

The future of UK manufacturing: Sector-by-sector analysis

In this section we consider the specific issues, challenges, and opportunities facing a selection of industry sectors of the UK manufacturing base, looking at the historical perspective, the current state of play, and the prospects for the future.

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Automotive



British cars were
once a byword
for excellence

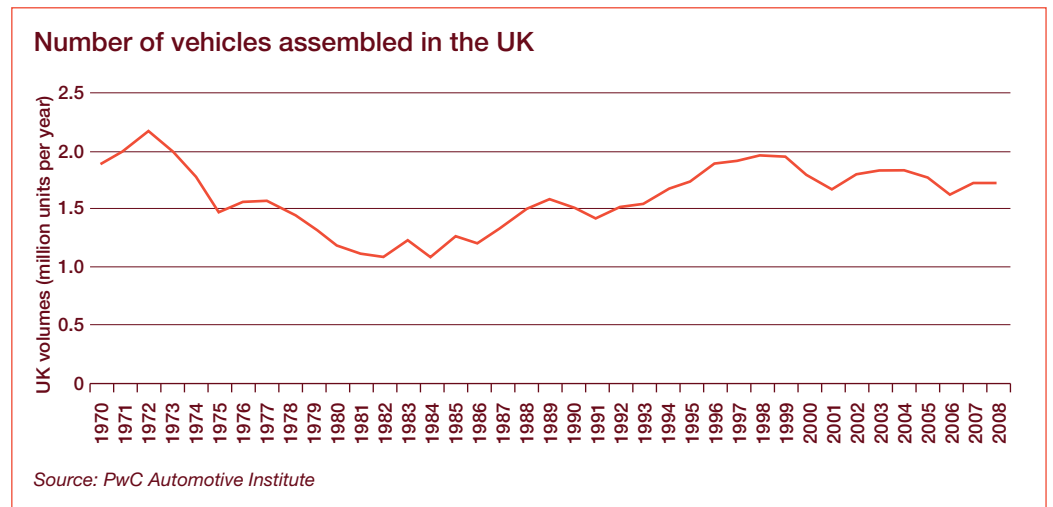
The historical perspective: the golden age and after

The UK was one of the driving forces in the development of the automotive industry, with world-leading brands like Rolls-Royce, Bentley, Jaguar and MG. In addition, the American Original Equipment Manufacturers (OEMs) chose the UK as a key base to develop and manufacture vehicles for European market. UK car production peaked in the early 1970s, at over 2 million vehicles per annum. By 1983, however, this figure had halved.

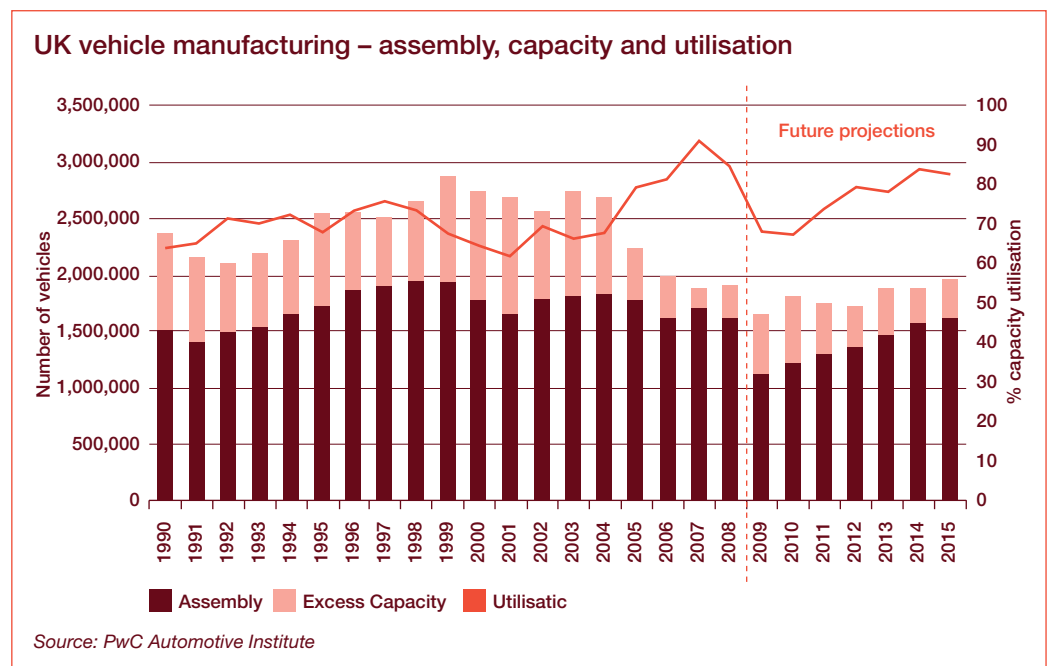
Two factors were needed to stimulate renewed investment in the 1980s and 1990s: UK government assistance, and the Japanese strategy to 'make where you sell'. Vastly improved productivity and supply chain efficiency followed, combined with better industrial relations, lifting annual volumes back to the 2 million mark in 1997.

The current state of play: holding its own, for now

Many headlines have been made about UK car plants closing: plants at Luton (GM), Dagenham (Ford), Browns Lane (Ford), Longbridge (MG Rover) and Ryton (Peugeot) have all ceased final vehicle assembly since 2002. However, the impact on production volumes has been much lower than this would imply. In fact, the UK produced more vehicles in 2007 than in 2001, as other plants, for example the MINI factory in Oxford, have seen strong growth.

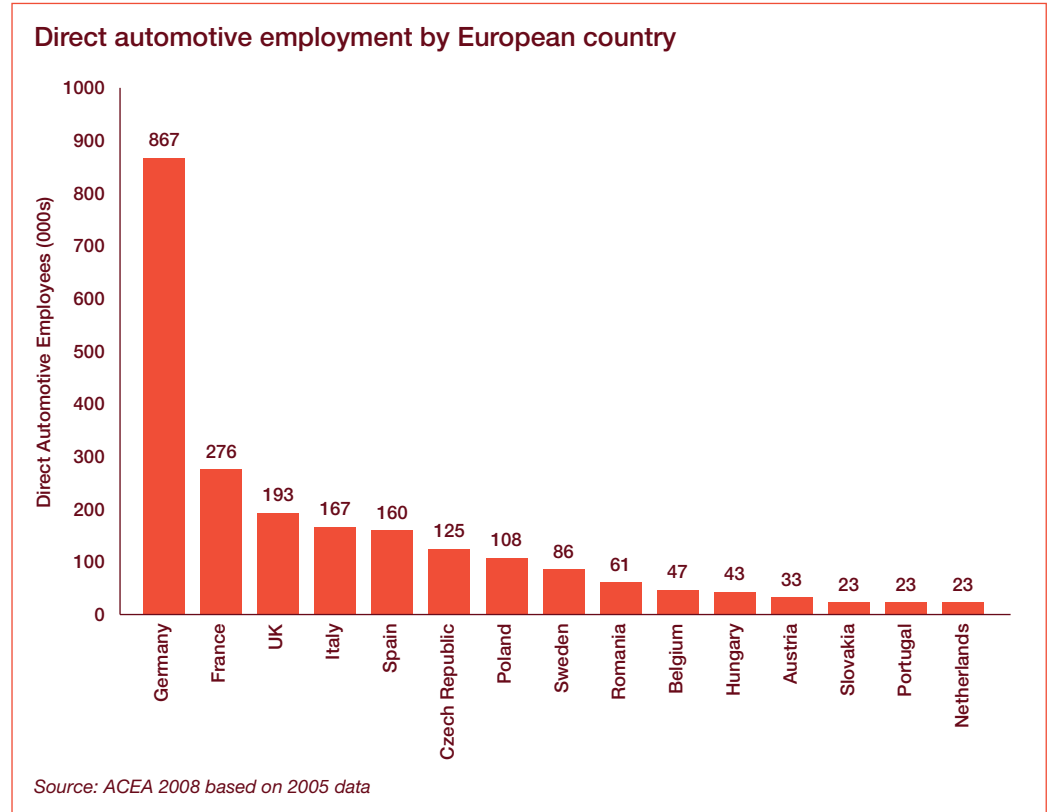


Over the same period, capacity utilisation (a key driver of profitability) increased from 62% to over 90%. So although the current crisis is putting considerable strain on the industry, this was immediately preceded by arguably its most successful period in recent memory.



More recently it has been Japanese investment that has driven up standards

So the contribution of the industry to the economy is still significant: auto manufacturing in the UK has a total turnover of £51bn, accounts for 3.5% of UK GDP and 11% of exports, and supports Europe's third largest automotive workforce.



‘Higher standards have been set by Japanese manufacturers which has been a major benefit to UK suppliers in such a competitive, quality-led market’

Anthony Marrett, MD
Precision Micro

The UK is still the third biggest car market in the European Union based on 2007 registrations, and maintaining a manufacturing presence in large markets is part of the Japanese marketing philosophy. In a BERR survey of Japanese OEMs and suppliers operating in the UK, ‘proximity to customer’ was cited as the second most important factor in location decisions, after ‘workforce quality and cost’. Therefore, partly due to its market size, the UK has attracted more investment from Japanese OEMs than any other EU nation. This has had a positive impact on the UK industry as Japanese manufacturers have demanded higher quality from the supply base, raised standards and established benchmark production sites in the UK, such as Nissan’s plant in Sunderland.

However, there are both short term and medium term pressures on OEMs to re-assess their manufacturing base. In the short term, sales of new cars have fallen sharply since the onset of the downturn, and many manufacturers are on short-time working, or have shut their factories temporarily. While a turnaround is expected in the next few years, car consumption in Western markets is then expected to level off, whilst OEMs continue to drive improved capacity utilisation. Permanent closures cannot be ruled out, particularly in countries with more flexible labour markets such as the UK.

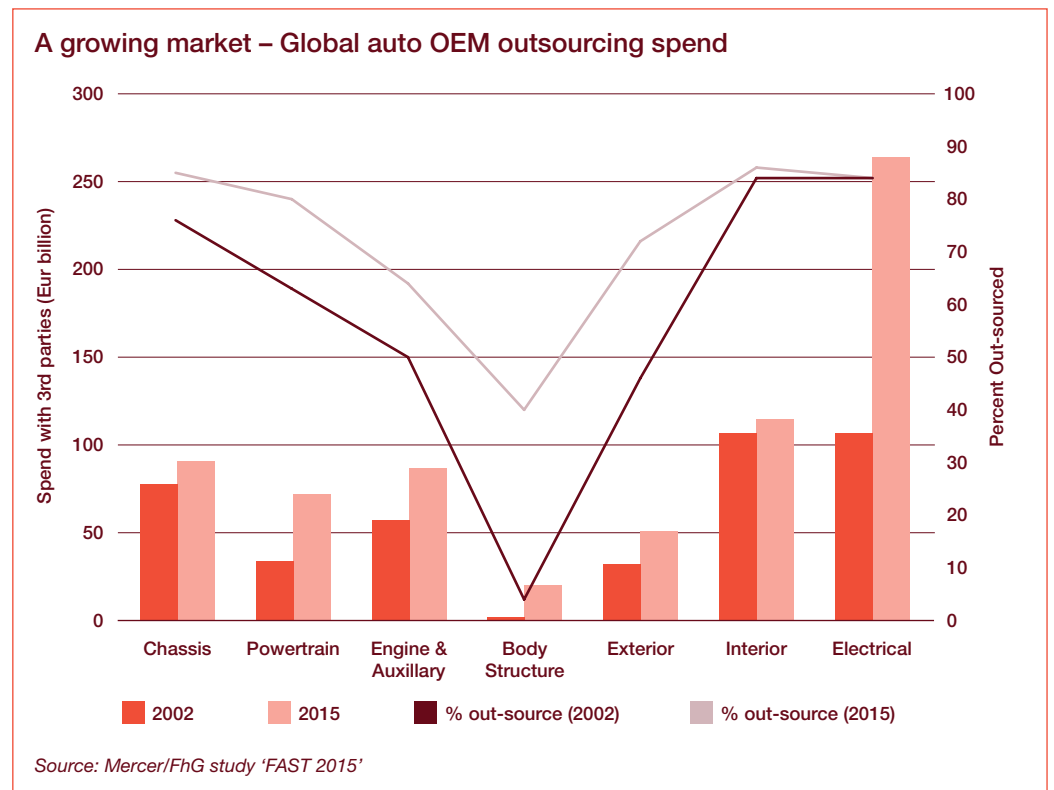
Outsourcing is changing, opening up new opportunities for automotive suppliers....

That said, we believe the Japanese manufacturers will retain a presence in the UK. The trend towards local outsourcing is likely to continue and this will give UK suppliers an opportunity to capture high value development and manufacturing work. As we discuss below, active co-operation within the sector and collaboration with leading automotive development institutions, will both be critical.

Prospects for the future: new opportunities in outsourcing, proven expertise in engineering

In the 1930s, Henry Ford’s factories received iron ore at one end and shipped out finished cars at the other, with foundries, stamping plants, and machine-shops on site. Since then, more and more of the manufacturing content has been outsourced, to the point where today’s OEMs add only around 30% of the vehicle’s final value.

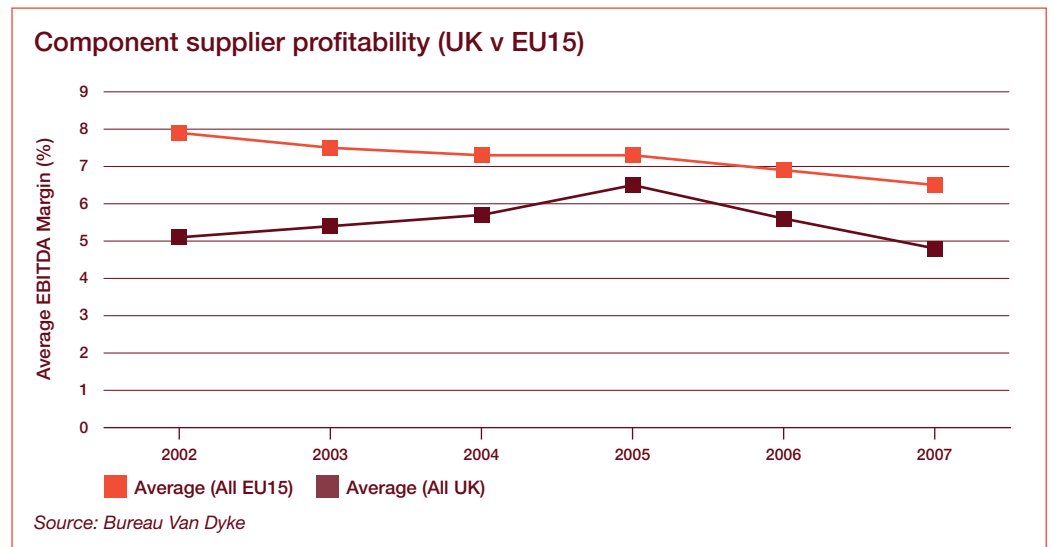
As in most manufacturing sectors, out-sourcing started with low-tech, high-volume components, shipped in from low-cost and emerging economies, to the detriment of UK manufacturing. However, the remaining outsourcing will be focused on increasingly complex items such as those associated with ‘greener’ powertrains and enhanced passenger comfort and safety. The sourcing model for such items favours mature supply chains located close to the point of use, creating a real opportunity for UK suppliers.



... but there are issues the industry will need to resolve

Likewise there is a clear advantage in using local suppliers where transport costs or the requirement for agility is unusually high: stamped body panels are costly to package and transport; interior trim parts are sequenced to meet production schedules set on a daily or hourly basis. As well as reducing lead times, logistics costs, and working capital requirements, shorter supply chains also cut both tactical and strategic risk, from production delays on the one hand, to political risk and counterfeiting on the other. All these factors tend to become more significant as the out-sourced component becomes more complex, which adds up to a compelling case for foreign car manufacturers based in the UK to use British suppliers.

Unfortunately, a 2008 BERR report on the business environment for Japanese automotive companies in the UK noted that OEMs and Japanese Tier 1 suppliers would like to source more components from the UK, but struggle to find suitable partners. The most common problems cited were cost, poor responsiveness, short-termism, and slowness to adopt lean techniques, particularly in the fields of electronics, facilities and tooling. The UK practice of quoting low and trying to force prices up mid-contract was another frequent complaint. Competing on price is not where the UK's strengths lie, but these issues may be part of the reason why UK suppliers have consistently posted profit margins below the EU average.

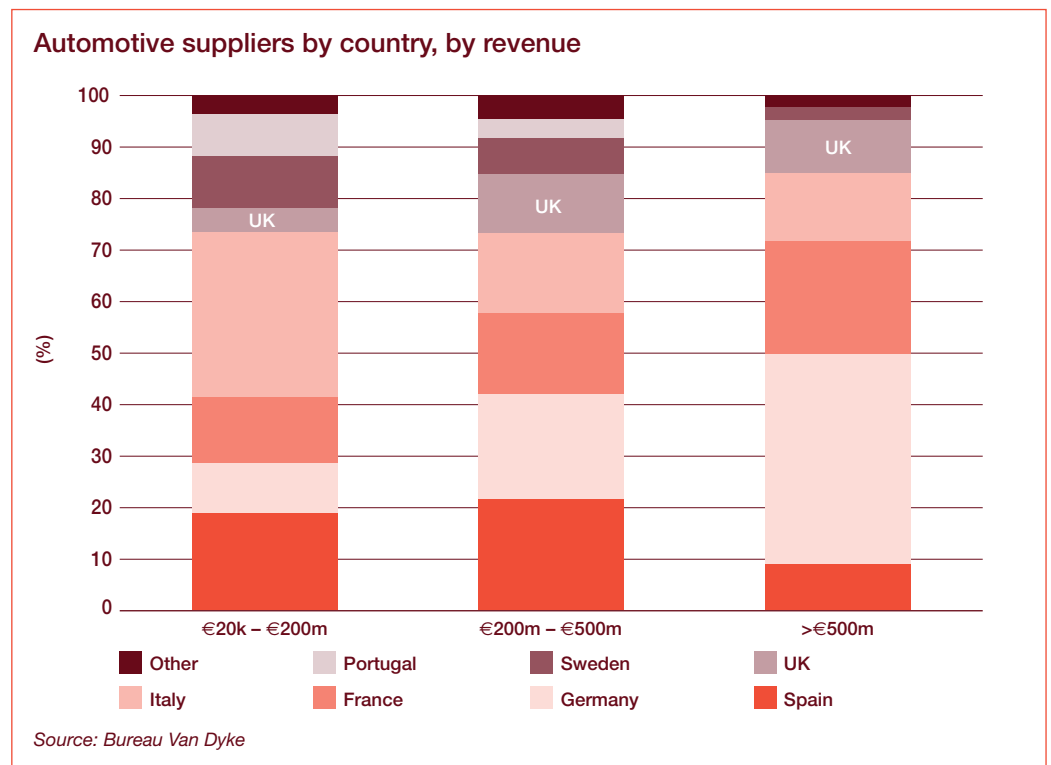


There is likely to be further consolidation in the supply base ...

However, the BERR report also demonstrated that the UK does have some highly regarded expertise, particularly in metal parts – casting, forging, machining and assembly. This is no doubt one reason why the number of engines produced in the UK annually is over 3 million and rising. Other strong sectors include plastic products and raw materials.

If the UK is to make the most of these skills and maximise the opportunities opened up by local sourcing, it will need to develop specialist knowledge across a range of disciplines, and invest in manufacturing capacity. Larger companies will be better placed to do this, and as a result we believe that the automotive supply chain will continue to consolidate, as it has been doing for the past 30 years.

At first sight the UK appears poorly placed to drive this consolidation as it lacks a concentration of large automotive suppliers. As shown below, the German market, for example, is dominated by suppliers with revenues exceeding €500m, while more British output comes from companies with €20m-500m revenues:



... but the UK is more likely to succeed through the development of industrial clusters

The UK has world-class engineering research, but it is under-exploited

‘There will be someone trained in Coventry in almost every good design studio around the world.’

David Smith, CEO,
Jaguar Land Rover

However, a substitute for physical consolidation is virtual consolidation through ‘clustering’ – the co-operation of diverse, usually co-located, companies within the same industry who together can provide service greater than the sum of their parts. The most prominent example is ‘Motorsport Valley’, which has grown up organically in the area between Northampton and Milton Keynes, and was home to seven of the eleven Formula One teams in 2008. As with clusters in other industries, tight local networks like this are particularly good at developing new links and partnerships, and this will be a key success factor for the future. The UK car industry must get much better at collaboration, whether in marketing or the development of new products or services, if it is to compete effectively against the emerging global giants.

Another area of real and under-exploited opportunity is the UK’s outstanding track record in engineering expertise and research. Our motoring heritage has given us several world-class engineering consultancies and academic research institutions. Companies like Lotus Group, Ricardo, Prodrive and McLaren Group provide cutting edge consultancy services to vehicle manufacturers around the world. Estimates from ACEA, the European vehicle manufacturers’ association, suggest that 20% of the independent global market in vehicle design-engineering is based in the UK.

UK expertise in this area is also reflected in the fact that UK trained automotive engineers are disproportionately prominent in automotive design offices around the world – the UK’s automotive design institutions, notably at Coventry University and the Royal College of Art, are globally respected.

But despite what should be a clear competitive advantage in design, the UK is severely under-represented when it comes to new vehicle development. In 2007, UK car companies accounted for only around 1.5% of the industry’s global R&D spend, despite manufacturing around 2.5% of global volumes. Jaguar Land Rover is the only major manufacturer to consistently develop new vehicles in the UK, and alone may account for about half of all UK development spend. The other big spender, Ford Motor Company, spends principally in its local specialities of powertrain and engine development. In general, companies tend to carry out R&D in their home country and then manufacture in the location which offers the best combination of proximity to market and lowest cost, either because labour costs are low or productivity high. This leaves the UK under-represented in terms of R&D in this technology-driven industry.

The challenge for UK industry is to leverage its respected niche position in automotive design to create more manufacturing employment and revenue. One clear way to do this is for forward-thinking companies to form alliances with research bodies to commercialise and exploit their ideas. Higher Education institutions have significant potential to assist automotive manufacturers, as realised in the examples of the Direct Injection Spark Ignition engine (jointly developed by University College London, Loughborough University, Lotus Engineering and Continental Powertrain) and Loughborough University’s Rapid Manufacturing project (funded by the Technology Strategy Board and industrial partners including Boeing and Bentley Motors). The UK’s strength in automotive design also puts it at the cutting edge of several important growth niches, such as green motorsport, alternative fuels, hi-tech manufacturing techniques, and powertrain refurbishment.

Three key factors for the future: collaboration co-operation and commercialisation

‘The UK has great latent potential for auto manufacturing. There is such a heritage and an enormous depth of people who are auto suppliers. They drop everything for auto... Our suppliers were eager to be involved in a new automotive project.’

Lord Borwick, Chairman,
Modex Electric Vehicles

Conclusion

The UK automotive industry has adapted to seismic shifts in manufacturing practices and emerged as a preferred investment target for some of the world’s leading car manufacturers.

As a successful niche player, the UK must look to high-value products to drive growth. The UK is at the cutting edge of several growth niches. This is in addition to an established base of suppliers and low volume OEMs whose focus on technology puts them in a good position to benefit from the continued rise in sub-system out-sourcing.

All the components to succeed are in place: a wealth of expertise and experience, globally respected development talent and a proud heritage in automotive manufacturing. Bringing all these together, especially in light of the current economic turmoil is another challenge. In our view the key question will be whether the industry can mobilise itself to collaborate, co-operate and maximise the commercial value of its engineering expertise. In the face of fierce global competition, the future for manufacturers in the UK depends on how well they collaborate with each other and to what extent they maximise the commercial value they leverage from our academic and private research bodies.

Aerospace & Defence



The UK has a leading position in the world A&D industry

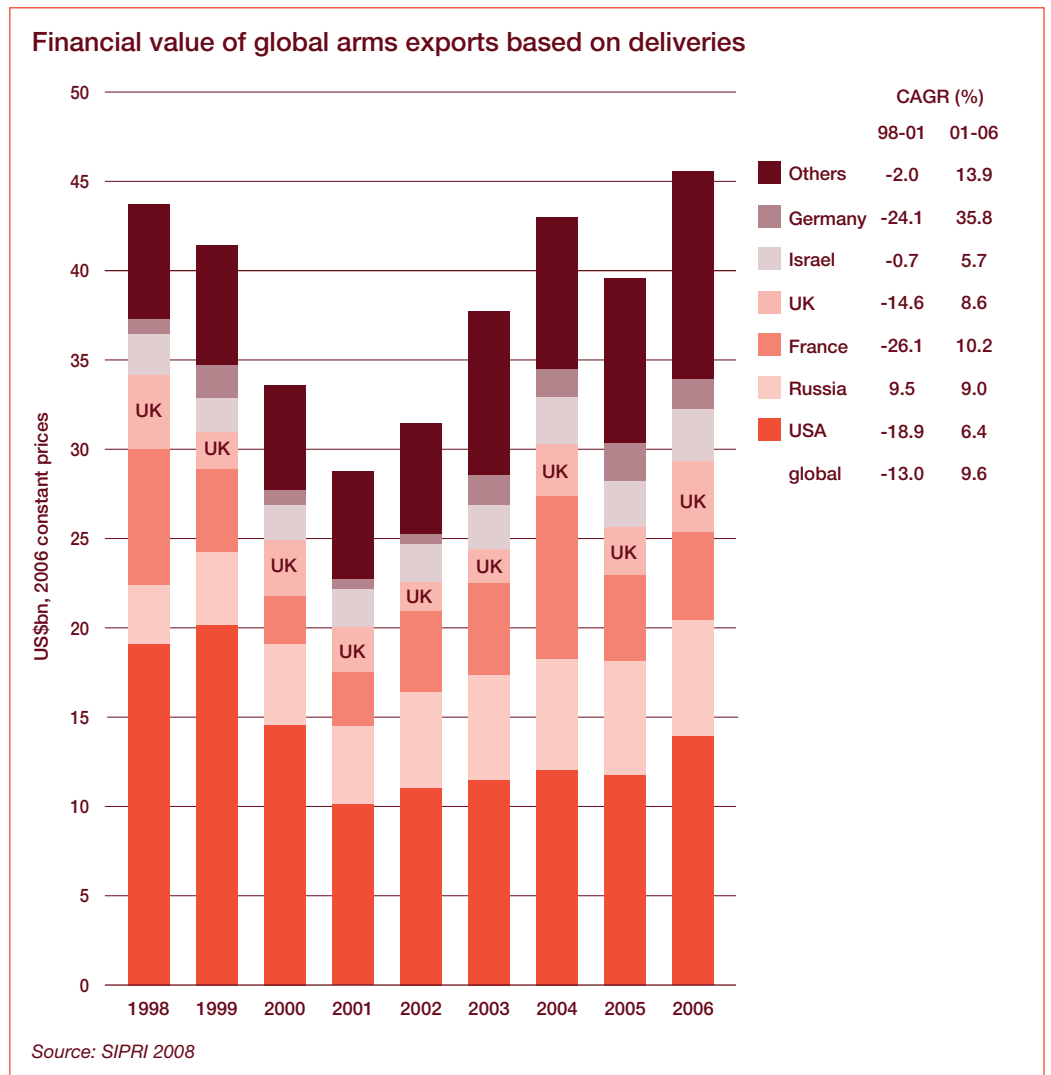
'A defence industry is a very long-term thing. You can't just build it overnight.'

Tim Otter, Future Business Director, Marshall Land Systems

The historical perspective: a genuine world leader

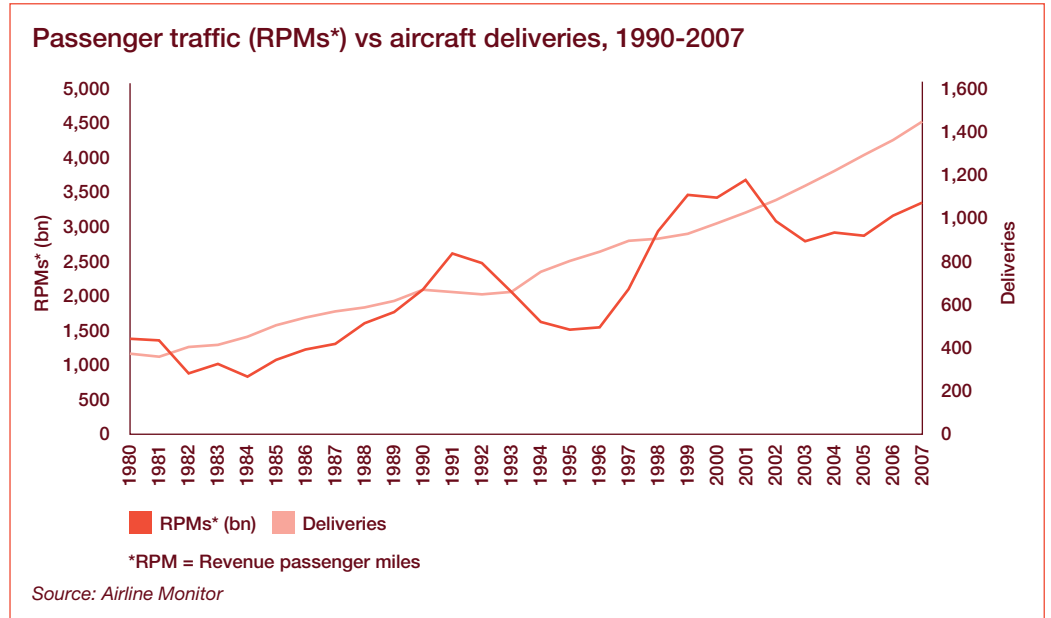
The UK Aerospace & Defence (A&D) industry is second only to the US. Eleven of the top 100 global A&D companies are based in the UK, accounting for around \$40 billion of annual sales. In 2007, the UK was the world's largest defence exporter by orders, largely thanks to the sale of Typhoon aircraft to Saudi Arabia.

The UK Aerospace & Defence industry expanded rapidly during the second World War. Post war, growth in civil air transport fuelled expansion of the civil aerospace sector and the UK was the first country to produce a commercial jet powered aircraft, the Comet. Many of the leading innovations that shape the UK's industrial base today originated in the UK including the jet engine (Rolls-Royce), Concorde (Airbus, GKN, Rolls-Royce) and Harrier jump jet (BAE Systems plc).



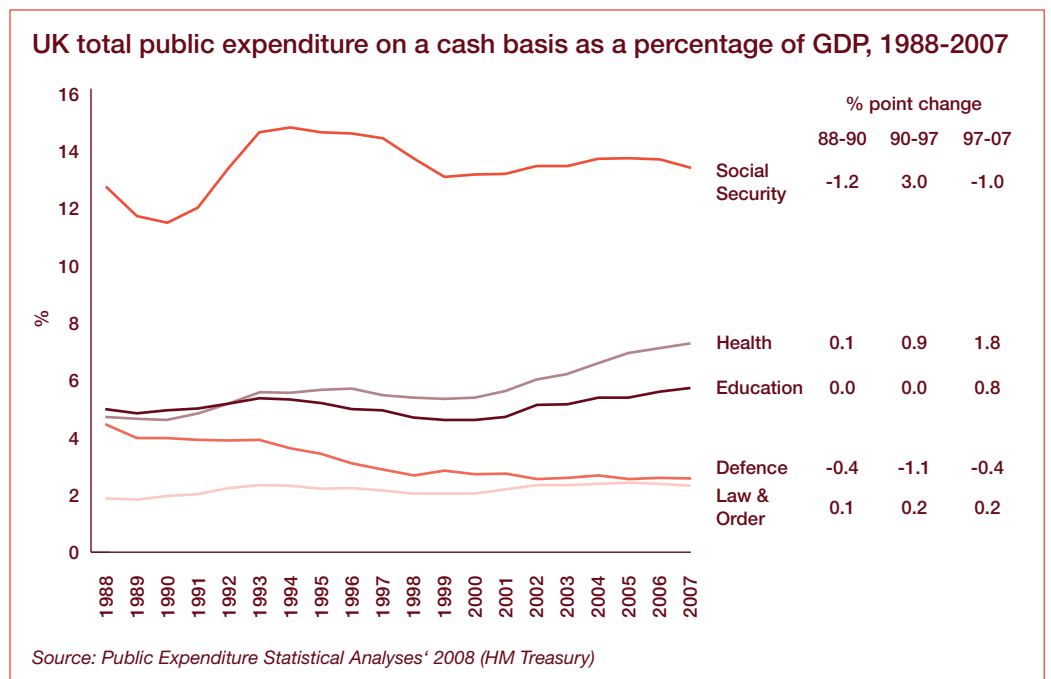
Aerospace and Defence are often coupled together as one sector, and while this makes sense in terms of their common technology and historical evolution, the underlying patterns of demand differ.

Demand in civil aerospace is global and cyclical, driven by the fluctuating trends of airline orders and deliveries, and the launch of newer aircraft models. In recent years, a significant backlog developed as manufacturers could not meet the strong increase in passenger demand. However, the civil aerospace market is now impacted by the tightening of the credit markets and the onset of the recession. Order backlogs will provide some cushioning effect as they work through the system but reductions in global demand levels tend to rapidly filter down through OEM supply chains to the UK's industrial base. See chart on page 12.



By contrast, UK defence demand is primarily dictated by the UK Ministry of Defence, the industry's largest single customer, and has historically been more stable than the civil aerospace sector. Moreover, within the total UK defence budget, spending on equipment has continued to rise, increasing by 40% between 1986 and 2007, even as active personnel numbers have dropped considerably. As a result, the UK has the second highest procurement spend per active service person in the world, second only to the US.

All the same, overall defence spending has consistently decreased as a percentage of overall GDP, dropping from 4.4% in 1987 to 2.5% in 2007. Other European nations have seen similar declines during the same period, which has also seen a significant increase in European collaboration on high-cost development projects like the Eurofighter and the A400M military transport aircraft.



The A&D sector is one of the driving forces behind the UK's R&D capacity

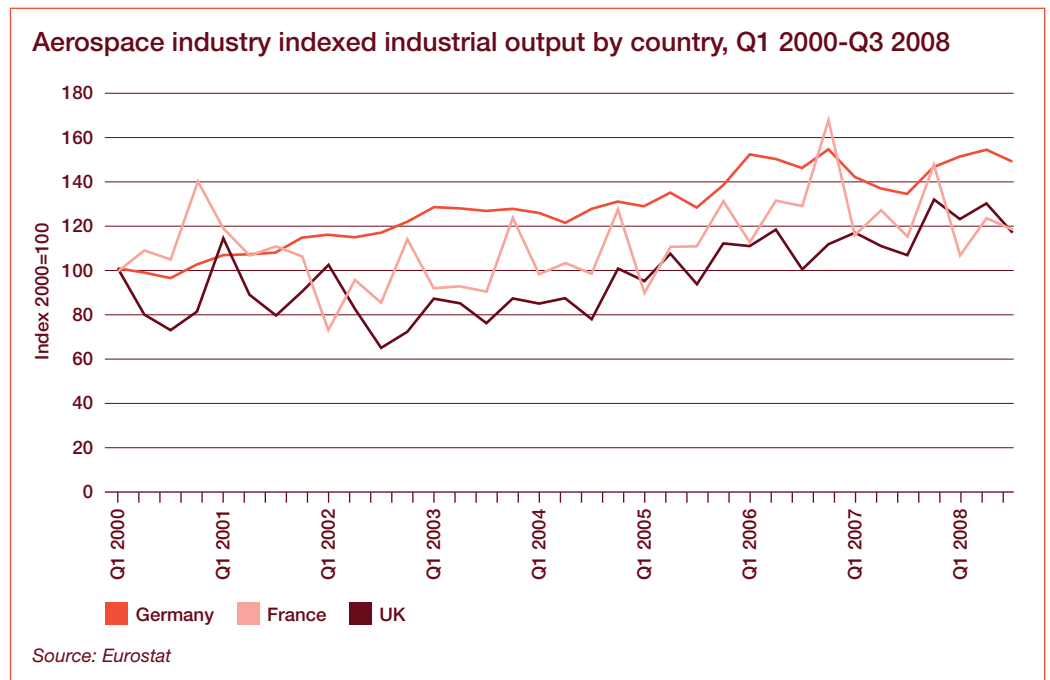
'The RAF is cutting edge, and system upgrades help keep their capability at the cutting edge, as well as keeping our products competitive in the export market.'
FTSE 100 Managing Director

Going forward, it is clear that the civil aerospace sector will continue to grow in the long-term. The outlook for defence spending is less certain as the underlying drivers are more complex, and the way governments respond to evolving security threats is difficult to predict.

The current state of play: still punching above its weight

A&D is still one of the driving forces behind R&D investment in the UK. The precise figure depends on classification, as much research that benefits this sector has other applications as well. The Bureau of National Statistics calculates that total A&D R&D has consistently exceeded £2bn p.a. in this decade.

The UK's success as a defence exporter owes as much to this high level of R&D investment, as it does to the sophistication of the UK armed forces as a primary customer base. It has also been driven by the need to supplement domestic sales with export revenues, given the level of investment required to maintain and upgrade systems designs. However, the UK is also proving to be an attractive market for overseas companies, especially in Europe, and competition is intensifying as a result. Figures from the Society of British Aerospace Companies show that between 2000 and 2008, production in the German aerospace industry grew by 49%, while in the same period UK and French aerospace output grew by 19% and 17%, respectively. Governmental support is a key factor in all three cases.



Outsourcing is becoming an issue here, as in other sectors

‘We will never compete with low cost – we need to be smarter and focus on where we can add value and protect employment in those areas’.

Allan Cook, CEO of Cobham plc

The A&D sector is also seeing the same trends towards outsourcing that have affected so many other traditional manufacturing industries. In the case of A&D the driving forces are both cost reduction and the need to have local operations in place to secure contracts with overseas customers. There are also subtle differences in this respect between civil aerospace and defence. **As Andy Hamment, Group Marketing Director of Ultra Electronics says, ‘You have to draw a line between Aerospace and Defence. Civil aerospace is a global industry with fewer restrictions on sourcing – Airbus and Boeing want to spend where they are selling aircraft. Off-shoring in defence is limited by the need for operational sovereignty and security restrictions.’**

In civil aerospace, this shift to local sourcing (i.e. sourcing components from countries that purchase their aircraft) by the big manufacturers is changing the focus of competition from cost to geographical and technological factors. Western-based suppliers are setting up operations abroad, as Spirit AeroSystems has in Malaysia, while companies in some developing countries are moving up the value chain as they develop their design capabilities, which intensifies the level of competition.

In defence, there are a number of structural factors that limit the extent of off-shoring. These include security restrictions, the requirement to maintain operational sovereignty, and the lower labour intensity and volumes that tend to characterise defence manufacturing.

In the UK, off-shoring is likely to have the greatest impact on the fragmented firms further down the supply chain, where the costs and challenges of establishing overseas operations are prohibitive. As with so many other UK manufacturers, the key here will be to establish a market position based on R&D and technological expertise, not price.

Prospects for the future: challenges and opportunities

Looking ahead, the UK A&D industry faces a number of challenges and opportunities. The senior executives we interviewed identified five in particular:

- The outlook for domestic demand
- Maintaining the UK’s competitiveness in exports
- Defending against off-shoring but also exploiting that opportunity where prudent
- Government investment and support
- Skills retention.

It is notoriously hard to predict demand in A&D, especially in defence, and this can make it difficult to manage R&D spend. The UK MoD developed its original Defence Industrial Strategy in 2005 in collaboration with industry, with the aim of supporting ‘national champions’ and retaining key defence capabilities in the UK. One key objective of the strategy was to set out government priorities, to give the industry more clarity for long-term decision-making.

However, our interviews with industry leaders have highlighted that a combination of changing operational sovereignty requirements and budget pressures have continued to complicate this issue, and most industry players still find it difficult to make long term plans. R&D is a vital driver of innovation in the A&D sector, and there is a need for more investment, targeted more precisely. It may well be that the time has come to move away from investment in numerous regional centres of excellence, as this is not only potentially wasteful, but could be hindering the cohesion the UK A&D industry will need for the future.

The key challenges for the future focus on demand, competitiveness and skills

UK A&D may need to concentrate itself both geographically and technologically, in future

‘A willingness to share risk and to invest will be crucial to the survival of SME’s. The Society of British Aerospace Companies and larger companies need to help with this. Unless this happens we will see more and more off-shoring, and this will be very difficult to pull back from’

Frank Bamford, VP Strategy
GKN Aerospace

The prospects for A&D globally are positive, but the UK will have to fight hard to retain the position it now enjoys

The shortage of skilled labour is an issue across UK manufacturing, and A&D is not immune. The senior executives we interviewed pointed in particular to a shortage of systems engineers and skilled technicians. A&D also has one unique problem not shared by other industries: even though the number of science and engineering graduates from UK universities continues to grow, an increasing percentage of these graduates are foreign nationals who are unable to work in the defence industry. This is one reason why some aspects of A&D work are being redirected off-shore. Likewise the very long timescale of most A&D programmes demands different skills at different times: systems design demands experienced engineers, while the later production phase requires the input of skilled technicians.

Both government and industry have made various attempts to address the skills issue, but there is a need for more co-ordinated action by all interested parties if the UK is to retain a world-leading and globally competitive A&D industry.

Conclusion

A&D is likely to remain a global growth industry. Britain’s place within that industry will largely be determined by two key factors: one is the country’s export competitiveness, and the other relates to the UK’s own operational sovereignty and equipment requirements, and its procurement funding levels.

We believe there are four key priorities for continued success:

- An affordable defence equipment programme, which will allow both government and industry to plan for the future
- Consolidation further down the supply chain, which will improve the UK’s export cost competitiveness, limit the threat of off-shoring, and enable the major manufacturers and suppliers to migrate supply chains abroad
- Continued government investment in R&D and skills
- The development of a ‘home markets’ strategy and international manufacturing capacity for leading UK-based A&D companies.

Oil & Gas Refining

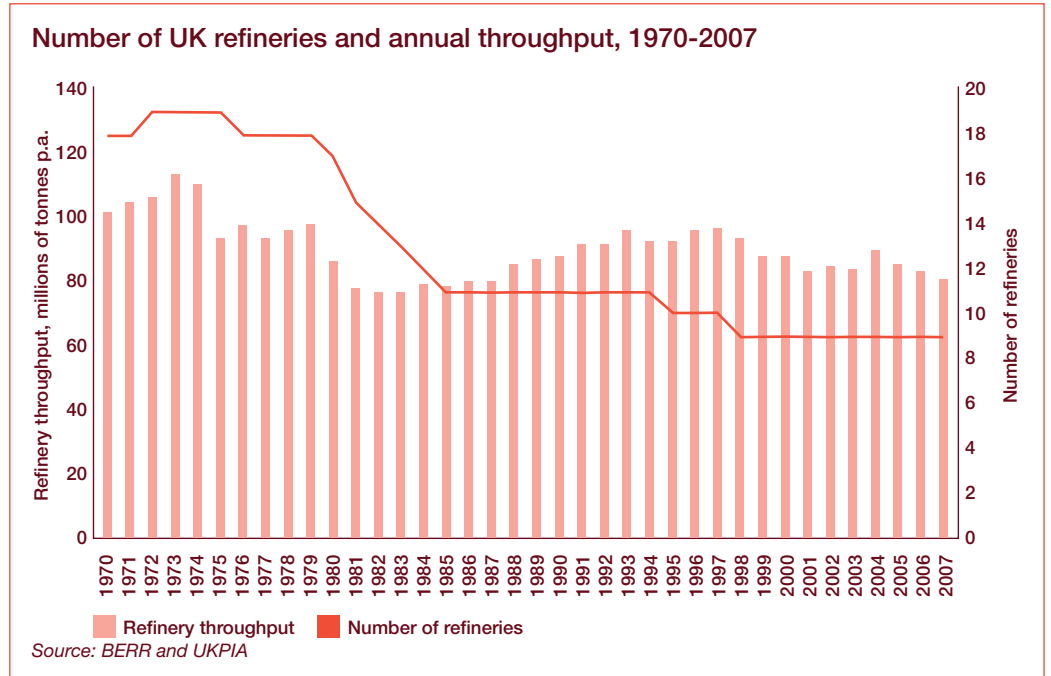


The oil and gas sector has historically been one of the UK's success stories

The historical perspective: the North Sea and after

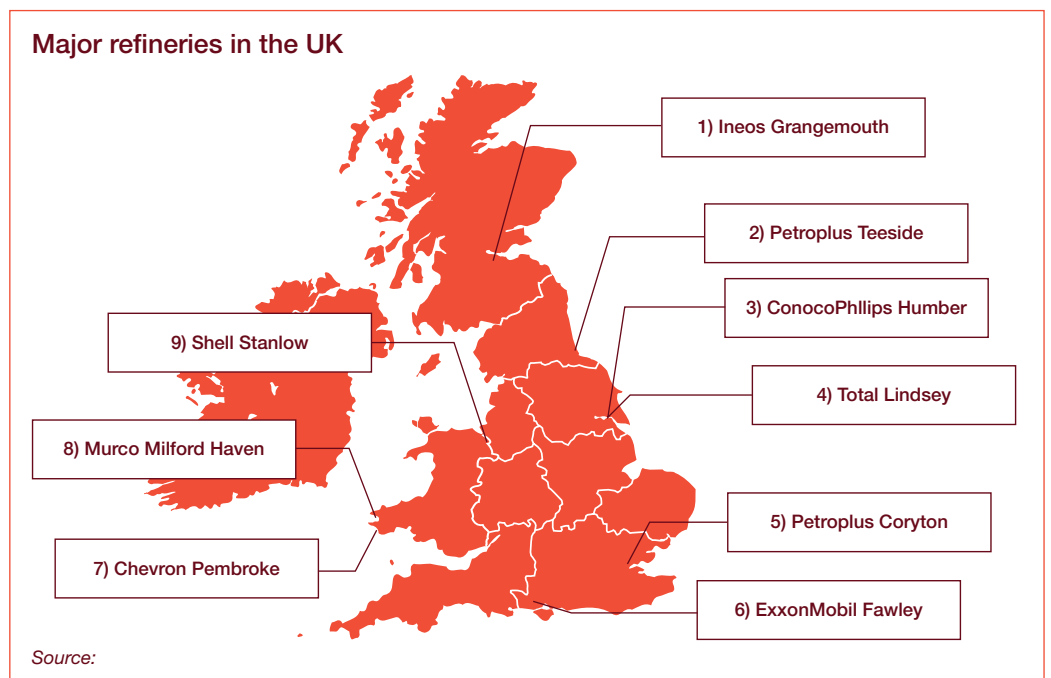
The UK has been refining oil since the early 1940s, initially using imported crude oil. Oil & Gas' share of UK manufacturing activity soared and widened to become a major contributor to GDP in the 1960s-70s, as a direct result of the discovery and exploitation of the North Sea oilfields. A significant amount of refinery investment was made at this time.

The first real challenges began to arise in the 1970s as the demands of the local UK market began to change, requiring costly capital expenditure in the refining area. First, demand shifted away from heavy fuel oil toward lighter products. A small number of refineries closed as a result, but several adapted by investing in 'cracking' technology to upgrade fuel oil to other products. Overcapacity in petrol and a shift in demand to diesel caused further closures in the 1990s. Overall, the number of large UK crude oil refineries has declined from 19 to 9 over the past 35 years but overall output has held up relatively well, largely as a result of increased productivity and capacity utilisation. The UK still has the 4th largest refining capacity in Europe.



Today the remaining refineries employ around 15,000 people (a 75% reduction since the 1970s), and are some of the most complex in Europe. Secondary conversion capacity for gasoline production is particularly competitive with mainland European refineries. UK refineries are spread around the country, and are linked by good distribution infrastructure and storage facilities, which results in some of the lowest pre-tax petrol costs in Europe.

At this point no new refineries are planned, though continued de-bottlenecking and consequent capacity expansion are expected from existing facilities. Looking forward, the volume growth rate in refining is expected to be less than 0.5% p.a.



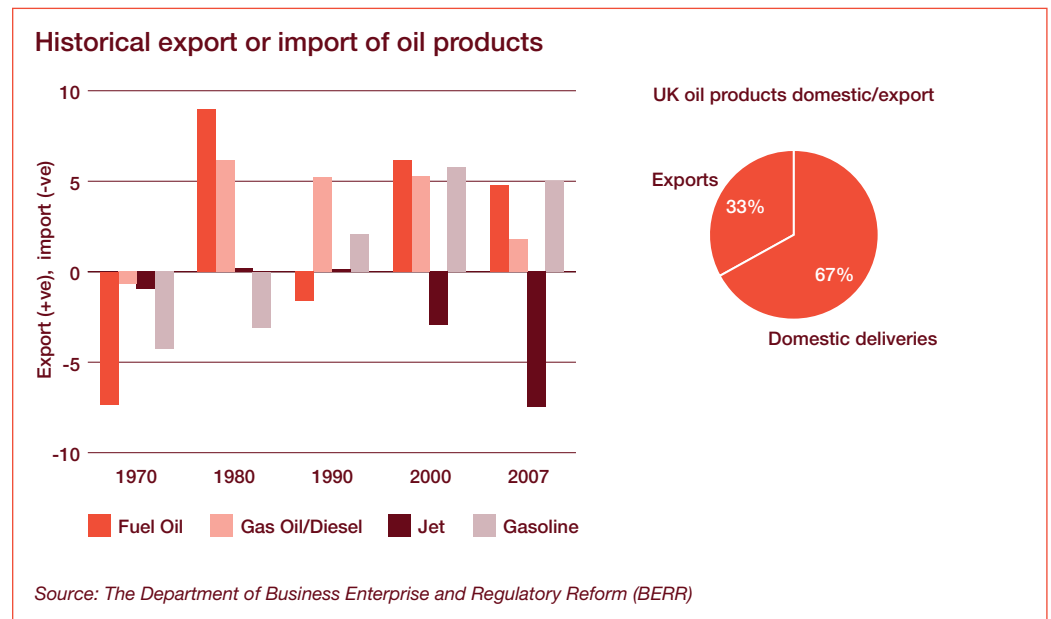
Refining is facing a tough combination of undercapacity in some areas, and overcapacity in others

The current state of play: getting the mix right

The challenge today for UK refining stems from the fact that the majority of Britain's refineries were built in the 1950s and 1960s, when there was heavy demand for fuel oil and petrol. As discussed previously, this has changed over time and the UK refining base has struggled to keep pace, primarily due to the very low margins that prevailed through much of the 1990s and the limited cash flow available for investment. The challenge facing most UK refiners is the inability to produce enough of what the UK/European market wants to buy, and a propensity to produce too much of what it doesn't. Eventually they must either identify cost-effective methods to alter their output mix, or close.

There is currently an overcapacity in petrol and an undercapacity in both jet fuel and diesel in the UK. Excess petrol is shipped to the USA while jet is imported from the Middle East and diesel from Russia and the CIS countries, but this is unlikely to be a long-term solution. Declining demand and increasing bio-fuels substitution in the key US gasoline market, in combination with growing demand for jet fuel in the Middle East, will ultimately force UK refiners to adapt or cease trading.

Competition is a major issue, as are the new environmental standards the industry is having to meet



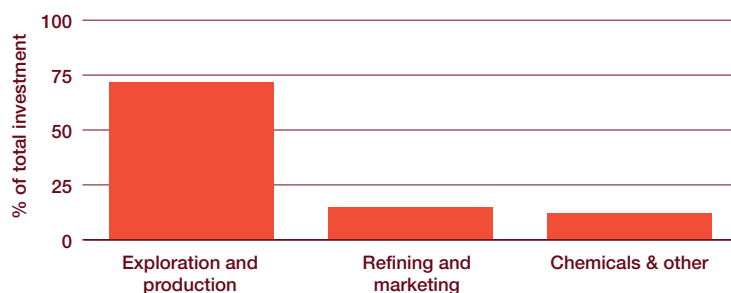
Despite this potentially bleak picture, ongoing and planned UK refining investments would indicate the UK refining sector is here to stay, although some lower-capacity refineries may be forced to close.

Our interviews with CEOs in the industry suggests that there are four main challenges for the future of refining in the UK:

- **Internal competition from better investment opportunities elsewhere:** many of what were the UK's major refiners (BP, Shell, Total) have oil and gas-related businesses in other geographies which compete internally for investment capital, and which may have higher returns than those generated by UK refining. Refining margins improved significantly in this decade as a result of a global shortage of refining capacity, but that was overshadowed until very recently by soaring crude oil prices, which helped many new upstream projects (including capital-intensive Canadian oil sand operations) deliver higher returns on investment than UK refining. This makes it challenging for refineries to access internal corporate capital.

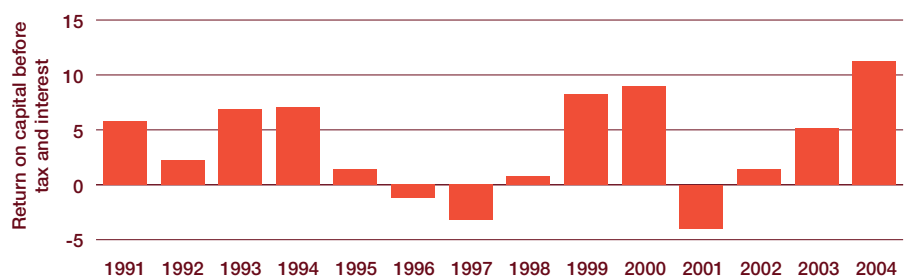
One might expect the recent collapse in oil prices to shift the balance back in favour of UK refining. However, significant new capacity in developing markets, coupled with a general slump in demand, has muddied the waters in recent months. The case for investment is not fully clear. Refiners that do not drill or pump oil themselves, however, do not have the capital allocation conflict as described above, and the fact that firms like Ineos and Petroplus are now operating refineries in the UK could, to some degree, protect and potentially give renewed competitive advantage to the refining industry in the UK.

Investment in finding and producing oil



Source: UKPIA Statistical report 08

UK refining and marketing return on capital before tax and interest charges



Source: UKPI: Meeting our energy needs

- **Growth in Asia:** in an industry that works to tight margins, lower-cost Asian refineries often offer the potential for better returns than those in the UK, although the largely-depreciated nature of UK assets does help reduce the gap.

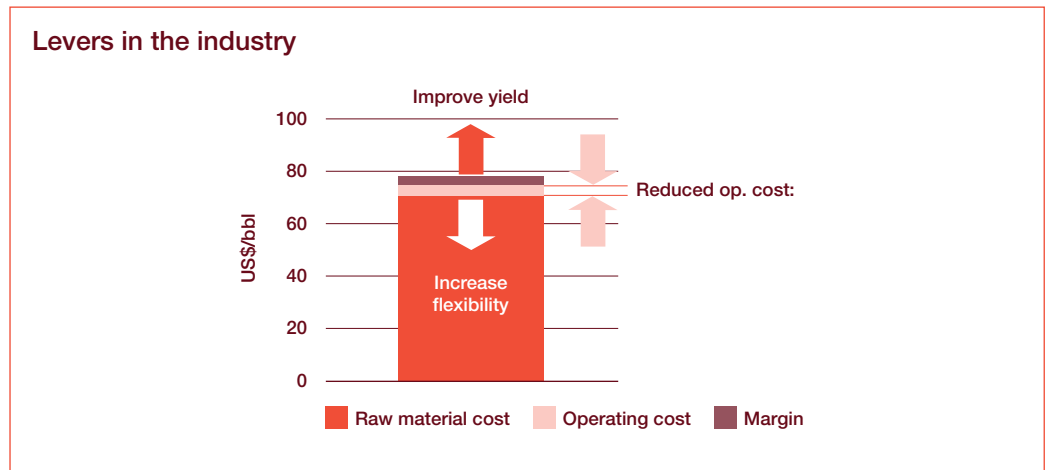
- **Cheap imports:** since 1999 North Sea output has been in decline. Domestic crude oil production is becoming increasingly difficult, and of lower quality, which increases processing cost. At the same time investment in developing markets is again creating overcapacity in the global refining market, with many new refineries having preferential crude supply and pricing structures through their parent oil companies. This could reasonably be expected to threaten the future of UK refining. The UK refining industry does, however, have one key advantage – the cost of importing finished products to British shores is higher than the cost of importing crude. This cost advantage is therefore likely to keep the sector profitable until at least 2020.
- **Higher environmental standards:** according to the UK Petroleum Industry Association (UKPIA), the refining industry has spent £5 billion in the last ten years to meet new environmental standards and improve product quality. This money has not significantly increased refinery capacity or profitability, but higher environmental standards do provide a barrier to entry from competitors outside the EU.

If the industry is to remain viable in the long term, it will need to surmount these challenges, and in our view this will boil down to two things: UK refining will have to act quickly to improve the profitability of its existing capacity, and then invest long term to upgrade it.

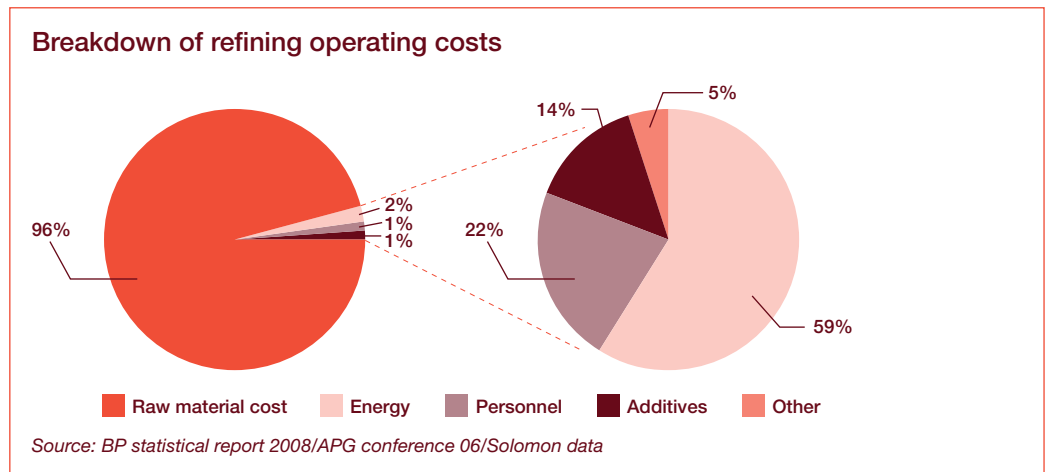
Prospects for the future: investment is key

In the short term there is only one way that the UK refining industry can improve the profitability of its existing assets: reducing operating costs, which are currently running at \$1- \$4 per barrel, and include energy, personnel, catalyst and chemical costs:

Future competitiveness will depend on short-term efficiency and long-term flexibility

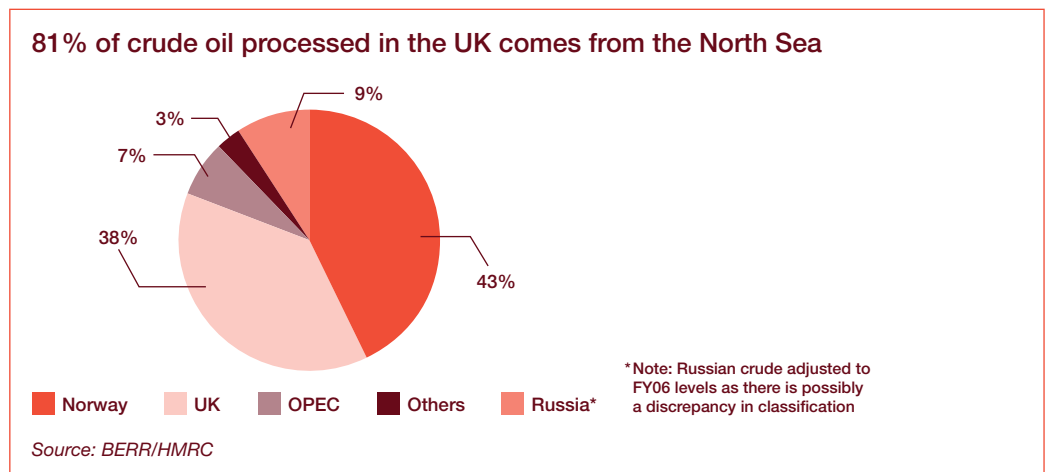


However, as the graph at the top of the following page demonstrates, this spend is only a very small proportion of the overall cost of refining – less than 4% of the outlay required on raw materials – so the scope for gains is limited. This means there is little advantage, for example, in moving operations to areas of cheaper labour. Energy costs are worth managing where gains can be made, but these still amount to only 2% of the industry's total costs.



Real and significant cost-savings will only be made longer-term through ‘capacity creep’ – in other words, by making new investments that create additional refining capacity from the existing physical assets. The current margin achieved by UK refiners is typically \$ 3.50 – \$5.30 per barrel. This could be increased by investing in new processes and technologies such as cokers, catalysts, and hydrocrackers; technology that can improve the yield of products with greater margin, providing this investment makes commercial sense. There is currently only one hydrocracker in the UK, and the new capacity coming onstream is going elsewhere. ExxonMobil, for example, is investing in Antwerp, not in the UK.

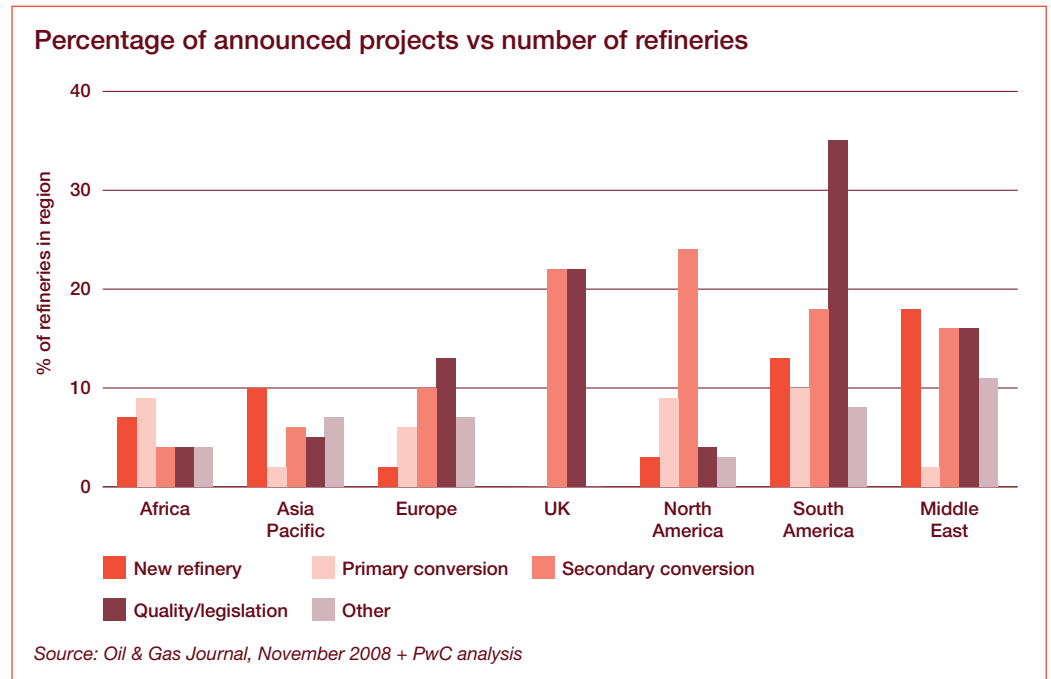
Looking further ahead, the industry could maintain its competitive position by making the significant investments that would allow it to deal with a wider range of crudes. UK refineries were originally designed to run on the sweet crude (i.e. low-sulphur, and therefore relatively easy to process) from the North Sea. These still account for 80% of feedstock but quality is deteriorating, as remaining extractable reserves are often heavier, more sour and more acidic.



Although some modifications have since been made, the UK is not as flexible – or as competitive – in this respect as many of its European counterparts, which can handle greater quantities of Middle East and Russian crudes. The higher sulphur content, acidity and viscosity (‘thickness’) of these crudes require specialised metallurgy, desulphurisation and hydrotreating equipment, and UK refineries’ capacity to handles these crudes is limited. Importing Middle Eastern or Russian crude typically adds around \$1.50 per barrel to raw material costs, but in certain market conditions it is still a more profitable option. But giving UK refineries the capacity to do this will demand significant extra investment – the UKPIA estimates upwards of £500 million per refinery.

The good news is that some of the refinery owners are already investing. Three projects have recently been announced to increase both secondary conversion capacity, and the UK's ability to handle sourer crudes. The Lindsey refinery on the Humber estuary is set to gain a £130 million desulphurisation unit, Chevron is planning to overhaul its Fluid Catalytic Cracking Unit, and the Humber refinery is spending £600 million this year expanding its hydrotreater. There are unconfirmed estimates that a further £2 billion could be earmarked for further upgrading at the Humber by 2013.

This investment in the longer term is especially important given that, as experience has proved, refineries that close are unlikely to open again and the consequences would not just be economic but political, since it would have a direct impact on the UK's security of energy supply. As long as we still have refining capacity in the UK, we can in times of national emergency pump oil from the North Sea and refine it to meet our needs even in the distant future – there will come a time when this is not the most economically attractive option, but in an emergency it could be a useful one.



Conclusion

The UK refining industry faces critical challenges that are unique to its industry. Put crudely, North Sea oil is running out, and the sector will have to decide how best to position itself for a future without it. According to Wood Mackenzie this could be a significant factor as soon as 2016.

That said, there is still strong demand from UK manufacturing industries dependent on oil-derived products including healthcare, packaging and plastics, and paints and glues, though UK refiners will face increasing competition in satisfying this demand. Likewise there could still be significant profits to be had from adapting existing refineries to take other types of crude oil, though the investment required is substantial, and the timescales for this sort of work are extensive – the time from an initial feasibility study to a new plant is around 3-5 years. We see grounds for cautious optimism but it won't be easy.

There are definitely some long-term opportunities for the sector, but they will come with a big price tag

Chemicals



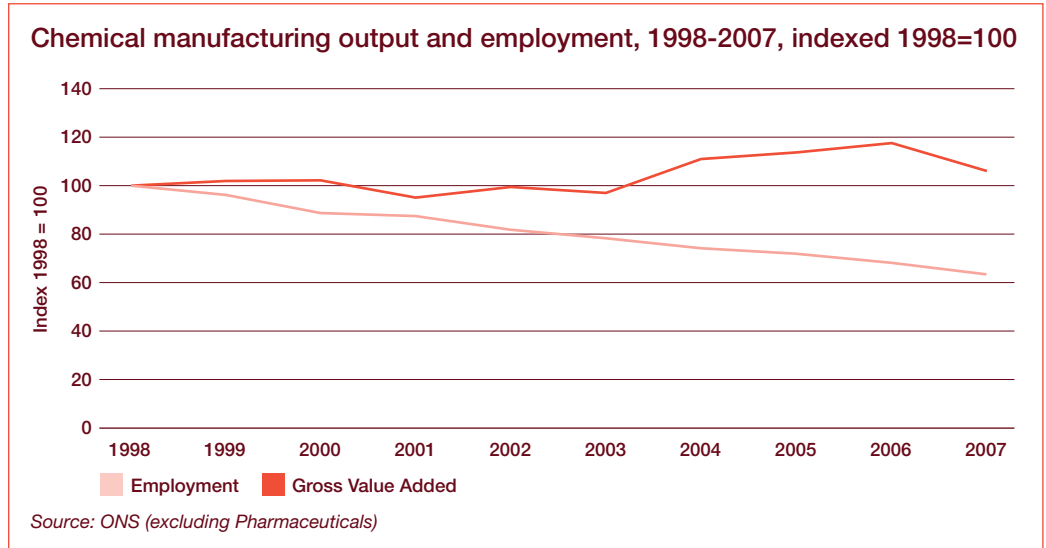
The UK used to be one of the world leaders in chemicals

Even today the industry is in better health than it may initially appear

The historical perspective: a spent force?

Some people would see the history – even the very name – of ICI (Imperial Chemical Industries plc) as a symbol of the apparently uninterrupted decline of the UK chemicals industry since the Second World War. Once an ‘imperial’ company in every sense of the word, with a worldwide presence, international standing, and a permanent place in the FTSE 100, ICI now survives only in some residual brand names, with the main business broken up and sold off to foreign owners. And there do indeed seem to be compelling parallels here with the UK chemicals industry as a whole. There are only four chemicals companies in the whole FTSE 350, and the number of people employed in the sector has dropped from over 206,000 to circa 130,000 in the last ten years.

But this is far from being the full story. Much of the UK chemicals infrastructure is still in place and productive, albeit sometimes under foreign ownership e.g. SABIC. In fact, the chemicals industry is the UK’s second largest manufacturing exporter, adding over £10 billion to the country’s GDP, and with a trade surplus of around £400m in 2007. And despite the statistical decline in employment in the last decade, the value of the sector’s output has actually increased during that period, driven by rapid and significant increases in productivity. Outsourcing has also made it harder to assess exactly how many people work in the industry, since many who were once employed directly by chemicals companies now work for contractors – hence current statistics may understate the true figure.



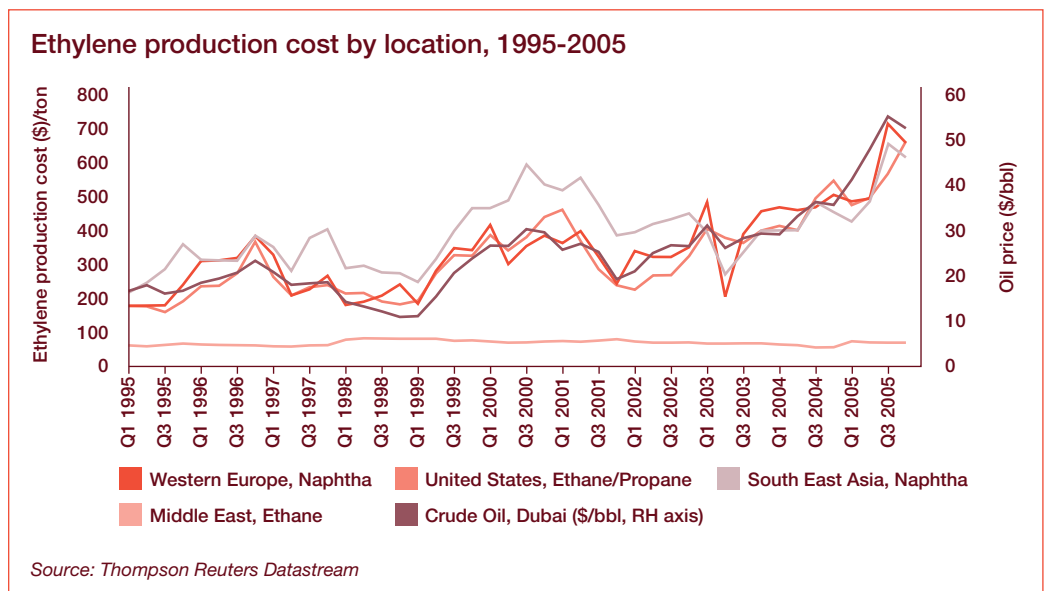
The current state of play: down, but not out

Chemicals is a heavy industry, and that alone is one of the main reasons why it has managed to survive relatively intact in the UK: both the raw materials and finished products are bulky, volatile, toxic or a combination of all three. In almost all cases they are expensive and difficult to transport, and as a result many chemicals plants were originally located at sites that were close to their principal customers, or their main suppliers, the most obvious example of the latter being North Sea oil. When these sites grew over time they often did so by expanding into easily-transportable products, such as paints, or by using imported raw materials, as was the case with BP's Naphtha cracker at Baglan Bay.

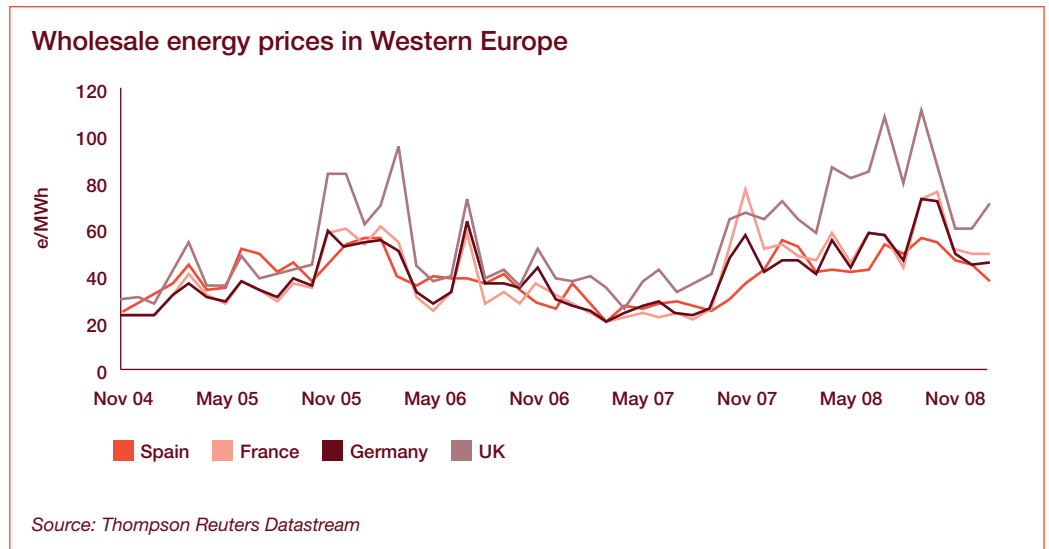
But in recent years the dynamics of the industry have changed. A number of factors have combined to bring this about:

- The supply of raw materials is either being exhausted, or becoming uneconomic. Many UK operators are already seeing the impact of declining North Sea oil reserves.
- It has become cheaper to move production to other low-cost economies. For example, Ethane crackers in the Middle East can produce Ethylene at around one tenth of the UK price.

The dynamics of the industry have changed...



- Energy prices have risen, especially in comparison to the European mainland. Wholesale electricity in France, Germany and Spain is, on average, around 25% cheaper than in the UK, and this has an enormous impact on the competitiveness of an industry where energy can account for up to 70% of the total variable costs.



... and while there are significant challenges ahead, the sector has some built-in advantages, and has actually grown in recent years

- The plants themselves have aged. The useful life of many production facilities is around 30 years, and in recent years many have been closed rather than undergo the cost of refitting. At the same time, the pace of technological change has quickened, making it harder and more expensive to keep older plants up-to-date. For example, many mercury cell Chlorine plants can no longer compete with membrane technology, and have been shut down. Older plants also tend to be smaller, which tends to make them less cost-effective: GrowHow closed its Severnside fertilizer site in 2008, saying that 'the facility is too small to compete.'
- Some sites have literally 'dis-integrated': many large chemicals sites used to house a number of different processes, all owned by the same manufacturer. But many of these individual operations have now been sold off to different buyers – the former ICI site at Wilton, for example, is now owned by no less than seven different businesses. This means that whereas the single owner used to be able to offset losses in some plants with profits upstream or downstream in the value chain, now a loss-making plant is more likely to be on its own and therefore closed.

Nonetheless, UK chemical production actually increased by 1.4% from 2002 to 2007, despite the fact that the number of UK plants declined. Those closed during this period included Baglan Bay (Ethylene), Staveley and Sandbach (Chlorine), Grimsby (Titanium Dioxide), Wilton (Nylon and Paraxylene), Grangemouth (Polyethylene) and Severnside (Ammonia). Most of these plants produced bulk chemicals, but this part of the market still managed to grow by 3.4% during this period.

Some of the sector's overall growth was undoubtedly the result of economic prosperity, and 2002 and 2007 were the acknowledged low and high points of the recent economic cycle. But there were also significant improvements in productivity, responsiveness, customer service, and the exploitation of intellectual property. This was especially true in the downstream end of the chemicals sector, in areas such as the manufacture of ingredients for cosmetics and personal care.

There are other reasons why manufacturing stays in the UK. Cleaning and remediating a former chemicals site can be so expensive that it can be cheaper to keep it running. Likewise it may be more economic – at least in the short to medium term – to maintain or increase production at an existing site rather than incur the capital costs of building an entirely new one elsewhere: a standalone plant typically costs 30% more to build than one on an existing large site which already has all the necessary infrastructure in place. And there are specialised skills needed in chemicals that are not easy to acquire or transfer to new markets. In some cases, these factors can combine together: As one director whom we interviewed observed, *'we brought [new manufacturing volumes] here for the simple reason we already owned and operated the site, our largest and best invested, with the most skilled operators.'*

Prospects for the future: innovation and specialisation

A key challenge for the UK Chemicals industry is that many of its plants are now reaching the end of their economic life. Refitting or replacing these sites may simply not be economic, especially in the current downturn: Ineos has already announced that it is reviewing the future of its 40 year-old G4 cracker.

Other closures will be driven by increased competition. The oil-rich Middle East is well-placed to expand downstream, and could compete fiercely on price, while the low-cost Asian economies will continue to draw manufacturing investment. At the same time, the UK will remain hampered by high costs of labour and energy. If it is to avoid shrinking to a purely domestic industry, the UK chemicals sector needs to find new sources of competitive advantage. As one leading figure in the industry told us, *'the key opportunity is market-facing [product] innovation'*.

There are already some examples of innovation in products like Polyethylene, which is now available in many more grades to suit many different applications, and in bulk chemicals, where it is currently mostly confined to larger-scale process innovations such as Lucite's alpha technology. In the longer term the pressure for innovation in bulk chemicals will be driven by the post-oil era, when it will be necessary to find plant-based alternatives for existing compounds. Recycled material is also a likely feedstock, whereby polymers are depolymerised and then made into high quality material.

By contrast, in the near future product innovation will be easiest to achieve in specialty sectors. Croda International plc, for example, recently launched their new 'Volulip' lipstick ingredient, building on the success of their previous 'Maxilip' patent. **As David Morgan, M&A director of Johnson Matthey plc observes, one model for future success may lie in having the 'production of newer, more innovative products... in the UK', which later 'moves abroad when the technology matures'**. Johnson Matthey are also at the forefront of value added services such as catalyst charging, discharging, recycling and commissioning services.

As in other sectors, knowledge and innovation will be key

Government has an important role to play

‘The government needs a clear strategy for manufacturing – which sectors it will back long term – backed by action and money that’s focused on value added and not just jobs created’

Paul Booth, President, Sabic UK

The role of Government

Many of our interviewees agreed that the UK government has an important role to play in promoting a more effective chemicals sector. One CEO we interviewed told us that ‘the government needs a flexible strategy that sees the bigger picture, like Singapore.’ In the UK the devil is often in the detail: for example, there are now over 20 different regulations affecting the industry. A streamlining and rationalisation of that regulation could help the sector’s ability to move fast and remain competitive.

The industry would also like to see the government make good on its commitment to be more ‘joined-up’: as one director observed, ‘a UK chemicals business may have to deal with up to ten different national and regional agencies, while the Irish government offers a ‘one-stop-shop’ where everything can be handled in one place.’

Conclusion

Particularly with the coming decline of the North Sea as a source of feedstock, the UK chemicals industry will continue to go through significant change. In the near term, we expect to see a continuing shift away from bulk chemicals toward more differentiated speciality products. But given the value of the installed manufacturing base, the extraordinary combined experience and expertise of the people who have worked in this sector for decades, and the opportunities in both speciality innovation and (longer-term) non-oil-based bulk products, we reject the idea that UK chemicals is dead or dying. Like UK manufacturing as a whole, it will continue to adapt.

Construction and building products

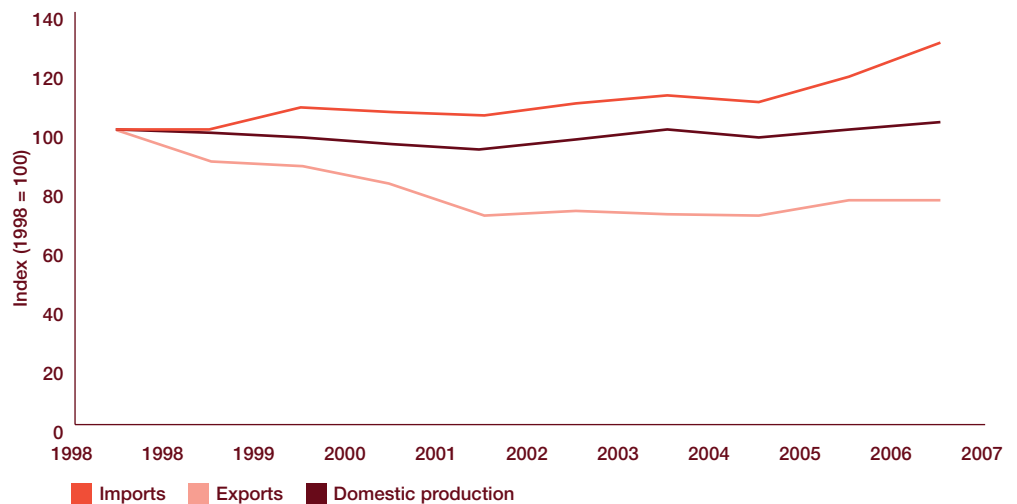


Building products have been booming

The historical perspective: the end of the boom

In the last ten years, the UK construction sector has benefited from strong market conditions, with real output growing by around 2% per year between 1998-2007. However, strong growth in the UK construction market appears to have masked a structural shift in the building products sector, away from UK manufacturing and towards overseas sourcing. UK building products manufacturing remained flat in real terms between 1998-2007, but imports gained share, growing by around 3% per year. Exports fell by around 3% per year over the same period.

UK construction output vs construction material imports and exports (Real), 1998-2007



Source: Office of National Statistics, Eurostat, Hews & Associates

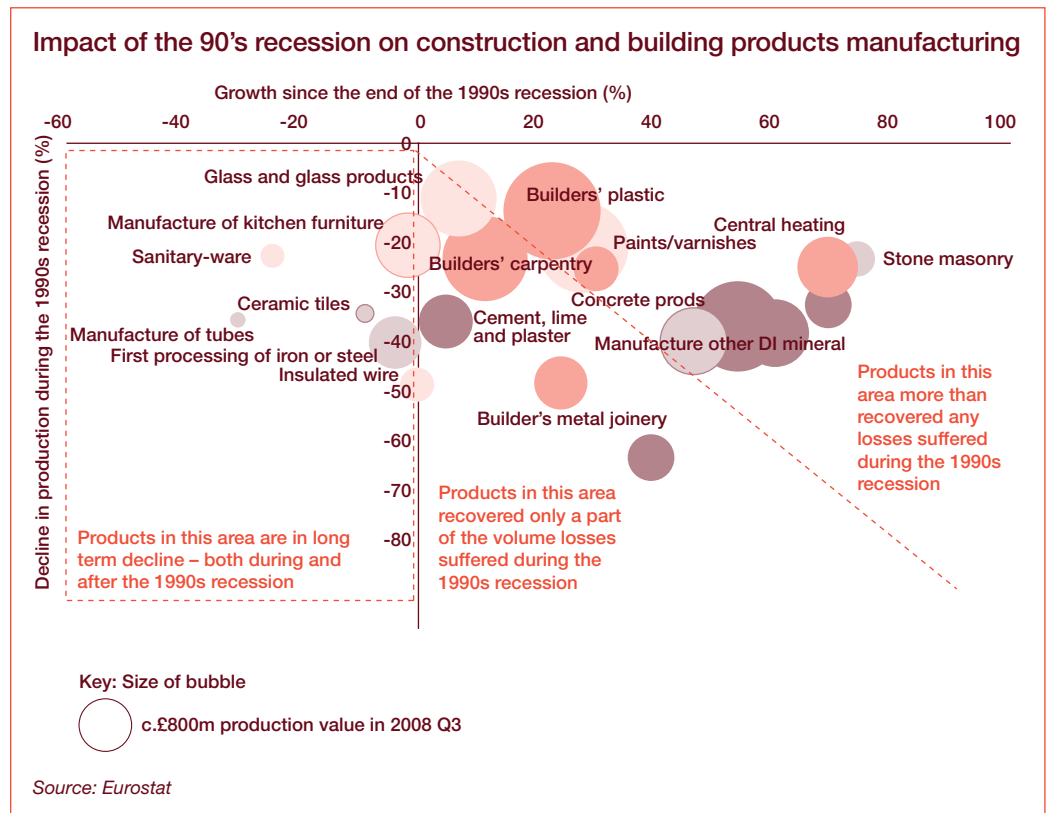
‘A large UK construction company recently had an issue with some boilers they had ordered from China: once the engineers had installed the products, there was no-one available that knew how to service them’

Mark Li, Low cost sourcing expert, PwC

The origins of the offshoring trend go back at least 10 years. As Duncan McKinlay, CEO of the Cable Management Group says, ‘The late 90s saw a mad rush to move manufacturing offshore, particularly in electrical products for house-builders. This decimated UK manufacturing. At the time labour costs were far cheaper in the Far East and the strength of the pound facilitated the movement of manufacturing to these markets. Only bulky or difficult to transport products continued to be manufactured in the UK.’

The graphic overleaf shows this in visual form. Products at the right hand side of the chart are those where UK production has either recovered or been retained since the 1990s recession. These products cover three broad categories:

- Heavy items such as concrete products and stone masonry
- Products with capital-intensive manufacturing and limited labour content, such as paints and varnishes
- Products like central heating components, where a UK manufacturing capability has been retained for a number of different reasons. For example, final assembly has often remained in the UK to guarantee quality of product and standards of service.



The industry is now facing both a cyclical downturn, and long-term structural change

As this suggests, a whole range of different factors have affected the current state of UK manufacturing in building products, from cost and labour considerations at one extreme, to quality and supply chain issues at the other.

The current state of play: more and more offshore

Offshoring has been discussed previously in this report, but even if there is a clear overall trend, the direction this is now taking in particular industries is often driven by quite specific sector-related factors. Building products is no exception. In this industry supply chain consolidation is a particular issue, which is affecting UK firms in two distinct ways:

- Construction products manufacturers have become increasingly international, and many smaller UK players have been acquired by large, diversified multinationals such as Saint-Gobain or CRH plc. Many decisions on manufacturing location that were once made nationally, now take into consideration the relative competitiveness of a number of different geographical locations.
- Distribution in the sector has consolidated considerably, which has given new power and influence to builders' merchants in the UK such as Wolseley plc, Travis Perkins, and BSS Group plc. By sourcing private-label products directly from low-cost economies, these players have been a major impetus behind the growth of offshoring, and the flip-side of this same phenomenon has seen increased pressure on branded suppliers to cut product costs.

The supply chain in construction is consolidating, but still relatively unsophisticated

‘We are determined to secure the efficiency and organisational benefits that will follow our plans to shift to offsite manufacturing. Working smarter means less open-air, unskilled preparatory activity within the confines of the construction site; and more offsite automation with smaller teams of skilled operatives completing the assembly of finished products onsite.’

FTSE 250 Chairman

Despite these more recent developments, the construction and building products industry still has relatively unsophisticated supply chain management in comparison with other industrial sectors. Logistical advances such as long-term demand planning and just-in-time delivery have yet to be implemented to anything like the same extent as in industries such as automotive. One reason for this can be found in the inherent uncertainty associated with construction work: poor weather or unexpected soil conditions can play havoc with project timescales. The building products industry is also highly cyclical, and more susceptible than most to trends in the macro-economic environment. And finally, the labour cost of installing many building products is far greater than their manufacturing cost. In those cases, the first economic priority is to ensure that on-site installation teams always have enough materials to work efficiently – any streamlining of the supply & delivery chain must not jeopardise that.

But while these structural issues can make the industry as a whole more inefficient, they can also work to the advantage of local building products manufacturers, whose proximity allows them to respond quickly to the demands of UK-based construction projects. For example Expamet International plc has been manufacturing its steel-based fence posts in China, because it can save around 30% by doing so, but it retains its lintel production capacity for the UK market in the UK – partly because it needs to offer a wider range of different products in this category and packaging them is complex, and partly because customers for these items tend to have short lead times of only 3-5 days.

This is one reason to retain production in the UK; others include easy access to the EU market, a relatively stable business environment, historically favourable taxation policies, and the absence of language barriers. The UK also has a flexible labour force, which allows companies to keep labour costs down, which is especially important in such a cyclical sector.

Prospects for the future: closures, competition, and collaboration

The impact of the downturn will be particularly acute in this sector. House prices are forecast to fall around 35% from their peak, new house-building is forecast to fall by 39% in 2009 after falls of 19% in 2008, and overall construction activity is forecast to fall by around 13% in 2009 after dropping 1% in 2008. Only government spending on infrastructure, housing and public buildings is set to increase.

Slowdowns in construction work in the early 1990s led to the closure or mothballing of many UK building products plants, many of which never came back. Bringing a mothballed plant back on-stream is expensive, which increases the risk that this capacity would be sourced off-shore when the market recovers.

On the other hand, required lead times are generally shorter in a downturn, as demand patterns become increasingly difficult to predict and customers look for more reliable and financially stable suppliers. Both of these factors can favour local UK-based firms over those in countries like China, where lead times are longer and payment terms generally shorter, both of which put extra pressure on customers' working capital at a time when credit is being squeezed. The weakness of the pound will also improve competitiveness, at least in the short term.

In the longer term, more profound structural changes to the industry may make it easier to forecast demand in the supply chain, and deprive local suppliers of this particular competitive advantage.

The downturn
may not be all
bad news...

For example, off-site manufacturing is a small but growing part of the construction industry. The ability to manufacture whole parts of a building/structure offsite makes weather conditions much less critical and allows for more standardised lead times, improvements in quality, health and safety and greater operational efficiency leading to an overall cost reduction. It may also increase the numbers recorded as employed in manufacturing, as trades like plumbing and plastering move into the factory environment. A key factor to succeed in widespread usage and optimisation of off site manufacturing is a shared public and private sector vision supported by major procurers and a fully integrated supply chain.

Construction companies are already pressing for increased co-operation between architects, engineers, and contractors in the design phase. This can reduce the amount of redesign and rework needed on a project, and also improve forecasting.

... and longer
term there are
new opportunities
to exploit

Both of these factors could prove to be challenges as well as opportunities for UK building products manufacturers. While the ability to deliver quickly may become less of an advantage if forecasting improves, more active collaboration with architects, engineers, and contractors will open up opportunities to provide customised products and delivery methods designed around the customer. Some of these may employ new technologies: for instance, radio frequency identification labelling might help to ensure that each component is put quickly into its correct place on a construction site. Construction products manufacturers may also be able to benefit from the UK's strength in R&D. Collaboration with Britain's world-class architectural and construction/engineering firms could allow the building products sector to exploit and commercialise high-value R&D know-how.

The nuclear power station market is another important area here. **The value of the nuclear programme is likely to be around £10-15 billion over the next 15-20 years**, and while this is small relative to the whole UK Construction market, it requires leading-edge knowledge and expertise and will provide a 'first to world market' opportunity for building product designers and suppliers to second generation nuclear plants.

At the other end of the scale, it is likely that heavy products will still be manufactured and sourced in the UK, and there will always be some products and some circumstances where the ability to deliver to a short lead time will still be a competitive advantage.

Conclusion

As with other sectors that we have examined, building products manufacturers will need to consider carefully which products and activities are best suited to the UK market, and which can be more effectively outsourced. These decisions will be driven by unique knowledge and expertise, and the ability to adapt to a changing market and changing customer needs.

Packaging



The low cost and high weight of most packaging products gives local suppliers a distinct advantage...

The historical perspective: local, but lagging

The UK packaging industry exists, in large measure, because other UK manufacturing exists. Most manufactured products require some form of packaging around them, and much packaging material is too bulky to ship economically over long distances. The packaging industry has evolved to serve the needs of UK Manufacturing plc, and its fortunes are very much tied to the wider sector, from heavy manufacturing through to (most significantly) fast-moving consumer goods.

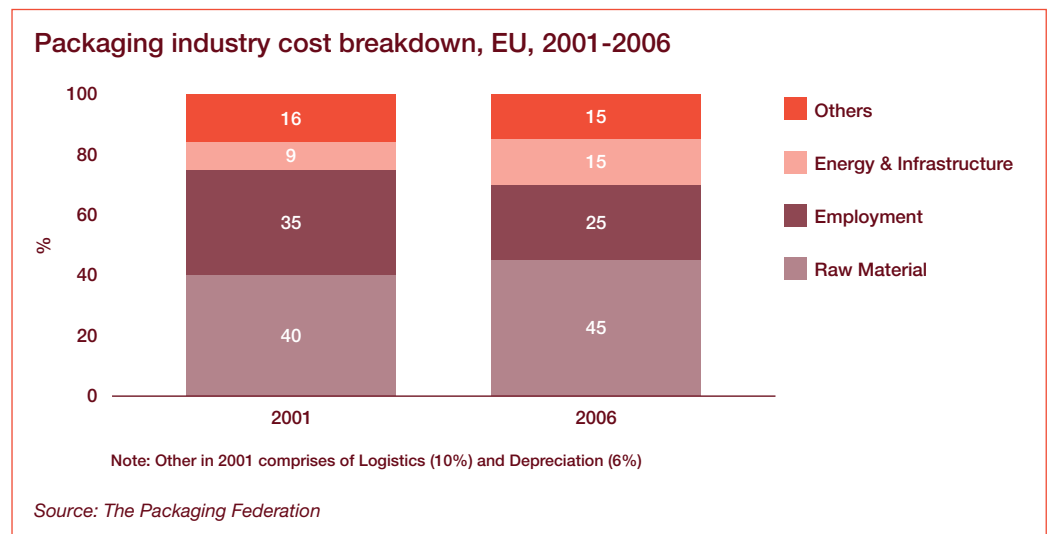
The UK packaging industry is currently worth £9.8 billion. Given the product's comparatively low value-to-bulk ratio, it is usually uneconomical to transport most forms of packaging more than about 200km. This is one reason why only 13% of UK production was exported in 2007. In fact, this sort of ratio of exports to domestic sales has remained broadly constant over the last seven years (see chart on page 34).

Despite the relatively low impact of imports, packaging has consistently been one of the most intensely competitive sectors in the UK economy – clear evidence that productivity gains rather than free trade are the key drivers of recent employment trends.

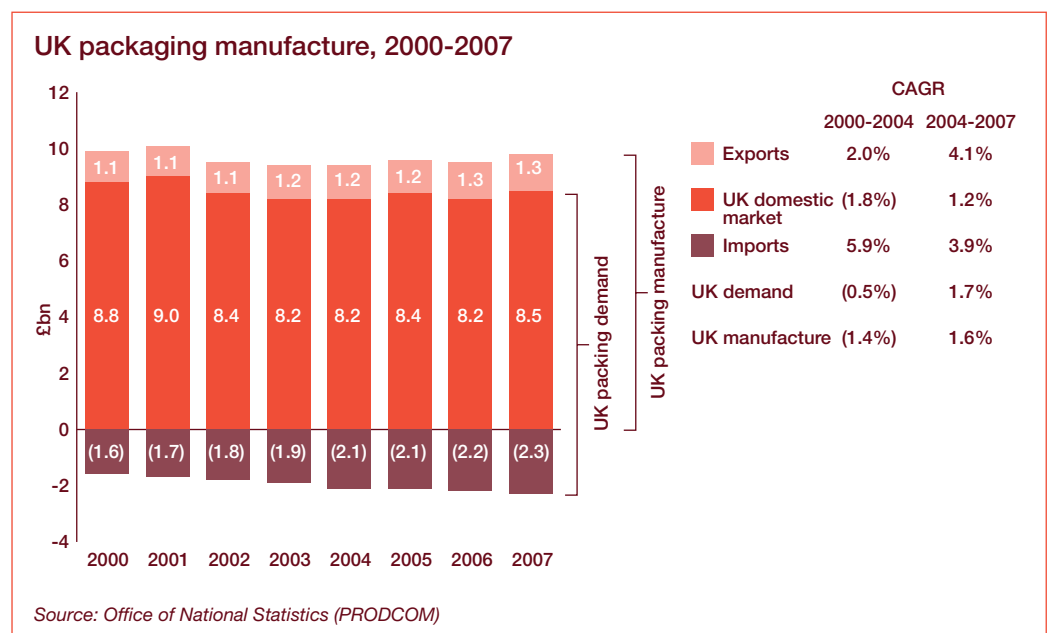
While UK manufacturing output has continued to rise over most of the past decade, the packaging sector has struggled to deal with an intense 'margin squeeze' caused by rising prices of key inputs, and more intense price competition as their large manufacturing customers have increasingly leveraged up their strategic procurement function and targeted packaging as a key area for continual year-on-year cost reductions. Increased consolidation and automation have helped UK packaging companies survive, but ironically

by increasing each plant's capacity these productivity improvements have also contributed to lingering overcapacity in the UK packaging sector, which favours the customer and makes profitability a challenge.

The graph below shows how the industry's cost structure changed in just five years: costs of raw materials and energy soared, and packaging companies reacted by delivering dramatic productivity improvements which allowed them to produce the same or greater output with considerably less labour.



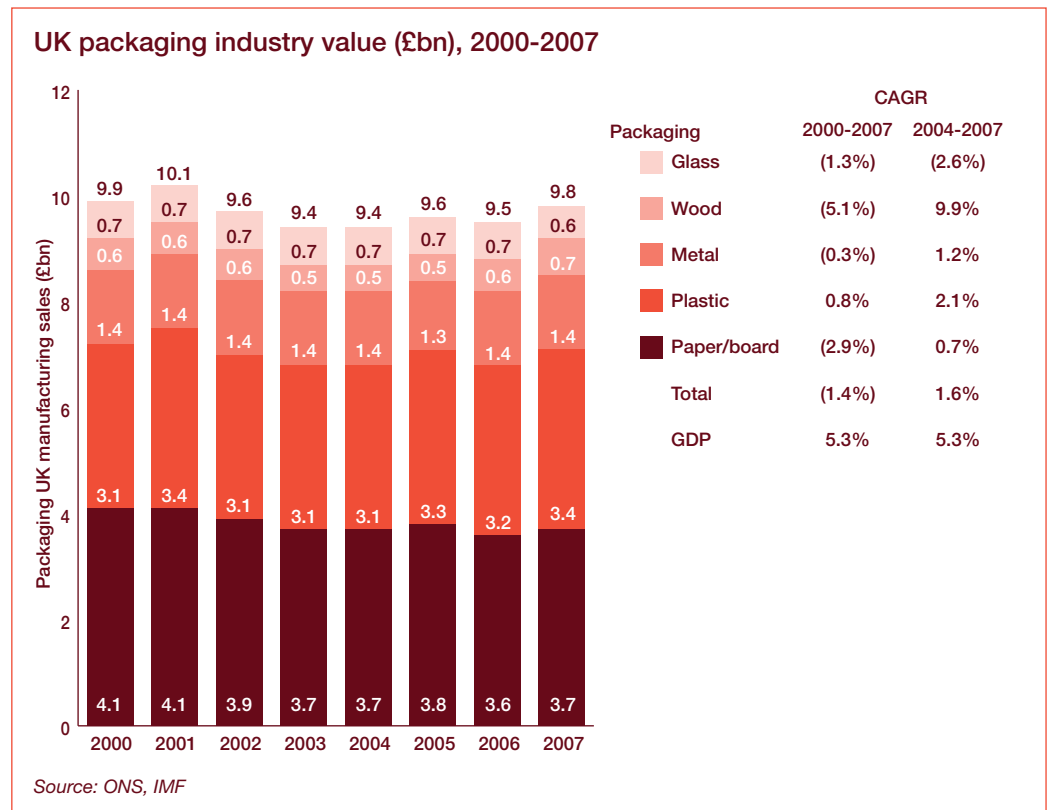
At the same time packaging imports have continued to grow, and were worth £2.3 billion by 2007. As a result the sector has moved from having a small trade surplus of £500 million in 2000 to a trade deficit of £1 billion in 2007, though it is worth noting that in this respect it has fared significantly better than UK manufacturing as a whole, reflecting the sector's predominantly local business model.



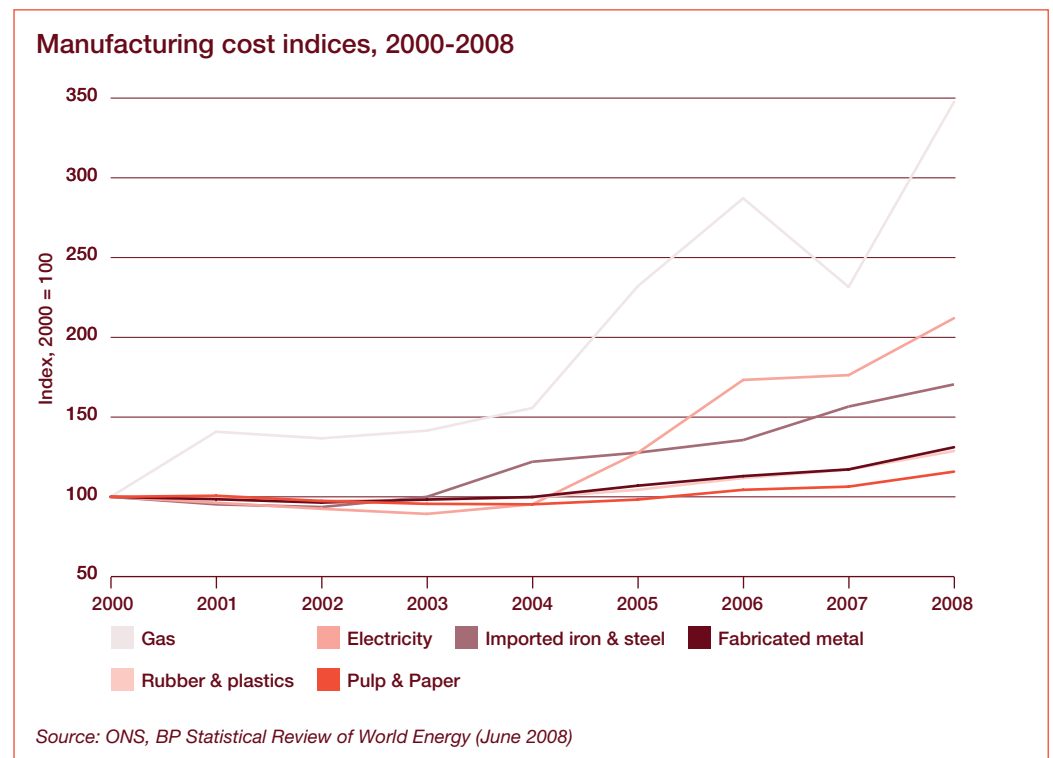
The current state of play: costs up, employment down

In the last ten years the only major areas of growth in UK packaging have been plastics, and to a lesser extent, wood. Overall the sector is dominated by plastic, paper and cardboard, collectively accounting for just over 70% of the industry's value in recent years. However, one less obvious underlying trend has been the growth of plastic at the expense of paper and board, and even more so of glass. Glass has shown the steepest decline in the UK, largely due to high energy costs and tough new recycling requirements.

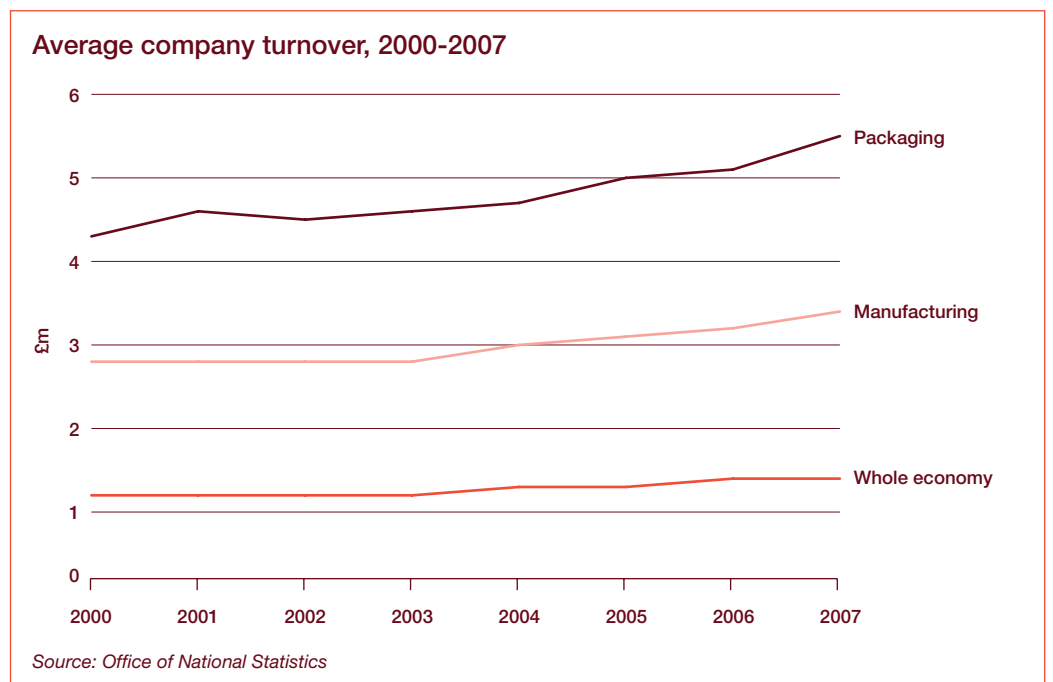
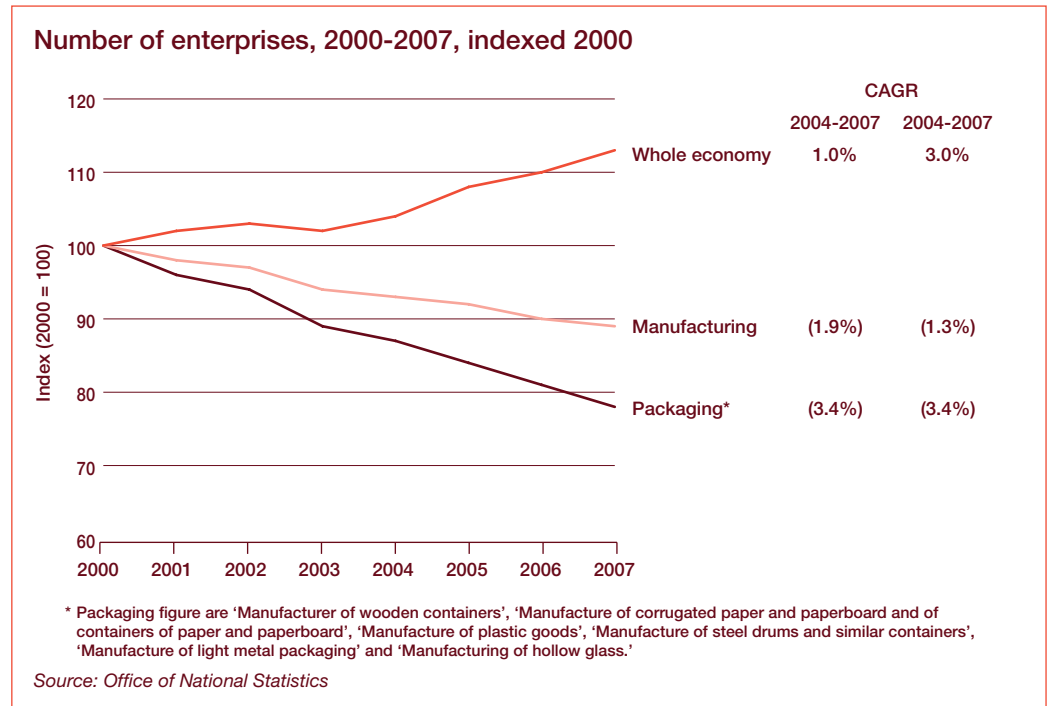
Rising costs are squeezing margins



That said, soaring and volatile energy costs have been a problem for the whole sector. In the period immediately prior to the current downturn packaging was one of the sectors to suffer most from high commodity and energy prices. Unlike some other industries, packaging did not find a reliable way to pass on these rising costs, and this problem is likely to recur when the economy begins to recover and commodity prices start to rise again (though higher oil prices do make it less competitive for importers to bring supplies into the UK due to high transport costs).

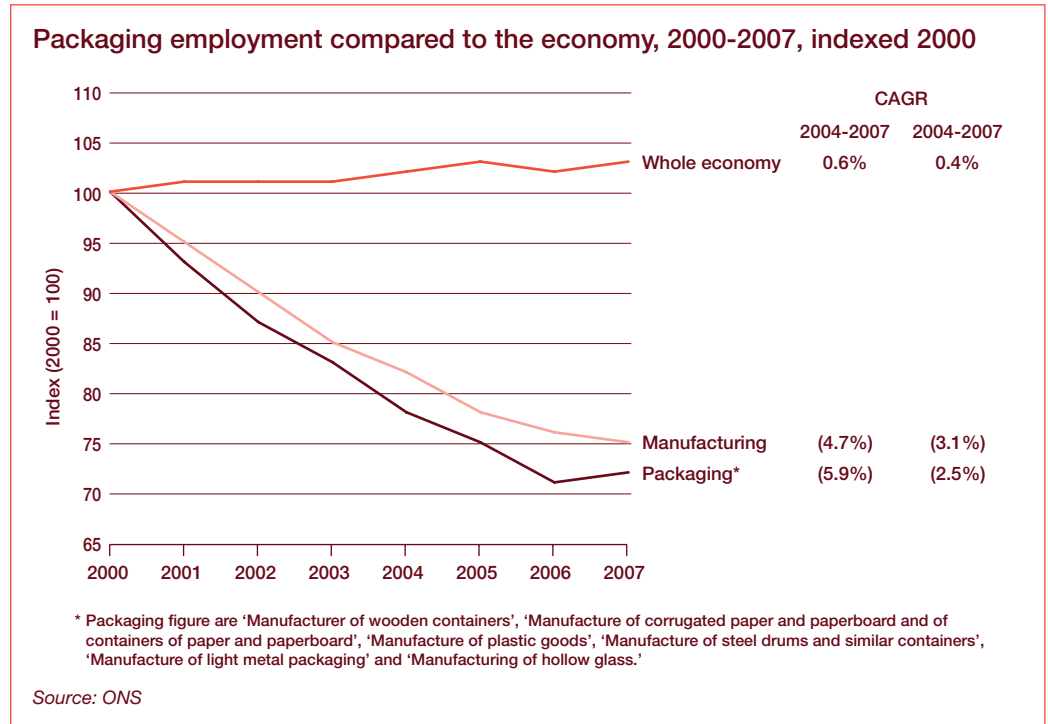


Although the industry remains fairly fragmented, rising energy and raw materials costs have driven some degree of consolidation and rationalisation. For example, LINPAC Group plc closed their Walsall plant in 2008 and moved the volume to Winsford, and Amcor Flexibles Food has consolidated the Ilkeston and Evesham production onto one site. This has resulted in improved efficiency, lower fixed costs, and greater competitiveness against imports, with lower levels of employment.



UK packaging sector employment has fallen more in the last decade than in manufacturing as a whole

In fact, the number of jobs in packaging has seen a bigger decline in the last ten years, than in UK manufacturing overall. However, the rate of decline slowed in 2004-2007. A combination of this fall in packaging jobs, and an increase in total UK employment, mean that the proportion of the UK workforce employed in this sector dropped from 0.5% in 2000 to 0.3% in 2004, and the situation remains largely the same today.



The future of the industry will be shaped by three factors: proximity to the customer, technological innovation, and sustainability

‘UK retailers are highly demanding and sophisticated... innovation for this market has been led by the UK’

UK CEO

Prospects for the future: local, leading edge, and sustainable

Looking forward, there are three key factors that will shape the future of the UK packaging manufacturing:

- The local nature of the industry, which therefore depends on a sizeable, profitable local customer base;
- The potential for higher value-added products driven by targeted R&D; and
- Last and arguably most important, the increasing demands by consumers and retailers alike regarding sustainability. We discuss this further below.

Staying close to the end customer will always be key for this industry, a growing challenge for UK producers as consumers all over the world increasingly gain wealth. Asian markets in particular are attractive because of their high growth rates. Indigenous Asian producers have a cost advantage in manufacturing but sometimes they can't fully keep up with growth in demand, and that can give UK manufacturers a window of opportunity.

Although not widely perceived as such, packaging is an increasingly high-tech product, with increasingly complex chemistry and software needed to deliver what customers demand at a competitive price. Companies with genuine technical superiority, unique intellectual property and a willingness and opportunity to collaborate with their customers in innovation, can use this as a lever to differentiate their products and limit the impact of price pressure.

Sustainability is both a threat and a substantial opportunity for this sector. The trend (and the pressure) is for more recyclability, more recycled content, and more investment in new technology like bio-plastics. Demonstrating a sound environmental track record is rapidly becoming not just desirable but essential, as customers increasingly demand details of their suppliers' environmental performance. Initiatives such as the Courtauld Commitment aim to bring manufacturers and customers together to reduce packaging weight, and have gained significant support from leading retailers and FMCG companies. Limited access to recycled product streams in some sectors, however, especially in some types of plastics, has been highlighted in our discussions with packaging companies as a constraint against driving the sustainability initiative.

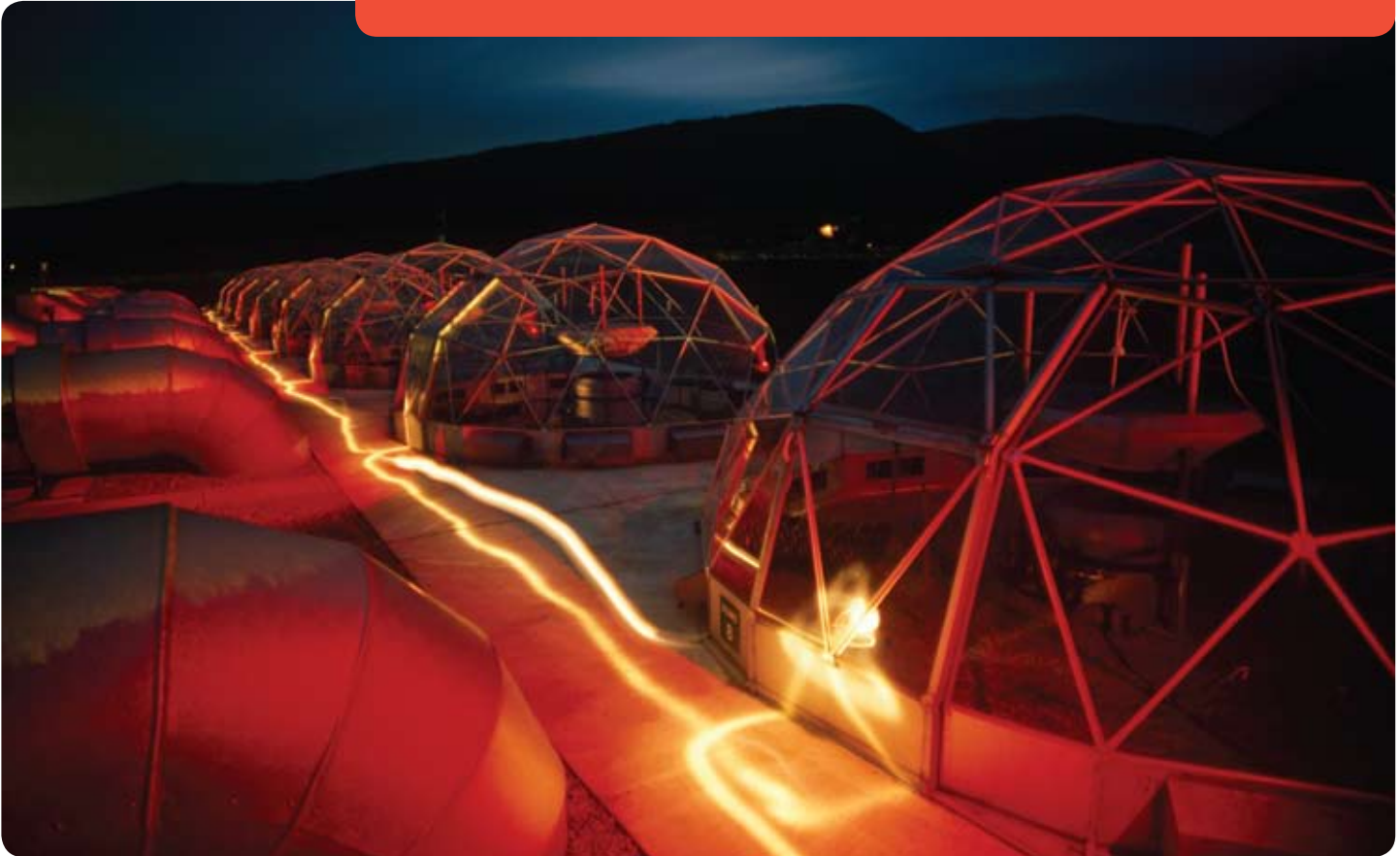
Until very recently, using more recycled material has made economic sense for packaging manufacturers, but this advantage is being eroded by the current economic downturn, and the collapse in raw materials prices. At the same time, the pressure for action on climate change at government level (most obviously the various EU directives on packaging waste) is now clashing with consumers' growing reluctance to pay more for sustainable products in recession. Packaging manufacturers risk once again being squeezed in the middle.

As things stand it's difficult to predict to what extent sustainability will open up genuine opportunities for UK packaging, at least in the short to medium term. One key factor will be active government participation and support, to ensure that the UK industry is not placed at a disadvantage vs. its European competitors. Relevant rules and regulations (for example, the mandated proportions of recyclable or compostable content in packaging) should not be set higher in the UK than in the rest of the EU. And, the UK government can actively support the industry by enabling an increased use of recycled product streams, through improvements in the UK's waste collection capabilities and infrastructure.

Conclusion

Packaging has one notable advantage over most other manufacturing sectors: transport costs make many imports uneconomic and often rule out even the very low-wage countries as viable competitors. As long as there is a sizeable UK manufacturing sector, and oil prices remain stable, the future for UK packaging seems relatively secure. However, these are factors beyond the industry's own control, and it must focus its efforts on improving its own long-term competitiveness. As a result the trend towards further consolidation and rationalisation looks likely to continue, or even accelerate, and the industry must also seize what advantages it can to drive differentiation and value-add through its R&D expertise, and from the sustainability agenda.

Clean technologies



Climate change is both a threat and – potentially – a significant business opportunity

The current state of play: making an opportunity out of a crisis

There is now broad agreement about the potential scale and speed of climate change, and a consensus that the world must move swiftly towards a low carbon, resource-efficient economy over the next 20-30 years.

The 2006 Stern Review on the Economics of Climate Change predicted that there would be a significant negative impact on global GDP unless concerted action was taken to tackle climate change. Stern also suggested that the massive shift towards low-carbon technologies required to do this would force a substantial shift in employment patterns, with over 25 million people working in these sectors worldwide by 2050. The Commission on Environmental Markets and Economic Performance was established in the wake of the report, with a remit to advise the UK government how to make the most of these opportunities, and they have acknowledged that clear, credible, long-term environmental goals are essential to provide industry with both the framework and the confidence to make the major investments needed to bring sustainable products and services to market.

The UK is at the forefront of many of the efforts to tackle climate change...

The UK government believes that the recent Climate Change Bill makes considerable progress in this direction, by imposing statutory medium and long-term emission reduction targets of 26% by 2020, and 80% by 2050. Indeed the UK is the first country to do this. The hope is that this will provide a major boost for sustainable forms of energy, transport, buildings, waste and products. In some areas – notably nuclear energy and renewables – new investment will be required to meet these targets, while in others, such as transport, there are ambitious new targets in place for vehicle efficiency that will cut CO2 emissions from around 164g/km to 100g/km by 2020. New homes will have to be zero carbon from 2016, with industrial and commercial buildings following by 2019. This will force innovation in the construction sector, particularly in relation to energy efficiency and micro-generation.

There are also a number of other measures underway, including the UK sustainable development strategy, which focuses on developing cleaner, more efficient products and processes, and the legally-binding Carbon Reduction Commitment, which imposes energy savings on large businesses and public sector organisations. As this suggests, the government is aware that it has its own role to play here, both by reducing its own emissions and by directing public sector spending towards greener products and services. The Office of Government Commerce is targeting a 12.5% reduction in the carbon emissions of government sites and operations by 2010-11, but the £150 billion spent every year on products and services could potentially have an even more far-reaching impact in driving positive change.

... and the current economic crisis could accelerate many of these measures

Many believe the current economic crisis could be a real opportunity to accelerate the move towards a low-carbon economy, by re-positioning some industrial sectors and creating new 'green collar' jobs. The new US administration has appointed one of the world's leading climate change experts as its chief scientist, and pledged to put the environment at the heart of its economic recovery programme. There are plans for half a million new jobs, investment in technology, and a doubling of wind and solar power capacity.

Similar moves are afoot in the UK, where the government is also bringing energy and environmental policy together in the Department for Energy & Climate Change. Lord Mandelson has recently claimed that the government's forthcoming Low Carbon Industrial Strategy could create a million more jobs in the UK by 2015.

Consumers are aware of these issues, but their concern is not yet translating into real behaviour change

There is also the changing nature of consumer demand to consider. In November 2008, the World Business Council for Sustainable Development (WBCSD) issued a report on Sustainable Consumption: Facts and Trends. This argues strongly that efficiency gains and technological advances will not be enough to bring global consumption down to sustainable levels, and that changes to consumers' lifestyles will also be necessary. The statistics in the report suggest that public concern for environmental, social and ethical issues is at an all-time high, in both developed and developing markets, but this doesn't necessarily translate into changes in behaviour or purchasing decisions. Typical barriers to change include availability, affordability, convenience, product performance, conflicting priorities, scepticism, and force of habit. In the WBCSD's view these barriers can be tackled in three related and complementary ways: through innovation, to deliver maximum environmental value at minimum social cost; through better communication of the value of more sustainable products and services; and through active intervention to remove unsustainable products, components, and services from the marketplace.

As some degree of climate change now appears to be inevitable, both private and public sector organisations will have to come to terms with increased flood, fire or drought risk, more volatile and extreme weather patterns, and higher risks to human health from diseases like asthma and malaria. Finding ways to adapt to these changes will be one of the most important drivers of technological development.

The sustainability agenda could open up significant new opportunities for UK manufacturing...

... particularly in the areas of nuclear energy, renewables, and low carbon vehicles

Prospects for the future: leadership in low carbon

The British government wants to transform the UK into a leader in the low carbon economy, and if this is going to be achieved manufacturing will have a central role to play. When BERR published its new strategy for manufacturing late last year it was with the aim of creating 'a globally competitive manufacturing sector', which is pre-eminent in two key areas: high value-added and low carbon. BERR believes that there are significant opportunities for the UK in low carbon and clean technologies, especially in software, electronics, and machinery equipment, particularly those linked to electricity generation and aircraft manufacture. The Engineering Employers Federation has also analysed how some high-performing companies have gained new competitive advantage by exploiting the sustainability agenda. Eco-friendly cleaning and paint producers are an obvious example, but there are also the manufacturers of the industrial process control equipment needed to improve resource efficiency, the makers of more efficient vehicle engines, and companies producing the chemicals needed to improve fuel efficiency and reduce engine emissions.

In fact, the environmental goods and services market in the UK is sizeable, and it is already a significant exporter. Moreover, the scale of the opportunity is not confined to what has traditionally been defined as the 'eco' market. A recent study by Innovas for BERR in support of its Low Carbon strategy valued the UK low-carbon environmental goods and services sector at £107 billion in 2007-08, between the UK's healthcare and construction sectors in size. Of this total, 'traditional' environmental goods and services represented 21%, while the faster growing sectors of renewable energy and low carbon technologies accounted for 29% and 50% respectively. The drive for a lower carbon, more resource-efficient economy will become all-pervasive, affecting the supply chains of a much wider set of products and services, and creating a demand for specialist components like control systems and sensors. Waste recycling will face similar challenges, and the water industry will also need to become far more innovative in the way it captures, stores, transports, treats and recycles this increasingly scarce resource.

The government is now committed to producing an integrated Low Carbon Industrial Strategy, focusing initially on nuclear, renewables, and low carbon vehicles. The Government issued its strategy vision paper in early March 2009, and a 3-month period of consultation is now underway:

- There will be huge opportunities in **renewables**, from R&D to fabrication, assembly, installation, operation, maintenance, and component supply. Wind power generation is planned to rise from a current level of 2.5 gigawatts to over 30 gigawatts by 2020, which will require thousands of new wind turbines needing high-performance castings, bearings, gearboxes, blades, and control systems. There are a number of UK companies with the know-how to do this, but the level of investment required is enormous – perhaps as much as £100 billion over the next twelve years.
- Replacing the UK's existing **nuclear power** stations would require seven large new reactors, each costing around £3 billion. Across the world there are likely to be 60 new reactors built in the next 15 years, and this level of expansion opens up the possibility for the UK to establish a globally-competitive supply chain for the nuclear industry, modelled on the success of the offshore supplies industry which grew up to service North Sea oil in the 1970s. The role of the Office of Nuclear Development will be pivotal in making this happen.
- On a smaller scale, energy efficiency regulations will generate huge demand for microgeneration technologies, from micro-wind and heat pumps to solar PV and solar thermal. This is already starting, but will really take off around 2012-13. There are a number of fledgling players in this space, but it is not clear that they will scale up quickly enough relative to competitors in other countries.

- On the other hand, the UK is already one of the leaders in the development of marine and tidal power. There is huge potential for this sector across the world, and it has the advantage of being more predictable than wind or solar. Many small companies in the UK are developing tidal and wave technology, but they need to scale up quickly. We believe that the rapid development of an integrated value chain for this segment should be a priority.
- **Low carbon vehicle** technology is seen as a key market opportunity for UK manufacturers. Technological advances will be needed to improve the energy efficiency of traditional engines, and develop more advanced low carbon vehicles. This will require green and clean technologies for turbo-chargers, hybrid systems, start-stops, regenerative braking, and electro motors. At the moment the development of these components appears to be concentrated in Germany, France, the US, and Asia. But as we have already discussed, the automotive industry is still an important part of the UK manufacturing base and has world-leading R&D expertise.

Conclusion

We are going to see growing demand for new products and services that are more efficient, allow us to do more with less, or maintain existing quality standards with fewer resources. Delivering this will not be easy, and will demand significant investment, operational agility, and a willingness to challenge established approaches and practices. A policy framework for a lower carbon economy is taking shape in the UK, and there are already significant potential opportunities for the British manufacturing sector. The question will be how, and how quickly, the sector can seize and exploit these new possibilities.

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