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The UK's Productivity Gap
What research tells us and what we need to find out

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Foreword

This booklet on productivity is the latest in a series in which the Economic and Social Research Council (ESRC) presents independent research in key policy areas to potential users in government, politics, the media, and the private and voluntary sectors.

Increasing UK productivity growth – and hence living standards – is a central concern of government economic policy. But understanding what drives our country's long-standing productivity gap with France, Germany and the United States – and how it might be closed – is not straightforward. Is it about investment? Is it about skills? Is it about innovation? Is it about management? Is it about competition?

Research being conducted in some of our biggest investments – notably the Centre for Economic Performance (CEP) at the London School of Economics (LSE) and the Centre for the Microeconomic Analysis of Public Policy at the Institute for Fiscal Studies (IFS), but also by fellows of the Advanced Institute of Management Research (AIM Research) – is making important contributions to our understanding of these central issues.

The work being done is social science of the highest quality, much of it ultimately published in the top scholarly journals. But it also connects with some of the deepest questions we face as a society – about our education system; about our public infrastructure; about our relationships with new technology; and about the way we organise our institutions, from small businesses to large corporations, from universities to government departments.

This booklet is intended to give an overview of what we know about productivity and what we are trying to find out. It also gives an indication of the value of the research community and the ESRC working with policy-makers in the Treasury, the Department of Trade and Industry (DTI), the Office for National Statistics (ONS) and the private sector. Collaborations between researchers at different institutions, between researchers and different providers of research funding and between researchers and policy-makers bring huge benefits for our stock of knowledge about productivity.

Research into productivity is just one example of the high-quality research that the ESRC funds. We address a wide range of economic and social concerns of importance to business, the voluntary sector and government.

Professor Ian Diamond AcSS
Chief Executive
Economic and Social Research Council

Introduction and summary

“ Productivity isn't everything,
but in the long run it is almost everything ”

Paul Krugman

For economists, labour productivity is the key indicator of economic health. Over the long haul, real income growth and hence living standards must follow labour productivity growth. But there is an infamous – and long-standing – productivity gap between the UK economy and the other big OECD economies.

At different periods in history, the UK's productivity gap has been attributed to one of – or some combination of – a wide range of possible causes that create disadvantage compared with other countries, notably France, Germany and the United States.

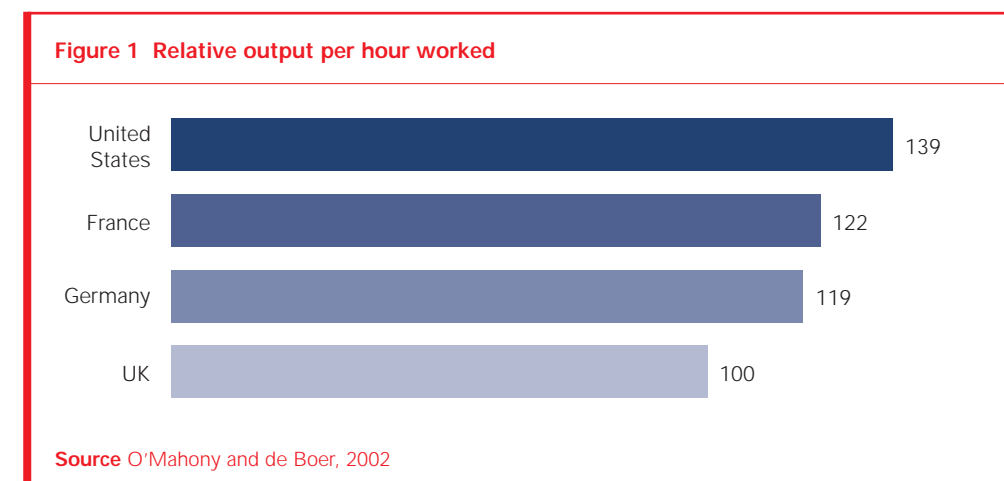
These include a relative failure to invest, failure to innovate, poor labour relations, trade distortions attributable to Empire, antagonism towards manufacturing, 'short-termism' among business leaders and financial institutions, technological backwardness, lack of entrepreneurship, over-regulation of business, an overly-instrumental attitude to work among employees, and the rigidities of the class structure. The list is not exhaustive.

It seems clear that no single factor will provide a satisfactory explanation for the UK's productivity gap. But research, much of it funded by the ESRC, is providing a series of valuable insights into the nature and causes of the gap and what policies might be effective in helping to close it. Work in progress is digging deeper into other key issues. The following outlines some of what we know and what we need to know.

What research tells us about productivity

The productivity gap

In the market sector of the UK economy, output per hour worked – the most commonly cited measure of labour productivity – is almost 40% below that in the United States. The productivity gap with France and Germany is around 20% (see Figure 1).



The persistent productivity gap between the UK and the two big continental European economies can mainly be 'explained' by the fact that they have more capital invested per worker and their workers are more skilled. Shortfalls in investment in physical and human capital account for a smaller proportion of the productivity gap with the United States. Around half of that gap is due to different ways of working – how firms are organised and how they use technology.

The sectoral composition of the productivity gap between the UK and the United States is very informative. The gap is particularly evident in key services, including wholesale and retailing, hotels and restaurants and financial services.

The role of competition

Productivity growth is highest in industries that face greater product market competition. It is driven by 'survival of the fittest' – the Darwinian process of entry and exit, in which less productive firms contract and close while new more productive ones open and grow; and where competitive pressures on existing firms force them to improve.

The historic weakness of competitive intensity in many sectors of the UK economy is gradually being eroded with deregulation and strengthened legislation against anti-competitive practices. Increased competition should improve productivity growth.

The role of capital investment

Capital investment plays an important role in productivity growth. But the UK has less physical capital per worker than the United States and considerably less than France and Germany.

Many explanations have been offered for these shortfalls, including macroeconomic instability, uncertainty and 'short-termism' by financial institutions. Most researchers are sceptical about short-termism as an explanation of low investment. Reduced macroeconomic instability over the past seven to ten years may benefit investment but it is possible that firm-level uncertainty has increased.

The role of innovation

An important driver of relatively slow UK productivity growth is relatively low levels of investment in research and development (R&D). Despite the high quality of UK science, there is a difficulty in translating scientific achievement into productivity, which is reflected in low levels of R&D expenditures and low levels of patenting and innovation.

R&D is important for innovation and productivity, not just for pushing forward the technological frontier in itself but also making it possible for firms to learn about and absorb innovations from elsewhere, including the output of basic science. Foreign direct investment can play a significant role in this 'technology transfer'.

The role of skills

Skills have an important impact on productivity. The UK is behind France and Germany in terms of intermediate skills and behind the United States in graduate skills.

There is indirect and anecdotal evidence that management skills are part of the story behind the UK's productivity gap with the United States.

What we need to find out: the productivity research agenda

Services

This sectoral composition of the productivity gap indicates the importance of studying what drives productivity in different sectors, focusing particularly on service sectors.

In retailing, for example, local planning regulation may affect productivity gaps by acting as a barrier to new entrants. Research is exploring whether limited entry and exit is directly due to planning by looking at geographical comparisons of the intensity of planning restrictions.

Management

The extent of variability in firm- and plant-level productivity – not just between industries but also within industries and even within firms – means that it is essential to dig down into establishment data and look at what drives productivity at the business level.

Research is looking at how different management practices influence productivity.

The new economy

Will the UK and Europe follow the US productivity growth acceleration associated with effective use of information technology (IT)? One view says that there may be just a lagged effect in Europe. Another suggests that a lack of competition and too much regulation are impeding the necessary organisational changes.

Research is looking at detailed micro-level data on differences in IT diffusion and productivity between industries and between firms, and on organisational behaviour within firms.

Outsourcing and technology transfer

Technology and globalisation appear to be creating a shift towards outsourcing and 'delayed', more flexible organisations that are more conducive to innovation.

Research is examining which UK firms and industries are outsourcing business services and how this is changing the nature of jobs and the regional distribution of employment. Further work will look at how firms organise their R&D activities, including locating R&D abroad, the extent of outsourcing of R&D and business-university interactions.

Public sector productivity

Poor relative productivity performance in the public sector is likely to have a large impact on a country's aggregate productivity. The effects are not only direct but also indirect given the importance for private sector productivity of having a well-educated and healthy population that can conduct business free of the fear of crime.

But measuring performance in the provision of public services is particularly difficult. Research is looking at measuring productivity in health and education and seeking to make international comparisons. It is also exploring incentives in the public sector.

Romesh Vaitilingam
Autumn 2004



The UK's productivity gap – how big and in what sectors?

The usual starting point for discussions of the UK's productivity performance is the work of Mary O'Mahony at the National Institute of Economic and Social Research (NIESR), whose research has been funded in part by the ESRC but also by the Department of Trade and Industry (DTI), the Treasury and the Office for National Statistics (ONS). Her cross-country 'growth accounting' comparisons (first reported in O'Mahony, 1999, and subsequently updated in O'Mahony and de Boer, 2002, and O'Mahony and van Ark, 2003) reveal a persistent gap in the UK's labour productivity performance compared with France, Germany and the United States.

The data for the market sector of the economy (that is, excluding public administration, health, education and property) indicate that output per hour worked in the UK is almost 40% below that in the United States. And while the gap narrowed by a small amount after 1979, it has widened again since 1995.

The gap with major European economies is also striking. Despite some improvement since the early 1990s, output per hour worked in the UK's market economy is around 20% below that of France and Germany. The UK is in the middle range of European Union (EU) countries, with productivity levels comparable to Sweden, Finland and Spain.

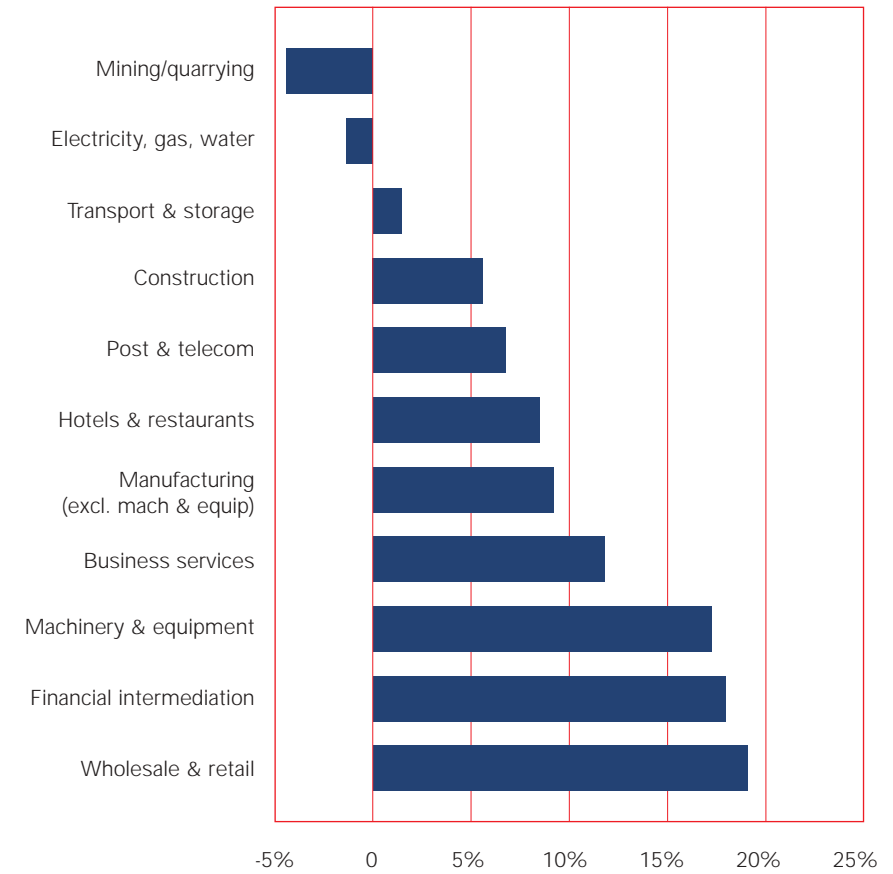
That is the aggregate picture but what do relative labour productivity levels look like by sector? O'Mahony and de Boer (2002) show that the US and French productivity advantages over the UK are largely driven by three sectors: the distributive trades (wholesale and retail), manufacturing and financial and business services. Germany's productivity advantage is driven by a lead in manufacturing and financial and business services with little contribution from the distributive trades.

Research conducted by Rachel Griffith and colleagues as part of the ESRC's Advanced Institute of Management Research (AIM Research) programme examines how the contribution of different sectors to the productivity gap have varied over time. It shows that while the gap between the UK and the United States has remained stable in the 1990s, at just over 40%, its sectoral composition has changed considerably (see Griffith et al, 2003).

Between 1990 and 2001, the UK narrowed the productivity gap in network industries ('electricity, gas and water' and 'post and telecommunications'), 'business services' and 'manufacturing excluding machinery and equipment'. At the same time, the gap widened in 'hotels and restaurants', 'wholesale and retail', 'financial intermediation' and 'machinery and equipment'. Indeed, the latter three sectors account for more than half the total productivity gap between the UK and the United States (see Figure 2).

This transformation in the sectoral share of the productivity gap indicates the importance of understanding the UK productivity problem by sectors, not just in aggregate. It also makes clear the need to look at the service sector in far more detail.

Figure 2 Percentage sector shares of the UK-US productivity gap (output per worker)



Source Griffith et al, 2003

Defining and measuring productivity

Productivity is the amount of output produced for inputs used. Output could be cars, steel sheets, insurance policies or haircuts; inputs could be workers, capital equipment or energy. The most commonly cited measure is one of labour productivity: output per hour worked. This is the easiest to measure and the most highly correlated with increases in living standards. Capital and other inputs are more difficult to measure.

The Treasury has recently been citing numbers on output per worker, arguing that long-run growth depends on increases in employment rather than intensity of work (see HM Treasury, 2000 and 2004). Looking at output per worker puts the UK in a better light than output per hour, with insignificant differences relative to Germany and smaller gaps relative to France.

The hours worked adjustment takes account of differences in the length of the working week, the extent of part-time working and differences in holiday entitlements. One way of interpreting the difference between output per hour and output per worker is to say that UK workers produce the same output as German workers but have to work much longer hours (16% more) in order to do so.

Output is typically measured by the value of sales deflated by a price index. In an international comparative context, the aim is to measure how many cars, haircuts, etc. of equivalent type are produced in the UK relative to the United States. To do so, statistical agencies sample a large number of items with fairly tight specifications (for example, a white 27cm porcelain plate) and see how their prices change through time. New products replace old ones when they become important in terms of share of aggregate expenditure, with various methods used to achieve consistency over time.

Getting a representative sample of items is relatively easy to do for manufacturing but services present more difficulty. There are problems defining the output of the service sector and some items, such as health, have no prices so are measured by inputs. It is also difficult to measure quality: defining the product specification as tightly as possible helps, but it may not be possible to match exactly across countries, especially in services. Some countries may put more effort into quality adjustment: the United States, for example, uses a 'hedonic' price index for computers, where price falls and quality improvements are frequent.

Nevertheless there have been many studies carried out spanning around fifty years, involving both statistical offices and independent academics. All paint the same broad picture of the UK lagging behind. The disputes tend to be about whether Germany is 15% or 20% ahead rather than whether the UK leads Germany.

The productivity gap between the UK and another country can be broken down into two parts: first, the quantity of the inputs; and second, how they are used. There are two key types of input. One relates to capital. Giving workers more and better equipment to use should enable them to produce more output from a given hour worked. This is known as 'capital deepening': more capital per worker means higher output per worker. The other type of input relates to skills. Here, improving the 'human capital' of an economy by increasing the supply of education should also raise productivity.

But inputs do not explain the whole story. After deducting the contributions of capital and skills from output per hour, there is a residual element known as 'total factor productivity' (TFP). Differences in TFP relate to different ways of working, for example, through better ways of organising firms or using better technology. They explain what is done with the physical and human capital.

Explaining the UK's productivity gap

In seeking to explain the continuing UK labour productivity gap, it is useful to distinguish between three periods over the past sixty years. First, after 1945, the UK and other Western European countries enjoyed a 'golden age' of economic growth. Europeans were successfully chasing the US productivity frontier. This catching-up was driven by the spread of new ideas from the United States to the rest of what now constitutes the OECD. Because catching up is easier than innovating at the technological frontier, US productivity growth was generally slower than in Europe. But the catch-up process was much slower for the UK than for France and Germany and the country slipped down the productivity rankings.

Research from the ESRC-funded Centre for Economic Performance (CEP) shows that part of the reason for slower UK catch-up, historically, is due to relatively low levels of investment in research and development (R&D) and human capital (see Nickell and Van Reenen, 2002). And a study that formed part of a major project on post-war European economic growth by the Centre for Economic Policy Research notes key features of the early post-war UK economy that lay behind low investment: an increasingly damaging system of industrial relations, the decline of vocational training and the weakness of competition (see Bean and Crafts, 1996).

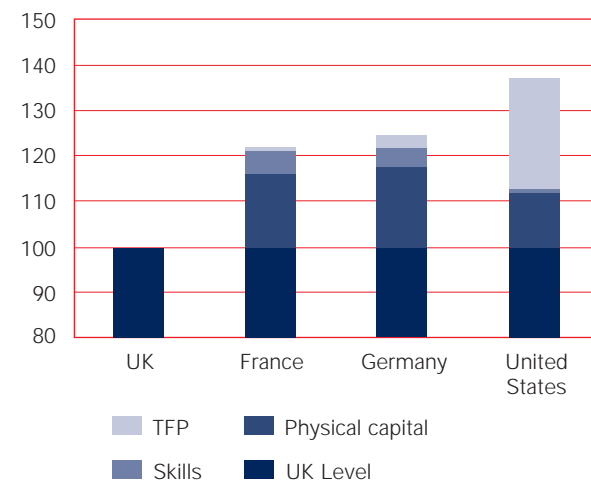
The second period, from around 1973, is more of a mixed picture. Following the oil shocks of the mid-1970s, both US and European productivity rates slowed significantly, though by 1990, France and Germany had caught up with the United States. From about 1980, productivity began to rise in the UK, especially in manufacturing as large numbers of jobs were shed and the power of trade unions, which sometimes militated against innovation, was reduced. A great deal of CEP research has been on unions: it finds some evidence that the weakening of unions has helped productivity growth (see, for example, Metcalf, 2004).

The deregulation of product and labour markets since 1980 has helped to halt the UK's long relative productivity decline. But while the country has started to do better in absolute terms, it has not been enough to make a significant improvement to its position in the productivity rankings.

Most recently, there seems to have been a structural shift in US productivity growth in the mid-1990s. It went from about 1.2% a year between 1977 and 1995 to 2.2% a year between 1995 and 2001. The cluster of information technology (IT) industries is an important part of the explanation of faster US productivity growth in this period. The falls in quality-adjusted computer prices accelerated after 1994 and led to big productivity growth in sectors like semiconductors and retailing. These growth rates were not matched in European countries and the previous long convergence between US and European productivity came to a halt.

So why does the gap persist? Research by Mary O'Mahony and others, which 'decomposes' the percentage contribution of physical capital, skills and TFP to comparative productivity levels, shows that the gap between the UK and France and Germany can be explained by the fact that they have more capital invested per worker and their workers are more skilled. But compared with the United States, even controlling for differences in skills and capital, there is still a 20% gap (see Figure 3). So around half the gap is due to higher US TFP – in other words, to different ways of working.

Figure 3 Decomposing the UK's productivity gap (output per hour worked)



Source Broadberry and O'Mahony, 2004

A historical perspective on productivity policy

What policies might be effective in improving productivity in the UK? Recent work by economic historian Stephen Broadberry and Mary O'Mahony suggests the value of a historical perspective. First, successful productivity performance requires a stable institutional framework for long-term investments in human and physical capital. The European model has been particularly good at providing this during the last half-century or so, and while the UK focused on 'Americanisation' during the 1950s and 1960s, most West European countries first caught up with and then overtook the UK.

Second, as countless historical episodes have shown, a country is constrained by its geography, and copying without adaptation to local circumstances is rarely a good policy. Geography has historically had quite a large impact on productivity differences between Europe and the United States, from the impact of resource abundance on factor proportions in manufacturing during the nineteenth century to the impact of land availability and population density on transport systems and the location of supermarkets in more recent times.

Third, a historical perspective highlights the need to pay attention to the different sectors of the economy. Circumstances can and do vary between sectors, but much conventional wisdom about growth policy is based on studies of manufacturing, which now accounts for around 15% of UK employment. Policies derived from research on manufacturing may not be of much help in improving productivity in the rapidly growing private services such as financial services, let alone in the equally rapidly expanding non-market service sectors such as education and health (see Broadberry and O'Mahony, 2004).

Investment in physical and human capital might be described as the 'proximate' drivers of labour productivity growth. But what lies behind them? Research outlined in the following pages is looking not only at capital investment and the acquisition of skills but also at the impact of competition, innovation and IT, and what drives them. It is also exploring the major new area of public sector productivity. But there remains considerable uncertainty about the relative effectiveness of different drivers of productivity growth across the whole economy.

The role of competition

In the mid-1990s, Stephen Nickell (who has long been associated with the CEP) published a landmark study of the importance of competition for corporate performance. His key finding was that increasing the intensity of product market competition raises innovation and productivity. He also opened up two major new areas for future research on productivity: the significance of 'diffusion' – of new technologies and new ways of organising firms; and the extent of variability in the productivity of firms not just between industries but also within industries and even within firms.

A growing body of research is confirming the importance of competition in driving productivity growth and pointing to the historic weakness of competitive intensity in the UK economy in many sectors. This weakness is gradually being eroded with increasing trade, deregulation in various product markets, privatisation and strengthened legislation against anti-competitive practices like the 2002 Enterprise Act, which was strongly influenced by research evidence.

For example, it is likely that the UK's improved relative productivity in network industries can at least in part be ascribed to increased competition due to privatisation and deregulation (see Griffith et al, 2003). Over a longer period, research comparing manufacturing firms' market power in the UK and Germany since 1950 (conducted as part of the ESRC's Understanding the Evolving Macroeconomy programme) interprets increasing competition in the UK as an important factor in narrowing the TFP gap since the 1970s (see Crafts and Mills, 2003).

Competition is particularly helpful for explaining the productivity gap with the United States, where companies by and large face more competition than UK companies. It is competition that puts pressure on companies and managers to perform, and if UK managers were subject to more competitive pressures, it is almost certain that they would perform better. The question now is how competition can be further enhanced. David Card and the CEP's Richard Freeman report comparative measures of UK competitiveness, some of which indicate that it is now the least regulated of OECD economies (see Card and Freeman, 2004).

Entry and exit

So how does competition affect productivity? There seem to be three effects, all arising from the phenomena of entry and exit of firms from an industry (and all the subject of ESRC-funded research):

- First, entry or the threat of entry may increase the efficiency and innovative efforts of incumbent firms.
- Second, entry and exit replaces low productivity plants with high productivity entrants and hence increases aggregate productivity.
- Third, entry may induce incumbent firms to organise work more effectively and to learn through imitation from new entrants who are using superior technology or superior organisational structures.



Most studies, Stephen Nickell's included, examine the first effect of competitive pressure: forcing existing firms to improve. ESRC-funded research by Richard Disney and colleagues focuses more on the second effect. It finds that productivity growth in UK manufacturing is driven not just by efficiency improvements in techniques and organisation within individual plants but by 'survival of the fittest' – the Darwinian process of entry and exit, in which less productive plants contract and close while new more productive ones open and grow.

The study, which analyses recently available ONS data, suggests that over the period 1980-92, half of labour productivity growth came from 'internal restructuring' – innovation and better use of existing inputs within manufacturing plants – and half from 'external restructuring' – the process by which successful manufacturing plants grow, while less efficient plants contract and exit.

Looking at TFP, over 80-90% of productivity growth came from external restructuring, and over half of that from exit and entry alone (see Disney et al, 2003). As Stephen Nickell wrote in 1996: 'Perhaps competition works not by forcing efficiency on individual firms but by letting many flowers bloom and ensuring only the best survive.'

What about competition and productivity in the service sector? Research by AIM Research Fellow Jonathan Haskel and Naveed Khawaja explores whether limited opportunities for entry and exit have held back productivity growth in UK retailing. It finds that over the period 1997-2001, 57% of productivity growth came from firms that were in the industry the whole time; the rest came from low productivity firms exiting and high productivity firms entering. This finding contrasts with US data indicating that over the same period, 100% of productivity growth came from shops opening and closing (see Haskel and Khawaja, 2003).

Research at the Institute for Fiscal Studies (IFS), much of it supported by ESRC funding, has looked at all three effects of competition on productivity, focusing particularly on the entry of foreign-owned firms. For example, research by Philippe Aghion and colleagues looks at the relationship between entry and TFP growth of incumbents. While it finds a positive relationship, there is substantial variation. In particular, the impact of entry is strong in technologically advanced industries; it is weak or negative in technologically laggard industries. For industries near the technological frontier, growth in TFP increases sharply with the threat of entry by new firms; for industries behind the frontier, it declines (see Aghion et al, 2004).

The policy implications

Research on the importance of competition in driving productivity growth has direct implications for policy debates in the UK and elsewhere on privatisation, deregulation and competition policy. Of course, competition should be encouraged not only at the national level, but also by openness to the international economy. Policies that encourage trade liberalisation, foreign direct investment and European integration are all significant here.

At home, the research confirms the importance of making the Competition Commission independent and reinforcing the powers of the Office of Fair Trading. It also suggests the value of general policy measures encouraging the start-up of new, innovative enterprises and taking a more relaxed view of failures – for example, in how bankruptcies are handled.

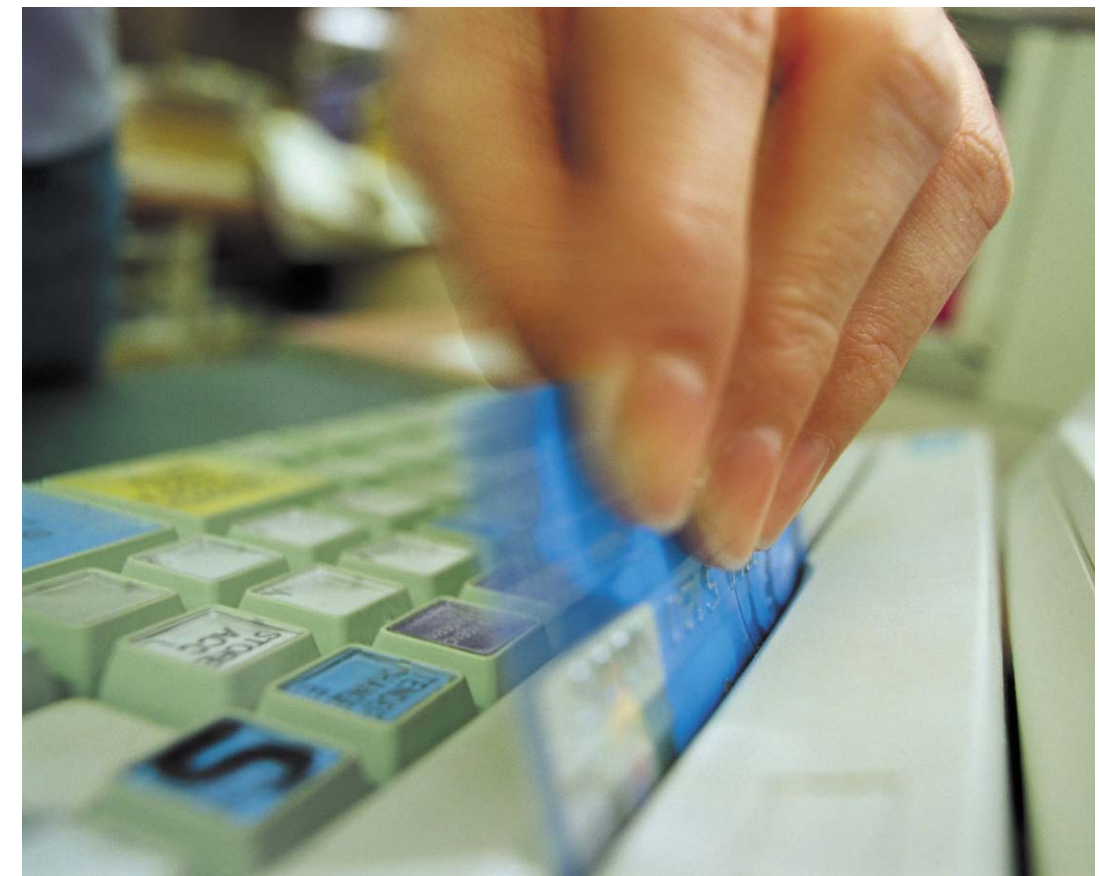
The study of entry and TFP growth suggests that policies aiming at decreasing or removing entry barriers alone may not be sufficient to foster productivity growth of incumbent firms in all sectors, even though such policies are likely to be growth-enhancing on average.

The research agenda

Local planning regulation may affect productivity gaps in particular sectors, notably retailing, by acting as a barrier to new entrants. Jonathan Haskel will be exploring whether limited entry and exit is directly due to planning by looking at geographical comparisons of the intensity of planning restrictions.

Future IFS work will also examine what drives productivity in the retail sector, including planning and IT adoption. In this context, it should be noted that there might be important welfare benefits from planning regulation, which would need to be traded off against any productivity gains from relaxing it.

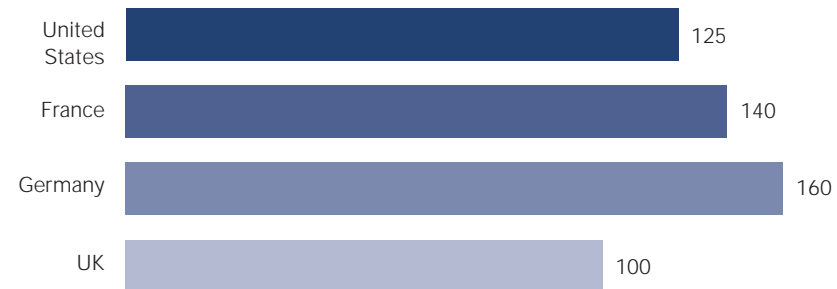
There is also planned IFS research using cross-country data and UK plant-level data to look at the interaction of product market reforms (which aim to increase competitive pressures) and labour market regulations, and their joint impact on productivity.



The role of capital investment

Capital investment plays an important role in productivity growth. But the UK has less physical capital per worker than the United States and considerably less than France and Germany (see Figure 4). Many explanations have been offered for these shortfalls, including problems with macroeconomic stability, the cost of capital and other financing constraints, uncertainty, and 'short-termism' by financial institutions.

Figure 4 Comparing the UK's capital intensity



Source Crafts and O'Mahony, 2001

It seems likely that part of the story on capital is government failure: public investment in roads, houses, schools and hospitals has historically been low in the UK compared with other countries (see Clark et al, 2001). Recent research by Patricia Rice and the CEP's Anthony Venables shows that the impact of improved transport infrastructure on UK productivity could be dramatic. Their analysis of regional productivity differences suggests that a 10% reduction in average journey times throughout the country would raise productivity by 1.12% and nearly twice this amount for areas whose access to cities is increased the most (see Rice and Venables, 2004).

Part of the story on capital may also be about skills: basic numeracy and literacy skills among the adult population – key components of human capital – are notoriously poor. This may be slowly changing with educational reform but low adult skills may be a factor behind low investment. There are two arguments here: first, skill shortages mean that capital is used less effectively; and second, since the wage costs of unskilled workers are lower, there is a weaker incentive to substitute capital for labour (though countries like Germany, which have accumulated more capital, were once in a similar position).

Required returns and 'short-termism'

Another important part of the story may be that UK managers choose to invest less than their foreign counterparts because the returns are lower. Why invest in new plant or IT that will not deliver a significant return? Again, there are two possibilities: actual returns may be lower; or actual returns may be the same as elsewhere but required returns are higher.

This relates to the 'short-termism' argument: the way that the incentives faced by institutional fund managers transmit a short-term focus to management, which means that they discount returns in the distant future too heavily. This biases them against making long-term investments and is thought to explain why investment and indeed R&D levels are relatively low in the UK.

A related argument concerns hostile takeovers: they are much more common in the UK than in France and Germany and, it is often argued, managers under threat tend to focus on the short term, cutting investment and R&D. But the evidence is that high R&D does not appear to increase vulnerability to takeover and firms that are acquired do not have higher R&D than those that are not.

ESRC-funded research in the 1990s by Tim Jenkinson and Colin Mayer and by Stephen Bond and Costas Meghir examined hostile takeovers. While the findings suggest that the threat of takeover may reduce investment, it also plays an important systemic role in corporate governance, helping to encourage managers to act in the interests of owners.

On the broader theme of corporate governance, Stephen Nickell's 1996 study suggested that competition can be a substitute for better corporate governance in raising productivity – unfortunately, for much of the post-war period, the UK had both weak competition and poor corporate governance arising from diffuse share ownership, which failed to hold managers to account effectively.

Most researchers are sceptical about short-termism as an explanation of low investment. Short-termism alone cannot be responsible, since the United States has at least as demanding financial markets (as well as more hostile takeovers) and has had the highest rate of output growth of rich countries in the 1990s.

Research involving economists at both the IFS and the CEP has reassessed the empirical evidence about the impact of capital market imperfections on investment spending by quoted UK companies. The novel aspect of this research is the use of analysts' earnings forecasts for individual companies to control for the influence of expected future profitability on current investment decisions.

The findings suggest that the correlation between investment and cash flow – traditionally interpreted as evidence of financing constraints – disappears when informative controls for expected profitability are included. In other words, higher cash flow predicts higher investment only because it signals more optimism about the future, not because the investment spending of these firms is constrained by the availability of internal finance (see Bond et al, 2004).



The policy implications

The ESRC/DTI-commissioned report on UK competitiveness by Michael Porter is particularly strong in calling for public investment to encourage and facilitate greater private sector investment. In particular, it calls for investment in the country's weak and deteriorating physical infrastructure (including both transport and telecommunications); investment in education and skills; and investment in science and technology (see Porter and Ketels, 2003).

Meanwhile, macroeconomic policy (at least since the establishment of the Monetary Policy Committee but quite possibly earlier when Ken Clarke was Chancellor and Eddie George was Governor of the Bank of England) has been far more effective in creating a stable economy than during much of the post-war period. The structure of both monetary and fiscal policy is geared towards maintaining this stability and reducing aggregate uncertainty. This may be beneficial for investment.

At the same time, however, firm-level uncertainty may have increased because of globalisation and policy changes. Companies may have less knowledge of their potential markets and competitors and may be more concerned about the effect of shifts in policy – both at home and by other countries – on their future profitability.

The research agenda

An IFS/CEP project currently in progress is developing new empirical evidence about the impact of uncertainty on company investment. The novel aspect of this research is the construction of firm-level measures of uncertainty based on both the within-year volatility of consensus earnings forecasts, and on the disagreement between individual analysts making forecasts for the same firm at the same time. Preliminary findings suggest that increased uncertainty significantly reduces company investment in both the short run and the long run.



The role of information technology

There is now considerable evidence that the cluster of IT industries has had a significant impact in raising productivity growth in the United States since the mid-1990s but less of an impact in Europe including the UK. For example, US research by Stephen Oliner and Daniel Sichel shows that a substantial proportion of the unexpected acceleration in US productivity growth came from capital deepening and from increased TFP in a constellation of high-tech and IT-using sectors (see Oliner and Sichel, 2002).

Martin Baily's sectoral analysis of productivity growth shows both higher growth and higher acceleration of growth in IT-intensive industries compared with non-IT-intensive industries. Of particular significance have been unexpected increases in productivity growth in service sectors, such as retailing, apparently driven by IT investments (see Baily, 2002).

Research by Kevin Stiroh, which looks at disaggregated industry data, finds that IT-producing and IT-using industries account for all the US productivity revival that is attributable to the direct contributions of specific industries. Industries that made the largest investment in computer hardware, software and telecommunications equipment in the 1980s and early 1990s show the largest productivity gains since 1995.

So what has been happening in Europe? It seems clear that much of the contrast in productivity growth arises from differences in IT investment: research by Bart van Ark and colleagues shows that the big difference is in IT-using sectors in manufacturing and services, where US productivity growth accelerated while Europe's decelerated (see Figure 5). Perhaps a third of the increased US productivity came from having a larger IT sector, which is itself high-productivity; but two-thirds came from capital deepening in user sectors, which has not been nearly as pronounced in Europe.

Europe's missing productivity surge

IT capital is globally available so what explains the relative failure of its diffusion in Europe?

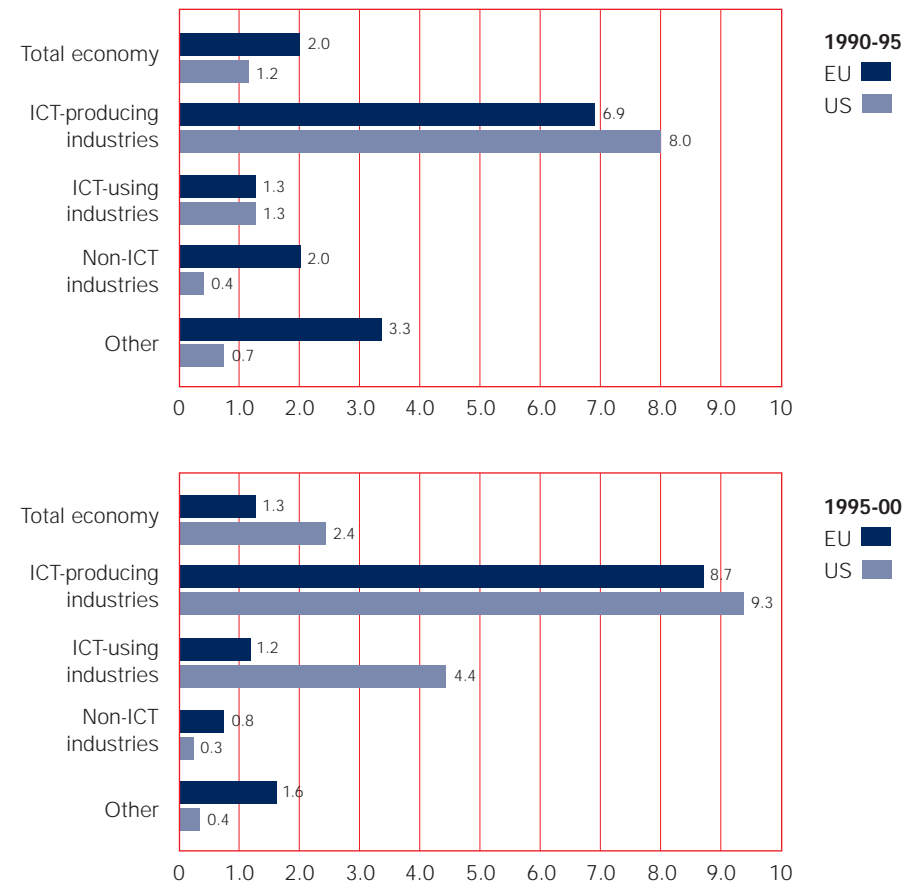
To answer this question, it is important to think about what drives firms to invest in IT and how they reorganise production around it. Getting the most from a new 'general purpose technology' requires organisational changes. And the extent of the productivity benefit from IT depends on both the size of the investment and the ability of firms to reorganise more efficiently to reap the full benefits of the technology – and there can be substantial lags before those benefits are seen.

There are two competing views. One is that IT adoption happened earlier in the United States because of large stocks of appropriate skilled labour and external benefits from defence spending: reaping the benefits of IT takes time and there may be just a lagged effect in Europe (see, for example, Oulton, 2001).

The alternative view is that a lack of competition and too much regulation impedes the necessary organisational changes: stronger competition and weaker regulation force US organisations into management 'best practice', which delivers higher returns to IT use (see Van Reenen, 2002).

What evidence might support the latter view? Suggesting weaker competition, there are comparative data on the prices of a large number of products, which indicate that the ability of firms to diverge in price is much stronger in Europe than in the United States. But as yet, there is little research evidence of what are the constraints on European firms' ability to reorganise around IT.

Figure 5 Productivity growth of ICT-producing, ICT-using and non-ICT industries in the European Union and the United States



Source van Ark et al, 2002

The policy implications

LSE economic historian Nicholas Crafts (who is associated with the CEP) sees merit in both views. A surge in European productivity may be just around the corner following an IT diffusion lag, but at the same time, a sclerotic Europe may now be less amenable to catch-up growth. There are clear implications for the role of European policies intended to reduce product and labour market regulations.

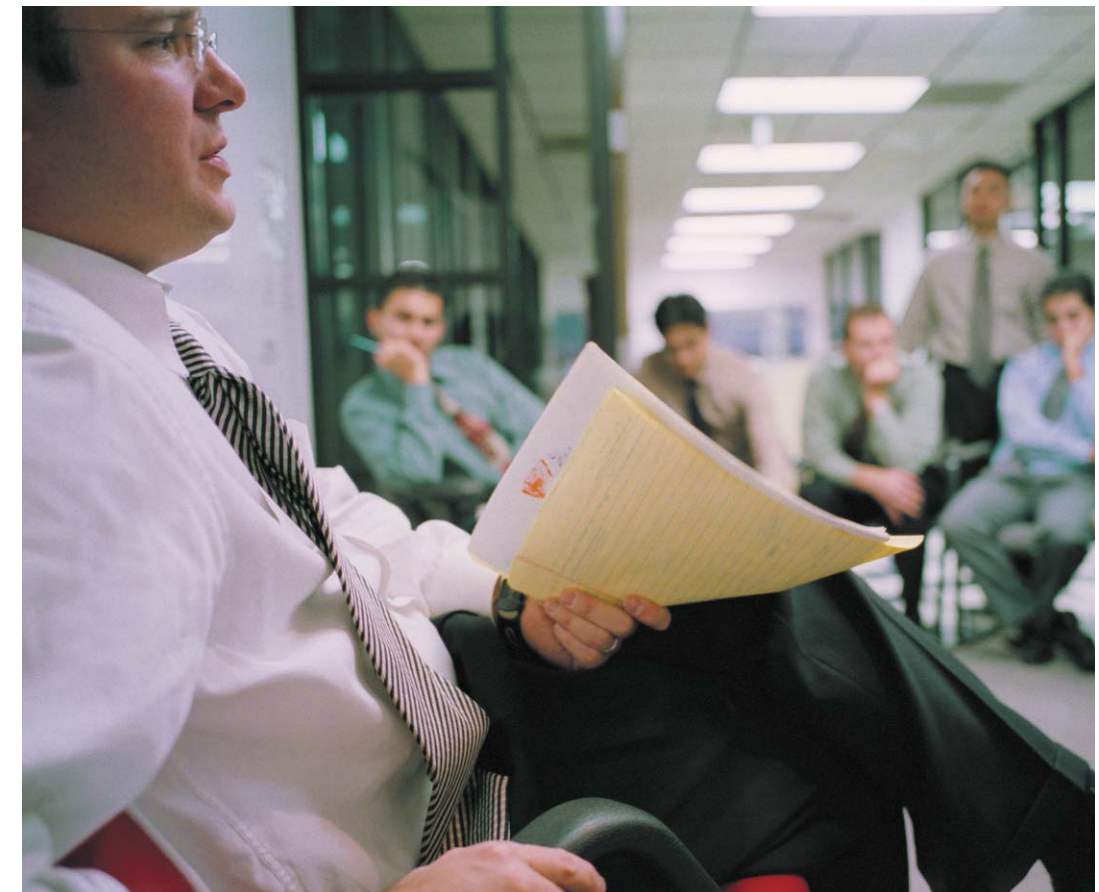
But Crafts also wonders if IT fits less well than earlier technologies with European 'social capability' – a society's effectiveness in assimilating a technology and quickly realising its productive potential – though this is not necessarily true for the UK. He writes: 'Interestingly, in this new technological epoch, the UK appears now to be better placed than Germany because of its greater strength in higher education and the weakness of its employment protection regulation.' (Crafts, 2004).

The research agenda

Will Europe follow the US productivity growth acceleration? And what determines the spread and impact of IT on company performance? These questions are central to the CEP's research agenda on productivity and a crucial part of this work is developing detailed micro-level data – on differences in IT diffusion and productivity between industries and between firms; and on organisational behaviour within firms.

Major projects in progress include developing an international database of IT and firm performance covering the UK, France, Germany and the United States; and a quantitative survey measuring features of organisational 'best practice' being conducted in partnership with McKinsey.

IFS work in this area includes a project with London Business School (funded by the Department for International Development and the ESRC) involving the collection of data on firms' adoption of IT in Brazil and India. Surveys of 500 firms in each country will include information on management practices, labour force skills and the nature of IT usage. A possible extension to the UK will provide evidence on how the impact of IT differs between developed and developing countries.



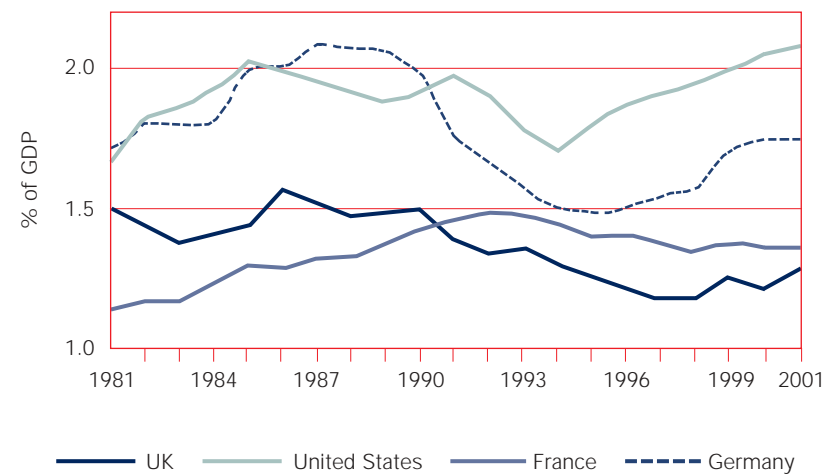
The role of innovation and technology transfer

Investment in R&D is essential for developing and adopting new technologies and raising productivity. But it is far lower in the UK than in the United States. In the latter, where 70% of R&D spending is private, the intensity of business expenditure on R&D relative to GDP is comparatively high and has increased over the 1990s; in the former, business expenditure on R&D as a percentage of GDP was flat during the 1980s and fell relative to the United States during the 1990s (see Figure 6).

What explains the UK's poor technological performance? The evidence seems to suggest that by and large, the UK's science base is high quality but there is a difficulty in translating scientific achievement into productivity. This is reflected in the low levels of R&D expenditures in the UK and their low growth rate, which in turn leads to a low level of patenting and innovation (see Nickell and Van Reenen, 2002). Certain industries, where UK R&D is concentrated, notably pharmaceuticals, have performed well but these are well-known exceptions to the rule.

During the 1980s, reductions in government-funded R&D, such as defence spending, explained a significant proportion of the UK's poor R&D performance relative to the United States (see Van Reenen, 1997). But during the 1990s, the UK's relative weakness can be attributed to slow growth in business funding for R&D within manufacturing industries (see Griffith and Harrison, 2003).

Figure 6 Intensity of business expenditure on R&D



Source Griffith and Harrison, 2003

Other IFS work involving John Van Reenen, now Director of the CEP, has looked at the role of R&D in facilitating 'technology transfer' and hence cross-country productivity convergence (see Griffith et al, 2000). This research describes the 'two faces' of R&D: its value not just in pushing forward the technological frontier in itself, but also making it possible for firms to learn about and absorb innovations from elsewhere, including the output of basic science.

So how can innovative activity be boosted? In both the United States and Europe, a growing belief that product market competition is good for innovation has driven reforms designed to increase competition. But what is the evidence on the relationship between competition and innovation?

Research by Philippe Aghion and colleagues suggests that there might be an inverted-U relationship between the intensity of competition and innovative activity, with innovation being lower in both very competitive and monopolistic markets. A major issue in this line of research is identifying the direction of cause and effect between competition and innovation. To tackle this, the research uses UK data and exploits the major policy reforms undertaken over the 1970s and 1980s, which dramatically changed the nature and extent of competition across industries and over time (see Aghion et al, 2002).

Outsourcing and inward investment

Technological innovation can be closely linked to organisational innovation. And many commentators believe that technology and globalisation are transforming the internal organisation of the firm:

- First, it is argued, new technologies, especially IT, are creating a shift from the old integrated firms towards more 'delayed' organisations and outsourcing.
- Second, globalisation often creates a tendency to transfer certain labour-intensive parts of the production process to countries with lower wages.
- Third, it is often maintained that the greater competitive pressures created by both globalisation and advances in IT favour smaller firms and more flexible organisations that are more conducive to innovation.

In this context, there has been some debate about UK firms conducting R&D overseas. The research on the 'two faces' of R&D suggests that technology sourcing is an important motivation for UK firms locating R&D activity in the United States in that they benefit from knowledge 'spillovers' from US R&D (see Griffith, Harrison and Van Reenen, 2004, for the latest evidence).

Inward investment by foreign-owned firms is also very important, both for bringing in technology and expertise, and for fostering competition and innovation. IFS research finds that foreign-owned establishments make up a significant proportion of establishments at the technological frontier in the UK (see Griffith et al, 2002).

In terms of the impact of such high productivity entrants, studies by IFS and the Centre for Research into Business Activity (CeRiBA) examine productivity differences between foreign-owned multinationals, UK-owned multinationals and other UK-owned firms. They find that multinationals are generally more productive than domestic firms whether they are foreign-owned or UK-owned (see Griffith, Redding and Simpson, 2004; and Criscuolo and Martin, 2003). The IFS research and another CeRiBA study (Haskel et al, 2002) find that inward investment boosts the productivity of domestic firms.



The policy implications

One potential policy response to stimulate greater business expenditure on R&D is tax subsidies. The United States has had an R&D tax credit since the 1980s and it seems to have been effective. The UK government has recently introduced two R&D tax credits. IFS research was influential in the decision to introduce R&D tax credits and in the design of the credits (see, for example, Bloom et al, 2002).

The importance of basic science and education as drivers of innovation suggests a strong role for public policy, as does the fact of knowledge spillovers, which may demand attention to the structure of intellectual property rights. And the Porter/Ketels report calls for regional structures to encourage the development of 'clusters' of companies and research institutions working in related industries.

The positive impact of inward investment on technology transfer and productivity suggests a potential rationale for subsidies such as Regional Selective Assistance grants. IFS research finds evidence that RSA grants are effective in inducing new plants (including ones set up by foreign-owned multinationals) to locate in assisted areas of the UK (see Devereux et al, 2004).

The research agenda

Despite the importance of innovation and outsourcing in public debate and a large literature on 'vertical integration', the economics profession is still far from a consensus on the empirical determinants of vertical integration in general and about the relationship between technological change and vertical integration in particular.

Work in progress is looking at outsourcing and productivity in service providers: which firms and industries are outsourcing business services? How important is outsourcing in the UK economy? How is this changing the nature of jobs and the regional distribution of employment? And how is outsourcing affecting the technology that is used and productivity in the supplier (outsourced) industry?

Further IFS work will look at mapping the UK innovation system, examining whether firms co-locate R&D and production facilities and to what extent they outsource R&D. Future CEP research will explore the relationship between knowledge spillovers and product market rivalry between firms.

The role of skills

A substantial body of research evidence indicates that increasing skills has a significant impact on productivity growth. For example, Lorraine Dearden, Howard Reed and John Van Reenen find that training is associated with significantly higher productivity. Furthermore, the magnitude of the impact of training on wages is only about half as large as the impact on productivity (see Dearden et al, 2000). Such findings confirm the value of education and training, the focus of a great deal of research at the CEP and IFS.

But how much of the UK's productivity gap can be explained by a lack of skills? The cross-country evidence indicates that the skills gap is significant when comparing UK productivity with French and German productivity – the UK is clearly behind the other EU countries in terms of intermediate skills. But the significance of skills is less clear when comparison is made with US productivity – though the UK is certainly behind the United States in terms of graduate skills (see Figure 7; and Broadberry and O'Mahony, 2004).

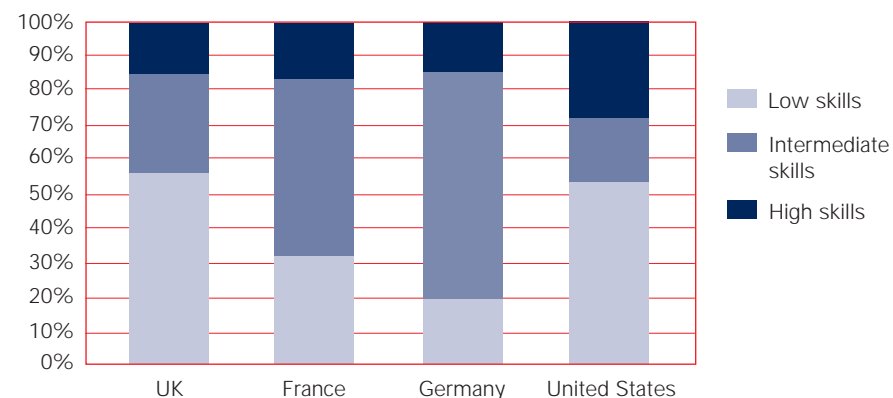
These comparative weaknesses arose over a long period of time, for example, the decline in the apprenticeship system due to attempts to replicate US standardised mass production methods in the 1950s and 1960s; and deficiencies in the mass education system, which provided good education at the high end but poor education for the majority. While the UK education system is excellent for those at the upper end of the ability range, the structure in place for post-school vocational education is weak and this leads to a noticeable shortfall in technician skills, which holds back the absorption of innovations.

Cross-country comparisons of skills and productivity gaps are valuable, but can skills explain productivity differences within a country? Research by Jonathan Haskel and CeRiBA colleagues makes comparisons of skills and productivity at the firm level. This work involves matching of two confidential and previously unavailable data resources, one covering firms, the other covering workers' skills.

The research finds that more productive firms do indeed hire more skilled workers. Plants in the top decile of the productivity distribution hire workers with, on average, around a third of a year of extra schooling relative to plants in the bottom decile. Yet this skills gap between the top and bottom firms in the productivity distribution explains only 3-10% of the TFP gap (see Haskel et al, 2004). This confirms that the overall level of skills cannot explain the productivity gap with the United States.



Figure 7 Comparing the skills of national labour forces: percentage shares with low, intermediate and higher qualifications



Source O'Mahoney and De Boer, 2002

The managerial labour market

What about the skills of UK management? The CeRIBA study looks at average skills but perhaps it is the poor skills of managers rather than the skills of the labour force as a whole that are holding back productivity. Future work will examine this question by analysing managerial skills separately. Meanwhile, there is a wealth of anecdotal evidence in support of the view that management skills are a problem in the UK.

It is certainly true that general management skills are not as highly valued as skills in finance, accounting and consultancy in the UK labour market, so the brightest graduates (science or arts) tend to go into the latter areas. John Harvey-Jones, former chairman of what was then the UK's largest manufacturing company, once said: 'When I was chairman of ICI, all the advisers that we used, advisers mark you, were all paid more than I was, be they auditors, be they the merchant banks, be they the City solicitors. Now, I ask you, in realistic national terms, who is likely to have the biggest impact on the fate of the bloody country?'

But there is still little hard evidence on whether a lack of managerial skills plays an important role in the UK's productivity gap. Indirect evidence comes from the research by Chiara Criscuolo and Ralf Martin, which compares the productivity of UK-owned and foreign-owned multinational firms operating in the UK and hence drawing on the same labour force and working with the same infrastructure. The fact that the firms have different ownership can be taken as an indicator of differences in management.

Analysing ONS micro-level data, the research finds that UK multinationals are as productive as continental European multinationals but not as productive as US multinationals (see Criscuolo and Martin, 2003). This suggests that if skills are part of the story behind the UK's productivity gap with the United States, the issue is one of management skills.

The policy implications

The importance of skills for productivity growth confirms the continuing need for policy to focus on education and training. But it remains unclear to what extent skills measured at the national level have an impact on productivity over and above the impact of skills on productivity at firm level: skilled workers might be more productive not only as a result of their interactions within their own workplaces but also through interactions with others in the wider population.

If there are significant 'externalities' of this kind, the question is whether they arise from basic skills or high skills. The answer has implications for whether the government should subsidise primary education or university education.

The research agenda

As part of his AIM Research fellowship, Jonathan Haskel will be investigating further the links between management skills and productivity at the firm level. He will also be exploring whether there are externalities of skills and, if so, for what kinds of skills.

The CEP's project with McKinsey involves a quantitative survey of organisational 'best practice', making it possible to explore in far greater detail whether management practices are a reason for lower UK productivity. The speculation is that because a large proportion of UK companies are not operating at the frontier of 'best practice', the majority of managers learn the job in a non-best practice environment, which in turn inhibits the generation and absorption of innovations.

There are also important questions to be addressed on the relationship between immigration and productivity. This is particularly significant in the context of an enlarged EU, an increasingly open EU labour market and growing numbers of high-skilled workers coming to the UK.

Productivity in the public sector

Poor relative productivity performance in the public sector is likely to have a large impact on a country's aggregate productivity. The impact is direct since the public sector makes up a large share of the whole economy. It may be also indirect given that the services that the public sector aims to produce – a well-educated and healthy population that can conduct business free of the fear of crime – are very important for private sector productivity.

But measuring performance in the provision of public services is particularly difficult. Public services are seldom sold in the open market so it is not possible to observe market prices. This makes it difficult to value the output; indeed, it is often difficult to define precisely what constitutes the output of many public services. While the output of the health sector is a healthy population, this is difficult to measure, particularly because health is subject to many influences, such as dietary, demographic and socio-economic factors. Are dentists more or less productive if they do fewer fillings?

This has led many to measure the output of the public sector either in terms of the amount the government spends on services or by intermediate outputs, such as numbers of operations or pupils taught. But although these intermediate outputs will affect health and education, adding them up to obtain an overall measure is troublesome. How can the relative importance of heart operations and tooth extractions – or primary pupils and university graduates – be assessed?

In the private sector, this is done by using the prices of outputs. In the public sector, many argue that it is necessary to consider outcomes, such as increased earning power from education or increased life expectancy. This requires measuring the marginal impact of the service provided on outcomes to allow for the impact of such factors as lifestyle changes (see Berndt et al, 2000).

An example of international comparative work in this area is recent research by Mary O'Mahony and Philip Andrew Stevens, funded by AIM Research. This measures the productivity performance of education by considering its effect on individuals' earnings and the probability of their becoming unemployed or inactive, controlling for such factors as gender, ethnicity and experience. The results suggest that the UK education sector has been outperforming its US counterpart in terms of labour productivity growth, since the mid-1990s. This stands in direct contrast to productivity growth in the whole economy.

Incentives in the public sector

Two ways in which the public sector is thought to be different from the private sector are the motivation of workers – incentives *in* public sector organisations – and the degree of pressure on organisations to perform – incentives *for* public sector organisations. With the former, it is argued that the sort of financial incentives common in the private sector are inappropriate for public sector workers and may in fact lead to worse outcomes (arguments reviewed in Burgess and Ratto, 2003).

An opportunity to test this view arose with the piloting of incentives in certain public agencies. Research by the Centre for Market and Public Organisation (CMPO), recently funded by the ESRC, focuses on the case of Jobcentre Plus, which saw the introduction of team-based incentives. The results show that public sector workers *do* respond positively to financial incentives, but that the detailed design of the scheme is very important: output measured as the number of job placements achieved increased substantially in smaller teams but fell in larger teams. The research suggests that incentives are a more cost-effective way of raising output than across-the-board pay rises or simply employing more staff (see Burgess et al, 2004).

In terms of incentives *for* organisations, it is clear that most public sector organisations do not face the same intensity of competition as the private sector. But competitive pressure is not entirely absent for some services, and it is central to the policy goal of increasing choice in public services. Two prominent areas where people do face a choice of providers are education and health. CMPO research on the latter shows that the nature of the 'internal market' in health care in the 1990s influenced the quality of care delivered. The market was set up with good information on hospital prices for the purchasers of care but very poor quality indicators. The evidence suggests that unsurprisingly in this context, aspects of care quality fell (see Propper et al, 2004).

This evidence shows that public sector providers do respond to competitive pressure but that care needs to be taken in setting the parameters of such markets. Work in progress is looking at the role of choice and competition in the market for secondary school education in England. Using very rich new data, researchers are examining the impact on the sorting of students into schools and on the progress that they make.

The research agenda

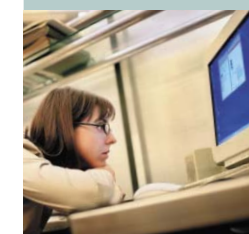
The Office for National Statistics has commissioned Sir Tony Atkinson to review the measurement of government output and productivity for the national accounts. His interim report was published in July (see Atkinson Review, 2004) with the final report due in early 2005.

The Department of Health has commissioned NIESR and the Centre for Health Economics at the University of York to measure productivity in the NHS. The approach they are adopting involves employing information on outcomes, which includes both impacts of health services on quality of life as well as life expectancy. In addition, the research will consider other characteristics of health services such as reductions in waiting lists and changes in patient satisfaction.

As part of her AIM Research fellowship, Mary O'Mahony is planning more research looking at the feasibility of undertaking international comparisons of productivity in the health sector. The ESRC is also launching a new research programme on Public Services: Quality, Performance and Delivery under the direction of Christopher Hood.

CEP research is looking at IT in public services. This is an important area given both the potentially positive impact of IT on productivity and the disastrous performance of a number of recent government IT projects (see Committee of Public Accounts, 2002 and 2004).

Future CMPO research will continue to look at the impact of choice and competition in the public sector. But it also involves recognising that many public sector outcomes are partly 'co-produced' by individuals, families and communities. These links need to be studied to get a full picture of the efficiency with which, say, education is produced. The prime example is the formation of neighbourhoods around schools, and the role of the neighbourhood and school peer groups in influencing learning.



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Sources of research

The ESRC acknowledges the valuable input from the following research centres and programmes in compiling this report.

Advanced Institute of Management Research (AIM Research) – With activities at over 34 institutions in the UK and overseas, its mission is to significantly increase the contribution of and future capacity for world class UK management research. <http://www.aimresearch.org>

Centre for Economic Performance (CEP) – It studies the determinants of economic performance at the level of the company, the nation and the global economy by focusing on the major links between globalisation, technology and institutions (above all the educational system and the labour market) and their impact on productivity, inequality, employment and stability. <http://cep.lse.ac.uk>

Centre for Economic Policy Research (CEPR) – It provides services for a network of over 600 researchers and the users of its research. <http://www.cepr.org>

Centre for Market and Public Organisation (CMPO) – It researches the impact of policy on the users of public services, in particular the effect of education, its impact on children and on the location of individuals in neighbourhoods. <http://www.bris.ac.uk/cmipo>

Centre for Research into Business Activity (CeRIBA) – An economic research centre for microeconomic analysis of business data with a current focus on productivity issues. <http://www.ceriba.org.uk>

Centre for the Microeconomic Analysis of Public Policy – Part of the Institute for Fiscal Studies (IFS), which exists to provide top quality economic analysis independent of government, political party or any other vested interest. <http://www.ifs.org.uk>

National Institute of Economic and Social Research (NIESR) – It promotes, through quantitative research, a deeper understanding of the interaction of economic and social forces that affect people's lives so that they can be improved. <http://www.niesr.ac.uk>

Public Services: Quality, Performance and Delivery Programme – New research programme that examines the quality and performance in public service provision. http://www.esrc.ac.uk/esrccontent/ResearchFunding/Public_Services.asp

Understanding the Evolving Macro-Economy – This research programme studies the behaviour, governance and management of the UK economy. <http://www.warwick.ac.uk/staff/Mark.Taylor/esrc/index.html>