





The DTI drives our ambition of 'prosperity for all' by working to create the best environment for business success in the UK. We help people and companies become more productive by promoting enterprise, innovation and creativity.

We champion UK business at home and abroad. We invest heavily in world-class science and technology. We protect the rights of working people and consumers. And we stand up for fair and open markets in the UK, Europe and the world.

# Foreword

In September 2003 the DTI published its first ever strategy document, setting out how the Department will contribute to the upgrading of UK competitiveness.

The Analysis Paper accompanying the strategy is republished here as *DTI Economics Paper No. 5*. It sets out our assessment of the UK's competitive position, the opportunities facing the UK, and the principles for effective intervention. It is the product of a year-long exercise which examined the drivers of productivity, gathered evidence on the UK's strengths and weaknesses, and evaluated departmental programmes.

The UK economy has grown well in recent years. We have achieved this by having a stable macro environment and a responsive regulatory framework. But as Michael Porter stated in *DTI Economics Paper No. 3*, the UK needs a new approach to competitiveness if it is to achieve sustained higher levels of prosperity.

This is because globalisation and new technology are sharpening competition and shortening product cycles. These forces offer challenges but also tremendous opportunities.

In order to take advantage of these trends, the key is to raise productivity throughout the economy. This doesn't just mean driving down costs. It is about changing what we produce and how we produce it so that we generate ever more value out of our inputs.

The evidence and analysis exercise underpinning the DTI strategy generated a range of more detailed studies on which this summary paper is based. These studies will be published separately, as part of the DTI Economics Papers series. The aim is to provide a further resource for researchers and to make transparent the evidence base upon which policy is made.

As a first step, further analysis will be provided in *DTI Economics Paper No. 6*, which will contain the latest review of DTI's Productivity and Competitiveness Indicators and *DTI Economics Paper No. 7*, which will give a more detailed assessment of UK innovation performance as background to the forthcoming innovation review.



**Vicky Pryce**

Chief Economic Adviser and Director General, Economics. DTI

# DTI Economics Papers

The reviews of the DTI in Autumn 2001 placed analysis at the heart of policy-making. As part of this process the Department has decided to make its analysis and evidence base more publicly available through the publication of a series of DTI Economics Papers that will set out the thinking underpinning policy development. Previous titles include

**Bundling, Tying and Portfolio Effects**, Professor Barry Nalebuff (Yale University), February 2003

**A Comparative Study of the British and Italian Clothing and Textile Industries**, Nicholas Owen (DTI), Alan Canon Jones (London College of Fashion), April 2003

**UK Competitiveness: Moving to the next stage**, Professor Michael Porter and Christian H M Ketels (Institute of Strategy and Competitiveness, Harvard Business School), May 2003

**Options for a Low Carbon Future**, June 2003

The views expressed within *DTI Economics Papers* are those of the authors and should not be treated as Government policy. We welcome feedback on the issues raised by the *DTI Economics Papers*, and comments should be sent to [dti.economics@dti.gsi.gov.uk](mailto:dti.economics@dti.gsi.gov.uk)

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# Introduction

This paper sets out the evidence underpinning the DTI Strategy. It explains the:

- **Economic context facing the UK** – highlighting that improving productivity is the key to improving prosperity
- **DTI's framework for intervention in the economy** – only soundly based policies that correct for market failures will generate sustainable increases in productivity
- **Strategic priorities** that DTI will focus on over the next five years

It draws on an assessment of the academic evidence on productivity, and considers evaluation evidence on the effectiveness of DTI's policies.

# 1

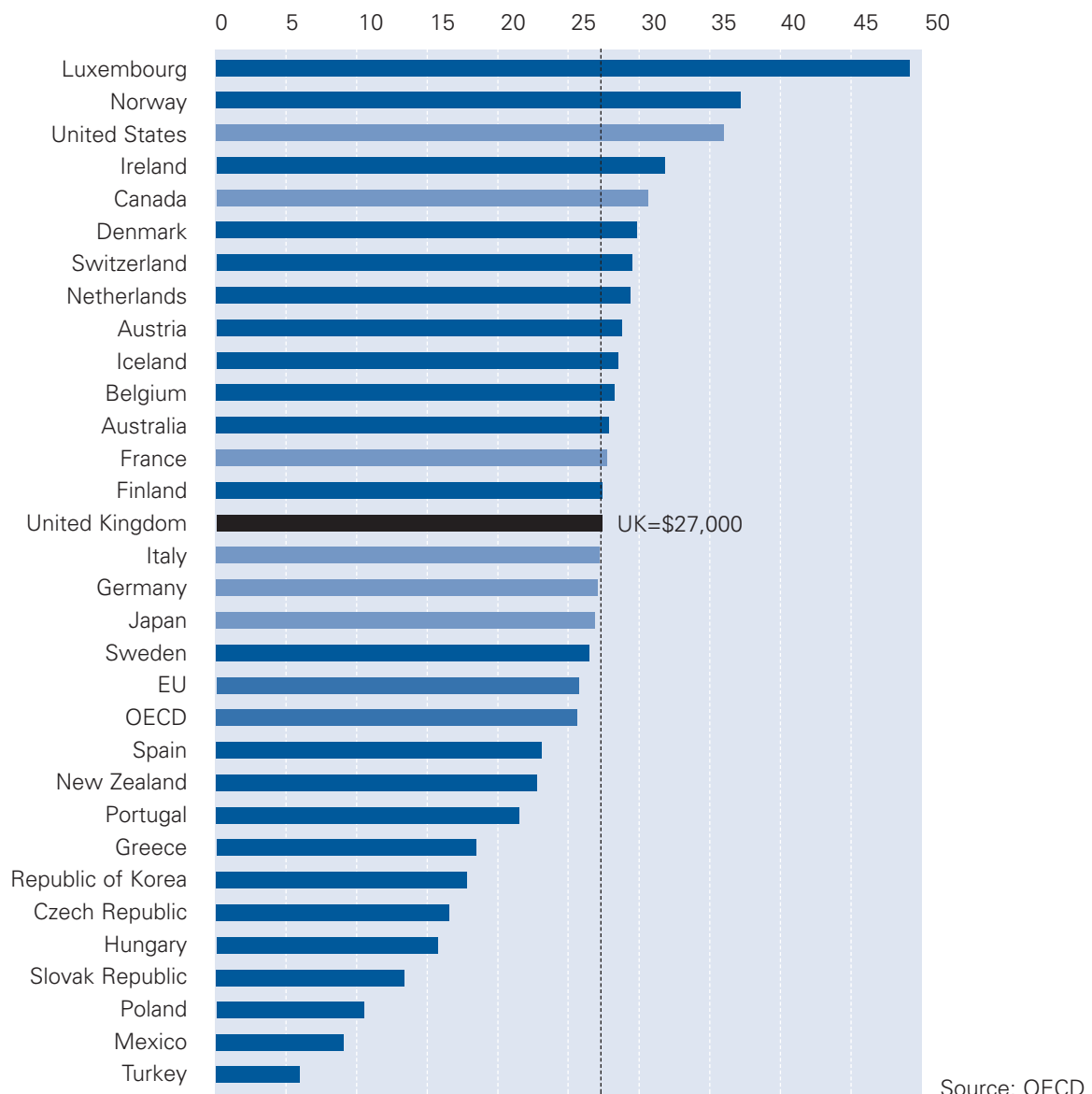
## The Economic Context

The Government's economic strategy aims to achieve sustainable increases in prosperity. It is improvements in prosperity – GDP per head – that allow for higher wages, profits and higher levels of investment in public services (box 1). Within the OECD, the UK is a middle ranking country in terms of GDP per head (chart 1). This is despite a relatively strong GDP growth performance in recent years.

### Chart 1: GDP per head of population

OECD comparison, 2002

US dollars thousands, purchasing power parities

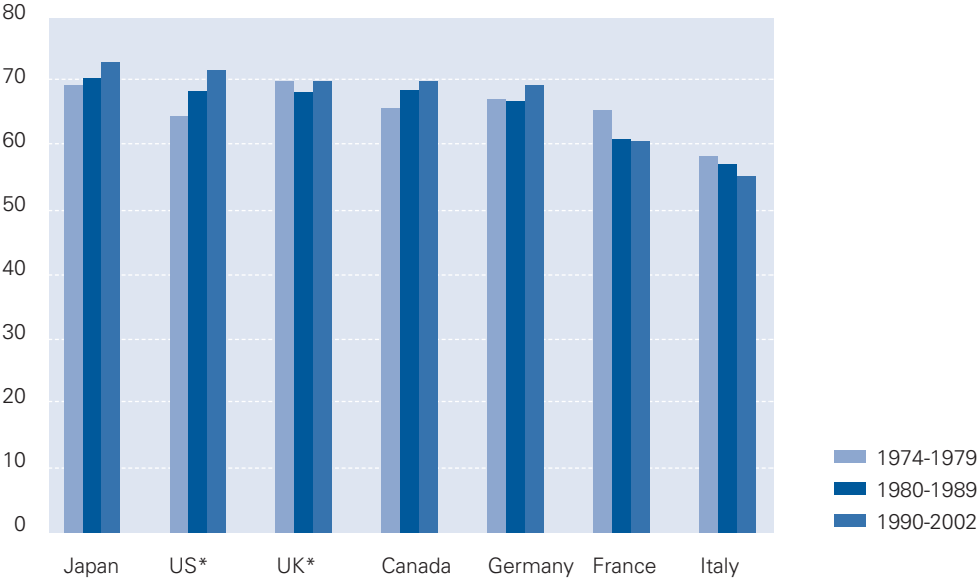


Source: OECD

The relative improvement of UK GDP per head has been largely driven by the labour market. Over the most recent international economic cycle (1990 – 2002) UK employment rates are ahead of Canada, France, Germany and Italy. Compared to the previous economic cycle, employment rates have increased; this is common across the G7, with the exception of France and Italy (chart 2).

**Chart 2: Average employment rate**

G7 Comparison, 1974 – 2002  
Per cent of population aged 15 – 64



\*employment aged 16-64  
Source: OECD

**Box 1: Economic Growth and Living Standards**

In order to generate overall increases in prosperity, we need to raise the level of gross domestic product (GDP) per head. GDP per head depends on both the number of workers and their productivity. If the Government wants to increase prosperity, it can adopt policies to improve labour market participation, or to raise the level of labour productivity.

Productivity is a measure of the efficiency by which the economy turns inputs, such as labour and capital, into value added. Traditional schools of economic thought – which stressed the importance of capital accumulation – suggested that there was little that Governments could do to raise the long-term rate of productivity growth. However, in recent years developments in the way economists think about economic growth have highlighted the important role of ‘externalities’ in the growth process. This ‘new growth theory’ suggests that government can have a positive effect on both the level and growth rate of productivity, and thereby prosperity, if policies seek to correct for *market failures*.#

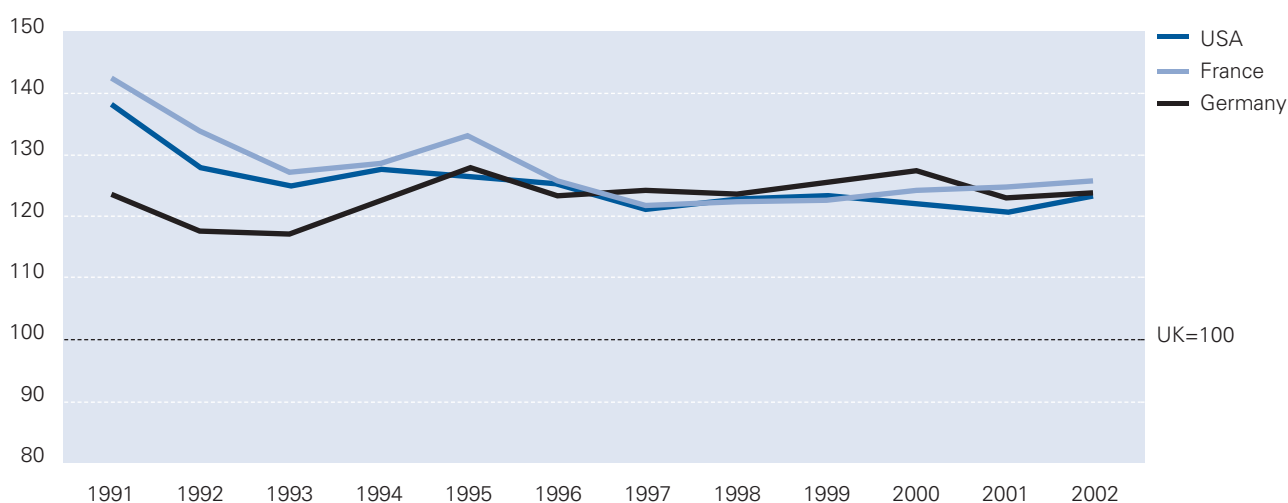
Prosperity also needs to be considered in the light of how it is shared among the population and whether it is sustainable. There is little point raising prosperity today if it leads to lower prosperity tomorrow. So in addition to a focus on GDP per head, Government also needs to take action in areas such as the environment, energy and social inclusion in order to achieve the ambition of prosperity for all.

# Aghion, P., and Howitt, P., *Endogenous Growth Theory* (1998)

As chart 1 showed, despite our strong labour market performance, the UK remains a middle ranking country in terms of prosperity. This is because of our weak record on productivity (chart 3). Workers in France, Germany and the US produce more per person and per hour worked (box 2). To some extent, the recent weakness of our productivity performance is the flip-side of our strong employment performance; improved labour market participation has brought workers with lower average productivity into the labour market.<sup>1</sup> However, this short-term phenomenon cannot disguise the fact that the UK has had a long-standing structural weakness in terms of productivity growth. This has resulted in a persistent gap in the level of productivity between the UK and its major competitors. This has been a feature of British economic history, opening up with the US in the 1870s, and Europe during the 1970s.<sup>2</sup>

### Chart 3: The productivity gap

Output per hour worked  
UK = 100



Source: National Statistics

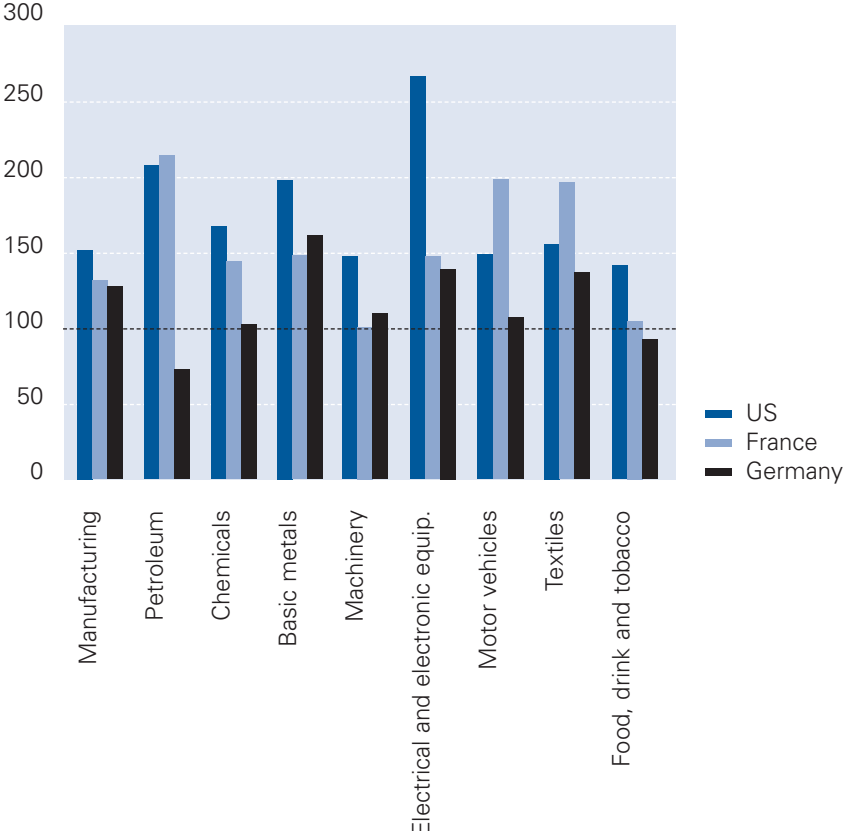
The productivity gap is a common feature across the UK economy, in manufacturing, as well as in services; the sectoral contribution to the gap is broadly proportional to each sector's share of overall output (charts 4 & 5). The UK productivity gap is not the result of there being 'too much' services, or 'too little' manufacturing.

1 Gregg, P. and Wadsworth, J., 'Mind the gap, please? The changing nature of entry jobs in Britain', *Economica* 67 (268) (2000)

2 Maddison, A., *Dynamic forces in capitalist development* (1991); Crafts, N.F.R. and Toniolo, G., *Economic Growth in Europe since 1945* (1996)

**Chart 4: Relative labour productivity – Industry**

US, France, Germany and UK comparison for selected industries, 1999  
 UK = 100



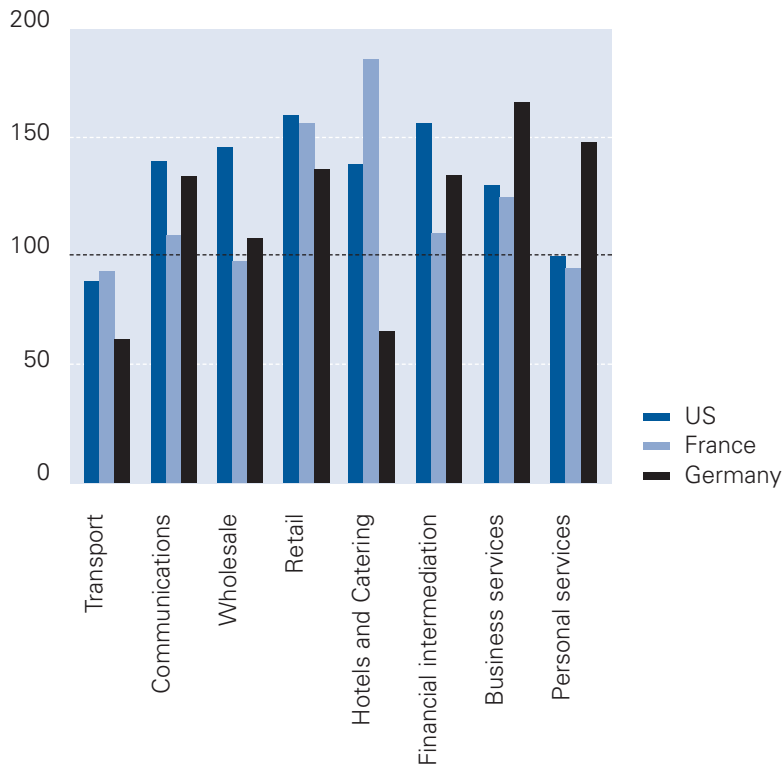
Source: NIESR

The gap also appears to be a feature common to most UK plants. Recent analysis of individual UK plants shows that apart from the best plants, which are equivalent to the best of our competitors, the remainder have consistently lower productivity than their international competitors.<sup>3</sup>

<sup>3</sup> Haskel, J. and Martin, R. 'The UK Manufacturing Productivity Spread', *CeRIBA Discussion Paper*, (2002)

### Chart 5: Relative labour productivity – Market services<sup>4</sup>

US, France, Germany and UK comparison, 1999  
UK = 100



Source: NIESR

There is also an important regional dimension to productivity. Analysis suggests that up to 60% of the differences in performance of the best and worst performing UK regions is the result of differences in productivity (chart 6).<sup>5</sup>

This is partly the consequence of different factor endowments, with the more productive regions having higher levels of skills and R&D.<sup>6</sup>

<sup>4</sup> There are a range of data and measurement issues that cause problems in cross-country comparisons of service sector productivity.

<sup>5</sup> HMT, *Productivity in the UK: 3 – The Regional Dimension* (2001)

<sup>6</sup> DTI, *Regional Competitiveness & State of the Regions* (2003a)

## Box 2: Labour Productivity

There are two measures of labour productivity:

- **Output per worker** is simple to measure, but comparisons suffer from differences in the way labour is used across countries (eg workers in some countries have longer holidays while others have a longer working week).
- **Output per hour worked** adjusts for labour intensity, and is the most commonly used academic measure of productivity. However, it is more difficult to measure.

Labour productivity per hour depends on two factors:

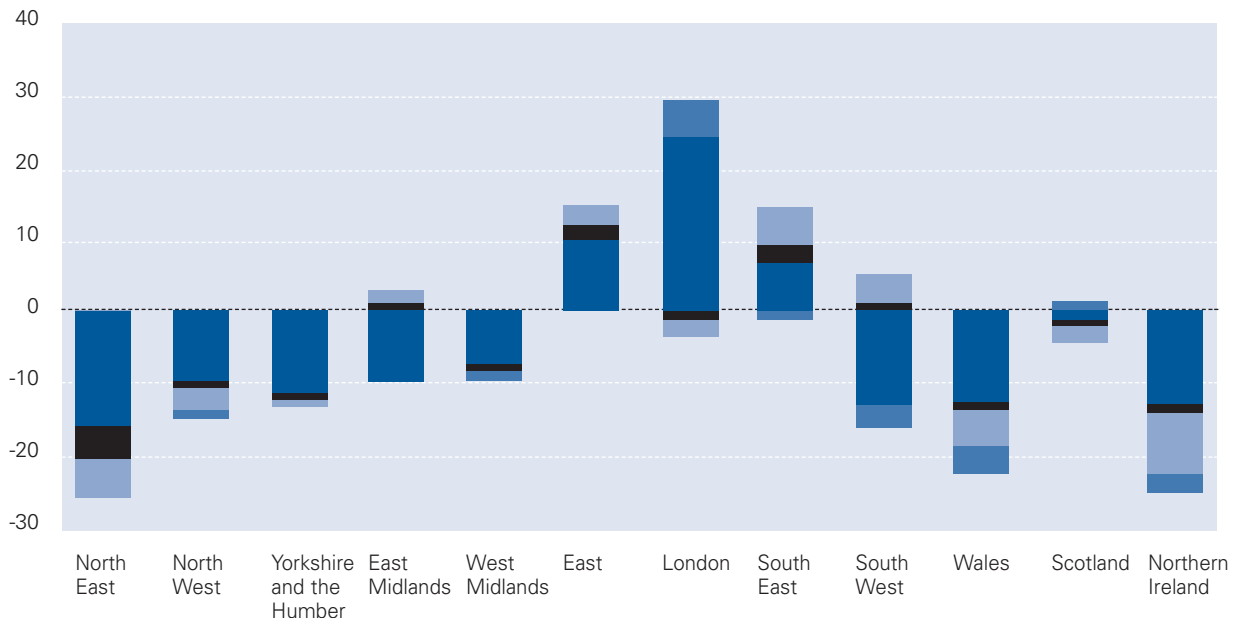
- The amount of **capital** the worker has to work with – workers who have lots of capital can produce more during their working lives than their less capital intensive counterparts.
- So called '**total factor productivity**' (TFP) measures how efficiently capital and labour are used together and captures a range of factors such as skills, technology, organisation, competition and economies of scale. The TFP gap has many interpretations, but the clearest way to understand the 15% TFP gap with the US is that even if the UK workers had the same level of capital, and worked as long as US workers, our productivity would be 15% lower.#

# O'Mahony, M. and De Boer, W. *Britain's Relative Productivity Performance: Updates to 1999* (2002). The 15% figure is derived from NIESR's analysis and should therefore not be used in relation to productivity estimates produced by the ONS.

## Chart 6: Decomposition of differences in regional gross value added per head

Regions, 1999

Per cent contributions



Source: HM Treasury, based on ONS data

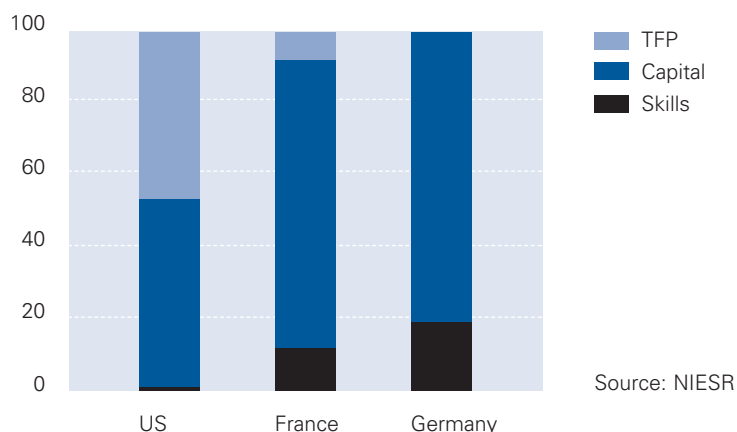
■ Productivity      ■ Participation  
■ Unemployment      ■ Working-age population share

A range of factors account for the productivity gaps that exist between the UK and its major competitors.<sup>7</sup> The relatively lower capital stock that supports each UK worker appears to be a common factor across all comparisons. Skills appear to be more of a problem in relation to continental Europe than with the US. Total factor productivity appears to have a substantial role in accounting for the productivity gap with the US (chart 7).

### Chart 7: Accounting for the UK's productivity gap

US, France and Germany, 1999

Per cent contributions



While growth accounting describes the differences in productivity performance, it cannot *explain* those differences.<sup>8</sup> This is why the Government has undertaken more detailed analysis by examining the 'Five Drivers' of productivity.

- Investment
- Innovation
- Skills
- Enterprise
- Competition

The five drivers provide an analytical and organising framework for assessing the UK's progress in improving productivity. There are, of course, complementarities and interdependencies between these drivers, so no one driver can be thought of as more 'important' than another. However, international comparisons permit benchmarking comparisons that identify the UK's strengths and weaknesses.<sup>9</sup>

7 Crafts, N., and O'Mahony, 'A Perspective on UK Productivity Performance', *Fiscal Studies*, Vol. 22 (3), (September) (2001). This analysis, which uses growth accounting, should be regarded as broadly indicative, as it does not take into account the interdependencies and complementarities that exist between different factors of production.

8 Maddison, A., *ibid* (1991); Maddison, A., *Monitoring the World Economy 1820-1992* (1995)

9 DTI, *Productivity and Competitiveness Indicators: Update 2002* (2002), provides a fuller assessment of the 'five drivers'.

## Investment

Investment raises the productivity of the existing workforce, and can embody new technology. The UK has a substantial deficit in terms of capital per worker, with US workers enjoying 50% more capital than their UK counterparts. This is the result of historic under-investment; the UK has tended to invest less than its major competitors, in both the public and private sector.<sup>10</sup> Recent developments have improved the investment climate: macroeconomic stability has brought down interest rates and there have been significant reforms to the tax system to encourage investment.<sup>11</sup>

## Innovation

Innovation – the successful exploitation of new ideas – is one of the main engines of long-term economic growth.<sup>12</sup> It can result in new technologies, new products and processes, as well as novel services and means of delivery. The UK has a long-standing strength in the generation of new ideas; our science base is among the most productive and highest quality in the world.<sup>13</sup> However, we have not been effective in turning those ideas into products, services and processes that consumers want to buy. The UK has one of the lowest levels of R&D per worker in the G7, and in manufacturing new products account for only 25% of total sales.<sup>14</sup>

## Skills

Higher skill levels allow workers to generate new ideas and adapt to the changing economic environment.<sup>15</sup> The UK has a long-term weakness in the level of human capital.<sup>16</sup> Despite recent improvements in schooling, the UK has a smaller proportion of workers with basic and intermediate skills than France and Germany. This arises at both level 2 (GCSE equivalent) and at level 3 (A level equivalent) where the UK has half the proportion of the working age population qualified to level 3 as Germany.<sup>17</sup>

## Enterprise

Enterprise involves the identification and exploitation of new business opportunities and is closely linked to innovation.<sup>18</sup> A range of indicators suggest that the UK has relatively low levels of enterprise. The overall framework for enterprise is supportive, with low regulatory start-up barriers. There are strengths in terms of access to finance where the UK scores relatively well in terms of private equity and venture capital. However, there are weaknesses in socio-cultural attitudes to risk-taking that act as a barrier to enterprise.<sup>19</sup>

10 O'Mahony, M. and De Boer, W., *ibid* (2002)

11 CBI/TUC, *The UK Productivity Challenge* (2001)

12 OECD, *The sources of economic growth in OECD countries* (2003); A more comprehensive account of UK innovation performance will be set out in an analytical report accompanying the forthcoming Innovation Review

13 DTI, *Excellence and Opportunity a science and innovation policy for the 21st century* (2000); OST, *The Forward Look 2003: Government funded science, engineering & technology* (2003)

14 OECD, 'Competition, Innovation and Productivity Growth: A Review of Theory and Evidence', *Economics Department Working Paper*, No. 317, (2002)

15 DFES, *Towards a National Skills Strategy: Evidence Paper*, Department for Education and Skills (2003b)

16 Crafts, N. and O'Mahony, M., *ibid* (2001)

17 DFEE, *Skills for all: Research Report from the National Skills Task Force*, SKT 29 (2000)

18 OECD, *Fostering Entrepreneurship* (1998a)

19 GEM, *Global Report* (2002); EVCA, *Annual Survey of Pan-European Private Equity & Venture Capital Activity: EVCA Yearbook 2003* (2003); European Commission, *Creating an Entrepreneurial Europe* (2000)

## Competition

An effective competition framework provides the right incentives for new businesses to develop and for firms to become more innovative. The UK's competitive environment is an asset. The UK possesses an open and effective competition regime, access to world markets, and a flexible labour market that has generated high levels of employment and a diverse range of job opportunities.

## Assessment

The benchmarking of the five drivers shows that there is no single factor holding back UK productivity performance. The productivity gap is the cumulative result of a series of historic weaknesses. The result has been a failure to make the most of high value added business opportunities. If productivity is to improve, then the UK has to be more adept at seizing those opportunities. As Michael Porter has noted:<sup>20</sup>

“the UK currently faces a transition to a new phase of economic development.....We find that the competitiveness agenda facing UK leaders in government and business reflects the challenges of moving from a location competing on relatively low costs of doing business to a location competing on unique value and innovation. This transition requires investments in different elements of the business environment, upgrading of company strategies, and the creation and strengthening of new types of institutions.”

If the UK can make this transition, then the rewards are enormous. Richer, larger global markets offer tremendous opportunities for UK business. DTI can help the UK make that transition by ensuring that its interventions are soundly based.

20 Porter, M.E. and Ketels, C.H.M., 'UK Competitiveness: Moving to the Next Stage' *DTI Economics Paper No. 3* (2003)

# 2

## DTI's Framework for Intervention

Government activity cannot substitute for private sector actions. Wealth is primarily created by the actions of firms operating in free markets, and it is clearly not the role of government to either duplicate or substitute for such private sector activity. But the Government does have a critical role in promoting a stable macro-economic environment, providing an effective commercial, legal and regulatory framework and improving the working of markets.

The analysis of the five drivers suggests areas where the UK's performance could be improved. But a weakness in a particular driver of productivity is in itself an insufficient condition for Government action. History is littered with examples of well-intentioned policies that sought to address problems, but resulted in failure. This is often because they were poorly targeted, or displaced private sector activity. Recent developments in economic theory, together with the evidence from evaluation of DTI schemes shows that effective industrial policy requires an approach that seeks to correct for market failures.

The presence of market failures means that the outcome generated by the unregulated market is not the 'right' result from the perspective of society as a whole. Market failures can occur in many different ways but they can all be classed into four generic categories:

- Externalities
- Barriers to entry
- Imperfect information and uncertainty
- Public goods

Government policy to support productivity needs to address these market failures in a way that is proportional to the problem, and is not outweighed by government failure.<sup>21</sup>

### Externalities

Externalities are often referred to as 'spillover' effects. These arise where the absence of property rights mean that actions by a firm or individual create benefits (or costs) that are not captured (or are not borne) by that firm or individual. Positive externalities can arise in the case of research and development (R&D), where the ideas generated by one firm's R&D can be shared by other firms. The problem arises because the firm undertaking the R&D cannot appropriate all of the benefit from that investment, creating a disincentive to invest. Consequently, the presence of externalities means that firms will 'under-invest' in R&D from the perspective of society as a whole.

<sup>21</sup> HMT, *Green Book, Appraisal and Evaluation in Central Government* (2003)

## Barriers to entry

Effective competition leads to efficient allocation of existing resources into the most productive areas. Competition also provides a dynamic incentive to innovate, to produce new products and processes and thereby raise productivity in the future. However, if there are 'barriers to entry' – created by private action or public regulation – then new firms with more efficient products, services or processes cannot come to market. This can stymie efficient resource allocation and innovation.

## Imperfect information and uncertainty

A lack of information can cause an inefficient allocation of resources. For example, if workers are not aware of the benefits – in terms of higher wages and employability – of training, they will invest less in training.

Similarly, levels of uncertainty are usually high when firms invest in R&D and there is the potential for significant information asymmetries. Difficulties in assessing future cash flows mean that the manager will have a much better idea about performance than outside investors. And the manager of the risky project, having received external financing, may undertake activities that are not in the financier's best interests. Investors therefore find it difficult to identify good managers. Recognising this, good managers may sacrifice longer-term projects to provide higher short-term returns that less able managers cannot match. As a result profitable (over the lifetime of the project) long-term investments (eg R&D) might be sacrificed leading to under-investment.

## Public goods

Public goods are those that are *non-rival* in consumption – one individual's consumption of the good does not mean that there is less of it for everyone else – and *non-excludable* – it is not possible to stop anybody else from using the good once it has been produced. Once goods with these characteristics – such as street lighting or national defence – are provided for one consumer, they are provided for all. This can result in an under-provision because the consumers of public goods have an incentive to 'free-ride', and the producers of those goods may not gain the full returns from their output. The public good concept provides the rationale for public support for basic scientific research: once they occur basic scientific breakthroughs are available to all; as a result they would be under-provided in a free market.

If these market failures are to be successfully addressed, Government interventions need to be carefully designed if they are to be effective. Evaluation evidence of DTI's programmes highlights five key lessons:<sup>22</sup>

- 1 The strength of a scheme's rationale is an important determinant of programme success.
- 2 Schemes that support the sharing of knowledge through the brokerage of partnerships or collaboration tend to achieve widespread economic benefits.
- 3 Schemes that involve SMEs tend to achieve greater additionality (ie encourage firms to do something they would otherwise not have done).
- 4 Programmes that support business activities that are long term and innovative in nature, and that engage strategic commitment, are successful because they are seen as core to the future of the business.
- 5 Successful programmes tend to be well-specified, have clarity about objectives and include well defined conditions for support.

22 SQW, DTI Industrial Support Policies: Mapping and Assessing the Pattern of DTI Industrial support and its implications (2001b)

These policy principles are now embedded in DTI processes. As part of the new approach to business support, business cases for all expenditure proposals have to be submitted to the Department's Investment Committee. The business cases have to set out the objectives of the expenditure along with an assessment of how the expenditure contributes towards UK productivity. The cases have to set out the market failure rationale underpinning them, along with a full option appraisal. Benefits and costs are quantified in order to ensure value for money and that the scale of project is proportional to the problem. The business cases also recognise the need for continuous improvement by setting out detailed evaluation plans.

# 3

## DTI's Strategic Priorities

'Market failure' provides an approach to thinking about how to intervene, but the question of where DTI should focus its effort depends on a rigorous analysis of the factors influencing productivity. The Five Drivers provide a valuable organising framework, but are at too high a level to permit effective Departmental prioritisation.

As a result, the DTI has looked to a level below the Five Drivers in developing this Strategy. DTI has identified sixteen policy areas that influence productivity and prosperity (Annex 1). The Department has undertaken an extensive evidence collection exercise for each of the sixteen policy areas. This has drawn on academic research into productivity and evaluations of DTI policies. The evidence exercise formed the basis for a structured assessment of DTI's evidence base, which considered two key questions:

- *How important is the policy area for productivity?*
- *How effective can DTI be in influencing that policy area?*

**The results of the evidence assessment suggest that DTI can make the most difference to productivity by focusing on four priority areas:**

- **Transferring knowledge**
- **Maximising potential in the workplace**
- **Extending competitive markets**
- **Strengthening regional economies**

**The evidence exercise also showed that DTI could not achieve its aims on its own. The Department would have to *forge closer partnerships* if it was to deliver higher levels of prosperity.**

There are many other areas where the DTI should and will continue to operate, such as improving enterprise in deprived communities and supporting resource productivity. The evidence assessment also noted the importance of maintaining energy security against a background of increasing risks of disruption. However, the analysis suggests that it is in the four priority areas that DTI can have the biggest impact on the UK's overall prosperity at the moment.

### Transferring Knowledge

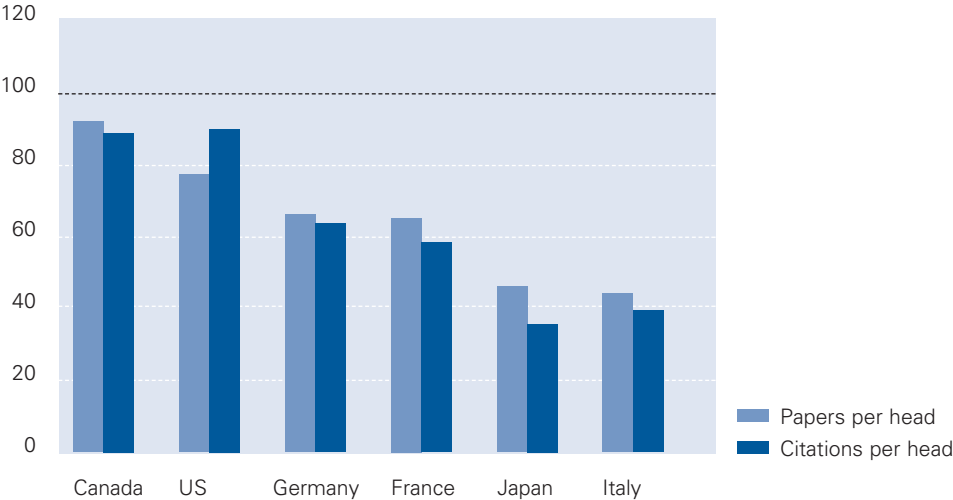
Innovation is the successful exploitation of new ideas. It can result in new technologies, new goods or services, or new products and processes. It can mean generating more value added from existing inputs of capital and labour. Measures of total factor productivity are often interpreted as proxies for innovation performance.<sup>23</sup> On this basis, the UK has a substantial gap with the US.

23 Crafts, N. and O'Mahony, M., *ibid* (2001). It should be noted that measures of TFP – which are effectively residuals – will also include a range of non-innovation factors such as the presence of economies of scale, differences in competitive intensity, and simple measurement error.

The challenges of globalisation and new technology mean that UK business will have to become more innovative.<sup>24</sup> Improved knowledge transfer, whether between business and universities, or from business to business, is a key to improved innovation performance.<sup>25</sup> The underlying excellence of the science base demonstrates the UK's capacity for technological innovation. The UK is ranked first in terms of papers and citations per head in the G7 (chart 8). The UK has 1% of the world's population, undertakes 5% of the world's science, produces 8% of all papers and has 9% of all citations.<sup>26</sup>

**Chart 8: Papers and citations per head of population**

G7 comparison, 1997-2002  
 UK = 100



Source: Evidence Ltd, Thomson ISI

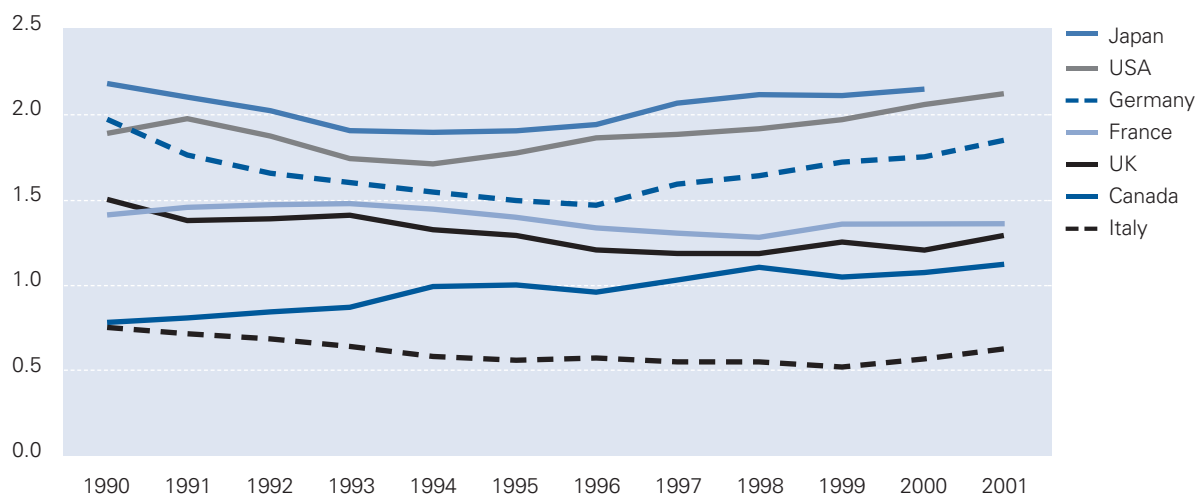
However, the UK under-performs in its ability to translate that scientific excellence into profitable products and processes. For example, the level of R&D spend remains low in both public and private sectors compared with our key international competitors (chart 9).<sup>27</sup> This is common across most industrial sectors. Although the UK scores very well on pharmaceutical R&D, it performs less well in aerospace and very poorly on office and computing machinery. As a result, UK businesses generate a smaller proportion of their turnover from new products and processes than their major competitors.<sup>28</sup>

24 Porter, M.E. and Ketels C.H.M., *ibid* (2003)  
 25 Lundvall, B. A., *National systems of innovation* (1992); Nelson, R.R., Recent Evolutionary Theorizing about Economic Change, *Journal of Economic Literature*, Vol. 33 (1995); Edqvist, C., 'Systems of innovation Approaches – Their Emergence and Characteristics', in Edqvist, C. (ed.) *Systems of Innovation, Technologies, Institutions and Organizations* (1997); Freeman, C., *The Economics of Innovation* (1997)  
 26 DTI, *Excellence and Opportunity: a science and innovation policy for the 21st Century* (2001)  
 27 DTI, *ibid* (2002)  
 28 DTI, *ibid* (2002)

## Chart 9: Business enterprise R&D as a percentage of GDP

G7 comparison, 1990 – 2001

Per cent



Source: OECD Main Science and Technology indicators

Innovation is not only about transferring knowledge and ideas from the science base. Businesses can learn from each other – from firms in the sector, from specialist intermediaries, and from others within the supply-chain. This collaboration helps to disseminate new techniques, facilitates the adoption of new practices, and the development of new products.

As chart 9 suggested, the UK under-performs in terms of innovation. One way for the Government to foster an improved environment for innovation is to correct for the market failures that affect investment in innovative activity.

In addition to the problems of the absence of property rights and the presence of externalities to innovation (table 1), there is likely to be less knowledge transfer than is socially desirable because of information failures. This is because the increased specialisation and growing division of labour required in a modern economy means that it is costly to acquire knowledge outside a firm's immediate domain of competence and experience.<sup>29</sup> Knowledge is an 'experience good': you only know if knowledge has any value once you have consumed it.<sup>30</sup> Consequently there are substantial search and sunk costs involved for firms deciding whether to purchase knowledge and ideas from other organisations. The presence of these costs may prevent firms from gaining knowledge and forging the links that are essential for successful innovation.<sup>31</sup>

29 Metcalfe, J.S., *Innovation as a policy problem; New perspectives and old on the division of labour in the innovation process* (1998)

30 Varian, H.R., Shapiro, C., *Information Rules: A Strategic Guide to the Network Economy*, (1998)

31 Smith, K., 'The Systems Challenge to Innovation Policy', in W. Polt and B. Weber, eds., *Industrie und Glueck. Paradigmenwechsel in der Industrie-und Technologiepolitik*, Vienna (1996)

Literature on innovation suggests that there are three priority areas where Government can foster improved innovation performance:<sup>32</sup>

- Learning and capability building within firms
- Strengthening the innovation infrastructure
- Improving the awareness of technology and market trends to inform judgements about market opportunities

**Table 1: Private and social returns to R&D**

Author (Year)	Estimated Rates of Return (%)	
	Private	Social
Nadiri (1993)	20-30	50
Mansfield (1977)	25	56
Terleckyj (1974)	29	48-78
Sveikauskas (1981)	10-25	50
Goto-Suzuki (1989)	26	80
Bernstein & Nadiri (1988)	9-27	10-160
Scherer (1984)	29-43	64-147
Bernstein & Nadiri (1991)	14-28	20-110

Source: Table adapted from Griliches (1992)<sup>33</sup> and Nadiri (1993)<sup>34</sup>

DTI intervention can be effective. DTI has re-engineered its business support delivery and will continue to support innovation through a re-focused set of business support products. The improvements to these products have drawn upon evidence on the effectiveness of previous interventions such as:<sup>35</sup>

- **'SMART'** which is to be superseded following the business support review by an R&D grant – provides grants to individuals and small to medium-sized businesses to develop technologies leading to commercial products.<sup>36</sup> Evaluation suggests that 70% of SMART projects reach market, and that 94% of beneficiaries would not have been able to pursue the project without the award. Each £1m of expenditure created additional turnover of £2.4m.<sup>37</sup>
- **'LINK'** aims to develop partnerships between UK industry and research organisations by supporting programmes of pre-competitive science and technology research. The recent Strategic Review concluded that there had been substantial commercial benefits from LINK programmes enabling more business relevant long term research.<sup>38</sup> Since its inception LINK provided a benefit cost ratio of up to 3.8 to 1. A recent evaluation of the LINK hydrocarbon reservoirs scheme found that the benefits of one project alone far outweighed the cost of the programme as a whole.<sup>39</sup>

32 Harris, R., and Robinson, C., *A critical review of empirical research on hindrances to productivity growth and the importance of relative constraints on UK business* (2001b)

33 Griliches, Z., 'The Search for R&D Spillovers', *NBER Working Paper No. 3768* (1992)

34 Nadiri 'Innovations and Technological Spillovers', *NBER Working Paper No. 4423* (1993) SQW, *ibid.*, (2001b)

35 SQW, *ibid.*, (2001b)

36 All named schemes are to be superseded by new products as a result of the DTI business support review.

37 PACEC, 'Evaluation of SMART (including SPUR)', *Department of Trade and Industry Evaluation Report Series No. 3* (2001)

38 DTI, *Strategic Review of LINK: Report of the Independent Review Panel* (2003b)

39 SQW, *An evaluation of the LINK programme on hydrocarbon reservoirs: Final report to the Department of Trade and Industry and the Natural Environment Research Commission* (2001a)

- **'TCS'** which will be superseded by Knowledge Transfer Partnerships – stimulates innovation in industry through collaborative partnerships between the science base and business through industrial placements. Successive quinquennial reviews have confirmed the value to business of the technology transferred; to University Departments of working with business; and to the skills base of the UK through the placement experiences of recent graduates.<sup>40</sup> Eighty per cent of companies involved believed that knowledge transferred during the placement was either new to the firm or represented a considerable advance on their knowledge base. Academics also believed that TCS provided a significant contribution to their research.

However, in addition to the problems posed by traditional market failures, innovation can be afflicted by system failures. These can occur because firms are embedded in a 'national innovation system' – a set of interconnected institutions to create, store and transfer the knowledge and skills.<sup>41</sup> This system supports and enables technology and knowledge driven innovation, which in turn feeds through into productivity growth and returns to wider economic benefits.<sup>42</sup> However, the institutions within the system may have different, or conflicting, objectives. For example the incentives universities face may not strike the right balance between published research and working with business. As a result, the system as a whole may under-provide the key innovation inputs and process required to successfully exploit new ideas.

DTI has a direct role in providing these inputs to the innovation system. DTI supports the basic science base through the Office for Science and Technology. The science budget has seen repeated real terms increases in resources and will rise from £2bn 2002-03 to £2.9bn in 2005-06.<sup>43</sup> DTI also provides some of the key system infrastructure, such as Standards and the National Measurement System (NMS), both with large and extensive impacts, validated by review and evaluation evidence.<sup>44</sup> Estimates suggest that the NMS underpins £5bn of UK GDP.<sup>45</sup>

DTI needs to build on the successful policies that foster innovation. These range from the crucial funding of basic science, through to encouraging collaboration and helping demonstrate the benefits of new technologies.

## Maximising potential in the workplace

Innovation means change, in the workplace as well as in terms of products, services and processes. The ability of employees to adopt and adapt to new approaches depends on the

- effectiveness of the labour market in creating and signalling jobs;
- skill levels; and
- capability of the organisation within which they work.

As noted above, the UK labour market has proved effective in recent years. The UK has one of the highest employment rates in the G7, and it provides a wide variety of employment opportunities for those seeking work (chart 10).

40 TCS, *Annual Report 2001/02* (2002)

41 "...set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies." (Metcalfe, S., "The Economic Foundations of Technology Policy: Equilibrium and Evolutionary Perspectives", in P. Stoneman, ed., *Handbook of the Economics of Innovation and Technical Change* (1995))

42 Metcalfe, S. *ibid* (1995)

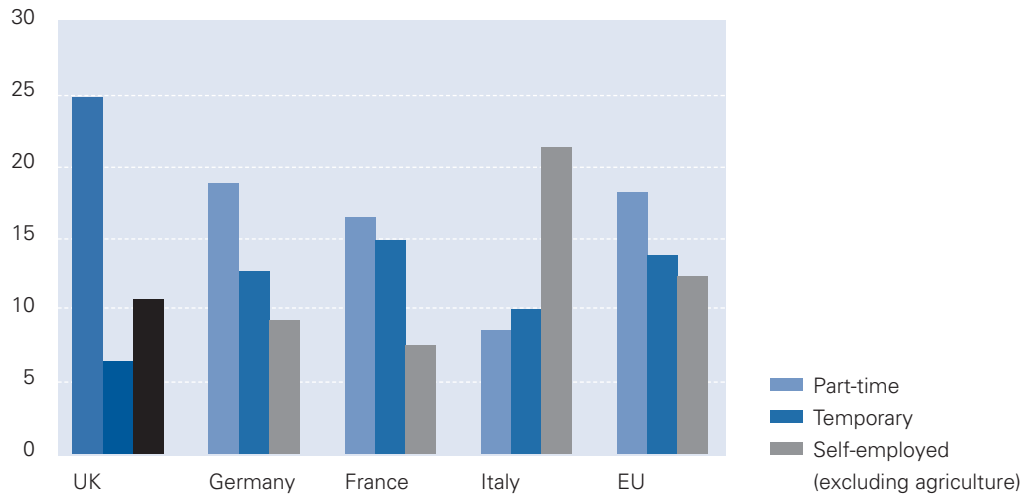
43 DTI, *Mapping a Route to Prosperity for All: Business Plan 2003-04* (2003)

44 DTI, *Department of Trade and Industry National Measurement System Policy Unit: Review of the rationale for and economic benefit of the UK national measurement system* (1999)

45 Swann, P., 'Report to PA Consulting Group' cited in, DTI, *ibid*, (1999)

### Chart 10: Part-time, temporary and self-employment

UK, Germany, France and Italy plus EU average, 2001  
Per cent of total employment

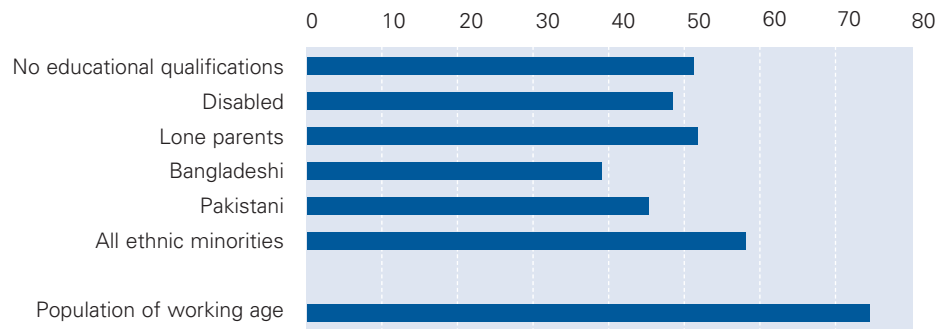


Source: Eurostat (European Labour Force Survey)

Despite the effectiveness of the labour market, there are still many disadvantaged groups that find it difficult to access work. As well as the wide spatial variation in employment rates, workers from ethnic minorities suffer from lower employment rates than the rest of society (chart 11).<sup>46</sup> Eight per cent of the population are from ethnic minorities, but they account for around 15% of the unemployed. This means that the right people might not be in the right jobs, resulting in wasted human capital, and lower productivity.<sup>47</sup>

### Chart 11: Groups in the labour market with relatively low employment rates

Employment rates by category, 2002 and 2003



Source: Labour Force Surveys, 2002 and 2003

As chart 11 shows, employability should also rise if skill levels improve. This is because in recent years technological change in the economy means that new jobs have been skill-biased, with rising demand for skilled workers, and a reduction in demand for the unskilled. As a result, unskilled male inactivity rates have risen from 3.8% in 1979 to 30.5% in 1998. Male workers with degrees now earn 93% more than their unskilled counterparts, compared to 63% more in 1979.<sup>48</sup>

46. HMT, DTI and DWP, *Full and Fulfilling Employment: Creating the labour market of the future* (2002)

47. Walby, S. and Olson, W. *The impact of women's position in the labour market on pay and implications for UK productivity* (2002)

48. Nickell, S., and Quintini, G., 'The recent performance of the UK labour market', *Oxford Review of Economic Policy* (2002)

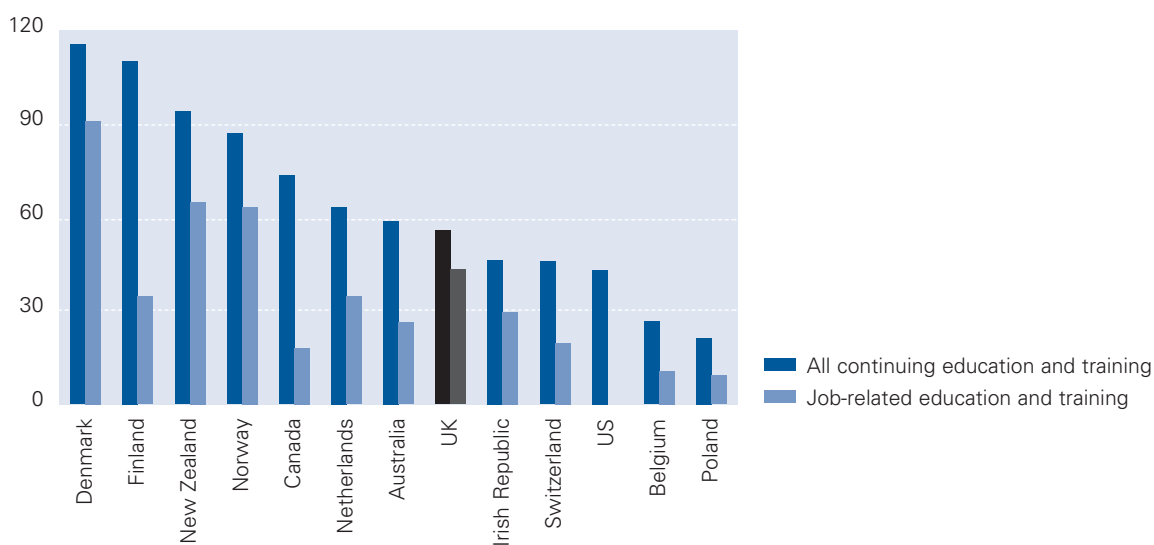
Skills have an important role in improving productivity.<sup>49</sup> Higher skill levels enable workers to work more efficiently and effectively. They are a complement for innovation and investment. NIESR estimate that up to 20% of our productivity gap with Germany is the result of the UK's lower levels of skills.<sup>50</sup> This finding is replicated at the level of individual plants, where analysis has shown that higher skill levels support innovation, more sophisticated production processes and improved performance.<sup>51</sup>

The NIESR analysis probably understates the true impact of skills on productivity. This is because of the complex interactions between a firm's decision to adopt particular product strategies, invest in new plant and equipment, and employ skilled workers. Low skill levels across the economy may also act as a constraint on both investment and a firm's ability to innovate. These 'low skills traps' emerge because firms are reluctant to invest in equipment because they cannot employ the workers with the skills to use it.<sup>52</sup> Workers are reluctant to train in new skills because there is insufficient demand for those skills, so they cannot be sure of earning a return on their training expenditure.<sup>53</sup>

The evidence suggests that the UK has a lower proportion of workers with level 2 (GCSE equivalent) and level 3 (A level equivalent) qualifications than France or Germany.<sup>54</sup> Moreover, UK workers do not catch up through workplace training, with lower levels of continuing education and training than our competitors (chart 12).

### Chart 12: Average hours of continuing education and training, by type of training

Selected OECD country comparisons, 1994-1998\*  
Mean number of hours, adult population aged 25-64



\*US 1999

Source: International Adult Literacy Survey and national surveys

49 HMT, *Productivity in the UK: The evidence and the Government's approach* (2000)

50 O'Mahony, M. and De Boer, W., *ibid* (2002)

51 Haskel, J. and Pereria, S., 'Skills and productivity in the UK using matched establishment and worker data', *CeRIBA Discussion Paper*, (October) (2002); Haskel, J., Hawkes, D and Pereira, S., 'Skills and productivity in the UK using matched establishment, worker and workforce data', *CeRIBA Discussion Paper*, (May) (2003); Jarvis, V., O'Mahony, M. and Wessels, H., 'Product Quality, Productivity and Competitiveness' *NIESR Occasional Paper 55* (2002)

52 DFES, *Towards a National Skills Strategy: Evidence Paper* (2003b)

53 DFES, *ibid* (2003b)

54 DFES, *Developing a National Skills Strategy and Delivery Plan: Underlying Evidence* (2003a)

Irrespective of an employee's skill level, the nature of their workplace can affect their ability to reach their potential. A number of studies suggest that 'high performance workplace' practices can raise employee commitment and morale, reduce absenteeism and reduce staff turnover, leading to higher productivity.<sup>55</sup> Firm level studies have shown that family friendly work practices are associated with above average financial performance, with higher productivity and reduced labour turnover.<sup>56</sup> The factors that seem to define the high performance workplace are:

- Modern employee management practices that develop workforce skills and use them flexibly within the workplace
- Good communications that work both upwards and downwards and enable employee involvement
- A spirit of trust and mutual commitment to common goals between employers and employees

Examples of these policies and practices include teamworking, joint problem solving, quality circles, strong appraisal systems, team briefings, and effective structures for information and consultation. The problem in the UK is not that these practices are unknown. It is that they are not applied widely or deeply. Surveys suggest that only 14% of workplaces had a majority (eight or more) of these practices in place; 29% had three or less in place.<sup>57</sup>

The failure to adopt these practices could be the result of information failure – because business may be unaware of the benefits – but could also be a symptom of the low skill levels across the UK economy: if managers and workers lack the ability to lead and adapt to change, then they will be less likely to adopt new approaches. A recent survey of business suggested that there was no single factor blocking the take up of these practices. It highlighted a range of barriers including attitudes to change, insufficient time, a lack of understanding of the benefits and a lack of workforce or management skills.<sup>58</sup>

Broader DTI policies and business support have a crucial role to play in supporting and enabling businesses to move up the value chain, triggering higher skill needs and thus enabling further innovation and growth. For example, an evaluation of the DTI's SMART awards scheme found that the majority of firms had observed an improvement in skills as a result of undertaking a SMART innovation project, with 16% of participants implementing formal skills strategies as a result of undertaking a SMART project.<sup>59</sup> The DTI has committed itself to ensuring due consideration is given to the likely impact on business' skill needs of all new business support products.<sup>60</sup> The DTI also has an important role to play in ensuring that the actions of other bodies such as DFES and the Learning and Skills Council account for the productivity impact of their decisions on funding and curricula by working more closely with business. This, together with the DTI's co-sponsorship of the network of Sector Skills Councils, should ensure that demand drives the skills system.

Information on the effect of specific policies to support high performance work practices is developing. DTI needs to build that evidence base and use it to disseminate best practice. This will enable all firms to have the opportunity to unleash the talents of the workforce, foster innovation and improve their productivity.

55 CBI/TUC, *ibid* (2001); Porter, M.E. and Ketels, C.H.M., *ibid* (2003); Bosworth, D. *Empirical Evidence of Management Skills in the UK, Skills Task Force Research Paper 18* (2000); Patterson, M.G., West, M.A., Lawthorn, R. and Nickell, S., 'The impact of people management practices on business performance', *IPD Issues in People Management*, No. 22 (1997)

56 Dex, S. and Smith, C., *The nature and pattern of family-friendly employment policies in Britain* (2002)

57 Cully, M., et al, *Britain at work* (1999)

58 EEF, *Catching up with Uncle Sam* (2001)

59 DTI, *Evaluation of Skills Impact of SMART Awards* (2003)

60 DFES, *21st Century Skills: Realising our potential; Individuals, Employers, Nation* (2003c)

## Extending competitive markets

The competitive framework within which businesses and consumers interact is central to productivity and competitiveness. The framework sets out the rights and responsibilities of participants and gives parties the confidence to engage with one another. It ensures that contracts are fulfilled, the companies do not abuse market power, that intellectual property is safeguarded and that consumers have rights to redress. Effective markets need demanding consumers who take action if business does not meet their needs and demand better service, new products and better value for money. Empowered consumers force firms to raise their game so driving up innovation and productivity. Markets will not work well if some firms are allowed to compete unfairly or are undercutting rivals by failing to meet legal requirements or damaging confidence by seeking to mislead consumers. Such actions will damage productivity. Extending competitive markets does not just refer to measures to improve the domestic competition regime. There is also the need to deepen competition within Europe and expand world trade more generally. The OECD has argued that there would be significant TFP gains across the EU if barriers to competition were significantly reduced.<sup>61</sup>

There is a 'positive and robust' relationship between measures of product market competition and productivity.<sup>62</sup> Analysis of individual firms shows increases in competition spur innovation where competitive intensity was previously weak, and that competitive pressures, as shown by entry and exit, spur productivity growth.<sup>63</sup> Studies suggest that the costs of anti-competitive behaviour is significant, accounting for around 1% of GDP.<sup>64</sup>

Historically, the UK has tended to be viewed as weak on competition policy, which has depressed incentives to innovate.<sup>65</sup> However, as a result of recent reforms the UK is now perceived to operate an effective competition regime. A review of regimes by competition experts places the UK in the top half of its peer group, behind Germany and the US, but ahead of the rest of the OECD.<sup>66</sup> The weaknesses identified by the peer reviewers have now been addressed in the Enterprise Act (2002). The UK also has one of the most competitive energy markets in the EU and G7.<sup>67</sup>

International trade and investment also adds to the competitive intensity of an economy.<sup>68</sup> It permits specialisation in those goods and services that economies produce more efficiently and access to larger markets permits the exploitation of economies of scale. Trade and foreign direct investment also generates wider benefits to the economy through knowledge spillovers, as domestic companies learn about new techniques and technologies from their international competitors.<sup>69</sup>

61 Scarpetta, S. and Tressel, T., 'Productivity and convergence in a panel of OECD industries: Do regulations and institutions matter?', *OECD Economics Department Working Papers* No. 342 (2002)

62 Sanghoon, A., 'Competition, Innovation and Productivity Growth: A Review of Theory and evidence', *OECD Economics Department Working Paper* No. 317 (2002)

63 Aghion, P., Bloom, N., Blundell, R., Griffith, R., and Howitt, P., 'Competition and Innovation: An inverted U relationship' *IFS Working Paper* 04/02 (2002); Disney, R., Haskel, J. and Heden, Y., 'Restructuring and productivity growth in UK manufacturing', *Economic Journal* v. 113 (2003)

64 Davies, S.W. and Majumdar, A., 'The Development of Targets for Consumer Savings Arising from Competition Policy', *Office of Fair Trading Economic Discussion Paper* 4 (2002)

65 Crafts, N.F.R., in HMT, *Productivity and the Role of Government* (2000)

66 PWC, *Peer Review of UK Competition Regime Report to DTI* (2001)

67 OXERA, 'Energy Market Competition in the EU and G7', (2003)

68 Proudman, J. and Redding, S., *Openness and Growth* (eds) (1998)

69 Fujita, M., Krugman, P. and Venables, A.J., *The Spatial Economy: Cities, regions, and international trade* (1999)

Improvements in technology and reductions in transport costs have made accessing global markets easier. This brings markets much closer together. In addition to the economic drivers fostering greater trade, Government intervention can have a powerful role in unleashing – or hindering – the growth of trade through the application of tariffs and other regulatory measures which restrict trade. Between the two world wars, Governments around the world imposed tariffs in an attempt to protect domestic industry. The post-war period has been characterised by attempts to reduce tariffs across the globe, in order to stimulate trade flows.

There have been many estimates of the overall potential gains from trade liberalisation. Since the end of the second world war there have been eight rounds of trade liberalisation, which have reduced average industrial tariffs from 40% to 5%. This has been associated with a twenty-fold increase in trade and a six-fold increase in world income.<sup>70</sup> The World Trade Organisation (WTO) has estimated that the impact of the 1994 Uruguay trade agreement was to increase world income by between \$109 bn and \$510 bn.<sup>71</sup> Analysts suggest that halving of current levels of protection in agriculture, industrialised goods and services combined with progress on trade facilitation in the Doha round would boost world prosperity by \$400 bn.<sup>72</sup> Further trade reform could also help spread the benefits of globalisation, lifting 144 million people out of poverty by 2015.<sup>73</sup>

In addition to gains from liberalising world trade, regional reform of the trade regime can bring benefits. Within the European Union, recent analysis argued that EU GDP was 1.8% higher in 2002 as a result of 10 years of the Single Market Programme.<sup>74</sup> Further reform could result in gains of around 3% of GDP.<sup>75</sup> The Treasury's recent assessment of the Five Tests also suggested that UK trade with the Euro area could rise by between 5% and 50% as a result of UK membership of EMU.<sup>76</sup>

Governments need to take action to support competitive markets because market failures (such as barriers to entry) may result in the creation of monopoly positions that can inhibit allocation of resources in the economy to where they are most productive. As a result, the market itself may not generate the 'right' level of competition in the economy.

Similarly, the existence of information problems may result in consumers making uninformed decisions, which could adversely effect the allocation of resources and the workings of markets. If consumers cannot monitor the quality of the output, there may be an incentive for rogue traders and inefficient producers to exploit the information gap, which is detrimental both to consumers and to efficient, productive firms. For all markets in the UK, an OFT study estimates the cost to consumers from rectifying and dealing with complaints to be £8.3 billion per annum.<sup>77</sup> In response to this, the DTI is rolling out Consumer Direct (a telephone and web based helpline) that will provide consumers with advice on obtaining redress that will empower consumers and help to make markets work more effectively.

70 OECD, *Open Markets Matter: The Benefits of Trade and Investment Liberalisation* (1998); WTO, 'Trading into the Future' (1995);

71 Francois, J., McDonald, B. and Nordstrom, H., 'The Uruguay Round: A Global General Equilibrium Assessment', *CEPR Discussion Paper No. 1067* (1994) supplemented with DTI calculations; Winters, A., *The Results of the Uruguay Round of Multilateral Trade Negotiations*, *World Bank Seminar* (1995)

72 Nagarajan, N., *The Millennium Round: An Economic Appraisal* report to the European Commission (1999)

73 World Bank, *Global Economic Prospects: Realizing the Development Promise of the Doha Agenda* (2003)

74 European Commission, *The Internal Market: Ten Years without Frontiers* (2002)

75 European Economy, *The Economics of 1992: An Assessment of the economic effects of completing the internal market of the EC* *European Economy* (March) (1988)

76 HMT, 'EMU and Business Sectors' *EMU Study* (2003)

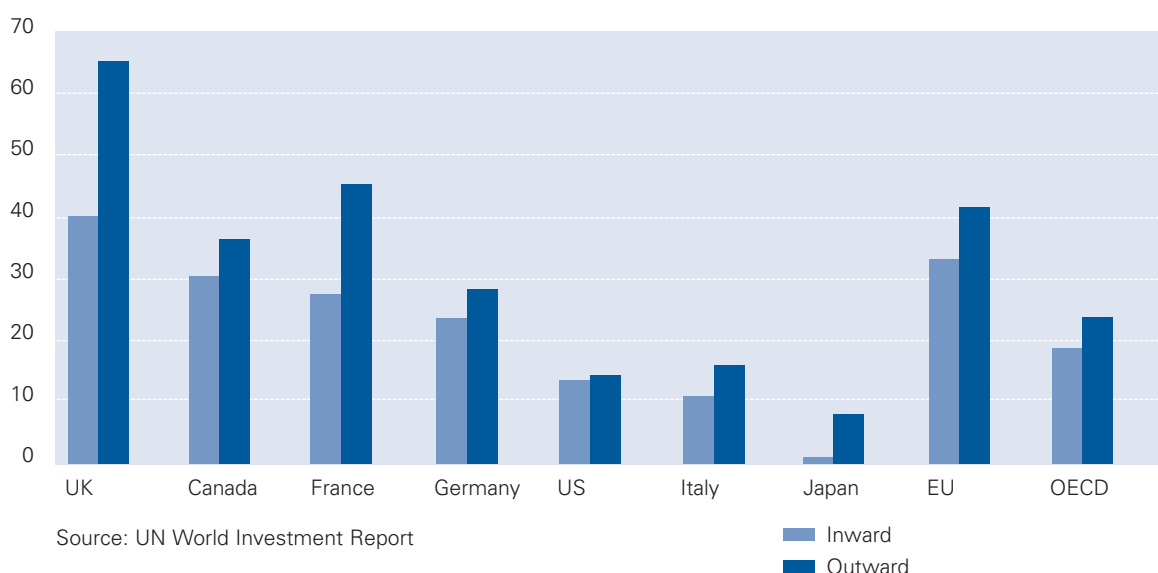
77 OFT, 'Consumer Detriment', *Fair Trading issue 34* (2000). This study estimated the cost for consumers of getting redress, rather than a loss of benefit from limited information.

Competition policy has undergone tremendous reform in recent years. DTI needs to ensure that the gains are maintained, through the efficient operation of the new regime by the competition authorities, by tackling regulation which inhibits competition, and by ensuring an effective regime in Europe and more widely.

Restrictions on world trade have a similar effect to low levels of competition. Uncertainty over the implementation of trade rules can also hinder investment, since firms will have less confidence on reaping the rewards from developing new products or processes.<sup>78</sup> However, trade restrictions are different in character from market failures because they tend to be government, rather than market, driven. As a result, it is the responsibility of Government to seek greater openness in trade. DTI has already achieved much in this area, but progress on European and trade reform needs to be maintained. The UK is an economy that is open to trade and investment (chart 13) and is seen as a strong advocate of trade liberalisation and is one of the architects of the Lisbon agenda. This progress needs to be maintained in order to ensure that the UK can capture the benefits of wider and deeper global markets.

### Chart 13: Value of foreign direct investment

G7 comparison plus EU and OECD averages, 2002  
Book value of balance sheet as per cent of GDP



### Strengthening regional economies

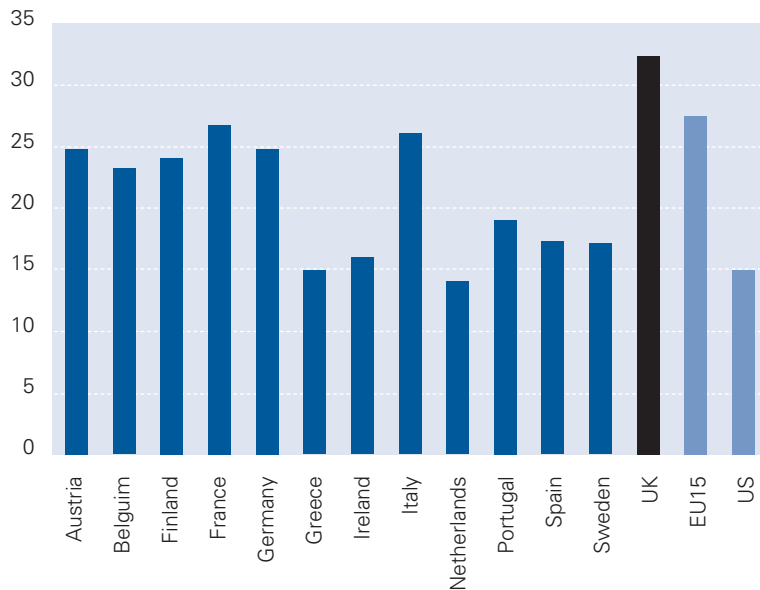
Raising productivity in every UK region and nation will lead to improvements in UK prosperity. As shown overleaf, there are wide disparities in prosperity, employment and productivity between UK regions, and there is a wider disparity in overall prosperity in the UK than in other European countries (chart 14).

78 Proudman, J. and Redding, S. *Openness and Growth* (1998)

### Chart 14: Sub-regional variation in GDP per capita

EU comparison, 1998

Co-efficient of variation



Source: European Commission (2001) and Bureau of Labor Statistics (2001)

This is partly the result of differences in employment rates, but is also driven by variations in productivity. Analysis suggests that the productivity performance is partly the result of different factor conditions: lagging regions suffer especially from lower skills and innovation performance. As with the international picture, broad industrial composition does not seem to be a major determinant of performance.<sup>79</sup>

Central to improving regional economic performance is developing local and regional capacity. National schemes to influence business location decisions will only ever have limited impacts, although they may be beneficial in terms of assisting certain areas to move out of deprivation.<sup>80</sup> National policy has an important role, and in so far as UK-wide approaches can rectify regional problems, then the policies to improve innovation and maximise potential in the workplace (through ensuring the labour market works for everyone and by upskilling) will bolster the performance of all regions.

But some regional problems will require regional solutions. Information failures mean that those closest to the problem will have the best understanding of how to solve it. This is why the Government has moved away from micro-managing regional policy, and has instead empowered regions to generate their own solutions through the Regional Development Agencies and local Learning and Skills Councils. This move has been backed by a joint PSA target between DTI, HMT and ODPM.

However, even where regions or nations gain greater autonomy over their own development, DTI has an important role in maintaining national coherence of industry policy, so as to ensure the gains from specialisation are not outweighed by the costs of duplication and losses of economies of scope.

79 HMT, *ibid* (2001)

80 Harris, R. and Robinson, C., *DTI Industrial Support Policies: The Impact of RSA and SMART/SPUR schemes, Final Report* (2001c)

## Forging closer partnerships

Across its key policy priorities, DTI can have significant influence, but its ability to control final outcomes is limited. The Department will have to work with others in order to raise UK prosperity: not just Whitehall, but also other stakeholders – the business community, employees and consumer groups. The Treasury is the DTI's key strategic partner on productivity, and both departments share a joint PSA target to narrow the productivity gap.

But in terms of the strategic priorities outlined above, the DTI will need to work with a range of agencies. On *transferring knowledge* DTI needs to work with universities, with the funding councils and with individual businesses. If the Department is to help *maximise peoples' potential in the workplace* it will need to work with DfES, the Learning and Skills Councils, with individuals, business and with unions. *Extending competitive markets* requires working across Whitehall, with the Foreign and Commonwealth Office, with DFID, and with other Governments, the EU and WTO. *Strengthening regional economies* requires partnership with the RDAs, and the range of regional and sub-regional partners who have the expertise and knowledge to make a difference to local prosperity.

Ultimately, DTI needs to work with business, employees and consumers if it is to realise the ambition of generating higher levels of productivity.

# 4

## Conclusion

If DTI is to raise prosperity through higher productivity, it will need to focus on

- *Transferring knowledge*
- *Maximising potential in the workplace*
- *Extending competitive markets*
- *Strengthening regional economies*

The scale of the challenge, and the Department's ability to influence outcomes, differs in each area. For competition the key is to implement the recent legislative reforms. For skills, DTI needs to continue to work with the main delivery agencies, and to develop workplace best practice. For knowledge transfer, the DTI will shortly set out an ambitious strategy following the Innovation Review. In all these areas, DTI will only be effective if policies are evidence based and seek to correct market failures.

However, the analysis also demonstrates that DTI will be unable to achieve these changes alone. DTI will need to *work in partnership* with other government departments, with regional agencies, with business, employees and consumers, to make the strategy a reality.

# Annex 1

## DTI Strategy evidence assessment exercise

### DTI Objectives

The DTI's aim is to deliver 'prosperity for all', through higher productivity. Over the past 12 months, DTI analysts have developed a framework for analysing how productivity and other policies which influence prosperity is generated in a modern industrialised economy. This framework is based on a systems thinking methodology.<sup>81</sup> It is derived from the Five Drivers of productivity:

- Investment
- Innovation
- Skills
- Enterprise
- Competition

However, the approach operates at a lower level of aggregation. It identifies the combination of factors that serve to drive a particular outcome and identify backward feedbacks. This works by specifying a series of evidence-based cause and effect relationships. From this analysis, the Department highlighted the sixteen key levers that contributed to the overarching aim of prosperity for all. These levers are set out in table A.1

**Table A.1**

Commercial best practice	Knowledge transfer
Promote a risk taking culture	Science base
Skills	Sustainable development
Finance	Economic reform in Europe and trade
Infrastructure	Competition and consumers
Security of energy supply	Diversity
Disadvantaged communities	Corporate framework
Regional development	Commitment in the workplace

<sup>81</sup> Richmond, B., 'System thinking: critical thinking skills for the 1990s and beyond', *System Dynamics Review* Vol. 9 No.2, (1993); Wolstenholme, E.F., *System Enquiry, A System Dynamic Approach* (1990)

These levers have supported the DTI Strategy process. The process draws on the Cabinet Office's best practice approach to policymaking.<sup>82</sup> The approach calls for:

- clearly defined outcomes and a long term view that takes into account the likely effect and impact of the policy in the future five to ten years and beyond;
- a holistic view looking beyond institutional boundaries to the government's strategic objectives;
- the best available evidence from a wide range of sources;
- a review of existing policies to ensure they are really dealing with problems they were designed to solve without having unintended detrimental effects elsewhere;
- stakeholder involvement at an early stage and throughout its development; and
- understanding of what works and what doesn't through systematic evaluation.

In keeping with the Cabinet Office approach, evidence has played a key role in shaping the strategy. During Winter 2002, the Department undertook an extensive evidence gathering exercise, with the aim of selecting the critical policy areas where DTI can make the most difference to productivity. As well as the academic and evaluation evidence on productivity, this work considered the future challenges facing the UK economy.

The futures work identified the following trends:

- **Increasing global competition and trade in goods, services and capital**
- **Demographic change**
- **Increasing demand for new and high level skills**
- **Continuing advances in technology**
- **Declining trust in established authority**
- **The growing importance of the service sector**
- **Decentralisation**
- **Increased clustering of economic activity**
- **Increased waste and increased pressure on resources**

The futures work, academic analysis and evaluation evidence were synthesised by using *multi criteria analysis* methods and facilitated workgroups of senior managers. Multi criteria analysis establishes preferences between various options by reference to an explicit set of objectives that the decision-making body has identified. As such it brings structure and analysis to the decision-making process.<sup>83</sup> The application of multi-criteria analysis techniques to the issue of UK prosperity generated a number of conclusions:

- The UK would have to become more innovative if it was to produce higher living standards in an environment of global competition and shortening product cycles.
- The workplace needed to be more functionally flexible in order to respond positively to change.
- Competition needed to be widened and deepened.
- Although many of these challenges to the UK will need to be tackled in a de-centralised way, there is a central requirement to maintain the UK's economic coherence.

<sup>82</sup> Cabinet Office, *Professional Policymaking in the Twenty First Century* (1999)

<sup>83</sup> Dodgson, J., Spackman, M., Pearman, A. Phillips, L., *Multi-Criteria Analysis: A Manual* (2001)

This led to four policy priorities:

- Transferring knowledge
- Maximising potential in the workplace
- Extending competitive markets
- Strengthening regional economies

The evidence also showed that, DTI could only achieve these objectives if it *forged closer partnerships* with others: with business, with consumers, across Whitehall and in Europe.

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Printed in the UK on recycled paper with a minimum HMSO score of 75.  
First published November 2003. Department of Trade and Industry. <http://www.dti.gov.uk/>  
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