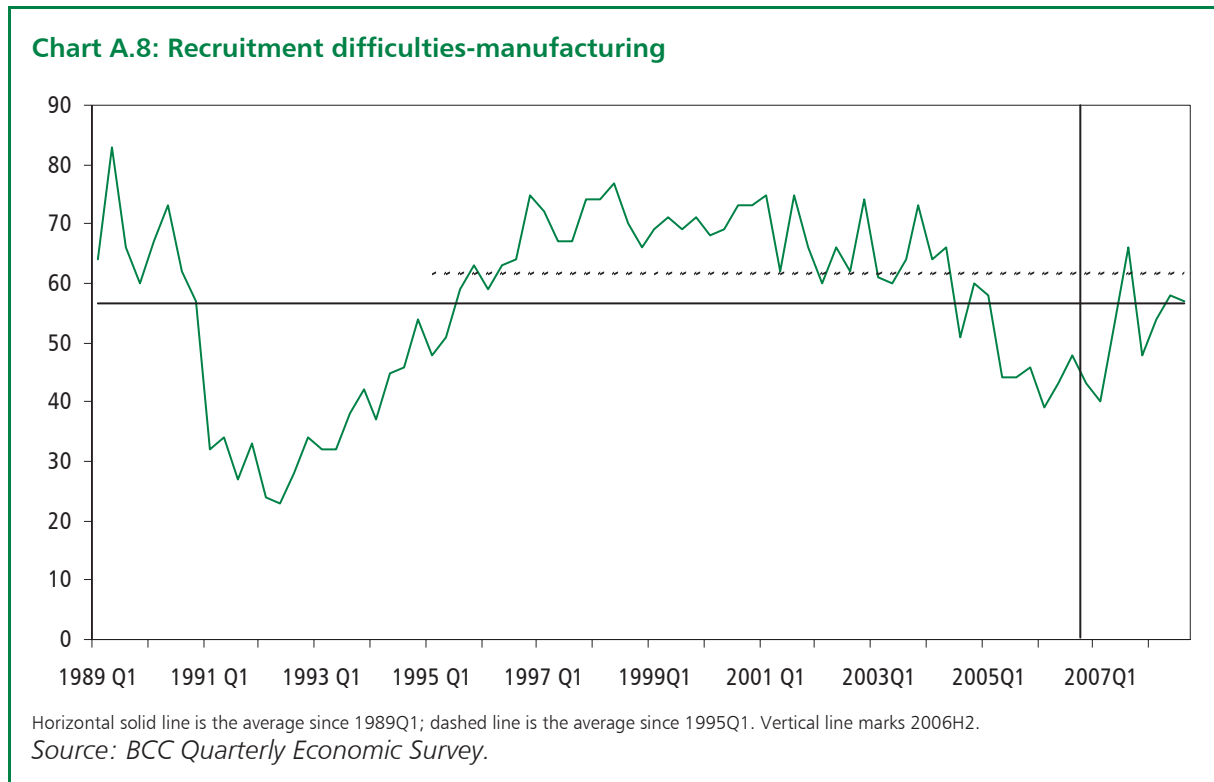


- 5 Comments:
 - The data series appears normally distributed at the 5 per cent significance level over the 1997 to 2008 and 2005 to 2008 periods with J-B test probabilities of 0.26 and 0.65 respectively. The chart above shows the average over the whole period.
 - Recruitment difficulties progressively tightened in the first half of 2007, passing up through the long-run average (since 1998) in June 2007 before easing to levels well below the long-run average. Overall this is consistent with an on-trend point in the latter part of 2006, reflecting the lagged response of employment levels to changes in output.

¹⁰ See *Definitions for the Agents' Scores*, Bank of England, available at <http://www.bankofengland.co.uk/publications/agentssummary/definitions.pdf>.

Employment

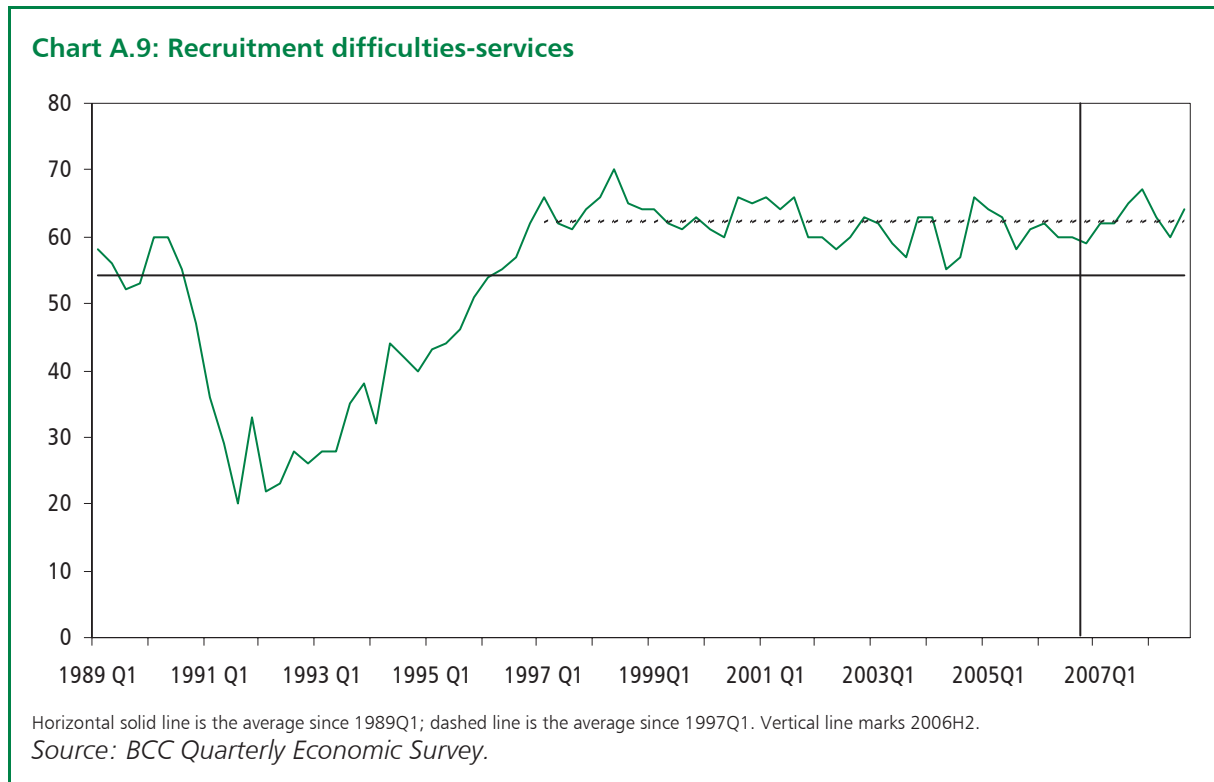
- 1 Indicator: Overall recruitment difficulties
- 2 Sector: Manufacturing
- 3 Source: BCC
- 4 Definition: Percentage of manufacturing firms experiencing recruitment difficulties. The survey question is "Did you experience any difficulties finding suitable staff?" The data series reflects the percentage of firms answering "yes".



- 5 Comments:
 - The distribution of the series appears normal at the 5 per cent significance level, with a J-B probability of 0.05. Evidence of normality is somewhat stronger between 1995Q1 and 2008Q3 and 1997Q1 and 2008Q3, with J-B test probabilities of 0.13 and 0.12 respectively.
 - This indicator passed through its long-run average in 1995Q3 and remained above it until 2005Q1 (except 2004Q3). Between 2005Q2 and 2008Q2, however, it has been broadly below its average since 1995 and long-run average.
 - Recruitment difficulties rose above both long-term averages in 2007Q3, before falling and then rising above the average since 1989 in 2008Q2, remaining just above this average in 2008Q3. The indicator remains firmly below the levels seen at previous on-trend points in 1997H1 and 2001Q3. Allowing for the lags between output and employment, however, the increases up to 2007Q3 are supportive of the economy moving close to trend from the latter part of 2006.

Employment

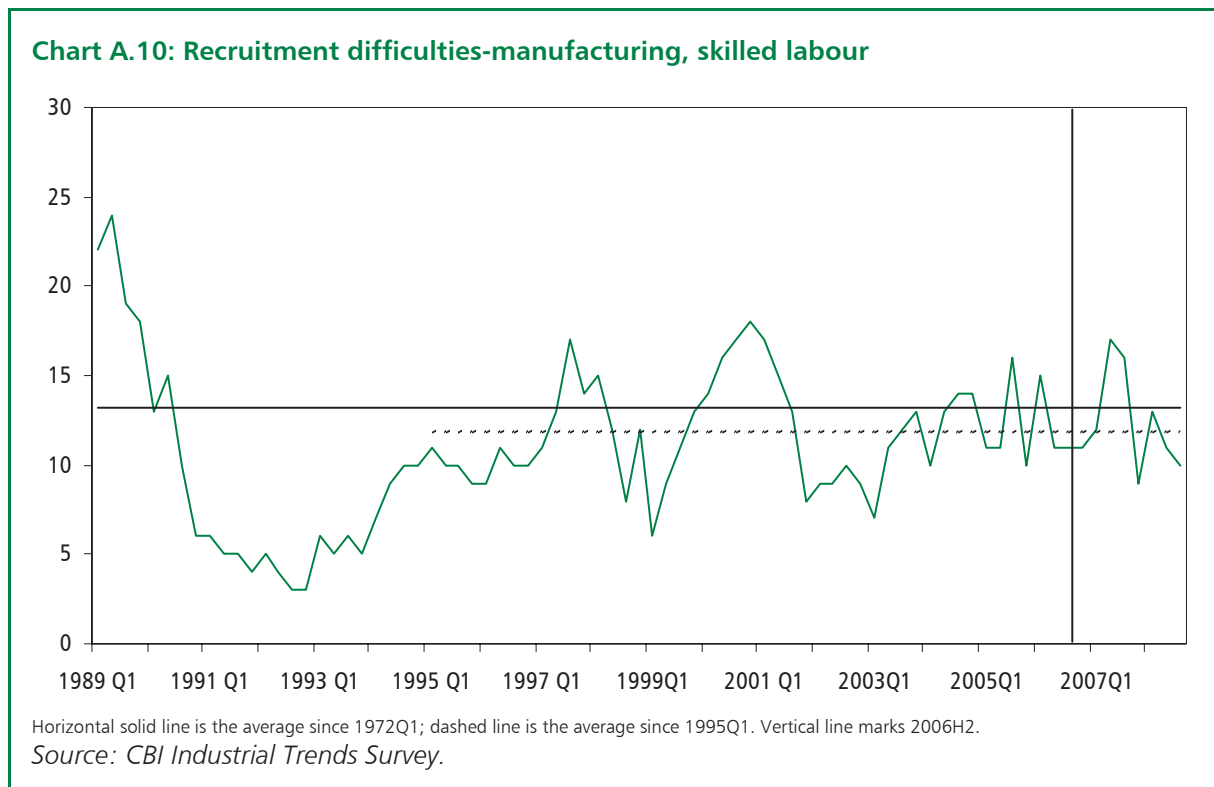
- 1 Indicator: Overall recruitment difficulties
- 2 Sector: Services
- 3 Source: BCC
- 4 Definition: Percentage of services firms experiencing recruitment difficulties. The survey question is "Did you experience any difficulties finding suitable staff?" The data series reflects the percentage of firms answering "yes".



- 5 Comments:
 - The distribution of the series is negatively skewed and so not normal at the 5 per cent significance level over the 1989-2008 and 1995-2008 periods, with J-B test probabilities of 0.00 in both periods. However, the series appears normally distributed between 1997Q1 and 2008Q3 with a J-B test probability of 0.98. The chart shows averages over the 1989-2008 and 1997-2008 periods.
 - Since 1997, recruitment difficulties in the services sector have remained close to their average over this period, although the indicator moved above this average in mid-2007 before subsequently falling back and rising again slightly in 2008Q3. During 2007, the indicator moved up to levels seen following the previous on-trend point in 1997H1, allowing for the lags between output and employment. This evidence is consistent with an on-trend point during the second half of 2006.

Employment

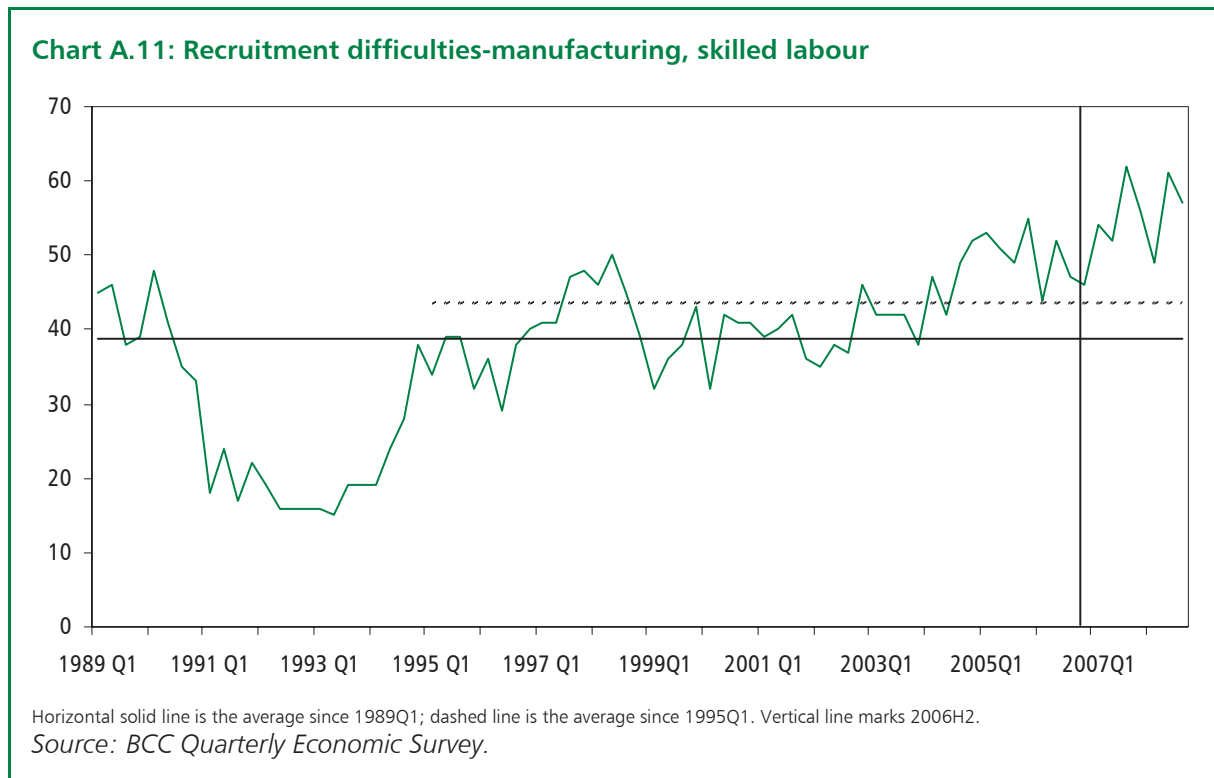
- 1 Indicator: Skilled labour constraint on output
- 2 Sector: Manufacturing
- 3 Source: CBI
- 4 Definition: Percentage of firms experiencing skilled labour recruitment difficulties. Survey question is "What factors are likely to limit your output over the next three months?" The data series reflects the percentage of firms answering "skilled labour".



- 5 Comments:
 - The distribution of the data series between 1972 and 2008 is positively skewed and so not normal at the 5 per cent significance level (J-B test probability is 0.00). The series appears normally distributed between 1995 and 2008, with a J-B test probability of 0.38. The chart shows the averages calculated over both periods.
 - From 2006Q2 to 2006Q4, this indicator remained slightly below both its long-run averages but consistent with the levels seen at the previous on-trend point in 1997H1. This was followed by sharp rises in 2007Q2 and 2007Q3. Given the lags between output and employment, this evidence would appear weakly consistent with the economy moving above trend at some point in 2006.

Employment

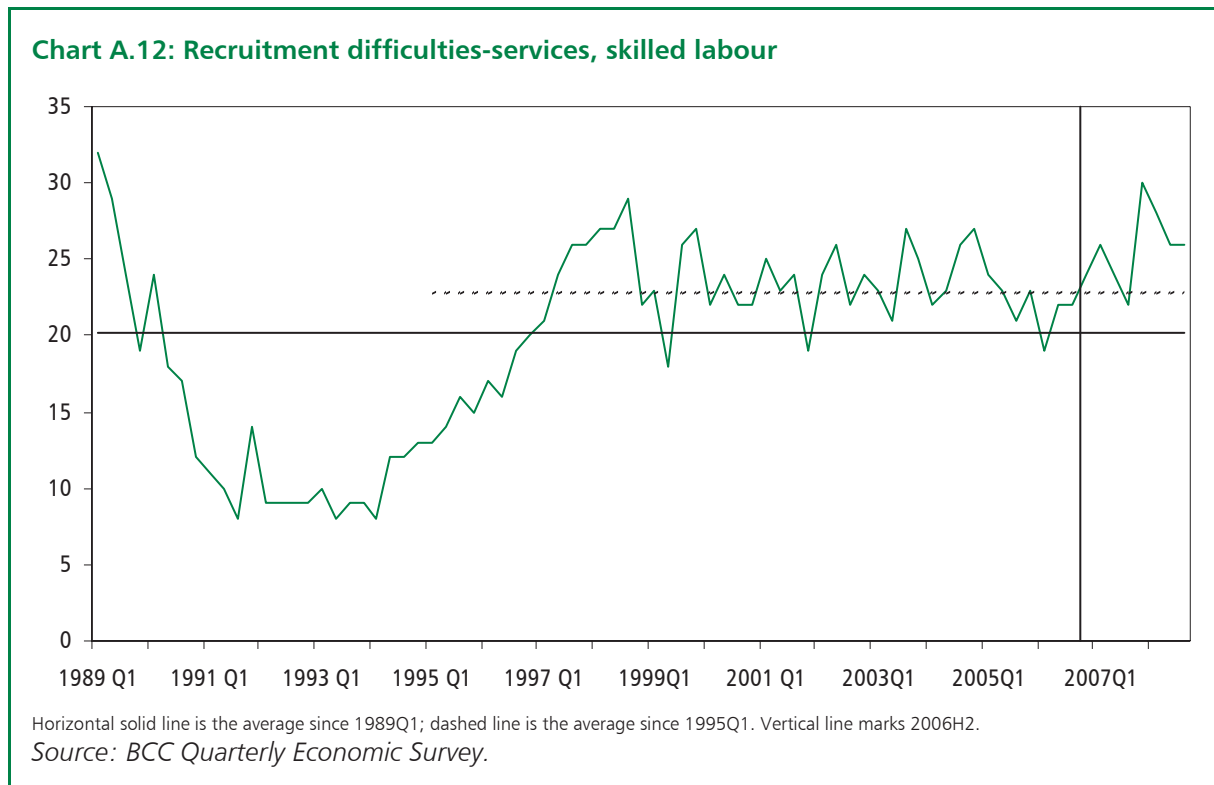
- 1 Indicator: Skilled manual labour constraint
- 2 Sector: Manufacturing
- 3 Source: BCC
- 4 Definition: Percentage of firms experiencing skilled manual labour recruitment difficulties. This question follows on from the 'overall recruitment difficulties' question. The survey question is "For which of the following categories did you experience difficulties in finding suitable staff?" The data series reflects the percentage of firms answering "skilled manual and technical".



- 5 Comments:
 - The series appears normally distributed at the 5 per cent significance level over the 1989-2008 period with a J-B test probability of 0.18, and over the 1995-2008 period with a J-B test probability of 0.42. The chart shows averages over both periods.
 - In 2006, this series operated above both the long-run average (since 1989Q1) and the average since 1995, passing through the latter in 2004Q3. The data were at the average since 1995 in 2006Q1 and after a rise in 2006Q2, fell back slightly in the second half of 2006, with further rises in 2007 and early 2008. From the second half of 2006 the indicator was above the levels seen for the previous on-trend point in 1997H1. This suggests that manufacturing firms were operating at or above trend levels of output during 2006.

Employment

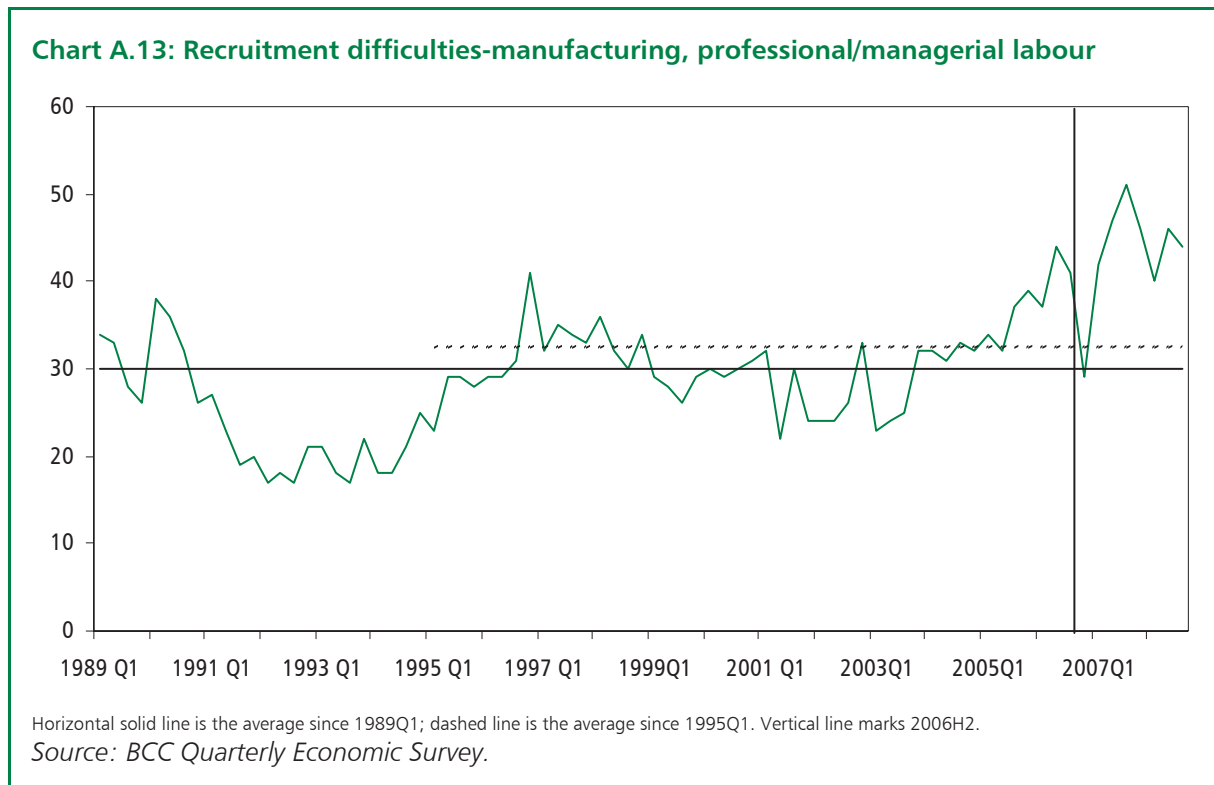
- 1 Indicator: Skilled manual labour constraint
- 2 Sector: Services
- 3 Source: BCC
- 4 Definition: Percentage of firms experiencing skilled manual labour recruitment difficulties. This question follows on from the "overall recruitment difficulties" question. The survey question is "For which of the following categories did you experience difficulties in finding suitable staff?" The data series reflects the percentage of firms answering "skilled manual and technical".



- 5 Comments:
 - The series appears normally distributed at the 5 per cent significance level between 1989 and 2008 with a J-B test probability of 0.05, and between 1995 and 2008 with a J-B test probability of 0.11. The chart shows averages over both periods.
 - This series was on an upward path through the mid-1990s, passing up through its average over the whole period in 1997Q1. The indicator passed up through its average since 1989 in 2006Q2 and through its average since 1995 in 2006Q4, with further rises during 2007 and the early part of 2008 (except 2007Q3). During the latter part of 2006 the indicator was at levels seen at the last on-trend point in 1997H1. This evidence is consistent with service sector output passing up through trend at some point in 2006.

Employment

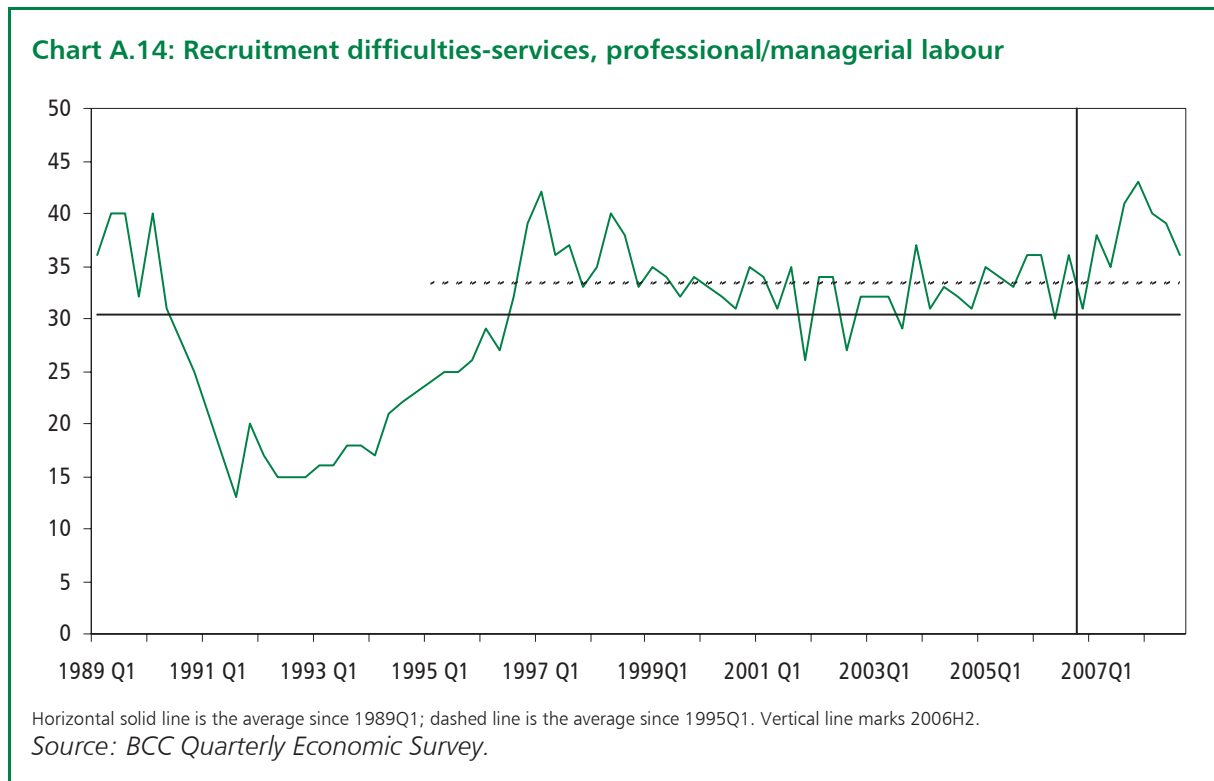
- 1 Indicator: Professional/managerial labour constraint
- 2 Sector: Manufacturing
- 3 Source: BCC
- 4 Definition: Percentage of manufacturing firms experiencing professional /managerial labour recruitment difficulties. This question follows on from the 'overall recruitment difficulties' question. The survey question is "For which of the following categories did you experience difficulties in finding suitable staff?" The data series reflects the percentage of firms answering "professional/managerial".



- 5 Comments:
 - The data series appears normally distributed over the periods 1989-2008 and 1995-2008, with J-B test probabilities of 0.32 and 0.07 respectively. The chart shows averages over both periods.
 - In 2006Q3 this indicator was well above its average since 1995, but fell erratically just below its long-run average in 2006Q4. During the latter part of 2006, the indicator was broadly at the level seen at the previous on-trend point in 1997H1. Recruitment difficulties rebounded in 2007 and the first three quarters of 2008, reaching a record high in 2007Q3. This is consistent with manufacturing recruitment difficulties for professional/managerial labour running close to trend levels in the second half of 2006, before clearly rising above trend.

Employment

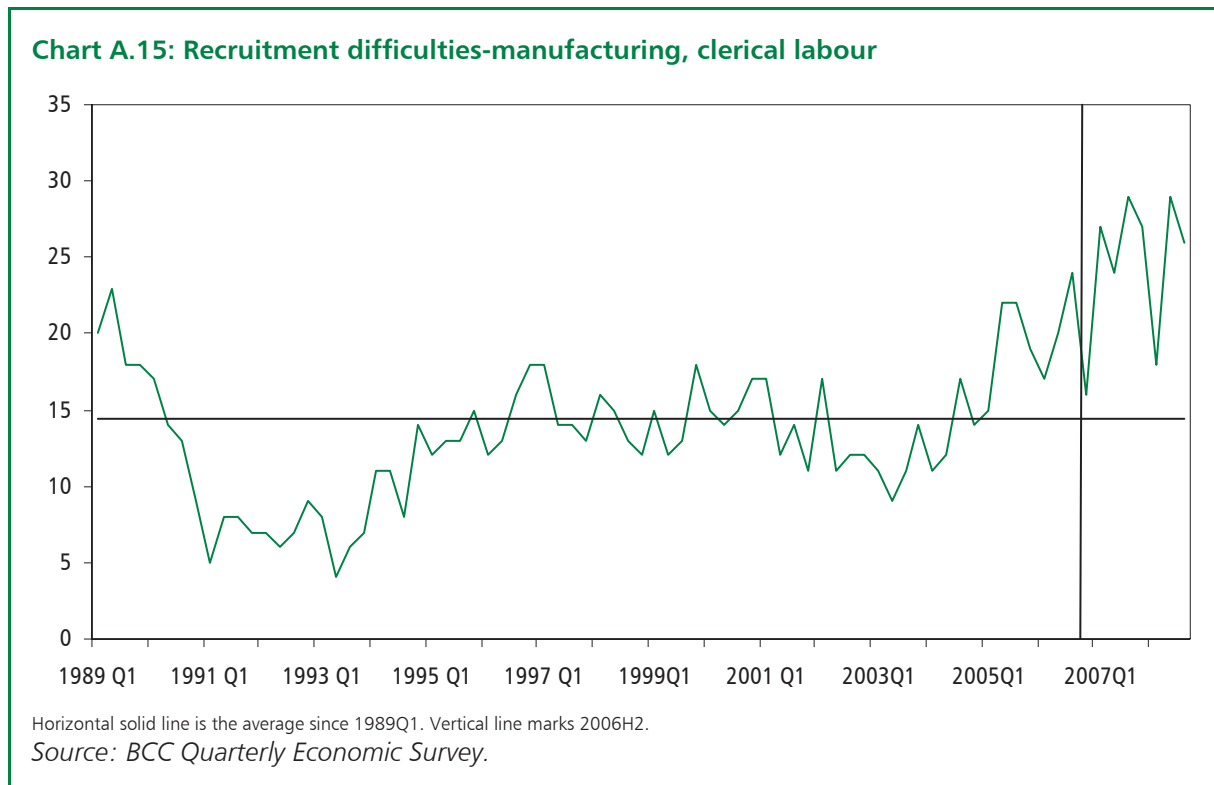
- 1 Indicator: Professional/managerial labour constraint
- 2 Sector: Services
- 3 Source: BCC
- 4 Definition: Percentage of services firms experiencing professional/managerial labour recruitment difficulties. This question follows on from the 'overall recruitment difficulties' question. The survey question is "For which of the following categories did you experience difficulties in finding suitable staff?" The data series reflects the percentage of firms answering "professional/managerial".



- 5 Comments:
 - The series is not normally distributed at the 5 per cent significance level over the 1989-2008 with a J-B test probability of 0.04, but appears normally distributed over the 1995-2008 period with J-B test probability of 0.92. The chart shows averages over both periods.
 - During 2006, service sector recruitment difficulties in professional and managerial labour remained generally above their long-run average and fluctuated around the average since 1995, passing up through the latter in 2007Q1. In the second half of 2006, the indicator was below levels seen at the previous on-trend point in 1997H1, but consistent with levels seen at the on-trend point in 2001Q3. This series continued to rise during 2007 and remained above its average since 1995 in early 2008. Allowing for the lags between output and employment, this would tend to be consistent with service sector output moving up through trend at some point in 2006.

Employment

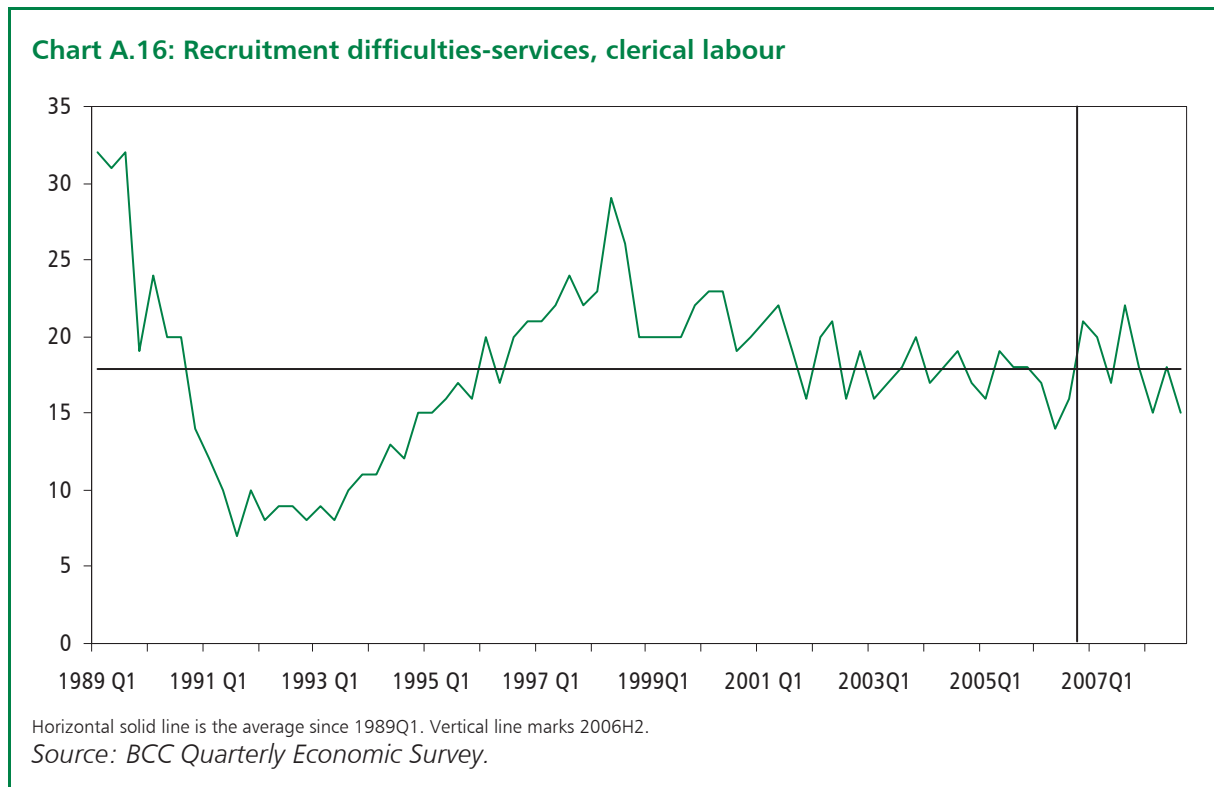
- 1 Indicator: Clerical labour constraint
- 2 Sector: Manufacturing
- 3 Source: BCC
- 4 Definition: Percentage of manufacturing firms experiencing clerical labour recruitment difficulties. This question follows on from the 'overall recruitment difficulties' question. The survey question is "For which of the following categories did you experience difficulties in finding suitable staff?" The data series reflects the percentage of firms answering "clerical labour".



- 5 Comments:
 - The series appears normally distributed at the 5 per cent significance level between 1989 and 2008, with J-B test probability of 0.06, but is not normally distributed between 1995 and 2008, with J-B test probability of 0.001. The chart shows the average since 1989Q1.
 - This indicator passed up through the long-run average in 2004Q3, falling again slightly in 2004Q4, before clearly moving well above average in 2007 and reaching a record high in both 2007Q3 and 2008Q2. During the second half of 2006, this indicator is clearly above levels seen at the previous on-trend points in 1997H1 and 2001Q3. This indicator appears to suggest that the economy was already above rather than moving up through trend in 2006.

Employment

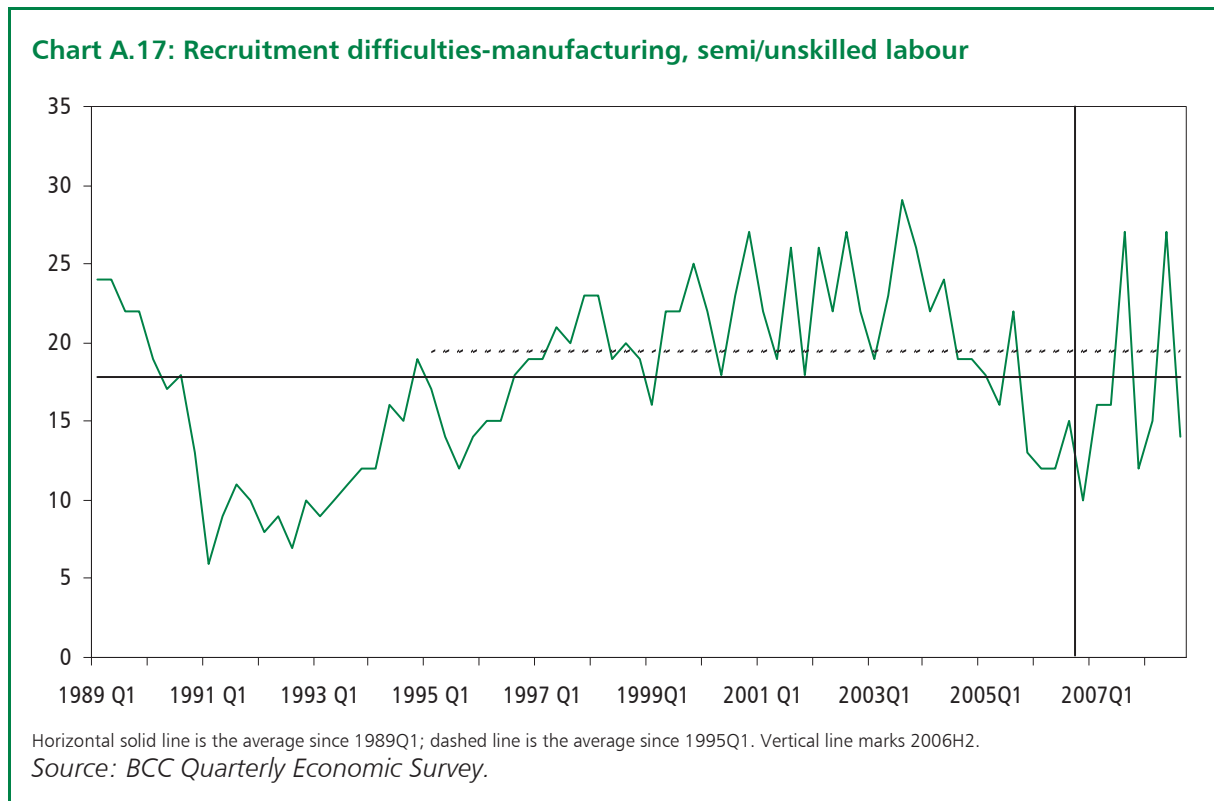
- 1 Indicator: Clerical labour constraint
- 2 Sector: Services
- 3 Source: BCC
- 4 Definition: Percentage of services firms experiencing clerical labour recruitment difficulties. This question follows on from the 'overall recruitment difficulties' question. The survey question is "For which of the following categories did you experience difficulties in finding suitable staff?" The data series reflects the percentage of firms answering "clerical labour".



- 5 Comments:
 - This series appears normally distributed at the 5 per cent significance level over the 1989-2008 and with J-B test probability of 0.55, but it is not normally distributed over the period 1995-2008, with J-B test probability of 0.03. The chart shows the average since 1989Q1.
 - The series passed up through its long-run average in 2006Q4, and only fell back clearly below average in 2008, with a brief pick-up in 2008Q2. The indicator is slightly below the levels seen at the previous on-trend point in 1997H1 but consistent with the level in 2001Q3. This evidence is broadly corroborative of the economy being close to trend in the second half of 2006.

Employment

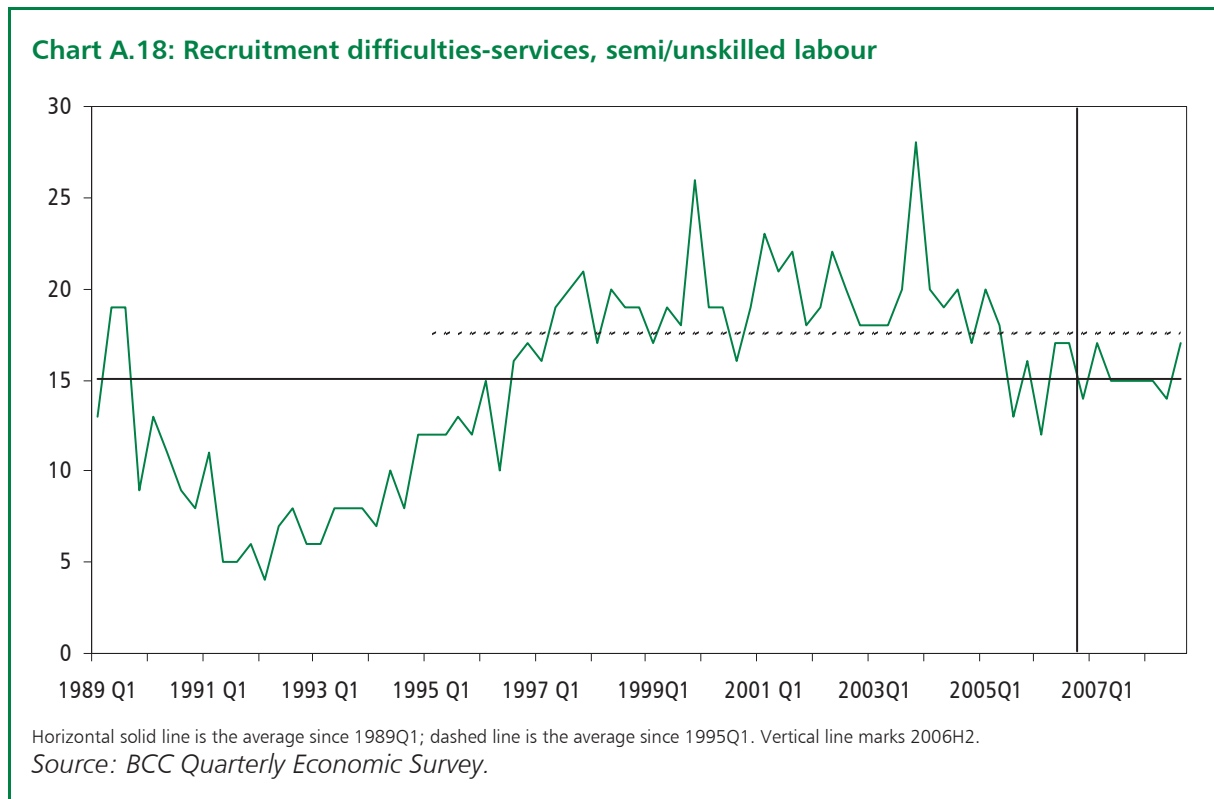
- 1 Indicator: Semi/unskilled labour constraint
- 2 Sector: Manufacturing
- 3 Source: BCC
- 4 Definition: Percentage of manufacturing firms experiencing semi/unskilled labour recruitment difficulties. This question follows on from the 'overall recruitment difficulties' question. The survey question is "For which of the following categories did you experience difficulties in finding suitable staff?" The data series reflects the percentage of firms answering "semi/unskilled".



- 5 Comments:
 - This series appears normally distributed at the 5 per cent significance level over the 1989-2008 and 1995-2008 periods with J-B test probabilities of 0.29 and 0.47 respectively. The chart shows averages over both periods.
 - Recruitment difficulties in semi and unskilled labour remained below both averages during 2006, and below the level seen at the previous on-trend point in 1997H1, passing down through their average over the whole period in 2005Q4. The series rose above both long-run averages from below in 2007Q3 and again in 2008Q2, before falling back in 2008Q3. Allowing for lags between output and employment, this evidence would appear weakly consistent with the economy moving close to trend in late 2006.

Employment

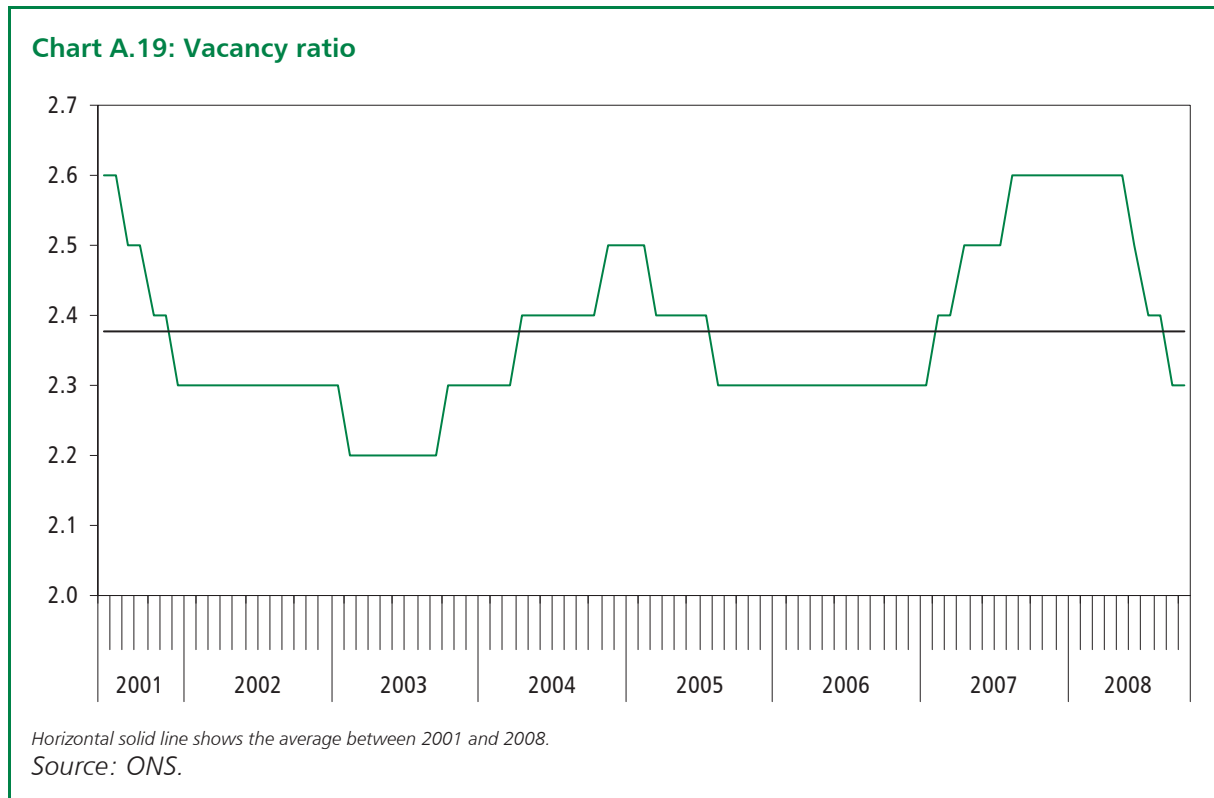
- 1 Indicator: Semi/unskilled labour constraint
- 2 Sector: Services
- 3 Source: BCC
- 4 Definition: Percentage of services firms experiencing semi/unskilled labour recruitment difficulties. This question follows on from the 'overall recruitment difficulties' question. The survey question is "For which of the following categories did you experience difficulties in finding suitable staff?" The data series reflects the percentage of firms answering "semi/unskilled".



- 5 Comments:
 - The data series appears normally distributed at the 5 per cent significance level over the 1989-2008 and 1995-2008 periods with J-B test probabilities of 0.38 and 0.28 respectively. The chart shows averages over both periods.
 - In 2006, the series was below its average since 1995 and the level at the previous on-trend point in 1997H1, but stayed close to its long-run average. The indicator remained close to its long-run average from 2007Q2 to 2008Q2 before picking up again in 2008Q3. This indicator does not provide evidence of the economy moving up through trend in 2006.

Employment

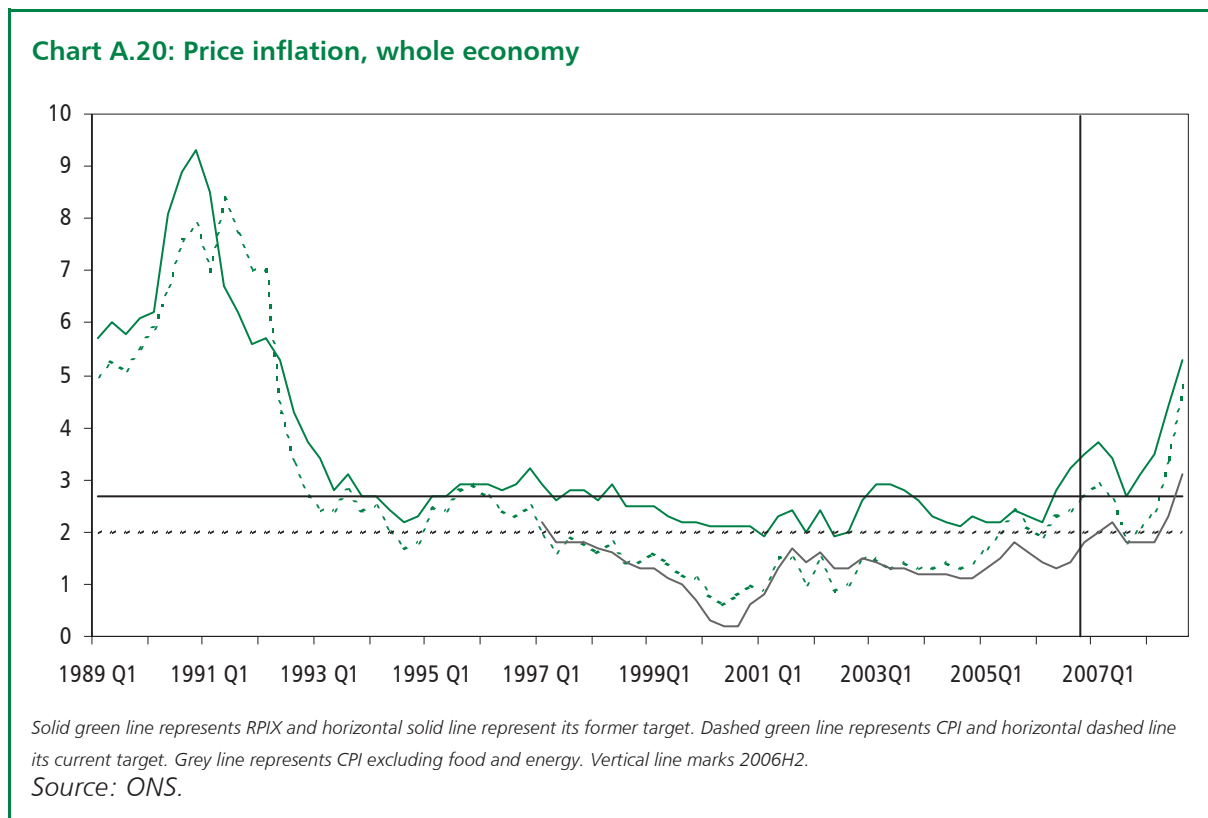
- 1 Indicator: Vacancy ratio
- 2 Sector: Whole economy
- 3 Source: ONS
- 4 Definition: Number of vacancies per 100 employee jobs, 3-month average. The ONS data series used in the calculation come from the Vacancy Survey and the employer survey of employee jobs (both UK, seasonally adjusted).



- 5 Comments:
 - The ONS Vacancy Survey used to calculate the vacancy ratio provides estimates of job vacancies across the UK economy and has been running since April 2001. The Jobcentre vacancy series used in calculation of the vacancy ratio between 1980 and 2001 was discontinued in 2001 due to changes in the method of recording vacancies at Jobcentres. The two series are not directly comparable and cannot be used in conjunction with one another. The chart shows the vacancy ratio from 2001 onwards using data from the ONS Vacancy Survey.
 - The vacancy ratio remained below average in 2006, before rising clearly to well above average during the first half of 2007. The indicator remained high during the second half of 2007 and early 2008 before falling back below its average in September 2008. Allowing for the lags between output and employment, this appears consistent with the economy having moved up through trend during the second half of 2006. The short duration of the data series means that a degree of caution should be exercised in interpreting this evidence.

General indicators of the output gap

- 1 Indicator: Price inflation
- 2 Sector: Whole economy
- 3 Source: ONS
- 4 Definition: Consumer Price Inflation (CPI) and Retail Price Inflation excluding mortgage interest payments (RPIX)



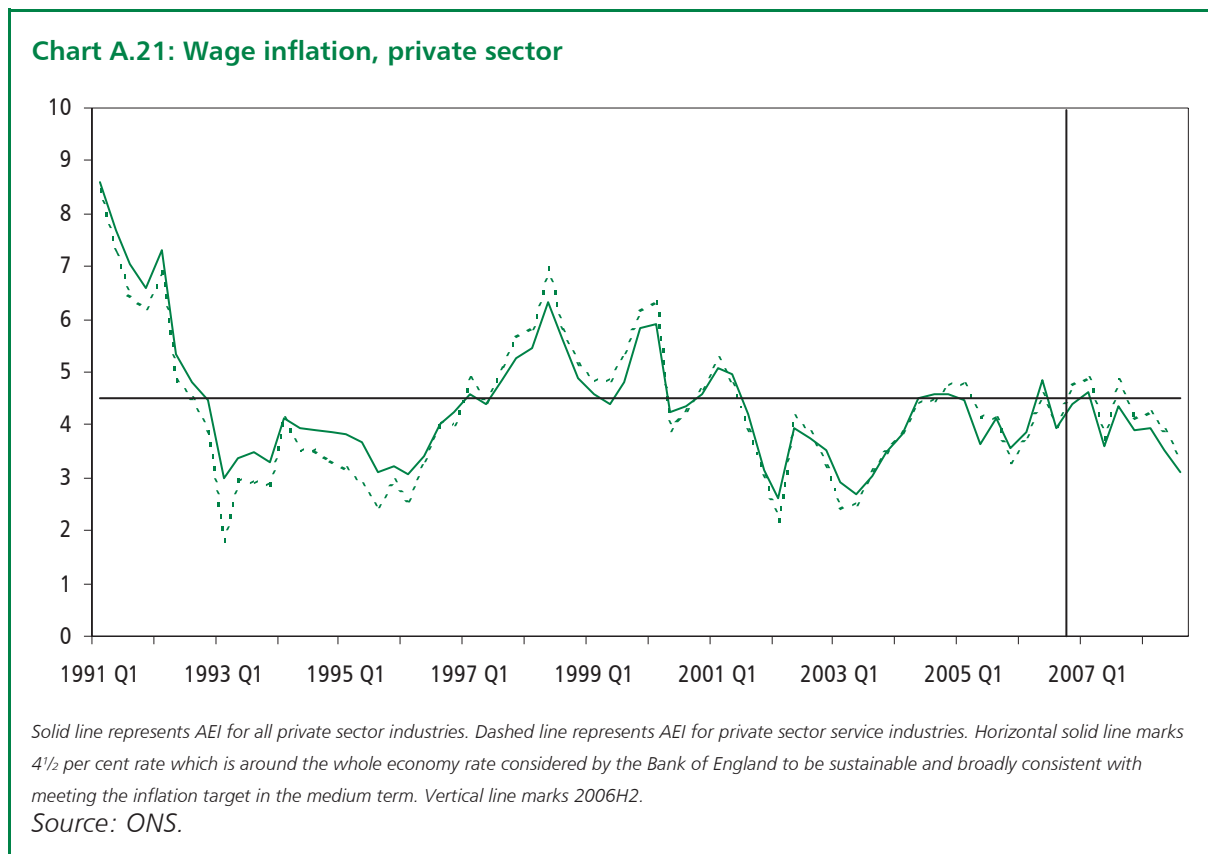
5 Comments:

- The relationship between the output gap and inflation is not simple. Inflation dynamics and the closer relationship between the output gap and domestically-generated rather than overall inflationary pressures mean that inflation developments do not necessarily give a straightforward reading of the economy's cyclical position. In particular global energy and food prices have played a large role in accounting for recent rises in inflation. The inflation rate is also dependent on a number of other temporary factors, such as movements in the real exchange rate and inflation expectations. And there may be 'speed limits' on how fast a negative output gap can be closed without putting upward pressure on inflation, for instance, due to short-term supply bottlenecks. Nevertheless, it is generally to be expected that a zero output gap should coincide with stable domestically generated inflation.
- The chart shows that CPI and RPIX inflation passed above 2 and 2.7 per cent respectively in 2006Q2, continuing to rise until early 2007 before temporarily falling back during the second half of the year.
- CPI inflation excluding energy and seasonal food, a proxy for domestically generated inflation, rose from 2006Q2, moderating in the second half of

2007 and 2008Q1 before rising again in 2008Q2 and 2008Q3. This evidence is consistent with the economy gaining momentum and moving up towards trend in the second half of 2006. Exceptional volatility in commodity prices make interpretation of the measures of inflation at the end of the period difficult as there are still significant indirect effects through input prices.

General indicators of the output gap

- 1 Indicator: Wage inflation (private sector)
- 2 Sector: (a) All industries and (b) services
- 3 Source: ONS
- 4 Definition: Year-on-year growth rates of ONS' quarterly Average Earnings Index (AEI) series (seasonally adjusted, private sector, including bonuses).

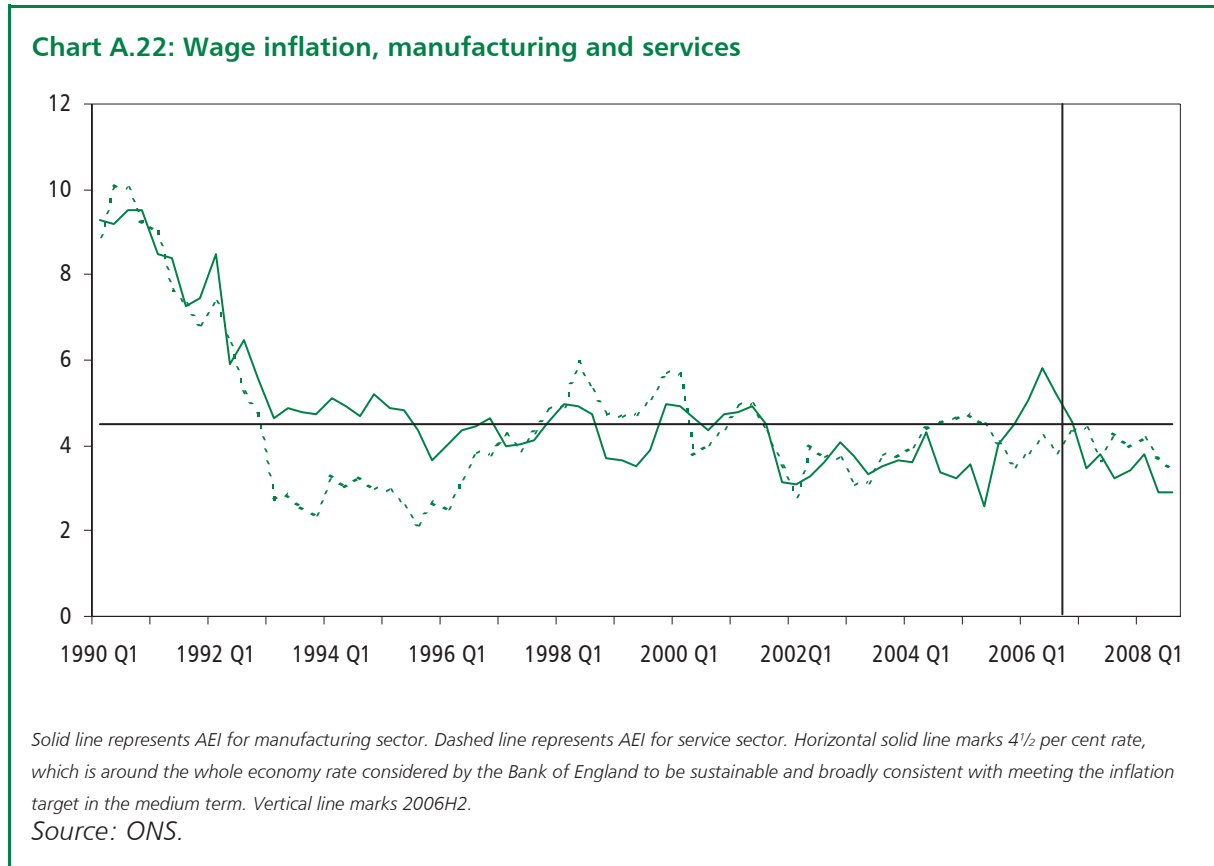


5 Comments:

- In addition to the data series shown in the chart, AEI excluding bonuses data are also useful in informing the judgement on the cyclical position of the economy. However, the 'excluding bonuses' data are only available from 1996Q2, which means that annual growth rates can only be calculated from 1997Q2, thus limiting the use of these data.
- Private sector earnings growth rates reached 4½ per cent in 2006Q2 and 2007Q1, but have subsequently remained subdued, below the 'sustainable rate' consistent with meeting the inflation target in the medium term.
- Private sector wage inflation indicators suggest that there was some degree of slack in the labour market towards the end of 2006 and throughout the course of 2007. This is somewhat at odds with the evidence from other labour market indicators over this period, suggesting that wage indicators may not necessarily provide a straightforward signal of the position of the economy relative to trend.

General indicators of the output gap

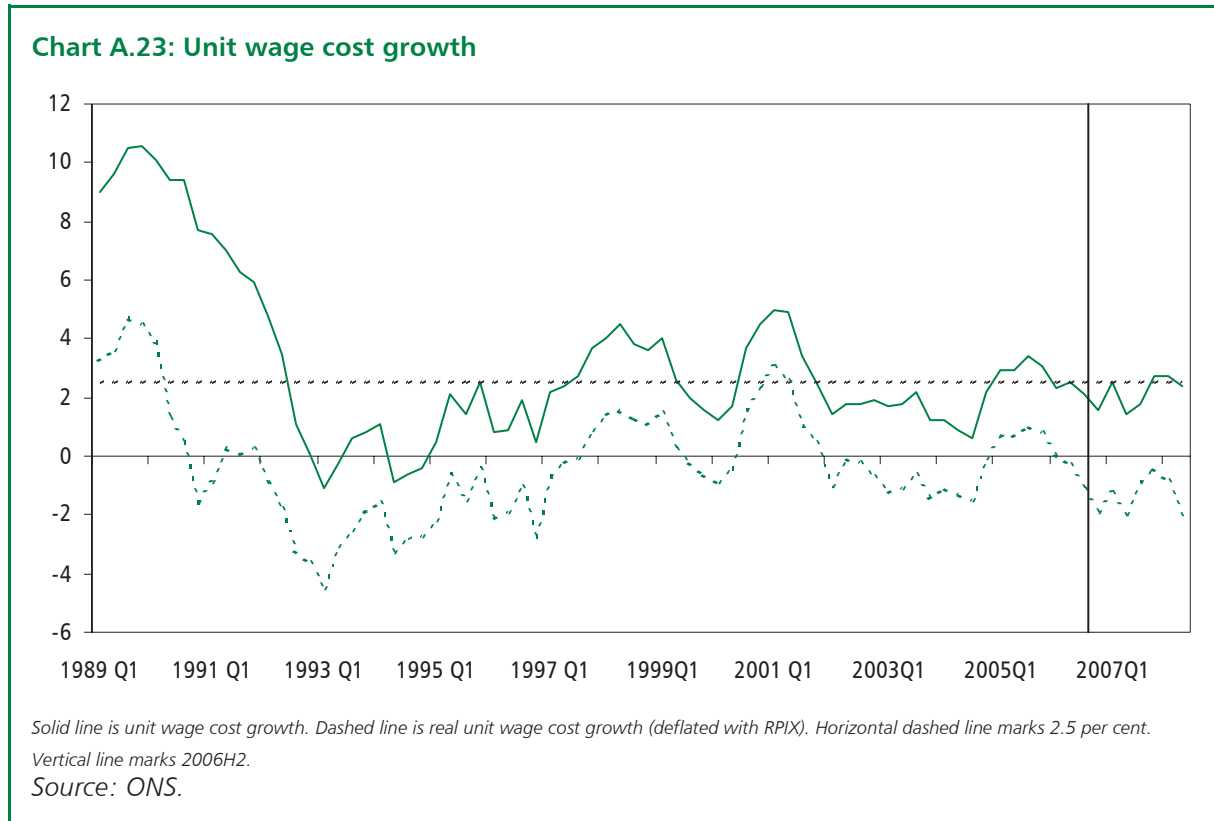
- 1 Indicator: Wage inflation (whole economy)
- 2 Sector: (a) Manufacturing and (b) services
- 3 Source: ONS
- 4 Definition: Year-on-year growth rates of ONS' quarterly Average Earnings Index (AEI) series (whole economy, seasonally adjusted, including bonuses).



- 5 Comments:
 - Both series were moved towards 4½ per cent in 2006Q4, with earnings growth in manufacturing rising at a slower rate and services remaining close to, but below 4½ per cent. Since 2007, both series have again remained subdued, staying below the 'sustainable rate' consistent with meeting the inflation target in the medium term.
 - This does not appear to support the evidence from other labour market indicators over this period, suggesting that wage indicators may not necessarily provide a straightforward signal of the position of the economy relative to trend.

General indicators of the output gap

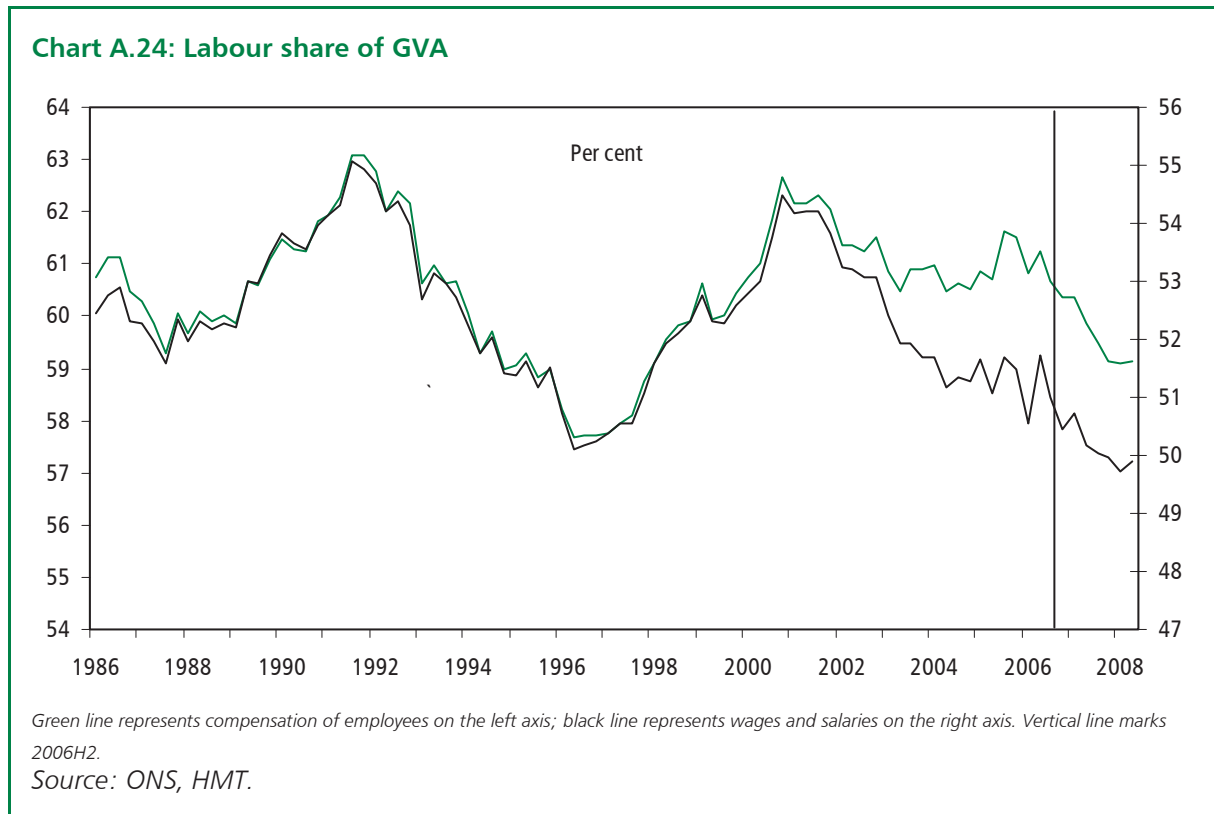
- 1 Indicator: Unit wage cost growth
- 2 Sector: Whole economy
- 3 Source: ONS
- 4 Definition: Unit wage costs, per cent change on year earlier, seasonally adjusted, whole economy.



- 5 Comments:
 - Unit wage costs are defined as the ratio of wages and salaries to output, i.e. the wage cost of producing one unit of output. Sustained unit wage cost growth over and above price inflation is usually associated with excess demand.
 - The horizontal line in the chart is drawn at 2.5 per cent i.e. broadly the RPIX equivalent of the inflation target, because components of RPIX, not CPI, are used for National Accounts deflation.
 - Unit wage cost growth was just below 2½ per cent in 2006H2, passing through 2½ per cent from above in 2005Q4; and again reaching 2½ per cent in 2007Q1. Both series are consistent with the economy being close to trend in 2006.

General indicators of the output gap

- 1 Indicator: Labour share of GVA
- 2 Sector: Whole economy
- 3 Source: ONS, HMT
- 4 Definition: Share of national income paid to workers: Total compensation of employees divided by GVA at basic prices, and expressed as a percentage. Both the numerator and the denominator are in current prices.



5 Comments:

- The labour share is conceptually equivalent to real unit labour costs. Over past cycles it has tended to rise during periods of excess demand when the economy has been above trend (i.e. a positive output gap), and fall when the economy has been below trend (i.e. a negative output gap). This implies that growth in nominal unit wage costs has tended to exceed price inflation when the economy has been above trend, and vice versa.
- Analysis presented in *Evidence on the UK economic cycle* (HM Treasury, July 2005)¹¹ showed a close empirical correspondence between on-trend points of the economy, as previously assessed by the Treasury, and turning points (i.e. peaks and troughs) in the labour share of GVA. A detailed discussion of the labour share as a cyclical indicator can be found in the HM Treasury July 2005 publication; and Annex C of that paper looks at the theoretical relationship between the labour share and the output gap.

¹¹ Available from the Treasury website: www.hm-treasury.gov.uk

- The chart shows that the labour share measured either in terms of compensation of employees or wages and salaries has been trending down since 2001 and has clearly fallen since 2006.
- Payments by employers aimed at reducing employee pension fund deficits may have boosted the compensation of employees series in recent years, though equally they may have depressed wages and salaries leaving compensation of employees relatively unaffected. This complicates interpretation of movements in the labour share series over recent years; and there are significant uncertainties relating to latest National Accounts data for wages and salaries growth over the recent past.
- Nevertheless, there is no conclusive evidence of a turning point in the labour share as yet. To this extent evidence on the labour share does not identify an on-trend point during the second half of 2006, even allowing for lags and the difficulty of identifying turning points until well after the event.

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