

What Strategy?

How the coalition's industrial policy lacks coherence and ambition

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Executive Summary

The UK government agreed on the need for a UK industrial strategy in September 2012. In the intervening two years they have identified eleven sectors that require more Government support and eight great technologies in which the UK should seek to be a world leader. In the first two years, success has been measured in terms of bodies created, goals outlined and funds awarded. In this sense the strategy has already been effective. The government is to be applauded for its decision to think strategically about how to help UK industry to compete.

Strategies have been compiled for each chosen industrial sector. Joint industry/government bodies have been established to implement the agreed policies. A series of research centres and research 'catapults' have been created where new technologies can be tested on a larger scale and commercialisation planned. Limited public finance has been extended to leverage private investment in the selected sectors and investment bodies created for each sector to encourage foreign investment. Two separate financial institutions have been created to address the problems of the lack of credit for small and medium-sized enterprises (SMEs) and the upfront costs of investing in the technology necessary to decarbonise the economy.

The approach has been to identify measures in the areas of supply chain development, access to finance, technology and innovation, export promotion and skills development where the UK Government can contribute to making UK firms more competitive. This includes the use of the UK Government procurement policy to encourage the development of a competitive UK supply chain. It is too early to pass judgement on the success of these programmes based on whether the goals they set have been achieved. We can pass judgement both on the goals set and whether they meet the significant challenges the UK economy faces. Here, I believe, they are found wanting.

The limited programmes contained in the strategy thus far cannot solve the structural problems in the UK economy in terms of business underinvestment, poor productivity, poor public education, a substantial trade deficit and a weakened manufacturing base. The sums assigned are small and they are divided between too many programmes. The goals set are modest and appear to be set to be easily achieved rather than to spur the sectors to succeed. Some of the funding and

programmes include repackaged funding rather than new funds. This strategy is not an equivalent of the Manhattan project to develop a nuclear weapon or John F Kennedy's pledge to send a man to the moon. It does not unite industry behind a cause of national importance.

The strategy does not promise to achieve a positive UK trade balance or to make the UK worker the most productive in the world. The strategy barely considers key issues which Vince Cable initially recognised as important such as UK labour costs, the value of the pound sterling and its effect on the level and type of exports, or the cost of energy and its impact on the UK manufacturing sector. The strategy pledges to double UK exports but the UK neither controls its own trade policy or has any desire to regain control of trade policy. This does not appear to be one of the UK aims in the EU renegotiation. UK exports are hampered as UK politicians have sought to force UK firms to compete in corrupt and state dominated emerging markets as though those markets operated according to UK legal norms. These are the same emerging markets upon which any export-led British economic rebalancing would depend.

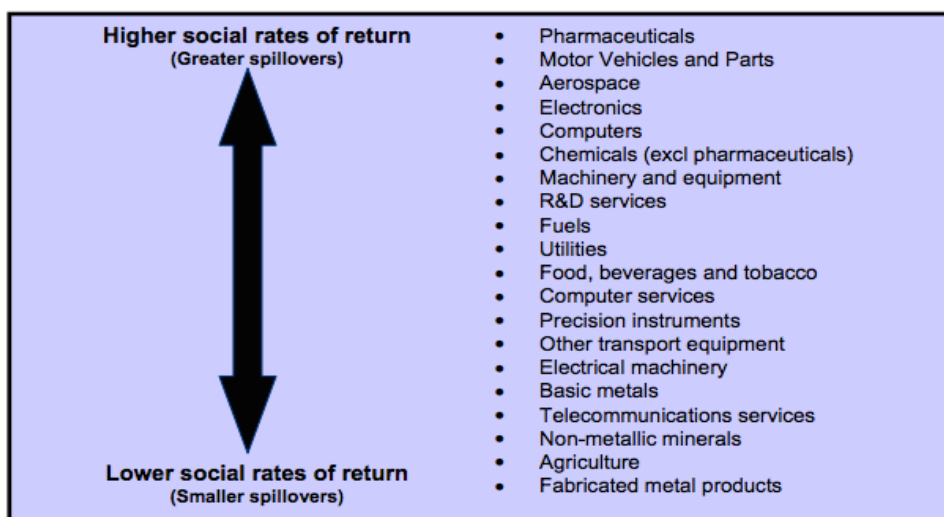
A key exception to the lack of ambition in the UK industrial strategy relates to the government desire to decarbonise the UK economy. This commitment permeates every aspect of the strategy. The government is convinced decarbonisation is the future but the process is taking too long. To speed the progress towards UK decarbonisation, the energy market has been redesigned to provide a significant subsidy to allow low carbon energy generation. The cheapest and most efficient low carbon form of power generation — nuclear — will receive no direct public subsidy due to the coalition government's political preferences. For each green technology sponsored, the flaws remain the same: demand for the products remains low, the technologies are predicted to require significant public subsidy for a sustained period and, in many cases, a significant proportion of the manufacturing process is likely to occur abroad.

It is difficult to see how the industrial strategy designed by the government would result in their stated desire for an economic recovery based on business investment, exports and productivity growth. Instead we have a UK economic recovery based on cheap credit, increasing house prices and domestic consumption. The industrial strategy appears to be little more than economic tinkering. It needs more work to make it fit for purpose.

Background

In September 2012, Business Secretary Vince Cable announced that the UK would develop an industrial strategy. Eleven sectors were identified based on an analysis of the sectors in which the UK has/could have a competitive advantage by the Department for Business, Innovation and Skills (BIS). These were; aerospace, agricultural technology, automotive, construction, information economy, international education, life sciences, nuclear, offshore wind, oil and gas, and professional and business services. Each sector would have a strategy. The plan was to extend this to other sectors of the economy in time. Plans for additional industrial sectors such as retail and chemicals have now also been developed. The choice of sectors, with the exception of agriculture, seems to accord with the analysis of Oxford Economics in 2006 about the potential of different industrial sectors to generate an economic spillover effect for the UK economy (see Figure 1).

Figure 1: Rates of social return in different industrial sectors



Source: Based on Oxford Economic Forecasting (2006).⁴¹

For each sector, the government considered how to increase the UK's global competitiveness, strengthen the manufacturing supply chain, support innovation and maximise export potential. Sector challenges in the following areas were identified: skills, access to finance, government procurement, technologies and sector partnerships.¹ Between 2012 and 2014 the Government developed strategies for each of the sectors identified and established joint

government/industry councils in each sector to oversee their implementation. Each sector strategy is explored in chapter 2.

Simultaneously, in the Autumn Statement 2012, £600 million was earmarked for scientific research. This was in addition to the £4.6 billion per annum science and technology budget, which has been ring-fenced and protected. In January 2013, David Willetts identified 'eight great technologies' in which the UK would seek to become a world leader, on which this £600 million would be spent. These were; advanced materials, agri-science, big data, energy storage, regenerative medicine, robotics and autonomous systems satellites and synthetic biology.² Each is explored in Chapter 3.

These programmes complement the Plan for Growth outlined in Budget 2011, which promised 'strong, sustainable and balanced growth that is more evenly shared across the country and between industries'. The four aims set in the Plan for Growth were:

- to create the most competitive tax system in the G20
- to make the UK the best place in Europe to start, finance and grow a business
- to encourage investment and exports as a route to a more balanced economy
- to create a more educated workforce that is the most flexible in Europe.³

In chapter 4, I consider the industrial strategies developed in other industrial sectors, other than the chosen eleven. I also examine the creation of the Business Bank and the Green Investment Bank (GIB) and the development of the UK trade strategy. In Chapter 5, I consider Government initiatives relating to the cross-cutting themes e.g. public procurement and skills that have not been incorporated in a strategy for a specific industrial sector. In chapter six I consider what aims could be set and how they might be assessed after a sufficient period of time has elapsed. This chapter cross-references some of the structural problems with the UK economy, which are identified in chapter 1.

Introduction

This report examines the measures contained within the industrial strategy as detailed on the gov.uk website, in the policy section, under the title 'Using Industrial Strategy to help the UK economy and business compete and grow.' At the time of writing (June-August 2014) this contained 182 separate entries with multiple documents for some entries. Given the short timescale, less than two years since the strategy was announced, it is premature to judge the success of the strategy. Instead, this report describes the various measures being implemented. It considers whether the strategy meets the challenges the UK economy faces. Where possible I also consider the measures rejected/not considered. I have not developed an alternative industrial strategy and I do not consider whether it is right for the government to have an industrial strategy. The latter is considered in two reports by Civitas: *Reviving British Manufacturing: Why? What? How?* by Alan Reece and Ha-Joon Chang (July 2011)⁴ and *A strategy for economic growth: A modern industrial policy* by David Green (October 2012).⁵

Why has the government decided to introduce an industrial strategy?

Business Secretary Vince Cable MP is an unlikely candidate to lead the industrial strategy. He admits that he was a late convert to the need for it.⁶ Prior to 2010 he had advocated the abolition of the Department for Trade and Industry which he now heads (now called the Department for Business, Innovation and Skills). He stated to Policy Exchange: 'I am still strongly against mercantilism — the idea that exports are good and imports are bad',⁷ but he has come to accept that 'governments play a role in the economy' and therefore 'we can have an industrial strategy by default or design. Ignoring this reality is not a policy - it is just negligence'.⁸ He wants a strategy 'which works with the grain of markets but is not passive'.⁹ Overall, the Business Secretary desires a recovery based on manufacturing and trade and investment, not 'debt financed private consumption and public expenditure'.¹⁰

What Problems Does the Industrial Strategy Need to Solve?

Lord Heseltine was hired to do a wide-ranging review to identify the UK's economic problems and propose solutions. This was released in October 2012. It is entitled *No Stone Left Unturned: In pursuit of growth*.¹¹ In January 2014 the government published a Growth Dashboard (now updated on a bi-annual basis).¹² It provides a snapshot of the problems the government is seeking to solve and how the industrial strategy is meeting them. I have used both documents in this chapter to identify the problems the UK economy is experiencing as described below.

The Growth Dashboard suggests that UK 'employment has performed well and is above pre-recession peak' (see figure 2) but noted that, in late 2013, UK GDP was 'below pre-recession peak, but recovering' (see figure 5 – note that the UK economic recovery means the UK economy has now surpassed its pre-recession peak). Consequently, 'UK productivity has fallen further than in other developed economies'¹³ (see figure 3) because UK employment did not fall as much as UK output during the recession.

Figure 2: Employment levels since recession (Growth Dashboard)¹⁴

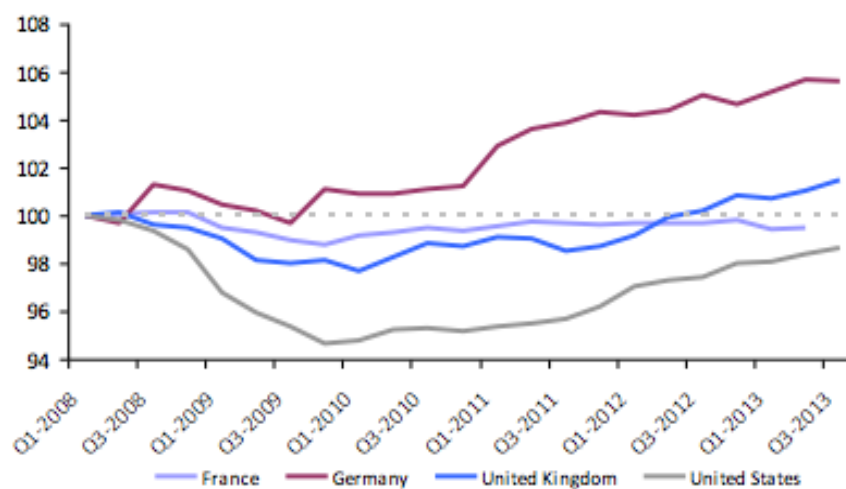
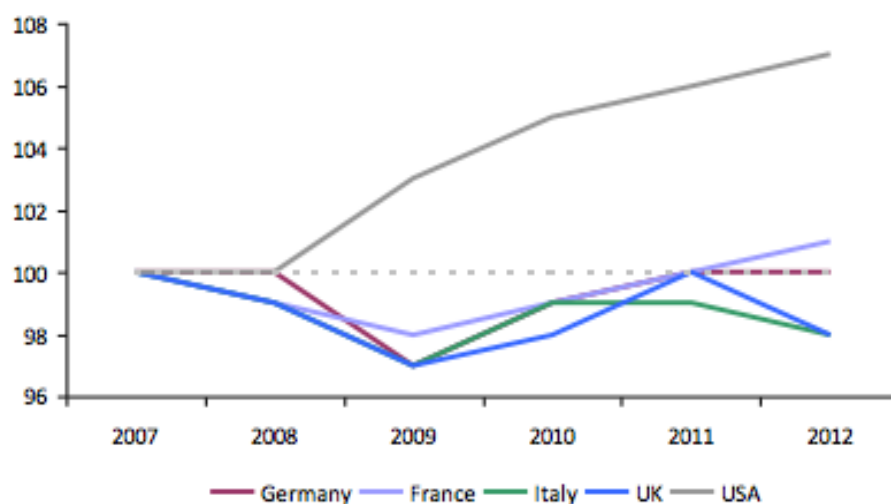


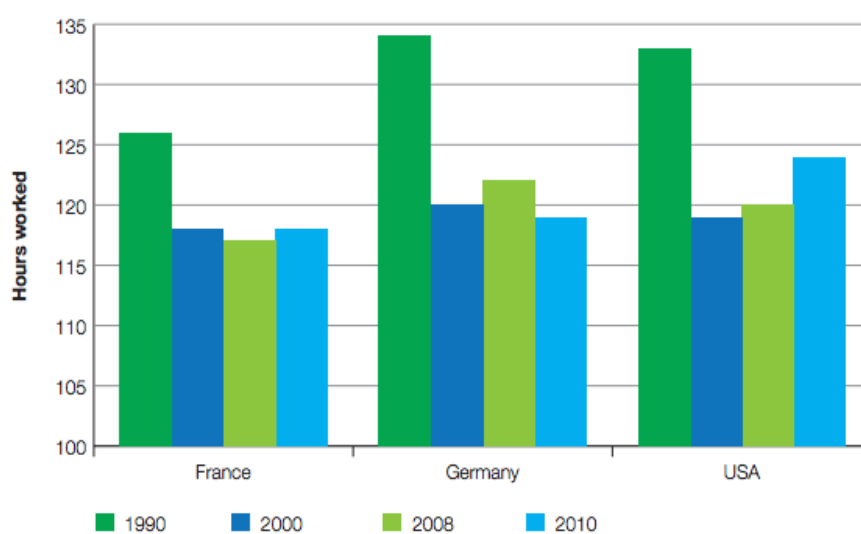
Figure 3: Labour productivity – output per hour (Growth Dashboard)¹⁵



Won't this be solved by the economic recovery?

The productivity weakness in the UK economy did not begin with the economic recession. There has been a persistent UK productivity deficit, compared with major OECD competitors, over the last two decades, as shown in figure 4.

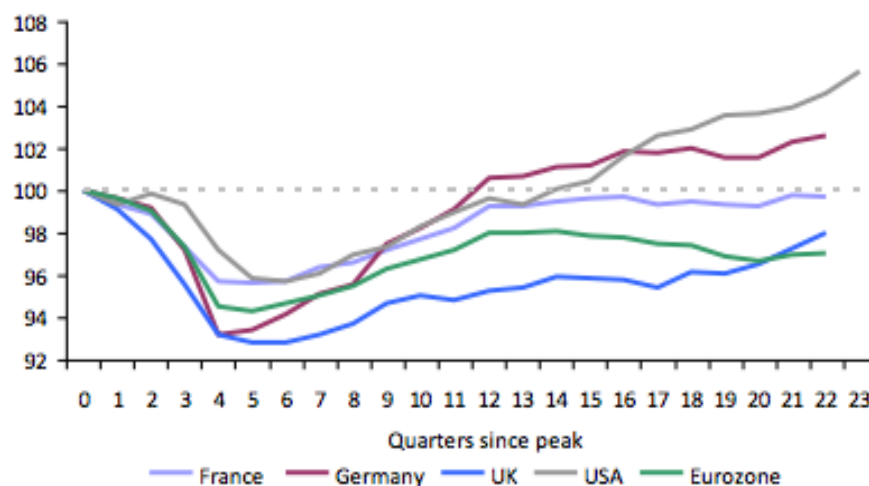
Figure 4: Relative GDP per hour worked, UK =100 (Heseltine Review)¹⁶



Source: ONS International Comparisons of Labour Productivity

During the Great Recession, UK GDP fell further and recovered slower than other advanced economies as shown in figure 5.

Figure 5: Real GDP since the recession (Growth Dashboard)¹⁷



Between 1997 and 2007 UK, economic growth averaged 3.2 per cent.¹⁸ This economic growth was dependent on government spending and household consumption. Both were dependent on increased levels of debt. Trade was a negative factor on economic growth post-1997 (see figure 6). This means there can be no return to the UK economic model that preceded the recent recession as this was unsustainable, as shown by figures six and seven.

Figure 6: Contributions to UK Growth (UK Growth Dashboard)¹⁹

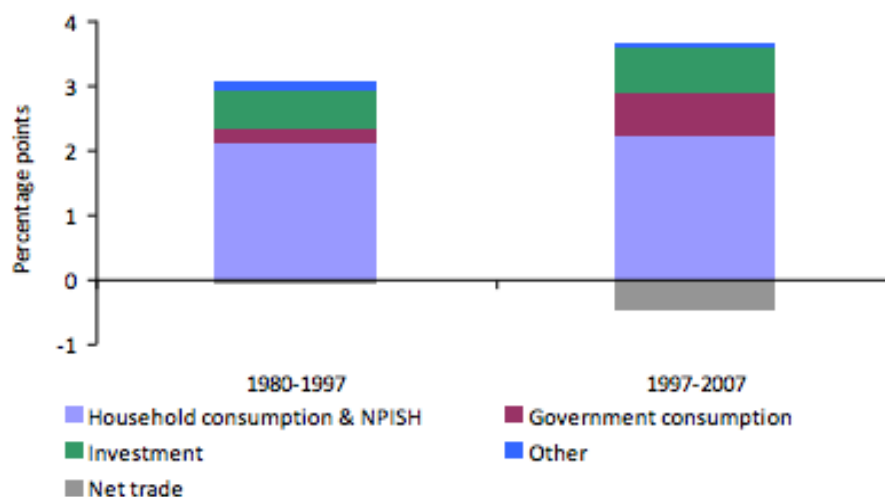
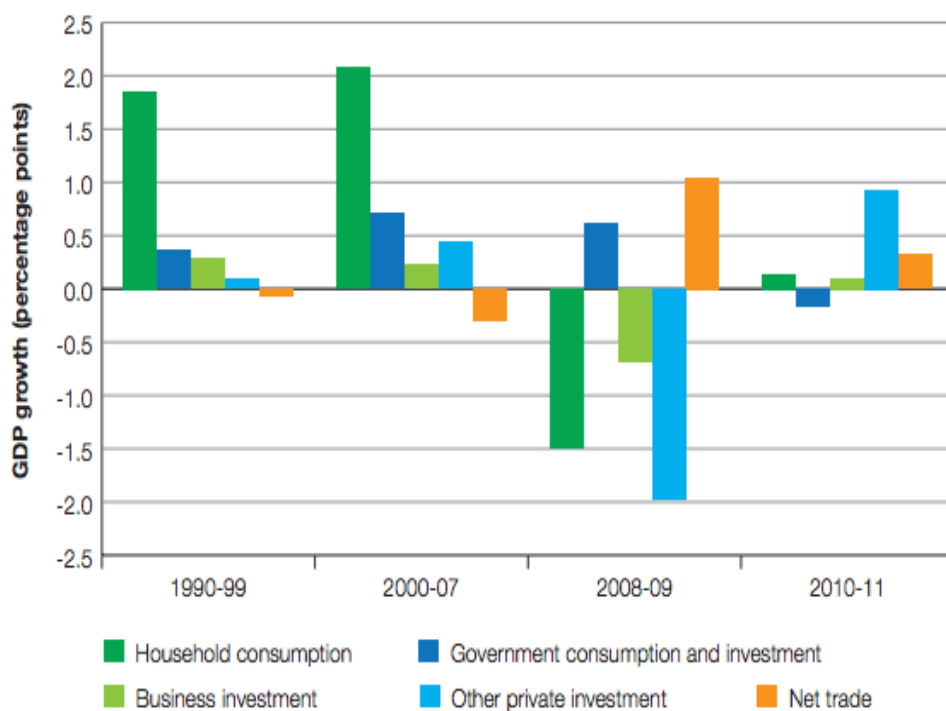


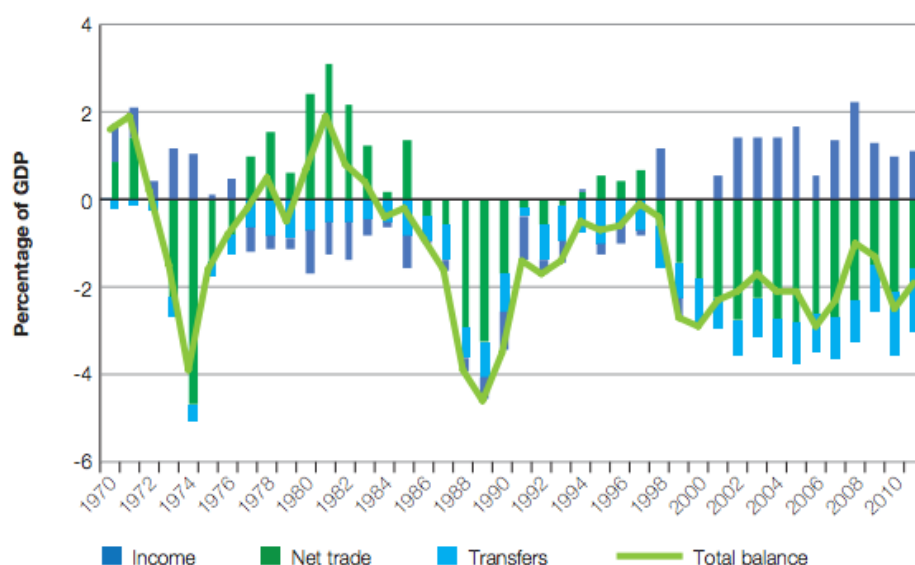
Figure 7: Average annual contributions to UK GDP growth (Heseltine Review)²⁰



Source: BIS calculations based on ONS National Accounts

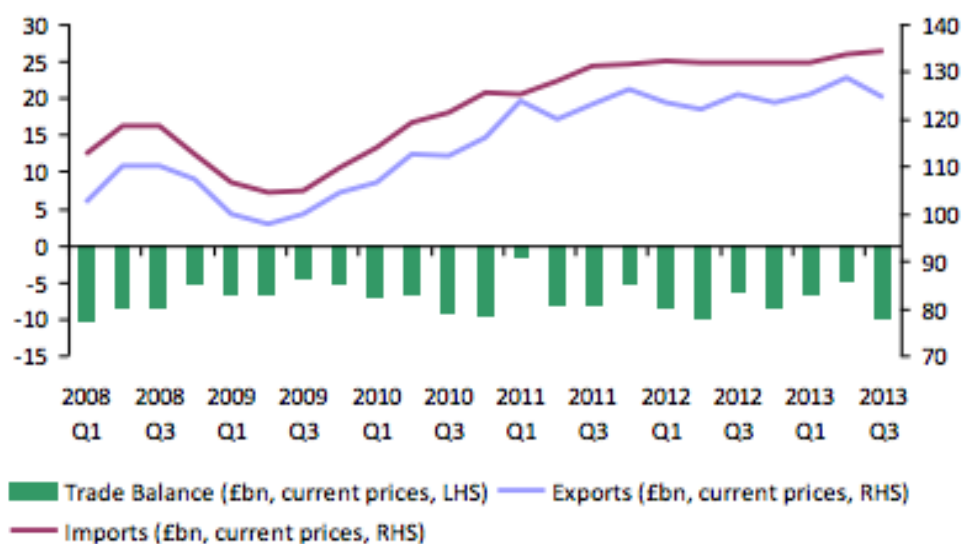
Trade has had a negative effect on UK GDP growth due to the UK's large and persistent trade deficit as shown in figure 8. Vince Cable MP acknowledged the role that 'a strong real exchange rate' has played in creating 'a badly unbalanced and unstable economy'.²¹ The pound was devalued during the Great Recession as the government pursued a 'loose monetary policy' to create 'a more competitive exchange rate'.²² Efforts to devalue the pound have had little effect on the UK trade deficit, as shown in figure 9. There are a number of plausible reasons for this. The sectors most responsive to the pound's valuation may have become hollowed out or extinct during the prolonged period of a high-valued pound that preceded the recession. It will take time to rebuild them. Businesses will only invest in these industries if they are confident the pound will not rise to a level that would once again make these UK industries uncompetitive.

Figure 8: UK current account balance (as a percentage of GDP) 1970-2011 (Heseltine Review)²³



Source: ONS Balance of Payments Quarterly First Release Q1 2012

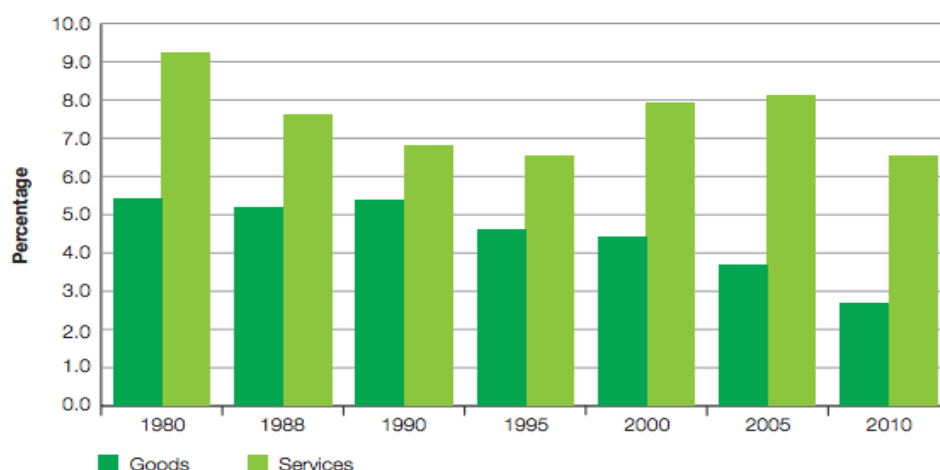
Figure 9: UK exports and imports (UK Growth Dashboard)²⁴



The UK share of global goods exports has declined. This decline is shown in figure 10. The UK is now only the tenth largest exporter of goods in the world.²⁵ This is the reason for the UK trade deficit. Lord Heseltine attributes this to the fact that 'when it comes to translating that research into goods and services, we remain below average on measures such as research and development intensity – the

level of profits our companies reinvest back into research and development – and the extent to which we commercialise our discoveries.’²⁶ David Willetts MP referred to this as the ‘Valley of Death between scientific and commercial discovery’, in which UK firms often were less successful than their foreign counterparts.

Figure 10: UK Share of global exports 1980-2010 (Heseltine Review)²⁷



Source: BIS calculations based on World Trade Organisation (WTO) data

In contrast to the trade goods sector, the UK services trade is in surplus and has been since at least the early 1980s, as shown in figure 11.

Figure 11: UK balance of trade in goods and services, £ billion 1970–2011 (Heseltine Review)²⁸

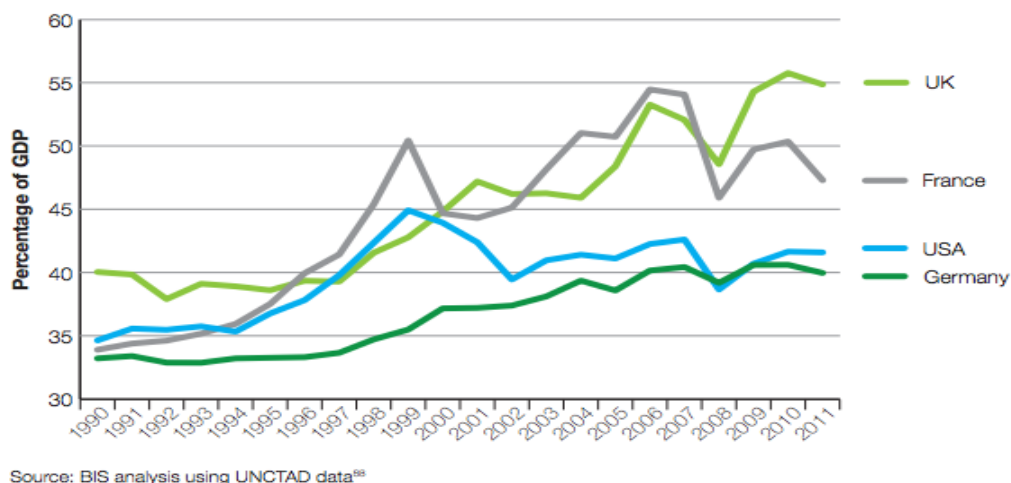


Source: ONS Balance of Payments Quarterly First Release Q1 2012

The UK has avoided a balance of payments crisis by convincing foreign investors to make capital investments in the UK. This comes in a variety of forms such as the purchase of UK companies and assets and/or investment in the creation of new

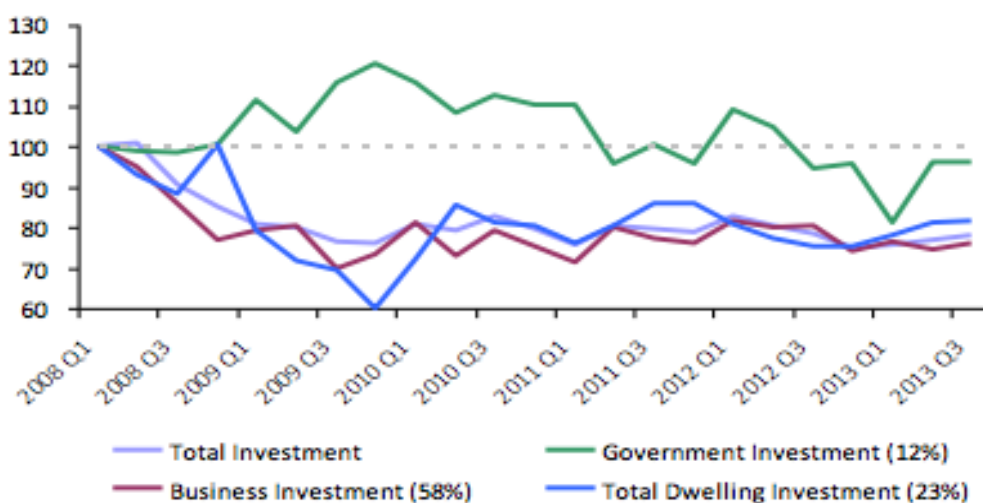
plant and equipment. The UK has the highest inward direct investment as a percentage share of GDP of the major economies as shown in figure 12.

Figure 12: Stock of inward direct investment represented as a per cent of GDP (Heseltine Review)²⁹



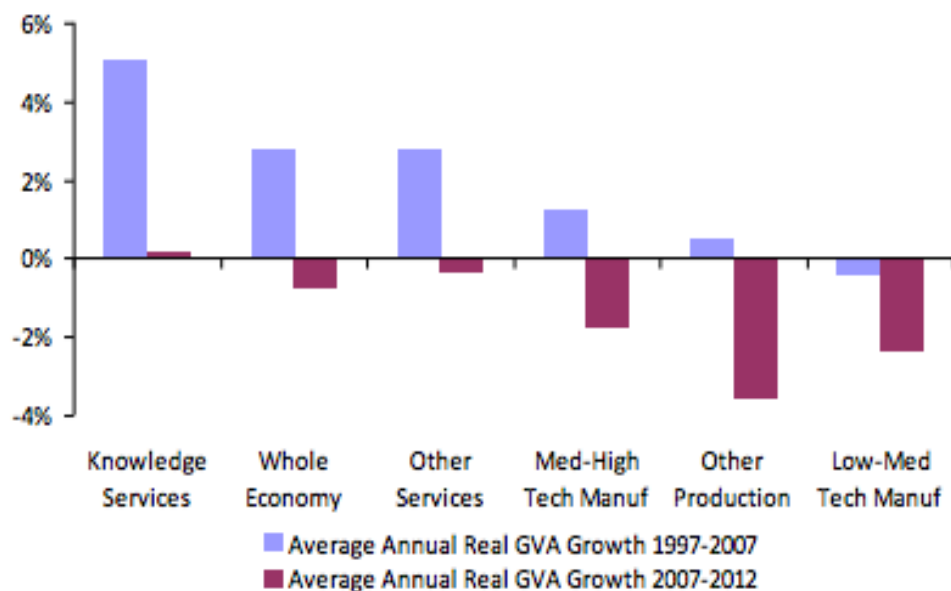
The economy also remains reliant on government expenditure. Initial predictions of a surge in business investment, contained in the Budget 2010, have not come to pass. Private and business investment has remained low throughout the economic recession as shown in figure 13.

Figure 13: Components of investment (Growth Dashboard)³⁰



Throughout the period of economic growth, between 1997 and 2007, the manufacturing sector of the UK economy was reducing staffing levels as shown in figure 15. This continued during the recession. The gross value-added provided by the UK manufacturing sector was stagnant between 1997 and 2007 (the period of economic growth). It declined most in the recession (2007-2012) as shown in figure 14.

Figure 14: UK output growth by industry (Growth Dashboard)³¹



This decline in manufacturing jobs and the rise in professional and business services concentrated UK wealth in London and the South East. These regions produce a large percentage of UK gross value-added. The gap between London and the rest of the nation has increased. The Growth Dashboard, a status update on the industrial strategy, stated in January 2014 that '23 per cent of UK GVA is generated in London, more than any other region; followed by the South East (15 per cent), North West (10 per cent) and the East of England (9 per cent)...nominal output per head is significantly higher in London (£37,200) and the South-East (£23,200) than the rest of UK (£21,700).' Regional differences are largely ones in 'output per head between areas' rather than the rate of employment in an area. London is 'responsible for 63 per cent of the variation in regional GVA per head'. Excluding London, the variation in GVA per head is 'unchanged from 15 years ago, but has risen slightly since the recession.'³² The difference in regional GVA per job

is contained in figure 16. This affects the contribution each region makes to UK GDP as shown in figure 17.

Figure 15: Employment growth by industry (Growth Dashboard)³³

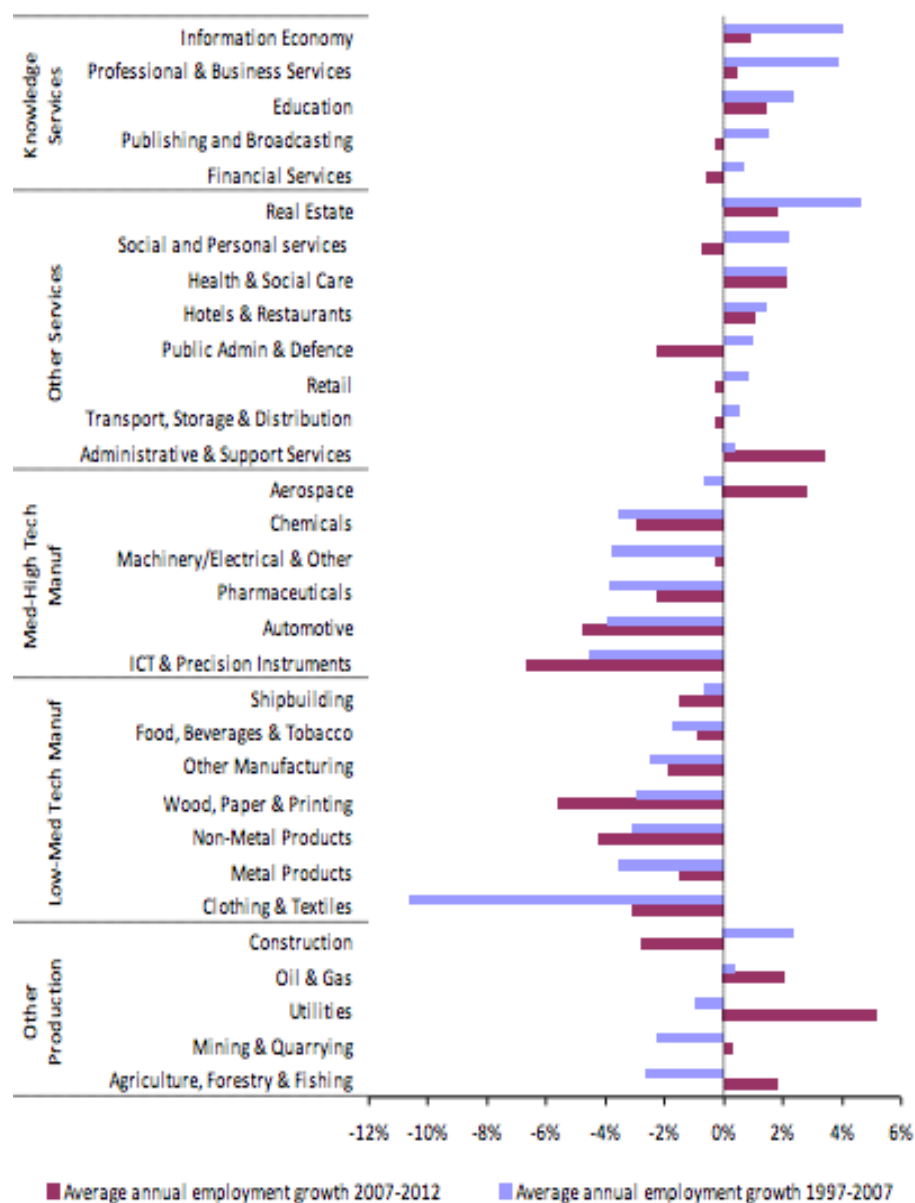
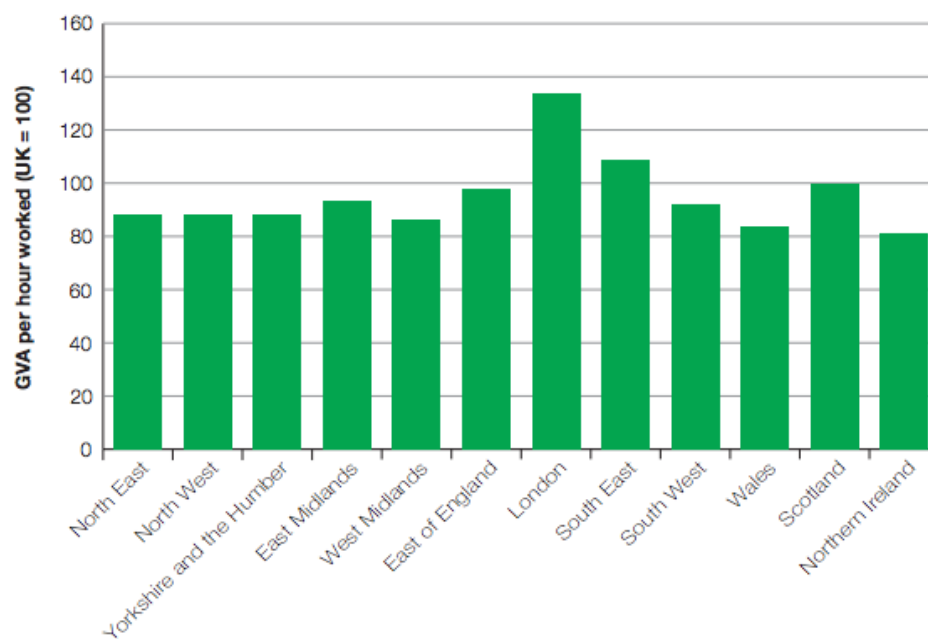
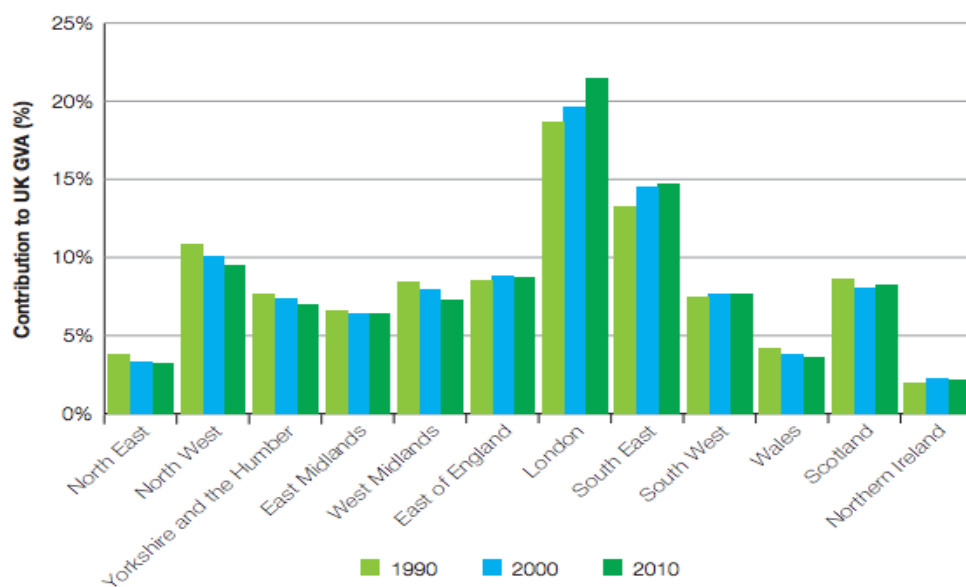


Figure 16: Regional GVA per job, 2010 (Heseltine Review)³⁴

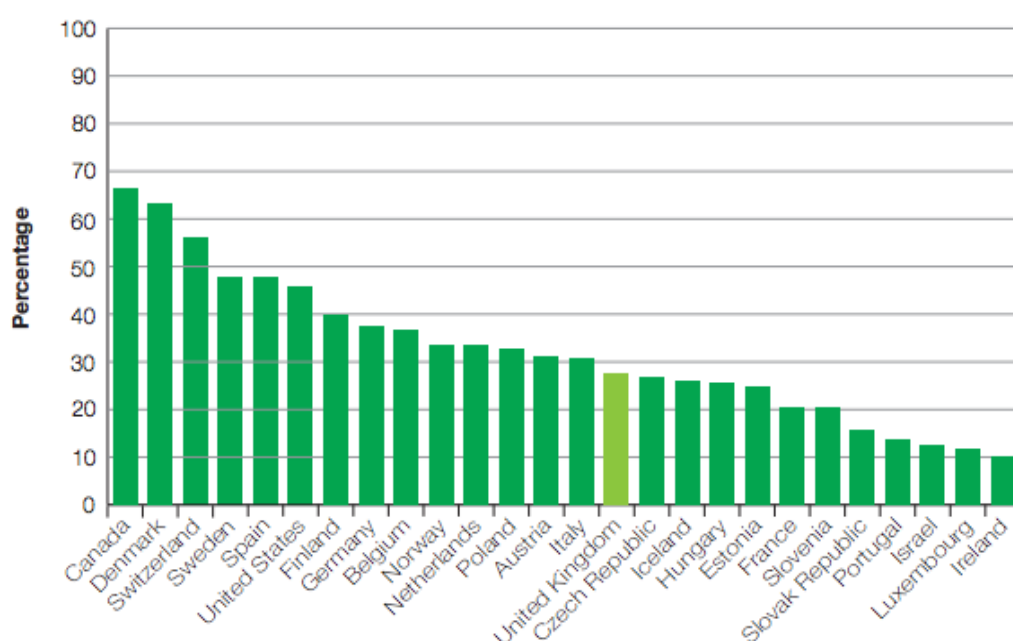
Source: Regional, sub-regional and local Gross Value Added, ONS 2011

Figure 17: Regional contributions to UK GVA, 1990-2010 (Heseltine Review)³⁵

Source: BIS Analysis of ONS Regional Gross Value Added, ONS 2011

The regional disparity in wealth creation is perpetuated by the way government resources are also concentrated in a central government based in London as shown in figure 18. Local government institutions have few powers and limited resources to devote to aiding the growth of industrial clusters in areas outside London.

Figure 18: International comparison of the percentage of general government expenditure spent by sub-central government (2010) (Heseltine Review)³⁶



Source: OECD National Accounts

As shown in figure 19, UK state schools compare poorly with developed world counterparts. UK performance in maths, science and reading in the OECD measures declined significantly between 2000 and 2009. The situation became so dire that 5.1 million UK adults were not functionally literate and 8.1 million were not functionally numerate in 2011, as shown in figure 20. An industrial strategy geared to creating high-value added roles is mismatched to a schooling system that produces a large number of students who are poor at maths, English and science.

The vocational courses that could have offered opportunities to these individuals were not highly regarded by companies or by a group of experts as shown in figure 21.

Figure 19: OECD's Programme for International Student Assessment (PISA) rankings for the UK (Heseltine Review)³⁷

Year	2000	2006	2009
Maths	8th	24th	28th
Reading	7th	17th	25th
Science	4th	7th	8th
Total countries participating ⁶⁵	32	57	65

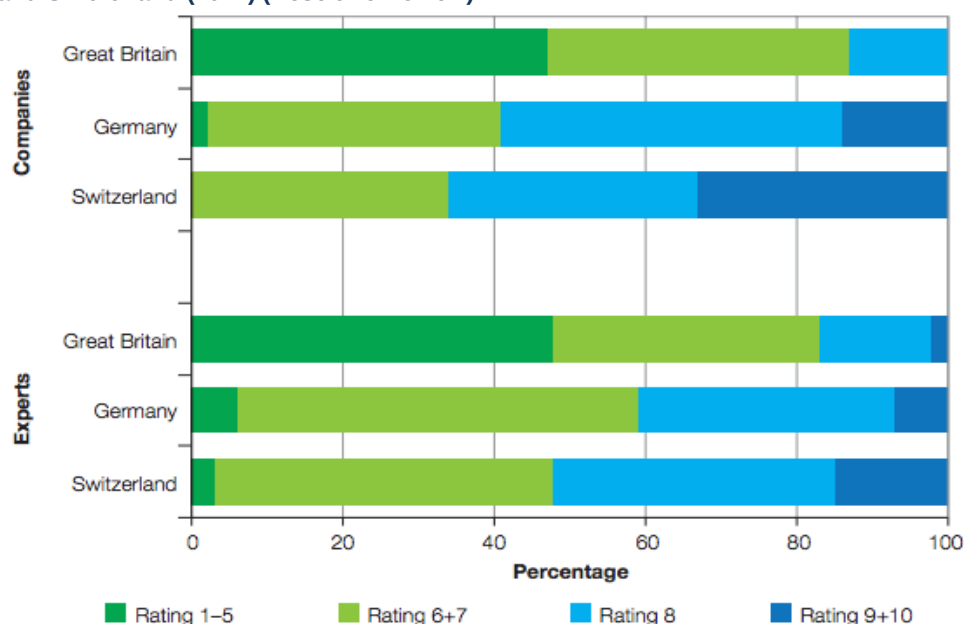
Source: OECD, Programme for International Student Assessment

Figure 20: Deficiencies in rates of functional literacy and functional numeracy in the working-age population in England (Heseltine Review)³⁸

	2003	2011
Not functionally literate	16% (5.2 million)	15% (5.1 million)
Not functionally numerate	21% (6.8 million)	24% (8.1 million)

Source: 2011 Skills for Life Survey, Department for Business, Innovation and Skills

Figure 21: Comparative ratings of vocational education systems in Britain, Germany and Switzerland (2011) (Heseltine Review)³⁹



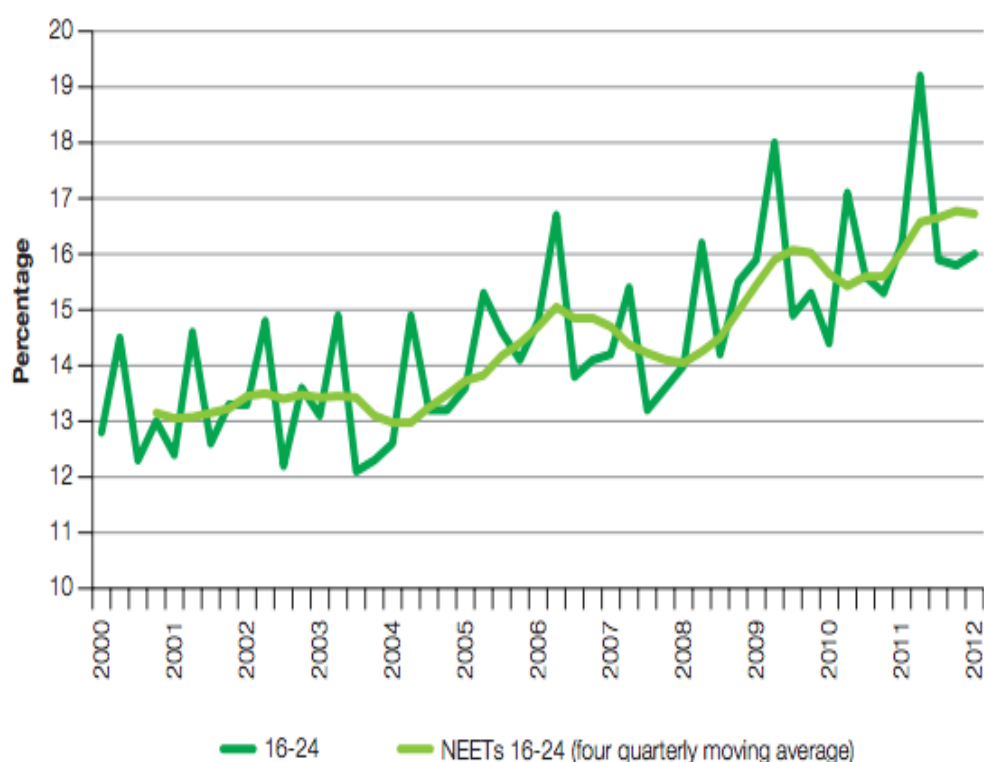
Source: Federal Office for Professional Education and Technology OPET, Swiss Confederation

Many of the poorly educated then transition from school to unemployment. The UK has a high proportion of young people not in education, employment or training as shown in figure 22.

Government expenditure constitutes a significant proportion of total expenditure in select industry sectors, as shown in figure 23. The UK had no comprehensive plan to boost the UK supply chain in these sectors until the industrial strategy was created.

UK business R&D expenditure is much lower than that of major competitors. The difference is larger than the disparity in government R&D funding compared to other nations where the UK also spends less. This is shown in figure 24.

Figure 22: Percentage of young people not in employment, education or training in England (Heseltine Review)⁴⁰



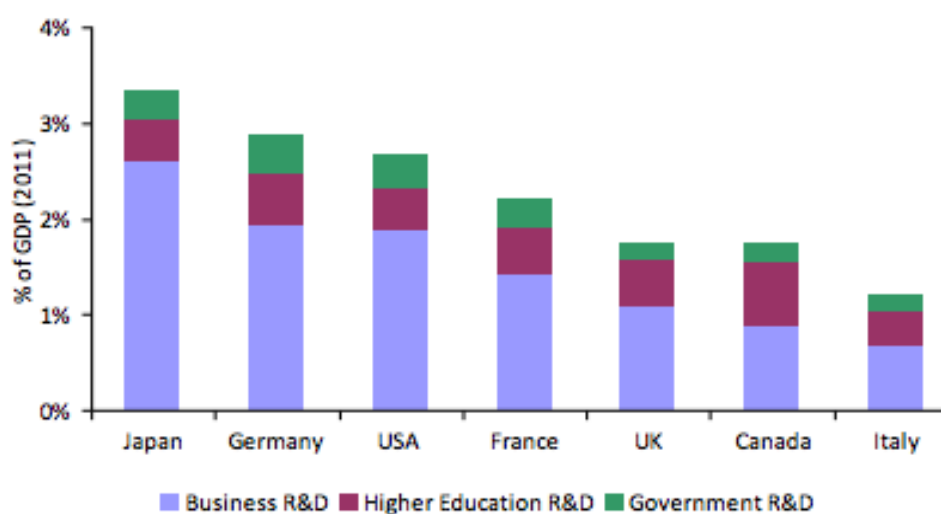
Source: BIS analysis based on data from The Data Service and DfE¹²⁵

Figure 23: Government demand as percentage of total UK demand in different sectors (Heseltine review)⁴¹

Sector	% Share of total demand
Education	61.2
Pharmaceuticals	33.9
Scientific research and development services	27.3
Printing and recording services	24.0
Computer, electronic and optical products	19.9
Legal services	18.0
Air and spacecraft and related machinery	14.8
Postal and courier services	13.1
Architectural and engineering services; technical testing and analysis services	8.6
Telecommunications services	7.6
Real estate services, excluding on a fee or contract basis and imputed rent	6.7
Accounting, bookkeeping and auditing services; tax consulting services	6.3
Advertising and market research services	6.2
Computer programming, consultancy and related services	5.9
Whole economy	16.3

Source: BIS calculations based on ONS supply and use data

Figure 24: R&D Expenditure⁴²



Given these problems what does the industrial strategy need to do?

The UK needs to reduce its goods deficit, either by importing less, exporting more or (preferably) a combination of both. Exports need to be aggressively promoted. A larger number of UK firms need to export. UK manufacturing needs to be rebuilt so that it employs a larger and growing number of people. The UK manufacturing sector also needs to become more productive by delivering more output in total and per worker.

The growth in the economic divide between a prosperous London and the South East of England and a less economically dynamic Rest of Britain and Northern Ireland needs to be halted and reversed. More private sector jobs need to be created. There should be a reduction of public sector jobs outside of London and the South East. The government needs to use its procurement policy to build strong UK-based supply chains while reducing the level of government expenditure as a percentage of UK GDP. UK schooling needs to improve dramatically to provide able employees for UK growth firms. Vocational education needs to meet employer needs better and become a respected career choice.

These tasks are not simple. The Industrial Strategy is a part of the government's plan to achieve them. We shall now explore what measures they have put in place to do so.

The Eleven Industrial Sectors Explored

How is the industrial strategy structured?

There are two broad types of measures an industrial policy can include. Vertical measures help a particular industry or company, e.g. loans or grants to particular companies. Horizontal measures seek to make the overall workforce/economy more efficient, e.g. having lower corporate tax rates than competitor nations and a tight fiscal policy to ensure low interest rates that encourage business investment. The government is trying to combine the two. They have identified select industries — a vertical approach. They then consider what measures can be taken to make the UK more competitive according to horizontal themes, e.g. skills, finance and technology.

The strategy recognises that different industrial sectors require different levels of support. Only a few 'require a long-term, strategic partnership with government'.⁴³ The government believes that 'much of the economy flourishes on its own' and government just needs to ensure that the UK is an attractive place to do business. However, some areas require a sector approach 'to deliver more tailored support and to gain insights into how to design and deliver horizontal policies more effectively'.⁴⁴ In some areas of the industrial strategy 'the true impact' might 'not be seen for a decade or more'.⁴⁵

The industrial strategy includes five themes: skills, technologies, access to finance, procurement and chosen industrial sectors.⁴⁶ It aims to provide small-scale practical help to address areas of recognised weakness in economic sectors of national importance. Small sums of public funding are provided to leverage private funding. UK firms are encouraged to develop their domestic supply chain. The percentage of UK SMEs winning UK government contracts is to be increased to 25 per cent. New financial institutions such as the Business Bank and the Green Investment Bank have been created to address specific financial issues such as SME and low carbon development funding issues.

The government aim to create industrial clusters. They are establishing technical innovation centres. These 'catapults' bring academics, businesses and government together in a physical space to enable the trial of innovation on a larger scale. The Technology Strategy Board is being funded to create Technology Innovation

Centres based on 'the German Fraunhofer model'.⁴⁷ They 'will identify and support core technologies, smoothing the path from original academic research to commercially viable application'.⁴⁸ They provide 'university researchers and businesses with facilities to collaborate to build prototypes, use large-scale clean rooms or develop virtual environments to support product design',⁴⁹ for example, centres in high value manufacturing and cell therapy. Offshore renewable energies and satellite applications are being created with £200m in Government funding.

How significant is the funding that has been allocated?

As of August 2014, around £4bn had been allocated to the strategy.⁵⁰ This is significantly less than one per cent of government annual expenditure. The sum has been allocated to cover a period exceeding one year. Funds allocated to the industrial strategy include existing funding brought under the control of institutions created by the Industrial Strategy, e.g. the Business Bank. There is no equivalent of the UK government's commitment to spend 0.7 per cent of gross national income on international development assistance, which is a commitment involving £11bn expenditure per annum that has been met.⁵¹

Does the industrial strategy provide work opportunities for UK workers with a broad range of skills?

The Prime Minister said at the Dubai Airshow that 'succeeding in this global economy doesn't mean trying to compete at the bottom end with low pay, low wages, low value-added. It means competing at the top end with high-paid, high-skilled, high-quality jobs'.⁵² Chancellor of the Exchequer, George Osborne MP, in an address on 'the future of British manufacturing', promised the recovery would bring 'good careers and decent salaries available for all'.⁵³ To achieve this the government needed to 'unashamedly back those parts of the economy that are a British success story – like car manufacturing, like biotechnology, like aerospace' to help them 'maintain their competitive edge'.⁵⁴ The sectors chosen are high-value opportunities. They require skilled and highly paid workers. The majority of sectors identified experience skills shortages.

UK employment has remained relatively high throughout the recession. The unemployed component of the existing UK population mainly divides between a subset of the population that is long-term unemployed and/or low skilled, and a section of the population that has not progressed into full time work but may be

underemployed. Whether the new industries rely on imported skilled labour or provide for the creation of a more skilled UK population is an important metric of whether the industrial strategy is a success but not one that has been adopted by the government. The strategy does recognise the need for sectoral variations in pay to ensure low wage sectors remain competitive despite the national minimum wage. It does not examine how UK welfare and tax credit policy can contribute to increasing the range of industries that are cost-competitive in the UK.

What would the UK be like in the future if the industrial strategy were successful?

The Business Secretary, Vince Cable MP, in his Mansion House Speech in March 2013 stated that the industrial strategy would 'establish a long-term collaborative approach between business and government' to allow industry to plan investment over a longer timescale'.⁵⁵ He set a goal that in ten years' time 'our advanced manufacturers, education and professional services industries overtake Italy and France in markets like Brazil and China and offer serious competition to Germany'.⁵⁶ A 'combination of better support from UKTI, a competitive exchange rate and some superb British companies with great products' will ensure increased UK exports to the emerging markets.⁵⁷ He wants to ensure that 'parts of north-east England and Scotland are thriving.' He also wants the UK energy sector to grow, including the gas and low-carbon sectors and nuclear.⁵⁸ The UK will also be 'a world leader in some of [the] disruptive new IT based technologies and – outside the US – the UK is the go-to country for entrepreneurs wanting a supportive environment for innovation'.⁵⁹ Advanced manufacturing in the UK and UK cities outside London should be revived if the industrial strategy works as planned. The banking system will be repaired. UK Universities will remain dominant but apprenticeships will have been 'expanded and respected'.⁶⁰ This is Mr Cable's vision of what the UK industrial strategy will achieve if it is a success.

Below I detail the measures contained in the eleven industrial sector strategies. There are not measures for each industrial sector under each of the cross cutting themes. I include a summary of the strategy at the beginning. At the end I suggest some measures that could be adopted.

1. Aerospace and defence

Key measures in this industrial strategy

- Aim to maintain the UK's position as number two aerospace and defence exporter and create quicker, more energy efficient aircraft manufactured in the UK.
- Use UK defence budget to procure items 'off the shelf' rather than bespoke by applying an exportability requirement to make it easier for UK firms to export the same equipment without an expensive refit.
- Address the engineering skills shortage through increasing the number of apprenticeships.
- Address the financing problems through a new finance forum and the training of specialist advisors in a UK bank.

Why has this sector been chosen?

Aerospace was chosen because the UK is a leader in the sector. The Growth Dashboard January 2014 reveals that during the recession the UK aerospace sector grew output by an average rate of six per cent from 2008-2012.⁶¹ In *Lifting Off – Implementing the Strategic Vision for UK Aerospace*, the predicted growth rate of the UK aerospace industry is 6.8 per cent over the next few years.⁶² The UK has a 17 per cent share of the global market⁶³ and is second in the world in the export of defence equipment and services.⁶⁴ The industry directly employs 100,000 people in the UK⁶⁵ and contributes over £22bn in annual revenues.⁶⁶ Globally the aerospace sector is growing by 4.8 per cent per annum. Air travel will double by 2015.⁶⁷ The government is committed to preserving this position. If the UK maintains its existing position in the market, the CBI estimate it will provide 20,000 more high skilled jobs and an extra £4.7bn per annum in exports.⁶⁸

Technology

The UK Government has created multiple bodies to represent the industry, promote technological development and encourage investment in the sector. The new bodies include the UK Aerospace Technology Institute (ATI), an Aerospace Growth Partnership (AGP), a Defence Growth Partnership (DGP) and a National Aerospace Technology Exploitation Programme (NATEP), which is led by the AGP. The NATEP works to address skills shortages and improve research and

development collaboration.⁶⁹ The ATI will invest £2bn over seven years in new technology and manufacturing to develop quieter, more efficient aircraft, and to secure a projected 115,000 jobs in aerospace and the supply chain.⁷⁰ It will have £150m annual government funding by 2014/15.⁷¹ £60 million has been allocated to high-tech aerospace technology at the Manufacturing Technology Centre (MTC) in Coventry.⁷² A new UK Aerodynamics Centre was also created in 2012. Whether the multiple institutions created under this strategy will conflict or duplicate their responsibilities remains to be seen.

At Farnborough International Airshow in July 2012, £100 million was pledged by government and industry to create low carbon aero-engine technology.⁷³ This funded seven research projects beginning in January and February 2014,⁷⁴ with a 50/50 split of government and industry investment. The projects cover the four high-value areas of aircraft manufacture the ATI is specialising in: aerodynamics, propulsion (engines), advanced systems and structures.⁷⁵ The funding model includes a £50 million competitive fund to encourage aerospace innovation.⁷⁶ The fund is joint-financed by industry and the government on equal terms. It is run by the TSB. The sector is also funded under cross-cutting government funding schemes. For example, under the Regional Growth Fund a Rochester-based firm has been granted £1m to develop a particular alloy.⁷⁷ This fund is also sponsoring the production of the 'Rapide S' in the UK by Aston Martin.⁷⁸ These multiple funding streams complicate efforts for the industry to plan long term. Given the small sums and their short duration, it is difficult to see how they constitute a long-term plan.

Capability assessment

Securing prosperity: A strategic vision for the UK defence sector outlines the aims of the Defence Growth Partnership (DGP).⁷⁹ The DGP is set up to coordinate academia, trade associations, the government and the whole supply chain. Participants so far have included government (BIS, MOD, UKTI), industry (15 companies), and the trade association ADS.⁸⁰ In value terms, 82 per cent of defence exports have come from the air domain in the previous decade.⁸¹ The DGP has formed teams to focus their export efforts, including an Air Capabilities Team and an Intelligent Systems Team to develop UK potential in electronics, software and systems integration⁸² and teams in value competitiveness, international business and skills. Their respective roles are described below.

The Air Capabilities Team and the Intelligent Systems Team will:

- Assess future market potential for air capabilities (both)
- Identify UK strengths and weaknesses and how the necessary capabilities can be built/maintained (both)
- Create channel for creative interaction with potential purchasers to shape production and procurement (both)
- Identify opportunities to link the civil and defence components (both)
- Develop next generation world-leading intelligent system products and services (Intelligent Systems Team only)

An International Business Team (IBT) and a Technology and Enterprise Team (TET) will:

- Coordinate tailored defence solutions with government and industry to offer these services to overseas customers (IBT)
- Develop new business and financial models that provide for the required investment and research and development (both)
- Identify opportunities for international collaboration (IBT)
- Champion innovation in defence products, services and manufacturing (TET)
- Identify future customer defence needs and develop technology roadmaps (TET)
- Stimulate technology cross over from civil to defence and the use of 'potentially disruptive technology' (TET)⁸³
- Build a more integrated defence sector with government, academia, SMEs and the defence industry in general (TET)

The Value Competitiveness Chain Team will:

- Identify ways to enhance the global competitiveness of the UK's defence value chain; covering prime activities and their associated supply chains, to provide differentiation in terms of capability, cost and market access
- Identify how to foster competitiveness and innovation in the UK supply chain and provide increased market access for the SME community

- Develop a strategic plan to harness and exploit examples of best practice throughout the sector.⁸⁴

The Skills Team will:

- Develop, in co-ordination with the ADSSG, an applicable skills strategy for defence
- Establish an ongoing assessment of the demographics of the defence industry
- Identify the current and future critical skill needs for the industry
- Promote the image of the defence sector to make it an attractive career choice for talented people
- Identify examples of best practice and opportunities to improve links between academia, trade associations, government and industry
- Ensure we develop a co-ordinated approach with sectors in adjacent markets facing similar issues, such as aerospace.⁸⁵

Supply chain development

The UK government has the fourth largest defence budget in the world. In the next decade the UK will spend £160bn on equipment and support. This could benefit the UK supply chain.⁸⁶ By 2013, the government and industry had allocated £213 million investment to strengthen UK advanced manufacturing supply chains.⁸⁷ Twelve projects had been awarded money from this initiative, including moves to tackle skills shortages in the aerospace sector.⁸⁸ A £40m national supply chain partnership has been approved, supported by £23m from the second round of the government's Advanced Manufacturing Supply Chain Initiative (AMSCI) and £17m from industry.⁸⁹ The AGP has created a National Technology Exploitation Programme (NATEP) to help SMEs to develop innovative technology and win orders from high tier companies worldwide.⁹⁰ The AGP believes a Manufacturing Accelerator Programme (MAP) should be created to develop an industry standard best practice toolkit for design, location and creation of production facilities.⁹¹ The Aerospace Members Committee of ADS represents the SMEs that supply components to the aerospace industry within the supply chain, ensuring their interests are incorporated into the industrial strategy for the sector. Introducing a review after a fixed number of years for each of these bodies to identify if they were meeting their objectives would be a good step to ensure they deliver.

At the Farnborough International Airshow in July 2012, the Department for Business set out its vision for the industry in *Reach for the Skies: A Strategic Vision for UK Aerospace*.⁹² This recognised the threat posed by 'an increasing number of developing aerospace nations who are investing heavily in technology, skills and supply chains, with strong support from their governments in order to acquire market share'.⁹³ Emerging market nations benefit from their lower labour costs but 'UK suppliers can differentiate themselves and remain globally competitive in a number of ways. They can be more innovative in the application of materials, technology, production equipment and processes into their manufacturing systems. They can also optimise transport and logistics networks to secure efficiencies in the flow of materials and components'.⁹⁴ Despite recognising the threat of cost-based competition, the government suggests only limited measures to meet this threat. These measures do not meet the challenge of high labour costs or the value of the currency.

Trade promotion in defence and civil air programmes

The UK is particularly strong in defence/security exports. Exports are 'running at around £9bn per annum and the defence sector supports some 65,000 highly skilled export-related jobs. Britain remains the second most successful defence exporter, behind the USA, holding a 20 per cent share of the global market and, as the government's 2010 Strategic Defence and Security Review highlighted, these exports help to strengthen the UK's strategic relationships'.⁹⁵ The Ministry of Defence is working with the UKTI to include 'exportability' in its procurement decisions to increase exports and reduce MOD procurement costs. However, the recent statements by the Business Secretary threaten the UK's role as a reliable provider of defence equipment. Mr Cable indicated that the UK would contemplate an export ban for military equipment to Israel in the event of a further bombardment of Gaza. It would be unwise for the UK to be seen as an unreliable supplier of military technology at the point that technology is actually to be used.

In general, the UK government is unequivocal about the merit of aerospace exports. The growth of air travel in Asia is recognised by the Business Secretary as an 'important opportunity'.⁹⁶ The Prime Minister and the Business Secretary have welcomed commercial airline purchases by AirAsia,⁹⁷ Etihad Airways, Emirates Airline⁹⁸ and Japan Airlines.⁹⁹ The Prime Minister has personally engaged in trade delegations to governments in the Gulf and India to lobby them to purchase fighter

aircraft that are part-manufactured in the UK. Key to these purchases has been the participation of the UK in international demonstration events such as the Dubai Airshow, attended by the Prime Minister.¹⁰⁰ The promotional work is welcome but there appears to be no comprehensive assessment of the measures being undertaken by other aerospace competitor nations. To meet the challenges other nations may pose, the government would first have to identify the measures different nations are taking to make their aerospace industries more competitive.

Skills development

Aerospace companies in the supply chain rely on aerospace orders for only 50 per cent of their business.¹⁰¹ Skills in the sector thus have a spillover effect into the wider UK manufacturing sector. In 2009, 15 per cent of aerospace companies ran apprenticeship schemes. This was below the UK manufacturing average of 18 per cent.¹⁰² Factors that have served to reduce the number of apprenticeships offered include an absence of local providers and limited access to finance. To address this, Engineering UK operates a Big Bang Fair in Birmingham including 170 organisations and 56,000 attendees. A Schools Aerospace Challenge serves to encourage interest in the Aerospace Industry.¹⁰³ Semta provides £1,000 grants for SMEs that recruit unemployed graduates. There is a £1,500 grant from the National Apprenticeship Service for employers to take on an apprentice if they have not done so within the last 12 months.¹⁰⁴ The measures to divert the low skilled and unemployed into this highly paid sector seem well judged but there is no commitment to assess their effectiveness on a regular basis

The Aerospace and Defence Sector Skills Group exists to meet the skills shortage in this sector. Capability assessments are being undertaken to map UK capabilities against world demand potential. In the UK Aerospace International Strategy 2012, the Group set out where public and private investment could finance the development of technology and supply chains and what the projected returns could be. There is a clear skills gap emerging in this sector. The shortage of engineers, scientists and technologists across the science, engineering and manufacturing sectors will number almost 100,000 by 2016.¹⁰⁵ In July 2012 the Government sponsored a business-led Talent Retention Solution to ensure the Advanced Manufacturing and Engineering sector retains skilled staff.¹⁰⁶ This is now self-financing. Five hundred Masters Degrees in aerospace engineering are being funded between 2013 and 2016 to address the skills challenge.¹⁰⁷ The Higher

Apprenticeship in Advanced Manufacturing Engineering has been developed by employers and currently provides 300 places for employees to be trained.¹⁰⁸ It is not clear how these limited measures will meet the challenge of securing 100,000 UK engineers by 2016.

Finance

Aerospace projects require high upfront costs, long timescales and delayed financial returns. An Aerospace Finance Forum has been created and a bank has developed a network of regional aerospace finance specialists.¹⁰⁹ Aerospace projects have received funding from the Regional Growth Fund and the Advanced Manufacturing Supply Chain Initiative. Previously the lack of certainty regarding UK public funding for aerospace programmes was held to be a reason why it has been 'hard for the UK to gain maximum benefit' from participating in EU collaboration programmes on aerospace R&D.¹¹⁰ The strategy does not identify areas with which the UK could collaborate with other nations on aerospace development or whether the existing collaborations will continue.

Measures that could be included in the industrial strategy but were not

- Adapt UK immigration policy to favour applicants who meet the shortfall in UK engineering roles
- Conduct a cost assessment for the aerospace sector to identify the major UK cost drivers and devise plans to reduce these costs
- Produce a target percentage of UK defence procurement to go to UK firms
- Conduct a comprehensive assessment of the measures taken by our leading aerospace competitors to promote the aerospace industry in their respective countries

2. Agritech

Key measures in this industrial strategy

- Set the UK up as a world centre of excellence for food security and farming expertise

- Reduce the cost of sector regulation and increase investment in research by leveraging additional funding from private foundations and foreign governments
- Establish Centres for Agricultural innovation to confront key sector challenges and an agri-tech catalyst to transition innovations to commercialisation

Why has this sector been chosen?

The agri-food supply chain currently generates £96bn per annum and accounts for seven per cent of UK gross value added.¹¹¹ Agri-food exports amount to £18bn per annum.¹¹² Employment in the sector amounts to 3.8 million people in the UK.¹¹³ The world market value of agricultural input sales is estimated to be worth \$355bn and is growing.¹¹⁴ The UK competitive advantage in the sector is due to a world-renowned science and research capability based in UK universities and an efficient retailing and farming base. The UK government spent £450 million in 2011/12 on R&D in agriculture and food. The private sector contributed a further £100m.¹¹⁵ An opportunity exists to set up the UK as a centre of farming expertise. UK companies could advise governments in places such as Qatar, the Arabian Gulf states and Asia on how to develop their food security strategies. This sector was identified by the Oxford Economics consultancy as one with a low rate of economic spillover. Its value for national security is perhaps higher than its economic value as food security issues could become more prominent.

Technology

Centres for Agricultural Innovation have been created under this strategy. They aim to address broad themes e.g. resilience. They do not attempt to challenge any other country's advantage in any single area of technology. The strategy says that the Centres 'must not try to do too much – the Centres cannot be good at everything'.¹¹⁶ A £70 million Agri-Tech Catalyst has been created to ensure new agricultural technologies successfully transition from the lab to the marketplace. It is being run by the TSB, who have invited bids for a first round of funding. The government has tried to rectify past mistakes in the area of research institutes. The rules governing the sale of government research institutes have been strengthened so that now the relevant Department must consider 'the institute's policy, regulatory and emergency response roles... its special scientific and technical capabilities, facilities and resources... [and] its broader economic role regionally, nationally and

internationally'.¹¹⁷ This is due to apparently negative effects of privatisation of government research institutes in the past, including facilities being relocated abroad following a sale and facilities being closed or mothballed. The measures on Agri-Tech are covered more fully in chapter 3. Agri-tech is one of the eight great technologies.

Supply chain and skills development

The Farming Regulation Task Force works to reduce sector regulation to keep the UK competitive. The delivery of skills policy involves the Leadership Council coordinating three bodies: the Agri-Skills Forum, LANTRA (the UK sector skills council for agriculture) and the Agriculture and Horticulture Development Board. It aims to achieve three things: to make what is currently available in terms of training and advice better known; to establish the skills the sector needs now and will need in the future; and to be involved in the design and delivery of appropriate vocational training.¹¹⁸ The TSB has created new innovation vouchers with a special remit to target SMEs in the agriculture sector. Possible measures to assess the value the innovation vouchers create could include the market value of technologies created with innovation voucher support and/or the number of patents granted. Without some sort of metric, it will be difficult to judge the success of the scheme.

Finance

Stakeholders consulted by government thought that £90 million [the sum assigned to create Centres for Agricultural Innovation] was a 'small sum to spread around four to six centres – the focus should be on a smaller number'.¹¹⁹ Industry preferred to invest in specific issues such as water supply rather than broad themes such as resilience. However constituted, the hope was that if the Centres were a success they could 'attract investment from foreign governments'.¹²⁰ The hope was that private bodies could be persuaded to provide additional funding. Non-industry players who might be interested in funding/supporting the Centre included the Sustainable Food Trust, Worldwide Responsible Accredited Production (WRAP), Food and Agriculture Organisation of the United States (FAO) and Nuffield scholarships.¹²¹ It should be possible to track the amount of private investment generated in relation to the £90m public investment as an indicator of success to produce a multiplier figure, e.g. every pound invested in the centres generates x pounds in private investment.

Measures that could be included in the industrial strategy but were not

The strategy does not commit to a single overarching aim or set of objectives that would constitute a strategy in this area. The sums involved are small and spread across too many centres. No central challenge defines the strategy. It could:

- stress the importance of maintaining the UK as a nation in which genetically modified crops can be developed. For instance, it does not detail how the threats posed to this research in terms of anti-GM food campaigns will be dealt with.
- commit to achieving food security for Britain through increased production. For instance, the Government does not show how the UK can ensure that the rise of the organic food movement, which is lowering agricultural production, does not result in UK food shortages.
- have a target to increase the proportion of the UK agricultural workforce that is comprised of UK citizens. This would provide more low skilled roles for unemployed UK citizens.

3. Automotive

Key measures in this industrial strategy

- Create a transport systems catapult and a low carbon vehicles innovation platform to encourage new technologically advanced vehicles development in the UK
- Achieve £3bn in new business for the UK in the automotive sector and divert a greater percentage of the component value chain to UK based suppliers
- Ensure no sector skills shortage is allowed to develop and that retiring skilled workers are replaced

Why was this sector chosen?

Between 2002 and 2012, the UK automotive sector 'accounted for an average of 0.7 per cent of UK GVA and 5.9 per cent of UK manufacturing jobs'.¹²² The UK is the fourth largest vehicle producer in Europe.¹²³ The UK is the second largest car market in Europe.¹²⁴ During the UK economic recession, car production rose to 1.6 million vehicles per annum.¹²⁵ This sector exports over 80 per cent of current

production.¹²⁶ Exports were up ten per cent in 2012 and the sector recorded a positive trade balance in 2012, the first year since 1975.¹²⁷ In 2013 UK car production reached its highest level since 2007.¹²⁸ Manufacturing output in the sector is now at pre-recession levels and exports have increased 17 per cent.¹²⁹ This represents a UK success story. It compares favourably with the industrial problems in the automobile sector in the 1970's such as the experience at British Leyland. Automotive exports represented 6.3 per cent of all UK exports in 2012. Exports to the EU26 represented 46 per cent of UK automotive exports in 2012. This success is the product of foreign investment as there is no UK owned mass-market car manufacturer.

Technology

The Engineering and Physical Sciences Research Council (EPSRC) is forming an advisory group to align research funding, academic research and the challenges facing the industry. The Low Carbon Vehicles Innovation Platform links the TSB, the Office for Low Emission Vehicles (OLEV), the EPSRC and BIS in a single mechanism to support R&D in the technologies identified by the Automotive Council. Physical High Value Manufacturing and Transport Systems Catapult centres are being formed to bring together industry and academia to develop 'high potential' ideas. Five technologies have been identified: internal combustion engines; electric machines and power electronics; energy storage and energy management; lightweight vehicle and power train structures; and intelligent mobility. The identification of the potential new technologies and the creation of coordinating structures to plan their delivery such as OLEV is a positive development.

However, the Government will need to ensure that government-subsidised innovation leads to the development of UK-based production facilities. Currently, the absence of domestically headquartered vehicle manufacturers and domestic first tier automotive suppliers help to ensure that 'non-UK suppliers currently acquire a large number of TSB-supported innovations. They usually take the technology to their home country for development.'¹³⁰ A key challenge is to ensure that technologies developed with UK government support contribute to the development of UK industries. Applying clauses in the provision of support that the technology would have to be developed and built in the UK would seem appropriate.

The Transport Systems Catapult Centre was established in March 2012. It aims to develop technologies in the areas of public transport and freight needs. Milton Keynes was chosen to be its base in July 2013. The industry will be worth an estimated £900bn by 2025.¹³¹ The Centre will receive £50 million from the TSB over five years. Industry sponsorship and collaborative R&D funding should increase this to around £150 million.¹³² It has been granted £17 million to look at real-time information for different forms of transport and developing journey planning software.¹³³ The TSB controls this Catapult. It aims to make the UK the centre for the design and development of integrated transport solutions. Success in this policy area would be the design and manufacture of a mass-market low emission vehicle in the UK. Given that it is estimated that a failure to invest in low emission vehicles could cost the UK an estimated 30,000 R&D jobs, it should be possible to demonstrate how these 30,000 UK jobs have been safeguarded by this strategy.

Finance

There are multiple sources of government finance for the industry, including £316 million for automotive projects from the Regional Growth Fund (RGF), £80 million both public and private funding from the Advanced Manufacturing Supply Chain Initiative (AMSCI) and £180 million from the TSB to allow collaborative R&D. There have also been regulatory and tax changes to increase the after tax financial return to investment. The patent box ensures a ten per cent corporation tax rate on profits achieved on UK/EU patents. The UK main rate of corporation tax is being cut to 20 per cent as of 2015. R&D tax credits have been introduced to reduce the cost of UK R&D activity. The OLEV, established in 2009, funds R&D in ultra-low emission vehicles. OLEV is subsidising the provision of a charging structure for vehicles and reductions to the unit cost of a low emission vehicle to the consumer with £400 million funding until 2015. Dividing the £400 million cost by the number of electric vehicles registered in the UK in 2015 would create a per car cost. The average amount of pollution produced by the electric vehicles if any could then be subtracted from the average amount of pollution produced per year by a diesel or petrol car. The cost per car could then be compared with the pollution saved to create a unit cost. This could then be compared with the cost of other emission reduction mechanisms to see if this was cost-effective.

Private investment in the sector is dependent on foreign investment. Between 2011 and 2013, the UK attracted £6bn investment from global vehicle manufacturers. The Prime Minister has welcomed investments made by Bentley in Crewe (£800 million)¹³⁴ and BMW in a new Mini to be built in Oxford (£750 million).¹³⁵ Central to bringing in more such investment will be the creation of a new Automotive Investment Organisation (AIO). This was formed in June 2013. It is led by the former Chairman of Ford of Britain and is based in the UKTI.¹³⁶ It has been granted £3m funding over two years (2013-2015). The AIO aims to double the number of jobs Foreign Direct Investment (FDI) creates or secures in the automotive supply chain over the next three years to 15,000.¹³⁷ The AIO will be the first point of contact with potential investors and will encourage increased FDI. The government is working with Local Enterprise Partnerships (LEPs) and the devolved governments in Scotland, Wales and Northern Ireland to strengthen the one-stop-shop offer to investors so the experience of investors dealing with government is similar across the UK. The Automotive Council is developing long-term investment finance projects and professional SME mentoring services to meet the needs of the automotive industry. Success in this area would need to be judged on the basis of the amount of FDI that was generated per annum after the creation of the AIO and how this differed with the average prior to its creation, to see if the level of investment increased.

These new financial incentives need to be balanced with the financial penalties that the government's green energy agenda has created. Businesses must cater for 'levies such as the Climate Change Levy, the Carbon Reduction Commitment and the Carbon Floor Price. The impact of these schemes can be compounded by complex regulations with overlapping but different requirements for management, measurement verification and reporting that create administrative costs that can be significant. Higher energy costs are a potential threat to continued growth in UK car production but the industry strategy does not adequately factor these costs into its assessment.

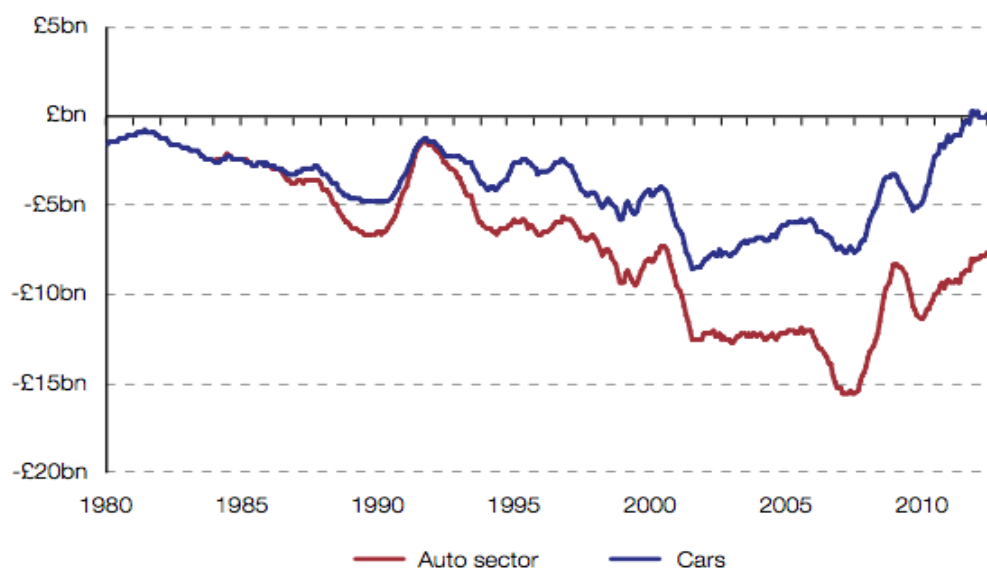
Supply chain development

In *Growing the UK Automotive Supply Chain: The Road Forward*, the Automotive Council UK set out the joint government/industry vision. The Automotive Council, formed in 2009, produced a 'sourcing roadmap' in 2011 to track and project sourcing patterns in the industry. By the end of 2013, it pledged to publish

technology roadmaps for the priority technology areas. They have now compiled a component table including the opportunities and their value. They estimated in 2012 that UK firms/overseas companies investing in the UK automobile sector could win £3bn in new business.¹³⁸ The Manufacturing Advisory Service (MAS) is providing this information to UK trade associations. MAS has £7m to deliver supply chain initiatives over three years. Existing efforts to strengthen the UK supply chain have included 'Meet the Buyer' events to alert companies to supply chain opportunities. This is important, as vehicle manufacturing creates three supply chain jobs for each engineer job created.

Despite having a positive trade balance for the finished product, the UK has a £6bn deficit for car components. The 'domestic supply chain is relatively weak. On average only a third of the parts that go into vehicles manufactured here are sourced from the UK.'¹³⁹ The amount of global purchasing spend automobile manufacturers made in the UK is 36 per cent but could increase to 80 per cent of all component types.¹⁴⁰ UK suppliers have lost orders because 'their unit cost was not competitive'.¹⁴¹ Existing data show that while the UK sources 40 per cent of transport equipment from motor vehicle intermediaries, France and Germany source 60 per cent or more. The Council has not set clear milestones for increasing UK manufacturers' portion of the value chain so the progress can be measured or provided a date by which the UK should seek to match the proportion of the value chain that German or French auto manufacturers have managed to capture for their domestic suppliers.

The 2013 BIS report *Driving Success* set the sector set two objectives: to 'secure the long term future of the sector by growing the UK share of the value chain and by getting ahead of the game in research and development (R&D) on ultra-low emission vehicles'.¹⁴² The UK is known for its flexible workforce, good design and innovative practice. In 2012 the Automotive Council estimated potential additional demand of £3bn per annum, an increase of 40 per cent on existing levels. Of the additional demand '30 per cent was for components manufactured using processes not currently available in the UK.'¹⁴³ The industry is developing an industry framework on collating and publicising supply chain opportunities. They will consider international best practice in support structures that nurture long term supply chain growth. The Automotive Council is bringing LEPs and the devolved governments together with the Council twice a year to determine how to implement the national strategy on a local/regional level.

Figure 25: UK Automotive Sector Trade Balance¹⁴⁴

Source: Trade in Goods, MRETS, Office for National Statistics, June 2013

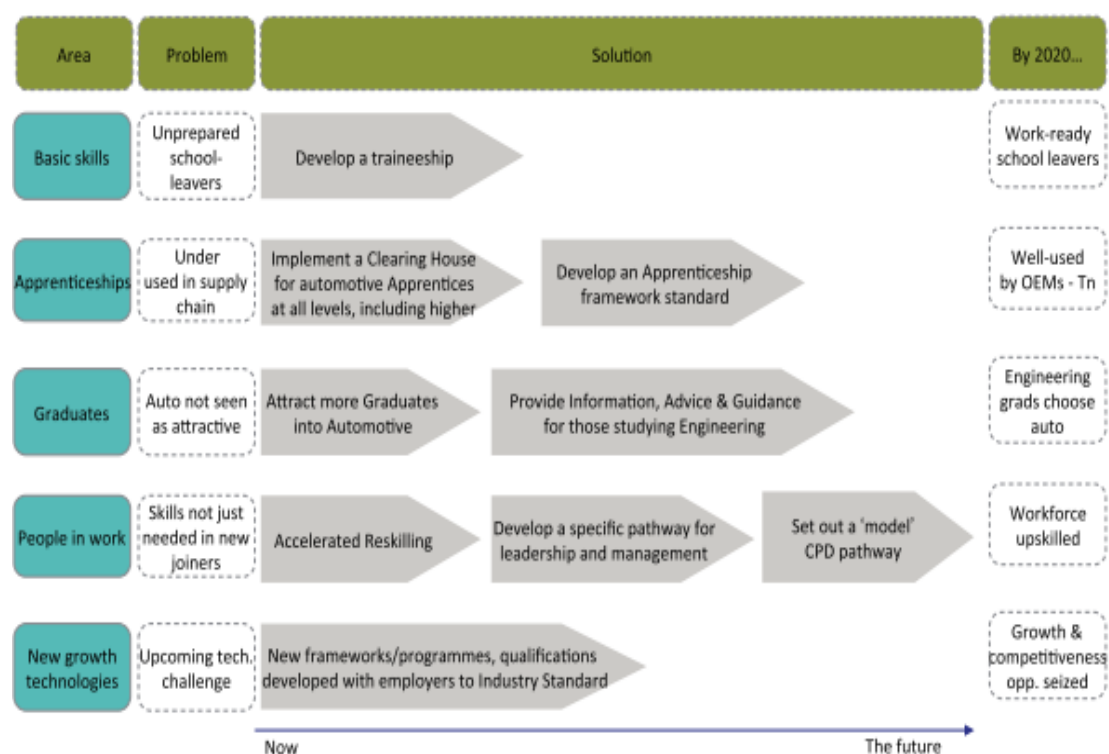
Skills development

The industry is seeking to ensure that skilled workers are attracted to the sector and remain within it; that the sector stays technologically advanced and adapts to changes; that the supply chain is strengthened; and that the business environment is competitive. UK labour productivity is high. A large number of employers offer apprenticeship schemes. Eighteen per cent of manufacturing employers provide apprenticeships but 43 per cent plan to do so, higher than the 13 per cent and 32 per cent respective figures for the wider economy. Between 2013 and 2018 members of the Automotive Council expect to take on 7,600 apprentices and 1,700 graduates.¹⁴⁵ The share of automotive establishments with a training plan matches that of firms in the wider economy but the proportion with a training budget is five per cent lower at 24 per cent of firms compared to 29 per cent in the wider economy.¹⁴⁶ This potential underinvestment in skills development could cause difficulties in future.

There is a skills shortage and 'hard to fill vacancies in the sector are above average'.¹⁴⁷ The sector needs to address UK weaknesses, which include the ageing and shrinking skilled worker base, the already weak domestic supply chain, the existing skills/capability deficiencies and the low UK investment in R&D as a proportion of GDP compared with the OECD and the EU average. The automotive sector also suffers from an alleged image problem, which makes it hard to attract

workers with higher education levels. This means 'only five per cent of automotive employers recruited a graduate from higher education over the last two to three years compared to seven per cent in manufacturing and ten per cent on average for the UK.'¹⁴⁸ To rectify this, the Automotive Council is creating a scholarship scheme for member firms to sponsor university students to study for relevant degrees. Industry executives also pledge to meet students and go to schools as part of the 'see inside manufacturing' programme. The skills roadmap has been adopted and is contained in figure 26.¹⁴⁹

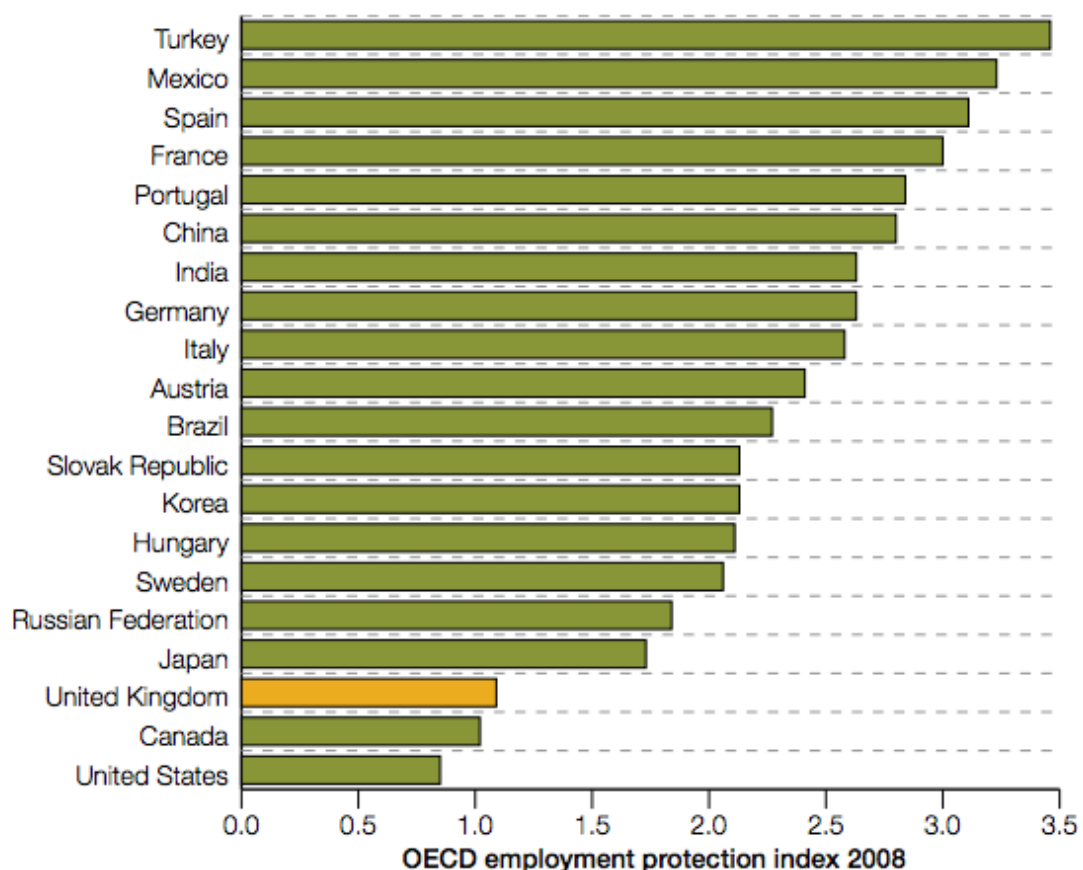
Figure 26: Automotive sector skills roadmap



The UK has low levels of employment protection, as shown in figure 27. It would be useful for the government to conduct an assessment to consider how important a factor this is in the decisions of foreign investors to locate automotive production facilities in the UK. Such an assessment might also help the government to design its welfare, taxation and labour regulation policies in such a way as to ensure that the high level of employment in the sector continues but employees in the sector are compensated effectively during the downturns in production. Figure 27 rates each country by the level of employment protection according to the OECD

designated employment protection indicators. A score of 0.0 signals a very low level of protection and a score of 3.5 a very high level of employment protection.

Figure 27: OECD Employment Protection Index 2008



Source: Legislation, Collective Bargaining and Enforcement: Updating the OECD Employment Protection Indicators, Social, Employment and Migration Working Paper no. 89, OECD, Paris

Measures that could be included in the industrial strategy but were not

- Conduct a thorough assessment of the reasons why French and German manufacturers purchase a greater proportion of components from their domestic producers than UK based firms do
- Conduct an assessment of the impact of change in energy prices and fluctuations in the value of the pound sterling on UK car production
- Commit to ensure that UK car producers will be able to access the lowest cost energy supplies of any European state so carbon shifting does not occur

- Work with industry to develop mechanisms to manage downturns in production in order to ensure that workers are fairly compensated and skills are not allowed to atrophy (where this is not already occurring)

4. Construction

Key measures in this industrial strategy

- Reduction of costs of government construction projects by 15-20 per cent by 2015 through widespread adoption of Building Information Modelling (BIM)
- Make suppliers aware of opportunities in the UK infrastructure pipeline through publishing the National Infrastructure Plan
- Reduce the payments period to 30 days to aid SMEs and reduce the level of regulation affecting development
- Promote low-carbon construction, subsidise green energy insulation and power generation measures taken by households
- Develop Future Cities approach and trial integrated data techniques to improve city management

Why was this sector chosen?

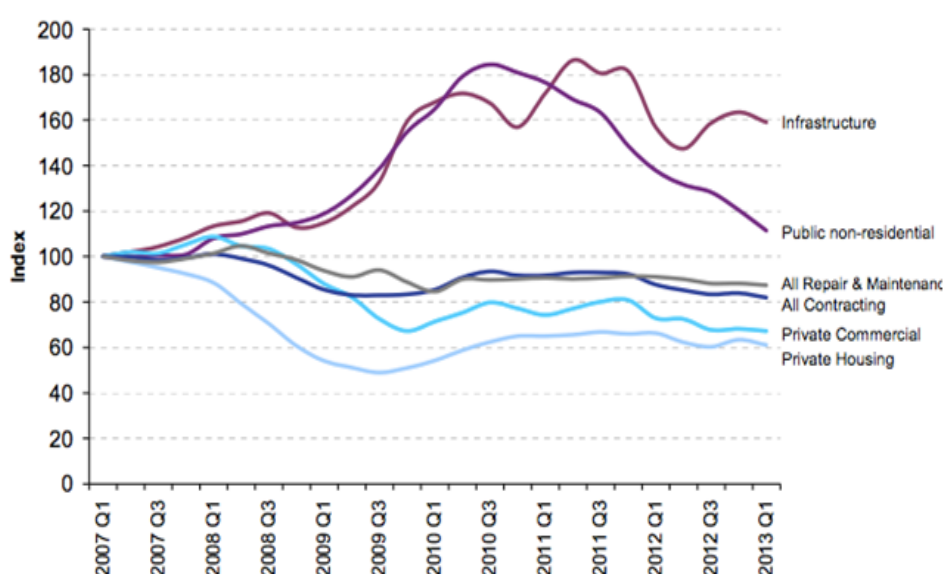
The economic analysis of UK construction in July 2013 demonstrated the value of the construction sector to the wider UK economy. The UK construction industry is one of the largest in Europe. It contributes almost £90bn to the UK economy (or 6.7 per cent) in value added, comprises over 280,000 businesses, including some 2.93 million jobs, which is equivalent to about ten per cent of total UK employment. Unfortunately the financial crisis has meant that 'key markets for construction have declined – output in the private housing market has fallen by 40 per cent and private commercial building decreased by over 30 per cent since 2007'.¹⁵⁰ The sector had an annual output of £107bn in 2010. The industry includes a variety of activities including 'mining, quarrying and forestry, the industry runs all the way from design, product manufacture and construction through to the maintenance of our buildings and infrastructure assets and, at times, into their operation and disposal'.¹⁵¹ This sector is one of the two chosen by the government in this industrial strategy that includes a significant amount of low skilled labour (the other being agriculture). It is a sector in which jobs can be created quickly. The UK

housing shortage has created a need for additional development. It would seem to be a sector ripe for significant growth. This has not occurred.

The effects of the UK economic recession on the construction sector

The construction sector has been affected disproportionately since the recession of 2008. In 2007 the construction sector accounted for 8.9 per cent of the UK's GVA. By 2011 the sector's contribution had decreased to 6.7 per cent. In early 2012, contractors in the construction industry returned to recession for the third time in five years.¹⁵² The decline in output since 2007 was a decline in private housing (40 per cent) and private commercial building (33 per cent). Government infrastructure and public non-residential activity grew post-2007 but has declined since 2010.¹⁵³ This has a significant effect on UK employment as the UK supply chain is heavily domestic: 'It is estimated that for every £1 spent in construction at least 90 per cent stays in the UK.'¹⁵⁴ The construction supply chain amounted to £124bn of intermediate consumption in 2010.¹⁵⁵ Construction output in 2012 was 88.5 per cent of the level in 2008.¹⁵⁶ In the January 2014 Growth Dashboard update on progress, construction output was still 14 per cent below peak, having contracted since 2007. The changes in construction output performance by sub-sector are contained in figure 28.

Figure 28: Change in output performance in construction contracting sub-sectors¹⁵⁷



Technology

The construction sector in 2011 spent £22 million on R&D. This has been declining since 2000. R&D in other business sectors has increased 35 per cent since 2000.¹⁵⁸ Nevertheless, the UK has 'a relatively higher proportion of patents related to construction in comparison to an average of G7 and BRIC countries'.¹⁵⁹ UK construction seems more effective at translating R&D investment into patented innovations. The government aims for the UK to become a world leader in Building Information Modelling (BIM). The BIM approach involves digital collaboration and design, including a 3D computer model that allows better management of project information during the project progression. Both the Cabinet Office and the Department of Business have implemented this approach across central government public procurement projects. There is an aim of doing it in every such project from 2016 onwards. The Government Construction Board and the IUK Client Group are driving this initiative forward. They are assisting each government department to develop a BIM adoption plan and engaging with trade bodies to spread knowledge of BIM in the sector. Regional hubs are being formed to enable SMEs to access details on BIM.

Through Digital Built Britain, the government aims to integrate BIM into its Smart Cities and Smart Grids approach. The government recognises that the UK has 'a limited "window of opportunity" to cement our position and if we fail to do so then other nations will quickly begin to erode our competitive advantage away'.¹⁶⁰ The Infrastructure UK Annual Report (published in June 2013) shows similar progress. There are £188m worth of construction-related science and engineering projects supported by the Engineering and Physical Sciences Research Council (EPSRC) alone, 80 per cent of which are collaborations with industry partners. BIM appears to be the government's means of translating its desire to save money on government construction projects into a project management approach that makes UK construction firms more competitive. The Government Construction Strategy (GCS) was initiated in May 2011. Its main aim was a reduction in the costs of government construction projects by 15-20 per cent by 2015.¹⁶¹ Under the GCS, £447 million of cost savings were achieved in the financial year 2012/13. By 2015 the target is to achieve savings of £1.2bn. In addition, the Construction Leadership Council wants to achieve a 50 per cent 'reduction in the overall time, from inception to completion, for newbuild and refurbished assets' and a 33 per cent 'reduction in the initial cost of construction and the whole life cost of built assets'. Reducing the

amount of time to deliver a construction project and ensuring that new construction does not build in higher carbon emissions are both wise aims for the sector to seek to achieve.

Is the BIM approach favoured by the government being embraced by the construction sector?

The governments' enthusiasm for BIM appears to be encountering difficulties. Industry analysis indicates that 'around two-thirds of construction contracting companies are not innovating at all'.¹⁶² The government notes 'growing cynicism amongst sub-contractors with regards to supply-chain integration activities' and that, among contractors, 'there was little spontaneous mention of Building Information Modelling (BIM)'.¹⁶³ Among firms in the supply chain 'there was little evidence either of innovative or adaptive responses to current market conditions, or of a belief that current conditions and price levels represented a new baseline'.¹⁶⁴ The lack of enthusiasm may be because there are 'few business or economic drivers to deliver meaningful change'.¹⁶⁵ The sector serves its clients' preferences and clients often focus on the upfront construction costs rather than the lifetime cost/value created. They are 'unaware of the potential value that integrated supply chains can bring'.¹⁶⁶ There is also a conservative attitude to innovation in the sector. Contractors in the construction sector are 'prepared to accept stable, though unexciting returns, rather than attempt changes that are seen as being "too difficult"'.¹⁶⁷ Until recently the sector lacked a single dominant representative group. The supply chain analysis notes that there were 'too many industry bodies' and these specialist bodies focused too much on 'transactional issues within their own technical specialist silos'.¹⁶⁸ Innovation in the sector has been subdued, in part, because there has been no effective coordinating board to lead innovation in the sector.

How else is the government encouraging innovation in the UK construction sector?

The Construction Leadership Council (CLC) will now lead joint industry/government efforts assigning actions to the different players. By 2025 the government hopes that the industry will not be characterised 'as it once was, by late delivery, cost overruns, commercial friction, late payment, accidents, unfavourable workplaces, a workforce unrepresentative of society or as an industry slow to embrace

change'.¹⁶⁹ Factors that increase project costs include 'incomplete design, design change and late variations [leading to] significant waste'.¹⁷⁰ The reduction in investment in plant and machinery experienced since the recession could affect the sector's long-term productivity.¹⁷¹ The government wants the UK to lead in green and sustainable building construction. Global growth in this area is predicted to be 22.8 per cent per annum between 2012 and 2017.¹⁷² The twin drivers of this growth are regulatory pressure (low carbon requirements) and consumer demand (ethical consumption). The government is investing £60 million through the TSB to support UK construction to design/develop more energy efficient buildings. They believe industry will contribute a further £60m, plus a further £30m from across government.¹⁷³ The Low Carbon Routemap for the Built Environment, which has been created by the Green Construction Board, also supports the decarbonisation drive. It includes actions for the construction industry to achieve the government target of an 80 per cent reduction in greenhouse gas emissions based on 1990 levels by 2050.¹⁷⁴ Supply chain interviews revealed that contractors were concentrating on the reduction of physical waste and not on other areas of waste. The supply chain analysis recognises that 'high levels of in-built waste will be a major source of opportunity for cost reduction', but waste is 'so deeply rooted in the way that the industry operates that even on best practice projects there is insufficient opportunity and incentive within the supply chain to cut waste'.¹⁷⁵ The CLC will need to direct suppliers to concentrate on all areas of waste in construction and to make it attractive for them to do so.

The Energy Companies Obligation provides £540 million support to help low income households to make their homes more energy efficient with payments under the Green Deal Cashback Scheme.¹⁷⁶ The strategy sets two strategic priority areas; green construction and smart construction with digital design. With green construction, the TSB invested £83 million in the Low Impact Buildings Innovative Platform, while the industry added £34 million. This fund has financed adaptations of existing buildings to make them low carbon.¹⁷⁷ Economic benefits estimated at £1.5bn over five years have been recorded. The Engineering and Physical Sciences Research Council (EPSRC) is establishing Centres for Doctoral Training in sustainable build and end-use energy demand. A Sustainable Product Engineering Centre for Innovative Functional Industrial Coatings (SPECIFIC) at Swansea University wants buildings to become mini power stations with coatings that can generate, store and distribute renewable energy.¹⁷⁸ These measures aim

to contribute towards the government's aim of achieving a 50 per cent 'reduction in greenhouse gas emissions in the built environment',¹⁷⁹ which represents a clear aim that could be proven to have been achieved or not.

Supply chain development

How do payment periods affect the size and survival rate of UK construction firms?

The UK construction industry is more fragmented and dominated by SMEs than its American and German counterparts. There is only one UK firm in the top ten European construction firms. The limited financial strength of SMEs makes them incapable of bidding for large projects on their own and vulnerable to late payment. Analysis for BIS by EC Harris (2013) found that, on average, on a 'typical' large building project (£20-£25 million), a main contractor manages 70 sub-contracts of which a significant number will be for £50,000 or less.¹⁸⁰ Three things that contractors need are prompt payment; effective project management; and realistic pricing.

Late payment is a problem. The Construction Trade Survey found that late payment was the most important issue affecting the construction sector, with 'only five per cent of specialist contractors being paid within 30 days'.¹⁸¹ The CLC, a partnership of both government and industry, agreed a Construction Supply Chain Payment Charter in April 2012, including eleven 'fair pay commitments'.¹⁸² It makes a commitment to reduce payment terms to the supply chain to thirty days from January 2018.¹⁸³ Prior to this it will fall to 45 days from June 2015 and to 60 days from April 2014.¹⁸⁴ A key problem is that it is unusual for trade terms to incentivise financially early payment or to penalise financially late payment through an interest charge.¹⁸⁵ Allowing firms a longer time period to pay their tax bills would be a cost-effective means of increasing trade credit, which the government should consider.¹⁸⁶

Cash flow issues have reduced the oversight and training of on-site management teams and this hampers project management. SMEs are less able to bid for contracts outside of their local market, thus reducing competition for projects, a factor worsened by the downward pressure on pricing caused by the reduction in demand. The price reduction in the sector has led to recognition that 'the construction industry is not currently generating sufficient return to cover costs and deliver a return'.¹⁸⁷ UK construction suffers from low profit margins. These margins

have dropped more than they have for firms in the rest of the economy during the recession.¹⁸⁸ Consolidation in the sector might improve both margins and investment in innovation, but the government is not encouraging such consolidation, and there is limited support for the development of consortia. If the consortia experiment proves successful, it might create a movement towards consolidation.

Skills development

Will a more productive UK construction sector employ fewer people?

The government analysis of technology and skills in the construction industry stresses the need to boost off-site construction to increase productivity. In 2010, twelve per cent of UK construction took place off-site.¹⁸⁹ This form of construction includes both small fixtures and complete buildings. It makes the build process safer, better quality and more efficient. However, it also reduces the skill levels required by on-site staff and the number of workers required. The analysis recommends a form of Continuing Professional Development using web-based learning on non-core working hours.¹⁹⁰ Deficiencies in the content of existing training programmes include 3D drawing; site supervision; logistics; BIM and an understanding of design technologies and materials used in offsite.¹⁹¹ This will probably lead to fewer low-skilled roles. There may be more opportunities in the higher skilled roles of design and project management. This process seems to be occurring already. The proportion of individuals in the construction sector with higher-level qualifications — a degree or equivalent — almost doubled in the previous decade.¹⁹²

Does the fragmented nature of the UK construction industry affect investment in workplace training?

Contracting accounts for 70 per cent of total value added in UK construction and 70 per cent of the jobs.¹⁹³ Self-employed individuals face a choice between learning and earning. They are half as likely to participate in training as employees in the wider construction sector.¹⁹⁴ Construction is seen to have low appeal as a career option with the sector 'scoring an average of 4.2 out of 10 among 14 to 19 year-olds and only slightly higher among careers advisers (5.6 out of 10)'.¹⁹⁵ The number of construction apprenticeships fell from 22,000 in 2008/09 to 16,000 in 2011/12.¹⁹⁶ The majority of employers (86 per cent) in the construction sector do

not plan to start an apprentice in the next 12 months.¹⁹⁷ Fewer are taking apprenticeships compared to the pre-recession era and to other sectors of the economy now. One fifth of the vacancies in the sector are persistent and employers can't recruit appropriately skilled staff.¹⁹⁸ Given the lack of investment in training, this acute problem will probably become worse.

The Olympics was a positive showcase for UK construction, as the Olympic Park was completed under budget and ahead of schedule. However, the industry is held to have an image problem. It requires a more diverse workforce. Two per cent of the work force is from ethnic minorities, and 13.5 per cent are female.¹⁹⁹ There is a belief that 'change is required in the construction industry itself and in how the construction industry is perceived by the public. Industry and government must work together to inspire young people.'²⁰⁰ The sector needs to begin its engagement in schools pre-GCSE and to publicise the improvements in site safety that have occurred. Fatal injuries have declined from 113 in 2000/01 to 50 in 2010/11.²⁰¹ Increasing the number of apprenticeships in the sector would be an effective means of addressing the skills problem but firms would need to be economically secure enough to participate in the programmes.

Finance

Are construction firms undercapitalised?

Construction firms appear to be 'somewhat undercapitalised... [They] employ less capital (less long-term debt and less equity capital) per pound of their total assets than do firms in the rest of the economy.'²⁰² There is not a divide between SMEs and larger firms in the sector in accessing bank lending because SMEs do not receive proportionately less bank finance than larger companies in this sector.²⁰³ But bank lending to the construction sector has decreased dramatically, from £32.2bn in early 2009 to £19.9bn in late 2012.²⁰⁴ This 38 per cent reduction compares with a five per cent reduction across all UK sectors.²⁰⁵ Construction companies were more likely than firms in the wider economy (27 per cent vs 24 per cent) to feel they needed to inject personal funds into their projects.²⁰⁶ One quarter of UK construction companies abandoned business/plans for growth as they lacked adequate finance.²⁰⁷

Construction growth requires trade credit growth. The available research indicates that 'each £ of growth of construction sales requires a 62 pence increase in total

assets, and that in turn requires a 20 pence increase in trade credit (but only 15p increase in construction equity); whereas in the corporate economy at large, each £ of growth of sales requires £1.16 increase in total assets, and that in turn requires a 16 pence increase in trade credit (but a 35p increase in equity capital).²⁰⁸ Construction firms rely on trade credit from their suppliers more than firms in other sectors of the economy by a factor of two to three and give more credit to their customers.²⁰⁹ The Construction Sector Strategy Analysis by BIS analysed the availability of trade credit to construction firms. This found that SMEs felt obliged to offer trade credit to their larger customers, who could easily obtain alternate credit themselves. SMEs receive less credit from their suppliers than they grant to their customers.²¹⁰ SMEs were unable to price that credit appropriately.²¹¹ Firms tended to vary the amount of credit extended and not its price.

Is it a case of banks unwilling to lend or firms unwilling to borrow to finance expansion?

It is both. Banks are thought to consider construction companies high risk compared with other business sectors.²¹² Smaller firms may lack the skills to make a compelling case for funds.²¹³ Construction firms are less likely to seek bank finance than firms in other sectors and 'if they do apply for an overdraft or loan, they are more likely to be turned down.'²¹⁴ They are 'less aware' of government support programmes. Two-thirds of contractors have no long-term borrowing.²¹⁵ The government is seeking to resolve these issues through Supply Chain Finance where large firms approve invoices from their suppliers early so the bank can then lend contractors the funds. The government is also promoting Project Bank Accounts (PBA) and an Enterprise Finance Guarantee Pilot through which larger firms offer trade credit to smaller firms.²¹⁶ As a customer, the government pledges to pay within 30 days if there is not a Project Bank Account (PBA). If there is a PBA, lower tier contractors can access funds within five business days. The government has spent £2bn using PBAs.

How does the industrial strategy seek to boost UK construction exports?

The government want UK businesses to secure part of an estimated £200bn per annum global market for integrated city systems by 2030. Global growth in the construction sector is driven by world population increases; from 7.2bn people currently to 9bn over the next forty years. In *Construction 2025*, released in July

2013, global growth in the construction market is predicted to be 70 per cent+ by 2025.²¹⁷ The global construction market is set to increase by 4.3 per cent per annum from 2012 to 2025.²¹⁸ The UK export policy, a GREAT campaign to promote UK construction abroad, was outlined in July 2013. The GREAT Britain campaign is the UK Government's initiative to promote the UK as a place to visit, study and do business. It operates globally but focuses on ten key markets which are China/Hong Kong, India, USA, Korea, Indonesia, Brazil, Mexico, Russia, Turkey and Emerging Europe. The GREAT Britain label serves as an umbrella brand for the promotional work done by the government for all sectors in this industrial strategy, and for firms in the wider UK economy, to promote UK firms. In the construction sector it focuses on global green construction. The CLC was formed to lead the vision to 2025.²¹⁹ Emerging economies will constitute 55 per cent of all construction spending by 2020.²²⁰ Research shows that firms that export tend to innovate more. The Consumer Innovation Survey (2011) found that 60 per cent of construction contractors that export were involved in a form of innovation in 2010.²²¹ Fewer construction firms export than firms in other sectors. In 2012, six per cent of SME constructing contractors exported. This may be due to the fact that UK firms tend to be smaller than their European competitors²²² but it would require government or industry analysis to prove this link.

The UKTI views its role as a 'readiness to facilitate consortia of UK companies', which it describes as 'most critical'. The Construction Council and UKTI are identifying global trade opportunities in professional services, contracting and product manufacture and promoting UK construction with the GREAT brand. The construction strategy aims to halve the trade gap between exports and imports for construction products and materials. The UK has a trade surplus in construction contracting (£590m in 2011) as well as in architecture and surveying services (£530m) but a massive trade deficit in construction products (£60n).²²³ The trade deficit in construction relates to products: 'four out of five of the largest UK export sub-sectors in construction products were in trade deficit in 2012'.²²⁴ This sector is an example of the goods deficit being the cause of the UK trade deficit as identified by the research produced by Lord Heseltine, cited in chapter one.

Public procurement and the supply issue in the sector

In October 2010 the government published the National Infrastructure Plan to provide visibility on upcoming projects. It was updated in December 2013.²²⁵ The

government want to build an industry 'that drives and sustains growth across the entire economy by designing, manufacturing, building and maintaining assets which deliver genuine whole-life value for customers in expanding markets, both at home and abroad'.²²⁶ In the Budget 2013 they increased capital spending by £3bn per annum from 2015-16, which means £18bn additional investment by 2020. The Growing Places Fund, the Local Infrastructure Fund and Get Britain Building are allocating £1.8bn of Government funding to stimulate economic development. Surplus public land has been identified. It will be sold for the development of 100,000 new homes.²²⁷ A £1bn Build to Rent Fund is providing finance for purpose-built rental units and to encourage institutional investment in this sector. This is supported by £10bn of private debt underwritten by the Housing Guarantees Scheme. The Affordable Homes Programme is delivering 170,000 new homes for rent and ownership by March 2015, an investment of £19.5bn. Each of these moves to encourage supply is welcome but they seem small compared with government investment in schemes which subsidise housing demand e.g. Help to Buy. UK Government programmes such as the Help-to-Buy Equity Loan Scheme, the £12bn Help-to-Buy Mortgage Guarantee Scheme and the £50bn Funding for Lending Scheme support demand by driving down the cost of loans for homeowners.

Planning: reducing government obstruction of construction projects

Regulation is a cost driver for the sector. A review of the paperwork that has to be submitted with a planning application is being conducted with a view to its reduction. Simplifying regulations on home extensions and improvements helps stimulate the domestic improvements sector, which amount to £27bn spend per annum. Economically unrealistic Section 106 agreements will be reviewed to prevent projects stalling. The Penfold Review recommended an end to the overlapping development consent regimes in addition to planning consent. This has been adopted. A fast track planning route for large-scale projects with a decision within twelve months has been created. The Localism Act 2011 abolished regional strategies. Infrastructure levy revenues are now passed to neighbourhoods to incentivise them to support development, and under neighbourhood plans both communities and businesses can develop pro-growth neighbourhood plans. The National Planning Policy Framework published in March 2012 reduced planning policy from 1,300 pages to 50 pages and introduced a

presumption in favour of development.²²⁸ The Growth and Infrastructure Act introduced four pro-development changes:

- allowing developers to submit major planning applications to the Planning Inspectorate where an authority is poor performing
- getting stalled sites moving with new appeal rights to allow for the renegotiation of affordable housing requirements
- removing the ability to block development through town and village green designation
- opening up the major infrastructure regime to deal with a wider range of economically significant developments²²⁹

An early indicator of the success of existing measures could be that planning approval rates are now at 87 per cent, which is a ten-year high, although the causation link would need to be established. Net housing supply increased 11 per cent in 2011/12 but housing multiples as a percentage of UK household incomes continue to increase, indicating that supply continues to lag behind demand. Other possible success metrics in this sector could relate to an increase in the proportion of construction materials manufactured in the UK or an increase in the average size of the UK construction firm. The government should aim to build sufficient housing supply to stabilise or reduce the cost of UK housing over a defined period, e.g. the next decade. The majority of UK government schemes in the construction sector approach the issue from the demand rather than the supply side.

Measures that could be included in the industrial strategy but were not

- Establish a target for housing construction which exceeds the rate of UK household creation by an amount sufficient enough to eliminate the UK housing shortage within ten years
- Calculate the percentage of UK citizens working within the construction sector and identify steps to divert unemployed UK citizens into the sector

5. Information economy

Key measures in this industrial strategy:

- Establish a Future Cities Catapult, the Smart Cities agenda and City Deals to promote the information economy sector and spread it to cities outside London
- Expand the range of public data open to UK charities and firms to exploit for commercial reasons
- Create a Tech City Investment Organisation to encourage private sector investment in the sector
- Protect intellectual property to preserve UK lead in the sector and to ensure that investments in innovation are captured by the firms making the investment

Why was this sector chosen?

In their Information Economy Strategy, June 2013, the Government seeks to make the UK the best place to start a technology company. However, they lack ‘an exact picture of the number of businesses in the information economy, or its employment, or the value it brings to the UK economy’. They recognise that ‘addressing the lack of clear and universally-agreed metrics will be an early priority for government and industry’.²³⁰ The sector had a global market value of £2 trillion in 2014.²³¹ In 2010 its value to the UK economy was £132bn. The UK has the highest percentage of individuals who purchase online, but only one third of UK SMEs sell their products online, and even fewer, one tenth of SMEs, sell to international clients online.²³² There is a clear potential for the number of UK online sales to increase. The UK has the largest trade surplus in computer and information services in the G7, a position it has held for the last decade. The UK is ranked fourth in the world for technological readiness by the World Economic Forum, ahead of the USA.²³³ The government aims to achieve 1.6 million SME businesses transacting online by 2018.²³⁴ The tech sector in London grew by 16.6 per cent between 2009 and 2012.²³⁵

Technology and innovation

The information economy strategy, published in May 2013, focuses on five sectors: smart cities, cloud computing, the internet of things, big data and e-commerce. It builds on the work of the e-infrastructure leadership council (ELC) established in March 2012.²³⁶ The Technology Strategy Board estimate the world market for

integrated city systems will be £200bn per annum in 2030.²³⁷ The Smart Cities agenda is explicitly part of the Information Economy strategy.²³⁸ The Smart City 'uses intelligent technology to enhance our quality of life in urban environments. Cities can use the data in a variety of ways: to save money, minimise waste, measure domestic water usage and manage transport routes.'²³⁹ Clusters of expertise help cement the competitive advantage of cities and create economic spillover into other services, e.g. food and tourism, which provide employment for a wide range of citizens.²⁴⁰ Big data and energy efficiency are two of the eight great technologies identified by the government that are explored in chapter three. The government commissioned Arup to analyse smart cities supply chains. Arup estimated the market could be worth \$400bn per annum by 2020. If the UK secured ten per cent of this market, it could generate \$40bn per annum. The British Standards Institution is developing standards and guidelines to help deliver smart cities. A time-limited e-commerce taskforce was established to identify how best to increase the cross border trade UK companies engage in and the priorities for UK strategy in terms of enforcing the EU Single Market in Digital Service.²⁴¹ An Industrial Partnership for skills in this sector believes it will 'lead to 100,000 more young people being likely to pursue technology careers by 2018'.²⁴² The 100,000 potential additional workers figure could be adapted into an aim for this sector but it is currently too vague.

With smart construction and digital design, the TSB set up the Future Cities Catapult with £50m government funding over five years, based in London.²⁴³ The Future Cities Catapult is working with cities to deploy and test city integration technology to prove the business case and to tackle procurement rules and lack of investment, which can frustrate such trials. To achieve this, the Catapult will analyse how to prepare local officials to release data and how to make that data user-friendly. The Catapult will look at how to develop a physical infrastructure that is smart and that communicates with planners. It will promote innovation, which requires that cities be flexible and open to change. The infrastructure should provide for transparency on outcomes and performance of city services for citizens. The Small Business Research Initiative has provided £100m since 2009 to partner with firms to solve policy issues.

City Deals were launched in December 2011. The City Policy Unit has concluded deals with the eight largest cities in England outside London to give them greater autonomy. A further 20 cities were invited to negotiate greater devolution in

February 2013.²⁴⁴ In 2012 the Technology Strategy Board launched a competition to bid to become a Future Cities Demonstrator. Glasgow won and will receive £24m from the TSB. This centre aims to be a global centre of excellence in urban innovation. Smaller sums will be awarded to Bristol, London and Peterborough who put in good bids. The Future Cities demonstrator programme will show how integrated data-led solutions can be applied. These measures will encourage the growth of the information economy outside London.

What are 'smart cities' and how will they contribute to growth in this sector?

A Smart Cities Forum has been formed, including representatives from academia, the research community, cities, business etc. to advise ministers on how to legislate for Smart Cities. This is in response to a recommendation by Lord Heseltine in his *No Stone Unturned* report.²⁴⁵ The Forum will aim to prepare UK industry to benefit from the wave of urbanisation predicted in the emerging markets. In China alone the urban population is predicted to increase by 200 million by 2025.²⁴⁶ Opportunities for UK business exist in intelligent transport systems such as congestion management, traffic monitoring and smart parking, assisted or independent living such as telehealth, water management such as water metering, water treatment and flood management, smart energy grids which manage demand and charge vehicles and waste management opportunities such as waste to energy generation.

Estimates of the value of this smart technology vary widely: the smart transport market is estimated to be worth between \$5.55bn and \$156.3bn in 2020.²⁴⁷ It is difficult to predict accurately the value of this emerging sector. The six policies that the Forum envisages will help to create a Smart Cities sector in the UK are:²⁴⁸

- Greater autonomy for city authorities to develop and implement a distinctive vision
- Develop open data standards and encourage more public bodies to release more data
- Test new underpinning technologies and demonstrate they work
- Department programmes to encourage the adoption of new technologies and approaches
- Participate more in EU programmes
- Aid UK firms to exploit their capabilities in global markets

Developing the UK's broadband and e-infrastructure

The government has pledged £1.2bn to extend superfast broadband to 95 per cent of UK premises by 2017.²⁴⁹ The government is investing £650m to transform broadband in the UK by 2015 and £220m to support high performance computing and e-infrastructure.²⁵⁰ Average broadband speeds were projected to triple between 2010 and 2015, with a 75 per cent increase in the number of homes and businesses having access to superfast broadband.²⁵¹ The government aims to have 90 per cent of homes and businesses able to access broadband with speeds above 24 Mbps by 2015.²⁵² A partnership of DEFRA and Broadband Delivery UK (BDUK) will deploy a £20m Rural Community Broadband Fund (RCBF) to ensure broadband coverage in rural areas.²⁵³ The Information Economy Council has been set up to coordinate these schemes. A data capability strategy is being developed with input from the government, academia and industry. A computing curriculum is to be taught in English schools from September 2014.²⁵⁴ A key omission from this part of the strategy is a comparison with the leading broadband-enabled countries in the world and an analysis of how they did this and how the UK could match their success.

Open public data and the development of the information economy

The government commissioned the Shakespeare Review of Public Sector Information in October 2012. This called for more ambition in the release of public data. The government believes that public data could be used to give UK firms a commercial advantage at little cost to the government. A Public Data Group comprising the Ordnance Survey, Met Office, Land Registry and Companies House will work on data release. A Public Sector Transparency Board, formed in June 2010, is driving a government transparency agenda on the advice of public sector data specialists and data experts. In December 2012, the Open Data Institute was created with £2 million funding per annum for five years from the TSB. This independent non-profit will train UK organisations to utilise open data. Urban Prototyping (UP) London asks how a city can improve their urban environment through art, design and technology. The TSB has launched a Connected Digital Economy Catapult with £50 million funding over five years beginning in 2013. It will explore how to fill innovation gaps and speed commercialisation of innovation. The Government Digital Strategy launched in November 2012 encourages government departments to make their data user-friendly. The Royal Mail has now made the

Royal Mail Postcodes Directory available for free to independent small charities and micro-businesses for one year. The possibility of a Consumer Rights Directive is to clarify online sales and pricing terms to increase user confidence in transacting online is being explored. Each of these measures could potentially benefit the launch of a new UK firm or service based on government data and they have been achieved at low cost.

Finance

In April 2013, a Tech City Investment Organisation met in East London. It agreed to form a UK Tech Cluster Alliance to aid sector growth. The government has developed a data capability strategy. Martha Lane Fox, an internet-entrepreneur who ran LastMinute.com, has been appointed UK Digital Champion. Her team's success will be reviewed in 2015/16. A Foreign Exchange Credit Support Scheme is helping exporters to manage the impact of foreign exchange rate movements on their firms in this sector. This is one of the few government schemes to recognise the role the exchange rate has on UK production and seek to help firms manage their exchange rate risk. It is to be welcomed. The Export Enterprise Finance Guarantee (ExEFG), launched in 2011, guarantees 'lenders who facilitate the provision of short-term export finance lines of up to £1m to exporting SMEs'.²⁵⁵ A private sector delivery partner is paid on a payment-by-results basis to attract foreign investment to the English regions. This body is expected to cooperate with Local Economic Partnerships to identify commercial opportunities. Another private partner operates on a similar basis to attract foreign investment to Tech City. The funding of these two bodies is linked to results, which is welcome but unique among the measures pursued in the industrial strategy. To make it more attractive to invest in small, more risky firms, stamp duty has been abolished on the trading of shares on the Alternative Investment Market (AIM), where small growth firms are listed. To help small firms that are not listed on the stock market, tax breaks for investors in a Seed Enterprise Investment Scheme were retained in the 2013 Budget.

Export promotion and market research

The Foreign and Commonwealth Office, through its Prosperity Fund, and in cooperation with the Department for International Development, is trying to encourage Foreign Governments to implement smart cities. Minister Alan Duncan

led a 'Smart Cities, Smart Living Mission' to Singapore, Malaysia and the Philippines in December 2012.²⁵⁶ The European Commission is promoting EU collaboration on Smart Cities through the creation of a European Innovation Partnership on Smart Cities and Communities²⁵⁷ and a Smart Grids Task Force to provide policy and regulatory directions for the deployment of Smart Grids.²⁵⁸ In formulating their plans, the Smart Cities Forum has considered international case studies including Chicago, Rio de Janeiro, Stockholm, Boston and Barcelona.²⁵⁹ UKTI has formed a new Global Technology Task Force to increase the export potential of growth companies. UKTI has developed the Export Communications Review service and the Web Optimisation for International Trade programme to help SMEs to become export ready. To demonstrate success, the UK government would need to highlight successful partnerships with governments in emerging nations to build Smart Cities or successful adaptation of a UK city to meet this status. Neither seems very developed at present but the industrial strategy is at an early stage.

How has the government incorporated the carbon reduction agenda in energy and waste into this strategy?

The EU has set a target of reducing energy demand by 20 per cent by 2020.²⁶⁰ No country has yet become the first end-to-end smart energy market. The smart water market is at a similar stage of development. The UK water companies are 'experiencing losses of up to 27 per cent of treated water due to the poor condition of the water networks'.²⁶¹ Existing levels of investment are not enough to maintain the water network. The value of the smart water market could grow 20 per cent per annum until 2020.²⁶² Unfortunately, the smart water business case appears to be purely government-driven. The surveys figured show that 'consumers have shown no willingness to buy smart appliance outside their ten-year average replacement cycle, unless they are available at the right price and deliver tangible energy savings'.²⁶³ The lack of demand from consumers and interest from producers may be because until now the UK government has lacked a 'strategic, holistic vision'²⁶⁴ of what these smart markets may look like or how the sector would develop.

The government is rectifying this. In November 2012 the TSB, the Department for Environment and Rural Affairs (DEFRA), the Natural Environment Research Council (NERC) and the Engineering and Physical Sciences Research Council (EPSRC) provided funding to seven projects to examine challenges in water

security in the UK and overseas.²⁶⁵ In waste management, the global industry has an annual turnover of \$430bn and employs 40m workers.²⁶⁶ The EU Landfill Directive and other regulations have made Western Europe a world leader in waste management. The Department for Energy and Climate Change is funding 120 innovation projects through its Entrepreneurship Scheme, and Ofgem's Low Carbon Networks Fund (LCNF) made £500m available to network operators between 2010 and 2015 to trial new approaches.²⁶⁷ Metrics for judging success in this area could include lower amounts of waste produced and more waste recycled.

Skills development

How does the government define success in this area?

Long-term success is defined in terms of:

- a highly skilled digital workforce which entails reversing the decline in the number of students studying Information and Communication Technology (ICT) over the last decade
- a digital infrastructure, both physical and regulatory, that supports high growth and protects data and privacy.

Employer Ownership of Skills Initiative pilots are being run to allow businesses to create and develop their training programmes in partnership with providers. A Higher Apprenticeship Fund, launched in July 2011, is allowing employers to recruit staff earlier and develop their skills to meet business needs. This may work better than relying on the university sector where computer science graduates are among the most likely to be unemployed six months after graduation. Efforts to publicise the employability of graduates on different courses may discourage people from studying computer science at university. Of one million UK IT jobs, 40 per cent are in information economy businesses, but the majority are in education, public administration and financial and business services.²⁶⁸ The majority of firms in this sector (95 per cent) employ fewer than ten people.²⁶⁹

Has the strategy identified any UK skills weaknesses and why is this important?

The UK Commission on Skills recognises that intangibles are a key source of UK productivity growth. Intangibles divide into three categories: economic figures such as brand identity, human capital and management structure and ability; innovative

property such as research and development and design work; and digitised information such as e.g. databases. The problem is that these factors 'are not always visible; not easily accounted for; and it may not always be easy to fully appropriate the returns.'²⁷⁰ Forty-four UK city regions were analysed to track productivity growth.²⁷¹ Intangible workers make up 17 per cent of all UK workers and earn more than double the wage of the average UK worker.²⁷² The study found that 'organisation capital, contributing to economic competences, has a greater impact than either R&D or IT capital' and differences in productivity may be better explained through 'the way organisations are managed and run'.²⁷³ This was particularly true in low technology, more mature and service sectors. Intangible capital can create spillovers. The full benefits are unlikely to be captured by the host firm. Less populated city regions are most likely to suffer from a weakness in organisational capital. The government has introduced an entrepreneurs' visa to encourage foreign citizens to settle in the UK and found firms. This could be a means of addressing the uneven way intangible capital is spread across the UK.

Public procurement

How is the government using public procurement policy to encourage UK SMEs in this sector?

Public procurement helps to shape the information economy. Central government expenditure on IT amounts to £7bn per annum.²⁷⁴ By 2015 the government wishes 25 per cent of this expenditure to go to SMEs but thinks that the long-term potential for SMEs is 50 per cent.²⁷⁵ The new Contracts Finder, a free online tool, is alerting SMEs to opportunities to supply central government. It lists all tenders over £10,000 and the possible sub-contracting opportunities.²⁷⁶ A G-Cloud programme is an online marketplace for firms to register to sell their services to the public sector. It allows public entities to buy non-custom built solutions. SMEs now make up over 60 per cent of G-Cloud sales and 83 per cent of suppliers listed on the site are SMEs.²⁷⁷ Central government operates a Cloud-First Policy. The government promises not to renew long-term contracts when they end in 2014/15.²⁷⁸ They will split the contracts into smaller component tasks to make it easier for SMEs to bid for work. The Mystery Shopper exercise combines spot checks on procurement documents and a means for SMEs to raise concerns about their experiences on an individual contract. These measures help to ensure that a larger number of UK SMEs can compete for government contracts.

How has the government sought to tackle the threat that e-crime poses to the information economy strategy?

The value created in this sector hinges on being able to maintain data security. A National Cyber Security Strategy has seen 11 universities granted Academic Centre of Excellence for Cyber Security Research status, two research institutes are being formed, and 78 PhDs in this field are being sponsored.²⁷⁹ A new 5G Innovation Centre based at the University of Sussex has been granted £50 million research funding from government and industry.²⁸⁰ The first Cyber Security Export Strategy was launched in May 2013 to build UK strength in cyber security.²⁸¹ Government, industry and consumer groups are working to create an Identity Assurance Solution for government services that could also be used in the private sector. This will potentially create a new market in identity-enabled services. The Information Economy Council is to work with the Intellectual Property Office to help SMEs to protect their intellectual property and use it to better commercial advantage. The Hargreaves Review of intellectual property (IP) and growth in 2011 suggested that SMEs fail to make effective use of their IP and need cost-effective advice. The Intellectual Property Office now funds strategic IP audits for SMEs. It has advisors and a training package to help SMEs. These measures represent an effective programme to meet the challenge posed by e-security issues.

Measures that could be included in the industrial strategy but were not

- The sector strategy could include targets around increasing the number of UK-based firms in this sector, their share of the world market value in the sector and the growth in sector exports
- The strategy could map intangible capital across the UK and design policies to address any weaknesses in particular regions

6. International education

Key measures in this industrial strategy:

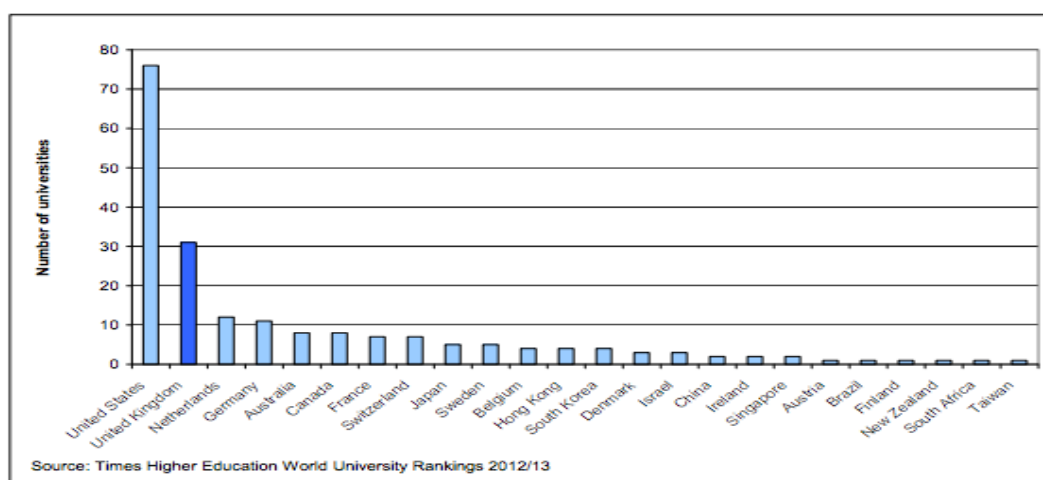
- Develop consortia to bid for education contracts in emerging markets and attract 90,000 additional foreign students to the UK
- Use foreign alumni of UK universities to sell the UK as a destination for study and a potential trade partner

- Promote a UK education in developing markets and allow talented foreign students to remain in the UK
- Harmonise qualification standards and promote the English language to foreign citizens so UK firms can trade more easily

Why was this sector chosen?

The International Education Strategy, Global Growth and Prosperity (July 2013), aims to preserve and enhance the UK's pre-eminence in further education as shown in figure 29. The UK has produced 14 per cent of the most highly cited scientific articles, second only to the US, indicating its strength in output and quality terms.²⁸² The value of education exports was £8bn in 2008/09²⁸³ but the education sector exported £17.5bn in 2011. Two million foreign students graduated from the UK in the previous decade. Three million are predicted to graduate from UK universities in the next decade.²⁸⁴ In 2010 the UK was one of five countries (the others being the US, Australia, France and Germany) which constituted two-thirds of international student enrolments.²⁸⁵ The international education strategy recognises that 'it is almost inevitable that the market share of each of these countries will decline over the longer term, given that increasingly other countries and their universities want to attract students, in some cases with strong government support to enhance their likelihood of success'.²⁸⁶ Contrary to this 'declinist' approach, the UK actually increased its share of the global international student market from 12.8 per cent to 13 per cent between 2006 and 2011 and is second only to the USA as a destination for international students.²⁸⁷

Figure 29: Top Universities by Country 2012/2013²⁸⁸



What is the government doing to encourage more foreign students to study at UK further education institutions?

The 'Education is GREAT' campaign has been launched in overseas markets. An improved Education UK website is aiding marketing efforts for the sector in these overseas markets.²⁸⁹ The UKTI set a goal to aid UK bodies to secure £1bn in exports by 2015.²⁹⁰ This target was met in 2014.²⁹¹ The new Education UK Unit is focusing on high value opportunities overseas, which the UK is not currently equipped to compete for. The Unit now has a long-term goal of securing £3bn in contracts by 2020.²⁹² They will identify opportunities in schools, colleges and universities, both in direct educational provision and support services. The Unit will then mobilise UK consortia to win contracts. The Unit is now scoping opportunities in Saudi Arabia, Mexico, Colombia and Kazakhstan.²⁹³ In 2014 the Unit 'announced UK success in the Saudi Colleges of Excellence programme worth £850 million. This means the team has already met its ambition to support £1bn of contracts by 2015.'²⁹⁴ The Unit has a sectoral interest in the oil and gas sector. An International Champion for UK Education will also be appointed and an International Education Council, co-chaired by the international education champion and the minister for universities and science, is to be created. It will be composed of members who have international experience.²⁹⁵ BIS is also developing an Education UK brand to promote the sector.²⁹⁶ Given the existing success of the sector, it is not apparent how the new bodies will promote the UK education sector more successfully.

The Sector Advisory Group on Education and Skills (SAGES) was established in 2006 as the UKTI education export advisory body. The International Education Advisory Forum (IEAF) was established in 2009 to coordinate UK government policy towards international education. In 2012 the government founded HEGlobal. It is targeting eight priority countries and a region: China, India, Brazil, Saudi Arabia, Turkey, Colombia, Mexico, Indonesia and the Gulf. It will identify opportunities for UK providers in services such as construction, legal advice and project finance. These multiple and overlapping bodies will make coordination difficult.

What is the potential size of the international student market and how much of this can the UK expect to capture?

Only two per cent of the students in higher education globally were enrolled in an institution foreign to them in 2012.²⁹⁷ One quarter of international enrolments in 2011/12 came from India and China alone.²⁹⁸ A pull factor for foreign students to study in the UK is 'the opportunity to study in English, and to improve their English language skills, whilst based in an English-speaking country'.²⁹⁹ The UK also offers one-year Masters compared to two-year courses in other nations. This works out cheaper overall for foreign students.³⁰⁰ The UK has the second highest share of foreign students in tertiary education. The majority of educational export income comes from international students studying in the UK (75 per cent).³⁰¹ The British Council estimates that the number of students will grow by 21 million between 2011 and 2020; of these around 450,000 will be internationally mobile and of those around 130,000 will go to major country education providers and could be open to UK study.³⁰² The strategy envisages that it is 'realistic for the number of international students in higher education in the UK to grow by 15 to 20 per cent over the next five years'.³⁰³ The strategy recognises that the UK brand needs to be protected. There is the potential for reputation damage if UK institutions chase foreign students who have poor English language skills and are of a low academic ability.³⁰⁴ The UK needs to focus on attracting a greater number of the internationally mobile high-calibre students.

What countries is the government prioritising in its student drive?

The International Education Strategy aims to attract 90,000 additional overseas students to the UK.³⁰⁵ The UK government will broker agreements with foreign governments that send students to the UK on government scholarships to increase their numbers and seek similar agreements with other nations, including emerging powers. The British Council, the Foreign Office, BIS and the Higher Education International Unit will administer any agreements made. The government has already negotiated large-scale scholarship programmes with Brazil, for 10,000 students over four years, and Indonesia for 150 PhD students per annum. The Chevening Scholarship Scheme helps to bring foreign potential leaders to study in the UK.³⁰⁶ The 2014 budget tripled the budget for Chevening scholarships in the UK from 2015 to build better links with emerging powers.³⁰⁷ In May 2013 a UK education delegation to Colombia and Mexico began a consortium approach that

will offer students in those countries services including English language training, vocational training, teacher development, student mobility and higher education. The Government is working with the United Arab Emirates, India and Russia, to achieve mutual recognition of qualifications. The UKTI is working with the British Council, on a one-stop shop initiative, to UK universities seeking to internationalise. These efforts should be judged on the basis of how many collaborations with foreign universities are achieved/overseas campuses established by UK institutions.

How can UK government research funding be better used to create new UK-based industries?

Fewer UK-based SMEs export, the proportion of SME revenues derived from exports is below the EU average, and UK SMEs spend less on R&D (only four per cent of their expenditure).³⁰⁸ The government aims to double UK exports to £1 trillion, to get '100,000 more UK companies exporting' and to double UK foreign direct investment to £1.5 trillion by 2020.³⁰⁹ The aim of the Witty Review was to ensure that UK inventions help build UK industries and not foreign industries. The review suggested that to enable UK firms to bridge the gap between invention and development,³¹⁰ funding should be allocated by technology/industry opportunity and not postcode. National resources should be deployed collaboratively. To achieve this, the Witty Review recommends that 'Arrow Projects' be established. These would be 'uninhibited by Institutional status, geography or source of funding' and would support early stage innovation through to commercial deployment.³¹¹ The Review believes that the £10bn per annum the university and research centres spend on research could be better targeted at more profitable opportunities.³¹² Potential investors should 'have online access to as much information as possible as to where there is research strength'.³¹³ The universities would lead the effort to develop technologies and ensure that their development creates manufacturing jobs in Britain.³¹⁴

The Witty Review recommends a fund of £1bn over a parliament for the Arrow Projects. There is a close link between universities' international ranking and the research funding they receive from industry. Universities are to be given extra financial incentives to demonstrate engagement with commercial partners. The 'impact' weighting of the Research Excellence Framework should be increased to 25 per cent from 2020 (it is 20 per cent now) to incentivise partnerships with

business and SMEs should be given 'a single point of entry' to access easily the right part of the university.³¹⁵ LEPs have €1bn of European Structural and Investment Funds (ESI) to invest in innovation per annum until 2020 (£6bn in total). The ESI will allocate a further 3.5bn to the rest of the UK, so there are funds available to achieve this.³¹⁶ The Research Partnership Innovation Fund has invested £1.2bn in university/industry partnerships, with a commitment to provide £100m a year more for 2015/16 and 2016/17.³¹⁷ Universities should be represented on LEP Boards because they are a key part of many local economies. In June 2013 the government announced that Local Enterprise Partnerships (LEPs) would be given control of £2bn per annum in the next Parliament. LEPs were tasked from March 2013 with developing multi-annual strategic economic plans for their area. EU rules for receiving innovation funds are that the resources are deployed to meet the EU funding priorities. This requires the creation of strategic economic plans. These plans were also used to conclude Growth Deals with the UK government.

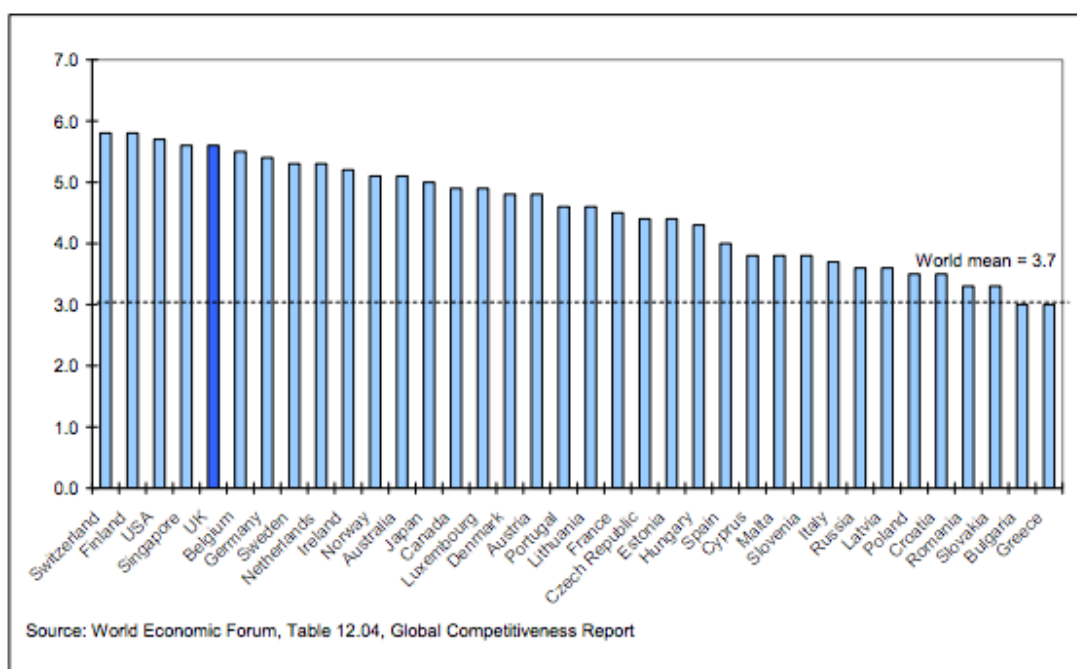
Is the UK university sector successful in forming commercial partnerships?

UK universities, which are often run as charities/non-profits, will need further to develop their commercial offering. They should also input to the development of quality assurance standards to maintain the existing high standards in the UK higher education sector. The World Economic Forum Global Competitiveness Report places the UK fifth in the world for university business collaboration in R&D as highlighted in figure 30.³¹⁸ Between 2003 and 2011, 40 university spin-offs were floated on the stock exchange with an initial public offering (IPO) value of £1.79bn; 25 were acquired for over £3bn. This indicates that the UK universities sector has examples on which it can build.

Research collaboration between UK and foreign universities helps to keep UK institutions more competitive. A new £375m Newton Fund for collaborative research with emerging powers has been formed.³¹⁹ Transnational education through overseas campuses helps UK institutions to bid for overseas funded research, e.g. the University of Nottingham can bid for Chinese government funding. Agreements with India (the UK-India Education Research Initiative) and China (UK-China Partners in Education Plan) aim to boost cooperation. The former is a five-year joint programme funded by both nations to improve bilateral education and research relations. It has operated since 2006 and was renewed in

2011 until 2016.³²⁰ The programme is worth £5m per year and focuses on four strands: leadership development, innovation partnerships, skills development, and enhancing mobility. A metric to judge the success in this area would be the value of contracts won involving cooperation with a foreign government or university.

Figure 30: University/Industry Collaboration In Research And Development In The EU28, Other G8, And Other Selected Countries³²¹



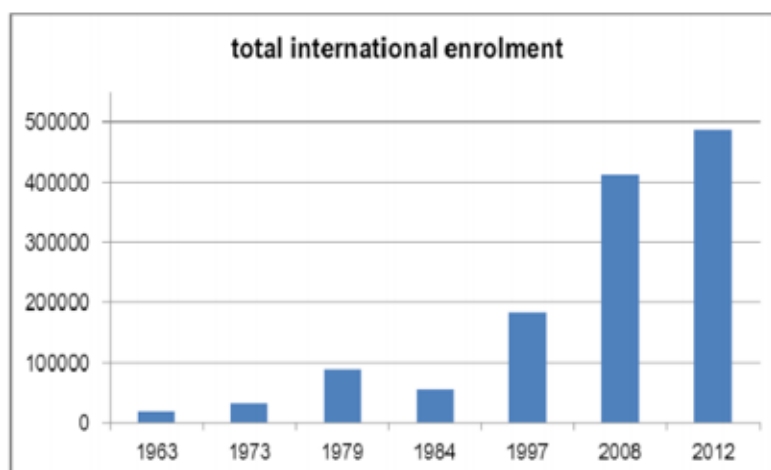
How is the UK government building on the network of foreign alumni of UK Universities to encourage more foreign students to study in the UK?

The benefits of foreign students studying in the UK are not purely economic. Students implant UK value in their home nations, they build links with the UK,³²² they act as ambassadors for the UK in their home country, they begin to form a positive view of the UK and trust the UK³²³ and they learn how to interact with a plethora of people with different cultural backgrounds.³²⁴ The British Council believes that the trust people develop in the UK makes them more 'interested in opportunities to do business with people and organisations in the UK than others'.³²⁵ Students who viewed the UK positively acquired a taste for UK brands, which they continued to purchase on returning to their home countries.³²⁶ Students who attend UK institutions and then obtain positions of power within their home

countries help to build UK soft power.³²⁷ The UK should learn from countries such as Japan, which through the Japanese International Cooperation Agency (JICA) runs back-up offices in countries including Nigeria, Jamaica and Bangladesh, to preserve links with foreign alumni.³²⁸

The Foreign Office is working to build and maintain links with the 200,000 foreign students who graduate from UK universities each year. Catalyst UK is recruiting a series of individuals, including British emigrants, foreign business personnel who traded with UK firms, and academics who studied in the UK, to be advocates for Britain. The advocates are chosen by nomination by other such advocates. The Education UK recruitment service is being expanded to attract additional international students to the UK. The GREAT Britain campaign developed in 2012 has an 'Education is GREAT BRITAIN' component. This works with the British Council and UKTI to promote the benefits of a UK education. The British Council, UKTI and the Foreign & Commonwealth Office are jointly developing GREAT campaigns promoting UK education in priority markets including China, Brazil, India, the USA, South Korea, Indonesia and emerging nations within Europe. Figure 31 shows how successful the UK has been in encouraging foreign students to study in the UK.

Figure 31: Trend in total international student enrolments in UK HE³²⁹



Supply chain and skills development

This includes three factors: ensuring the UK has the physical infrastructure to compete; that the UK can ensure that foreign students studying in the UK with

skills the UK needs can remain after their course ends; and training foreign students to learn English to generate income and ease UK business access to foreign markets. The physical infrastructure is being upgraded. The UK government, through the College Capital Investment Fund (CCIF), distributed £550m to colleges between 2013 and 2015 for this purpose.³³⁰ The second round includes £77.7m Skills Funding Agency investment and £91.1m investment from 20 further education colleges.³³¹ The facilities will be used for skills training in key areas such as engineering and construction. The government has committed itself to form local growth teams as suggested by Lord Heseltine to enable greater coordination of local economic partners.³³²

The government has not put a cap on the number of legitimate students allowed to study in the UK. There is no regulatory bar on the expansion of UK education institutions. In 2011/12 they estimate that foreign higher education students paid £10.2bn in tuition fees and living expenses. All PhD graduates have a right to stay in the UK and work for a year following the end of their course. A graduate entrepreneur scheme was launched in April 2011. This allows up to 2,000 students in 2013/14 to stay in the UK for two years after graduating if they can demonstrate a good business idea. Foreign postgraduate students could help to rectify the skills deficit in key UK sectors. For instance, in 2011/12 foreign students made up 84 per cent of new entrants in electronic and electrical engineering, 76 per cent in production and manufacturing engineering and 67 per cent in computer science. Foreign graduates in computer science could fill any skills gap in this sector.

The British Council and English UK are both working on an end-to-end offer in English Language Training that can be adapted for different countries. Vodafone is delivering affordable English language courses for mobile platforms in India. Education UK Unit is exploring how to meet the demand for English language training in Brazil. A new accreditation scheme for English language teaching bodies is to be developed. A centre of excellence for English language teaching in Latin America is to be created and there will be a facility to scale up teaching of English in Kazakhstan. Key to the success of this approach is an agreement with these states to provide for mutual recognition of qualification standards. UK institutions gain entry fees for operating as Qualifying Exam Boards. Some may also repatriate overseas profits. Indirect benefits include more of a market for English language products, greater ease of access for UK exporters and an expanded group of students capable of studying in the UK. There is no strategy to

improve UK citizens' knowledge of foreign languages or to recruit the British-based foreign-born population to promote trade with their home countries.

Technology

A group has been established to advise the skills minister on educational technology and how it can be used to enable e-learning. The Strategy recognises the potential, both positive and disruptive, of Massive Open Online Courses (MOOCs) that allow courses to be taught worldwide. This concept was developed ten years ago but the online platforms 'took off in the last two years' in the US.³³³ UK institutions need to decide whether to figure their offer on US platforms or to develop a UK alternative through collaboration. Edinburgh University is offering the former through the Coursera platform. The Open University is attempting the latter in cooperation with overseas partners. The Open University has now created FutureLearn. It has 29 partner organisations and is a world leader in MOOCs.³³⁴ The TSB is launching a call for designers to suggest means of exploiting the new educational technology. The Small Business Research Initiative has launched a £1m competition for educational technology.³³⁵ The Department for Education is developing a voluntary scheme to quality assess British Schools Overseas to operate as a kitemark of quality in the market. The government appears to be aware of the need to balance the embrace of new technology, e.g. online courses, with the need to maintain the brand identity of the UK education sector as a mark of high quality.

Measures that could be included in the industrial strategy but were not

- Commit to maintain or increase the existing number of UK universities in the world top 100
- Produce a target relating to the percentage of the new worldwide online education market that the UK should capture and identify steps to achieve that goal
- Commit to train a specified number of UK students in specific foreign languages relating to the markets identified by the government as key target markets to enable them to promote trading links

7. Life sciences

Key measures in this industrial strategy:

- Use the NHS global brand to promote exports and encourage collaboration with foreign research institutions
- Financially incentivise investment in drugs through building a competitive tax system that favours patenting inventions in the UK
- Reduce bureaucratic delays in UK patients accessing experimental drugs and participating in drugs trials and in early-stage drugs being approved
- Establish independent research bodies with public funding and use aggregated NHS data to inform drug research and development in the UK

Why was the sector chosen?

The UK pharmaceutical industry is the fourth largest in the world, with a positive trade balance of £7bn.³³⁶ GlaxoSmithKline and AstraZeneca are the second and fourth largest pharmaceutical companies globally in terms of market share of global sales.³³⁷ The pharmaceuticals, medical biotechnology and medical technology sectors include 4,500 firms, employ 165,000 staff, have an R&D spend of nearly £5bn and an annual turnover of over £50bn.³³⁸ Life sciences manufacturing accounts for eight per cent of the UK total (by gross value added).³³⁹ The pharmaceuticals sector alone accounts for more UK-based business R&D than any other manufacturing sector (accounting for over 28 per cent of all business R&D).³⁴⁰ The Strategy for UK Life Sciences is a ten-year programme. It was launched in December 2011.³⁴¹ The strategy sets out three key aims: building a life sciences ecosystem involving universities, research organisations, businesses and the NHS, attracting, developing and rewarding the best talent and overcoming barriers and creating incentives for the promotion of health care innovation.³⁴² There are five core parts of the strategy: research clusters and collaborations; data; improving the environment, including for SMEs; global marketing of the UK; and improving the skills and talent of the workforce. The government between 2012 and 2014 committed £3bn to the sector through the Research Councils and the NIHR.³⁴³

Finance

This area presents two key financial challenges. First, to ensure that it is profitable to invent new drugs in the UK. The Budget 2012 launched the Patent Box as of April 2013. Phased in over five years, it reduces corporation tax to a ten per cent rate on profits made on patents registered in the UK or EU and some types of IP³⁴⁴ from April 2013.³⁴⁵ The Patent Box is currently under investigation by the European Commission as, potentially, a form of harmful tax competition. In 2012 a Seed Enterprise Investment Scheme (SEIS) was introduced with a 50 per cent income tax relief on investments up to an annual limit of £100,000 to encourage investment in early stage companies. In 2012/13 a capital gains tax exemption was introduced for the disposal of an asset, the capital of which was then invested in SEIS in the same year. The pre-clearance procedure for SMEs claiming R&D tax credits for the first time is to be made simpler.³⁴⁶ In 2012 the EU VAT cost-sharing exemption was introduced.³⁴⁷ The VAT cost-sharing exemption will apply to 'shared services', allowing charities and universities to cooperate with for-profit entities to deliver some services jointly.³⁴⁸ In Budget 2011, the minimum spend requirement was removed and the rate of relief increased for SMEs from 200 per cent to 225 per cent in the case of super-deduction relief from April 2012.³⁴⁹ Each of these changes serves to make it financially more attractive to develop drugs in the UK.

The second is to ensure that there are adequate financial resources, both public and private, to fund the necessary research. The Enterprise Capital Fund (£300 million) and the Business Angel Co-Investment Fund (£50 million) aim to invest in early stage SMEs that have difficulty accessing funding, particularly in regions dependent on government expenditure.³⁵⁰ A Venture Capital team in UKTI is working with partners to pick SMEs and link them with international investors and domestic or overseas technology clusters.³⁵¹ A number of funds have been created: a UK Future Technologies Fund (UKFTF) to allow firms to diversify investment in early stage technologies and invest in technology funds; a UK Innovation Investment Fund (UKIIF), which is a £330m part-government financed 'fund of funds';³⁵² and a Life Sciences Investment Organisation (LSIO), which promotes the UK as a destination for investment.³⁵³ The LSIO works with the UKTI to present a united investment message to investors and to deliver increased inward investment.³⁵⁴ A UK Research Partnership Investment Fund of £300 million fund was created in 2012. £146.5 million of this funding has been assigned to nine of the fourteen projects relevant to the Life Sciences sector, which gained funding

in the first round.³⁵⁵ The Regional Growth Fund has allocated £42m to the life sciences sector.³⁵⁶ £1bn is being invested in the NIHR to promote industry/NHS cooperation.³⁵⁷ These multiple funding bodies, multiple funding streams, and the relatively small sums being awarded, mean that coordination and long term planning is not enhanced by the strategy. The approach contrasts with the 'single pot' approach favoured by Lord Heseltine.

Technology and innovation

The creation of the Health Research Authority (HRA) in December 2011 has served to streamline the current approval system and provide consistent standards for compliance and inspection.³⁵⁸ The UK has particular strengths in biotechnology, with 170 medical biotechnology companies based in a triangle between Oxford, Cambridge and London.³⁵⁹ £180 million has been provided over three years to form a Biotechnology Catalyst Fund, which is a joint MRC/TSB collaboration.³⁶⁰ The Catalyst was created to ensure that research could be effectively commercialised and the 'early response from industry is that this funding is already having the intended impact of stimulating innovative research'.³⁶¹ The Catalyst has so far awarded £146.3m to 186 projects and has been augmented by £77m of private funding.³⁶² Research council funding rules 'can preclude some small state-of-the-art technology facilities from bidding for funding, where they lack a critical mass' of researchers. In response, the government is seeking to give greater funding to small and non-commercial research facilities.³⁶³ £75m is being invested in expanding the European Bioinformatics Institute in Cambridge to create a new biological data storage facility and to create a new technical hub in Hinxton, Cambridge.³⁶⁴ Focusing on cancer and rare and infectious diseases, the Department of Health has committed £100m to sequence 100,000 genomes and by April 2014 some genomes will have been sequenced.³⁶⁵ The latter project in particular represents the type of groundbreaking research this strategy should be designed to encourage.

How is the government making use of the NHS to ensure that patients have the opportunity to access experimental drugs and surgical procedures at the earliest opportunity?

The Office for the Life Sciences has developed a Strategy for the Life Sciences which seeks to reduce the cost and time delays in releasing new drugs. New drugs

now take 20 years and \$1bn on average to gain approval.³⁶⁶ The Strategy aims to make commercialising academic research easier; to encourage the NHS to innovate and adopt innovation; and promote the UK as a focus for life sciences investment. In 2012 the Medicines and Healthcare Products Regulatory Agency (MHRA) consulted on an Early Access Scheme to reduce the costs and the time delay in releasing new drugs.³⁶⁷ The Early Access Scheme ensures that patients receive early stage therapies and funds companies to undertake this financially risky research.³⁶⁸ The NIHR re-launched a web-based UK Clinical Trials Gateway in March 2012³⁶⁹ to provide patients and researchers with information on UK clinical trials. In 2012 the MHRA was consulting on whether to allow patients to access new medicines before they are licensed.³⁷⁰ The NHS constitution could be amended so that individuals can opt out but are assumed to consent for NHS data to be used for research, subject to protection of patient confidentiality and for patients to be given the option to participate in trials.³⁷¹

NIHR has earmarked £6.4 million to fund eight NIHR Healthcare Technology Co-operatives (HTCs) 'developing new concepts, demonstrating proof of principle and devising research protocols for new medical devices, healthcare technologies or technology-dependent interventions'.³⁷² The NIHR BioResource launched in April 2014 provides a group of volunteers to participate in the medical trials.³⁷³ The UK Biobank has been expanded to include 500,000 participants and the use of 8,000 brain scans to discover the cause of dementia,³⁷⁴ and is involved in a £10m genome analysis of its participants.³⁷⁵ The NIHR introduced a 70-day waiting period from receipt of a valid application to recruiting the first patient effective for all new NHS contractors from 2013. NIHR is making funding for NHS services conditional on recruiting first patients for trials within 70 days of receiving approval. NIHR will publish clinical trial information against public benchmarks.³⁷⁶ The 70-day benchmark for NIHR contracts for the recruitment of the first patients for trials has been introduced but the metrics to show compliance are yet to be introduced.³⁷⁷

A Medicines Red Tape Challenge resulted in a reduction of regulation,³⁷⁸ but the regulation of clinical trials is the preserve of the EU. The UK is urging the EU to adopt a 'risk proportionate approach to clinical trial approvals'³⁷⁹ but does not appear to be seeking the repatriation of this power in the EU renegotiation process. The NHS Life Sciences Innovation Delivery Board is working to get the NHS to adopt healthcare innovations sooner.³⁸⁰ The NHS Commissioning Board has established the Specialised Services Commissioning Innovation Fund (SSCIF) 'to

rapidly test and evaluate innovations that have the potential to deliver high impact changes for specialised services throughout the NHS'.³⁸¹ Both the Clinical Practice Research Datalink (CPRD) and the Health and Social Care Information Centre are drawing together NHS clinical datasets for medical research purposes.³⁸² The launch of the CPRD in March 2012, with a £60m investment (50:50), makes anonymised patient data for clinical trials and observational studies available to both the public and professionals.³⁸³ The Health and Social Care Information Centre (HSCIC) launched the Data Linkage Service on 17 September 2012.³⁸⁴ It amalgamates sets of data, matches them and offers anonymised data on a monthly basis from April 2013.³⁸⁵ The data services provided include 'data matching and linkage services, and data validation to support the clinical trial and observational study work of the life sciences research community'.³⁸⁶ Given the unique status of the NHS, with its access to millions of patient records, the information represents a key commercial opportunity just now being realised.

Skills

The NIHR is offering eight new research professorships to individuals with high research potential in their early careers.³⁸⁷ Cogent operates a High-Level Apprenticeship (HLA) for Professional Technicians, providing nine places in a pilot scheme to allow people to enter life sciences at the technician level. The low number of positions involved indicates that the schemes will not have a decisive effect in addressing the skills issue. A one-stop shop website links training providers with employers by listing details of placements, apprenticeships, mentoring, and research and careers advice. Cogent is developing a Life Sciences Skills Gateway, which is web-based, as a careers resource for employees.³⁸⁸ Cogent, the Sector Skills Council for Life Sciences and the Society of Biology are focused on building training opportunities to meet employer needs.³⁸⁹ A review of skills gaps is also being undertaken by Cogent.³⁹⁰ Cogent is creating an employer-led Technical Apprenticeship Service as a one-stop shop for STEM employers to recruit talented staff.³⁹¹ A tailored mentoring scheme will be run by Cogent to offer SMEs support to recruit apprentices.³⁹² These schemes should help the government to understand better the skills issues affecting the sector, but might not be adequate to meet those challenges.

A Higher Level Apprenticeship (HLA) programme for Life Sciences is being created with £900,000 of government funds. Thirty-one people were undertaking the Higher

Apprenticeship for Life Science and Chemical Science Professionals in late 2013. There will be 100 a year after three years.³⁹³ Through the National Bioinformatics Framework for career development, the Research Councils are investing in 'the fields of bioinformatics, biostatistics and computational biology at the PhD and junior investigator level'.³⁹⁴ The Society of Biology has launched an undergraduate degree accreditation programme in March 2012 after a 2011-12 pilot programme involving eight institutions and covering biochemistry and in-vivo sciences.³⁹⁵ There is an ambition to create 420 apprenticeships covering post A-level education over the next five years.³⁹⁶ The NIHR is funding research professorships for young individuals capable of translating research into industry/commercial usage.³⁹⁷ The Society of Biology is expanding accreditation for undergraduate biology degrees.³⁹⁸ Kitemarking further education programmes was trialled in 2012.³⁹⁹ These schemes would need to be assessed in relation to the sector needs as identified by Cogent.

Supply chain development

Two independent life sciences champions are to be created: a chair of an independent Life Sciences Advisory Board and a collaboration champion to foster partnership across the UK clusters and within government.⁴⁰⁰ The UK has adopted the Academic Health Sciences Centres (AHSCs), an international model for University/healthcare provider collaboration. Manchester, Cambridge, Imperial, UCL Partners and King's Health Partners were designated as AHSCs in 2009, but the first ones will be formally established from 2013.⁴⁰¹ The NIHR Clinical Research Network (CRN) has partnered with The *Guardian*-led Clinical Research Zone to publicise information on which NHS Trusts are involved in clinical research.⁴⁰² The Growth Review required the NHS Chief Executive to report on how the NHS can promote and adopt innovation.⁴⁰³ A new Francis Crick Institute is to be established in 2015 as a partnership between government, the Wellcome Trust and University College London, King's College London and Imperial College London to conduct biological research utilising £700m in funding.⁴⁰⁴ With NICE, the government is providing SMEs with information on the data needed to prove the value of their technologies.⁴⁰⁵ The Life Science Skills Awards honours those contributing to the industry.⁴⁰⁶ Each of these measures helps to promote the sector and enhance its capacity but few have metrics attached that could establish their value.

Export promotion

In August 2012 the government published an update to its Life Sciences Strategy.⁴⁰⁷ They want to create an NHS Global Brand that allows UK healthcare-related businesses to win foreign orders. To market the UK globally, the government is creating a single brand offer to invest in UK life science. A Healthcare and Life Sciences Global Business Summit was held at the Olympics to promote the sector. There is also a business development programme focusing on dementia and neuroscience, translational medicine, stratified medicine and medical technologies. The UKTI has supported the UK health sector to exhibit at world trade events in the life sciences sector including BIO 2012 (biotechnology) in Boston, Medica (medical technology) in Dusseldorf and Arab Health (medical technology) in Dubai.⁴⁰⁸ UKTI will work with the Catalysts to incentivise investment in UK life sciences and attract world-class talent to the UK.⁴⁰⁹ A new 'Bio-Bridge' initiative is bringing China and the UK together in an R&D partnership to create shared, world-class intellectual property and medicines.⁴¹⁰ This is part of a broader initiative to get SMEs and start-up companies to partner with larger global companies to test new biotechnologies more cheaply. Success in this area should be judged on the basis of the number of collaborations with foreign institutions that bodies in this sector establish and their value.

Measures that could be included in the industrial strategy but were not

- Measures to protect key UK companies and keep their research infrastructure based in the UK following US based companies' attempts to purchase Astra Zeneca and Shire
- A pledge to cure a specific disease by a specified point to motivate the relevant research bodies and the development of policy proposals to achieve this
- Commit the UK to achieve a specified percentage (larger than the current figure) of the patents recorded in the worldwide pharmaceutical research sector and a target relating to the financial benefits these patents will generate at set points e.g. after five and ten years

8. Nuclear

Key measures in this industrial strategy

- Make the UK a world leader in decommissioning nuclear facilities and waste management and increase exports in the new build market
- Build new nuclear reactors in the UK without extending a direct subsidy to the supplier and with a requirement that they adopt a full decommissioning strategy
- Increase the percentage of the UK nuclear value chain captured by UK firms
- Collaborate with the United States in developing a new type of reactor design and with the French to build a nuclear reactor and testing facility

Why was the sector chosen?

The government's carbon plan wants to ensure competition between different forms of low-carbon electricity generation. The nuclear sector accounts for 62 per cent of low-carbon energy.⁴¹¹ Three of the four government scenarios for the future of the UK energy market envisage more nuclear capacity. It is predicted that, by 2050, 40 to 50 per cent of the energy mix could be from nuclear compared with 20 per cent now.⁴¹² Despite the recognition of the Committee on Climate Change, in its recent Renewable Energy Review, that nuclear costs including decommissioning were 'among the lowest of the low-carbon options', the UK government will only allow new nuclear plants 'provided they are subject to the normal planning process for major projects and receive no public subsidy' beyond the carbon price support provided to all renewables.⁴¹³ Investors in the sector also have to allow for the costs imposed by the Energy Act 2008 which requires prospective nuclear plant owners to put in place a Funded Decommissioning Programme and plans to provide for this.⁴¹⁴ To provide the necessary certainty for firms to invest, the government has made changes to energy pricing so that consumers will subsidise investment in the sector. The Electricity Market Reform in the Energy Bill put Contracts for Difference (CFDs) in place.⁴¹⁵ These give investors' confidence in long-term pricing to invest in projects with high up-front build costs but low running costs.⁴¹⁶

What is the government vision for the sector?

In the UK, industry has plans to build at least 12 new nuclear reactors at five sites by 2030⁴¹⁷ at a cost of around £60bn.⁴¹⁸ In March 2013, government granted development consent for the first new nuclear plant in the UK since 1995, at Hinkley Point in Somerset. Hitachi and Horizon were planning to invest £20bn in new nuclear plants at Wylfa in Anglesey and Oldbury in Gloucestershire.⁴¹⁹ In the Long-term Nuclear Energy Strategy in March 2013 the government set out its goal for the sector: to build a safe sector, in which nuclear is a competitive part of the low-carbon energy mix. The UK should aim to be a world leader in decommissioning nuclear facilities and waste management, where the UK secures 'a significant share of high-value contracts globally'⁴²⁰ and leads on 'future technology advances across the fuel cycle.'⁴²¹ The sector should also retain public support and have an effective UK-based supply chain.⁴²² The government wants the UK to capture £600 million per annum in tangible exports in the new-build market by 2025.⁴²³ A Nuclear Industrial Vision Statement detailed UK ambition to be a 'top table' nuclear nation. There is a Long-term Nuclear Energy Strategy, an R&D Roadmap showing different R&D requirements under different scenarios, and a Nuclear Supply Chain Action Plan.⁴²⁴ The Nuclear Innovation and Research Advisory Board (NIRAB) has been established to coordinate public R&D and support the nuclear sector.⁴²⁵

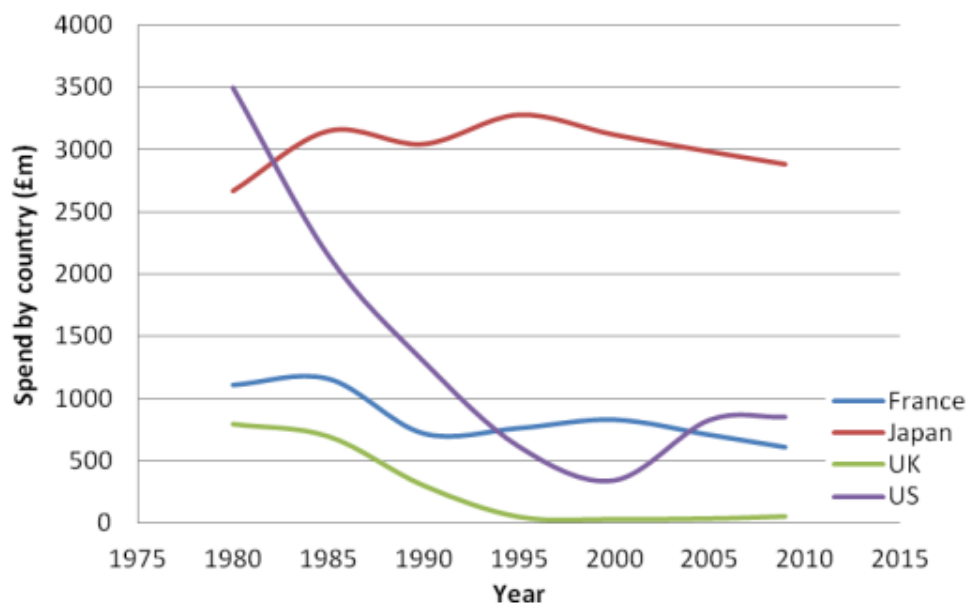
Technology

Has the UK lost ground in developing nuclear technology?

Despite being a member of the Generation IV International Forum (GIF), 'an R&D collaboration aiming to select and develop six nuclear energy systems for further development', the UK has not signed the 2010 Framework Agreement and thereby is not involved in any of the GIF's R&D.⁴²⁶ UK R&D expenditure rose between 2000 and 2009, but in 2009 was only seven per cent of the level in 1980.⁴²⁷ Figure 32 shows the civil nuclear R&D spending for France, Germany, the UK and the US between 1980 and 2009 (standardised to 2010 prices in \$m). The UK R&D funding for civil nuclear in 2010/2011 was £66 million, which 'is low compared to some international competitors and negligible for research into future generations of fission reactors and their associated fuel cycle'.⁴²⁸ The Review also found that 'the majority of funding is directed towards decommissioning, safety and performance

of current reactors and fusion energy' and so there is 'a noticeable dearth of funding provided to R&D of future fission energy'.⁴²⁹ The UK's only research reactor, run by Imperial College, is soon to be decommissioned.⁴³⁰ The university-based accelerator at Cranfield University is due to be closed. Privatisation fragmented nuclear R&D so 'there are currently few centralised bodies or national objectives around which the supply chain can coalesce and invest confidently for the long-term'.⁴³¹ This echoes the concerns in the agri-tech sector that privatisation of research institutes can hollow out the research base.

Figure 32: Civil Nuclear R&D Spending by Country (\$)⁴³²



Supply chain development

Prime Minister David Cameron argued that 'reshoring of jobs is vital because it means that more of the benefits of globalisation can be felt by the British people'.⁴³³ Despite being the first country safely to develop a nuclear power plant, the UK does not have any domestic reactor design vendor.⁴³⁴ Foreign companies own the majority of nuclear power stations in the UK. This is in contrast to France where the French government own firms that operate in the UK nuclear industry, including Areva (90 per cent state-owned), EDF Energy (75 per cent state-owned), French Nuclear Safety (IRSN) and waste management agency (ANDRA) and the atomic energy commission (CEA).⁴³⁵ Select UK companies do figure in the supply chain including Rolls Royce (safety instrumentation and control systems), AMEC (design,

construction, licensing and operation of nuclear plants) and 'Sheffield Forgemasters (a world leader in the provision of high quality heavy forged and cast steel products).'⁴³⁶ In 2008 the Nuclear Industry Association suggested UK firms could secure 70 to 80 per cent of the new build programme but 'recognised that some of the key components, e.g. very large forgings, reactor pressure vessels, turbo/generators, currently cannot be produced by UK companies' (NIA 2008).⁴³⁷ The UK lacks domestic capacity in key areas of nuclear power generation. Oxford Economics estimated that 45 per cent of supply chain requirements could be delivered by UK firms, given the existing capacity, but this could increase to 60 per cent if barriers were removed.⁴³⁸ A range of between 60 per cent and 80 per cent of the nuclear new build programme could go to UK suppliers if we consider that the real UK supplier potential lies sometime between the estimates of the Nuclear Industry Association and Oxford Economics.

The European Council agreed and promised to do 'more to cut red tape, attract investment, stimulate innovation and pioneer more work on reducing energy costs, including shale gas'.⁴³⁹ New nuclear plant operators will be given certainty over 'the maximum final price they will be expected to pay the government for the provision of a waste disposal service'.⁴⁴⁰ The TSB provided £2m to fund nuclear feasibility studies in 2010 and £18m to Nuclear Feasibility and Near to Market Nuclear Innovation Support in 2012. The Nuclear Advanced Manufacturing Research Centre (Nuclear-AMRC) through the Fit for Nuclear programme aids UK businesses to become suppliers to the industry. The Nuclear AMRC includes the University of Sheffield and the Dalton Nuclear Institute at the University of Manchester to help British companies to 'compete for nuclear contracts worldwide'.⁴⁴¹ The now abolished Regional Development Agencies Yorkshire Forward and Northwest Development Agency and the BIS jointly funded it.⁴⁴² It is part of the High Value Manufacturing Catapult. In 2012 the Regional Growth Fund awarded £37.1 million to the Nuclear-AMRC.⁴⁴³

The TSB has held competitions to promote collaboration among SMEs in the supply chain (2010) and to support innovation in the supply chain (2012).⁴⁴⁴ The NDA has committed to a SME procurement target of 20 per cent of the total supply chain spend by 2015.⁴⁴⁵ To help achieve this, the Nuclear Supply Chain Action Plan includes a commitment by the NDA to place contracts on Contracts Finder.⁴⁴⁶ A Procurement and Infrastructure Client Group is being established including industry and government this will work to simplify procurement by reducing the

bureaucratic workload in the area of registering interest for a contract, pre-qualification procedures and finding out about available contracts.⁴⁴⁷ The government must recognise that, due to the security concerns, the potential for SME involvement in this sector will be limited. Adapting the procurement aim in this sector to focus on UK content rather than SME involvement would seem wise.

What is the sector strategy timetable for restoring the UK's position as an industrial power in this sector?

The Industrial Vision Statement divided its plan into three stages. The first and current period lasts for five years, the second is the expanding global market era (between five and twenty years from now), the third phase will mean developing new technologies as yet unknown.⁴⁴⁸ In the first period the UK will be expanding the life of its existing fleet by seven years on average and 20 years in the case of Sizewell B.⁴⁴⁹ Three consortia (NNB Genco, Horizon and NuGen) are preparing the new-build plans.⁴⁵⁰ A new facility at the University of Manchester will provide an ion beam accelerator and a cobalt-60 irradiator.⁴⁵¹ There is a refusal to provide public subsidy in the form of a levy or direct subsidy payment for new build capacity but this does not rule out subsidy of R&D or skills development. It is widely recognised that the type of reactor design the government chooses will affect the supply chain used as a supplier may already have a supply chain set up.⁴⁵²

What facilities does the government need to put in place to allow UK nuclear to succeed?

The long timescale for advanced fuel cycle technologies seems to 'preclude industry investment alone' and will require coordination by 'an enduring R&D body that can serve national interests'.⁴⁵³ The government needs to 'define long-term R&D programmes of national strategic importance on future nuclear energy systems'.⁴⁵⁴ This is because 'industry cannot be expected to fully fund this with commercialisation likely to be 25 years away as the returns are too far off'.⁴⁵⁵ In November 2011, the House of Lords Select Committee on Science and Technology report *Inquiry into Nuclear Research and Development Capabilities in the UK* recommended forming an independent Nuclear R&D Board, a Nuclear R&D Roadmap and a long-term nuclear strategy.⁴⁵⁶ In March 2012 the government responded by forming an ad hoc Nuclear Research and Development Advisory Board to make plans.⁴⁵⁷ The Review found that 'although the benefits of

international engagement are recognised in the UK, and a number of strong ad hoc relationships exist between UK organisations and foreign counterparts, at present, there is no coordinated strategy for engagement with international nuclear R&D'.⁴⁵⁸

The Nuclear Industrial Vision Statement, published in March 2013, presented a plan to restore the UK to being a top player in the nuclear market.⁴⁵⁹ This includes partnerships with international bodies to ensure 'knowledge transfer into UK organisations'.⁴⁶⁰ The government is investigating the potential to partner with the US Department of Energy in its plan to develop commercially small modular reactors.⁴⁶¹ The UK will negotiate with the EU over its nuclear R&D budget to 2020 and participate in the Jules Horowitz Reactor programme in France to be operational by 2018.⁴⁶² The UK is investing £12.5 million to part-fund construction of this facility in France. The reactor will ensure the UK has a radiation testing facility to develop future advanced nuclear fuels.⁴⁶³ The UK is to supply fuel pins and lead test assemblies to the global market and invest in developing a fuel recycling capability.⁴⁶⁴ The National Nuclear Laboratory (NNL) is going to advise the UK government on nuclear matters and in strategic research projects.⁴⁶⁵ This national research body will look out for national interests, horizon scan for the future and represent the UK in the world.⁴⁶⁶ The Nuclear Advanced Manufacturing Research Centre and the Manufacturing Advisory Service both support the sector. The government has commissioned a research project on the challenges to SMEs in the nuclear sector in accessing finance.⁴⁶⁷

The Nuclear Roadmap recognises 'a significant nuclear energy R&D programme is required within the UK regardless of the extent of new nuclear build and of the systems and technologies deployed'.⁴⁶⁸ The minimum is that the UK will be 'an intelligent buyer' and 'deliver effective and independent regulation of an expanded nuclear power sector'.⁴⁶⁹ The ORION scenario predicts 75GW of capacity in the UK by 2050, seven times the existing level and requiring the construction of 50 new reactors.⁴⁷⁰ This requires a selection of fuel cycles and reactor design. The report recognises that the 'fragmented nature' of UK R&D mean it is not 'currently optimised' to install the required capacity and does not have 'the strength in depth'.⁴⁷¹ The report wanted to 'generate the information needed to inform strategic decisions'.⁴⁷² It suggested that a priority should be to 'identify the demonstration facilities that could be hosted in the UK, playing particularly to the UK's strengths'.⁴⁷³ What seems likely is that, if Hinkley Point C is not built, then 'over a relatively short period the UK will not be seen as the place to go for nuclear

capability because others (specifically China and Russia) will overtake the UK's position'.⁴⁷⁴

The government conducted Revealed Comparative Advantage analysis, which found that the UK had a comparative advantage in 'consultancy, R&D and decommissioning'.⁴⁷⁵ The UK is a world leader in fusion research with CCFE operating Joint European Torus, 'the only device in the world capable of fusion, under contract from EURATOM'.⁴⁷⁶ The Nuclear Decommissioning Authority hosted/supported trade missions to Japan, China, South Korea and Canada.⁴⁷⁷ NDA suggests a single database across government of company capabilities, accreditation, bids and awards.⁴⁷⁸ In 2013 UKTI adopted a civil nuclear export strategy which seeks to create 'packaged solutions' for potential clients.⁴⁷⁹ UKTI promotes UK industry attendance at the International Atomic Energy Authority annual general conference to promote UK firms to potential clients.⁴⁸⁰

What is the size of the world market in nuclear power generation for UK firms?

The UKTI is working with the Nuclear Industry Council (NIC) and the Nuclear Industry Association (NIA) to develop an export strategy.⁴⁸¹ The government will aim to build strategic relationships with 'the US, France, South Korea, China, India, Japan, to boost trade and future technology development'.⁴⁸² In the production of fuel, UK facilities for uranium enrichment allow 10 per cent of global supply to be produced at the Capenhurst site and the UK is one of the few nations with capability across the fuel cycle.⁴⁸³ Worldwide, 31 nations are thinking of or making plans to introduce nuclear power, half of which will commission by 2030 and six by 2020.⁴⁸⁴ It is predicted that 317 new reactors will come into operation by 2030.⁴⁸⁵ In the next few decades the global nuclear industry will spend £930bn on new reactors, £250bn on decommissioning reactors and further investment on extending the life of nuclear plants.⁴⁸⁶ The strategy envisages that 'maturing R&D' means that new UK plant can have 'significant UK design content'.⁴⁸⁷ The build process will enable UK manufacturers 'to supply components and assembly' for 'overseas clients'.⁴⁸⁸ In 2025 international nuclear procurement is estimated to reach £25bn per annum.⁴⁸⁹ Simultaneously, 200-plus nuclear power plants will be closed by 2030 and decommissioning programmes will be needed to achieve this.⁴⁹⁰ Decommissioning of the 19 existing UK nuclear reactors is governed by the Nuclear Decommissioning Authority which spends £3bn per annum, with £1.6bn

spent on the supply chain.⁴⁹¹ Figure 33 shows the export potential by region as identified by the Oxford Economics Consultancy.

Figure 33: Export potential by region as estimated by Oxford Economics through to 2025⁴⁹²

Region	Number of New Plants	Potential Market Size (£ billions)	Export Potential
North America	12	13.0	Mid
Latin America	3	3.3	High
Western Europe	11	12.0	High
Eastern Europe & Central Asia	48	52.2	Mid
Africa	1	1.1	High
Middle East and South Asia	39	42.4	High
Southeast Asia and Pacific	6	6.5	Low
Far East	101	109.7	Low
Total	221	240.2	
Source: WNA (2012) and Oxford Economics.			

What competitive threats to the UK are emerging in this sector and how is the Nuclear Industry Council seeking to meet them?

The UK government has recognised that the UK cannot compete across the nuclear value chain as ‘the UK supply chain will find it difficult to compete on a price’.⁴⁹³ The government believes that: ‘it is neither desirable nor realistic to be the leaders in all aspects of the nuclear fuel cycle. A strategic decision will need to be taken on the areas in which the UK should take a leading role.’⁴⁹⁴ This contrasts with the approach of countries such as South Korea (2012) and China (2015), which have pledged to become self-reliant in nuclear technology.⁴⁹⁵ Instead, the Nuclear Industry Council has committed to a strategy including:⁴⁹⁶

- £15m to establish the National Nuclear Users Facility for universities and companies carrying out research into nuclear technology⁴⁹⁷
- 36 nuclear research and development projects have won £18m worth of support from a Technology Strategy Board competition, which will leverage in a further £13m of private sector investment⁴⁹⁸
- Nuclear Energy Skills Alliance will implement a Skills Delivery Plan to enable new build. UKTI will promote exports and encourage inward investment.⁴⁹⁹

Skills

The UK government has set up the Nuclear Technology Education Consortium to meet the skills shortage. The Nuclear Industry Council (NIC) is responsible for the sector strategy. The UK 'nuclear workforce is ageing' and up to '70 per cent of its highly skilled workers [are] forecast to retire by 2025'.⁵⁰⁰ A majority (53 per cent) of the nuclear sector workforce are over 45 years old. Many will retire in the next decade. It takes time to upskill employees.⁵⁰¹ The 16 GW new build nuclear facilities could support up to 30,000 jobs at their peak.⁵⁰² The Nuclear Industry Council is working to develop performance indicators on skills development.⁵⁰³ A National Skills Academy for Nuclear was set up with £3.5m funding. A £2m Transformational Growth programme for the supply chain and an Employment Investment Fund have been established. £10.5 million from the Engineering and Physical Sciences Research Councils (EPSRC) has been awarded for training nuclear PhDs through both the Nuclear First Centre for Doctoral Training and the Nuclear Engineering Industrial Doctoral Centre.⁵⁰⁴

The Nuclear Energy Skills Alliance is working to promote the appeal of this sector as a career path and promote cooperation in the sector. This should be a simple task. Oxford Economics note a 'nuclear premium' effect as nuclear jobs are more productive roles.⁵⁰⁵ On average, jobs in the nuclear industry are paid 15 per cent more than the manufacturing sector.⁵⁰⁶ The Perkins Review of the skills issue suggested that engineering needed to challenge negative views of the profession⁵⁰⁷ by building a more gender and ethnically based workforce; helping people enter the profession through sponsorship and expanded apprenticeships; encouraging those that have left the profession to return; and providing an educational infrastructure adequate to meet the needs of the sector.⁵⁰⁸ A new qualification, the Triple Bar for new nuclear, has been developed and the Suitably Qualified Experienced Personnel (SQEP) status is to be promoted. The Construction Industry Training Board (CITB) and Engineering Construction Industry Training Board (ECITB) are working to ensure that the workforce has the skills to deliver the new build reactors.⁵⁰⁹ UKCES are funding a Nuclear Workforce Model to do labour market analysis.⁵¹⁰ NDA sites are often located in remote locations, which can make them one of the few local employers offering skilled jobs.⁵¹¹ A Nuclear College is to be created, joint funded by industry and government.⁵¹²

Measures that could be included in the industrial strategy but were not

- Develop wage- and currency-based policies to make a greater percentage of the nuclear value chain price-competitive
- Designate a particular area to store the radioactive waste in a geological disposal facility. Currently the government is asking a community to volunteer⁵¹³ and none has volunteered, which is holding development back.⁵¹⁴
- Create a recruitment policy to secure the services of trained nuclear technicians working in friendly and stable states which are reducing or eliminating their domestic nuclear capacity e.g. Germany

9. Offshore wind

Key measures in this industrial strategy

- Establish catapult in offshore renewable energy to coordinate UK research and subsidise demonstration projects
- Fix electricity market prices to enable long-term investment in otherwise uneconomic forms of power generation e.g. offshore wind
- Fund innovation through the new Green Investment Bank (GIB) and guaranteeing private loans
- Promote the sector as a career choice to skilled engineers and to potential UK suppliers to capture a greater share of the UK wind power supply chain for UK firms.

Why was the sector chosen?

The Government is investing in offshore wind rather than onshore wind despite the fact that the latter is cheaper and that wind power is more expensive and less reliable than non-renewable energy sources such as gas. The low-carbon sector requires investment 'totalling around £50 to £130bn (nominal) between now and 2020 to meet the government's renewable objectives'.⁵¹⁵ The Climate Change Act 2008 set a target to cut emissions by 80 per cent by 2050.⁵¹⁶ The Energy Act was passed and the Electricity Market Reform Delivery Plan was published, creating certainty on strike prices and contract terms that will allow for the development of offshore wind.⁵¹⁷ Electricity market reform was 'vital for the success of the industry'

as ‘the new support framework for low-carbon electricity provides the certainty needed to underpin long-term investment’.⁵¹⁸

The offshore wind industry is predicted to be worth £7bn by 2020.⁵¹⁹ The UK wind sector is more competitive in the UK than the wind industry in other nations. The UK has more offshore wind capacity than the rest of the world combined.⁵²⁰ The UK also has ‘the largest wind farm, the largest construction project, the largest planning application and the largest development pipeline in the world’.⁵²¹ In 2013 the two largest offshore wind farms in the world became operational, in London Array and Greater Gabbard in the Thames Estuary.⁵²² The UK has ‘shallow seas and strong winds’ which make the industry more competitive in the UK.⁵²³ Between 2011 and 2013, employment in the offshore wind industry doubled. 12,000 people are employed directly in the industry or the wider supply chain.⁵²⁴

Technology

An Offshore Renewable Energy Catapult has been established. It has £46m of funding and a five-year business plan.⁵²⁵ The strategy seeks to create ‘tens of thousands of long-term UK jobs’ and a ‘clear and sustainable project pipeline’ with ‘major manufacturing facilities in the UK’ and a ‘competitive UK-based supply chain’ and a sector that is ‘cost-competitive with other low-carbon technologies’.⁵²⁶ The Low-carbon Innovation Co-ordination Group (LCICG) is a body that coordinates public sector groups to conduct Technology Innovation Needs Assessments (TINAs) to assess where it is best to invest.⁵²⁷ It is providing £100 million of innovation support funding between 2011 and 2015.⁵²⁸ Its Low-carbon Innovation Strategy sets a shared vision till 2020.⁵²⁹ The Offshore Wind Cost Reduction Task Force helps arrange demonstration projects as those projects are; ‘very complex, difficult to consent and finance so companies acting alone are often not able to deliver the testing capacity needed’.⁵³⁰

Finance

In their assessment of value for money in possible GIB investments, the government found that ‘while some of the investments have a positive net present value such as materials recovery facilities for waste and energy efficiency investments, others do not, namely offshore wind and direct combustion energy from waste due to the higher cost of low-carbon products (e.g. renewable electricity generation) compared with more traditional products (e.g. fossil fuel electricity

generation)'.⁵³¹ Nevertheless, offshore wind will receive £1bn in investment from the Green Investment Bank by March 2015.⁵³² The government is investing £20m through the Regional Growth Fund to aid the UK supply chain and £46m to coordinate innovation activity.⁵³³ The government is creating the Offshore Wind Investment Organisation to attract inward investment. Both the Renewables Obligation and Contracts for Difference provide price support for low-carbon technology.⁵³⁴ Electricity market changes are fixing prices to give industry the confidence to invest. The strategy recognises that 'as with all renewable generation technologies, offshore wind currently benefits significantly from price support, which is paid for by UK consumers through electricity bills'.⁵³⁵ In November 2012, a Levy Control Framework was agreed and it set the total subsidy of low-carbon technology at £7.6bn per annum in 2020/21, based on 2011/12 prices.⁵³⁶

The government put in place a Final Investment Decision Enabling for Renewables (FID Enabling) programme to prevent investors waiting until the CFD contracts were operational before investing. The resulting investment contracts focused on whether the investment would lead to a long-term growth in electricity generation from renewables.⁵³⁷ The limits on annual spending on low-carbon generation under the levy control Framework were set out in 2013 up to 2020/21.⁵³⁸ Contracts for Difference agree to pay the developer the difference between market prices and the previously agreed strike prices when they sell their energy into the grid, but force the supplier to pay the difference to the government if the market price is higher than the strike price. This comes into effect in 2014.⁵³⁹ Contracts awarded a CFD are given price certainty for fifteen years. In June 2013 the government announced the strike prices. These guarantee the price level through to 2018/19.⁵⁴⁰ The prices were set at a level to enable 30 per cent of UK electricity to be generated from renewables by 2020.⁵⁴¹ In 2020 the strategy envisages 8-16GW of offshore wind capacity.⁵⁴²

The UK government has also invested £50m in the IPO flotation of Greencoat UK Wind plc, an infrastructure fund specialising in wind energy.⁵⁴³ The Catapult is recruiting 120 industry experts to drive industry standards.⁵⁴⁴ The Business Bank operates Enterprise Capital Funds (an equity investment scheme to firms unable to access venture capital), a Business Angel Co-Investment Fund (a public/private partnership) and an Enterprise Finance Guarantee to SMEs needing up to £1m debt funding but without a track record or adequate security.⁵⁴⁵ A UK Guarantees Scheme provides government backing for £40bn in debt finance to support

infrastructure projects.⁵⁴⁶ The Cost Reduction Task Force 'identified the need to better educate the finance sector (including insurance companies) on true risk.'⁵⁴⁷ Some firms want the Government to be interventionist and back loans.⁵⁴⁸ These investments are based on a false assumption – that wind is a new technology and that the finance sector is thereby unable to calculate the financial risks involved in investment. Windmills have been in operation since the first century AD. If the sector lacks investment this may be due to the fact that, without extensive market manipulation, it is uneconomical.

Skills development

The Offshore Wind Industry Council was created to oversee the Offshore Wind Industrial Strategy.⁵⁴⁹ The industry suffers from 'the novelty of the technology' and 'lack of long-term track record' and the 'reliance on policy to support its economics'.⁵⁵⁰ The major skills issue for the sector is the 'lack of skilled engineers and lack of younger people choosing engineering as a career'.⁵⁵¹ As a new industry, the sector's profile is low and young people are unaware of 'the skills and qualifications the industry needs'.⁵⁵² There are technical challenges specific to offshore wind. It is difficult to access the turbines for repairs and maintenance and transmission distances are greater. They require different technology to operate compared with the offshore equivalent. RenewableUK runs an annual Offshore Wind Conference and in June 2013 ran a Share Fair for developers to inform would-be suppliers of upcoming contracts.⁵⁵³ The Champions for Wind Scheme is run by Forewind and informs young people of the benefits of a career in the wind sector.⁵⁵⁴ A Wind Turbine Engineering Apprenticeship has been developed with EU Skills and key wind sector employers.⁵⁵⁵ A Talent Retention Solution and a National Skills Academy for Power encourage engineers to remain in the sector and source government funding for SMEs to provide apprenticeships.⁵⁵⁶ In England, Centres for Offshore Renewable Engineering (COREs) is partnering with the government and six locations to promote the sector to the local population.⁵⁵⁷

Supply chain development

The government recognise that 'Britain does not have currently a large-scale wind turbine manufacturer',⁵⁵⁸ that 'the manufacturing part of the supply chain is likely to continue to remain outside the UK',⁵⁵⁹ and that 'export opportunities in onshore wind manufacturing are limited'.⁵⁶⁰ Small firms are less likely to export and find the

cost of attending trade fairs high.⁵⁶¹ However, the analysis of capabilities and opportunities shows that the UK is a market leader in this sector. Transferable skills from oil and gas include cable and umbilical route design.⁵⁶² The report describes the presence of a nacelle assembly facility as 'politically desirable'.⁵⁶³ There is currently no UK blade manufacturer for the onshore market. Creating one in the north of England is a possibility.⁵⁶⁴ Labour costs are recognised as a significant factor in the manufacturing process, which place a limit on the amount of parts that can be built in the UK. Factory construction of nuclear towers could occur by 2017, given the two-year lead-time, to ensure UK tower manufacturers can meet the increase in demand. The opportunity in tower construction relates to the low labour content.⁵⁶⁵ UK production also has value due to the low costs of transportation and logistics costs.⁵⁶⁶ The report recognises that 'the UK market is insufficient to stimulate investment in new UK component manufacturing capacity' and 'component manufacturing investment decisions are based on the global demand for electrical systems or where there are centres of technical excellence'.⁵⁶⁷ The UK government recognises it does not have the capacity to pump-prime the UK wind power market to make the UK a mass producer of wind capacity on the world market.

The strategy recognises key challenges facing the sector such as making firms aware of the size and timing of future demand; attracting firms to invest in manufacturing facilities in the UK; meeting the challenges of financing and skills and preparing the UK supply chain to compete on cost and quality.⁵⁶⁸ Bidders for a CFD will need to produce a supply chain plan.⁵⁶⁹ The MAS Offshore Wind Supply Chain Growth Programme (GROW: Offshore Wind) is a £20m programme run by the Manufacturing Advisory Service (MAS), RenewableUK and the Advanced Manufacturing Research Centre (AMRC) and financed by the Regional Growth Fund.⁵⁷⁰ The Advanced Manufacturing Supply Chain Initiative (AMSCI) runs a competition based on competitive bids that was funded with £120m in 2013. It promotes collaboration in the supply chain.⁵⁷¹ These bodies can develop standardised contracts and agglomerate contracts to give suppliers the confidence to invest.⁵⁷² The Crown Estate produced a supply chain gap analysis for the European offshore wind industry in 2013.⁵⁷³

The Offshore Wind Developers Forum (OWDF) has a goal of 50 per cent+ UK content in offshore wind projects, and developers have agreed to track UK content in expenditure to determine if this is met.⁵⁷⁴ The OWDF was formed to drive cost

reduction.⁵⁷⁵ The Strategy suggests the UK could 'specify UK content' in procurement, or subsidise port development and/or incentivise a foreign firm to set up business in the UK.⁵⁷⁶ The majority of firms thought '50 per cent UK content in capital expenditure is ambitious and only achievable with certain caveats, for example a wind turbine manufacturer located in the UK'.⁵⁷⁷ The Offshore Wind Sector Strategy, released in August 2013, detected a 'perceived uncertainty' in UK energy policy, which was stopping investment.⁵⁷⁸ New market entrants bemoan the 'scale of investment required to gain market entry', the 'need for a track record' to compete in the market and a lack 'energy policy certainty'.⁵⁷⁹ Some respondents 'are concerned that currently UK companies cannot compete on cost'.⁵⁸⁰ The majority of the components analysed seemed to have a high imported element in the manufacture, e.g. 'the main supplier of steel for monopiles is located in western Germany'.⁵⁸¹ In some areas the savings are not significant, including monopiles and transition pieces.⁵⁸² Investors in non-monopile steel foundations 'are waiting for firm orders before investing in efficient large-quantity production capacity'.⁵⁸³

UK ports are private compared with continental state-owned ports, allowing them to prioritise the local economic benefits rather than their profit margin.⁵⁸⁴ There is no policy for UK ports to invest in the capacity to enable offshore wind production to be fully UK-based.⁵⁸⁵ Ports can apply for a UK Guarantees Scheme to back the debt finance needed to invest to upgrade their ports for renewables.⁵⁸⁶ The risk is that 'European ports are often able to offer cheaper space and services'.⁵⁸⁷ In the shipbuilding sector 'there is little economic capacity for large vessel construction in the UK' and the shipyards are 'unlikely to secure contracts for large vessel construction against global competition'.⁵⁸⁸ Continental ports could compete with UK ports if manufacturing is also on the continent.⁵⁸⁹ In response, the Hull and East Riding of Yorkshire Councils and the Humber LEP Chair helped to secure a £310m investment by Siemens and Associated British Ports.⁵⁹⁰ Estimates indicate that, by 2030, offshore wind could increase UK net exports by £7-18bn.⁵⁹¹ The UKTI believes there are trade opportunities in 'wind turbine design; project management; training; and the manufacture of specialist components, such as control and condition monitoring systems'.⁵⁹² UKTI is targeting offshore wind projects in China and Taiwan under the High Value Opportunities (HVO) programme.⁵⁹³ There are no UK subsea cables to export offshore wind energy, so domestic power generation will not achieve export earnings for the UK.⁵⁹⁴

Measures that could be included in the industrial strategy but were not

This sector produces energy in a way that is less reliable and at a price significantly higher than other sources of power generation. The investment of over £1bn by the GIB in the sector should be cancelled. These funds should be directed to less costly and more reliable energy sources.

10. Oil & gas

Key measures in this industrial strategy:

- Lower the taxes on oil and gas to increase the amount of economically recoverable energy through reduced taxes on decommissioning
- Reduce the level of regulation affecting the sector and its cost
- Promote sector as a career choice for a more diverse workforce
- Invest in carbon capture and storage to meet carbon reduction targets and increase amount of recoverable oil and gas

Why was the sector chosen?

The government recognise that 70 per cent of British energy requirement will be met by oil and gas into the 2040s.⁵⁹⁵ The UK's 'energy security' and 'long-term economic performance' require a healthy oil and gas sector.⁵⁹⁶ The UK sector meets one half of the UK's primary energy needs.⁵⁹⁷ It helps boost the balance of payments by £50bn per annum through reducing imports and increasing exports.⁵⁹⁸ It employs 400,000 people in the UK.⁵⁹⁹ The UK needs to maximise UK oil and gas extraction both on and offshore to provide greater energy security and grow the UK supply chain. More collaboration between the sector and the government should be encouraged.⁶⁰⁰ Investment in enhanced and increased oil recovery would allow the UK to increase its production by 15 to 24 billion barrels.⁶⁰¹ Despite this clear opportunity, no comprehensive information on the UK supply chain's export performance is currently available.⁶⁰²

Finance

Both the Energy Bill 2013 and the Gas Generation Strategy of November 2012 have set an aim of affordable low-carbon energy. Moving from coal to gas is part of the reduction in UK emissions.⁶⁰³ The Gas Act has been changed to allow Ofgem to launch an innovation competition that could generate £160m of additional investment in the gas network.⁶⁰⁴ A tax regime has been established which encourages continued investment in the UK continental shelf, including tax relief on decommissioning assets, as announced in Budget 2013. The Decommissioning Relief Deed gives businesses certainty over the tax to be paid on decommissioning assets.⁶⁰⁵ The Ring Fence Expenditure Supplement was increased from six per cent to ten per cent with effect from January 2012 to boost investment.⁶⁰⁶ Readers will note the relative lack of practical financial support provided to this profitable sector by the government in comparison with the investment in offshore wind. Deployment of new technology in the oil and gas sector has been subdued as R&D expenditure is 0.3 per cent of sales in the UK but 4 per cent in Norway, which could affect the amount of oil and gas recoverable in the UK.⁶⁰⁷ PILOT has been established as a partnership between government and industry to meet this challenge and maximise economic recovery to UK offshore oil and gas resources.⁶⁰⁸

Exports

The UKTI was given £140m funding in Autumn Statement 2012 to help SMEs to export, with a particular focus on Australia, Brazil, Mexico and Saudi Arabia.⁶⁰⁹ The Foreign Secretary has welcomed the BP investment in Azerbaijan, which establishes a fourth gas corridor to Western Europe and thereby increases both the diversity of gas supply and Western European security.⁶¹⁰ UKTI is focusing on opportunities for the UK in Australia, Brazil, Iraq, Kazakhstan, Mexico, Libya and Saudi Arabia.⁶¹¹ To achieve this, a new Oil and Gas Industry Council, chaired by BIS and DECC and an oil and gas producer, has been formed. It will create and publicise success measures and determine when they have been met.⁶¹² Given the declining oil and gas reserves in British waters, a strategy to maintain or increase the reserves of UK oil and gas firms in foreign states would seem appropriate. No vision on how UK firms' investments in foreign oil and gas fields will be increased and defended is included in this strategy.

Skills development

The sector is facing a skills shortage which is 'impacting project schedules and driving up costs'. A national centre of excellence for technology is being established. Ex-military personnel are being retrained to enable them to work in the sector. Education is a devolved matter so a single UK policy is not possible. The response of the devolved administrations and the UK government will have to be coordinated. The See Inside Manufacturing programme promotes the sector as a career path to young people. One problem identified is that 'it is incorrectly perceived that the industry faces an unsustainable future and that it is coming to the end of its life'.⁶¹³ In fact, global demand for oil and gas is forecast to increase by 28 per cent by 2035.⁶¹⁴ Domestic shale gas has potential despite the government suspension of hydraulic fracking. The UK government's unwillingness to support fracking contrasts unfavourably with the United States, which is already seeing large-scale reductions in energy prices due to domestic fracking. The industry in the UK remains untapped.

Supply chain development

It is difficult to increase the UK part of the sector's supply chain as UK firms already make up such a high percentage of it. In the UK oil and gas sector 'more than 70 per cent of capital expenditure is through UK-based suppliers'.⁶¹⁵ The PILOT Supply Chain Code of Practice (SCCoP) is a tiered award system that monitors purchasers' behaviour. The different levels are Bronze, Silver and Gold awards and this is determined by 'feedback and scores submitted by suppliers and other criteria such as participation in Share Fairs'.⁶¹⁶ Two hundred companies uphold the UK Supply Chain Code of Practice. It aims to reduce costs, increase efficiency and add value.⁶¹⁷ Supply chain analysis found that a big order for a small company could make a company financially weaker as they were required to post a performance bond. This acted as a barrier to growth.⁶¹⁸ Planning policy has been a problem because developers cannot vary planning consents. This has frustrated efforts to include the latest technology or incorporate new energy-efficient design changes. Under an amendment to the Electricity Act, they will now be able to make changes with a three-month consultation rather than having to reapply for planning consent.

Technology: carbon capture and storage

The industry committed to reduce hydrocarbon releases by 50 per cent during the three years to 2013.⁶¹⁹ In December 2012 BIS hired Element Energy Limited to update the 2030 Carbon Capture and Storage Abatement Cost Curve for the UK.⁶²⁰ It found that: 'even in the most favourable locations, point-to-point capture-transport-storage solutions for industrial emitters below 1 Mt/yr will likely be prohibitively expensive; indeed economies of scale are significant even up to 10 Mt/yr, implying the use of shared networks.'⁶²¹ CCS is one of three means of reducing emissions by 70 per cent compared with 2009 levels by 2050 as envisaged by the UK Carbon Plan, the others being energy efficiency and switching between fuels.⁶²² The study found that 'the available UK data does not allow reliable comparison today of the relative costs of CO₂ capture from different industries.'⁶²³ Installation involves 'high up-front costs and diverse risks' for infrastructure developers and is unattractive to small industrial sources.⁶²⁴

The carbon capture and storage project is being funded with £1bn. The GIB is committed to funding a further three projects (four in total) with lifetime costs of between 7.2bn and 9.5bn.⁶²⁵ The GIB recognise that 'CCS is not currently a commercially deployed technology so market size tends to be described by the level of government subsidy available and predictions of future requirements in order to meet climate change objectives'.⁶²⁶ The UK is no longer a top-three recipient of research funds for CCS programmes under the EU Framework Programmes. Investment in CCS seems to be a means of enabling 'clean coal' power stations to be built. The EU Directive on the Geological Storage of Carbon Dioxide requires that prior to a combustion plant of over 300MWe receiving planning consent, it must plan to capture, transport and store its CO₂ emissions.⁶²⁷ The carbon price floor and the EU Emissions Trading Scheme make CCS economically viable. The latter includes a penalty for emitting carbon starting at £16 per tonne of CO₂ in 2013, increasing to £30/tCO₂ in 2020, and £70/tCO₂ in 2030.⁶²⁸

The Committee on Climate Change predicts that power generation decarbonisation by 2030 will mean net present costs of £100bn in the 2020's.⁶²⁹ Costs of CCS installation are between 10 per cent and 60 per cent more expensive in Europe than America.⁶³⁰ Nearly 600 potential sites were identified in the UK.⁶³¹ However, analysing the transport and storage costs can cost 'several millions of pounds'.

They can't 'predict performance reliably' for many of them and there is a 'realistic chance that many units will not actually be suitable on deep analysis.'⁶³² While onshore storage is cheaper than offshore storage, 'political difficulties' and onshore transport faces NIMBY-based restrictions.⁶³³ No industrial source of CO₂ could be found that had invested in the necessary transport and storage infrastructure.⁶³⁴ Carbon storage appears to be an expensive means of increasing the amount of recoverable oil and gas at best. At worst it is an expensive cost factor for an important UK industry already facing the cost pressure of having to extract less easily recoverable oil and gas from now mature fields. This amounts to an act of economic self-mutilation by the UK government.

Both industry and the government are working to increase field recovery and developing the UK supply chain. Capital investment has increased 80 per cent between 2010 and 2013.⁶³⁵ In January 2014, the government and Oil & Gas UK published a Fabricator's Directory, listing the capabilities of UK producers.⁶³⁶ Government sponsored the creation of the Neptune Centre in Newcastle to develop subsea expertise. An Oil and Gas Innovation Centre has also been established.⁶³⁷ Thirty-three people have completed the sector skills body (OPITO) Transition Training Programme for ex-military personnel.⁶³⁸ Both the Decommissioning Relief Deeds and Brown Field Allowances have been delivered but the Bareboat Chartering proposals by HMRC to cap the amount deductible for intra-group leasing payments for sizeable offshore oil and gas assets threaten future exploration.⁶³⁹

Measures that could be included in the industrial strategy but were not

- Aggressively promote investment in UK shale gas extraction
- Earmark tax revenues received from the oil and gas sector (a resource that will run out) for funding the UK industrial strategy through the Business Bank
- Produce a study calculating the cost of carbon capture and storage compared with a similar level of investment in non-domestic energy efficiency in the UK. If the former is less cost effective, then divert resources to the latter.

11. Professional and business services

Key measures in this industrial strategy

- Encourage SMEs to access subsidised export advice
- Lower main corporate tax rate to 20 per cent and introduce one-in-two-out rule for new regulation to reduce the absolute level and cost of regulation
- Keep UK open to talented foreign workers but expand the apprenticeship schemes to ensure more positions are taken by a more diverse range of workers including students from poorer backgrounds
- Boost sector exports to Asia and other non-traditional markets in particular i.e. not concentrating on North America or Europe though exports will also be promoted to those markets.

Why was the sector chosen?

The sector accounts for 15 per cent of UK GDP.⁶⁴⁰ PBS growth in the last decade has been about four per cent per annum⁶⁴¹ with a higher rate of 5.3 per cent per annum between 2000 and 2008.⁶⁴² It provides 12 per cent of UK employment and 11 per cent of gross value added.⁶⁴³ Gross value added growth in the PBS sector was almost seven per cent in 2012-2013.⁶⁴⁴ The strategy for this sector is entitled *Growth is our Business: A strategy for professional and business services*. A Professional and Business Services Industry Council (PBSC) Strategy identifies the main aims of this sector strategy as increasing access to highly skilled workers; creating an attractive business environment; bringing in new investment; and increasing exports to emerging markets.⁶⁴⁵ In terms of competitiveness, the UK ranked eighth in the World Economic Forum ranking and seventh in the World Bank ranking for international competitiveness in 2012 (up from tenth and down from sixth respectively, compared to the 2011 rankings).⁶⁴⁶

Finance, regulation and skills development

The PBSC, in *'Seizing the Opportunities for Growth'*, recommended that the government create a stable, low tax regime to attract investment to the UK and increase business confidence. The government has cut corporation tax. By April 2015 it will be 20 per cent, the lowest rate in the G20 and the G7.⁶⁴⁷ The PBSC wanted the government to create a smarter regulatory regime, building on the flexible UK labour market and rule of law. In January 2013 the government

upgraded its one-in-one-out rule on regulation to a one-in-two-out rule, under which every one poundsworth of regulatory cost added must be accompanied by two poundsworth of regulatory reduction. The PBSC believe that the UK should remain open to highly skilled workers from the developing world.⁶⁴⁸ The Home Office has committed to having a business friendly visa system.⁶⁴⁹ A BIS analysis of how to maintain UK leadership in professional and business services included an estimate by the UK Commission on Employment and Skills that, over the next decade, 600,000 additional jobs would be created in the PBS sector.⁶⁵⁰ The report advocated increasing the diversity of people employed in the sector and the number of highly skilled people from non-graduate backgrounds. Almost half (44 per cent) of PBS employers reported that the school leavers they recruited were not adequately prepared for work.⁶⁵¹ The strategy seeks to boost the number of higher apprenticeships to 10,000 per year (3 times the existing number) to boost non-graduate roots into the sector.⁶⁵² One sample scheme, the London Professional Apprenticeship (LPA), provides places for 250 London apprentices. Run by PWC, it was launched in December 2013. It is funded by £900,000 from PWC and £1.4 million from BIS.⁶⁵³ A matching service allows small businesses to join the LPA and attract apprentices. The LPA trained 250 PBS apprentices in the Olympic boroughs.⁶⁵⁴ The PBSC believe that business engagement with the skills system needs to be increased. A PBS Education Engagement Taskforce is analysing how effective the sector engages with education, where there are good case studies and how they can be expanded.⁶⁵⁵

Supply chain development

The sector is described as being an 'enabler'.⁶⁵⁶ It can, through its networks, create business opportunities for UK firms in other business sectors. In 2014 a £30 million Growth Voucher began to fund English SMEs to access professional advice on how to grow their businesses.⁶⁵⁷ This aimed to identify how best to encourage firms to access such advice and the advice that was most effective. The PBSC is exploring how best to encourage collaboration between specialist firms. It will identify the barriers to business development that need to be removed.⁶⁵⁸ A regional outreach exercise with eight Local Enterprise Partnerships (LEPs) in England helped to capture the views of PBS firms. It highlighted the need to maintain a dialogue with SMEs to get an informed local and regional perspective.⁶⁵⁹ The PBSC wishes to ensure that the UK's physical and broadband infrastructure is sufficient to sustain growth. The UK government has committed to

increasing UK capital spending by £3bn per annum from 2015/16. No announcement has been made on a third runway for Heathrow. The issue has been given to an Airports Commission. If foreign individuals cannot physically access the UK without significant delays and are required to access the UK via feeder airports based on the European mainland, they may choose to invest in other nations instead.

Export promotion

Exports in this sector doubled between 2000 and 2009. The UK has a trade surplus of £19bn in this industrial sector.⁶⁶⁰ The UK is second to the US in its share of PBS exports to developed countries, at 12 per cent of total exports.⁶⁶¹ In recent years the growth in UK PBS exports has been slower than that achieved by Germany, but from a much higher UK base.⁶⁶² The value of PBS exports grew by 120 per cent between 2001 and 2011. They accounted for 24 per cent of UK services exports in 2011.⁶⁶³ UK PBS sector exports 'remain low in global growth markets in Asia and the Far East', with 36 per cent of sector exports going to the EU and 22 per cent to the US.⁶⁶⁴ To boost exports, a new network of senior business envoys is to be formed by UKTI. These will be individuals from high profile firms who will do this during their normal business travel. UKTI will arrange two PBS-specific trade missions per annum.⁶⁶⁵ A named contact will be put in place in each of the key export markets. A Single Market Centre contains information exchange functions and advises on the EU Services Directive.⁶⁶⁶ Leading PBS companies will also be encouraged to draw in inward investment from key markets. Success means more PBS firms exporting and winning high value contracts.⁶⁶⁷

Measures that could be included in the industrial strategy but were not

The government expects UK firms to boost exports to emerging markets with high rates of local corruption but pledges to prosecute UK firms for any acts of corruption UK firms commit abroad. The government say there is 'no intention to relax the application of the Bribery Act, which will be used to prosecute the giving and taking of bribes at home and abroad'.⁶⁶⁸ The government wants to ensure that the guidance surrounding the legislation does not 'impose unnecessary costs or burdensome procedures on legitimate business', so the Ministry of Justice and BIS are 'working with small businesses to ensure that they understand the

requirements of the Act and only put in place proportionate measures to comply',⁶⁶⁹ but they have not compared the burdens this legislation poses on UK firms with those placed on our major competitors by their respective anti-bribery rules. They could pledge to ensure that the legislation governing foreign acts of bribery by UK firms would be no more onerous than the regulation present in our European competitors.

The Eight Great Technologies Explored

How, why and when were the eight great technologies chosen?

David Willetts MP, Universities and Science Minister identified eight technologies in a speech in January 2013 that had been chosen on the basis of an analysis by the Government Office of the Chief Scientist.⁶⁷⁰ The Eight Great Technologies are: advanced materials, agri-science, big data, energy storage, satellites, regenerative medicine, robotics & autonomous systems and synthetic biology.⁶⁷¹ To promote technological development in the eight technologies, a number of Catapult Centres have been established. 'Catapult' networks are physical centres 'where businesses, scientists and engineers work side-by-side on late-stage research and development in order to transform high potential ideas into new products and services to generate economic growth'.⁶⁷² Catapults allow industry figures to cooperate in a physical facility to develop new technologies to demonstrate that their inventions work on a greater scale.⁶⁷³ In March 2012, the TSB announced the first seven catapults would be in high value manufacturing, cell therapy, offshore renewable energy, satellite applications, connected digital economy, future cities and transport system. All were open by the end of 2013. A further two in energy systems and precision medicine are scheduled to open in 2015, bringing the total to nine.⁶⁷⁴ The TSB controls the Catapults. The TSB budget was increased by 60 per cent for the 2015-16 spending round,⁶⁷⁵ an additional £185bn. The Research Councils currently spend £3bn per annum on promoting technological development.⁶⁷⁶ An additional £600 million has been invested in the eight great technologies to allow the development of new R&D facilities.⁶⁷⁷ An Innovation Investment Organisation (IIO) is planned to support the Eight Great Technologies.⁶⁷⁸

Technology 1: Advanced materials and nano-technology

Advanced materials include materials developed 'from the atom up'. These can have 'characteristics not found in nature'.⁶⁷⁹ Commonly known examples include nylon, teflon, Pilkington glass and graphene. David Willetts MP explains how advanced materials are a cross-cutting theme. They include fields from energy storage to quantum photonics.⁶⁸⁰ The government highlights a series of examples of how advanced materials have made an impact. For instance, UK scientists have produced a bone replacement material used worldwide,⁶⁸¹ and UK researchers

have produced LED bulbs that can act as wireless transmitters.⁶⁸² Materials are also being developed to absorb greenhouse gases. Industries in this area, based in the UK, have an annual turnover of £197bn.⁶⁸³

The strategy to aid growth in this technology is very limited. It sits with the broader Framework for Advanced Manufacturing, which sets out a ten-year plan to boost manufacturing. It wants to 'establish the UK's reputation as a leading European exporter of high-value manufactured goods and services'.⁶⁸⁴ The government believes the field of advanced manufacturing has an image problem which is 'a barrier to growth' as young people are not attracted to the sector.⁶⁸⁵ Key to changing perceptions is to publicise the potential of new technologies such as 3D printing. The government is trying to understand what level of funding is required to enable the UK to develop a commercial advantage in niche areas and exploit that commercially.⁶⁸⁶ An example of where this has occurred is the National Nuclear User Facility (NNUF). This has been established and provided with £15m over three years from 2012/13.⁶⁸⁷ It is 'part of the EPSRC investment in advanced materials – one of the Eight Great Technologies in which the UK is or can be global leaders'.⁶⁸⁸

Technology 2: Agri-science

Agricultural technology development supports the UK food and drink sector, which is the largest UK manufacturing sector. The UK food and drink sector has an entire value of £96bn.⁶⁸⁹ Eighty per cent of breeding chickens are from genetic stock based in the UK.⁶⁹⁰ The UN estimates that food production will need to expand by 40 per cent by 2030 and 70 per cent by 2050.⁶⁹¹ Without investment in scientific advances in food production, an expanding world population could cause food shortages. Altering the genes of key crops such as wheat can make them more resistant to drought or flooding risk. The use of satellite technology can be used to inform how fertiliser is spread across a field to improve crop yields, reducing waste. The new Agri-Tech Leadership Council is implementing the Agri-Tech strategy developed by the UK government, science base and food and farming industry.⁶⁹² The strategy aims to ensure the UK becomes 'a world leader in agricultural technology, innovation and sustainability' and exploits opportunities to develop and adopt new and existing technologies, products and services to increase productivity' and 'contributes to global food security and international development'.⁶⁹³ The UK Agricultural Technologies Strategy was launched on 22 July

2013. It included £160m government investment to help develop products such as cancer fighting broccoli and ensuring their commercialisation.⁶⁹⁴

Of the £160m, £70m was assigned to create a catalyst in October 2013 to bring together academics and business. The first eleven projects were announced in March 2014.⁶⁹⁵ A second round of catalyst funding occurred in June 2014.⁶⁹⁶ The catalyst supports the industry to conduct 'proof of concept' development of agricultural technologies.⁶⁹⁷ This includes better alignment of public funding with the industry's needs to develop more efficient practices, to help industry train a skilled workforce and retain them, to provide a stronger voice in government for the sector, increase investment in the sector and its export performance. David Willetts MP indicated that this catalyst will help new agricultural technologies bridge the so-called valley of death between the lab and the marketplace, rebuilding the applied research capacity and links with industry that were reduced in the past.⁶⁹⁸ The Biotechnology and Biological Sciences Research Council and Rothamsted Research set a target of producing 20 tonnes of wheat per hectare in 20 years' time (now less than 20 years).⁶⁹⁹ Organic crop yields can be up to 40 per cent lower.⁷⁰⁰ On average wheat crop yields have been improving at a slower rate since 1980.⁷⁰¹ They are currently at a rate of 8.4 tonnes per hectare.⁷⁰² Underinvestment in agri-tech has made it difficult to convert research into commercial products.⁷⁰³ An additional £10m in funding will be given to the catalyst by DFID to transfer these new technologies to developing countries.

Of the £160m, £90 million has been earmarked to create several centres for agricultural innovation and fund their expenditure over the next five years.⁷⁰⁴ These centres will develop, disseminate and utilize new technologies and processes to increase sector productivity and promote sustainability. The first is a Centre for Agricultural Informatics and Metrics of Sustainability (at an estimated cost of £10m).⁷⁰⁵ It specialises in data and how it could be used to improve productivity at the farm level.⁷⁰⁶ Datasets that could be used more effectively include: environmental; economic; animal welfare; soil; yields; supply chain; waste; disease severity and incidence; weather; genetic performance; breeding pedigrees; genomics; earth observation; biodiversity.⁷⁰⁷ If successful the UK could 'show global leadership on the agenda of benchmarking sustainability metrics'⁷⁰⁸ for figures such as 'crops yield and quality; soil management; livestock disease severity and incidence; agronomic performance data; biodiversity; energy and

resource use; financial performance; farming management practices; greenhouse gas emissions; land use; nutritional attributes'.⁷⁰⁹

The Leadership Council suggested these centres address 'Grand Challenges', of which they identified six potential candidates.⁷¹⁰

- Industry resilience: how can the UK industry become resilient to and avoid exacerbating environmental change?
- Boosting productivity and nutrition sustainability: how can improvements in livestock and crop production systems improve productivity in both quantity and in nutritional quality?
- Farming systems: how can efficient crop and livestock production systems support and benefit from the structure and functioning of agro-ecosystems?
- Food and supply chains: how can producers better meet the changing needs and opportunities arising in their supply and food chains?
- Future global markets: what are the greatest opportunities for global exploitation of UK agri-tech?
- Big data and metrics: how can big data be used to boost productivity and provide metrics by which to assess the comparative sustainability agricultural products and production systems?⁷¹¹

The strategy does not provide a clear plan to achieve the increase in crop yields. No attempt is made to highlight the danger organic foods pose in terms of future food shortages. No protective measures are outlined to protect the UK's position as a place to trial and develop GM foods. The UK could commit to becoming the world centre for the development of GM foods.

Technology 3: Big data

In the Autumn Statement 2012, the government announced £189 million funding for this sector.⁷¹² In October 2013 the government outlined its strategy for UK data.⁷¹³ This technology has been chosen because the UK has a historic strength in mathematics and has uniquely extensive public datasets.⁷¹⁴ The UK has 'the third largest share of the global data centre market'. In 2011/12 the UK invested the second highest amount in data centres.⁷¹⁵ In 2012 the UK was 'the second lowest risk destination in the world for data centre locations' and 'third in the overall Data Centre Development Index, which ranks markets according to their state of development'.⁷¹⁶ The UK also has 25 of the world's 500 most powerful

computers.⁷¹⁷ A High Performance Computer Centre has been created in northern England to allow businesses to use larger amounts of data in their modelling.⁷¹⁸

The Government strategy aims to achieve three things. First, is to provide 'a skilled workforce, and data-confident citizens'.⁷¹⁹ Second, to create an e-environment in terms of tools and infrastructure to enable effective data storage and use.⁷²⁰ Third, that users should be able to 'access and share data appropriately'.⁷²¹ The 'Engineering and Physical Sciences Research Council is developing a proposal for a national network of centres in big data analytics' and the government is working with external bodies to 'promote the UK data storage market overseas'.⁷²² Four innovative administrative data research centres have been created to form an Administrative Data Research Network (ADRN).⁷²³ The ADRN establishment is the first stage of the ESRC's Big Data Network. Next there will be a 'focus primarily on business data and local government data' and then 'on third sector data and social media data'.⁷²⁴ The UK already has the necessary infrastructure established. This constitutes a comparative advantage in developing this technology.

How is the government ensuring the creation of a sufficiently skilled workforce in this sector?

The government is working with the Information Economy Council 'to bolster the image of data science as a discipline, and illustrate different career pathways in data analytics'.⁷²⁵ An e-infrastructure Leadership Council has been formed to advise the government on skills. The UK already has a high proportion of 'computing, mathematics and statistics doctoral graduates'.⁷²⁶ E-skills predicts 'an increase of between 13 per cent and 23 per cent per annum in demand for big data staff between now and 2017'.⁷²⁷ Both e-skills and SAS are monitoring the need for big data specialist roles. They use this to predict employment levels up to 2017.⁷²⁸ The sector is not yet a recognised profession. It lacks the financial structure or accreditation that give a profession status and allow individuals to map a career pathway.⁷²⁹ In the area of skills: 'the UK needs to develop an all-educational-level approach from equipping school children with basic mathematics and analytics skills, through ensuring the wider workforce remain abreast of developments in data use, to funding doctoral students working at the cutting-edge of data analytics'.⁷³⁰ From September 2014, students between five and 16 will be taught how to build apps and write programmes.⁷³¹ Core maths qualifications are being introduced as a middle ground between GCSE maths and A level/AS level. This

will be the maths bit of a new Technical Baccalaureate which will be introduced in September 2014 as part of vocational education.⁷³² One of eight Trailblazer projects in the new government apprenticeship framework is in the digital sector. It will include software development.⁷³³

How is the government building the e-infrastructure sufficient for the UK to compete effectively in the sector?

UK broadband speeds have quadrupled since 2008. By 2015, 98 per cent of the country will have access to 4G mobile broadband.⁷³⁴ The Super Connected Cities Programme will increase broadband speeds in UK cities. A G-Cloud Procurement Framework has been introduced to standardise government data and allow interoperability so that different government entities can interact electronically with each other.⁷³⁵ The government has created a Connected Digital Economy Catapult (CDEC) with over £50m of funding from the TSB to 'ignite digital innovation to power sustained economic growth in the UK'.⁷³⁶ CDEC is to create an Innovator Centre in London for companies to showcase their ideas on data usage.⁷³⁷ This investment is vital and to be welcomed. However, there is no indication that the UK has identified with the fastest broadband infrastructure and that it seeks to match or exceed them, which would be a more effective aim.

How is the government ensuring that public data is made available for commercial use?

A Research Sector Transparency Board will advise on how to implement open data. One hundred universities are receiving £10m direct government funding and £37m from the Research Councils to increase open access to data. This funding was distributed between 2013/14 and 2014/15.⁷³⁸ Open data requires 'a strong skills base... a strategic plan for our data infrastructure across the country... [and] world-leading research and development'. It requires that 'data can be accessed and shared securely, as appropriate'.⁷³⁹ The Shakespeare review of public sector information identified a need for 'core reference data', meaning the basic information for each government department, as identified by an external body.⁷⁴⁰ The governments belief in the commercial potential of public sector information has received external validation. The European Commission believes that 'between 15 per cent and 25 per cent of total data used in e-commerce trading is based on

public sector information'.⁷⁴¹ The UK government has launched the Open Data Institute to advocate for this.

The Hargreaves Review of Intellectual Property and Growth in 2011 recommended that the Intellectual Property Office should amend copyright law to allow users to use data in non-commercial research.⁷⁴² 10,000 government databases have been made publicly available through data.gov.uk.⁷⁴³ The strategy will take advantage of the high quality of UK databases in the NHS, meteorological records etc.⁷⁴⁴ The Local Government Association survey of councils found lack of data skills among employees as a cause frustrating the release of data.⁷⁴⁵ A What Works Network includes 'six evidence centres covering health and social care, education attainment, ageing better, local growth, crime reduction and effective early intervention' and shares information about what works and what does not with Government bodies.⁷⁴⁶ The government has also invested £23.5m in the ESRC-led Life Study, which tracks 100,000 children from birth in age cohorts.⁷⁴⁷ The value of these data sets is difficult to estimate but the measures seem intrinsically worthwhile.

Technology 4: Energy storage

This technology raises a series of challenges, from storing power after its generation to extending the life of batteries in handheld electronic devices to powering existing technologies such as vehicles and planes in new ways. Developing a low emission vehicle is a key challenge the UK is looking into. Vehicles need to be converted from petrol/diesel to electric/hydrogen/hybrid cars. The challenges are to develop a battery that is cheap, a network of accessible refuelling sites and a battery that lasts a long time before the need to refuel. A UK H2Mobility Project was undertaken in 2012 to explore how hydrogen fuel cell electric vehicles (FCEV) could be launched in the UK.⁷⁴⁸ This resulted in a roadmap for their rollout beginning in 2015.⁷⁴⁹

The government recognises the need to reduce the cost of vehicles and provide a refuelling network to ensure the around ten per cent of new vehicle buyers 'receptive' to buying an FCEV actually proceed to do so.⁷⁵⁰ No subsidy for buying FCEV vehicles is assumed in this roadmap. Commercial quantities of the vehicles won't be sold until the mid-2020s.⁷⁵¹ The strategy aims for 10,000 sales per annum in 2020 and 300,000 in 2030.⁷⁵² The rollout needs to ensure variety in refuelling

stations in the core areas and a concentration on trunk roads and dense population centres, with a network growing from 65 recharging points to 1,150 by 2030.⁷⁵³ The network would not reach break-even point until the late 2020's.⁷⁵⁴ The roadmap envisages £418m financing until break-even with £62 million pre-2020,⁷⁵⁵ with a reduction in CO2 emissions compared with diesel of 60 per cent in 2020, 75 per cent in 2030 and zero carbon by 2050.⁷⁵⁶ The projected annual plus to the UK economy is £1.3bn by 2030.⁷⁵⁷

The Carbon Plan seeks ultra-low emission vehicles of any type, of which hydrogen is one. The start-up costs are high for this technology and the returns low as the demand for such vehicles is low. The first hydrogen vehicles will be in the larger vehicle group so diesel is the best comparator. Plug-in vehicles tend to be preferred by these users as they can plug them into the existing grid to refuel. Even with an extensive refuelling network, most consumers wanted a discount to buy an FCEV compared with the high market price.⁷⁵⁸ By 2025 there would be a refuelling network to serve 50 per cent of the UK population.⁷⁵⁹ Half of diesel used in the UK is imported and this could be replaced by UK produced hydrogen. This economic benefit exceeds the cost of building the refuelling network.⁷⁶⁰

Plug-in-vehicle infrastructure is viable in the UK, which is a small and densely populated island. The TSB has provided £80m of funding for 60+ projects in the last three years to enable collaboration between universities, manufacturers and engineers on the development of low-carbon vehicles.⁷⁶¹ £300 million in grants has been provided to reduce the cost of these vehicles to the consumer from 2010-2015 by up to £5,000 each.⁷⁶² These vehicles are also exempt from Vehicle Excise Duty and Company Car Tax. One thousand electric charge points are now installed and £30m has been allocated under the Plugged-in Places programme to match fund, increasing this to 8,500 charging points.⁷⁶³

The Low-carbon Vehicle Innovation Platform operates an Ultra-Low-carbon Vehicle Demonstrator programme. This has trialled over 320 electric, plug-in and hydrogen vehicles under the direction of the Technology Strategy Board.⁷⁶⁴ The government believes the UK has a comparative advantage through its 'world leading foundations in electrochemical research' and 'technology specialisms in batteries, motors and power electronics'.⁷⁶⁵ However, they also suggest that 'the market is at such an early stage that it is difficult to predict what will happen and whether there will be a gap to be filled by the GIB'.⁷⁶⁶ In 2010 there were only 167 electric cars

registered in the UK.⁷⁶⁷ By 2030 it is predicted that 60 per cent of new cars and vans will be electric.⁷⁶⁸

Technology 5: Regenerative medicine

Regenerative medicine involves the development of new medical techniques for repairing and replacing damaged human tissue.⁷⁶⁹ The UK Stem Cell Bank was the first facility to store and distribute stem cell lines in the world.⁷⁷⁰ The estimated value of the global regenerative medicine industry was £1bn in 2011, and it was predicted to reach £5bn by 2014.⁷⁷¹ £108 million of government funding has been allocated to this area so far.⁷⁷² The central challenge, as described by David Willetts MP, is 'the generation outside the body of a renewable source of transplantable tissue'.⁷⁷³ The MRC [Medical Research Council], Engineering Physical Sciences Research Council (EPSRC) and Biotechnology and Biological Sciences Research Council (BBSRC) will establish a new national programme in regenerative medicine to build a competitive UK cluster.⁷⁷⁴

A Strategy for Regenerative Medicine was launched in 2012. It included a £25m regenerative medicine platform.⁷⁷⁵ This includes five individual hubs: cell behaviour, differentiation and manufacturing hubs; a stem cell niche hub, engineering and exploiting the niche; a safety and efficacy hub, focusing on imaging technologies; an acellular approaches for therapeutic delivery hub; and an immunomodulation hub.⁷⁷⁶ A £50m Cell Therapy Catapult has also been launched. By March 2014, between 12 and 18 Academic Health Science Networks (AHSNs) will be established in England to spread innovation and best practice throughout the NHS.⁷⁷⁷ The Medical Research Council Laboratory of Molecular Biology in Cambridge is being rebuilt.⁷⁷⁸ The Crick Institute will open in 2015 as a centre of biomedical research.⁷⁷⁹

Technology 6: Robotics & autonomous systems

This technology seeks to address a key failing in the UK manufacturing sector. David Willetts MP believes that 'our wider manufacturing industry has so far been a slow adopter of industrial robotics. (The UK has 25 robots per 10,000 employees in non-automotive sectors; whilst Japan and Germany lead the world with 235 and 127 robots per 10,000 employees respectively.) This slow adoption of a crucial new technology may be one reason for the continuing lags in British industrial productivity.'⁷⁸⁰ The applications in this sector range 'from assisted living for

disabled people through to nuclear decommissioning'.⁷⁸¹ The Technology and Innovation Futures report indicated that service robotics could grow quickly in the 2020s.⁷⁸² The devices the technology could be used for include vacuum cleaners, cars, planes and personal and social care.

Autonomous vehicles could be owned collaboratively. With car sharing, cars could be utilised for a greater percentage of the time they existed. An Advanced Propulsion Centre (APC) has been formed. £130 million funding was provided in 2014; £500m in total will be provided for this Centre by government and £500m from industry over the next decade.⁷⁸³ The Centre will safeguard 30,000 jobs involved in production of engines and more in the supply chain.⁷⁸⁴ Propulsion systems is an area in which the UK is already a significant power, with one third of all Ford Worldwide engines produced in the UK.⁷⁸⁵ The APC will try to make the UK an R&D hub, increase UK global market share and the UK share of the supply chain and increase UK exports.⁷⁸⁶ This will allow the unit to test driverless cars in a pedestrianised area.⁷⁸⁷ Future Transport Systems in Newcastle was aided by the TSB to trial electronic vehicles and has driven 540,000 miles so far.⁷⁸⁸ A competition to find a permanent location for the APC was held in 2014.⁷⁸⁹ A facility based in Nuneaton allows autonomous vehicles to be tested.⁷⁹⁰

The winners of funding under the first round of the Advanced Propulsion Centre competition were announced in April 2014. A second round concentrating on low-carbon technologies began in May 2014. Projects that put Formula 1 technology in buses and diggers and develop next generation engines will be the first to receive funds from the £1bn government/industry fund. UK technology is also being used in the European Mars Rover vehicle which, when launched in 2018, will be able to travel around the planet without waiting for instructions from earth.⁷⁹¹ The TSB has spent £50m on an Autonomous Systems Technology Related Airborne Evaluation & Assessment (ASTRAEA) programme between 2008 and 2013.⁷⁹² Prior to the creation of the APC, the UK government, through the TSB, committed £10m for low-carbon R&D projects capable of commercialisation.⁷⁹³

Technology 7: Satellites

The global space industry is worth 150bn and is predicted to grow by five per cent per annum for the next twenty years.⁷⁹⁴ The UK was the third nation in space. The UK developed its own space launch capacity. It is the only country to have 'given

up such a capability having developed it'.⁷⁹⁵ The European Space Agency, Telecommunications and Integrated Applications Directorate is to be based outside Oxford, in an Enterprise Zone which will also be the base of a Catapult Centre for 'applying space-based data'.⁷⁹⁶ £300 million has been invested in the UK Space industry of which £165 million has been given to the European Spallation Source (ESS), a neutron microscope that is 30 times as powerful as the microscopes we now use and the size of 140 football pitches.⁷⁹⁷ £100 million has been earmarked for the square kilometre array, which is the largest radio telescope in the world.⁷⁹⁸ It could create faster internet speeds and quicker smartphones. The UK will contribute £25m towards the M3 Space Mission to deploy a giant telescope.⁷⁹⁹ However, David Willetts MP recognises that: 'For a major advanced economy we have a very small public sector space programme – and indeed the UK Space Agency, bringing together our civil space programmes, was only formed in 2010.'⁸⁰⁰

Satellites have a data usage. They are a means of transmitting, receiving and collecting data. Google estimate a third of web searches relate to location.⁸⁰¹ David Willetts MP indicates that the Met Office 'has more raw data than it can analyse rapidly despite having one of the country's more powerful computers. The single most important determinant now of the accuracy of weather forecasting for the whole meteorological research community is the capacity of IT systems to handle satellite data.'⁸⁰² Around 40 per cent of the world's small satellites come from Guildford, Surrey.⁸⁰³ A key area under development is in reusable launch materials, as currently the space launch technologies are one-use products. The UK is lobbying the EU to provide the regulatory framework for the UK to provide a spaceport. The UK could also lead in providing broadband via satellite rather than fibre-optic cable. The plan for this technology needs to include an analysis of the space programmes of other nations, which it currently does not.

Technology 8: Synthetic biology

Synthetic biology engineers genes to heal, feed, and fuel people. Synthetic biology 'is the design and engineering of biologically based parts, novel devices and systems as well as the redesign of existing, natural biological systems'.⁸⁰⁴ In November 2013, a £10 million synthetic biology start up fund was created by the Biotechnology and Biological Science Research Council (BBSRC) to help entrepreneurial scientists initiate start-ups.⁸⁰⁵ The Synthetic Biology Leadership

Council was established in December 2012 and the Synthetic Biology Roadmap for the UK was published in 2013. Synthetic biology is looking to standardise the processes for how new genes are created.⁸⁰⁶ The rationale for the UK strategy in this area is described by David Willetts MP as: 'the more we can invest at the early stage to reduce the uncertainty and risk of these technologies and to show it can be scaled up, the more business will invest too'.⁸⁰⁷ The TSB operates a competition for synthetic biology (£6.5m funding) in addition to ones for energy efficient computing (£1.25m funding) and for energy harvesting for autonomous sensing, developing the technology to underpin the intelligent sensor networks highlighted in the Foresight report (£1m funding).⁸⁰⁸

The New Financial Institutions and the Non-core Industrial Sector Strategies

In addition to the eleven industrial sectors and the eight great technologies, the industrial strategy has begun to develop sector strategies in additional industrial sectors including chemicals and the retail sector. Two new institutions have been created, the Business Bank and the GIB. A trade strategy has also been developed. Each of these is considered below.

For which other sectors has the government developed industrial strategies?

A Chemistry Growth Partnership (CGP) was created. A sector strategy was created in October 2013 entitled *Chemistry at Work: A Strategy for Delivering Chemistry-fuelled Growth of the UK Economy*. It set a target of '50 per cent growth in sector GVA by 2030'.⁸⁰⁹ The National Composites Centre (NCC) was opened in 2011. It expanded in 2014 from aerospace to other sectors including 'automotive, renewables, construction, oil and gas, and rail'.⁸¹⁰ The Composites Leadership Forum was founded as a cross-sector industry body.⁸¹¹ A sector strategy is being formed to outline steps until 2020.⁸¹²

Retail: a key source of low skill employment

This sector is the largest private sector employer: around three million people work in it.⁸¹³ A retail strategy was devised in October 2013.⁸¹⁴ This was entitled *A Strategy for Future Retail*.⁸¹⁵ Actions were agreed with the British Retail Consortium and the Association of Convenience Stores.⁸¹⁶ The retail sector accounts for five per cent of UK Gross Value Added.⁸¹⁷ In 2012 online sales accounted for 9.3 per cent of retail sales.⁸¹⁸ There are three key challenges. The first is how to revive or rethink the UK high street to combat its decline. The second is how to complete the EU Single Market and ensure UK firms gain a significant share of European e-sales. The third is to support UK-based retailers to enter emerging markets, particularly the Indian market, where their modern distribution systems could give them a competitive advantage.

In response to the first, the government has welcomed the creation of jobs by major retailers⁸¹⁹ and accepted 27 of the 28 recommendations of the Mary Portas Review on how to revive the high street, which it commissioned.⁸²⁰ In March 2013,

DCLG set up the Future High Street Forum. This is a network of stakeholders tasked with generating ideas on subjects such as how to manage the overcapacity in retail space.⁸²¹ The National Planning Policy Framework (NPPF) in 2012 stressed the need for councils to prioritise the high street by measures including permission to change the use of high street retail properties into housing units.⁸²² The role of retail in offering 'a breadth of career opportunities, with varied roles and careers at all levels of business, and across many different professions' and the social mobility in the sector were recognised and valued.⁸²³ The retail sector offers opportunities to 'young people, the long term unemployed, and returners'.⁸²⁴ However, there is limited evaluation of the role played by minimum wage laws in encouraging supermarkets to move to self-service counters. Recent above inflation increases in the minimum wage may increase the move towards automated checkout services.

The European retail market is underdeveloped because the EU Services Directive has been subject to 'inadequate or inconsistent implementation in many Member States'.⁸²⁵ However, the EU Commission Digital Agenda for Europe, 2010, has taken some steps to improve the retail environment. It has sought to increase access to high speed broadband, modernise intellectual property rules and develop consistent rules for trading online to provide for consumer confidence.⁸²⁶ In January 2013 the European Commission proposed a European Retail Action Plan to help create an EU Single Market in retail by the end of 2014.⁸²⁷ The government has sought out retail pathfinder LEAs to test different approaches.⁸²⁸ UK SMEs that sold to consumers in the EU amounted to 6.4 per cent of the total and compared with five per cent who sold to non-EU customers worldwide in 2010.⁸²⁹ The UKTI Retail International Action Plan was developed in March 2013, to run until 2015⁸³⁰ and to achieve the potential of the European Retail Action Plan (ERAP).⁸³¹ The UKTI promised by 2012 to 'develop a new programme to enable retailers to take full advantage of international opportunities and to help them to overcome barriers to growth in overseas markets'.⁸³² This envisaged that staff with retail expertise would be based in diplomatic teams in 'priority markets'.⁸³³ It seeks to allow UK retailers to access foreign markets through e-commerce, grow luxury brands overseas, develop the domestic supply chain, attract foreign direct investment and establish a physical presence internationally. BIS is seeking to develop an engagement toolkit with case studies of successful government/industry collaborations.⁸³⁴ The actual delivery has been more muted. The Indian retail

market is potentially the greatest opportunity for UK retailers, but recent efforts to open it to UK companies had limited success. UK 'success stories' in foreign markets such as Tesco are now facing difficulties.

The Green Investment Bank (GIB)

The Green Investment Banking system aims to address 'a market failure where it is not possible to fund high-risk but potentially profitable projects'.⁸³⁵ The Deputy Prime Minister, in a speech to the CBI in July 2013, stated that £200bn needed to be invested by 2020 to achieve the UK low-carbon ambitions.⁸³⁶ The UK Green Investment Bank has been given £3.8bn in funding.⁸³⁷ Every £1 of government investment in this area leverages £3 in private investment.⁸³⁸ The government has a target of generating 15 per cent of UK energy from renewables by 2020 (to meet the EU Renewables Directive).⁸³⁹ This is required to meet the target in the Climate Change Act 2008 of a 50 per cent reduction in emissions by 2027 and at least 80 per cent reduction by 2050, based on 1990 levels.⁸⁴⁰ The government strategy is 'motivated by and consistent with' the EU decarbonisation roadmap.⁸⁴¹ However, the UK government has chosen to exceed the EU targets of 40 per cent by 2030 and 60 per cent by 2050.⁸⁴² The Low-carbon Agenda is a cross-cutting theme. The GIB is designed to aid the transition to a decarbonised economy.

The GIB was promised in the Coalition Agreement in 2010 and established in May 2012. The location of Edinburgh was chosen in December 2012 after a competitive bid process. Capitalisation of £3bn was provided up to 2015 in the 2011 budget and borrowing powers as of 2015/16 or when government debt begins to fall as a percentage of GDP.⁸⁴³ The government will set investment criteria to translate strategic aims into metrics to judge investment decisions. Owned by the government, the GIB will preserve the option of full or partial privatisation later on. The fund will need to generate a return on investments made, preserve its capital and fund a diverse collection of investments. GIB funding periods will match government spending review periods. The institution made loans on fully commercial terms until gaining EU approval on state aid grounds on 29 October 2012.⁸⁴⁴ The GIB will provide a series of financial tools including covering first losses and refinancing existing projects. It will group with insurers, pension funds and sovereign wealth funds.⁸⁴⁵

The GIB project team in BIS identified fifteen sectors 'for their importance to the green economy'.⁸⁴⁶ The sectors include carbon capture and storage, photovoltaics, marine energy, plug-in vehicle infrastructure, onshore wind, smart meters, rolling stock, flood defences. Non-domestic energy efficiency is 'one of the solutions to reduce carbon emissions in the UK with the lowest costs'. It also increases the competitiveness of UK industry.⁸⁴⁷ The government recognises that the GIB will not make much difference to UK growth: 'Given the GIB's initial size, analysis suggests that it is unlikely to have a significant impact on economic growth in the UK in the short term, but there might be some benefits in the long term.'⁸⁴⁸ The strategic focus until 2015 is on 'offshore wind, commercial and industrial waste, energy from waste, non-domestic energy efficiency, and support for the Green Deal'.⁸⁴⁹

The £200bn figure is equivalent to the total annual level of UK investment, so achieving it 'is not straightforward'.⁸⁵⁰ In 2011 green energy firms raised £18bn in new capital and invested £6-8bn in green projects.⁸⁵¹ The government accepts that carbon-neutral energy is more expensive than carbon-based fuels. Carbon emissions are an externality; they are not being priced in to the cost of energy. Investments in carbon reduction do not necessarily justify themselves financially in terms of the individual investor. Some technologies may require an infrastructure or supply chain not yet present. Capital ratios in banks and increased risk aversion reduce the finance available for innovation. Firms may be unable to price the risk of new schemes without a financing track record. Government therefore needs to invest. This could be achieved by 'offering contingent debt facilities, taking tranches of subordinated debt or first loss equity or via guarantees or insurance-like products'.⁸⁵² The GIB could include equity co-investment or a promise to refinance short-term debt if the project requires a longer funding period than the market would bear.⁸⁵³ The investment is designed to 'address the under-provision of capital and/or increase the speed of its deployment'.⁸⁵⁴ The government is undecided on what type of borrowing authority the GIB should have. The GIB could potentially borrow from the market without a government guarantee/with a government guarantee, through the issuing of government 'green gilts' or by loans from the National Loans Fund or through Debt Management Office borrowing.

How is the government using regulatory policy to encourage investment in this sector?

Smart grids and smart meters are being rolled out to all households and small non-domestic buildings between 2014 and 2019.⁸⁵⁵ The meters measure gas, electricity and water consumption. The predicted benefit is £18.7bn.⁸⁵⁶ The Green Deal allows 'private firms to offer consumers energy efficiency improvements to homes, community spaces and businesses at no upfront cost, and recoup payments through a charge, paid in instalments, via the consumer's electricity bill'.⁸⁵⁷ It has funded improved insulation. The measures must meet a Golden Rule that 'the periodic charge should not exceed the expected savings for that period' and that 'measures should have a positive Net Present Value (NPV) at a discount rate equivalent to the cost of finance and excluding social benefits, such as the value of non-traded emissions abated'.⁸⁵⁸ Measures to improve energy efficiency are to be welcomed as they potentially decrease business costs while also reducing carbon emissions.

How would the GIB be judged to be a success and what areas is it considering investing in?

Possible success metrics include CO2 emissions averted, landfill averted and green impact per pound of funding.⁸⁵⁹ Some areas for possible investment appear promising but non-domestic energy efficiency improvements suffer from information asymmetry. Firms may be ignorant of the cost, timescale and potential returns and not view energy efficiency as a core way of achieving improved financial margins. Employees may also be compensated for short-term returns. This may prevent investment in long-term projects with delayed return. The UK would benefit from standardising contracts in this sector. This would reduce legal and due diligence costs for energy efficiency projects. Both the USA and Germany operate similar schemes.

The sector's investment value varies considerably. The government will spend £2.16bn on flood defences between 2011 and 2015.⁸⁶⁰ Investment in defences achieves £8 in return for every £1 invested.⁸⁶¹ On photovoltaics the UK has 'no PV manufacturing firms in the global top 15'.⁸⁶² The Committee on Climate Change believes 'there is 'limited scope for the UK to influence the pace of cost reduction' and 'PV deployment currently only occurs due to government support'.⁸⁶³ On marine and tidal energy, despite having the second largest tidal range in the world,

at nine metres in the Severn Estuary, 'there are no plans to develop the site fully at the moment and there are no operational tidal range power stations in the UK'.⁸⁶⁴ Tidal power technology 'will continue to depend upon subsidy for a long time, either in the form of capital grants or revenue support'.⁸⁶⁵ The Marine Renewables Deployment Fund, created in 2004 with £42m of capital grants support to fund demonstration projects, made no grants as no technology reached a stage sufficient to access the funds.⁸⁶⁶ It has been replaced by a new £20m fund for demonstration projects.⁸⁶⁷ The UK is a world leader in marine energy technologies, ranked fourth in the world at registering marine patents between 1988 and 2007.⁸⁶⁸

The UK Marine Strategy was launched in 2011.⁸⁶⁹ It sets a goal of four per cent compound annual growth, and gross value added of £25bn by 2020.⁸⁷⁰ In February 2014 the University of Southampton was commissioned to 'research the strengths and opportunities, including investment-ready sites, research and development assets, skills and technologies that have a competitive edge'.⁸⁷¹ The sector experienced a decline in European exports but a rise in exports to non-European countries between 2007 and 2011.⁸⁷² UK leisure marine companies 'do not have the scale of their French and Italian counterparts' and are focused on declining EU markets.⁸⁷³ A key barrier to growth is the 'patchy' awareness of export opportunities and the difficulty in achieving this, particularly in emerging markets.⁸⁷⁴ The UK government announced in its Autumn Statement 2011 that a £1.5bn lending facility would allow foreign buyers to purchase capital/semi-capital goods from UK companies including small and medium-sized transactions where loans from commercial banks are not available.⁸⁷⁵ This funding began in April 2013 and terminates in 2015-16.⁸⁷⁶

The government pledges a green export campaign including trade missions and events to 'generate positive media coverage for UK business'.⁸⁷⁷ The targets will include China, India, Brazil, the west coast of America and institutions such as the World Bank and the United Nations. However, there is limited exploration of export potential in the Green Investment Bank's published rationale for its investment decisions. In marine technology, the UKTI's Tradeshow Access Programme has helped UK firms to attend trade shows in Germany and Holland.⁸⁷⁸ UKTI is developing sector investment prospectuses to take to foreign investors. BIS conducted a capability assessment to see which areas of the value chain the UK can compete on.⁸⁷⁹ Luxury marine is being included in the China GREAT campaign to promote UK exports. UKTI will attempt to influence Chinese buyers through their

close links with the China Entrepreneurs Club, whose combined wealth is equal to eight per cent of Chinese GDP.⁸⁸⁰ Marine is a market characterised by over-supply. In terms of the defence market, 'many nations have closed acquisition processes, are subject to trade restrictions or questionable transparency in business dealings, or have strong pre-existing political ties'.⁸⁸¹ Oxford Economics estimates that marine exports constitute 1.2 per cent of UK economic activity.⁸⁸² There appears to be a limit to how much marine defence exports could grow due to security and protectionist concerns.

The British Business Bank

The UK Business Bank manages £3.9bn of funding.⁸⁸³ £2.9bn of this comes from existing commitments now transferred to the administration of the Business Bank, including the BIS-run Capital for Enterprise Ltd.⁸⁸⁴ All existing government finance schemes are brought together in one place, making the support available more transparent, easier for users to access, easier for the products to be managed and assessed and for more long-term finance options to be provided. The Bank does not directly lend to firms or invest in them. In February 2014 the Business Bank made an appeal for managed investment opportunities where it could provide up to 50 per cent of the finance on equal terms to its private partners.⁸⁸⁵ The Business Bank aims to create a diverse funding market for SMEs, leverage private finance, increase aggregate lending to SMEs and ensure its funds are lent to SMEs with annual global turnover not in excess of £100 million.⁸⁸⁶ Applicants for loans must be able to repay the capital within ten years.⁸⁸⁷ The Bank provides both managed and direct capital investments, and, while both use the same investment criteria, they are assessed in different ways. In both cases funds will need to be deployed within three months of receipt or be forfeited. Loans must also demonstrate they have not displaced other forms of funding.⁸⁸⁸

The £300 million business finance partnership programme was created to support new entrants to the business lending market and help small lenders to expand.⁸⁸⁹ The Enterprise Finance Guarantee Scheme (EFG) was created to help SMEs without collateral/a track record. It distributes £1.7bn in loans through loan portfolio guarantees. It is piloting long-term growth finance products and developing business bank advice practices.⁸⁹⁰ Forty-three institutions offer EFG loans.⁸⁹¹ It provides banks with a government guarantee for 75 per cent of the loan value for SMEs if they would not otherwise qualify for credit.⁸⁹² The Business Bank sought to

extend this scheme to provide guarantees to lenders up to 25 per cent of the loan repayment and separately to provide EFG for businesses without a track record seeking up to 25k in loans.⁸⁹³ In November 2013 the Business Bank pledged £60m to two investment funds to provide debt finance to SMEs in 2014.⁸⁹⁴ £1 million was invested in a Sector Mentoring Challenge Fund and a Growth Accelerator Scheme was launched to help 10,000 potentially high growth firms.⁸⁹⁵ For other SMEs, the 'government has focused on providing high quality, low cost, high volume support, for example through new online tools and advice and through a network of 27,000 volunteer mentors'.⁸⁹⁶ These business advice and finance schemes will be fully combined in the new Business Bank by 2015.⁸⁹⁷

Creating venture capital funds to finance early investment

A £75 million fund has been created to increase venture capital investment in SMEs from 2013/14.⁸⁹⁸ This has been deployed in two parts. The Enterprise Capital Fund programme now includes a £25m VC Catalyst Fund, which will invest in venture capital funds that specialise in early-stage SMEs.⁸⁹⁹ The Business Angel Co-Investment Fund (CoFund) has been doubled to a £100m fund (an additional investment of £50m).⁹⁰⁰ It invests between £100,000 and £1m in chosen businesses.⁹⁰¹ Post-2010, 'the government has deliberately targeted most business support spend on around 100,000 firms a year that have the potential to achieve high levels of growth'.⁹⁰² A Wholesale Guarantees Pilot has been launched. It guarantees SME lending through a government portfolio guarantee for a fee and it reduces the capital banks need to hold for SME lending.⁹⁰³ The Seed Enterprise Investment Scheme (SEIS), launched in 2012, has allowed 1,100 SMEs to gain £82m equity investment.⁹⁰⁴

Investing in SMEs direct through new web-based lending platforms and direct state loans

The Business Finance Partnership (BFP) lent £20m to SMEs through the Funding Circle peer-to-peer platform in December 2012.⁹⁰⁵ In March 2014 the Business Bank pledged an additional £40m to support £450m of lending over 18 months.⁹⁰⁶ The Regional Growth Fund has joined with some LEPs to found regional growth funds, e.g. Norfolk and Suffolk have created the The New Anglia Local Enterprise Partnership Growing Business Fund which dispenses £3m in grants. These provide up to 20 per cent of the total investment in portions between £25,000 and

£100,000 to credit-starved local firms able to demonstrate the creation of one job per £10,000 borrowed from the fund.⁹⁰⁷ The Regional Growth Fund has leveraged in £6 of private investment for every £1 of public investment.⁹⁰⁸ Allowing local government to keep business rates from April 2013 has given them a financial incentive to promote local economic growth. Tax increment financing allows them to use anticipated tax receipts to provide for investment in their area.⁹⁰⁹

How will the Business Bank be judged to be a success?

The Bank will be judged on whether it manages to:

- raise the overall amount of finance provided to viable but underserved SMEs and mid-sized businesses
- increase the diversity of suppliers and products in the SME and mid-cap finance market
- improve effectiveness, raise awareness and increase use of government finance and other support
- achieve the above while generating an appropriate return on the bank's capital dedicated to commercial or near-commercial schemes and maximising the impact of those schemes which involve the provision of subsidy.⁹¹⁰

Have any of the individual products been evaluated?

Analysis of the StartUp Loans Programme, launched in 2012 and expanded in 2013 to provide loans up to £2,500 to SMEs with approved business plans,⁹¹¹ indicated 'there is some evidence of the StartUp Loans Programme displacing existing activity' from other government business loan schemes because it offered a more competitive rate of interest.⁹¹² However, there was also evidence that it 'has indeed supported the creation of businesses that would not otherwise have been progressed'.⁹¹³ The report made no comment on value for money as they thought the scheme was too new to judge.⁹¹⁴ Clearly the government schemes are supporting some bank lending – they estimate that existing business finance schemes support 'up to £9.5bn of finance once private sector contributions are included'.⁹¹⁵ Nevertheless early indications are that Business Bank and other government lending schemes are not providing adequate finance. For instance, in November 2013 the StartUp Loans Scheme had lent £50m of the £151m earmarked for loans and 10,000 of the 30,000 firms promised by 2015.⁹¹⁶

Despite the creation of the Business Bank, SME lending has declined 25 per cent since the 2009 peak. It is ten per cent lower than the level in 2006 (in real terms). Only around one in ten SMEs apply for a loan or overdraft each year and over a third of those applying for a loan ended the application without the loan (34 per cent) in 2011.⁹¹⁷ The Growth Dashboard revealed that, as of 2013, the UK government measures had not prevented lending to SMEs remaining subdued, being 13.7 per cent below the level in July 2011.⁹¹⁸ Business Minister Michael Fallon wrote to the five major high street banks to urge them to increase EFG lending in September 2012, as SME lending was still falling.⁹¹⁹ The government made a late appeal to SMEs in November 2013 for them to apply for round five of the Regional Growth fund by the December 2013 deadline. By November 2013, 400 projects had already been funded in previous rounds.⁹²⁰ The Business Secretary, Vince Cable MP discussed with the Governor of the Bank of England in November 2013 his concerns that the Funding for Lending Scheme should support 'growth in the productive economy, rather than simply stoke the housing market'.⁹²¹ The decline in business lending is shown in figure 34 and 35 overleaf.

Figure 34: Real SME & total business lending stock since 2006⁹²²

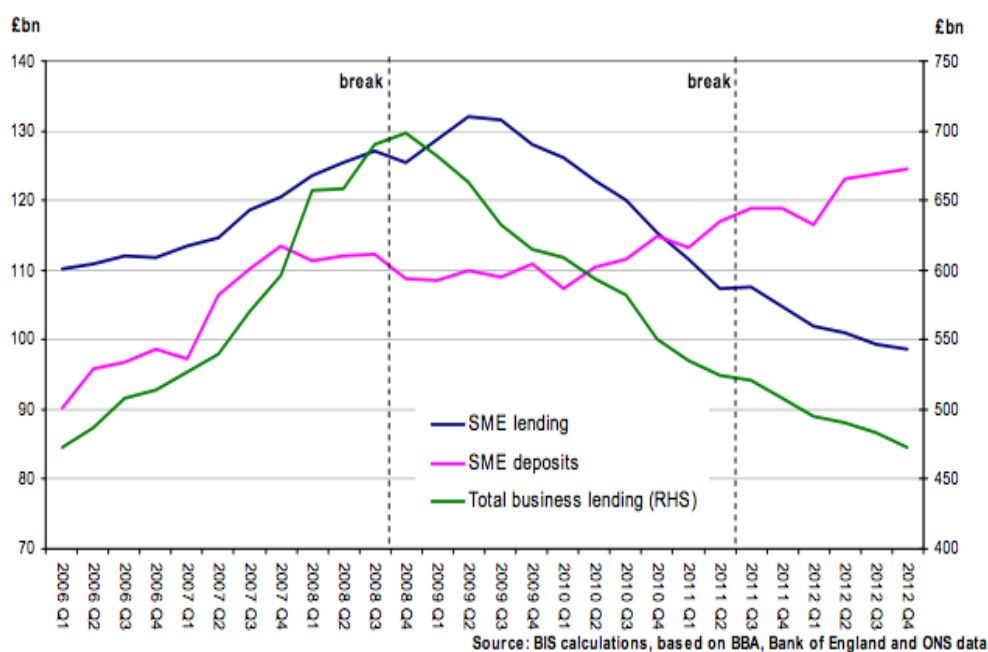
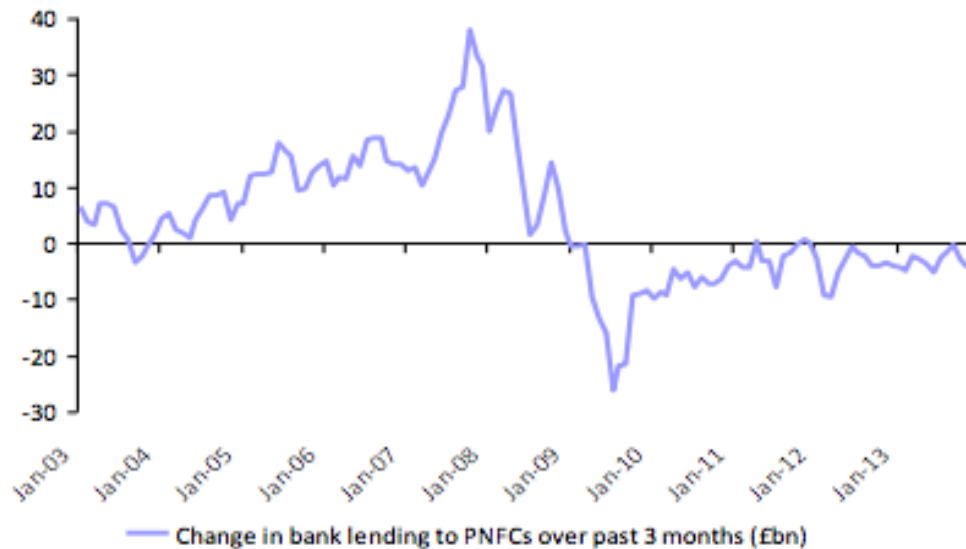


Figure 35: Change in net lending to business



Trade and Investment Strategy

What are the aims of the trade and investment strategy?

In 2011, under the Britain Open for Business initiative, the Trade and Investment Strategy set out a five-year strategy to achieve the following objectives: to encourage more SMEs to export and to double UK exports to £1 trillion by 2020;⁹²³ and to identify and to win a series of high value opportunities valued at over £250 million, of which the government will focus on 100 projects at any one time.⁹²⁴ A government study, *Long-run income elasticities of import demand*, examined demand for UK products and found UK export market-share decreasing, while UK export prices exceeded world prices.⁹²⁵ The report found 'that UK exports are less sensitive than world exports to changes in income'.⁹²⁶ This could be because the value of the pound has meant UK firms exporting products that are price-sensitive have already ceased trading or gone bust and it will take time for firms developing these types of products in the UK to be created and to grow.

The Prime Minister, David Cameron, in a speech to Bentley Motors declared that: 'one in five of our SMEs export, if we could make that one in four we would wipe out our trade deficit overnight'.⁹²⁷ The National Export Challenge, launched in 2011, aimed to increase the number of exporting SMEs to 100,000 by 2020.⁹²⁸ A

new SME exporter award was created, judged by a team of 'dragons', to complement the Queen's Award for Enterprise.⁹²⁹ In April 2013, 152 UK companies were recognised by the Queen for international trade, innovation, sustainable development and other categories. One in four entrants won an award.⁹³⁰ The UKTI is increasing the number of firms it advises from the average of 20,000 per annum over the last three years to 25,000 per annum.⁹³¹ It will operate a regional events programme, profile case studies of successful exporters on its website and use its business organisation partner networks to encourage more firms to export. The Passport to Export programme provides visits to target markets, access to locally based trade mentors and an assessment of the firms export readiness.

International trade advisors are identifying the English firms with the best growth prospects. A new online SME self-help network will allow companies to advise each other on exporting. This was piloted in 2011 and delivered in 2012.⁹³² A Commercial Development Unit has been created in UKTI to coordinate their services in a systematic way.⁹³³ These services include the Market Introduction Service, an online Overseas Security Information for Business Service advising firms on political, business and economic risks, and an online Business Opportunities Service which alerts UK firms to business leads.⁹³⁴ UKTI are piloting a scheme to provide intensive support for a limited number of projects, linked to a success fee. Sector Advisory Groups exist to provide information on their specific industries to help inform the UKTI offering. There is some evidence that UKTI schemes have had a positive effect. Businesses using the UKTI service were '50 per cent more likely to report faster growth'.⁹³⁵ The UKTI High Value Opportunities Programme targets 100 projects globally⁹³⁶ and, by January 2014, had secured £8bn of contract wins under the programme.⁹³⁷

How has the government changed UK diplomacy to encourage UK exports?

The Foreign and Commonwealth Office (FCO) has assumed a more explicitly commercial function in the new FCO Charter for Business. The FCO will create a ASEAN-UK Business Council and other partnerships with the Middle East, North Africa and Latin America. The GREAT Britain campaign to promote UK products is operating in 134 countries on a continuing basis.⁹³⁸ The government aimed to double trade with the following markets over the parliament: Brazil, China, Colombia, Egypt, India, Indonesia, Malaysia, Mexico, Qatar, Russia, Saudi Arabia,

Singapore, South Africa, South Korea, Taiwan, Thailand, Turkey, UAE and Vietnam.⁹³⁹ The government also aimed to access China through Hong Kong. Premium Visas are in place in 14 high growth and emerging markets.⁹⁴⁰ The government has established an Emerging Powers Committee in the National Security Council to improve UK relations with high growth markets.⁹⁴¹ Trade deals with China and India have been agreed, an India/UK CEO Forum established and an aim to increase exports to China to \$30bn per annum by 2015 declared.⁹⁴² UKTI and BIS have engaged in a joint review that 'has mapped UK capabilities against the projected evolution of global demand, across a broad range of sectors' to inform export strategy.⁹⁴³ There is some evidence that this has been a partial success. The Growth Dashboard reveals that exports to the BRICs increased by 30 per cent between 2010 and 2012, of which exports to Russia were the fastest growing (44 per cent). However, emerging economies account for a very small percentage of UK exports, with China accounting for just 2.8 per cent.⁹⁴⁴

How is the government promoting the UK as a destination for foreign direct investment and how successful was the government in using the Olympics to promote UK products?

The number of jobs recorded as 'secured or created' by FDI was 170,000+ in 2012/13.⁹⁴⁵ The UK's position as the largest recipient of foreign direct investment in Europe is to be aided by identifying 750 projects per annum, to be funded by FDI over five years, with the potential for productivity spillover into the wider UK economy.⁹⁴⁶ A new cross-government Strategic Relations Unit based in UKTI is coordinating the government's efforts to secure funding from sovereign wealth funds and overseas pension funds to finance these projects. It aims to build 'strategic relationships' and allow inward investors and exporters to solve bureaucratic problems more simply.⁹⁴⁷ Measures to utilise the Olympics to boost the UK economy in the long term included a Springboard to Success UK Suppliers' Directory. This was an online print marketing tool which highlighted 450 UK companies' capabilities to international buyers for major sporting and other global events.⁹⁴⁸ CompeteFor was deployed as a brokerage service to match buyers and suppliers to ensure that international clients converted their interest into UK orders.⁹⁴⁹ A new British Business Embassy was formed with events in the Olympics venue that could then be replicated in future Olympics in Russia and Brazil through Host2Host the UK's Olympic legacy programme.⁹⁵⁰

The Cross-cutting Themes (Non Sector Specific)

The government included a series of documents which proposed policies under the cross-cutting themes which did not fit under either the technologies chosen or the sector strategies identified. These are reviewed below.

Skills

What was the problem with the existing skills strategy?

The private sector underinvests in training as employees can leave for competitors. The UK Commission for Employment and Skills (UKCES) found that 'only a third of employers across the UK report that they have high-value product strategies, which demand higher skills', and the UK is growing high-skilled jobs at a rate which is 'particularly low, with a growth rate ranked twentieth out of 27 OECD countries'.⁹⁵¹ The majority of training employers provide is 'specific to an employee's job', but health and safety training is the next most important and, in some industry sectors, it makes up 'the bulk of training provided'.⁹⁵² UKCES, in *Employer Ownership of Skills: Securing a sustainable partnership for the long term*, recognise that if firms join Government schemes all 'too often when the funding ceases so does the training'.⁹⁵³ The government has committed £250m between 2012 and 2014 for apprenticeship and work experience schemes. These have changed from providing grants for all to 'employer incentives for apprenticeships and work experience' for the young, and 'employer investments and loans' for adults.⁹⁵⁴ The Business Department published *Employer Ownership of Skills: Building the Momentum*. It recommended giving employers greater power over skills training.⁹⁵⁵ The government revamped the apprenticeship scheme. They now offer 50:50 funding for employers to operate the schemes.⁹⁵⁶ Under the Employer Ownership Pilot Scheme round one, the state invested £67m and the private sector £98m. There were 34 successful bids.⁹⁵⁷ It was launched in November 2012 and 'the level of interest was high with employers bidding for over six times the amount available and successful bidders offering almost £1.2bn in matched funding'.⁹⁵⁸ Pilots were established between September 2012 and Spring 2014 to try this approach.⁹⁵⁹ Education colleges and training providers will have to provide courses that employers request. The Employer Ownership Pilot Round Two is funded by both BIS and the Department for Education and is spending £340m in 2015/16.⁹⁶⁰

The government wants to increase the number of apprenticeship schemes available and the esteem in which they are held.⁹⁶¹ Employers have been incentivised to aggregate training programmes by involving their smaller suppliers and providing investment loans along the supply chain. Funding was linked to showing how it leveraged business investment. Large companies are being encouraged to form apprenticeship schemes in partnership with their supplier network.⁹⁶² BAE Systems is developing a formal referral mechanism to link engineering apprenticeship applicants they are unable to take on to firms in their supply chain.⁹⁶³ The single supply chain apprenticeship programme includes work experience, internships and job trials. A £1m Mentor Challenge Fund has been created to fund large employers to mentor smaller firms, with matched funding up to £150,000 for activities taking place pre-31 March 2015. Currently only six per cent of SMEs have a mentor.⁹⁶⁴ The numbers undertaking apprenticeships increased by 77 per cent between 2009/10 and 2012/13 and the rate of apprentices over 25 years of age has increased by a factor of four.⁹⁶⁵ Forty trailblazers have been established (initially 11 and then 29 more in March 2014).⁹⁶⁶ The budget provided £85m in 2014-15 and 2015-16 to extend the Apprenticeship Grant for Employers Scheme and provide 100,000 incentive payments for SMEs to take on apprentices.⁹⁶⁷

How is the government encouraging UK citizens to pursue a career in engineering?

A key criticism of the government's industrial strategy is that it offers a limited vision for individuals seeking work in low and medium skilled roles. The government seems to accept passively this increasing inequality in job prospects between the more educated and less educated workers. The Perkins Review of Engineering Skills in 2013 found that 'over the last thirty years we have seen a widening gap between the wages and job prospects for skilled workers, compared with the unskilled. Under any plausible scenario for our future growth, new technology is likely to drive greater demand for higher, technical skills.'⁹⁶⁸ The UK has the lowest proportion of female engineers in the EU⁹⁶⁹ and 'only about 20 per cent of students in England study maths after GCSE, significantly lower than comparable countries'.⁹⁷⁰ The government is increasing the rigour of GCSEs as of 2016. It has introduced bursaries of £20,000 and scholarships of £25,000 to incentivise STEM graduates to become teachers.⁹⁷¹ Thirty-three university technical colleges have been created specialising in engineering and catering for

14-19 year olds.⁹⁷² The EPSRC is setting up centres for doctoral training in universities in sectors including those in the industrial strategy, e.g. aerospace and pharmaceuticals, with £350m funding.⁹⁷³ The government has invested £250,000 in a Tomorrow's Engineers programme to encourage school children to become engineers, and matches firms that want to promote engineering in schools and organisations which can achieve that through the National Careers Service.⁹⁷⁴ However, ensuring that more students graduate in STEM subjects is not enough. The report says: 'there is significant leakage at the juncture between HE and employment: three years after graduation, just under 70 per cent of male engineering and technology graduates are working for employers in those fields'.⁹⁷⁵

Public procurement

Public procurement accounts for 15 per cent of demand, or £238 per annum. By comparison, UK exports are worth £230bn per annum.⁹⁷⁶ The government recognises that they 'have an important role to play in helping to remove barriers to growth, for example where there are skills shortages, underinvestment in innovation, a lack of competition, or problems with access to finance'.⁹⁷⁷ Transparency on future demand is essential to building the supply chain. The government has set a clear target of 25 per cent of their procurement spend going to SMEs by 2015. Between 2010-11 and 2012-13 the proportion of procurement spend going to SMEs increased from 6.8 per cent to 10.5 per cent.⁹⁷⁸ Procuring in a more standardised manner reduces project costs and allows UK firms to export more easily, as products are less unique. Also the government can smooth its consumption to provide investment confidence. The G-Cloud simplifies the process of becoming a government contractor, and 60 per cent of G-Cloud sales have gone to SMEs.⁹⁷⁹ Under the Contracts Finder Portal the government is publishing procurement pipelines in 90 sectors worth £177bn plus.⁹⁸⁰ In 2014 the Government committed to abolish the Pre-Qualification Questionnaires (PQQs) for contracts below a certain threshold, standardised the PQQ for contracts above the threshold and made all the contracts available on a single portal.⁹⁸¹ These measures have helped SMEs to become more aware of government contracts and made it simpler to bid for them.

In procurement, UK supply chains have 'become progressively weak' and they have 'hollowed out'.⁹⁸² This has meant 'capacity and capabilities have been lost with critical links in the chain disappearing from the UK altogether. Domestic supply chains can be fragile even in sectors where the UK is competitive.'⁹⁸³ In December 2013 the UK Government published the procurement pipelines in 19 sectors, worth £177bn.⁹⁸⁴ In Budget 2013 the Small Business Research Initiative (SBRI) was increased from £40m in 2012-13 to £200m in 2014-15.⁹⁸⁵ It provides 100 per cent R&D funding to support SMEs to develop an innovation for the public sector. Companies can receive up to £1m to develop their ideas and then sell them commercially.⁹⁸⁶ Forty departments have held 182 SBRI competitions awarding 1,500 contracts worth £170m.⁹⁸⁷ Reports on the UK's strategic capabilities have been conducted in Tunnelling, Building Information Modelling (BIM) and Renal Care to identify the potential export opportunities and weaknesses that need to be addressed.⁹⁸⁸

Supply chain competitiveness

Why is there a need to rebuild the UK supply chain?

UK supply chains have suffered 'years of underinvestment' and there has been 'a decreasing proportion of the supply chain locally sourced, and a persistent trade deficit'.⁹⁸⁹ The industrial strategy aims to address this by ensuring that government will 'act strategically over the long term' to build success in certain industrial sectors and address market failures in skills and innovation through a partnership between government and industry. This will create spillover effects that benefit both. Government action 'has to be joined up' and concentrate on long-term value not short-term savings and not act in departmental silos but be coordinated.⁹⁹⁰ The strategy recognises the 'great potential for import substitution through supply chains'⁹⁹¹ but that these have 'been hollowed out' and 'are hard to replace' as firms in the automotive and textile sectors have found 'they can no longer find enough UK-based companies able to supply or willing to bid'.⁹⁹² The government has begun to realise that applying cost and EU rule considerations 'too narrowly risks neglecting wider economic considerations and the benefits of maintaining a competitive supplier base'.⁹⁹³ However, there is no UK strategy to challenge the application of EU procurement rules in the UK.

The Advanced Manufacturing Supply Chain Initiative (AMSI) is the government's primary programme to build the domestic supply chain. In April 2014 it was assigned a further £100m to allow a fifth round of bidding.⁹⁹⁴ The previous four rounds delivered around half a billion of public (£245m) and private investment and directly/indirectly created or safeguarded 30,000 jobs in total.⁹⁹⁵ It works to 'support research and development, skills training and capital investment to help UK supply chains achieve world-class standards and encourage major new suppliers to locate in the UK'.⁹⁹⁶ Successful bidders for the AMSI, launched in March 2012, were predicted to have benefit to cost ratios of between 2:1 and 25:1.⁹⁹⁷ There are seven centres in the High Value Manufacturing Catapult, with each working to increase collaboration in the supply chain to boost R&D.⁹⁹⁸ Broadband vouchers are being deployed in ten out of twenty-two cities. A £100m fund provides individual vouchers worth £3,000 each for firms to increase their broadband capability.⁹⁹⁹

What is the chance that manufacturing could be re-shored?

Sectors in the industrial strategy amount to 'a third of the economy' and eleven million jobs.¹⁰⁰⁰ In a Manufacturing Advisory Service survey, 11 per cent of respondents had re-shored production and five per cent had moved production abroad.¹⁰⁰¹ A 2013 KPMG survey found that a majority of respondents from the five largest economies were planning to make their supply chain more domestic to reduce risk.¹⁰⁰² But it is not as simple as saying that all the value chain should be re-shored. UK firms also derive benefits from being involved in a global supply chain. Some UK higher tech manufacturing sectors are 'integrated into global supply chains with foreign businesses accounting for around 20-30 per cent of the value added in UK exports' and these include 'UK exports in transport equipment (e.g. aerospace and automotive), chemicals and machinery and equipment'.¹⁰⁰³ These imports help to make UK finished products price-competitive. Greater supply chain integration helps combat key weaknesses in the current global economic climate as 'exchange rates are turbulent, borrowing costs have risen and bankruptcies by both customer and suppliers have left gaps in supply networks'.¹⁰⁰⁴ Supply chain integration can also be in the form of 'long-term contracts, joint ventures, strategic alliances, technology licences and asset ownership or franchising'.¹⁰⁰⁵ These measures are not sufficiently explored in the industrial strategies, for example the industrial strategies rarely identify foreign governments

to cooperate with in developing products, nuclear and aerospace being clear exceptions.

How is the government creating new financial products to strengthen the supply chain?

The Prime Minister David Cameron agreed with a series of FTSE 100 companies to provide Supply Chain Finance in October 2012.¹⁰⁰⁶ Supply Chain Finance means that a bank is notified by a large company that an invoice has been approved. The bank can then advance a similar sum at low interest rates to the supplier, sure of the capital sum being paid. This could allow £20bn of funding to go to smaller companies in the supply chain. The UK government is also looking to provide this facility for its suppliers. A scheme for community pharmacies in England provides up to £800m of new credit for 4,500 pharmacy businesses.¹⁰⁰⁷ This mechanism allows larger firms to 'improve suppliers' cash flow while maintaining their own working capital'.¹⁰⁰⁸ The Business Finance Partnership (BFP) provided £10m to URICA in May 2013 to expand the latter's business offering to cater for firms with in excess of £5 million turnover. URICA is a web-based supply chain finance firm.¹⁰⁰⁹ A new online receivables exchange, Market Invoice, was given £5m by the BFP. Debt finance schemes to enable smaller firms to raise performance bonds are also being trialled. The Tees Valley Catalyst Fund offers short-term loans to allow performance bonds to be raised so that small firms can bid for bigger contracts.¹⁰¹⁰ There is also the government's Prompt Payment Code which was created in December 2008 and has 1,500 companies signed up and.¹⁰¹¹

UK R&D is very cost effective. Scientific research generates 50 pence per subsequent annum for every £1 initially invested.¹⁰¹² Despite having three per cent of the global R&D spend, the UK has six per cent of global research articles and 16 per cent of the most highly cited papers.¹⁰¹³ £1 million has been invested in a laser technology company through the regional growth fund to contribute to a £5m project to develop lasers for use in the manufacture of smartphones.¹⁰¹⁴

Marketing the industrial strategy to young Britons and foreign potential business partners

The Industrial Strategy refers in numerous places to a perceived image weakness for UK manufacturing with the UK general public. To address this, the government has initiated a See Inside Manufacturing (SIM) programme.¹⁰¹⁵ Businesses are giving tours of their workplaces to parties of school children (aged between 11 and 19) and their teachers to hear of the career opportunities available. As of September 2013, this existed in three sectors: automotive, aerospace and food and drink. Seven more sectors are to be added, including chemicals, electronics, nuclear, oil & gas, offshore wind, construction and life sciences.¹⁰¹⁶ The initiative began in June 2011 in the automotive sector, involving 35 companies and 100 events.¹⁰¹⁷ From October 2013 SIM has been held every October.¹⁰¹⁸ Ministers have consulted with various stakeholders on the industrial strategy, including attendees at the BIS Manufacturing Summit¹⁰¹⁹ and the G8.¹⁰²⁰

Miscellaneous announcements recorded under the industrial strategy

The strategy documents include a series of announcements that are of limited relevance or not easily categorised. These include:

- opening new Business Parks¹⁰²¹
- an analysis of the importance of the UK/Irish economic relationship, which found that Ireland was experiencing the type of export and business investment-based recovery sought by the UK government¹⁰²²
- UK Government for a Small Business Saturday (imported idea from the United States) on 7 December 2013¹⁰²³
- the announcement of a record high in the number of private sector businesses (4.9 million in total)¹⁰²⁴ and the employment figures¹⁰²⁵
- Fuel duty has been frozen, saving the average SME £1,300 on petrol by 2015¹⁰²⁶
- The Employment Allowance is operational from April 2014, giving each business a £2,000 allowance to reduce employer national insurance contributions¹⁰²⁷
- The Red Tape Challenge has identified 3,000 regulations for scrapping or improvement since 2011 and this will save around £800 million per annum¹⁰²⁸

Assessing the Success of the Industrial Strategy

There are a few specific policy objectives contained within the industrial strategy of which the success or failure can be measured. Either UK exports will double to £1 trillion or they will not. Either 25 per cent of UK government procurement spend will be with UK-based SMEs or it will not. The number of apprenticeships created will achieve the target or not. However, the strategy contains few other cross-cutting measures by which it can be assessed. Below I suggest ten possible measures on which the industrial strategy in its entirety could be judged. These are not the metrics as specified by the UK government. They were compiled by comparing the problems identified in the UK economy in chapter 1 with the government measures to address these problems, as specified in chapters 2 to 5.

Ten measures to judge the success of the UK Industrial Strategy

1. Does it create jobs for UK citizens or require the importation of skilled foreign labour to achieve success?
2. Does it increase the productivity of the average UK worker, defined in terms of output per hour worked, at a rate faster than the growth rate in the sector in the decade prior to the industrial strategy?
3. Are UK workers earning higher real after-inflation wages after a defined period of years within the industrial sectors chosen, compared with the previous wage growth rate or other sectors of the economy?
4. Does the UK become a world leader in the selected technologies as defined by the number of patents granted, the annual sales of technologies developed and their contribution to UK gross value add?
5. Can the UK translate early innovation success into the creation of new domestically based industries, which include a heavily domestic supply chain?
6. Will these industries be able to survive fluctuations in the exchange rate, and if not can the government take steps to insulate them from the effects of exchange rate changes?
7. Does the industrial strategy create jobs for UK workers of varying levels of skill and ability, allowing a higher rate of employment in the industrial sectors

chosen or associated spillover sectors compared with the decade prior to the industrial strategy?

8. Does the UK maintain or increase its share of world trade and does the UK become the main European trading partner for key emerging powers, e.g. China and India, measured in terms of exports rather than total trade?
9. Does the percentage of value in the supply chain retained within the UK increase for the selected industrial sectors in the decade following the implementation of the sector strategies?
10. Does the industrial strategy reduce the number of UK citizens who are without formal qualifications by a substantial margin, e.g. half, through the creation of a respected and large-scale apprenticeship programme?

Do the measures taken justify the argument that this is a marked change in approach?

The Business Secretary argues that the industrial strategy marks a significant change from the previous laissez faire approach. It is not clear that this is the case. No UK government has been indifferent to the ability of firms to access finance or the skill levels of the workforce or the need for government to sponsor UK research. A pure vertical approach has been rejected as it is vulnerable to regulatory capture, a possible bias towards incumbent firms and technologies, and possible curbs on competition. The government is aware that any bias in favour of established firms can distort competition and lower economic growth. Neither the government nor the opposition has adopted any policy on what the 'appropriate' exchange rate for the pound is and how the government could achieve this. The industrial strategies barely mention the exchange rate issue. The government continues towards more interventionist measures, which would mark the approach as unique/a break with existing policy. These could include some of the following:

- Favouring UK companies for procurement bids (the approach of the strategy is to make them more competitive so they win a greater proportion of bids in fair competitive conditions)
- Accept that wage levels affect the competitiveness of different industry sectors and their viability in the UK and develop welfare policies that make a broader range of industries cost-competitive if based in the UK

- Recognise the importance of maintaining a broad manufacturing sector including low-skill roles to ensure employment opportunities for less skilled workers
- Acknowledge the trade-off between the promotion of expensive green energy and the presence of energy-intensive industry in a nation and the consequent effects on employment opportunities for low-skilled labour
- Recognise the impact of the value of the currency on the type of exports the UK can compete in and develop a view on what the appropriate value of the pound should be to enable UK firms to compete
- Consider how UK bribery laws affect UK firms' chances of export success in high growth emerging markets with high levels of corruption and high levels of state involvement in the economy, e.g. Russia.
- Identify measures to increase UK savings and to direct those funds to UK firms needing capital to increase domestic ownership of UK firms and the commitment of UK firms to maintain UK production
- Consider UK ownership of key firms in the identified sectors as an aim, analyse the effects of foreign ownership of UK firms in key sectors or consider means of protecting UK firms from foreign takeover
- Take a view on the balance of trade and identify measures that could be taken to substitute for imports and achieve a 'positive' UK/rest of the world trade balance within a defined time period

This report does not suggest that these measures are desirable or should be adopted. It simply notes that they are common figures of industrial strategies employed by other nations. The UK strategy as currently developed seems to reject these measures — if they are even considered. The UK government's unwillingness to be interventionist is not shared by other nations.

Does Lord Heseltine's vision represent what an ambitious industrial strategy could look like?

Lord Heseltine recognises that as a Minister he 'was confronted by the way other governments aided and supported their wealth creating capabilities'.¹⁰²⁹ He wants the Prime Minister to lead a national growth council with 'an overarching and long-term National Growth Strategy setting out its vision for wealth creation, with concrete commitments against which it can be held to account'.¹⁰³⁰ Public funding for economic development should be devolved and a clear strategy for every sector of the economy agreed with industry and academia.¹⁰³¹ The Growing Places

Fund and City Deals are welcome steps, but Lord Heseltine suggests that while ‘all these initiatives are welcome and empower local places’, the government approach prior to the industrial strategy was ‘piecemeal and creates complexity. It is as though the government is prepared to dip its toe, or even several toes, in the water but is not yet prepared to accept the logic of its position with the confidence it should.’¹⁰³² He suggests bringing the multiple pots together into a single pot to support growth through a competitive process¹⁰³³ and allowing ‘all major sectors of the economy the opportunity to form a relationship with government’.¹⁰³⁴ The latter they have begun to do with the creation of the Industrial Strategy.

Conclusion

The Industrial Strategy as currently constituted will achieve the government's objectives because the objectives identified are not sufficiently ambitious. It is easy to meet them. The Strategy as constituted gives the appearance of being an effort to indulge a Minister (Business Minister Vince Cable MP) who has publicly argued for an Industrial Strategy (see March 2012 Open Letter to the Government), without committing the resources to allow that strategy to have a major impact on the future direction of the UK economy. It is hoped that this strategy will grow piecemeal as elements of the existing strategy are recognised to have been successful. Almost absent from the strategy are considerations of the cost of labour, the total level of employment and the exchange rate, amongst others. The strategy offers no comfort to the UK unemployed, whose skill levels do not match the high skills expected of those who will fill the few new posts created by this strategy. It is guilty of a lack of ambition.

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