

Our Competitive Future



UK Competitiveness Indicators 1999

dti

Department of Trade and Industry

UK Competitiveness Indicators 1999

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I am pleased to publish the first in what I intend to be an annual series of *UK Competitiveness Indicators*.

The indicators will be used to monitor the progress of the UK as a knowledge driven economy, to assess our competitiveness against the world's leading economies and to help in designing policies to narrow the gap in productivity and living standards with our main competitors. The indicators are intended to be helpful not only to the Government as a guide to policy and priorities, but also to UK companies whom I encourage to think about how they might improve performance in areas highlighted by the indicators.

In seeking to audit performance in this way, we are breaking new ground. Although there have been previous benchmarking studies of the UK economy, this will be the first time that there has been a systematic assessment based on a wide-ranging set of competitiveness indicators.

This is no easy task. There are many influences on a nation's competitiveness and, although there is reasonable consensus over the factors that are the most important, economists and others disagree over the precise number and nature of the factors to be included. Even where agreement can be reached on the concepts, it is sometimes difficult to find reliable statistical indicators that can be compared across countries.

Nevertheless, I believe that an attempt can and should be made to benchmark our performance in key areas. My department has consulted widely on the factors to include and the measures to use by studying work done in other countries, by talking to researchers in universities and international organisations and by seeking the views of members of the Competitiveness Council that I set up earlier this year.

This publication is the product of that consultation. But I want this spirit of consultation to continue. I want to hear from business and other interested parties whether the approach we have adopted to measuring competitiveness this year is the right one. Have we picked the right factors? Are there too many indicators or too few? Are the indicators representative of the factors that truly determine national competitiveness? Do they capture the main features of the knowledge driven economy? What areas of research need to be pursued in order to develop better measures?

Some of these questions are addressed, and preliminary views expressed, in the report. However, I would like the *Indicators* report to be a living document, which evolves over time as new research is carried out and as we develop improved measures of competitiveness. I want this process to be open and transparent and I want to hear as wide a range of views as possible. I would therefore encourage business and others to pass on their comments to my officials at the address given in the final chapter of the document.

Measuring our progress in building a successful knowledge driven economy is essential. But before we embark on measurement, I want to be sure that the approach commands general acceptance in the business community and more widely. I look forward to hearing your views.

A handwritten signature in black ink that reads "Stephen Byers". The signature is written in a cursive, flowing style with a long horizontal line extending from the end of the name.

The Rt Hon Stephen Byers MP
Secretary of State for Trade and Industry

Comments on *UK Competitiveness Indicators* should be sent, by 30 April 2000, to:

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UK Competitiveness Indicators 1999

In the modern global economy, British companies increasingly have to compete by developing and exploiting their skills, knowledge and creativity. Companies will choose to locate elsewhere if the economic environment in the UK does not support a modern knowledge economy. Moreover, the challenge of the global marketplace is heightened by the development of the European single market and the advent of a single currency in the euro area.

The *UK Competitiveness Indicators* are designed to track the UK's competitiveness as a knowledge driven economy and to monitor progress in closing the gap in productivity and living standards with our main competitors. The selection of indicators is based on the analysis underlying the Government's Competitiveness White Paper, *Our Competitive Future: Building the Knowledge Driven Economy* (Cm. 4176) and draws upon the views of the recently established Competitiveness Council chaired by the Secretary of State for Trade and Industry.

This first assessment, which is intended to propose a baseline for future comparisons, shows that in many respects the UK is beginning to succeed as a knowledge driven economy, but in a number of areas we have some way to go to achieve the standards of the best.

Despite a history of macroeconomic instability, there are now many positive features in the business environment, which should give our companies the right platform to achieve the standards of the best.

Following a period of macroeconomic volatility, the prospects for economic stability have now improved. The UK appears to have an economy that is open to international trade and investment, with a labour market widely regarded as functioning well. This is reflected in a good employment performance, at least by European standards. Business perceptions of the political, institutional and regulatory environment are relatively positive and we score well on some measures of the quality of life.

However, comparisons looking at price levels suggest that in many areas competition can and should be more intense. There are still concerns about trends in cost competitiveness and doubts about whether we have a sufficiently discerning and demanding consumer base. In addition, levels of long-term unemployment and youth

unemployment are still a problem. The Government has taken action in all these areas although it will naturally take time for the measures to have their full effect.

There is some encouraging evidence on resources such as the strength of our science base and take up of ICT, but progress is being held back by poor skills and under-investment.

The UK's science base is strong and our research is highly regarded around the world. However, we need to keep investing in the science base to safeguard this strong performance. Between the mid-1980s and the mid-1990s, government expenditure on R&D and business investment in R&D both fell relative to our main competitors.

One set of technologies that will be crucial for future performance is Information and Communications Technology (ICT). Businesses in the UK seem to be realising the importance of ICT and investing in it, although they have been less effective in putting these new technologies to the best use.

Gaps in workforce skills could be a contributory factor. Skill levels remain a cause for concern across the economy as a whole, despite the progress being made towards the National Learning Targets, which set qualifications targets for the working population whether acquired during initial education or during working life.

A combination of macroeconomic instability and deficiencies in management and workforce skills has contributed to a history of under-investment. This is important in the knowledge driven economy because new investment embodying the latest technology is an important way in which new ideas are spread through the economy.

This new investment is in certain respects being held back by the availability of appropriate finance, particularly for fast-growth, early-stage firms. The provision of equity finance, and in particular venture capital, is crucial, and although there has been a substantial increase in the amount of venture capital in recent years, a funding gap still remains.

In terms of the innovation process, the UK is well keyed in to the global pool of knowledge, although more needs to be done to turn our expertise into marketable products.

Receptiveness to foreign ideas, as measured by internationally financed R&D and collaboration across borders, is a strength. However, there are weaknesses in many aspects of the innovation process. Data on patents, business enterprise spending on innovation, and the share of turnover in manufacturing accounted for by new or improved products suggests that UK industry's innovation performance is lagging behind our principal competitors. However, the record of the UK service sector in innovation appears somewhat better.

Collaboration between business and universities is under-developed, although joint authorship of publications by higher education institutions and business is expanding strongly.

Enterprise is more important than ever in the knowledge driven economy but performance in and attitudes towards entrepreneurship fall short of best practice amongst our competitors.

On average, we work more hours than our competitors to achieve results, but national income per head is still almost one fifth lower than the G7 average. We need to work smarter, rather than harder, and build on undoubted areas of strength.

GDP per head is around the European Union average but still 18 per cent below the average for the G7.¹ Our relatively good performance on employment and the growth in total hours worked contrasts with a disappointing productivity performance. Securing productivity improvements by the more effective use of knowledge is the way to improve living standards, spreading strong performance in some key knowledge-intensive sectors throughout the economy.

Overall, the indicators in this report, and the discussions in the Competitiveness Council, confirm that there are many encouraging examples of good performance across the UK economy. Macroeconomic prospects are improving and other features of the business environment are positive; the proportion of people in work is high; the UK's science base is strong and our research is highly regarded around the world; and we perform well in some key knowledge-intensive sectors.

However, there are also clearly areas where improvement is needed. The Council identified innovation, enterprise and small firms, management, skills and the role of consumers as areas requiring attention. In all these areas, the Government is already taking action. The indicators will be refined and used to monitor progress in addressing these and other challenges, although it is recognised that sustained effort over a number of years will be required to narrow the gap with our main competitors.

¹ UK, Germany, France, Italy, US, Canada and Japan.

Chapter 1: Introduction

The Competitiveness White Paper and the accompanying *Analysis and Background* paper identified a performance gap with our major competitors. The White Paper went on to examine how this gap could be closed in the context of an economy where success increasingly depends on the generation and exploitation of knowledge. The White Paper also emphasised that the progress of the knowledge driven economy does not depend simply on pushing back the frontiers of knowledge or promoting high-tech or knowledge-intensive sectors. It is about the more effective use and exploitation of all types of knowledge across the whole range of economic activity.

In explaining the thinking behind the White Paper, the *Analysis and Background* paper described how information and communication technology, scientific and technological development, global competition and changing demand were driving the increased importance of knowledge for prosperity. It also explained how this is changing the mix of inputs an economy needs to succeed, and the processes by which these inputs are transformed into high value goods and services and hence incomes.

In the global economy, capital is mobile, technology spreads quickly and goods can be made in low cost countries and shipped to developed markets. British business therefore has to compete by exploiting distinctive capabilities which competitors find hard to imitate. Whereas, in the past, competitiveness – a nation's ability to sustain high and rising standards of living¹ – might have been based on raw material, land or cheap labour, increasingly in the modern economy it needs to be based on knowledge, skills and creativity.

The challenge is all the greater when multinational companies have a choice of where to locate. This challenge is heightened by the development of the European single market and the advent of the single currency in the euro area.

Purpose of the UK Competitiveness Indicators

The White Paper stated the Government's intention to develop a set of competitiveness indicators, to measure the UK's progress in meeting the challenges of the knowledge economy and closing the performance gap with other advanced economies.

A new Cabinet sub-committee has been established, and part of its role will be to review the UK's performance against the *UK Competitiveness Indicators* each year. Seeking improvements in the UK's performance against the *UK Competitiveness Indicators* is part of the Department of Trade and Industry's Public Service Agreement and is one of the DTI's Key Targets for 2002. The *Indicators* will also be used as a tool to help meet the joint HM Treasury and DTI target of putting in place policies to narrow the productivity gap relative to other industrialised countries over the cycle, by highlighting strengths and weaknesses, and helping prioritise areas that may need attention by Government.

There are a number of different ways of tracking UK performance. The most straightforward would be to look at a single measure such as GDP per head. GDP per head is generally considered to be the best overall measure of living standards, when used in conjunction with measures of the quality of life and the distribution of income. However, in analysing the economy and drawing policy conclusions it is necessary to look beyond GDP at the determinants of economic success.

Drawing upon the *Analysis and Background* paper and on work done in the US and a number of other European countries, this report identifies a set of indicators that together can be used to improve our understanding of the performance gap, and to monitor progress in closing it. Unlike some other competitiveness reports, there is no overall composite indicator. A single-valued index cannot capture all the dimensions of economic performance, nor can it do justice to the complexity of the economy. Instead the approach taken here is to use a series of indicators accompanied by an assessment explaining why each indicator is important, how the UK performs and what this means for the UK.

The *UK Competitiveness Indicators* complement a number of other initiatives being taken forward across Government. These include the DfEE's National Learning Targets, the specific competitiveness targets set for the Regional Development Agencies, Scottish Enterprise and the Welsh Development Agency, the Regional Competitiveness Indicators published by the Department of Trade and Industry, the DETR's Sustainable Development

¹ The widely used OECD definition of a nation's competitiveness is "the degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term".

Indicators and the DSS's Poverty Indicators. The *UK Competitiveness Indicators* are consistent with these other initiatives, and build upon other analyses.

Structure of the UK Competitiveness Indicators

The indicators are grouped under four headings working from the business environment and inputs, through processes to results:¹

- **the business environment** – measures of macroeconomic stability, competition, business perceptions and the quality of life in the UK;
- **resources** – measures of human and physical capital, finance, technology and R&D;
- **innovation process** – measures of commercial exploitation of science and technology, entrepreneurship, diffusion of knowledge across borders and between firms; and
- **results** – GDP per head, productivity, employment and trade, and the changing structure of output.

The indicators under these headings reflect key themes in the White Paper and the *Analysis and Background* paper, in particular those of promoting competition, strengthening British capabilities and encouraging people to collaborate to compete.

Apart from macroeconomic stability and a well developed institutional framework, **competition** has a central role to play in shaping the business environment. It is seen both as a force behind the development of the knowledge driven economy and a stimulus to productivity improvement in general. The degree of competition in an economy depends on the whole range of factors determining how firms interact. Across the economy, competitive pressures will depend on openness to foreign trade and investment, the domestic regulatory environment, the extent to which markets are liberalised, and the degree of protection against monopoly power.

The White Paper also identified the need to develop UK resources or **capabilities** in key areas – creating and exploiting scientific knowledge and technology; fostering enterprise and innovation, which in turn depends on well functioning capital markets; and improving the skills of the

workforce, while ensuring their skills are used effectively.

The development of a knowledge driven economy is also changing the way firms organise themselves, promoting new partnerships between employers and employees and encouraging collaboration between firms in networks and clusters. Two basic processes were identified that required greater collaboration within and between firms:

- The fortunes of the firm are more dependent on the development of the knowledge within it. Managers have to pay greater attention to ensuring that the right incentives are set and the right relationships established in the workplace to ensure knowledge is used effectively and developed. Meanwhile, the ease with which information can be spread facilitates contracting out and new forms of business organisation; and
- The nature of competition between firms is changing. Increasingly, firms are finding that to share development costs and to keep up with rapidly advancing best practice, they have to develop new formal and informal links. Sometimes, this can lead to the emergence of clusters of high performing firms in a region.

The indicators chosen

In order to assess performance, we have identified 39 indicators to be monitored. These indicators – listed in the Contents page – are to be tracked over time and, where possible, across countries. International comparisons are based on the G7, and may go beyond the G7 where data is available and where other countries have an interesting story to tell. Where comparable international data are not available, UK time series data is used instead.

Many aspects of the knowledge driven economy remain imperfectly measured. Some activities are entirely new, while others are inherently difficult for the statistical authorities and businesses to quantify. For instance, the knowledge available to an enterprise, so important to competitiveness, is much harder to measure than its physical assets. However, there is enough information to compile a set of indicative statistics that can enable us to benchmark UK performance.

¹ This structure is based loosely on a model developed for Massachusetts, the *Index of the Massachusetts Innovation Economy*, published by the Massachusetts Technology Collaborative.

Measurement difficulties mean that a proxy often has to be used for an aspect of performance that needs to be captured (e.g. innovation needs to be proxied by a mix of indicators such as R&D spend and patent counts). The measurement of the size of the knowledge economy itself is problematic. In the *Analysis and Background* paper, the growing use of knowledge in the economy was illustrated by the share of knowledge intensive sectors such as aerospace or business services. This indicator is included here using a slightly wider definition, and a similar approach has been used in the trade performance indicator to look at how the UK's comparative advantage is changing.

However, illustrating the importance of knowledge in this way understates the use of knowledge in the whole economy – in nominally “high-tech” sectors or otherwise. For this reason, the OECD have recently widened their definition of the knowledge-intensive sector to include some sectors which use high technology methods of production and not just those which produce high technology products. However, the growing importance of knowledge in other “traditional” sectors is also important, but much more difficult to track.¹

The Data Notes and Sources section explains how the indicators were compiled and raises issues about the data that need to be taken into account in interpreting the indicators.

As understanding and measurement techniques improve, it is likely that new indicators will be generated by academics, Government or other institutions that could usefully be incorporated in the *UK Competitiveness Indicators*.

The following four chapters describe the 39 indicators, and appraise our performance under each. The main policy conclusions are summarised at the beginning of each chapter where historical performance against each of the indicators is assessed under three headings: signs of strength; performance only average; or clear weaknesses. This is illustrated in a “traffic lights” diagram, where, broadly speaking, the green zone corresponds to performance matching the top two of the G7, while the red zone denotes performance in the bottom two. Equivalent rating schemes are employed when comparisons are made with other countries or over time.

¹ The DTI published a paper on *Manufacturing in the Knowledge Driven Economy* in November 1999.

Chapter 2: Business Environment

The context in which business operates, innovates and competes, much of which is beyond the control of individual firms, is a key determinant of performance. Business is more likely to flourish in an economy characterised by stability, flexibility and a high quality of life.

Five areas of the business environment are considered in the UK Competitiveness Indicators:

- **Macroeconomic environment** – instability affects business confidence, the cost of capital and the willingness of entrepreneurs to take risks.
- **Competition** – strong domestic and foreign competition encourages the development of new products and processes.
- **The labour market** – in a rapidly changing world, the labour market needs to be responsive to new circumstances if employment opportunities are to be generated and conditions created for sustained productivity growth.
- **Business perceptions of UK institutions** – factors such as the legal framework and the efficiency of the regulatory system affect the willingness of firms to invest.
- **Quality of life** – there is increasing recognition that quality of life is not only the key goal of economic activity, but an important determinant of economic performance.

The traffic light summarises the historical performance of individual indicators, with each indicator assigned to a band on the basis of the assessment set out in the rest of this chapter. There is no international comparison for the quality of life indicators (sustainable development), but it appears in the average box because while progress is being made, there is much more to be done.

The analysis shows that despite a history of macroeconomic instability, there are now many positive features in the economic environment, which should give our businesses the right platform to achieve the standards of the best.

Following a period of macroeconomic volatility, the prospects for economic stability have now improved. The UK appears to have an economy that is open to international trade and investment, with a labour market widely regarded as functioning well. This is reflected in a good unemployment performance, at least by European standards. Business perceptions of the political, institutional and regulatory environment are relatively positive and we score well on some measures of the quality of life.

However, comparisons looking at price levels suggest that in many areas competition can and should be more intense. There are still concerns about trends in cost competitiveness and doubts about whether we have a sufficiently discerning and demanding consumer base. In addition, levels of long-term unemployment and youth unemployment are still a problem. The Government has taken action in all these areas, although it will naturally take time for the measures to have their full effect.

Summary of Business Environment Indicators

- | | |
|-----|---|
| 2.2 | Openness to trade and foreign investment |
| 2.6 | Industrial action |
| 2.7 | Labour market regulation |
| 2.8 | Business perceptions of the institutional and political environment |
| 2.3 | Prices |
| 2.4 | Unemployment |
| 2.5 | Diversity of employment opportunities |
| 2.9 | Sustainable Development Indicators |
| 2.1 | History of macroeconomic volatility |

The green band shows those areas where the UK has signs of strength. UK performance is regarded as only average in those indicators placed in the amber box. Indicators in the red section show clear signs of weakness. Within each of the three bands, indicators are listed in order of their appearance in this chapter.

2.1 Macroeconomic volatility

Instability has been a long-term problem, but is set to improve

Why is it significant?

Instability and uncertainty are bad for business. Volatile interest rates, high and unstable inflation and uncertainty over the future course of output and demand undermine business confidence and damage the incentives to invest and plan for the long term.

Of course, uncertainty cannot be banished altogether. Swings in output are a natural feature of modern economies. However, there is a clear difference between a natural process of change and economic instability created by poor macroeconomic management.

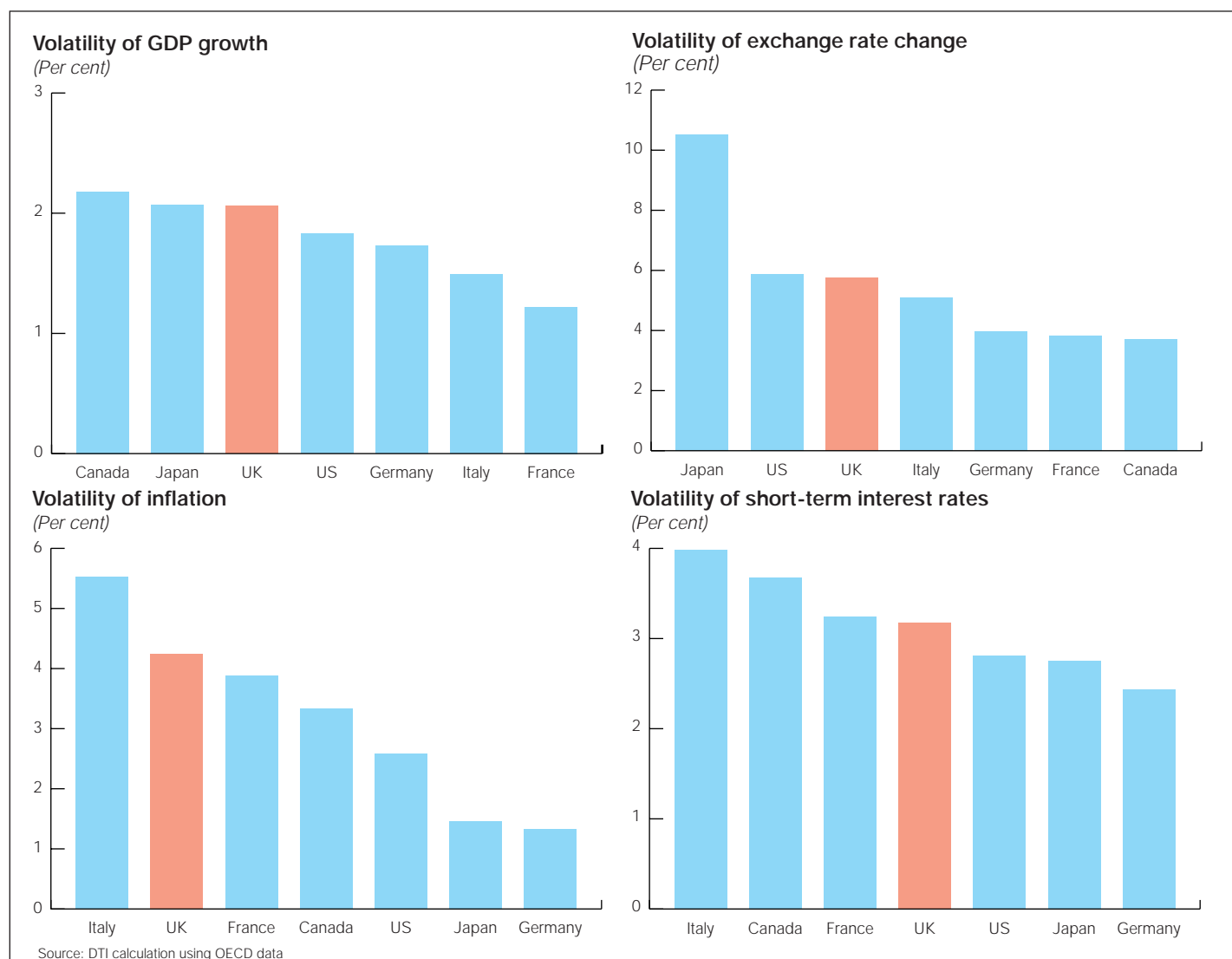
How does the UK perform?

In the last three decades, the UK's record on economic volatility has been poor, with damaging effects on incentives

and growth. This is not simply because of fluctuations in the international economy. The UK has been more volatile than other economies, partly due to policy choices in macroeconomic management. During this period, there were frequent changes in the monetary and fiscal objectives. UK monetary policy, at different times, gave prominence to or targeted broad money, narrow money, nominal GDP, the exchange rate and inflation. Fiscal objectives tended to shift over time. The resulting uncertainty contributed to lower levels of investment, productivity and, ultimately, growth.

This instability in the macroeconomic policy framework is reflected in the volatility of the economy. Chart 2.1 shows the volatility of each G7 country's growth rates, exchange rates, inflation rates, and nominal short-term interest rates for the period from 1979 to 1998.

Chart 2.1: Volatility in the G7 1979-1998
(Measured by standard deviation in percentage points)



During this period, the UK was one of the G7's most volatile economies. The UK had one of the most volatile growth rates and also suffered the two deepest and longest recessions in the G7 in the post-war period, as well as one of the largest booms. Despite a relatively active monetary policy, as shown by the volatility of short-term interest rates, the UK has also had the second most volatile inflation rate.

Further analysis can be undertaken to see how the UK's volatility experience has been changing over time. Analysing a succession of ten-year periods from 1979 to 1998 suggests that inflation rate volatility has remained roughly constant since 1985, while the volatility of the UK's growth rate has been falling. Nevertheless, OECD estimates of the output gap show that the UK had the most volatile economic cycle of any of the G7 economies in the late 1980s and early 1990s.

What does this mean for the UK?

It is clear that the UK had a more volatile macroeconomic environment than its G7 competitors between 1979 and 1998. This contributed to our relatively poor productivity and investment performance. Over the last full international economic cycle, 1982-1993, the UK invested a lower share of GDP than any other G7 country.

The UK needs a period of sustained stability. Government should aim to avoid unnecessary fluctuations in output and design macroeconomic policies to promote stability and

reduce uncertainty. For this reason, the Government has reformed the macroeconomic framework to focus policy on stability. The Bank of England was given operational responsibility to set interest rates to meet the Government's inflation target. As data on inflation expectations shows, this has increased the credibility of the Government's commitment to low inflation. The Government also enshrined the Code for Fiscal Stability in legislation to enhance the credibility of the commitment to setting fiscal policy on a sustainable basis, including meeting two fiscal rules:

- the golden rule that the current budget be in balance or surplus over the economic cycle; and
- the sustainable investment rule that over the economic cycle net public debt as a proportion of GDP remain at a prudent and stable level.

The transparent and forward-looking monetary and fiscal policies now put in place will reduce the risk of instability being caused by short-term political factors and focus macroeconomic policy on the long-term interests of the economy. This in turn will encourage business to plan and invest for the long term.

As a result of these policies, the future looks promising. The OECD has projected macroeconomic performance to the year 2000, and the implication of their analysis is that the UK will become an absolutely and relatively less volatile economy.

2.2 Openness to trade and foreign investment

The UK remains relatively open

Why is it significant?

Competition drives companies to improve productivity, to reduce prices and to innovate. It benefits consumers and improves the competitiveness of the UK economy.

However, competition is difficult to quantify and cannot be measured by a few standard indicators. Competition is a complex and multi-dimensional dynamic process and the key drivers of competition vary considerably between markets. Competition is affected by the structure of markets, in particular the degree of concentration, the ease of entry, the openness of an economy to international trade and foreign direct investment (FDI), the rate of innovation, the conduct of companies in a market, and the strength and effectiveness of how competition policy is enforced.

Moreover, the degree of competition is also influenced by the attitudes of consumers. By being flexible in their buying patterns, assertive, demanding and well informed, consumers can enhance competitive pressures and stimulate firms to produce at the lowest cost. Furthermore, sophisticated consumers can encourage innovation by providing a market for new and novel products.

Economies that are open to trade and FDI are able to specialise in producing what they do best. Openness facilitates technology transfer, spreads best practice and promotes access to the global knowledge pool. It opens up new markets and increases the potential returns to new ideas. There is also considerable evidence that industries that

are open to foreign competition perform more strongly, that inward investment boosts productivity, and that outward investment complements exports and technology transfer.

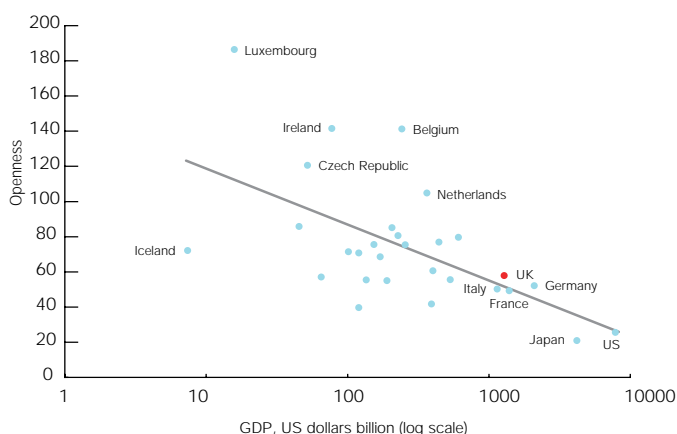
How does the UK perform?

Measuring competitive pressures in terms of openness to trade, the UK has a mixed record. One measure of openness to trade is shown in Chart 2.2.1 which takes account of the fact that trade as a proportion of output tends to be higher for small countries, and shows that the UK performs at least as well as can be expected for its size, against other OECD countries.

The extent of barriers to trade is another aspect of openness. Two important indicators are tariff rates and the frequency and import coverage of non-tariff barriers. The best figures available are for the EU, with whom we share a common trade policy. Average tariffs on imports to the EU in 1996 were 8 per cent compared with 5 per cent in the US and 3 per cent in Japan. Non-tariff barriers affect 19 per cent of EU tariff lines, slightly above levels in the US (17 per cent) and much higher than in Japan (11 per cent). But the proportion of imports covered by non-tariff barriers is about the same in all three cases, around 7-8 per cent.

While the UK's performance on openness to trade is about average, it has a much better story to tell on FDI. In terms of the stock of FDI, the UK is the main location in Europe for inward investment and has the second

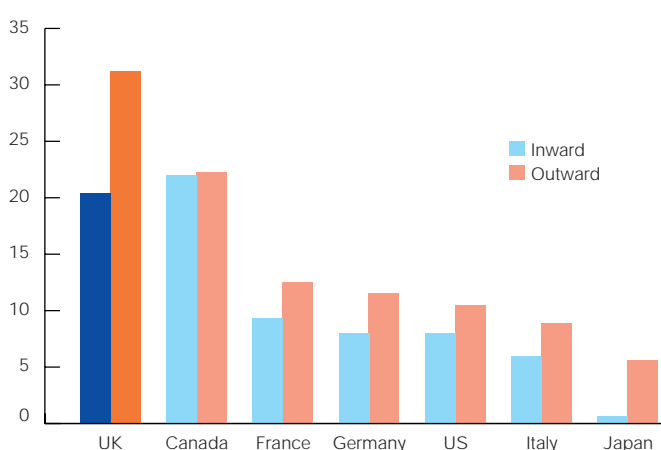
Chart 2.2.1: Relationship between openness and GDP in 1997



Source: DTI calculation using OECD data

Note: Openness is defined as imports plus exports of goods and services as a percentage of GDP

Chart 2.2.2: Stock of foreign direct investment in 1996 (Per cent of GDP)



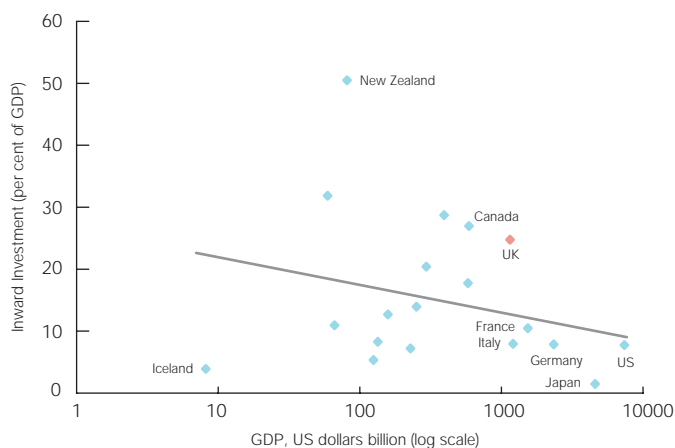
Source: OECD

largest stock of inward investment in the world after the US. We also have the largest stock of outward investment in the world. The UK has a similarly good record on flows of inward and outward investment, but the focus here is on stocks because flows can be very erratic year-to-year.

FDI as a proportion of GDP is used as the basic indicator for comparisons across countries (Chart 2.2.2). The UK has one of the highest ratios of FDI to GDP in the G7 countries. However, in common with trade, the size of the economy will influence this ratio. Smaller economies tend to be more open.

The relationship between the size of the country and the foreign investment ratio can be seen more clearly in Chart 2.2.3 below. This shows the relationship between the inward investment ratio and GDP. The UK's position firmly above the line shows the relative strength of the UK's inward investment performance. Outward investment shows a similar picture.

Chart 2.2.3: Relationship between inward investment and GDP in 1996



Source: DTI calculation using OECD data

What does this mean for the UK?

Looking at trade and FDI together confirms the perceptions of organisations such as the OECD and IMD that the UK is very much a part of the global economy. The UK's relative openness means that our businesses benefit from operating in an environment where best practice is observable, and where new ideas can be exploited.

But barriers to trade and investment remain, and the UK must continue to work with our EU partners and the World Trade Organisation to remove them. Competition policy needs to be enforced throughout the supply chain to ensure that the benefits of freer trade reach consumers. Studies also show that the UK lags behind its competitors in adopting new techniques and processes. UK business face being overtaken unless it has the capability across the board to take advantage of its links with foreign world-class companies and use these contacts to emulate the best. Again, the importance this Government attaches to competition policy will be a driving force behind the adoption of best practice.

2.3 Prices

US competition is the most intense

Why is it significant?

While measures of openness to trade and the extent of FDI indicate the degree to which the UK is open to international competitive forces, price measures can also provide an insight into the level of competition. Indicators such as relative national price levels, price convergence between countries and the mark-up of prices over costs can give a flavour of competition within an individual country.

There are a number of reasons why prices may differ between countries. If non-traded input costs such as the rent paid for land differ then, for a given strength of competition, prices would also differ. Economies of scale can also affect price comparisons. But prices can also vary as a result of different levels of competitive intensity. So relative prices, and the convergence of those price levels, can be an important indicator of competition.¹

In principle, pricing above marginal cost might be an indicator that competition is weak. However, in industries that are characterised by dynamic, innovative competition, firms can only survive if they earn a return on their innovations. Without a positive mark up there is no incentive to innovate. Nevertheless, evidence that mark-ups differ between countries can indicate the relative strength of competitive pressures in different countries.

It might be thought that competitive pressures can be measured by an aggregate indicator of concentration or market structure. However, there are significant conceptual problems with the use and interpretation of such indicators. Measures of market structure are by themselves meaningless unless accompanied by assessments of entry conditions and the full range of other factors that affect the intensity of competition between firms in the industry.

How does the UK perform?

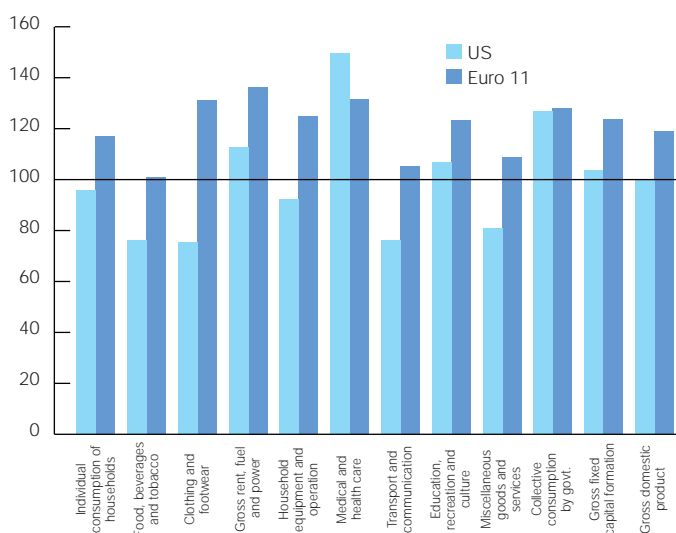
One comprehensive source of data on international price differentials is the OECD's recently published triennial survey of price levels. The results of the 1996 survey are shown in Chart 2.3.1. For a number of reasons, richer countries, such as the US, with relatively high GDP, productivity levels and wage levels might be expected to have relatively

higher prices. However, the OECD survey shows that prices are lower in many key sectors in the US than in the UK, particularly those most visible to visitors such as food and clothing. The chart also shows that there are significant areas where the US faces high prices, particularly medical and health care, which bring up the US's overall price level.

Compared to France and Germany, at the level of the whole economy the UK came out in 1996 as a relatively low priced country. Analysis undertaken by the European Commission of the OECD data has shown that this result held from 1985 to 1996. The comparison is however influenced by exchange rate movements. The appreciation of sterling against European currencies since 1996 will have increased the UK price level relative to France and Germany, though detailed comparisons are not yet available.

Recently, there has been considerable concern that prices in certain sectors in the UK are currently higher than elsewhere. One of these sectors is the car industry, which is currently being investigated by the Competition Commission (CC). The CC has not yet reached any final conclusions on any aspect of the enquiry. However, its present view is that due to certain restrictions operating within the industry framework, "prices of new cars are higher in the UK than they would be in a less restrictive environment."²

Chart 2.3.1: Relative price levels in 1996
(UK = 100)



Source: OECD

¹ Price convergence by itself is neither a necessary nor a sufficient condition for an increase in competition, since absolute price parity can result from collusive behaviour as well as from the theoretical situation of perfect competition.

² Competition Commission press release, 5 October 1999.

The European Commission has also undertaken a comparative car prices survey across the EU. The most recent version, covering prices on 1 May 1999, showed that “the UK remained the most expensive market for 62 of the 75 best selling models examined.”

More generally, there is a lack of robust and up-to-date information that enables a comparison of current price differences. The OECD data for 1999 is not expected until 2002. The DTI is therefore commissioning comprehensive research into prices in the UK, France, Germany and the US. This will report in January 2000.

Turning to evidence on mark-ups, calculations by the OECD, reported in Table 2.3.1, suggest that economy-wide mark-ups are very similar in the US and the UK. However, this result masks considerable sectoral variation.

Table 2.3.1: Mark-up ratios in selected sectors, 1980-92

	US	UK	OECD average (14 countries)
Manufacturing	1.15	1.15	1.19
Electricity, Gas, Water	1.34	1.34	1.54
Construction	1.17	1.25	1.20
Wholesale, Retail Trade, Restaurants, Hotels	1.25	1.37	1.45
Transport, Storage and Communication	1.33	1.25	1.36

Source: OECD, Economic Studies, 1996

A similar OECD study confirms the result that overall mark-ups in manufacturing were very similar in the UK and the US between 1970 and 1992, and that they were below those seen in France, Germany and Japan.¹ In the ‘wholesale, retail trade, restaurants and hotels’ sector, the US seems to have the lowest margins. This is consistent with the OECD data on prices in Chart 2.3.1 above, which showed the US to be relatively cheap in food and clothing and footwear.

What does this mean for the UK?

Competition is a complex and multi-dimensional process that cannot easily be measured. The assessment of competition issues is a microeconomic process that does not produce internationally comparable aggregate indicators. This complexity is reflected in the Guidelines to the Competition

Act 1998 that have recently been published by the Director General of Fair Trading.² The Government is currently developing measures of the effectiveness of competition policy.

The indicators of openness in the previous section and the analysis of relative price levels and mark-ups show that, in comparison to the major European economies, the UK performs relatively well. Nevertheless, comparisons with the US show significant differences persist. Lower production costs and economies of scale may be part of the explanation, but stronger competition in the UK could bring prices for consumer goods more in line with those in the US, and this would produce significant benefits for UK consumers.

There are a number of developments within Europe which are likely to lead to significantly stronger competition across Europe and have positive effects on UK competition. The Single Market Programme will continue to have a positive impact by integrating markets more effectively. This process will be enhanced by the introduction of the euro – even if the UK does not join. The euro will increase price transparency to consumers and improve their ability to identify the lowest prices.

The mixed picture on competition suggests that there is no room for complacency. Moreover, competition is such an important force for innovation and efficiency that close attention on competition policy is always required, whether the UK appears to be performing relatively well or not. This Government has already acted to improve competition in the UK by introducing the Competition Act 1998 which is due to come into force on 1 March 2000. This, together with the extra resources that are being made available to the Office of Fair Trading, is a significant strengthening of competition law, and is a long overdue reform of the competition legislation.

The Government has begun a fundamental review of domestic merger legislation. Effective and efficient regulation of mergers is vital to ensuring open and competitive markets, and to providing the clear and stable commercial framework business needs. In August, the DTI published a consultation document proposing major reforms aimed at modernising the system and ensuring that its operation is as clear and predictable as possible. UK consumers can also help to generate a more competitive environment. The Government is committed to empowering consumers through its Consumer Strategy which will improve advice on consumer rights.

¹ Oliveira Martins, J. and Scarpetta, S. (1999): *The levels and cyclical behaviour of mark-ups across countries and market structures*; OECD Economic Working paper No 213.

² Copies of the Guidelines to the Competition Act (1998) are available from the Office of Fair Trading's web-site: www.oft.gov.uk.

2.4 Unemployment

Unemployment lower than in Europe but above US and Japan

Why is it significant?

The knowledge driven economy is characterised by change and this requires labour markets to operate efficiently and workers to become more flexible. The efficiency of the labour market is difficult to measure, but analysis of unemployment, changing employment patterns, industrial relations and survey evidence of the impact of regulation can be used to give an indication of how smoothly the labour market is operating.

While the headline rate of overall unemployment is a good starting point in understanding how well labour markets operate, it is also important to consider how far this unemployment rate is structural and how much is driven by the business cycle. There are also some types of bottleneck that can be particularly damaging to the economy's performance. Long-term unemployment not only has an acute personal cost, but is often associated with a loss of the unemployed's ability to participate in the labour market. Similarly, youth unemployment can be very damaging to future employment prospects. A track record of unemployment can be a disadvantage in competing with a new cohort of entrants to the labour market. The extent of youth unemployment is also a measure of how the labour market caters for new entrants who cannot bring the benefits of experience and on-the-job training to the workplace.

How does the UK perform?

Comparisons of standardised unemployment rates across the G7 (Chart 2.4.1) show the UK performing well by European standards. The US and Japan show the strongest performance on unemployment, although via very different institutional structures in the labour market.

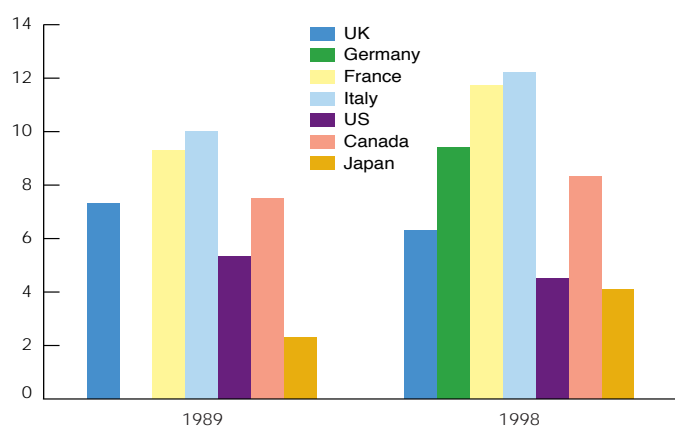
Estimates of structural unemployment are subject to both numerical and conceptual uncertainties. However, OECD estimates of structural unemployment¹ show a similar pattern across countries, with structural estimates moving in the same direction as actual unemployment rates. This message on structural unemployment is also confirmed by looking at flows into and out of unemployment.

Analysis of these flows shows that the number of people losing a job and becoming unemployed in Europe and the UK is no higher than in the US or Japan. The crucial difference is that there is a much greater likelihood of finding a job more easily after a period of unemployment in the US and Japan than in Europe.²

Chart 2.4.2 shows that both the US and Japan's relatively strong unemployment performance is supported by a very low share of long-term unemployment in the total and relatively good performances on youth unemployment. On these measures, the UK also generally performs well by European standards.

Chart 2.4.1: Standardised unemployment rates

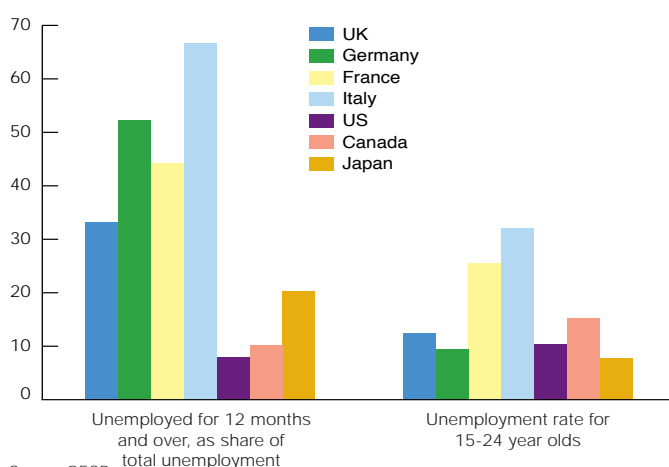
(Per cent of labour force)



Source: OECD

Chart 2.4.2: Long-term and youth unemployment in 1998

(Per cent)



Source: OECD

¹ Based on Secretariat estimates of the non-accelerating wage rate of unemployment (NAWRU) made for the OECD *Economic Outlook* No. 60, 1996.

² OECD *Employment Outlook*, 1995.

What does this mean for the UK?

Although UK unemployment performance is relatively good in European terms, it does not match the standards of the United States or Japan. The Government's policies to achieve long-term sustainable growth, along with the Welfare to Work programme and tax and benefit reforms, are all improving the prospects for a high and sustainable level of employment, and a low level of unemployment, in the future.

2.5 Diversity of employment opportunities

A wide range of employment opportunities available to employees and employers

Why is it significant?

As the economic environment changes, employers' needs for particular types of labour also change. A labour market with a wide and diverse range of employment opportunities is one way to give business the flexibility it needs. Different patterns of working can also be a way of getting round other restrictions, often regulatory ones, in the way the labour market operates. For example, businesses in some sectors have responded to changing market conditions and consumer preferences by extending opening hours. Changed opening hours may not fit comfortably with the 'traditional' 9-to-5 job. In these circumstances, offering part-time work is a means of extending cover in a flexible manner.

Equally, the existence of a wide range of employment opportunities is likely to benefit potential workers by making it easier to find the right 'match' between work and other interests or commitments. Part-time work, for example, offers the possibility of paid work to people whose other commitments (such as caring for dependants or education) mean they cannot take up a full-time job.

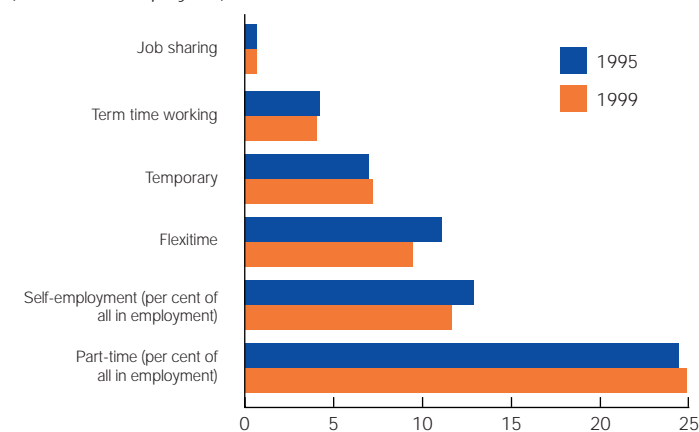
How does the UK perform?

Chart 2.5.1 presents Labour Force Survey data on the numbers of people in a range of specified employment patterns. The incidence of these forms of work has, in aggregate, increased in recent years. Longer-term comparisons are possible for part-time work and self-employment (Chart 2.5.2). Part-time work has increased in significance since the 1980s, and self-employment which grew in the late 1980s has been relatively stable in the 1990s.

Recent comparable data on part-time, temporary and self-employment is available for EU Member States, drawn from the European Labour Force Surveys. Chart 2.5.3 shows that the proportion of people working part-time is relatively high in the UK, when compared to other EU Member States, whereas the incidence of self-employment is about average and that of temporary employment is below the European average.

Chart 2.5.1: Working patterns in the UK

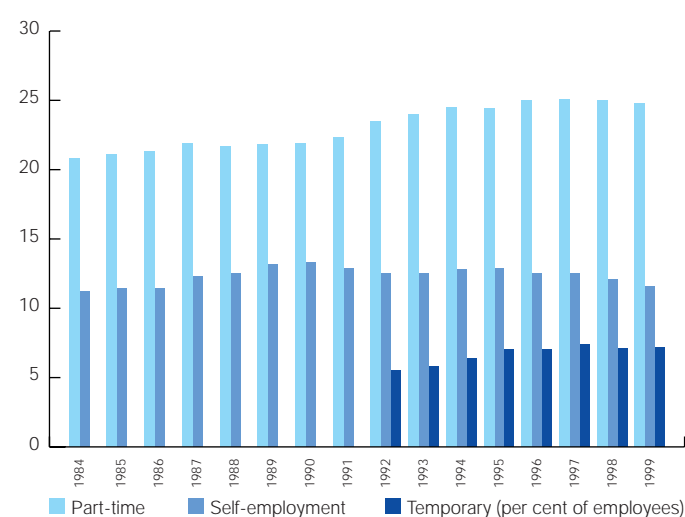
(Per cent of employees)



Source: ONS, Labour Force Survey

Chart 2.5.2: Part-time, temporary and self-employment working in the UK

(Per cent of all in employment)



Source: ONS, Labour Force Survey

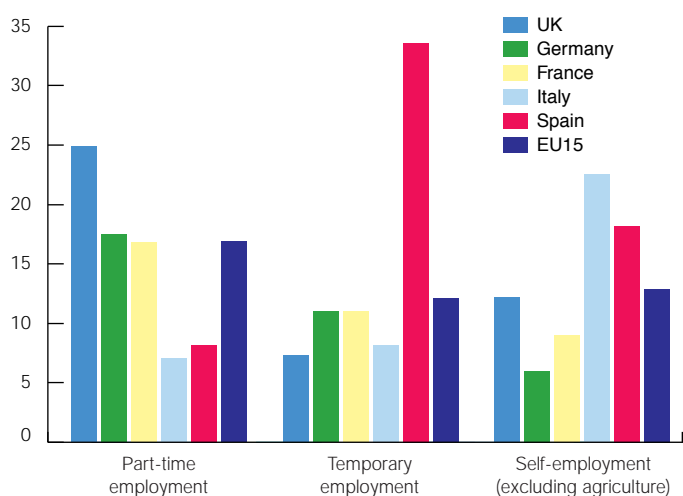
What does this mean for the UK?

For both employers and potential workers, it is the range of employment opportunities available that is crucial to improved labour market efficiency. The mix of employment opportunities taken up in practice may vary over time in response to employer requirements and the needs of potential workers. Thus the incidence of some particular forms of work may increase over time while others may decrease. For example, the Government's National Childcare Strategy aims to improve the supply of affordable childcare. An increase in the supply of childcare may enable some currently outside the labour force to work on a part-time basis; but it may also enable some currently working part-time, to work on a full-time basis.

While an improvement in the mix of employment opportunities is important for competitiveness, the growth of new forms of employment also needs to be carefully monitored. Some of these forms of employment, such as part-time work, may be associated with less access to non-wage benefits or training. Temporary and self-employment status has in the past been used as a device by some employers to evade their legal responsibilities. The Government is taking steps to curb any cases of abuse, through powers it has taken in the Employment Relations Act and implementation of the European Directives on part-time work and fixed-term contracts.

Chart 2.5.3: Part-time, temporary and self-employment working in selected EU member states in 1997

(Per cent of total employment)



Source: European Labour Force Survey

2.6 Industrial action

Collective disputes have fallen to low levels

Why is it significant?

The level of industrial action provides one indicator of the general employer-employee relations climate. A low level of industrial action is a necessary – but not sufficient – condition for constructive dialogue, partnership at work and improved business performance.

How does the UK perform?

Chart 2.6.1 presents UK time series data for the numbers of days lost due to industrial stoppages. Rates in the last couple of years are the lowest since records began in 1891 and well below the levels of the 1970s and 1980s.

Comparisons based on ILO and OECD data suggest that, in recent years, the UK has seen a lower rate of labour

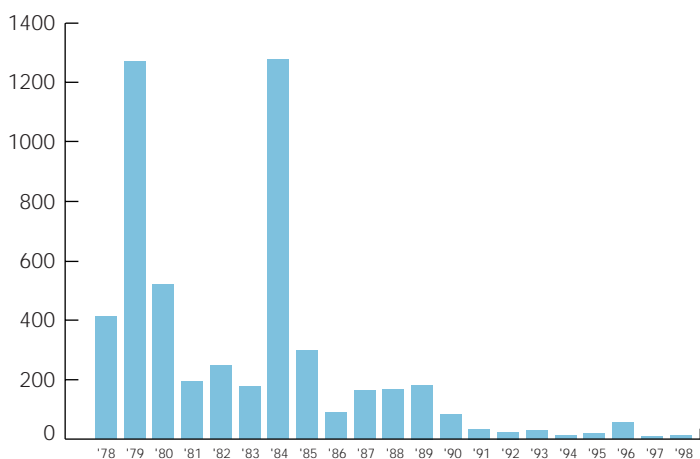
disputes than Canada, Italy, France or the US, although the incidence of labour disputes in Japan and Germany remains very low (see Chart 2.6.2).

What does this mean for the UK?

Strikes – and the economic disruption they bring – are now a comparatively rare event in the UK. The Government intends to build on this through the measures it is taking to promote a partnership approach at the workplace, one which involves employers and employees working together to improve the success of their businesses. The Government intends to support new and innovative partnership projects through a Partnership Fund.

Chart 2.6.1: UK labour disputes

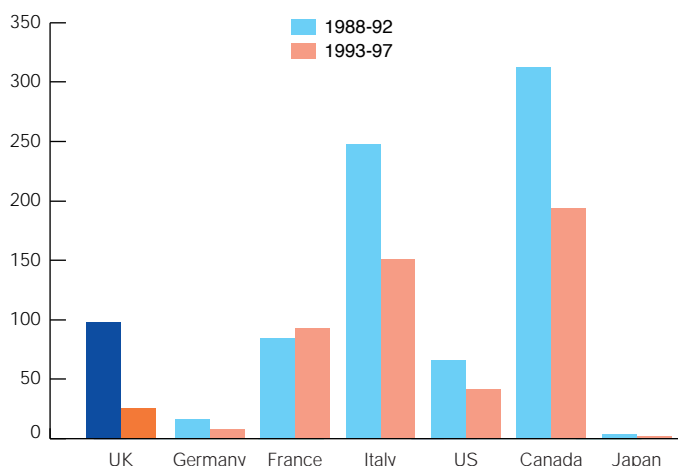
(Working days lost per 1000 employees 1978-1998)



Source: ONS

Chart 2.6.2: International comparison of labour disputes

(Working days lost per 1000 employees)



Source: ONS, Labour Market Trends

2.7 Labour market regulation

Business leaders view labour market regulation favourably

Why is it significant?

The ability of employers to offer a diverse range of employment opportunities to meet their needs and those of their employees, along with the ability of the unemployed or inactive to choose to take part effectively in the labour market, is obviously affected by how the labour market is regulated. Labour market regulation is a necessary and important component of the institutional framework. Getting the level of regulation right is the key.

How does the UK perform?

Direct measures of the degree of labour market regulation are not available. The International Institute for Management Development (IMD) in its World Competitiveness Yearbook surveys business leaders on whether labour market regulations are 'too restrictive or flexible enough'. The results of this suggest that, taking account of the full range of employment legislation, the UK labour market has a regulatory environment perceived as being on a par with the US and significantly better than other major European countries (Chart 2.7).

Another measure of the burden of government intervention in the labour market is the mark-up on wage

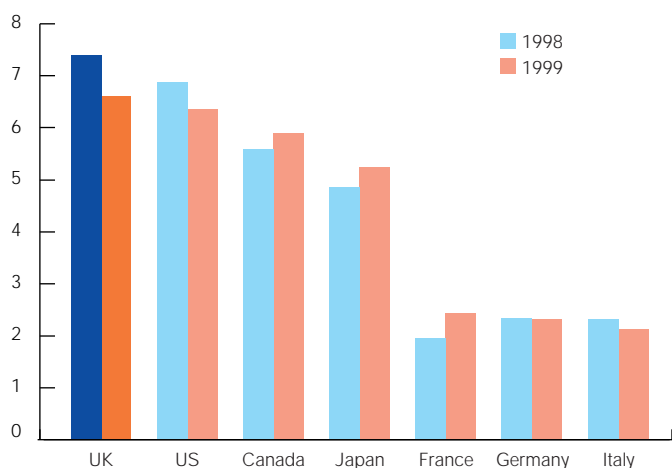
costs faced by employers as a result of, for example, social security charges, compulsory pension contributions and health insurance. Figures compiled by the US Bureau of Labor Statistics show that the UK compares very favourably with other G7 countries on this measure. Non-wage labour costs in 1997 amounted to only one eighth of total labour costs in the UK, compared to between one quarter and one third in other major European countries.

What does this mean for the UK?

The results reflect concerns across continental Europe that European labour markets are over-regulated and that this is holding back economic performance. In the UK, the level of regulation is seen by business in a relatively favourable light. But business perceptions of labour regulation became less favourable in 1999, perhaps reflecting business concerns about recent Government measures. However, the Government's recent initiatives such as the minimum wage and measures associated with our signing of the EU Social Chapter are designed to put in place a basic framework of workers' rights and standards, whilst at the same time minimising any additional burdens or red tape. These improvements in working conditions are important for long-run competitiveness.

Chart 2.7: Business perceptions of labour regulation

(Survey score, 0-10 scale)



Source: IMD

Note: A higher score implies a more favourable business perception

2.8 Business perceptions of the institutional and political environment

A positive view

Why is it significant?

The ability of any country to develop a stable, flexible and competitive economic environment depends on its institutional and political structure. A competitive business environment requires a set of credible institutions committed to improving performance.

While such institutional features are important, they are difficult to quantify. One solution is to use evidence from surveys of business leaders undertaken by bodies such as the Institute for Management Development (IMD).¹ The IMD survey focuses on such characteristics as the quality of government administration, management of public finances and the extent of regulation. A similar exercise is undertaken each year by the World Economic Forum (WEF).²

The results from surveys of this type need to be interpreted with caution, since survey responses for individual years are highly related to short term macroeconomic fluctuations and can be affected by sampling problems. They are also only an indicator of how far regulation constrains business; they do not say whether this regulation is unnecessary. Governments always need to regulate. Better regulation is the objective. These results can nevertheless give an insight into perceived strengths and weakness. Perceptions are important in their own right as they can influence the choice of business location.

How does the UK perform?

The Data Notes and Sources section explains the broad range of political and institutional indicators that were used to derive Charts 2.8.1 and 2.8.2. For the first chart, these include survey measures of the incentive effect of taxation, the adaptability and transparency of the legislative process,

the legal framework and the efficiency of administration. Overall, on measures such as these, the UK was in 1998 and 1999 regarded as having the second most supportive political and institutional environment in the G7.

Of particular interest to business within this set of measures is the effect of the corporate tax system, an important factor for companies making investment decisions. Comparisons across countries are difficult because of differences in tax structures, but survey measures such as those in the IMD and World Economic Forum reports suggest that, overall, the UK corporate tax system is seen by business leaders in a favourable light.

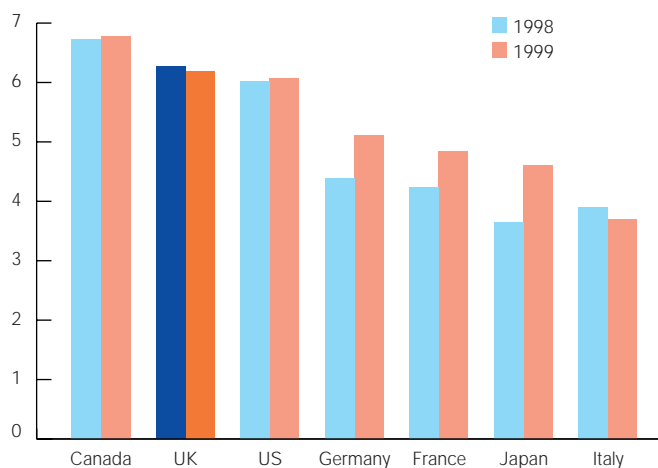
Another concern of business is the degree of government regulation. Chart 2.8.2 records the results of the IMD survey for 1998 and 1999 for the series of questions on regulation. In general, there appears to be a perception that regulation became less favourable in the UK, but this is a trend observed in other G7 countries. The chart shows that the UK is perceived to be the second most lightly regulated economy in the G7 for both 1998 and 1999. Similar results can be found in the WEF survey.

What does this mean for the UK?

The political, institutional and regulatory environment of the UK is regarded as relatively supportive. However, the indicators solely reflect the opinions of business leaders from major companies and may not be representative of the population or business sector as a whole. The Government is working to ensure that regulations are transparent and proportional and that the institutional and political environment meets the needs of all people, while maintaining this favourable business perception over the longer term.

Chart 2.8.1: Business perceptions of how institutions and government policies support competitiveness

(Average survey score, 0-10 scale)

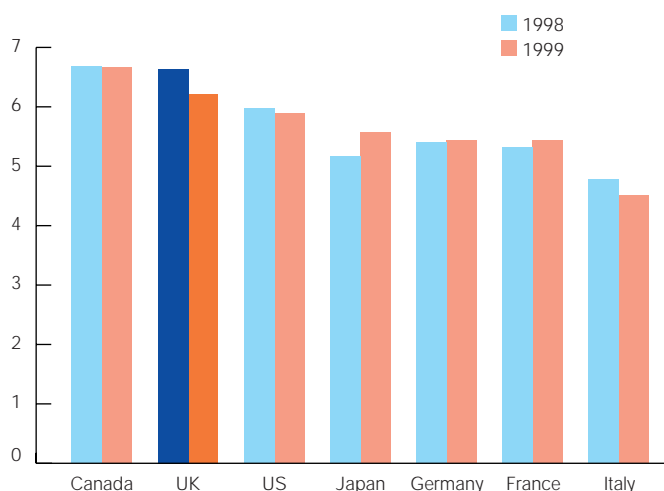


Source: Derived by DTI from IMD data

Note: A higher score implies a more favourable business perception

Chart 2.8.2: Business perceptions of regulation

(Average survey score, 0-10 scale)



Source: Derived by DTI from IMD data

Note: A higher score implies a more favourable business perception

¹ The World Competitiveness Yearbook 1999, IMD, 1999.

² The Global Competitiveness Report 1999, World Economic Forum 1999.

2.9 The Government's Sustainable Development Indicators

Good, but a lot more to be done

Why is it significant?

There is increasing recognition that quality of life is not only the key goal of economic activity, but an important determinant of economic performance. For instance, a healthier population will also be more productive at work, while quality of life can also be an important influence on firms' location decisions. Actions by individuals to improve the quality of life can also be complementary to economic progress: for example more sophisticated consumer purchasing decisions can reduce environmental degradation and stimulate the development of more innovative products.

This means high and stable levels of economic growth and employment must be consistent with the other sustainable development objectives of social progress (which recognises the needs of everyone); effective protection of the environment; and prudent use of natural resources.

Achieving sustainable development means addressing all of these objectives equally, both for present and future generations.

How does the UK perform?

It is clearly inappropriate to select a single indicator as a proxy for sustainable development. The Department of the Environment, Transport and the Regions monitor 15 headline indicators (four of which also feature in the *UK Competitiveness Indicators*), and 132 other indicators. Table 2.9 lists the headline indicators.

Other indicators cover such issues as utility prices, low pay and consumer expenditure. DETR also plan to develop a measure of consumer sophistication.

What does this mean for the UK?

Performance against these indicators will be an important consideration in determining whether we are succeeding as a knowledge driven economy or not. More information is available in *Quality of Life Counts: Indicators for a strategy for sustainable development for the United Kingdom; A baseline assessment*.

Table 2.9: The Headline Sustainable Development Indicators

THEMES, ISSUES AND OBJECTIVES	KEY INDICATORS
Maintaining High And Stable Levels Of Economic Growth And Employment	
Our economy must continue to grow	Total output of the economy (GDP) <i>(see competitiveness indicator 5.1)</i>
Investment (in modern plant, machinery as well as research and development) is vital to our future prosperity	Investment in public, business and private assets <i>(see competitiveness indicators 3.3 and 3.4)</i>
Maintain high and stable levels of employment so everyone can share greater job opportunities	Proportion of people of working age who are in work <i>(see competitiveness indicator 5.3)</i>
Social Progress Which Recognises The Needs Of Everyone	
Tackling poverty and social exclusion	Children in low income households, adults without qualifications and in workless households, elderly in fuel poverty
Equip people with the skills to fulfil their potential	Qualifications at age 19 <i>(see competitiveness indicator 3.2)</i>
Improve the health of the population overall	Expected years of healthy life
Reduce the proportion of unfit (housing) stock	Homes judged unfit to live in
Reduce both crime and fear of crime	Level of crime
Effective Protection Of The Environment	
Continue to reduce our emissions (of greenhouse gases) now, and plan for greater reductions in longer term	Emissions of greenhouse gases
Reduce air pollution and ensure air quality continues to improve through the longer term	Days when air pollution is moderate or high
Reduce the need to travel and improve choice in transport	Road traffic
Improving river quality	Rivers of good or fair quality
Reverse the long-term decline in populations of farmland and woodland birds	Populations of wild birds
Re-using previously developed land, in order to protect the countryside and encourage urban regeneration	New homes built on previously developed land
Prudent Use Of Natural Resources	
Moving away from disposal of waste towards waste minimisation, reuse, recycling and recovery	Waste arisings and management

Chapter 3: Resources

Successful innovative economies need the right capabilities. They need sufficient resources of technology, physical capital and skilled labour if they are to generate rising living standards.

Five sets of resource indicators have been chosen for inclusion in the *UK Competitiveness Indicators*:

- **Human capital** – as knowledge becomes more important to business success, it is ever more essential that workers are equipped with the right skills.
- **Physical capital** – investment is an important vehicle for ensuring the latest technology is available to business.
- **Finance** – liquid capital markets free managers and entrepreneurs to invest in new ideas.
- **Information and communication technology** – ICT allows companies to transform the way they do business, creating new markets and changing the dynamics of old ones.
- **Science and technology** – the strength of the science base is an important determinant of the capacity of a nation to generate knowledge.

The traffic light summarises the historical performance of individual indicators, with each indicator assigned to a band on the basis of the assessment set out in the rest of this chapter.

The assessment suggests that there is encouraging evidence on the strength of our science base and take-up of ICT, but progress is being held back by poor skills and under-investment.

The UK's science base is strong and our research is highly regarded around the world. However, we need to ensure continued value for money investment in the science base to safeguard this strong performance. Between the mid-1980s and the mid-1990s, government expenditure on R&D and business investment in R&D both fell relative to our main competitors.

One set of technologies that will be crucial for future performance is Information and Communications Technology (ICT). Businesses in the UK seem to be realising the importance of ICT and investing in it, although they have been less effective at putting these new technologies to the best use.

Gaps in workforce skills could be a contributory factor. Skill levels remain a cause for concern across the economy as a whole, despite the progress being made towards the National Learning Targets, which set qualification targets for the working population whether acquired during initial education or during working life.

A combination of macroeconomic instability and deficiencies in management and workforce skills has contributed to a history of under-investment. New investment embodying

Summary of Resources Indicators

3.7	Stock market size and turnover
3.11	Publications and citations of UK research in academic journals
3.2	National Learning Targets
3.5	Venture capital
3.8	Business uptake and use of ICT
3.9	ICT understanding in companies
3.10	E-commerce
3.1	Adult literacy and numeracy
3.3	Business investment per worker
3.4	Past record on government investment per head
3.6	Second tier markets
3.12	Past record on government spend on R&D per worker
3.13	Business spend on R&D per worker

The green band shows those areas where the UK has signs of strength. The UK is regarded as only average in those indicators placed in the amber box. Indicators in the red section show clear signs of weakness. Within each of the three bands, indicators are listed in order of their appearance in this chapter. Within each of the three bands, indicators are

the latest technology is an important way in which new ideas are spread through the economy.

This new investment is in certain respects being held back by the availability of appropriate finance, particularly for fast-growth, early-stage firms. The provision of equity finance, and in particular venture capital, is crucial, and although there has been a substantial increase in the amount of venture capital in recent years, a funding gap still remains.

3.1 Adult literacy and numeracy

UK lags in basic skills

Why is it significant?

Success in the knowledge driven economy requires a skilled and motivated workforce and management. The effects of the knowledge driven economy are already clearly visible in the labour market. Workers everywhere are more highly educated. Advances in technology enable firms to produce the same amount of output with fewer unskilled employees, while at the same time increasing the demand for skilled labour to operate the equipment.

The most basic skills are literacy and numeracy. People with poor levels of either will find it increasingly difficult to compete effectively in the labour market as the proportion of unskilled jobs in the total falls. Without adequate literacy and numeracy, they are unlikely to be able to take full advantage of education and training opportunities, and are at greater risk of social exclusion

How does the UK perform?

The data suggests that the UK ranks poorly on both basic literacy (Chart 3.1.1) and numeracy (Chart 3.1.2). Only the US has a higher proportion of adults with low levels of literacy. Among the countries featured in the numeracy study, UK adults also performed worst on average.

Other studies of basic skill levels in the population and workforce confirm this picture. The Skills Audit, a comparative study of skill levels in five countries, concluded that the UK basic skills position was similar to the US and Singapore but significantly behind Germany and to a lesser extent France.¹ The position was less strong in numeracy than literacy. Moreover the UK was losing ground to France and Singapore.

What does this mean for the UK?

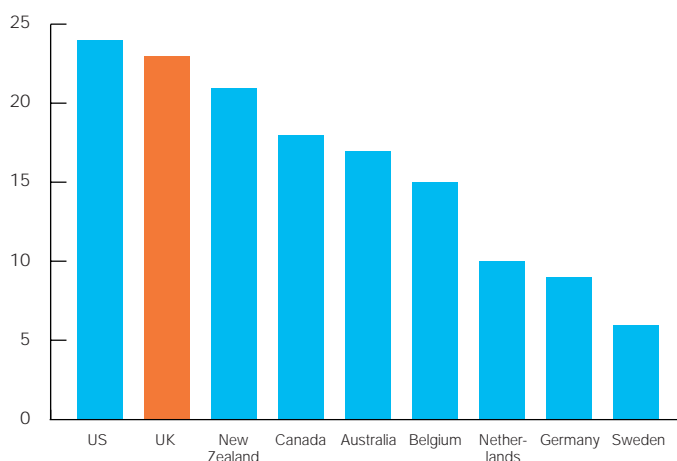
Low levels of basic educational attainment in the workforce are potentially a serious competitive disadvantage in building the knowledge driven economy. Upgrading of products and processes to meet the global competitiveness challenge will be difficult if UK workers have poor levels of literacy, numeracy and other basic skills.

Comparisons with the US suggest that deficiencies in basic skills are not necessarily a barrier to high productivity. US literacy and numeracy figures are no better than the UK's. However, studies suggest that poor basic skills in the US are compensated by a more highly qualified top layer of people who are able to seize commercial opportunities and to recognise and understand

best practice. The UK seems to fall somewhere between the US model, which depends on a relatively high proportion of highly skilled managers, and the German model where a very large proportion of the workforce has achieved intermediate skill levels. Improvements in basic skills are therefore a more urgent priority in the UK.

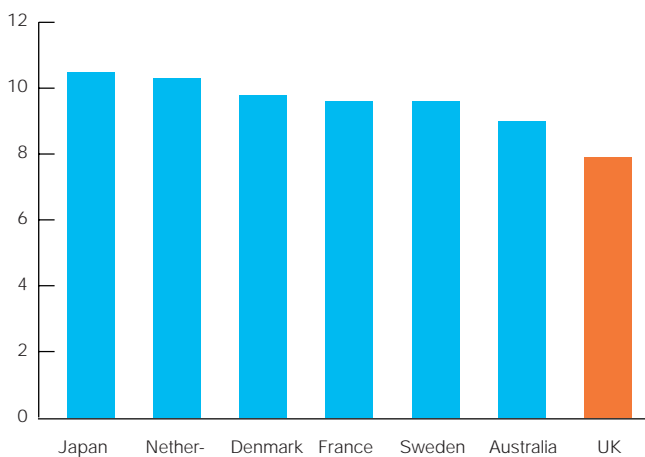
Improving skill levels is critical to improving UK productivity performance. At the level of basic skills, the DfEE are developing a national strategy for adult literacy and numeracy.² The main elements of the package will include: measures to reduce the number of functionally illiterate adults; a new curriculum, new standards and a new system of qualifications; access to a broader range of learning opportunities; and improved teacher training and inspection.

Chart 3.1.1: Adults with poor literacy skills in 1995
(Per cent)



Source: OECD

Chart 3.1.2: Scores achieved across 12 numeracy tasks in 1996
(Average number of correct answers)



Source: Basic Skills Agency

¹ *The Skills Audit: A Report from an Interdepartmental Group*, DfEE and Cabinet Office, 1995.

² *Improving Literacy and Numeracy for Adults: A Fresh Start*. Summary and Recommendations of the Working Group chaired by Sir Claus Moser.

3.2 Progress in meeting National Learning Targets

Skill levels increasing

Why is it significant?

Numeracy and literacy are basic skills, but success also requires a higher level of all-round skills. Modern theories of economic growth ascribe a central role to the accumulation and use of knowledge and the functional flexibility associated with highly trained workers. Moreover, education has an important role in creating informed, sophisticated consumers who can stimulate innovation by their willingness to try novel products.

The Government's National Learning Targets set quantitative indicators for the qualifications of the working population, both those acquired during initial education and those acquired during their working life.

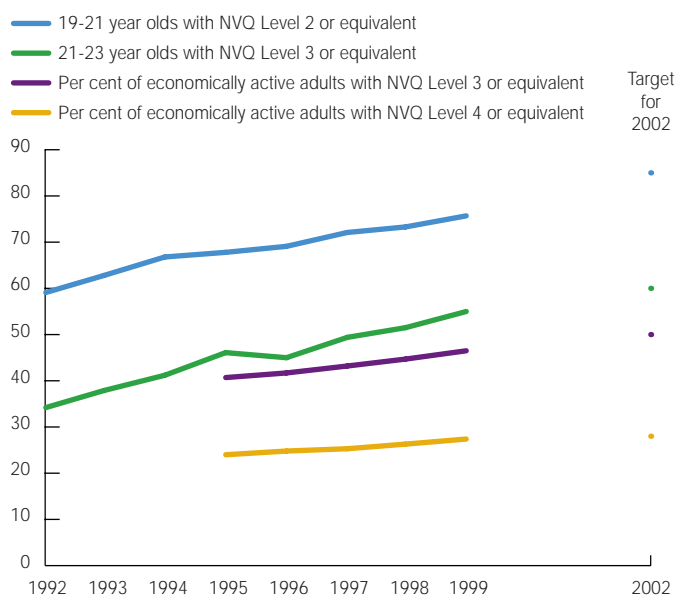
How does the UK perform?

Chart 3.2 shows the percentages of the population of working age with qualifications meeting those set out in the National Learning Targets. The data and the Targets are for England only. Comparable data for the G7 countries is not available.

What does this mean for the UK?

In all cases, the charts show that steady progress is being made towards the levels set out in the targets. The qualification base of the workforce is increasing, suggesting that the UK is going some way to developing the necessary workforce for the knowledge driven economy.

Chart 3.2: Performance against National Learning Targets
(Per cent)



Source: ONS, Labour Force Survey

3.3 Business investment per worker

UK business has consistently invested less than most of its main competitors

Why is it significant?

Investment in intangible assets such as education and skills is increasingly important in the knowledge driven economy. However, recent theoretical work has also stressed the role of investment in physical assets in generating economic growth. This is partly because it is through the acquisition of new generations of equipment that technological innovations are spread throughout the economy.

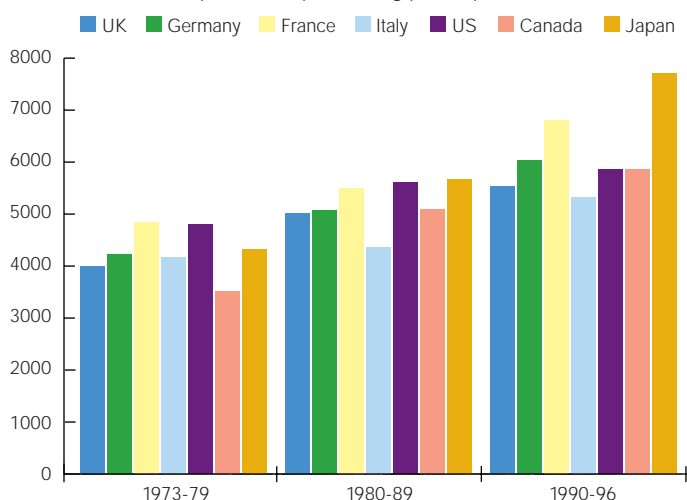
The strength of investment performance is also a symptom of economic conditions more generally. The quality of management and skills, the efficiency and liquidity of capital markets, macroeconomic stability and growth, labour market rigidities, savings rates and cultural factors all influence companies' incentives and their ability to invest. These factors also impact upon the quality of the investment that is undertaken. More investment is not always a good thing. When considering our investment performance, it is not just the quantity of investment that matters but also its quality.

How does the UK perform?

Investment performance varies over the economic cycle so it is important to look at a run of years. Chart 3.3 shows business investment per worker over the international economic cycles as defined by the OECD. The UK has consistently invested less than most of the G7.

Chart 3.3: Business investment per worker

(US dollars, at 1990 prices and purchasing power parities)



Source: OECD

These decades of under-investment are reflected in the UK having a lower capital stock than in other developed countries. The capital stock available per hour worked in the market sector (i.e. excluding the health, education and government sectors) was recently estimated to be 13 per cent higher in Japan, 19 per cent higher in the US, 33 per cent higher in France, and 40 per cent higher in Germany.¹

Measures of the quality of capital investment are difficult to come by. Some work has been undertaken comparing the relative age and sophistication of machinery and equipment in particular sectors, but no comprehensive analysis is available. Data on rates of return on investment suggest that UK compares well with other G7 countries, but that may simply be a reflection of relatively low capital-labour ratios in the UK, rather than the quality of investment as such.

What does this mean for the UK?

International comparisons of the UK's investment performance show that UK investment levels are below the levels of most of our competitors. Economic analysis supports the view that more investment could improve the UK's GDP per head. But low business investment is a symptom as well as a cause of poor economic performance. It reflects deficiencies in skills and managerial ability, entrepreneurship and innovation. It is also a result of our past record of macroeconomic instability and a disappointing growth performance.

¹ Source: Mary O'Mahony, *Britain's Productivity Performance 1950-96*, March 1999. The estimates are for 1995, which is the latest year available for these comparisons.

3.4 Government investment per head

A legacy of under-investment, now being corrected

Why is it significant?

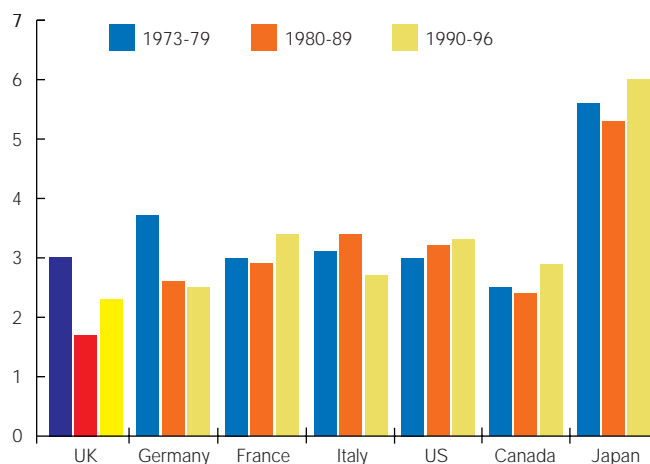
The public sector is responsible for a significant part of the nation's capital stock. The state remains an important provider of health, education and housing services, and needs to ensure value-for-money investment if they are to be delivered effectively and efficiently. Investment in transport and other infrastructure can also be an important factor in competitiveness. For example, poor transport links, or other weaknesses in communications, may be a factor hindering the development of industrial clusters, generally considered to be an important source of innovation and dynamism in the knowledge economy.

How does the UK perform?

Our public sector investment performance in the period up to 1996 has been disappointing. Chart 3.4 shows general government investment as a proportion of GDP. In addition to central government investment, this measure of government investment includes investment by NHS trusts, but excludes privately financed government investment. It demonstrates that since 1979 the UK has clearly had the lowest level of government investment per head in the G7.

However, care is needed when interpreting this chart as it does not provide any information on the demand for the provision of infrastructure, the extent to which this is met by the private sector, or the quality or value for money of investment.

Chart 3.4: Government investment
(Per cent of GDP, 1990 prices)



Source: OECD

What does this mean for the UK?

If the UK is to enjoy high quality public services and infrastructure, then the level and quality of public investment must increase. The Government has already put in place policies to achieve these aims, underpinned by a new macroeconomic framework designed to deliver high and stable levels of economic growth. The policies include the Comprehensive Spending Review (which incorporates the Government's commitment to double public sector net investment), Departmental Investment Strategies, Public Private Partnerships and Invest to Save. The aim of these arrangements is to improve the quantity, quality and stability of public sector investment.

3.5 Venture capital

Strong growth of venture capital but a funding gap still remains

Why is it significant?

Investment – whether in skills, ideas or physical infrastructure – depends on the availability of finance. The emergence of the knowledge driven economy requires new approaches to investment and increases the cost of capital market imperfections. Two features of the knowledge driven economy are of particular relevance for capital markets – the increased pace of innovation and the associated need for different forms of finance for enterprise; and the importance of intangible assets, including R&D. Enterprise and competition both require well-functioning capital markets.

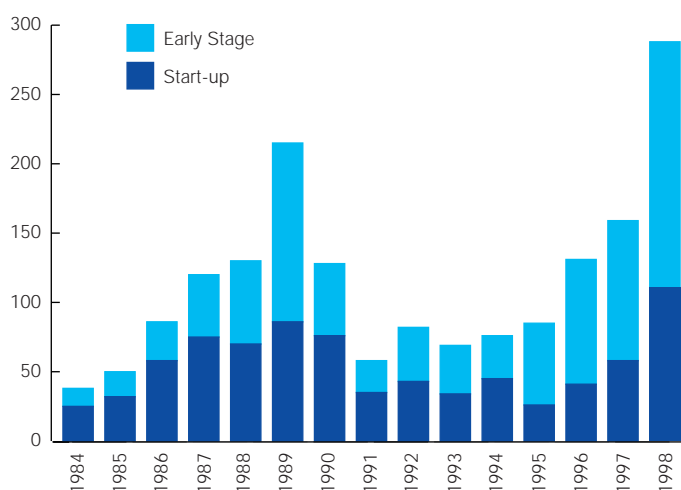
The ability to access the appropriate level and type of finance is one of the main factors influencing the performance of dynamic, entrepreneurial firms. Bank and trade finance are the most important sources of finance for the majority of smaller firms. However, where a firm is involved in projects perceived to be of high risk, or where lead times are long, bank finance is often not appropriate and trade finance will be too short-term. For this type of firm, equity finance is often more suitable because it avoids the cash flow problems associated with debt finance and allows the finance provider a share of any upside.

For start-up and early-stage companies, the usual sources of equity finance are personal, family and friends' finance, and formal and informal ('business angel') venture capital finance. There are no reliable figures for personal, family and friends or informal investment, but the British Venture Capital Association produces estimates of the amount of start-up and early stage formal venture capital.

How does the UK perform?

Evidence from a number of sources suggests that some small firms, particularly technology-based small firms in their start-up and early stages, face difficulties obtaining equity finance. Chart 3.5 suggests that progress is being made in this area. It shows that, after falling back in the early 1990s, there has been a substantial increase in the amount of venture capital finance in recent years.

Chart 3.5: Venture Capital
(£ million)



Source: British Venture Capital Association

What does this mean for the UK?

As venture capital provision increases, and the skills and expertise amongst venture capital providers improve, fewer good projects will fail to raise finance. This will be good for the economy in general. Furthermore, many of the companies financed by venture capital will be characterised by knowledge spillovers, so there may be dynamic effects from the ability of the UK to finance such ventures. An improvement in venture capital provision can also be seen as a symptom of changes in cultural attitudes towards entrepreneurship and risk taking more generally. It is important that this trend continues so that the financing constraints facing growth-oriented entrepreneurial firms may be overcome. The Government is seeking the development of a thriving venture capital sector: the Competitiveness White Paper created an Enterprise Fund, and the 1998 and 1999 Budgets put in place enhanced tax measures to encourage venture capital.

3.6 Second tier markets

Encouraging development of markets in Europe

Why is it significant?

An important pre-requisite for the development of the venture capital market and other forms of early stage finance is an available 'exit route'. At some stage, venture capitalists may want to cash in their investments, often through an initial public offering (IPO).

The lack of a vibrant market on which to float their companies will discourage entrepreneurs and venture capitalists, and potentially put a brake on the continued growth of these businesses.

Like many of the UK Competitiveness Indicators, the lack of liquidity of markets for IPOs is a symptom as much as a cause of poor performance. In particular, it can reflect a reluctance amongst investors to invest in smaller companies, partly associated with the different ownership structures of shares in these countries, and also a reflection of attitudes toward risk.

Table 3.6 shows, for the new UK and pan-European second tier markets (AIM, EASDAQ, and Euro NM): both the number of companies listed and market capitalisation

reflect the fact that the different exchanges have marketed themselves to different niches. To give some indication of how developed these markets are, we also look at data on NASDAQ and the NASDAQ Small Cap.

How does the UK perform?

AIM is well established at the smaller end, and along with the new stock markets in Europe, has in general been performing well and weathered last year's stock market volatility encouragingly. However, although not directly comparable, the NASDAQ and NASDAQ Small Cap data show that the US is considerably more advanced than Europe in this area.

What does this mean for the UK?

The emergence of second tier markets in Europe is an important development that significantly improves the environment for start-up and early stage companies. However, the exit opportunities are more limited than in the US, which may to some extent hold back the growth of companies in Europe.

Table 3.6: Market capitalisation and number of companies, 1999

	Market capitalisation (US dollars, billions)	Number of companies
AIM	11	332
EASDAQ	22	49
Euro NM	60	291
NASDAQ (small cap)	350	1011
NASDAQ	2990	4827

Source: NASDAQ, London Stock Exchange, EASDAQ, Deutsche Boerse

3.7 Stock market size and turnover

London still one of the world's leading financial centres

Why is it significant?

Larger firms can normally more easily access finance in the global financial marketplace. Nevertheless, the existence of a large, liquid and sophisticated financial market in a particular country facilitates the process of raising capital for firms based in that country, quite apart from being a source of growth and employment in its own right.

The relative size of the stock market is taken here as an indicator of the sophistication of the capital market in a particular country, and its ability to meet the needs of larger businesses more generally.

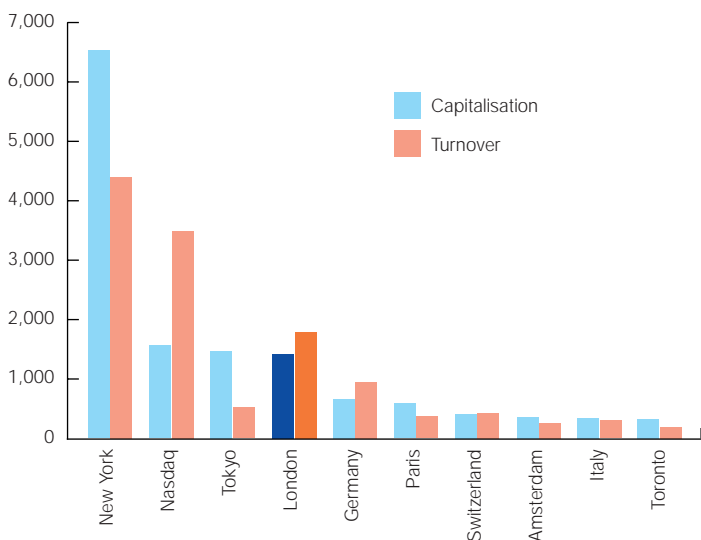
How does the UK perform?

In 1998 the London Stock Exchange was the fourth largest market in the world by capitalisation, and the third largest market in terms of turnover as seen in Chart 3.7. It is by far Europe's largest international financial centre, with more foreign banks based in London than in any other city in the world.

What does this mean for the UK?

The size of the City of London as a financial centre suggests that the infrastructure exists in this country to meet larger firms' financial needs. This is not to say, however, that capital markets in this country are always as efficient and innovative as elsewhere in the world. Commentators have long debated how issues like ownership structures and corporate governance arrangements affect the cost and availability of capital. These issues will be looked at further in later issues of the *UK Competitiveness Indicators*.

Chart 3.7: Stock exchange capitalisation and turnover in 1998
(£ billion)



Source: London Stock Exchange

3.8 Business uptake and use of ICT

Areas of strength in ICT, but smaller firms lagging

Why is it significant?

Digital technologies are a key enabler of a modern knowledge driven economy. If UK business lags behind others in adopting digital technology, it will be unable to take advantage of the opportunities provided by e-commerce and networking. To some extent, penetration of ICT also acts as a proxy for the capability of business to adopt new technologies and to innovate.

It is of course not just ownership but the effective use of ICT that is the determinant of performance. If a company's personal computers are not linked to other PCs within the firm, or connected to the Internet, then the firm will not be grasping the full range of opportunities available to it. Effective networking is important to make full use of the power of ICT.

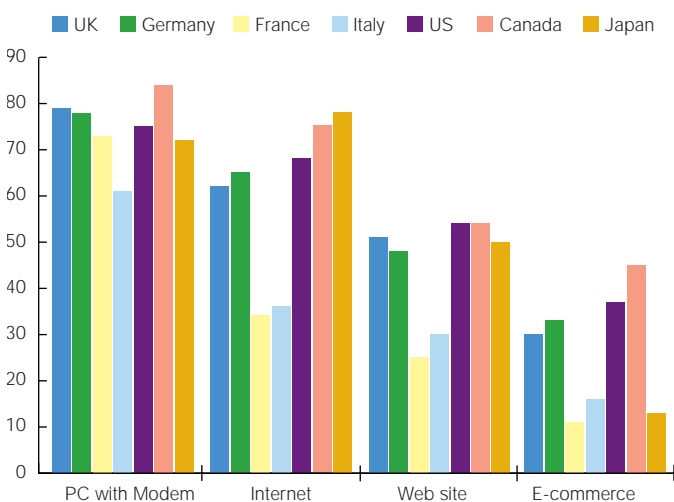
How does the UK perform?

The DTI published a study benchmarking aspects of the digital economy in December 1998 with the Competitiveness White Paper.¹ Some of the data used in that study has since been updated.² These studies show that only Canada out of the G7 is ahead of the UK in terms of business PC ownership (Chart 3.8). Our performance is less encouraging in the use of ICT for networking applications. North America consistently leads the field.

Benchmarking studies also show that, although we are behind the US, we are catching up. Business use of the

Chart 3.8: Business ownership of ICT in 1999

(Per cent)



Source: "Moving into the Information Age: International Benchmarking Study 1999", Spectrum Strategy Consultants

¹ *Our Competitive Future: Benchmarking the Digital Economy*, DTI, December 1998.

² *International Benchmarking Study*, Spectrum Strategic Consultants 1999.

Internet and web-sites has grown by 80 per cent and 90 per cent respectively in the UK since 1997, compared with 33 per cent and 40 per cent in the more mature US market. Growth rates in Germany and France were even faster, albeit from a smaller base.

Benchmarking the Digital Economy also showed there is a significant difference in the use of ICT between large and small business. This has been confirmed by the most recent *International Benchmarking Study* which shows that the adoption of external networking technologies by the UK's larger businesses (more than 100 employees) is up with the best in the world (US, Germany, France and Japan) but our smaller businesses (less than 100 employees) are behind the G7 average, and in the case of the smallest businesses (less than 10 employees) the UK's performance is poor.

What does this mean for the UK?

In this crucial area, the UK at an aggregate level is performing relatively well. However the failure of Britain's smaller firms to make the most of networking opportunities suggests that we still have some way to go in implementing best practice.

The Government has recognised this problem and has set itself stretching targets for improvements in SME performance to be achieved by 2002:

- 1.5 million small businesses wired up to the digital marketplace;
- one million small businesses trading on-line; and
- bringing the performance of UK's smaller businesses to a par with the best in the world.

Some of the key barriers to the greater use of digital technologies in the UK seem to be cultural. A number of studies suggest that there is an 'attitude gap' amongst businesses as well as consumers. In smaller businesses, 31 per cent of firms employing under 100 people are 'indifferent or uncertain' about ICT, compared to 21 per cent in larger firms. Only 8 per cent of UK businesses have an IT Director compared with 67 per cent of US businesses.

However, there is also evidence that attitudes are changing. The 1999 *International Benchmarking Study* showed that over 70% of UK businesses believe ICT's to be 'essential' or 'very important' for business competitiveness, on a par with the other leading G7 nations.

3.9 ICT understanding in companies

UK workers need more training in IT

Why is it significant?

Firms need workers who fully understand the capacity of ICT, and are able to utilise that capacity to generate value added. Business needs sufficient ICT skills to take full advantage of opportunities such as e-commerce – the fastest growing sector of the economy.

How does the UK perform?

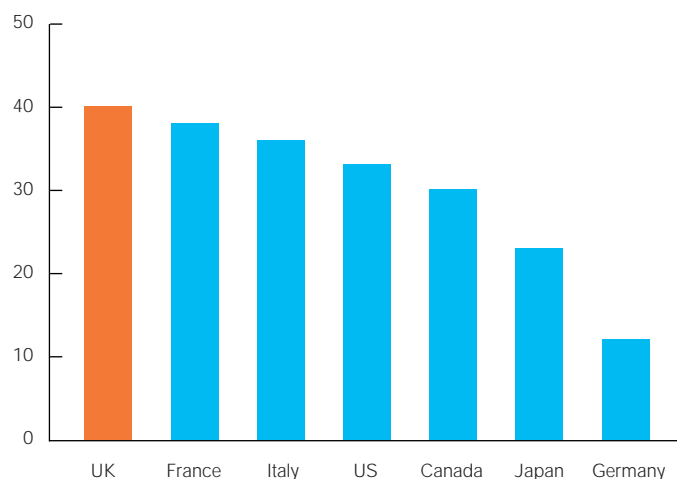
The DTI's *International Benchmarking Study* found the UK was perceived as having the least satisfactory workplace IT skills. 40 per cent of businesses surveyed perceived staff were in need of IT training. This could imply that even though IT levels are relatively high, UK managers are

more aware than their counterparts of the capability of IT. On the other hand it could simply mean that IT skills in the UK are poor. Irrespective of the reason, British business wants higher IT skills from its workers; a finding that is also confirmed by the *Skills Audit*.¹

What does this mean for the UK?

Chart 3.9 suggests that, although the UK has a relatively strong ICT infrastructure, firms believe that performance is being held back by lack of IT skills. If we are to utilise the potential of ICT, more must be done to train managers and employees alike to take advantage of these opportunities.

Chart 3.9: Proportion of business that perceives its staff need IT training in 1999
(Per cent)



Source: DTI

¹ *The Skills Audit: A Report from an Interdepartmental Group*, DfEE and Cabinet Office, 1995.

3.10 E-commerce

The US leads the world in e-commerce

Why is it significant?

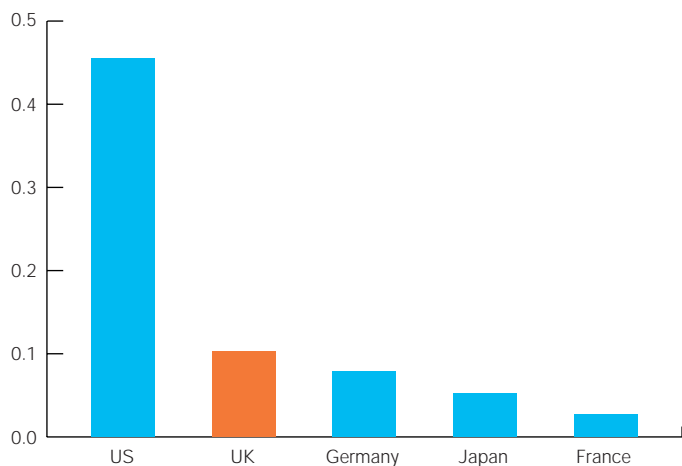
The increase in both ICT capacity and skills has propelled the development of the Internet and with it, e-commerce. E-commerce is the fastest growing market-place in the global economy and it radically affects every element of the value chain. It allows businesses to reform their internal processes and their supply chains to strip out waste, improve quality and give better customer service. E-commerce reduces transactions costs which opens up new opportunities for SMEs who can enjoy low cost access to the global market place.

Moreover, the development of e-commerce, and uptake of ICT more generally, will reflect the willingness of UK consumers to adopt more innovative and novel products. It will also act as a proxy for a number of underlying factors such as the quality of infrastructure, prices and regulation, attitudes, skills and access to particular types of finance.

How does the UK perform?

A review of recent Internet user surveys shows that 18 per cent of the UK population are regular Internet users, compared with 37 per cent in the US, 11 per cent in Japan, 10 per cent in Germany and 7 per cent in France. UK Internet users who buy on-line spend more on average than those in any other European country. This, together with a relatively broad user base, combines to give the UK an estimated 25 per cent share of total e-commerce expenditure in Western Europe.

Chart 3.10: E-commerce in 1998
(Per cent of GDP)



Source: International Data Corporation, OECD, December 1998

The UK is also behind the US in the use of the Internet for commercial transactions, although on a par with Germany and Japan. E-commerce is still in its infancy in Europe. But latest published data from the International Data Corporation suggests that the value of e-commerce in Western Europe will grow at an average rate of over 120 per cent up to 2002 – an estimate which may be revised significantly upwards in the light of current research.

What does this mean for the UK?

The broad picture that emerges from these indicators of ICT and the analysis in *Benchmarking the Digital Economy* is that the UK is behind, but catching up with the leaders in developing the digital economy. In particular, the *Benchmarking* document highlighted a number of strengths:

- A world-class IT and communications infrastructure. A recent survey of information processing, telecommunications and networking across the OECD found that the UK had the most advanced infrastructure of all G7 economies other than the US, and was well ahead of both the EU and OECD average.¹ The UK's early lead on digital television will help strengthen this leadership;
- Relatively low telecommunications prices – although we do less well on peak time Internet access and charges and PC prices; and
- A regulatory structure which facilitates intense competition.

Successful e-commerce requires an environment where business and consumers can feel confident trading over the Internet. While UK consumers seem to be more ready to use the Internet than those in Europe, the Government can help to increase consumer confidence and remove the obstacles that stand in the way of e-commerce. The Electronic Communications Bill aims to do this while at the same time reforming the law to put e-commerce on a secure legal footing.

¹ *Diffusion and Utilisation of ICT and New Organisational Arrangements: Final Report of the Benchmarking Pilot Project DGIII*, European Commission, 1998.

3.11 Publications and citations of UK research in academic journals

Evidence that the UK has a world-class science base

Why is it significant?

The science base helps train graduates and carries out basic and strategic research. Business can draw upon the science base in order to develop new products and processes. A high quality science base is essential for success in the knowledge driven economy.

There is no precise measure of the quality of the science base, but scientific **papers** provide us with an indicator of the production of know-how and **citations** give us an indicator of the quality of papers. It is likely that the citation indicator gives academics an advantage in the UK compared to academics in other countries because of a natural tendency amongst researchers to cite articles in their own language.

How does the UK perform?

The UK is a major force in research. With only 1 per cent of the world's population, the UK has produced 8 per cent of the world's scientific research papers. Our scientific publications are also among the most heavily cited – attracting 9 per cent of all citations. Chart 3.11 shows that the UK leads France, Germany, Japan and Italy in terms

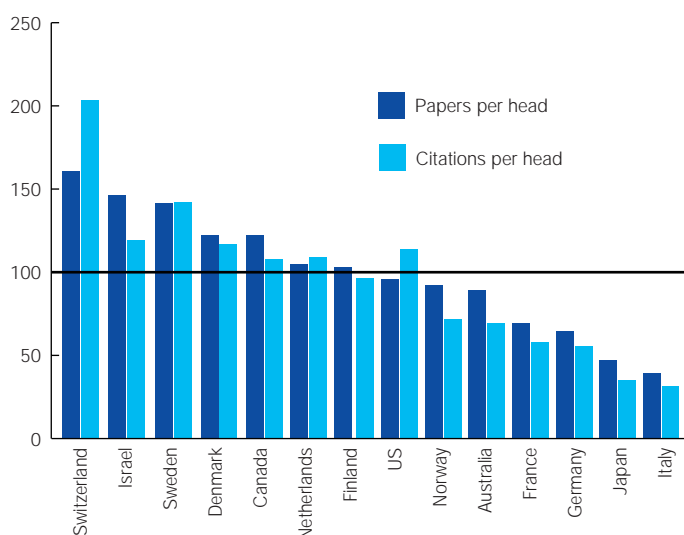
of papers and citations per head. However, this strong performance will also reflect the fact that English is widely read and understood. The two other English-speaking G7 countries, Canada and the US, both score better than the UK. Other international comparisons also suggest that our best academics excel. For example, the UK is second only to the US, and well clear of third place Germany, in winning major internationally recognised science prizes.¹

What does this mean for the UK?

The UK has a world-class science base, but current success is no guarantee of future performance. We need to sustain scientific excellence and the Government, in partnership with the Wellcome Trust, will spend an extra £1.4 billion over the next three years to modernise the UK science base. Careful attention needs also to be paid to the allocation of resources to the best institutions and the right kinds of research and to ensuring that we get more economic value out of the science base. This last point is considered in Chapter 4 on the Innovation Process.

Chart 3.11: Papers and citations per head 1981-1994

(UK = 100)



Source: OST

¹ ie. those in excess of \$200,000.

3.12 Government spend on R&D per worker

Past record shows government R&D falling relative to other major economies

Why is it significant?

Government finances R&D carried out by universities and Research Councils, the NHS and Government departments. These funds help maintain the world class standing of the UK science base. They are essential to ensure that government policies are well founded especially in the areas of health, the environment and agriculture. This spending also has wider spillover effects: from research in the last century into improving crop yields, to the modern day defence spending in the US which laid the foundations of the Internet.

How does the UK perform?

Chart 3.12 shows that compared to the average for the G7 countries, government spending per worker fell in real terms between 1985 and 1995. Although spending also declined in many other countries, the UK decline was the steepest, especially between 1985 and 1990. In part, this was due to reductions in military spending on R&D and cuts in R&D spending by government departments. The

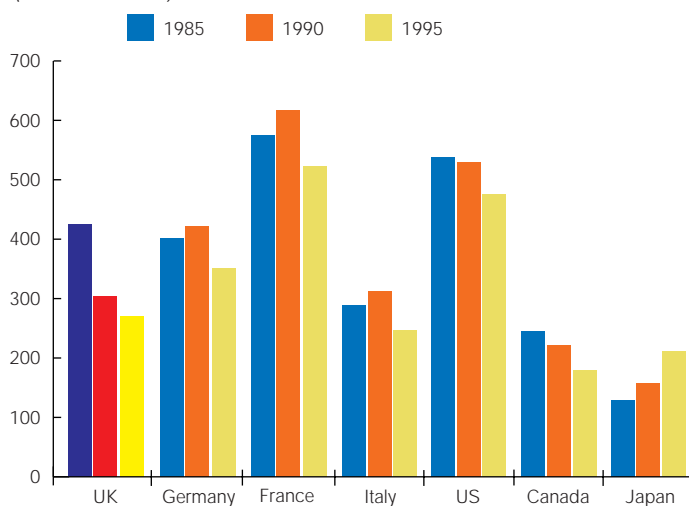
decline has also been partly due to the reclassification of the Atomic Energy Authority to the business sector between 1985 and 1986.

Government spending on R&D saw marked changes in funding direction over the period between 1985 and 1995. Funding aimed at health and environmental objectives, and non-orientated programmes dedicated to the advancement of knowledge, took an increased share of the budget; areas such as defence and economic development saw their budget share decrease.

What does this mean for the UK?

While the focus of government financed R&D is quite rightly different from the focus of business funded R&D, both activities generate important externalities. The Government recognises that falling expenditure on R&D would undermine the long term knowledge base available to industry. This was a factor in the Government's decision to allocate an extra £1.4 billion to the science base over the next three years.

Chart 3.12: Real Government R&D per worker
(1990 US dollars)



Source: OECD

3.13 Business spend on R&D per worker

Business R&D expenditure low compared to major competitors

Why is it significant?

Expenditure on R&D is one measure of the extent to which business is developing and exploiting new technologies and ideas. Business expenditure on R&D is the largest component of R&D expenditure, accounting for two thirds of the total. Expenditure on R&D by industry has also been shown to generate important externalities – the benefits of R&D do not just accrue to the firm concerned but benefit other firms as well, increasing the benefit to the economy as a whole.

It is important to remember, however, that firms spend money across a wide range of activities when they develop an innovative product or process (e.g. training, equipment purchases). Furthermore, viewed as an input indicator, R&D expenditure makes no allowance for differences in how firms, sectors or countries differ in their ability to turn R&D into profitable products or processes.

How does the UK perform?

The most recent R&D Scoreboard for companies in 1999¹ showed that the UK's largest companies invest as much in R&D as their foreign competitors. However, this is not true of UK companies as a whole. Chart 3.13, which shows industry funded business enterprise R&D (BERD), demonstrates that UK firms spend less per worker on R&D compared to most of their major

competitors. Since 1981, the record of UK firms has worsened, especially vis-à-vis the US and Japan.

R&D spending tends to vary by sector, so poor performance could reflect different mix of economic activity across countries. However, even taking this into account, R&D performance of UK businesses is weak, with comparable (or better) performance to their major competitors in only two industries: drugs and metal products.

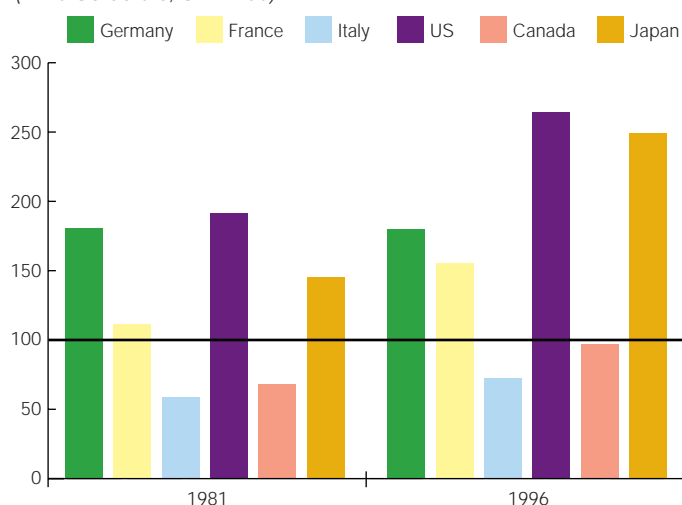
What does this mean for the UK?

Firms invest in R&D in the hope of developing new technologies that they can turn into commercial successes. Low levels of R&D could disadvantage UK firms in that they are unable to develop, or identify, new technologies which have commercial applications. Undertaking R&D is also an important way of developing the capability to understand new technologies developed outside the firm. If UK firms fail to continuously develop new product ranges which attract higher prices, then they run the risk of finding themselves competing in markets where profits are increasingly eroded by lower cost competition. Because of the under investment of R&D, the Government has announced that it will introduce an R&D tax credit in Budget 2000 for smaller firms to increase their ability and incentive to invest in R&D.

Low levels of R&D spending therefore matter because they reduce UK firms' capacity to develop new products and processes and to understand new technologies developed elsewhere. But weaknesses in R&D can handicap innovation for more fundamental reasons. For successful innovative firms, R&D is not just an input to innovation, but an intimate part of the whole innovation and production process. This is considered further in the next chapter.

Chart 3.13: Real Industry Funded BERD per worker relative to the UK

(1990 US dollars, UK = 100)



Source: OECD

¹ R&D Scoreboard, DTI and Company Reporting, June 1999.

Chapter 4: Innovation Process

Success in the knowledge driven economy depends on the ability to take advantage of the business environment and the available resources to generate new products and processes. As product lives become shorter, innovation and entrepreneurship are ever more important. Firms can sustain competitive advantage by being smarter than the rest: by generating new products and applying new ideas to existing processes.

The interlinkages and mechanisms whereby the resources available to the knowledge economy are transformed into results in the form of higher productivity and higher prosperity are extremely complex. For shorthand, we refer to these linkages as the ‘innovation process’. Ideally, this should be a measure of the nation’s innovative capacity, comprising not just its capacity for the commercial exploitation of science and technology, but also its openness to foreign ideas, the extent of collaboration and interaction between firms and between firms and the science base, and the degree of dynamism and entrepreneurship in the economy.

The *UK Competitiveness Indicators* includes four sets of indicators of the innovation process:

- **Technology commercialisation** – excellence in science is not enough. We must ensure that good ideas are commercially exploited.
- **Receptiveness to foreign ideas** – we have to be alert to the ideas of others and tap into the global pool of knowledge.
- **Knowledge transfer** – to stay ahead of the game, businesses in the UK have to make the most of the knowledge of their workforce and engage in new forms of collaboration.
- **Entrepreneurship** – we need the ability to seize new business opportunities and implement them effectively.

The traffic light summarises the individual indicators and each indicator is assigned to a band on the basis of the assessment set out in the rest of the chapter. There is no internationally comparable data on both joint publishing by universities and industry, and university spin-outs. The former has shown signs of strength, reflected by its recent rapid growth rate, and is placed into the green band. University spin-outs are regarded as weak because of a wide variation in performance across the UK: indicating that best practice is far from common and that more can be done.

The UK is well keyed in to the global pool of knowledge, although more needs to be done to turn our expertise into marketable products.

Receptiveness to foreign ideas, as measured by internationally financed R&D and collaboration across borders, is a strength. However, there are weaknesses in many aspects of the innovation process. Data on patents, business enterprise spending on innovation and the share of turnover in manufacturing accounted for by new or improved products suggests that UK industry’s innovation performance is lagging behind our principal competitors. However, the record of the UK service sector in innovation appears somewhat better.

Collaboration between business and universities is under-developed, although joint authorship of publications by higher education institutions and business is expanding strongly.

Enterprise is more important than ever in the knowledge driven economy but performance in and attitudes towards entrepreneurship fall short of best practice amongst our competitors.

Summary of Innovation Process Indicators

4.5	Internationalisation of R&D
4.8	Joint publishing by universities and industry
4.1	Business spend on innovation/R&D – services
4.3	Proportion of firms who innovate
4.4	Share of sales from new or improved products
4.6	Technological alliances between firms
4.7	Sources of information for innovation
4.10	Entry and exit rates
4.11	Fast growing firms
4.12	Attitudes to entrepreneurship
4.1	Business spend on innovation/R&D – manufacturing
4.2	UK’s patenting performance
4.9	University spin-outs

The green band shows those areas where the UK has signs of strength. UK performance is regarded as only average in those indicators placed in the amber box. Indicators in the red section show clear signs of weakness. Within each of the three bands, indicators are listed in order of their appearance in this chapter.

4.1 Business spend on innovation including R&D

In manufacturing, UK innovation spend comes near the bottom of the European league; in services, near the top

Why is it significant?

This indicator includes business expenditure on R&D, covered in the previous chapter, but also a wider range of innovation spending such as design, training, marketing and equipment which are linked to the development of innovative new products or processes. It cannot show the effectiveness of the innovation spending but gives an indicator of the commitment to innovation. The extent to which levels of spending differ will in part reflect differences in industrial structure across countries.

The inclusion of business expenditure on research and development in both the resources and the innovation process chapter is deliberate. A rounded picture of innovation performance is only possible if business R&D spending is included since the latter is as much a process indicator as an input indicator. It is too simplistic to view the innovation process as the creation of innovation outputs, however measured, from R&D (or other) inputs. Successful innovation is only possible if there is close interaction between R&D personnel and the other functions of the firm such as marketing, production and design.

How does the UK perform?

The Community Innovation Survey (CIS) provides data on the innovation activities of enterprises. According to the CIS, in contrast to other European economies, UK manufacturers spend much less on innovation as a

proportion of turnover than UK services (Chart 4.1). Manufacturing companies in the UK come near the bottom of the European league, spending less than those in Germany, France, Ireland, Sweden, Finland, Austria or the Netherlands. UK services spend more on innovation than their European counterparts.

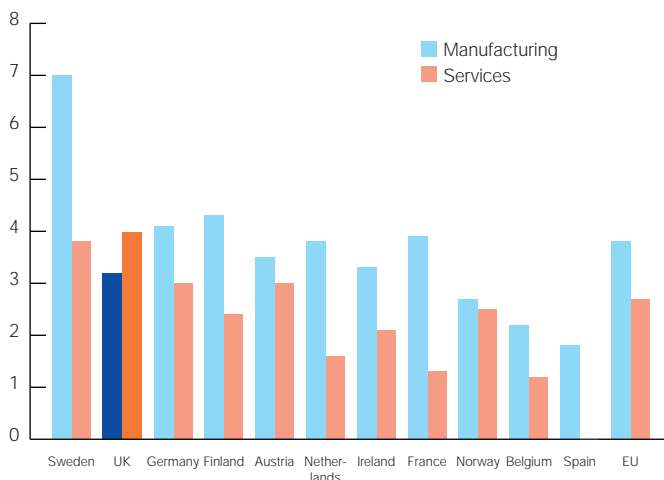
What does this mean for the UK?

For manufacturing this indicator confirms the picture provided by the R&D data that UK manufacturers spend less on developing new products or processes than their major competitors. Prior to the CIS, our knowledge of the relative innovation performance of services was poor because of a lack of relevant data sources (R&D data provides a very partial coverage of innovation undertaken in the service sector). While there may be doubts about the comparability of some of the data, the CIS data reinforces the perception that at least some parts of UK service sector are very innovative and out-perform their European counterparts in terms of their commitment to innovation.

If the UK is to close the gap in productivity with its main competitors, commitment to innovation throughout UK industry needs to be strengthened and brought up to the level of the best. Often the constraint is management attitudes and a lack of commitment to innovation, factors which are not easily measured but nonetheless important.

Chart 4.1: Business spend on innovation in 1996

(Per cent of turnover)



Source: Eurostat (Community Innovation Survey)

4.2 UK's patenting performance

The UK's share of US patents has declined

Why is it significant?

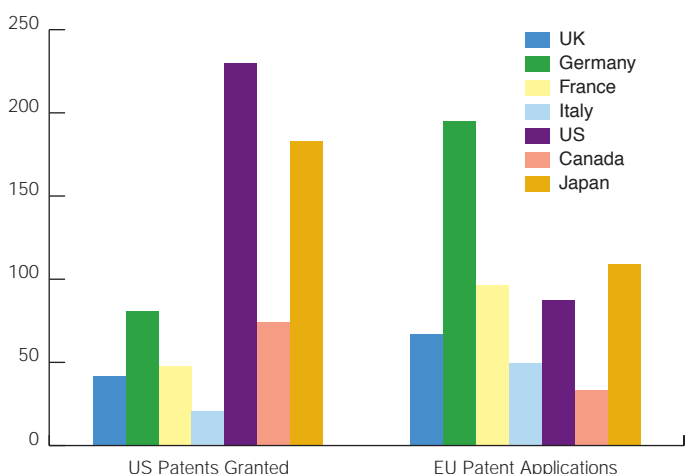
Patents are one means of protecting the intellectual property invested in an innovation. They therefore provide us with an indicator of how successful the UK is at converting knowledge into a new product or process.

However, while useful to consider, patents can only be an imperfect indicator. They are a much better measure of invention than they are of innovation. But even the relationship between patenting and invention is far from perfect. Many inventions are not patented as firms find other ways of protecting them. For example, patenting is rarely used in the software sector, one of the areas of strongest growth in recent years.

Patents are also of uneven value. Many cover inventions of low value which never reach the market or fail there, others protect major technological and commercial successes.

Industries and countries also differ in their propensity to patent. Due to differences in individual countries patenting systems it is also more useful to focus on patents taken out in common marketplaces. Here we look at shares of patents granted in the US and applications filed in EU patent offices.¹

Chart 4.2: US and EU Patents in 1998
(Number of patents per million of the population)



Source: US Patent and Trademark Office, European Patent Office

How does the UK perform?

The UK under-performs nearly all its major competitors in terms of number of patents granted or filed per head of population (Chart 4.2). Our record is significantly worse in both the US and EU than the US and Japan. Looking at countries of roughly similar size, the UK's level of patenting is lower than Germany and France but better than Italy's.

The predominance of US companies or individuals in holding US patents partly reflects 'home advantage' since patenting abroad is generally more difficult and more costly than patenting at home. Nevertheless, the US records a relatively strong performance in Europe as well.

The relatively poor showing of the UK in patenting is consistent with the results of a study carried out for the US Council on Competitiveness.² The US Council's index, based on patents data and determinants of innovation performance, showed the UK languishing at the bottom of the table of countries surveyed, with an expected patent output per head only about one third of the level of top-tier innovators.

What does this mean for the UK?

Notwithstanding the caveats which surround the use of patent data, the data suggests that the UK has some way to go to catch up with German, Japanese and US innovative capacity. The US is pulling ahead, at least in terms of patents granted in its own market, and we are not catching up with Germany. This may reflect relatively low levels of R&D spending although there is also some evidence that business perceptions of the strength of intellectual property protection in the UK are below the average for other countries surveyed.³

¹ Differing measures have to be used for the US and the EU as a result of the administrative processes involved.

The patent numbers for the two areas are therefore not directly comparable, since not all applications for patents are granted.

² Michael Porter and Scott Stern, *The Innovation Index – New Challenges to America's Prosperity*, US Council on Competitiveness.

³ *World Competitiveness Yearbook*, Institute for Management Development, Geneva, June 1999.

4.3 Proportion of firms who innovate

UK manufacturers appear innovative, service sector about average

Why is it significant?

Survey information from the CIS provides another angle on measuring innovation by asking firms about their innovation activities. Firms were asked if they had brought new products or processes to market or developed new process technologies.

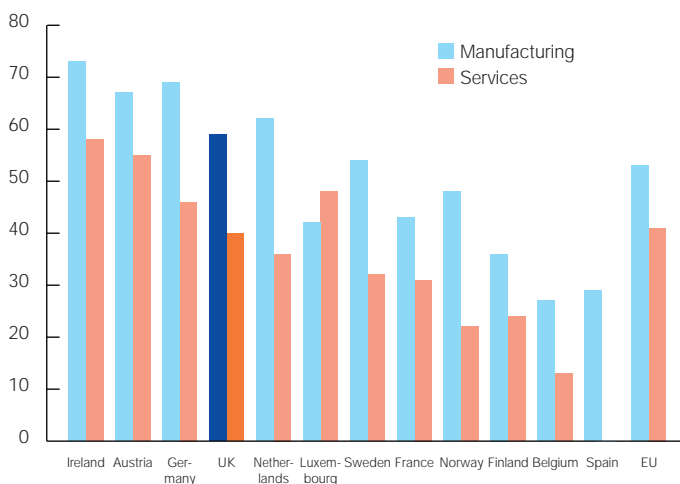
How does the UK perform?

Over half of UK manufacturers described themselves as innovators, which is above the European average. In services, the proportion of firms describing themselves as innovators was in line with the European average.

An interesting picture emerges that UK manufacturing does relatively well in the proportion of enterprises which innovate (Chart 4.3) in contrast to its relatively poor performance in the level of expenditure on new products or processes (Indicator 4.1). In services, we have an average share of innovators even though our service sector has the highest level of innovation expenditure in Europe.

Chart 4.3: Enterprises that bring new products or processes to market or develop new process technologies 1994-1996

(Per cent of enterprises)



Source: Eurostat (Community Innovation Survey)

What does this mean for the UK?

It is clear that many UK enterprises recognise the importance of innovation since many of them are developing new products or processes, both in manufacturing, and to a lesser extent, in services. Whether UK manufacturing enterprises invest enough in innovation is a moot point. Part of the shortfall could be due to the industry mix of the UK economy, though this is unlikely to explain all the difference. The strength of German innovation suggested by the above indicator is confirmed.

The results suggest differences between the service and manufacturing sectors in terms of the effectiveness of the innovation process. Compared to the rest of Europe, many manufacturers describe themselves as innovators despite the fact that spending on innovation is relatively low. In contrast, service providers spend highly on innovation but are only average in terms of innovation outputs.

Further research is necessary to understand the reasons for this difference and whether the manufacturing and services sectors could learn from each other to improve innovation performance. One aspect of this is the extent to which firms who describe themselves as innovators earn revenues from their new products and processes. A measure of this is provided in the next section.

4.4 Share of sales from new or improved products

UK manufacturers' sales from new products in the bottom half of the EU league table

Why is it significant?

One way of judging the success of innovation is to look at the revenue generated by new or improved products. Here, we look at the value of the innovations introduced by firms covered by the CIS. Enterprises were asked whether products introduced between 1994 and 1996 were new, or improved, compared to those previously produced by the enterprise. The indicator does not tell us whether the sales arise from products that are revolutionary, in the sense of being new to the market and embodying a significant advance on the status quo; or whether they simply represent the take-up of existing technologies or the copying of products already sold elsewhere.

By comparison with other indicators of the innovation process, measures of the proportion of sales from new or improved products give a more output-based measure of firms' performance. They show the extent to which innovation spend is successful not only in leading to new processes and products but whether the new products stand the test of the market place.

How does the UK perform?

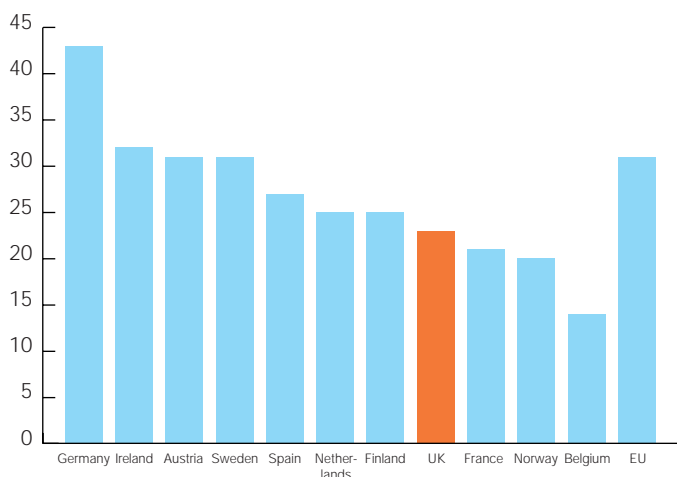
The CIS shows UK manufacturers are in the bottom half of the EU league in terms of the revenue they earn from new or improved products (Chart 4.4). Only 23 per cent of turnover is derived from new and improved products compared with an EU average of 31 per cent.

What does this mean for the UK?

The low share tells us that our manufacturing sector depends on older products to generate sales compared to many of our EU competitors. In part, this may reflect differences in the markets to which UK enterprises sell. However, this indicator appears to show that, despite the more encouraging picture from the number of manufacturing firms describing themselves as innovators, the low levels of innovation spending by UK manufacturers appear to translate into correspondingly low levels of earnings from product innovation.

Chart 4.4: Manufacturing turnover from new or improved products in 1996

(Per cent of turnover)



Source: Eurostat (Community Innovation Survey)

4.5 Internationalisation of R&D

About 30 per cent of UK R&D is undertaken by foreign firms resident here

Why is it significant?

Compared with other stages of the production process the practice of establishing R&D laboratories outside the parent company's home country is still quite unusual. In many cases foreign ownership of R&D centres results from the acquisition of existing foreign facilities through mergers.

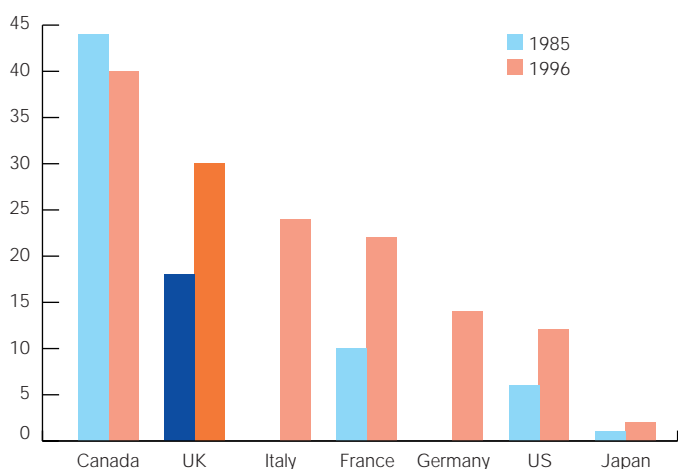
However, there are two other phenomena that help explain the increased internationalisation of R&D: the preponderance of multinational firms who can take an international perspective on the best place to locate their R&D activities; and the increase in international technological co-operation as firms attempt to broaden the range of scientific and technological competencies available to them (discussed in more detail in the next indicator).

Greater internationalisation of R&D should enhance the capacity of the host country to access the global pool of knowledge and so keep pace with the technology leaders.

How does the UK perform?

The share of UK R&D accounted for by foreign affiliates is one of the highest in the OECD area. Between 1985 and 1996 the share rose by two thirds, partly reflecting take-overs of R&D establishments by foreign firms.

Chart 4.5: Share of foreign affiliates in industrial R&D
(Per cent of R&D accounted for by foreign affiliates)



Source: OECD

What does this mean for the UK?

The willingness of foreign companies to locate their R&D capability in the UK also suggests the UK has a favourable environment in which to undertake this type of activity. Often foreign companies will be attracted to the UK because of its world class science base and the relatively low cost of well-qualified scientists and engineers.

However, the forces which drive the internationalisation of research are quite different from those which drive the internationalisation of development activities. In recent years many firms have set up research centres in the UK to exploit the UK science base. These research centres often have no connections with the company's operating subsidiaries in the UK involved in development activities. Development work undertaken by inward investing companies generally reflects the length of time they have been in the UK, and the relative success of the UK subsidiary within the world-wide group. In some cases (e.g. IBM, some pharmaceutical companies) they have acquired a world-wide, or European-wide, role as an R&D centre in certain product areas.

When foreign companies undertake R&D in the UK, they can help preserve competencies in the UK which might otherwise be lost. The activities of foreign companies in the UK also provide us with other benefits – often in the form of new technologies and organisational methods which can diffuse through the UK economy. However, the extent to which foreign owned R&D centres spread these benefits depends on the capabilities and receptivity of UK-owned firms. This underlines the need for UK companies to raise their R&D spending, workforce skills and management standards to match the levels of their competitors.

4.6 Technological alliances between firms

Some UK firms actively seek out technological alliances abroad

Why is it significant?

Increased collaboration is a feature of the knowledge driven economy. The next section looks at collaboration within the UK more generally. Here we focus on cross-border alliances. Alliances can take many forms – from an agreement to share research results to the establishment of joint ventures. Like other forms of collaboration, these are a means by which firms can reduce innovation costs and spread risks. Cross-border alliances are interesting in that they are a way firms can access new markets and a wider range of knowledge and competencies. This is important since the UK will only ever be responsible for developing a small share of the world’s new knowledge. In order to succeed, UK firms will have to seek out knowledge developed elsewhere in the world.

How does the UK perform?

UK firms enter into more international technological alliances compared to other major EU countries. Given the UK’s size, the number of alliances is broadly comparable with the US and Japan (Chart 4.6).

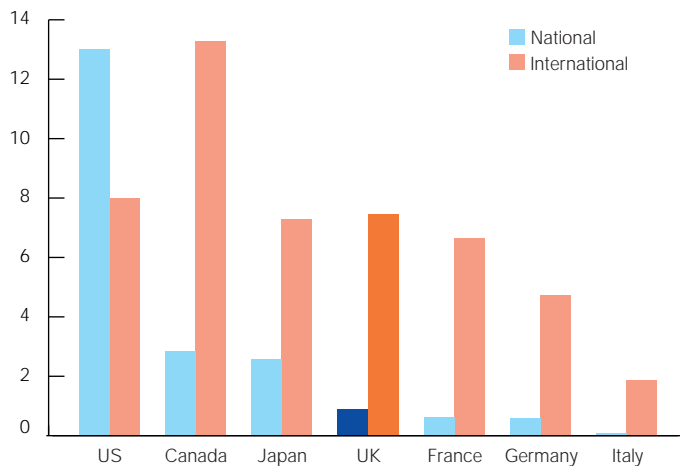
What does this mean for the UK?

UK businesses appear more willing than those in other EU countries to access the global knowledge base by developing international technological alliances. This supports the general picture that UK R&D is very internationalised with a number of UK firms actively engaged in R&D collaborations abroad; and an important part of the R&D effort in the UK coming from foreign companies.

Firms in some sectors, such as pharmaceuticals, are increasingly looking for foreign sources of knowledge to maintain their competitive edge. In other sectors, where there is less of a commitment to engaging in forms of innovation activity, firms find themselves competing with foreign affiliates who are more prepared to invest in innovation.

Chart 4.6: Number of technological alliances between firms, national and international, 1992-1995

(Per million of the population)



Source: Merit

4.7 Sources of information for innovation

UK enterprises look to their clients for innovation

Why is it significant?

The knowledge driven economy both facilitates and requires greater collaboration at many different levels at home, as well as across borders. Within the firm, the value of the enterprise increasingly resides in the knowledge of individuals. This means that managers have to pay greater attention to ensuring that the right incentives are set and relationships established to use and develop this knowledge most effectively. Firms also gain valuable knowledge from external sources: from customers and suppliers. Shorter product cycles place a premium on being first to respond to consumer needs, and closer links through the supply chain help diffuse best practice. Meanwhile, competition is intensifying, but also changing in nature. Increasingly, costs have to be sunk at the development stage. To spread these costs, (and benefit from economies of scale and scope in dealing with increasingly complex technologies) firms are finding it necessary to work together.

How does the UK perform?

The CIS asked enterprises about the most important sources of information for their innovation activities (Table 4.7). Overall, it found that firms regard internal sources of information more highly than external sources. However, fewer UK enterprises rank

internal sources as very important compared to enterprises in the rest of Europe. UK enterprises typically place more emphasis on customers or suppliers as information sources.

Only a small number of highly innovative enterprises across Europe regard universities as key sources of information and knowledge for innovation.

What does this mean for the UK?

Successful innovation starts from a clear assessment of client or customer needs. The focus of UK innovators as suppliers and customers is a source of strength, and may follow from a higher premium placed on supply chain management and a greater tendency to outsource non-core activities. UK business' recognition of the importance of customer demands is also a good sign for the role of consumers in shaping the innovation process. However, the benefits derived from this focus on customers may be diminished if firms neglect links with other firms and partnerships within the workplace.

Only a small number of enterprises cite higher education institutions as important sources of information for innovation. An improvement in this indicator for the UK would indicate better utilisation of the UK's science base.

Table 4.7: Sources of information considered as very important for innovation

(Percentage of innovating enterprises)

	Manufacturing sector		Service sector	
	UK	EU average	UK	EU Average
Sources within the enterprises	43	51	38	52
Other enterprises within the enterprise group	19	26	29	39
Competitors	17	18	20	19
Clients or customers	54	46	65	38
Consultancy enterprises	2	4	10	11
Suppliers of equipment; material; components or software	23	19	27	18
Universities or other higher education institutes	4	5	4	5
Government or private non-profit research institutes	2	3	7	3
Patent disclosures	4	3	0	1
Professional conferences; meetings; journals	5	8	8	15
Computer based information networks	3	4	9	11
Fairs and exhibitions	15	21	17	17

Source: Eurostat (Community Innovation Survey)

4.8 Joint publishing by universities and industry

Joint authorship is increasing strongly

Why is it significant?

Joint authorship of scientific and technical articles by universities and businesses is another indicator of the informal networks through which knowledge and information passes between the science base and industry.

How does the UK perform?

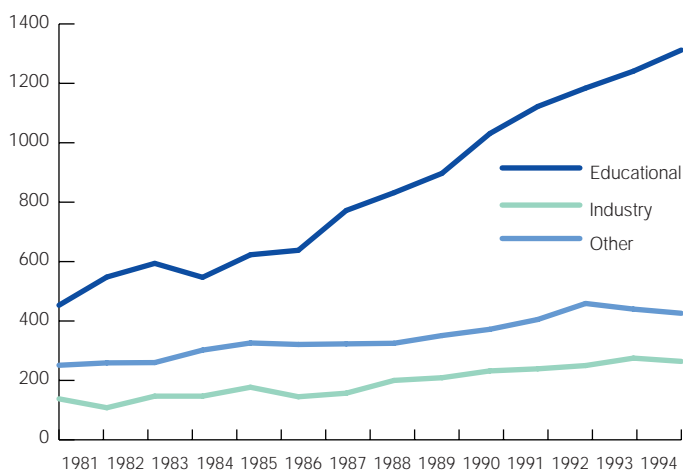
Joint publishing with universities is increasing (Chart 4.8). The pharmaceuticals and chemical sectors dominate, accounting for just under 40 per cent of joint papers published. Publishing in electronics, electricity and other defence related sectors has declined. However, almost all industries publish and in almost all industrial sectors collaborative publications out-number non-collaborative.

What does this mean for the UK?

The upward trend in joint publications partly reflects broader industrial changes including privatisation, increases in R&D expenditure on pharmaceutical products, and the decline in defence R&D expenditure. But the general increase in collaboration with universities indicates that firms are increasingly looking towards them for new sources of knowledge.

Chart 4.8: Papers produced collaboratively by industry

(Number of papers with partner sector)



Source: SPRU – UK Corporate Research and Collaboration (Hicks & Katz)

4.9 University spin-outs

Target to increase spin-outs by 50 per cent by 2001

Why is it significant?

The 1998 Competitiveness White Paper noted that most dynamic economies have creative partnerships between strong universities and business. One form of partnership is the creation of spin-out companies set up for the commercial exploitation of university research.

How does the UK perform?

A survey for the Office of Science and Technology found 223 business spin-outs from UK higher education institutions in 1997-1998. This survey only covers those spin-outs wholly owned by the universities. It ignores those businesses owned by former academics using ideas generated in universities, in which the university does not have a stake.

However, performance is not uniform. The performance of university technology licensing offices, which encourage interchange and collaboration between universities and business, suggests that there is significant variation around the country.

What does this mean for the UK?

Given the lack of comparative data, it is difficult to say how well the UK is commercialising its knowledge. However, the fact that there are differences between institutions regarding the extent of spin-outs suggests that the UK is not making the most of the commercial potential of its world-class academic research. Universities and businesses can learn from the experience of those higher education institutions with strong track records in commercial exploitation, and the Government has set itself a target of securing a 50 per cent increase in the number of spin-outs by 2001.

Another symptom of greater university-business links is the emergence of industrial clusters based around universities. While clusters are not systematically measured in the UK, there are some good examples in Cambridge, Oxford, Warwick and Guildford. Since clusters are important sources of innovation, the Government is planning to develop methods to improve their identification and measurement.

4.10 Entry and exit rates

Economy less dynamic than the US

Why is it significant?

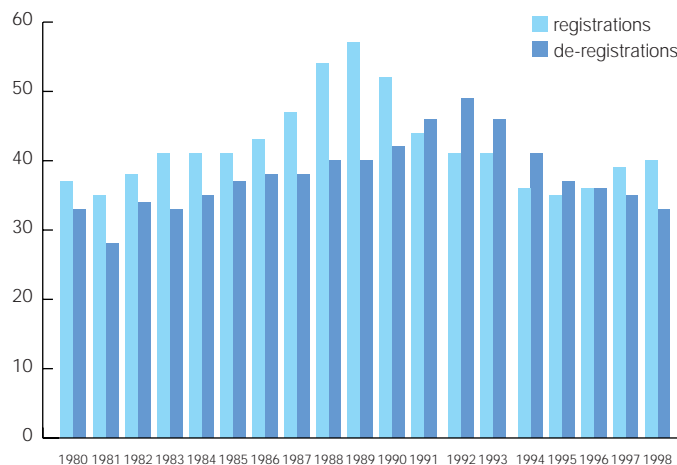
The OECD defines entrepreneurship as ‘the ability to seize new business opportunities’.¹ New ideas are the raw material of the knowledge driven economy. Entrepreneurship describes the part of the innovation process that actually brings new ideas to market.

In common with other aspects of the innovation process, entrepreneurship is difficult to quantify. Here we look at several proxy indicators that can be used to draw lessons about the strength of entrepreneurship in the UK.

The first of these is entry and exit rates amongst small firms. One way to exploit a new business opportunity is by starting a new firm. We look at the numbers of registrations and de-registrations for VAT. Together these provide some indication of the overall competitive dynamism of the economy.²

Internationally and across the UK, a high entry rate tends to go hand in hand with a high exit rate, as resources are quickly re-allocated to those most able to exploit them. Ultimately we are interested in promoting high quality start ups that are capable of surviving in the market place, but it is very difficult to identify these systematically beforehand.

Chart 4.10: Number of enterprises registering and de-registering for VAT in the UK, 1980-98
(Per 10,000 resident adults)



Source: DTI

How does the UK perform?

It is difficult to draw conclusions from the data on registrations and de-registrations. Both tend to vary with the cycle. The data for more recent years (1992 onwards and 1994 onwards) are also affected by increases in the VAT threshold (Chart 4.10).

International comparisons of entry and exit rates are also problematic. Nevertheless, the broad picture emerging from a range of indicators is that the US is out in front, with the UK having at least as high entry and exit rates as anywhere in Europe. However, the UK’s comparatively good performance is driven primarily by the relatively high incidence of self employment in this country. Looking at entry and exit rates of firms with employees, which are more likely to be firms with growth aspirations rather than having been set up for lifestyle reasons, appears to bring the UK’s position down into the EU pack.

What does this mean for the UK?

A more stable macroeconomic environment will give people the confidence to establish themselves in business and take on their first employee. In future, this should be reflected in trends for registrations.

The international comparisons seem to confirm that taking on the first employee is a less attractive prospect than in the US and a key growth hurdle in the UK and probably across Europe as a whole.

¹ OECD, *Fostering Entrepreneurship: A Thematic Review* (1998).

² There are difficulties in identifying which of these registrations and de-registrations are genuine new starts and closures.

4.11 Fast growing firms

Performance consistent with our European partners but behind the US

Why is it significant?

A relatively small number of fast growing enterprises tend to be the main source of innovations, wealth and jobs. They tend to be firms which are good at exploiting emerging or niche markets and technologies. Their growth can be encouraged by the right institutions and legal framework and the presence of an accompanying supporting network of suppliers, professional services, financial markets and potential employees.

How does the UK perform?

Of the 168,000 enterprises registering for VAT in 1994, an estimated 8,400 had achieved annual turnover of £1 million or more by their fourth year of trading. A further 6,900 enterprises had not yet done so, but had grown to employ 10 or more employees. Other recent research suggests that the propensity of firms in the UK to at least double their sales within a four year period is remarkably consistent across size bands. Only the very smallest firms (which also tend to be the youngest) have a greater propensity to fast growth.¹

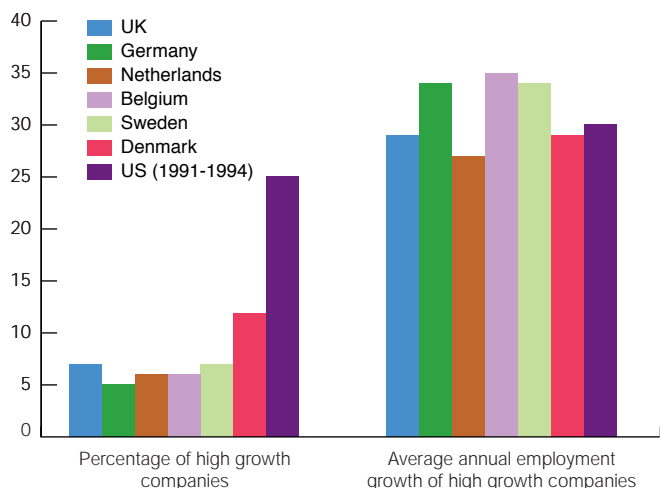
Research undertaken by the Dutch government looking at international comparisons of fast growth firms tells a similar story for UK performance, and shows the proportion of such firms in the UK to be around what is achieved amongst other north European countries (Chart 4.11). The US is out in front although this exceptional performance on the proportion of fast growing firms is not matched by higher average annual employment growth amongst these fast-growing firms.

What does this mean for the UK?

While performance in the US has been helped by favourable macroeconomic conditions in the early 1990s, the evidence still suggests that in this particular area, best practice resides there. The UK still has some way to go in developing the right climate, networks and infrastructure so that new ideas are given the best chance of success. The Government is committed to creating that environment and has adopted a Public Service Agreement target to increase the number of high growth business start-ups.

Chart 4.11: High growth companies among enterprises with between 100-1,000 employees, 1990-1993

(Per cent of all enterprises with between 100-1,000 employees)



Source: High Growth Companies in the Netherlands 1999

Note: high growth companies defined as those in which employment grew by at least 60% in three years

¹ DTI SME Statistics Unit, unpublished analysis of the Inter-Departmental Business Register.

4.12 Attitudes to entrepreneurship

A more supportive enterprise culture would foster greater dynamism

Why is it significant?

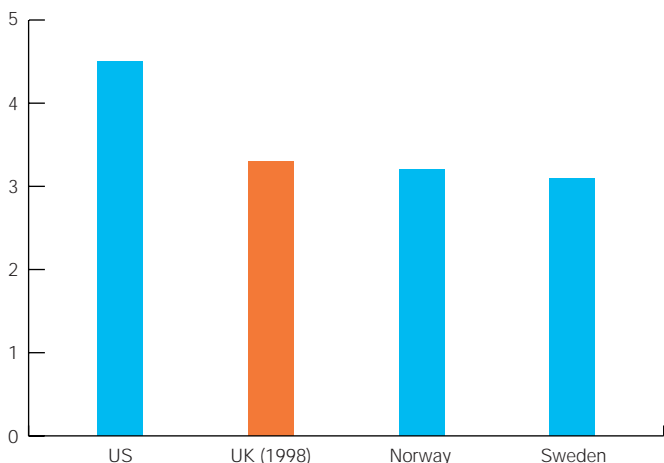
While the entry and exit of firms is one indicator of the dynamism of the economy, it will not capture the entrepreneurial activity that takes place within existing firms. This is partly about the quality of management and their attitude to change and to risk-taking, factors which are hard to measure, but of crucial importance nevertheless. In part, management attitudes within established firms are likely to reflect the culture of the country as a whole.

A range of indicators is available which can give a picture of the entrepreneurial culture in a particular country. If the society is not supportive of entrepreneurs and their activities fewer people will be prepared to take risks in business. Attitudes to failure are also important as sometimes individuals need to learn from their mistakes in business before establishing a successful venture. We consider survey evidence on nascent entrepreneurs (people who intend to set up in business), and on attitudes to entrepreneurship across the economy.

How does the UK perform?

Survey evidence from the National Panel Studies of Business Start-ups suggests that the proportion of adults who intend to start a business was lower in the UK than in the US in 1997, although comparable to the proportion in Norway and Sweden (Chart 4.12.1). In part, the better showing in the US will have been driven by strong economic performance there, although Norway's growth prospects were also very strong in 1997.

Chart 4.12.1: Adults trying to start a business in 1997
(Per cent of adult population)



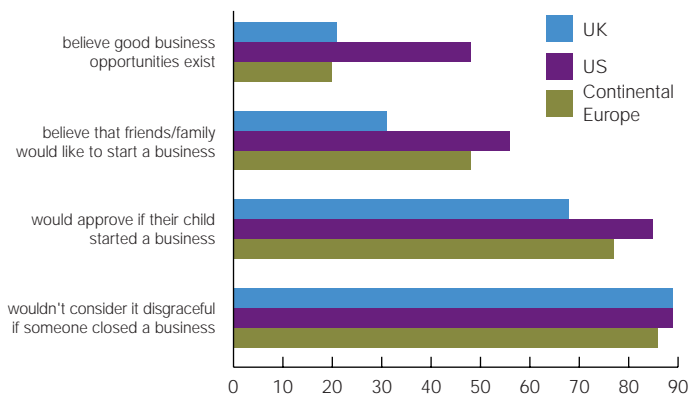
Source: National Panel (Longitudinal) Studies of Business Start-Ups

This result is also reflected in research undertaken by the Global Entrepreneurship Monitor (GEM)¹ which examines the creation of new firms across the G7 plus Denmark, Finland and Israel. It finds that the US has the highest level of entrepreneurial activity. The UK is regarded as having an average level of entrepreneurial activity, on a par with Italy, but ahead of France and Germany. The superior performance of the US in terms of nascent entrepreneurs is also reflected in society's wider attitudes to entrepreneurship. Across a range of survey questions on this issue, the GEM (the 'Entrepreneurship Index') picks up more favourable attitudes to entrepreneurship in the US than in the UK and continental Europe. It is more difficult to draw strong conclusions about UK performance relative to continental Europe.

What does this mean for the UK?

Whilst it is difficult to draw strong conclusions from the data that is available, it does not appear that the UK has achieved 'best practice' in terms of attitudes to entrepreneurship in society (Chart 4.12.2). The importance of cultural attitudes is supported by evidence suggesting the most favourable cultural climate can be found in the US, a country which also scores highly on the other indicators of entrepreneurship covered here. Attitudes to entrepreneurship and entrepreneurial activity may be seen to pick up as confidence in the stability of the macro-economy is restored.

Chart 4.12.2: Attitudes to entrepreneurship in 1998
(Per cent of adults who . . .)



Source: Global Entrepreneurship Monitor

¹ Entrepreneurship Research Council's Global Entrepreneurship Monitor (GEM)

Chapter 5: Results

The analysis of the business environment, available resources and the innovation process helps identify the factors contributing to economic prosperity. Improving current and potential performance against these indicators is the key to higher incomes and an improved quality of life.

However, success in achieving competitiveness in the knowledge driven economy ultimately needs to be judged by results. There are five sets of results indicators:

- **Output** – the best guide to overall living standards.
- **Productivity** – the most important determinant of prosperity.
- **Employment** – a successful and sustainable economy should be able to provide employment for its workforce.
- **Trade specialisation** – if the UK is to succeed in the knowledge driven economy, it needs to compete on the basis of quality and know-how rather than cost. Analysis of trade performance can indicate whether the UK is specialising in knowledge-intensive activities.
- **Composition of output** – analysis of how the structure of the UK economy is changing can also be used to draw lessons about the increasing importance of knowledge across the whole economy.

The traffic light summarises the historical performance of individual indicators, with each indicator assigned to a band on the basis of the assessment set out in the rest of this chapter.

The analysis shows that, on average, we work more hours than our competitors to achieve a national income per head that is still almost one fifth lower than the average of the G7 industrialised nations. We need to work smarter rather than harder, and build on undoubted areas of strength.

UK GDP per head is around the European Union average but still 18 per cent below the average for the G7. Our relatively good performance on employment and the growth in total hours worked contrasts with a disappointing productivity performance. Securing productivity improvements by the more effective use of knowledge is the way to improve living standards, spreading strong performance in some key knowledge intensive sectors throughout the economy.

Summary of Results Indicators

5.3	Employment rate
5.4	Trade balances in knowledge based industries
5.5	Share of output in knowledge based industries
5.1	GDP per head
5.2	Output per worker and per hour

The green band shows those areas where the UK has signs of strength. UK performance is regarded as only average in those indicators placed in the amber box. Indicators in the red section show clear signs of weakness. Within each of the three bands, indicators are listed in order of their appearance in this chapter.

5.1 GDP per head

Income still well below the G7 average

Why is it significant?

Although performance in terms of GDP per head has to be considered in the light of how this output is shared amongst the population and whether it is sustainable, this measure is usually taken as the best indicator of living standards. All the indicators under the previous three sections of the *Indicators* were chosen because of their significance for current or future GDP and its sustainability.

GDP per head relative to our main competitors is not only a measure of prosperity. It can also be taken as a proxy for the quality of consumer demand. As consumers grow more prosperous, they become more sophisticated and demanding, placing more emphasis on the quality of the goods and services they buy and more generally on the quality of life. This can have a positive “pull-through” effect on innovation and competitiveness, an effect which is especially important in the knowledge driven economy.

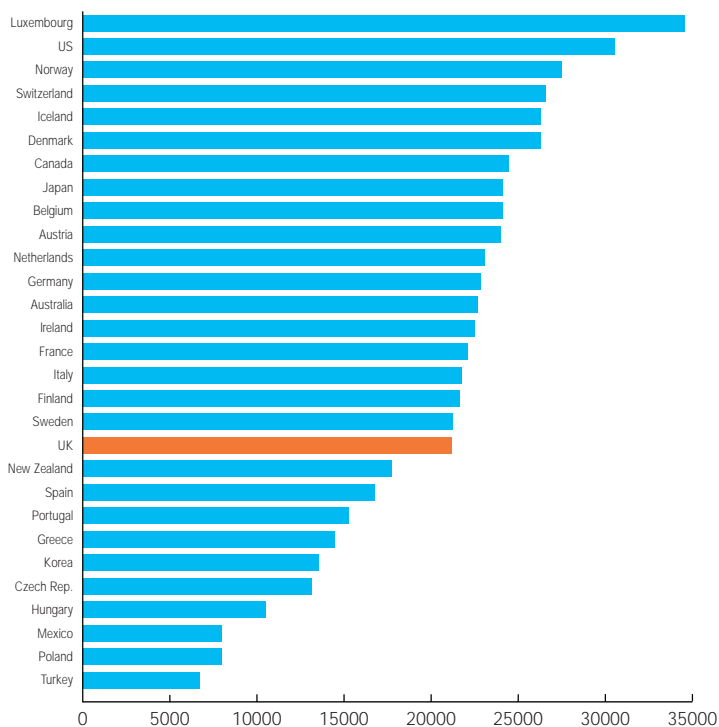
How does the UK perform?

The UK’s GDP per head is around the European Union average but still 18 per cent below the average for the G7 (Chart 5.1.1). For decades we grew more slowly than other members of the G7. The 1980s saw some improvement in the UK’s comparative growth performance as other countries slowed down and we slightly picked up. However, the UK’s relative performance weakened in the last economic cycle (Chart 5.1.2).

What does this mean for the UK?

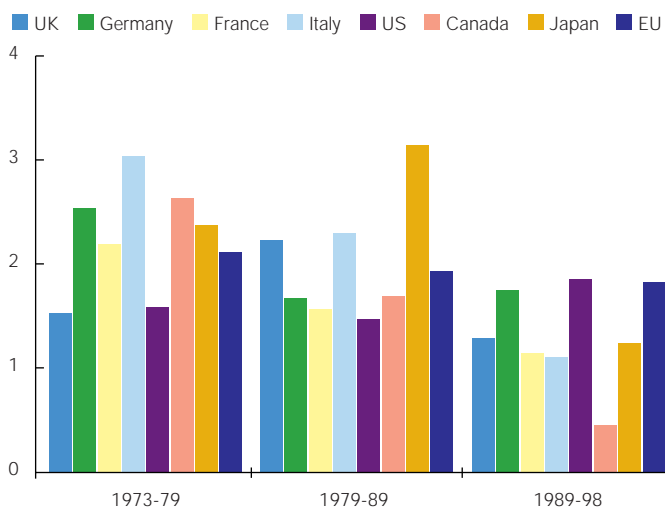
Comparisons with other OECD countries show what can be achieved. The performance of many of our competitors suggests we should be able to do better. If the UK is to catch up with the leaders we must improve our productivity performance, although not at the expense of lower employment. During the 1980s, our improved relative growth performance was mainly due to a relative increase in the number of hours we worked, rather than stronger productivity performance. This improvement in performance was not sustained into the 1990s.

Chart 5.1.1: GDP per head in 1998
(US dollars, purchasing power parity)



Source: OECD

Chart 5.1.2: Growth of GDP per head
(Per cent per annum)



Source: OECD

5.2 Output per worker and per hour

Improved productivity is the key to higher prosperity

Why is it significant?

Productivity is the most important determinant of long term GDP growth. If we can produce more with less, then we can transfer those additional resources to other activities, and so stimulate growth in the economy. Quality improvements are also important as a source of higher value added for a given resource input. There is a general consensus between trade unions and employers on the need to improve productivity in order to reduce costs, raise profitability and increase wages.

How does the UK perform?

Productivity can be measured by output per worker, or output per hour worked. The latter measure takes account of time off and part-time working. On either basis, the UK lags behind the other leading nations, with the exception of Japan, whose poor performance on the productivity per hour measure primarily reflects low productivity in the service and agricultural sectors (Chart 5.2). In terms of output per worker, the productivity leader (the US) is some 33 per cent ahead of the UK; in terms of output per hour, France is 26 per cent ahead.

Studies by the National Institute of Economic and Social Research and others show that this shortfall in productivity is common to both the manufacturing and service sectors.

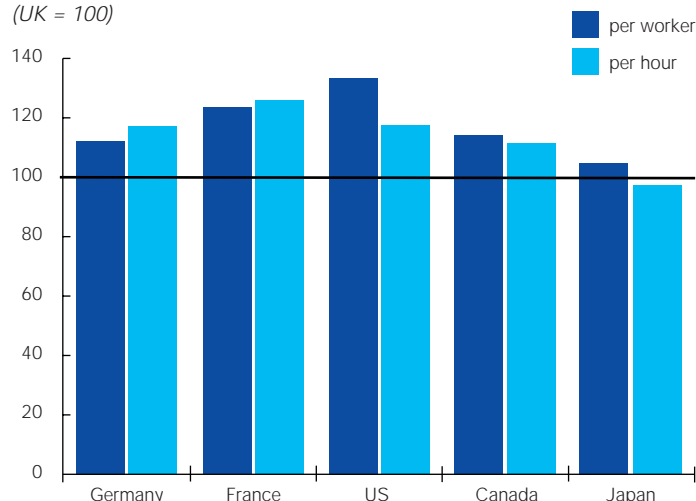
Although there is considerable controversy over the speed of the process, most economists expect productivity levels to converge amongst the industrialised countries in the long run. Productivity followers have an advantage over the leader in that they can copy the leader's best practice. Over time we have been closing the gap with the US but losing ground to Germany and France, while Japan has been catching up with the UK.

What does this mean for the UK?

Our disappointing performance in GDP per head is primarily due to a shortfall in our productivity performance. Although we have some world beating firms, this disappointing performance is common across sectors. Improving productivity should not be at the expense of compromising our good record of job creation. Rather, the key is to ensure that all firms make full use of the knowledge available to them and continue to learn from the best.

Chart 5.2: GDP per worker and per hour worked in 1997

(UK = 100)



Source: DTI calculation based on Harley and Owen (1998)

5.3 Employment rate

Strong employment performance by European standards

Why is it significant?

The proportion of the population in work is an indicator of the ability of the economy to generate job opportunities for those who want them. It also shows how well the skills and knowledge of the population as a whole are being tapped in the formal economy.

How does the UK perform?

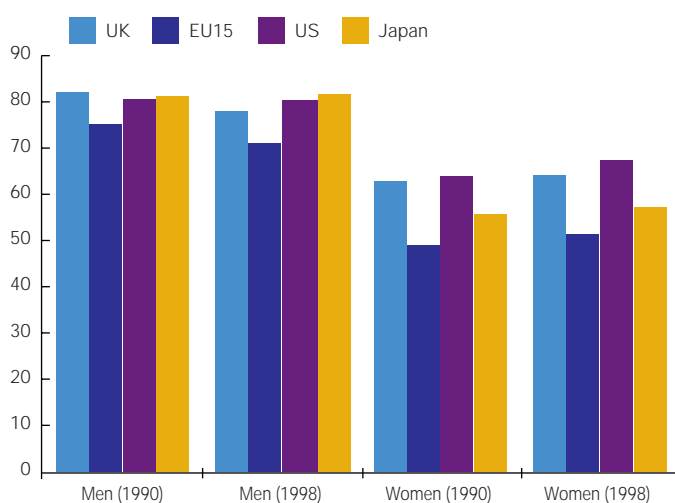
Chart 5.3 shows that the UK employment rate is relatively high, second only to the US in the G7. Across the whole of the OECD, only Iceland, Switzerland, Norway, Denmark, the US and Sweden had higher employment rates in 1998. While the rate clearly changes over the economic cycle, the underlying trend has been for a modest increase. There has been a downward trend in the male employment rate, but this has been partly compensated for by an increase in the female employment rate.

What does this mean for the UK?

The UK continues to be relatively successful in generating employment opportunities. However, there is a significant part of the workforce still unable to take advantage of the UK's continuing success at employment creation. If we are to avoid social exclusion and ensure that labour market participation is available to all, then we not only need efficiently functioning labour market institutions; we also need to ensure that everyone has sufficient skills and training, and access to information and guidance, to enable them to compete in the labour market. The Government's employment policies are aimed at achieving this. The Government is also pursuing family friendly policies which will be crucial in enabling both women and men to participate fully in the labour market.

Chart 5.3: Employment rate

(Per cent of persons aged 15-64)



Source: OECD

5.4 Trade balances in knowledge based industries

Strength in knowledge intensive services

Why is it significant?

Our future prosperity depends on competing on quality and know-how rather than cost alone. Knowledge based activities are often characterised by rapid growth in demand, and by externalities in the production process which confer an additional benefit for the economy as a whole. Looking at trade balances in selected sectors is one way to judge whether the UK is specialising in activities that are intensive in the generation and exploitation of knowledge.

It is difficult to measure knowledge in the economy. The OECD identifies a number of sectors that it defines as “knowledge based” and which it uses to proxy the importance of higher quality outputs across countries. These knowledge based industries are knowledge based services (communications, finance, insurance, real estate and business services, community, social and personal services), and high-tech manufacturing (aircraft, office and computing equipment, drugs and medicines, and radio, TV and communication equipment) and medium high-tech manufacturing (professional goods, motor vehicles, electrical machinery (excluding communication equipment), chemicals (excluding drugs), other transport equipment and non-electrical machinery).

The problem with such broad brush groupings is that they inevitably include some activities and firms that would in general not be described as knowledge based, while ignoring the importance of knowledge for performance across all other sectors. Nevertheless, looking at trade balances in these sectors can help identify broad trends in the development of the knowledge driven economy.

How does the UK perform?

The charts below look at trade balances in high-tech manufacturing activities and knowledge-based services. The indicator used is the “standardised trade balance”, a measure of the trade balance in a sector adjusted for the total volume of trade (exports plus imports) in that sector. A £1 million trade surplus in a sector with high volumes of trade like the automotive sector would score less highly than a £1 million surplus in a sector where the trade flows are smaller.

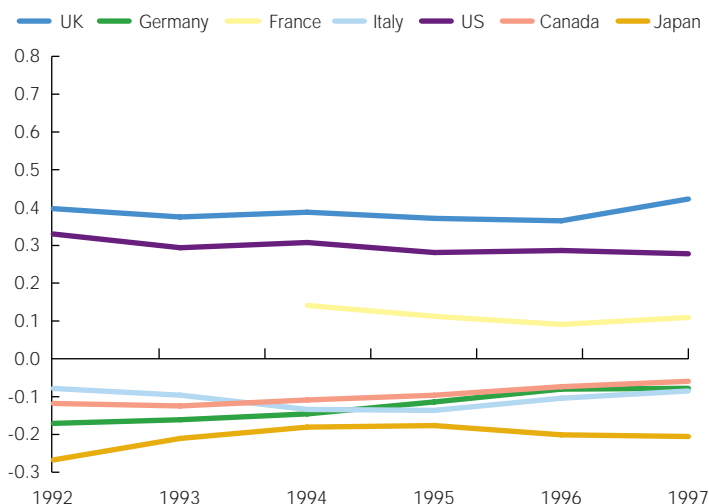
Charts 5.4.1 and 5.4.2 shows that on this measure the UK is specialising in knowledge based services, but not in high and medium high-tech industries, defined by the OECD, where the trade performance is close to balance. However, this is still a relatively strong performance in these two industries, when seen in the context of the overall trade deficit.

This picture is consistent with that emerging from other ways of measuring where the UK’s comparative advantage lies, such as looking at shares of manufacturing world trade.

What does this mean for the UK?

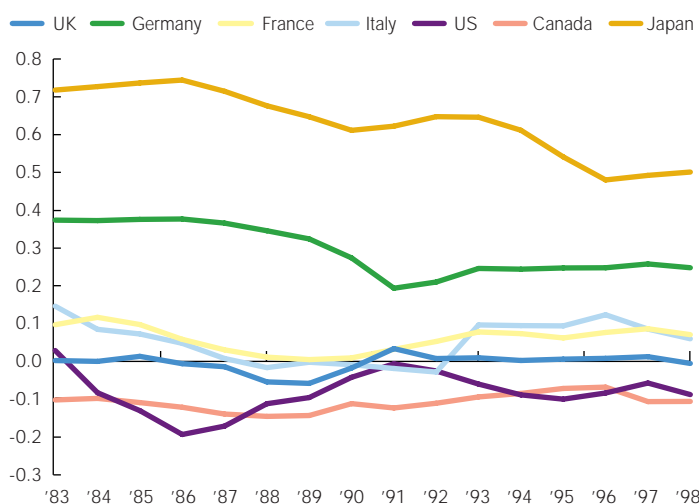
It is encouraging that the UK appears to have a comparative advantage in knowledge based sectors. The UK should build on this undoubted area of strength. However, on its own, this will not be sufficient. The size of the overall productivity gap with our competitors suggests that best practice needs to be spread throughout the economy and that all industries need to make full use of the knowledge available to them.

Chart 5.4.1: Trade performance in knowledge based services
(Standardised trade balance)



Source: IMF, ONS

Chart 5.4.2: Trade performance in high and medium-high tech industries
(Standardised trade balance)



Source: United Nations

5.5 Share of output in knowledge based industries

UK well placed in the most knowledge intensive sectors

Why is it significant?

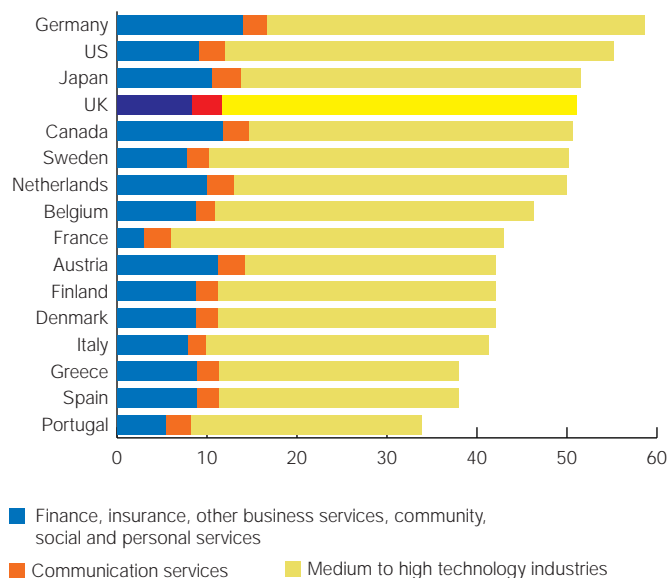
While the UK's trade balance may show strength in knowledge based sectors, it is important that this is reflected across the economy as a whole. Again, OECD definitions of knowledge based industries can be used as a proxy for structural change across the economy.

How does the UK perform?

Performance in the knowledge driven economy can be seen in comparisons of output across countries. In 1996 knowledge based industry was responsible for 51.5 per cent of business sector value added (Chart 5.5). More of German, Japanese and US output was accounted for by knowledge based industry, but the UK had a higher proportion of knowledge intensive output than the other G7 and EU countries.

Chart 5.5: Importance of knowledge based services and industries in 1996

(Per cent of business sector value added)



Source: OECD

Examples of strong performance in knowledge intensive activities can be found across the whole economy, from traditional manufacturing to knowledge based services. The UK has world-beating companies in sectors such as aerospace, pharmaceuticals, motor sport and control systems. Another area of strength for the UK in the knowledge driven economy is the performance of our creative industries. These industries – including sectors such as advertising, architecture, film, broadcasting, design and software – generate revenues of more than £60 billion, of which some £8 billion is earned from exports. They employ 1.4 million people and are growing at a rate of 5 per cent a year, twice the national average.

What does this mean for the UK?

Trade and other data suggests that the UK has a comparative advantage in knowledge based sectors. This is reflected in the economic structure of the UK where knowledge based industry accounts for over half of UK output. Moreover, the rate of growth of knowledge based industry is higher than that for the business sector as a whole. The challenge for the UK is to maintain this development and make the most of the opportunities that the knowledge driven economy presents. The Competitiveness White Paper and the 1999 Budget have already put in place policies to help the UK succeed in this environment and the latest Pre-Budget Report continues this process.

Chapter 6: Conclusions and next steps

The purpose of this first edition of *UK Competitiveness Indicators* is mainly to propose a baseline against which future performance can be measured. But lessons can still be drawn from the indicators in this first report. Discussion of the report in the Competitiveness Council confirmed that there are many encouraging examples of good performance across the UK economy. Macroeconomic prospects are improving and other features of the business environment are positive; the proportion of people in work is high; the UK's science base is strong and our research is highly regarded around the world; and we perform well in some key knowledge-intensive sectors.

However, there are other areas where the UK lags our main competitors and where improvement is needed:

Innovation. We do not make enough of our expertise in science and technology and our openness to ideas. Indicators in the report from the Community Innovation Survey show that, in terms of business spend on innovation and R&D and the proportion of revenues earned from new and improved products, many of our manufacturing firms fall well short of European best practice. These failings appear to reflect a lack of commitment and leadership in UK firms when it comes to innovation. More also needs to be done to get the best out of our universities and the UK science base, for example through developing university-industry links and promoting networks and clusters.

Management. It is clear that management performance needs to improve if we are to be successful in the knowledge economy. Studies indicate that the UK's poor investment record is due in large measure to deficiencies in management skills and attitudes. The results from the indicators on innovation and the experience of venture capitalists also suggest a shortage of good managers, particularly for fast-growing companies in high-technology sectors. There is a need to improve incentives in such companies and to upgrade management skills.

Human capital. The skills gap faced by businesses in the UK goes beyond management. 'Human capital' is another area of poor performance identified by the *Indicators* and confirmed by discussion in the Council. Our education system must deliver the product that wealth-creating business requires. Business skills need to be integrated more fully into teaching at all levels of education, from schools through to our world-class universities and research institutes. And work-based training and learning needs to continue after people have left full-time education and moved into the work-place.

Enterprise culture and small firms. The lack of an enterprising culture is a particular handicap in the knowledge driven economy. Attitudes in the UK to entrepreneurship are less favourable than in the US and in

some respects fall short of our European partners. Small firms can face difficulties in gaining access to finance, both at the start-up stage and in achieving sustained growth. Further work is needed to promote a culture of entrepreneurship, particularly among young people, and remove the barriers to the development of a dynamic small firms sector.

Consumers. Discerning and informed consumers are an important spur to competition and innovation. In part, greater consumer sophistication comes with rising income levels and rising educational attainment indicators both of which are included in the report. But anecdotal evidence suggests that UK consumers show more inertia and are generally less demanding than in other countries at similar income levels. This is an area that is being addressed in the implementation of the Consumer Strategy White Paper.

The work programme of the Competitiveness Council will reflect these themes. But, as members of the Council warned, achieving improvements will be a long-term process. UK performance as measured by the *Indicators* cannot be expected to pick up overnight. It is likely to require sustained effort over a number of years to narrow the gap with our main competitors

The *UK Competitiveness Indicators* will be used to track progress over time in addressing these priority areas. The choice of indicators will be refined as new data becomes available and as the analysis of the factors determining our relative economic performance develops. In monitoring the UK's performance, the views of business need to be incorporated. The Competitiveness Council, under the chairmanship of the Secretary of State for Trade and Industry, will therefore continue to have a role in shaping the *UK Competitiveness Indicators* and interpreting the results.

As made clear in the Introduction, not all the factors that are important for competitiveness in the knowledge driven economy are well measured at the moment, and the indicators need to be developed further. Particular areas where refinement is needed are indicators to capture the sophistication of consumer demand, competition, capital quality, work-based training, entrepreneurship and finance, the environment for e-commerce, and the development of "clusters" and other forms of collaboration. Research is under way to improve measurement in these areas.

Membership of the Competitiveness Council

The Competitiveness Council was established in July 1999 and is chaired by the Secretary of State for Trade and Industry. Its terms of reference are:

“To advise the Secretary of State for Trade and Industry on the priorities for government and others in taking forward the programme for improving UK competitiveness set out in the Competitiveness White Paper; on the progress towards achieving the desired improvements in competitiveness; and on any further policy proposals needed to address the competitiveness challenges of the future”.

The Council met for the first time in July 1999 to review the *Indicators*

Members of the Council include:

Iqbal Ahmed, Chairman, *Seafood Marketing International plc*
 Professor Kumar Bhattacharyya, *Director, Warwick Manufacturing Group*
 Sir Peter Bonfield, *Chief Executive, British Telecommunications plc*
 Sir John Browne, *Group Chief Executive, British Petroleum Co plc*
 C K Chow, *Chief Executive, GKN plc*
 Dr Chris Evans, *Chairman, Merlin Scientific Services*
 Sir Richard Evans, *Chairman, British Aerospace plc*
 Amelia Fawcett, *Managing Director and Chief Administrative Officer (Europe), Morgan Stanley Dean Witter*
 Sir Anthony Greener, *Chairman, Diageo plc*
 Deirdre Hutton, *Vice Chairman, National Consumer Council*
 Charles Leadbeater, *independent author and consultant*
 Sheila McKechnie, *Managing Director, Consumers' Association*
 John Monks, *General Secretary, TUC*
 Rosemary Radcliffe, *Chief Economist, PricewaterhouseCoopers*
 Reuben Singh, *Chairman, RSGOC*
 Ian Smith, *Group Commercial Director, Ocean Group plc*
 Sir Richard Sykes, *Chairman, Glaxo Wellcome plc*
 Carl Symon, *Chief Executive, IBM (UK) plc*
 Adair Turner, *Director General, CBI*
 Derek Wanless

GLOSSARY

G7 includes the UK, Germany, France, Italy, US, Canada and Japan.

G5 includes the UK, Germany, France, US and Japan.

OECD refers to countries belonging to the Organisation for Economic Cooperation and Development. The following are members: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, The Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

EU and **EU15** refer to the countries who are currently members of the European Union: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden, UK.

DATA SOURCES

BUSINESS ENVIRONMENT INDICATORS

2.1 Macroeconomic volatility

Annual data for GDP growth and inflation are taken from OECD *National Accounts*, up to and including 1997, with data for 1998 taken from OECD *Main Economic Indicators*. Data for exchange rate changes and nominal short-term interest rates come from the OECD *Economic Outlook*, June 1999. Volatility is measured by the standard deviation across the period.

2.2 Openness to trade and foreign investment

Openness to trade data is taken from the OECD *National Accounts*.

The source for FDI stocks is the OECD *International Direct Investment Statistics Yearbook 1998*.

2.3 Prices

Mark up data taken from Oliveira Martins, J., Scarpetta, S. and Pilat, D., *Mark up Pricing, Market Structure and the Business Cycle*, OECD Economic Studies, no. 27, (1996).

On price comparisons, the source for the Eurostat data is, *Economic reform: Report on the Functioning of Community Product and Capital Markets* presented by the European

Commission in response to the conclusions of the Cardiff European Council. Ref: COM(1999) 10 final. ISSN 0254-1475, Office for Official Publications of the European Communities, 20 January 1999. It analyses data collected by Eurostat and the OECD for calculating purchasing power parities.

2.4 Unemployment

The source for chart 2.4.1 is the OECD *Labour Force Statistics* publication and the source for chart 2.4.2 is the OECD *Employment Outlook*, 1989 data are not available for United Germany. Figures for youth unemployment in the US and UK are for the 16-24 age group. The discussion of structural unemployment is based on OECD Secretariat estimates of the non accelerating wage rate of unemployment (NAWRU) made for the OECD *Economic Outlook* No. 60, 1996. A change is considered significant (in absolute terms) if it exceeds one standard deviation. The latter was calculated for each series and country over the 1986-96 period.

2.5 Diversity of employment opportunities

The data for charts 2.5.1 and 2.5.2 are taken from the *Labour Force Survey* produced by the Office for National Statistics.

The data for chart 2.5.3 is taken from the 1997 *European Labour Force Survey* produced by Eurostat.

2.6 Industrial action

The data in Chart 2.6.1 are taken from the *Labour Market Trends* (Office for National Statistics), June 1999, and measure the number of working days lost per 1,000 employees.

The data in Chart 2.6.2 are taken from *Labour Market Trends* (Office for National Statistics), April 1999 and measure the number of working days lost per 1,000 employees. The original source for the number of days lost was the International Labour Organisation (ILO) and the source for the employee data, the OECD.

2.7 Labour market regulation

The source used was the International Institute for Management Development's (IMD) *World Competitiveness Yearbook*, which surveys businesses on whether labour market regulations are 'too restrictive or flexible enough'.

2.8 Business perceptions of the institutional and political environment

The source used was the International Institute for Management Development's *World Competitiveness Yearbook*. Two broad sets of indicators were selected in Chart 2.8.1, which presents the simple average of the scores under these headings.

For government policies the following indicators listed in that publication were chosen: the deterioration or improvement of the management of public finances; the incentive effect of real personal taxes; the incentive effect of real corporate taxes; the extent of tax evasion; the adaptability of government economic policies to a changing economic environment; the legislative activity of the parliament and its relation to the nation's competitive requirements; and transparency – the government does not communicate its intentions clearly.

For institutions those used were: the effect of the legal framework on competitiveness; the appropriateness of the political system to today's economic challenges; the effect of the customs administration on the efficient transit of goods; the extent of corruption; public service and political interference; are government decisions effectively implemented? is the law fairly administered? and are people and property adequately protected?

For the regulation chart (2.8.2), the following indicators were used: does environmental regulation hinder business? is labour regulation too restrictive? the extent of government price controls; do competition laws prevent unfair competition? bureaucracy and its effect on business development; and product liability as a constraint on business.

2.9 Sustainable Development Indicators

The Government's *Indicators for a Strategy for Sustainable Development for the United Kingdom: A baseline assessment* are published by the Department of the Environment Transport and the Regions (DETR). They can be found on the Internet at: www.environment.detr.gov.uk/sustainable/quality/monitor/index.htm#

RESOURCES INDICATORS

3.1 Adult literacy and numeracy

Literacy: The chart shows the percentage of adults with 'poor' level 1 literacy skills. Source: *Literacy Skills for the*

Knowledge Society: Further results from the *Adult Literacy Survey*, November 1997, OECD.

Numeracy: Average number of correct responses to 12 arithmetic questions set to a sample of adults. Note that the data presented in the chart excludes respondents who refused to answer any or all of the questions set. The percentage of refusals was higher in the UK than in other countries. Source: Basic Skills Agency.

3.2 National Learning Targets

Data measuring progress in meeting National Learning Targets for England for 2002, set by the Department for Education and Employment are derived from spring labour force surveys.

3.3 Business investment per worker

Figures for investment per worker in the business sector are taken from the OECD's Business Sector Database. Business investment includes investment in public corporations. The version of the database used is 1998 No. 2 as the most recent version contains data for some European countries based on the latest system of national accounts (ESA95) and some on the previous version (ESA79). The capital stock numbers are taken from *Mary O'Mahony, Britain's Productivity Performance 1950-1996: An International Perspective*, (1999), published by the National Institute of Economic and Social Research.

3.4 Government investment per head

The OECD Business Sector Database is used as the source for government investment at current prices and the deflators required to generate constant price estimators. purchasing power parities were taken from the OECD *National Accounts* and for the most recent years the OECD *Main Economic Indicators*. Population figures are taken from the OECD *Economic Outlook*. The version of the Business Sector Database used is 1998 No. 2 as the most recent version contains data for some European countries based on the latest system of national accounts (ESA95) and some on the previous version (ESA79).

3.5 Venture capital

The data on the amount and composition of venture capital come from the British Venture Capital Association. 'Start-up' venture capital is defined as: the provision of finance to companies for use in product development and

initial marketing. Companies may be in the process of being set up or may have been in business for a short time, but have not yet sold their product commercially. 'Early stage' venture capital is: the provision of financing to companies that have completed the product development stage and require further funds to initiate commercial manufacturing sales. They may not yet be generating profits. They are not strictly comparable over time since membership changes annually. 3i investment is not included in the 1984-86 figures.

For 1992 to date, secured debt is included where it is concurrent or alongside equity investment, or where it is rescue finance. Previously unsecured debt as part of an equity/quasi-equity package is included.

3.6 Second tier markets

Analysis draws upon Muzyka D., B. Leleux and N. Guegan, *European New Issues Markets: A Preliminary Review*, published by INSEAD and 3i Venturelab, November 1998. Euro NM includes the Nouveau Marche in France, NMAX in the Netherlands, the Neuer Markt in Germany, Euro NM in Belgium and Nuovo Mercato in Italy. It is an association that permits the collective communication of stock offerings, but the actual mechanics of trading remain with the individual member markets.

3.7 Stock market size and turnover

Data taken from the London Stock Exchange, *Fact File* (1999). Using market makers doubles the level of turnover in comparison with the order book/matching method. In order to make the figures internationally comparable, the turnover figures for those exchanges that use market makers, such as the UK, are halved.

3.8 Business uptake and use of ICT

Estimates of growth in web pages and new users in 1998 from International Data Corporation (IDC). Results on attitudes to ICT amongst large and small business from the *International Benchmarking Study*, Spectrum Strategic Consultants, 1998. Results on IT Directors from Institute for Directors/Oracle *Blueprint for Business*, 1998.

3.9 ICT understanding in companies

The data comes from, DTI, *Moving into the Information Age: DTI International Benchmarking Study* (1999). This was prepared for the DTI by Spectrum Strategy Consultants.

3.10 E-commerce

Data on Internet users came from NUA (www.nua.ie), drawing on multiple studies published between June 1998 and May 1999. Data on e-commerce transactions came from IDC, December 1998.

Estimates of the number of Internet users are from InternetTrak, commissioned by Ziff-Davis/Yahoo!/Dell. Consumer attitudes taken from *The Lifestyle Revolution*, September 1998, commissioned by ICL and conducted by MORI.

3.11 Publications and citations of UK research in academic journals

Data taken from *The Quality of the UK Science Base*, Office of Science and Technology (OST) (1997).

3.12 Government spend on R&D per worker

Data taken from the twice yearly OECD *Main Science and Technology Indicators*.

3.13 Business spend on R&D per worker

Data taken from the OECD Main Science and Technology Indicators and OECD Labour force statistics. Data for France are 1996, not 1997.

INNOVATION PROCESS INDICATORS

International comparisons using the second *Community Innovation Survey* (CIS), with reference years 1994-96 should be treated with caution. While the survey is designed to be consistent across countries, it is not clear that questions have always been interpreted consistently across countries. Moreover, some countries have low response rates which will undermine the reliability of the sample.

4.1 Business spend on innovation including R&D

The *Community Innovation Survey* (CIS) provides data on the innovation activities of enterprises employing more than 10 people across most EU and some EEA countries. The results are currently available for Belgium, Denmark, Spain, France, Ireland, Luxembourg, Netherlands, Austria, Finland, Sweden, UK and Norway, and are based on answers from 33,700 enterprises. The survey covers all manufacturing industries, utilities, transport and distribution services, telecommunications and financial services, computing and engineering services.

4.2 UK's patenting performance

Data for the US comes from the US Patent and Trade Mark Office. European data is provided by the European Patent Office.

4.3 Proportion of firms who innovate

The *Community Innovation Survey* (CIS) asked enterprises whether they introduced new or improved products or processes between 1994 and 1996. If an enterprise indicated they had, the CIS describes them as an innovator.

4.4 Share of sales due to new or improved products

The *Community Innovation Survey* (CIS) records the percentage of total turnover of new and improved products in manufacturing.

4.5 Internationalisation of R&D

Data taken from the OECD database on the activities of foreign affiliates. Revised UK data for 1996, published by the ONS, which has yet to appear on the OECD database, has been used.

4.6 Technological alliances between firms

The source of the data is MERIT, which is a research organisation of the University of Maastricht. Alliances can take a variety of forms, ranging from simple partnerships (cross licensing) to the establishment of common research subsidiaries.

4.7 Sources of information for innovation

Community Innovation Survey.

4.8 Joint publishing by universities and industry

The source for the chart is SPRU, *UK Corporate Research and Collaboration*.

4.9 University spin-outs

The data on spin-outs is taken from *Industry Academic Links in the UK*, published by the Higher Education Funding Council for England, December 1998. Prepared for the Office of Science and Technology.

4.10 Entry and exit rates

Large increases in the VAT registration threshold in 1991 and 1993 mean data before and after these years are not entirely comparable.

Source: DTI Small and Medium Sized Firms Statistics Unit. They capture all enterprises with a turnover above the VAT registration threshold (currently £50,000 per annum). The Regional Competitiveness Indicators uses the number of registrations as a percentage of stock of businesses. This is more appropriate on a regional basis, because it takes account of both different regional characteristics and the fact that people may live in one region and work in another.

4.11 Fast growing firms

High growth companies are defined as those who have seen an employment increase of at least 60% within three years. The data is taken from the Netherlands' Ministry of Economic Affairs, *High Growth Companies in the Netherlands* (1999).

4.12 Attitudes to entrepreneurship

The source for the data on nascent entrepreneurs is the National Panel (Longitudinal) Studies of Business Start-ups from the Great Britain Pilot Nascent Entrepreneurs Study. This has been developed by Colin Mason of Southampton University in conjunction with Barclays Bank. The first study of this kind was undertaken by Paul Reynolds of Babson College. The National Panel Studies of Business Start-ups identify a representative sample of individuals trying to launch a new business. A range of details surrounding the start-up activity are collected. The individuals are re-contacted over time to see if they did indeed start a business and how the business is developing. At this stage the US and five other countries are involved. The UK results for 1998 are from a pilot study.

The other indicators come from the Entrepreneurship Research Council's *Global Entrepreneurship Monitor* (GEM). This is a cross-national comparison of the role and impact of entrepreneurship in national economic growth. Ten countries from North America, Europe and Asia are currently involved.

RESULTS INDICATORS

5.1 GDP per head

Data on levels of GDP per head in the OECD are taken from the OECD *Main Economic Indicators*. The source for the growth rates is the OECD *National Accounts* (1999) for years up to and including 1997. Estimates for 1998 are generated using data from OECD *Main Economic Indicators*.

5.2 Output per hour and per worker

Data on GDP per worker are derived using the OECD *Labour Force Statistics* and *National Accounts*. The GDP per hour estimates are based on the methodology described in Harley, E., and Owen, J., 'International comparisons of productivity and wages', *Economic Trends*, January 1998.

The source for average annual hours worked for non EU countries is the OECD *Employment Outlook*. For Japan changes in hours for dependent employees has been projected forward from 1995 to allow a comparison to be made beyond that date.

5.3 Employment rate

Percentage of the population of working age (men and women aged 15-64) in paid employment. Source: OECD *Employment Outlook*. When interpreting these figures it must be recognised that if there is an increase in the number of people in full-time education (and who are not working) then the employment rate would fall. However, the magnitude of a fall for this reason would be mitigated by the fact that many students have some form of casual employment, and so would appear in the employment figures.

5.4 Trade balances in knowledge based industries

It is difficult to measure knowledge in the economy. However for illustrative purposes, the OECD use different sectors as proxies for knowledge intensity. The OECD define **knowledge based industries** as **knowledge based services** (communications, finance, insurance, real estate and business services, community, social and personal services), **high-tech manufacturing** (aircraft, office and computing equipment, drugs and medicines and radio, TV & communication equipment) **and medium-high-tech manufacturing** (professional goods, motor vehicles, electrical machinery (excluding communication equipment), chemicals (excluding drugs), other transport equipment, non-electrical machinery).

The main criteria used in deciding which industries are included as knowledge based industries is the amount of R&D. There is also an element of "embodied" technology, i.e. that present in intermediate inputs.

For services there is no formal methodology. The principle is that knowledge intensive services (and indeed manufactures) include those with high IT use and/or high R&D spending and/or high proportion of highly skilled workers – such as communications, finance and arguably, areas of health and education. Lack of detailed service data in many countries means that it is difficult to formally group industries according to knowledge intensity (hence there is no formal methodology).

Standardised trade balances are calculated as (Exports – Imports)/(Exports + Imports). These measures are preferred to industries' shares of OECD or world exports, or markets, because they measure the extent to which Britain has specialised in some industries, rather than others, compared to a hypothetical, autarkic economy. Data problems for calculating world shares are also greater, particularly for the service sector where the quality of the data is lower.

5.5 Share of output in knowledge based industries

Data taken from the OECD, *Science, Technology and Industry Scoreboard 1999*. Figures for UK, Denmark, Greece, The Netherlands are for 1995. Figures for Spain and Sweden are for 1994, and for Portugal, 1993.

