



HM Government

Strength and Opportunity 2012

The landscape of the medical technology, medical biotechnology, industrial biotechnology and pharmaceutical sectors in the UK

Annual Update – December 2012



This is the fourth annual report which analyses the information contained in the Bioscience and Health Technology Database.

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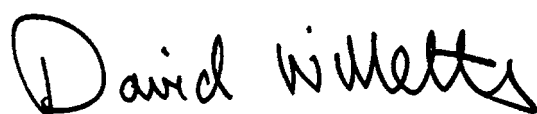
Ministerial Foreword

The UK life sciences industry is vibrant and dynamic and a key contributor to sustained economic growth. It continues to be one of the world largest and most productive life science sectors, renowned for its creativity, exceptional research base and outstanding talent. The industry has cutting edge sectors such as biotechnology, pharmaceuticals, healthcare and medical technologies. The pharmaceutical sector alone attracts near £5bn in R&D funding. The industry has remained resilient during the recession, with robust export growth of 31% between 2008 and 2011. Looking forward, the sector has a crucial role to play in helping solve the big societal challenges of our age such as addressing the needs of an ageing population, improving sustainably, de-carbonising our economy and feeding a growing global population.

The global life sciences sector is, however, changing. In 2012 we have seen more examples of the impact of global restructuring of pharmaceutical companies in the UK. We know that we must adapt to ensure that the UK remains a leading player in the global market. An ongoing understanding of the size and shape of the industry is crucial to foster an environment in the UK where life sciences companies can continue to flourish. My Department, UK Trade and Investment, the Medical Research Council (MRC) and the Biotechnology and Biological Sciences Research Council (BBSRC) are working together to achieve this. Between us we support the Bioscience and Health Technology database which has become an important source of evidence to inform Government and industry policies and promotional activities.

I am delighted to present this report, the fourth of an annual series, which analyses the information contained in the database to present a picture of the real strength of the UK life sciences in 2012, a highly innovative industry with over 4,500 companies, employing over 167,000 people and generating a turnover of over £50bn.

I would like to thank everybody who has contributed to this work, in particular the Trade Associations, Medilinks and life sciences networks.

A handwritten signature in black ink, reading 'David Willetts'.

The Rt Hon David Willetts MP
Minister for Universities and Science
DEPARTMENT FOR BUSINESS,
INNOVATION AND SKILLS

Executive Summary

The global life sciences industry is undergoing profound change. The financial crisis is affecting healthcare budgets in many developed countries and the industry is restructuring and looking for attractive markets in which to invest, research and employ.

Against this background of change and global recession, the UK life science industry has continued to show strength and resilience. In 2012 it is comprised of over 4,500 companies, employs around 167,500 people (1,500 more than in 2011) and generates a turnover of over £50bn.

This report is based on information from a set of companies identified as having their primary economic activity in life sciences (e.g. pharmaceuticals, medical technology, medical and industrial biotechnology) or where life science activities are carried out in a division of a company for which separate information is available. Turnover and employment data has been used where this is available (see Methodology Appendix II) and it is available for most but not all the companies in the dataset.

The Office for National Statistics (ONS) also provides data on pharmaceuticals manufacture and wholesale, medical technology manufacturing and biotechnology research through its Annual Business Survey (ABS). This data is not directly comparable with the figures from the Bioscience and Health Technology database. The ONS figures are typically smaller than those in this report due to narrower definitions of the life sciences sectors and different compilation methodology. As result, some companies in the Bioscience database will be classified under industries other than life sciences according to the ONS.

Figure 1 gives an overview of the turnover, employment and number of companies in each of the four life science sectors covered in the Bioscience and Health Technology database. The pharmaceutical sector is the largest by turnover but the medical technology sector is the largest life sciences employer (employing 3,000 more people than in 2011).

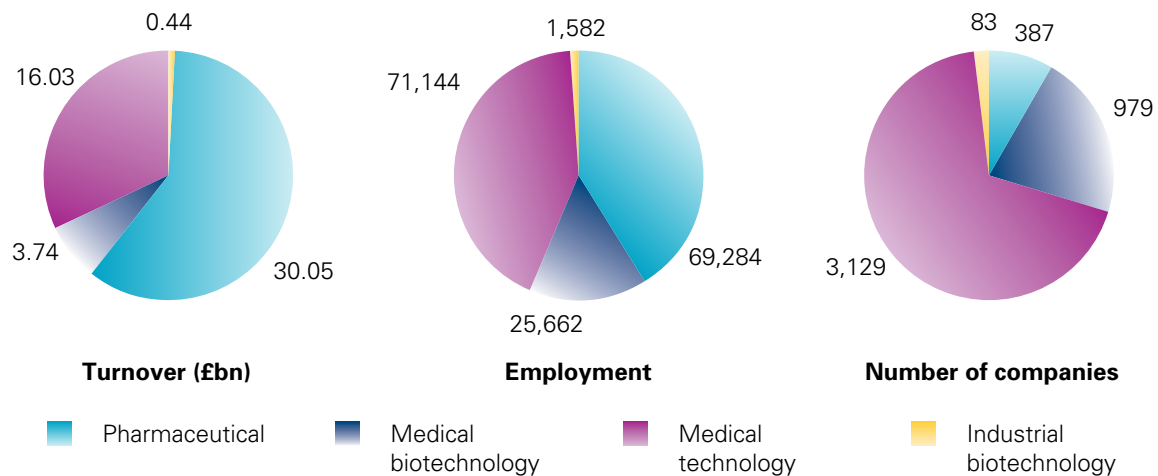
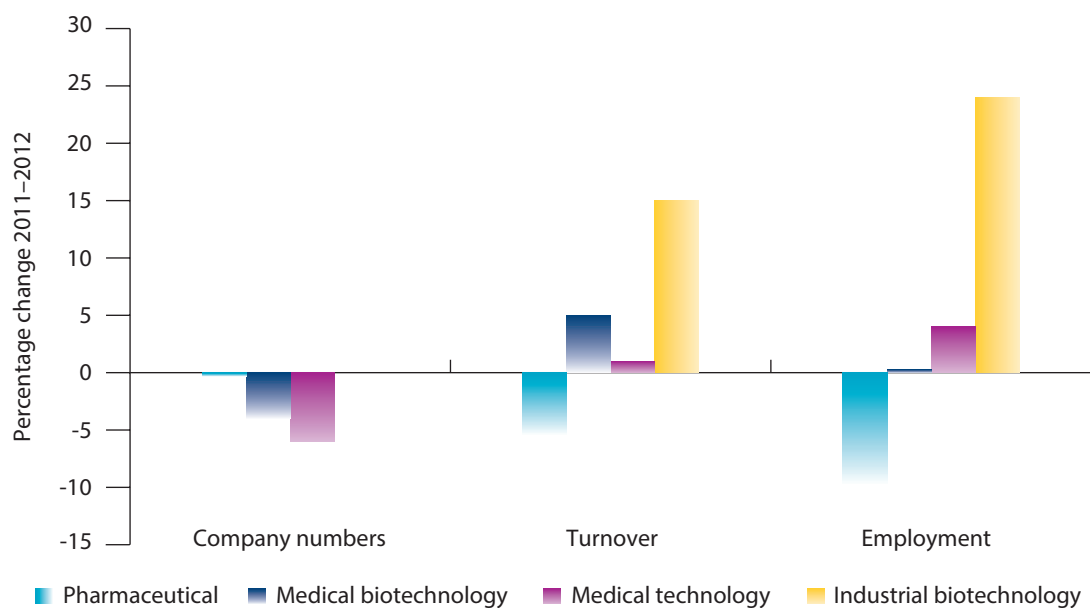
Figure 1. Turnover, employment and number of companies in UK life science sectors

Figure 2 shows that the number of companies has declined in all life sciences sectors, however employment has increased in medical technology (up by 4%), medical biotechnology (up by 0.3%) and industrial biotechnology (up by 21%). Turnover has also increased in medical technology (up by 1%), medical biotechnology (up by 5%) and industrial biotechnology (up by 15%). The pharmaceutical sector has seen an overall decrease in turnover and employment of 5.4% and 9.7% respectively between 2011 and 2012. These decreases have been concentrated in the top 20 global research-based pharmaceutical companies with presence in the UK and reflect the global restructuring and financial challenges facing the sector.

Figure 2. Company numbers, turnover and employment for the UK medical technology, medical and industrial biotechnology and pharmaceutical sectors between 2011 and 2012

Medical Technology Sector

The medical technology sector in the UK is comprised of 3,129 companies which employ just over 71,000 individuals and have a combined annual turnover of £16bn. Trend data based on a sample of 1,762 companies (56% of the total) for which financial data is available in the period of 2009-2012 show a 1% increase in turnover and 4% increase in employment between 2011 and 2012. Total company numbers have decreased by 6%; there were 8 new companies formed and 189 company cessations (mainly due to mergers or acquisitions).

The overwhelming majority of medical technology companies are small and medium size enterprises (SMEs), 99% of the companies in the sector employ fewer than 250 people. The age profile shows a high percentage of companies over 10 years old (65%) and only 1% younger than 2 years old. The overall picture is that of a sector made up by small but well established companies.

As in 2011, companies producing single use technology form the largest segment within the medical technology sector by turnover (£1,786m) followed by companies providing professional services, wound care and management and in-vitro diagnostic technology. These 4 segments have a combined sales turnover of near £5bn, almost a third of the total medical technology turnover.

The segment showing the highest levels of employment is professional services and consultancy, with 7,900 employees. This is followed by single use technologies, in vitro diagnostic technologies and orthopedic devices. Each of these segments employs over 5,000 people.

Trend data based on the same sample of 1,762 companies shows that the cardiovascular, neurology and radiotherapy segments had the highest increase in turnover in 2012 with figures ranging between 14% and 189%. Employment trends show an increase in the workforce of anesthetic and respiratory, ICT and e-health and medical imaging companies, between 28% and 74%. The number of companies in most segments has decreased in 2012, however, the number of companies that provide drug delivery has remained stable over the past 4 years while the number of companies providing medical imaging, anesthetic and respiratory and infection control have seen low levels of decline (between 2%–6%). Radiotherapy equipment, ICT and e-health, in vitro diagnostic technology and implantable devices are the segments that have seen the largest fall in companies, between 16% and 18%.

Companies in the medical technology sector are very dispersed across the UK; however, the regional areas that host the greatest number of companies in this sector are the West Midlands, the East Midlands and the East of England. Together they host 44% of all medical technology companies in the UK.

One measure of the health of the UK industry is the number of devices from UK-headquartered companies that have been approved for marketing in the world's largest medical technology market, the USA. Between January and August 2012, 37 new medical devices developed by UK companies received approval. If this pace of activity continues until the end of 2012 we would expect to see similar

overall numbers of approvals to 2011 (around 60). This is still below the number of approvals between 2004 and 2008 (around 80-100 per annum).

Medical Biotechnology Sector

The medical biotechnology sector in the UK is comprised of 979 companies, employs close to 26,000 individuals and generates a turnover of £3.7bn. Trend data based on a sample of 410 companies (42% of the total) for which financial data is available in the period of 2009-2012 show a healthy increase of 5% in turnover and a small 0.3% increase in employment between 2011 and 2012. There was also a small overall fall in company numbers of 4%; 3 new companies were formed and 48 ceased trading between 2011 and 2012.

The sector is dominated by SMEs with 98% of all companies employing less than 250 staff. 53% of companies in this sector have less than 5 employees. There is a healthy mix of young and older companies. A large percentage of companies (49%) are over 10 years old.

Most medical biotechnology companies use an outsourcing business model. Companies operate in a “virtual” way contracting staff employed by other organisations rather than using their own full time employees. This has created a large segment of specialist services made up of 636 companies employing over 16,410 people with a turnover of over £2bn, more than 50% of the total sector turnover. Within this segment, specialist consultants continue to be the largest sub-segment with 426 companies, while specialist suppliers (347 companies) are next.

The medical biotechnology segments of advanced therapeutics, small molecules and specialist services have all seen increased turnover in 2012 compared to 2011. Specialist services has also seen an increase in staff numbers (up by 8%), but more widely, employment has decreased in most segments by between 2% and 30%. The number of companies in all the segments in this sector has fallen in 2012 with the exception of blood and tissue products which has remained the same.

There are medical biotechnology companies in all UK regions. The East of England has the highest concentration of these companies, followed by the South East and Scotland. Together these 3 regional areas account for 50% of all medical biotechnology companies in the UK and 51% of the total employment in medical biotechnology.

Turnover figures of this sector are likely to underestimate the total economic activity of the sector because many medical biotechnology companies are investing heavily in research and development and may have no or very low sales. There is a high level of venture capital supporting UK medical biotechnology companies. Total European venture funding in medical biotechnology in 2012 was £2.9bn, of which the UK received the largest amount, followed by Switzerland.

The pipeline of new products under development within the sector remains broad and well populated, with 876 in discovery and development. The majority of these

products continue to be small molecule drugs (305 in development). The total number of protein, vaccines and advanced therapies products in development is 510.

Industrial Biotechnology Sector

The industrial biotechnology sector is comprised of 83 companies which employ just under 1,600 people and generate a turnover of £438m. These are companies whose principal activity is the development, manufacture and selling of products and services that use or contain biological material as catalysts or feedstock to make industrial products. Companies that use industrial biotechnology to make products or provide services which do not constitute a major proportion of their total turnover are not captured in this analysis. This sector, therefore, contributes to a wider economic activity than that of these core 83 companies. Some studies indicate that industrial biotechnology has the potential to make a significant impact to the sustainability strategies of industries such as chemicals, waste treatment, energy production and plastics which have a combined turnover of £81bn and employ 800,000 people.

Based on a sample of 79 companies for which financial data is available for the period of 2009 -2012 (95% of the total) there is a positive growth trend in the sector between 2011 and 2012 with 21% and 15% increases in employment and turnover respectively. Companies involved in biofuels, specialist services (contract suppliers, engineering, and consultancy) and fine and specialty chemicals have shown consistent growth over the last 4 years and remain the largest segments in the sector. The sector is dominated by SMEs with fewer than 250 employees. 88% of companies are older than 4 years.

The sector continues to use both well-established technologies (such as fermentation and the processing of biomass) and relatively new approaches like biotransformation, that is, using enzymes or biological catalysts as a safe and environmentally improved alternative to chemical catalysts.

Companies in this sector are dispersed across the UK with no or very limited evidence of geographical concentration.

Pharmaceutical Sector

The UK pharmaceutical sector is comprised of 387 companies. They are a major contributor to the UK economy with a combined turnover of £30bn and employment of just below 70,000 people. The sector is defined in this report as companies with annual turnovers greater than \$1bn who are either research-based companies producing drugs using a range of technologies, companies producing generic pharmaceuticals, providing clinical research, or contract manufacturing organisations.

Based on a sample of 371 companies for which data is available (96% of the total) for the period of 2009-2012, the sector has seen an overall decrease in turnover and employment of 5.4% and 9.7% respectively between 2011 and 2012. These decreases have been concentrated in the top 20 global research based pharmaceutical companies with presence in the UK and reflect the global restructuring and financial challenges facing the sector. These global companies have collectively shown a fall of nearly 7% in annual turnover and employ nearly 5,000

fewer people. The UK is however adjusting to global trends, including the development of newer classes of drugs (e.g. biologics such as monoclonal antibodies), and the sector remains one of the major sources of business innovation.

Globally the top 20 pharmaceutical companies account for \$484bn of sales or around 61% of the global total. 17 of these 20 have research and development, manufacturing and sales sites across the UK. The strong research capability, development infrastructure, appropriate and transparent regulatory regime, and stable economic and legal environment help retain these companies in the UK. Employment figures for the sector show that 59% of the nearly 70,000 people in the UK industry are employed in the top 20 global pharmaceutical companies. In 2012 these 20 companies account for 68% of the sector turnover. 80% of the sector turnover is concentrated in 24 of the 387 pharmaceutical companies operating in the UK.

The breadth of activity of the global pharmaceutical companies makes distribution of their turnover across pharmaceutical segments difficult to assess. Underlying data shows that the top 20 global pharmaceutical companies operating in the UK appear to generate most of the turnover in the vaccines and blood and tissue products segments. If the top 20 companies with their diverse activities are excluded, most other companies operating in the UK are involved in small molecule drug development, followed by companies who are specialist suppliers and those involved in therapeutic proteins.

Further analysis shows that segments of significant growth, such as the therapeutic proteins segment (turnover up by 8%), have been overshadowed by a large fall in the reported turnover of the top 20 pharmaceutical companies (down by 7%) and specialist services (down by 11%). A number of the companies working in specialist services have shown a gradual decline in turnover over the last 2 to 3 years.

While most UK regions host some pharmaceutical companies, there are clear geographical areas with strong clusters of economic activity. The South East, East of England and London together have the highest number of sites and employees in the sector and there are well-recognised clusters within these regions. Significant concentrations of activity can also be seen across the North of England stretching from the Northwest through parts of Yorkshire to the Northeast. In the central belt of Scotland a strong focus on biomedical research and investment continues to support a cluster of pharmaceutical companies. The Northwest and Northeast of England show a higher proportion of manufacturing infrastructure and capability.

Introduction

The UK has one of the strongest and most productive life sciences industries in the world, contributing to patient well-being, improving the sustainability and the de-carbonisation of the economy and supporting growth. The industry is high-tech, innovative and highly diverse, spanning pharmaceuticals, medical technology, medical and industrial biotechnology. Through the development of innovative medicines, medical technologies and services, life sciences businesses contribute to a stronger and fairer society, helping people enjoy better health, well-being and quality of life. Life sciences companies working in the industrial biotechnology sector can help provide solutions to many of the resource-based challenges facing our world such as food security, clean water and energy and climate change.

The UK pharmaceutical sector has more than 350 companies employing just below 70,000 people and generating an annual turnover of £30bn. It attracts near £5bn annual in R&D funding and makes an important contribution to the UK's trade balance with exports having grown by 11% a year between 2000 and 2011. Over the last 15 years the pharmaceutical sector has increasingly applied biotechnology to develop new types of medicines including those containing antibodies, DNA and stem cells. In 2012 the UK biotechnology sector is comprised of 979 companies and employs close to 26,000 individuals with a turnover of £3.7bn.

A proof of the strength of the medical technology sector is its continuous growth throughout the global financial crisis. In 2009 the sector had 2,771 companies providing employment to 52,000 people and generating £10.6bn turnover. In 2012 the UK medical technology sector is comprised of 3,129 companies which employ just over 71,000 individuals and have a combined annual turnover of £16bn. This represents a 36% increase in employment and 50% increase in turnover between 2009 and 2012. Although smaller in size, the industrial biotechnology sector has also grown by 90% in turnover (from £230m in 2009 to £430m in 2012) during the same period.

Back in 2008 the Department for Business, Innovation and Skills, the Department of Health and UK Trade and Investment collaborated with regional and national life sciences networks to develop a database of life sciences companies active in the UK. Currently supported by the Department for Business, Innovation and Skills, UK Trade and Investment, the Medical Research Council and the Biotechnology and Biological Sciences Research Council, the Bioscience and Health Technology database has become a key resource to facilitate the development of effective evidence based policy and to promote the UK life science industry to investors.

Since 2009 the database has been updated each year and an analysis of the updated data, supplemented by data from other sources, published annually. This report is the fourth in the series. A detailed analysis of each life sciences sector is contained in individual chapters. Information about the methodology and segmentation used by the database can be found in Appendices II and III.

Global Sector Market Overview

The medical technology, medical biotechnology, pharmaceutical and industrial biotechnology sectors are linked by either their focus on the healthcare market place and/or their use of biotechnology. Companies working in these sectors produce products and services for markets which are or have the potential to be global in scale and require innovation for continuing success. Globally, the pharmaceutical, medical biotechnology, medical technology and industrial biotechnology sectors have estimated combined global sales of \$1-1.5 trillion with R&D spend to sales ratios higher than 10%.

The global life sciences industry has changed since 2008 and its innovation model is under strain. The financial crisis is affecting healthcare budgets in the West and customers are demanding proof of improved outcomes and lower prices. The industry response is earlier economic analysis and a more targeted approach to investment in R&D.¹

1.1. Medical Technology Market

The medical technology market was estimated to be worth \$325bn worldwide in 2011 with a compound annual growth rate (CAGR) of 7% between 2005 and 2011.² The growth drivers for the industry mirror those of the healthcare market as a whole: an ageing world population, growing populations in emerging markets and expanding healthcare coverage in markets such as China, India and in regions such as South America. Growth is forecast to be moderate over the next 6 years with a CAGR 4.4%.³ However, this is greater than the consensus forecast for the pharmaceutical market.

In 2011 the top 5 medical technology segments in terms of sales were in-vitro diagnostics, cardiology, diagnostic imaging, orthopaedics and ophthalmic representing together 50.9% of the total market. The future top growth segments are forecast to be neurology, plastic surgery and ophthalmic, although among currently largest segments the top performers are ophthalmic, endoscopy and in-vitro diagnostics. The in-vitro diagnostics segment is forecast to maintain the position as the largest over the next 6 years driven by companion diagnostics and its integration into clinical pathways.

1.2. Medical Biotechnology Market

In 2011 medical biotechnology products captured 19% of the global pharmaceutical market, amounting to \$142bn of sales. This is a 7% increase in its share of the total market between 2004 and 2012.⁴ The strong growth in this sector is predicted to continue with analysts forecasting growth of 9.5% over the coming years driven by monoclonal antibodies, vaccines and therapeutic proteins. It is estimated that the market will be worth \$215bn by 2018 as there was a strong pipeline of products currently in clinical trials and a high R&D spend to sales ratio of 23% in 2011.⁵

There is an increasing proportion of biologics in the top 100 selling drugs; in 2011 34% of these top 100 were biologics. It is estimated that by 2018 biologics and traditional small molecule based drugs will be sold in equal proportions (50/50 proportion), although some forecasts point out that on average the annual revenue for a biologic drug will be almost 20% higher than for a small molecule, partly driven by the higher manufacturing costs typically for a biologic and the sophistication of these products which commands premium pricing.⁶

The USA is the current largest market for biologics and it is expected that it will continue to be for at least the next 10 years. However actual growth rates of biologics will be highest in the emerging economies, driving an increasing number of companies to focus their activities on these markets. The impact of the generic or biosimilar products is increasingly important to the medical biotechnology sector as biologics with estimated sales revenue of \$20bn come off patent in 2015.

1.3. Industrial Biotechnology Market

The current size of the market for products and services derived from industrial biotechnology is estimated to be \$50-60bn worldwide, with some suggesting this will grow to \$300bn by 2030.⁷ The biofuels and chemicals markets are considered to be the largest segments within the sector. In the chemicals segment the potential of the range of existing chemicals that could be made by biotechnology process is huge, but currently only 11.7% of consumer chemicals (e.g. cosmetics, detergents), 9.1% of speciality chemicals and 3.5% of base chemicals are made by industrial biotechnology processes.⁸

Bio-energy has been and will likely continue to be a key driver for growth in the sector, stimulated by government policies promoting sustainability and energy security. Another segment expected to grow is bio-plastics. The combination of regulatory and policy incentives coupled with advances in technology has driven significant growth in the sector such as the doubling of bioethanol production over 2005 to 2010, and the quadrupling of biodiesel production over the same period. The potential market for biofuels is forecast to be 65m barrels by 2020.⁹

The industrial biotechnology sector is receiving increasing attention from governments around the globe attracted by its potential to contribute to economic sustainability and world environmental targets.

1.4. Pharmaceutical Market

The global sales of prescription and over-the-counter (OTC) drug sales was \$612bn in 2011 (excluding biologics), prescription sales contributed to 95% of the total. The growth in prescription medicines over the last 8 years has averaged 7.1%. This figure includes a slowdown period between 2009 and 2010 (less than 3% annual growth) and a recovering 5.9% growth rate between 2010 and 2011.¹⁰ Forecasts point to a future rate of growth of around 3-4% over the next 5 years. This slowdown in growth is explained by pricing pressures and the lower revenues from so-called blockbuster drugs coming off patent and allowing entry of lower priced generics. It is forecast that generic products will grow by around 10% over the next 5 years.¹¹

The pharmaceutical industry is undergoing profound changes. As traditional geographical markets mature, the discovery and development of innovative medicines becomes increasingly challenging and governments focus on constraining rising public healthcare costs. Despite this, the industry continues to be a key investor in research and development. In 2011, global R&D pharmaceutical spend was estimated to be \$135bn and to have grown at a rate of 6.5% CAGR over the last 6 years. Growth in R&D expenditure is however forecast to decrease to 1.5% CAGR over the next 6 years.¹²

Medical Technology Sector

2.1. Sector Definition

For the purpose of this report, companies in the medical technology and diagnostics sector are those whose major business activity involves the development, manufacture, or distribution of medical devices as defined by European Union Medical Devices Directive (93/42/ECC) and companies who have significant activity, defined as more than 10% of their turnover, in supplying specialist services to the medical technology sector.

The definition of this sector is wider than that traditionally focused on the regulatory definition of a medical device. Companies that provide specialist services represent a vital part of the medical technology overall supply chain and a significant portion of the sector employment. It is therefore useful to include them in the context of analysing the overall economic impact and trends of the medical technology sector.

The medical technology sector in the Bioscience and Health Technology database has been divided into 22 segments based on the products or services they develop or offer (see appendix III). The database allows companies to be classified as being active in more than one of these segments. In the majority of analysis presented here companies have been classified according to their primary activity, that is, that from which the majority of turnover and employment is derived.

2.2. Sector Overview

The UK medical technology sector is comprised of 3,129 companies, which employ just over 71,000 individuals and have a combined annual turnover of £16bn. Trend data based on a sample of 1,762 companies (56% of the total) for which financial data is available for the period of 2009-12 shows a 1% increase in turnover and 4% increase in employment between 2011 and 2012. Total company numbers have decreased by 6% (8 new companies and 189 company cessations mainly due to merger or acquisitions). Between 2010 and 2011 the number of companies decreased by 3% (9 new companies were created). The lower start-ups figure is not inconsistent or unexpected in the current economic climate.

The sector continues to be dominated by SMEs, which make up 99% of all the companies. Companies producing single use technology, professional services, wound care and management and orthopaedic devices form the four largest segments all with turnovers greater than £1bn.

The sector is dispersed across the UK, however there are small concentrations of companies in the West Midlands, East Midland and the East of England.

2.3. Segmentation Turnover and Employment

The turnover of each medical technology segment is shown in **Figure 3**. Single use technology, professional services, wound care and management, and orthopaedic devices are the top 4 segments by turnover, with combined sales of almost £5bn in 2012. These were the same segments with highest turnovers in 2011 although professional services have replaced wound care in the top 2. Companies producing single use technologies continue to have the highest turnover in the sector.

Analysis of the best and worst performing segments by turnover (**Figure 4**) shows that the radiotherapy equipment segment has increased by 189%. This is followed by neurology (up by 63%) and cardiovascular and vascular devices (up by 14%). Neurology was also one of the top 3 segments by increased turnover in 2011. Conversely, the segments with the largest fall in turnover are medical imaging/ultrasound (down by 8%), education and training (down by 9%) and drug delivery (down by 26%).

Figure 3. Turnover by medical technology segment in the UK

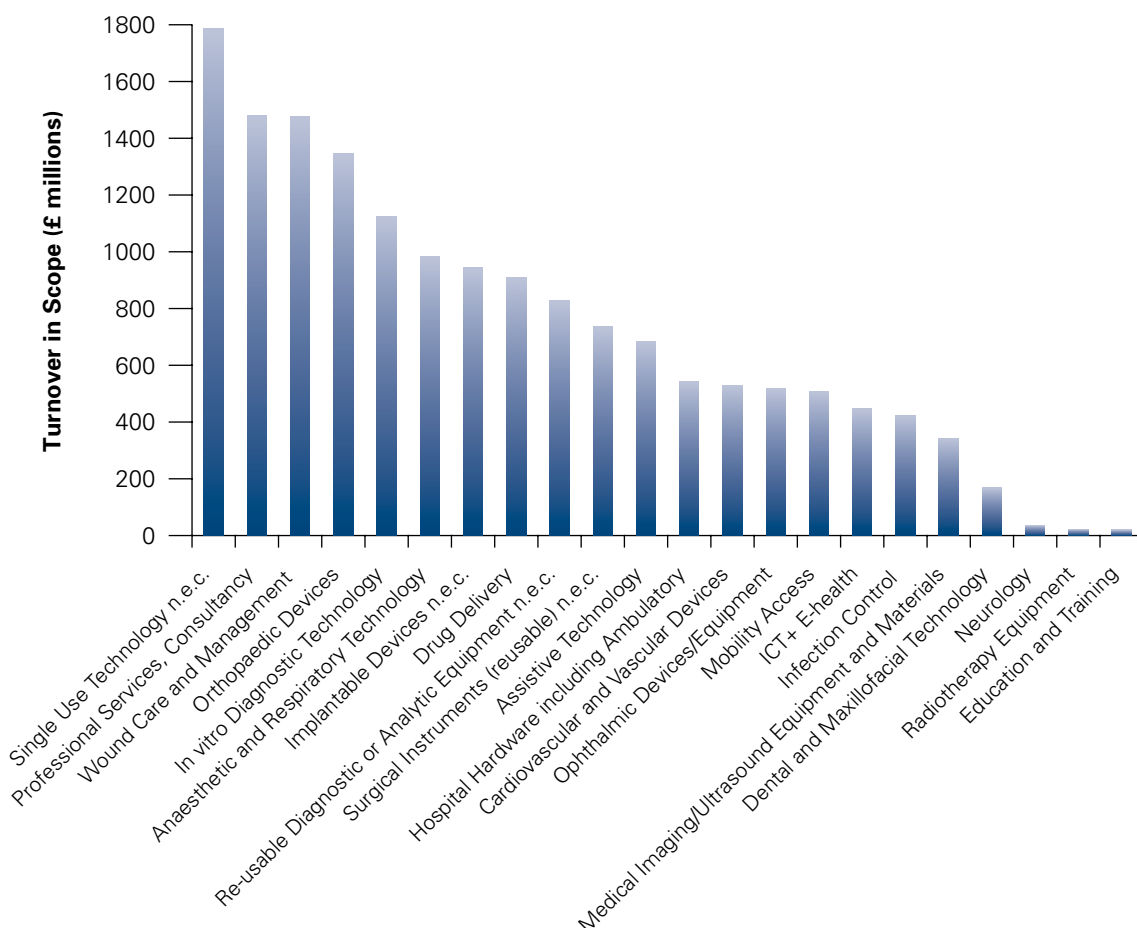
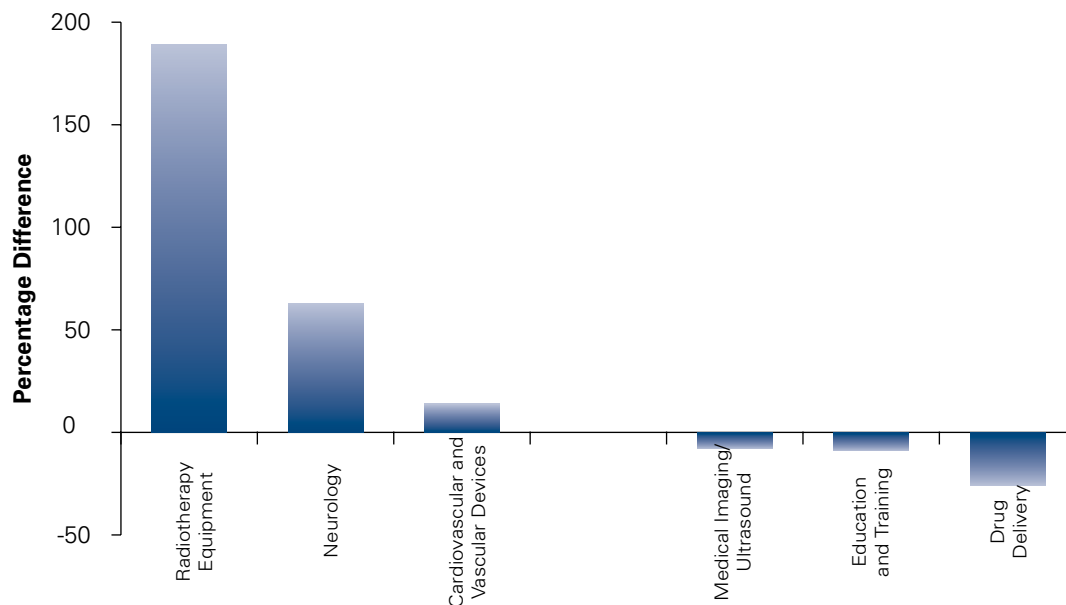
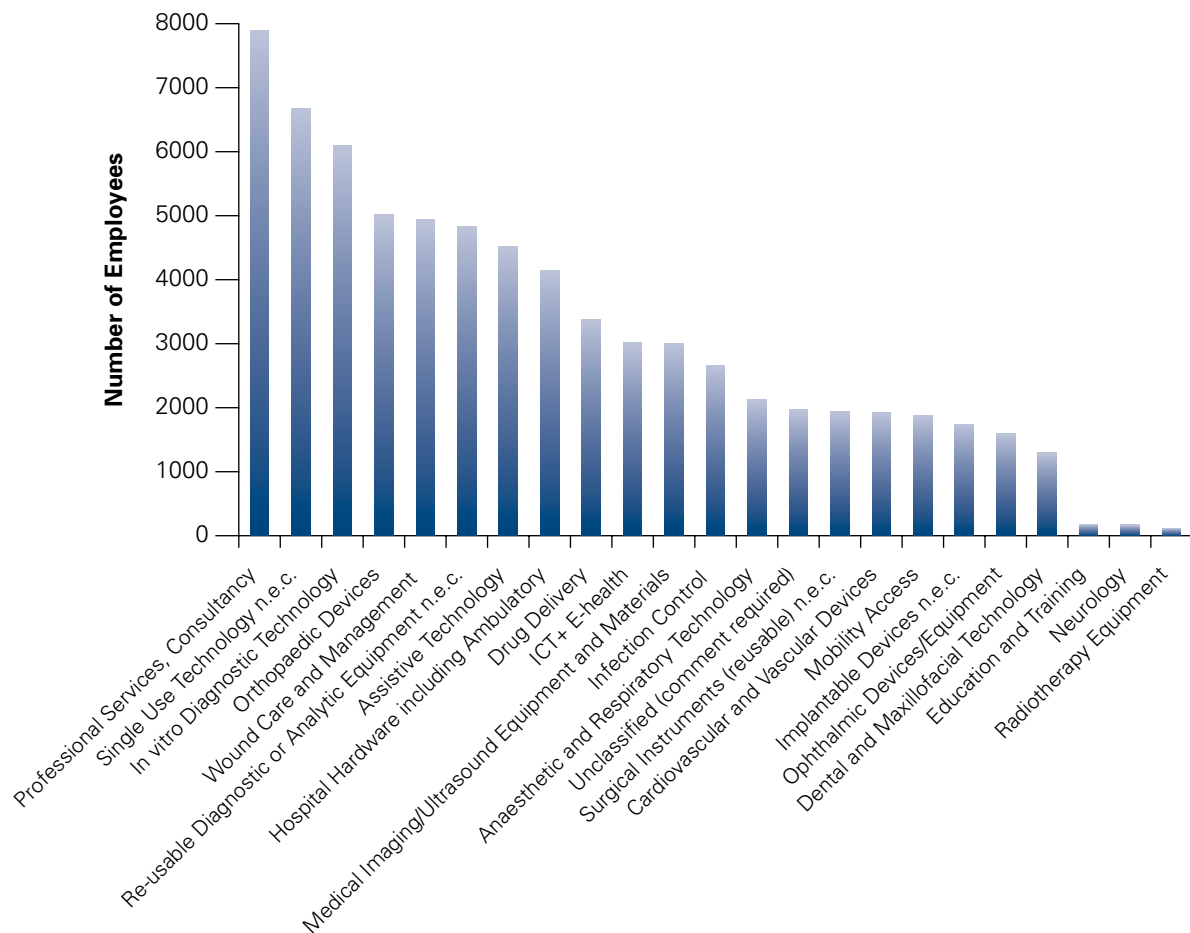


Figure 4. *Turnover by medical technology: top and bottom 3 segments*

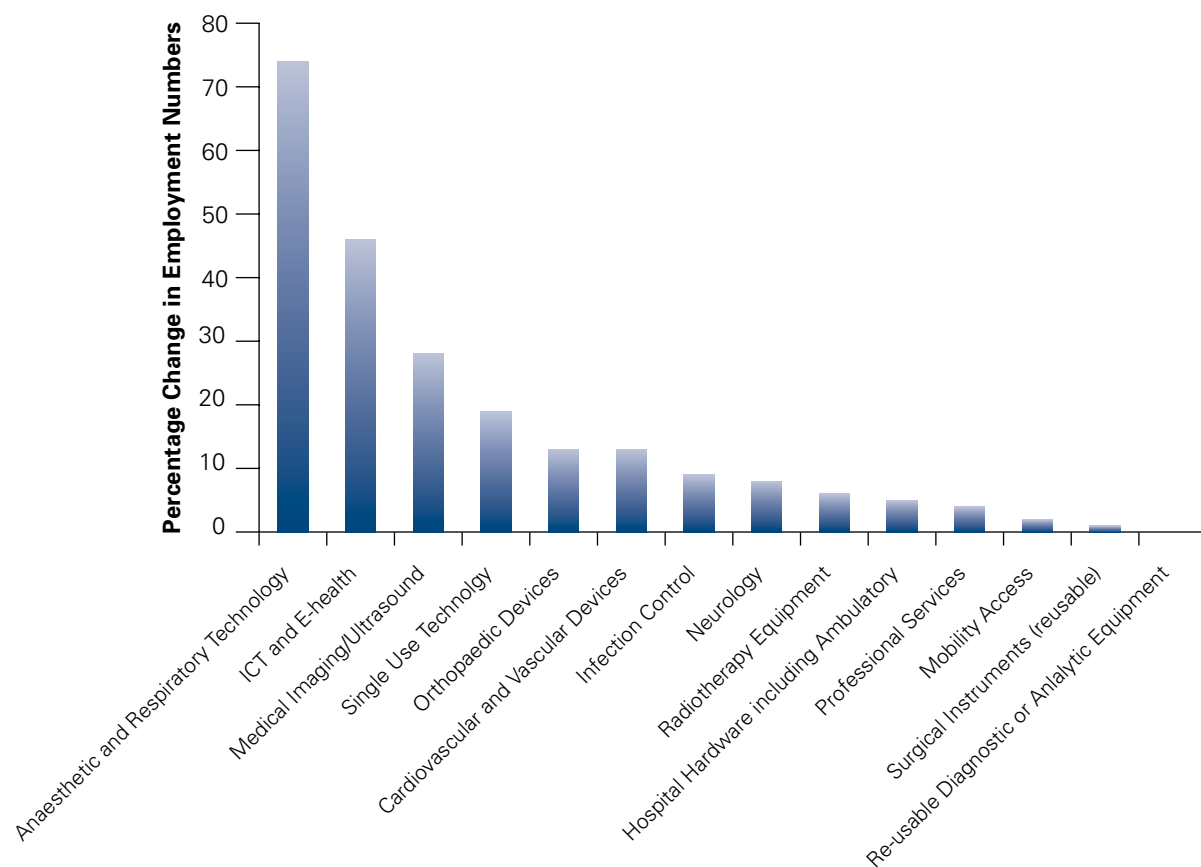
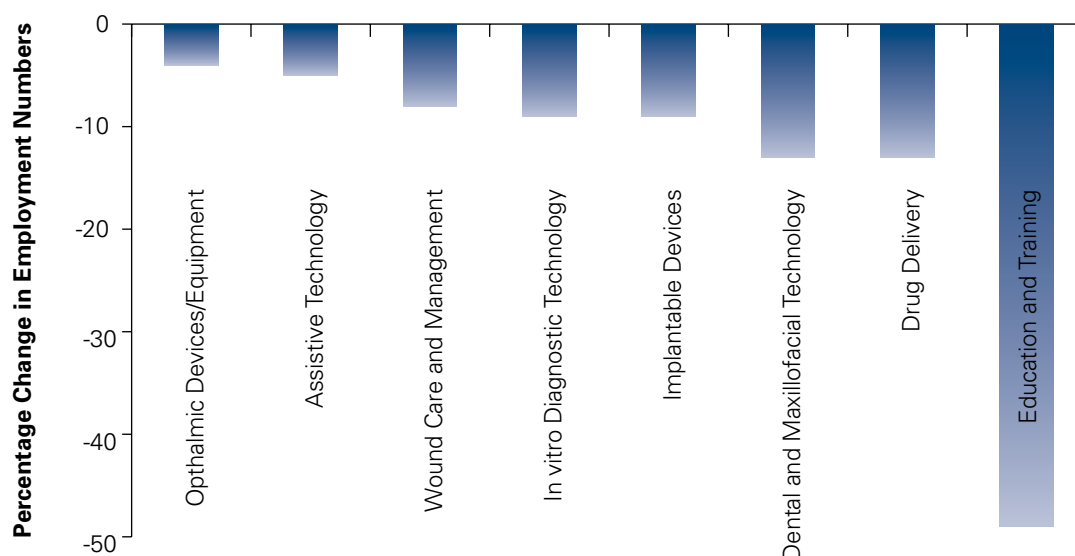
The distribution of employment across all the segments shown in **Figure 5** is different to that of turnover. As in 2011, professional services employ the largest proportion of individuals with just below 8,000 employees. Companies that form the professional services medical technology segment provide a wide range of activities that are part of the extended supply chain and are vital to the efficient operation of the sector. The largest companies within professional services by employment in 2012 continue to be those offering consultancy, regulatory advice, legal services and the provision of servicing and maintenance.

The other top employment segments are single use technology, in vitro diagnostic technology and orthopaedic devices. This differs from 2011 as assistive technology has fallen out of the 4 top employers and has been replaced by orthopaedic devices. Other segments that employ over 4,000 individuals include wound care, re-usable diagnostics, assistive technology and hospital hardware.

Figure 5. *Employee numbers by medical technology segment in the UK*

Figures 6 and 7 show the changes in employment between 2011 and 2012. There are 13 segments in which employment has increased, 1 segment where it has remained static and 8 segments where employment has fallen. The segment with the largest employment increase in the past 12 months is anaesthetic and respiratory technology (up by 74%), followed by ICT and e-health and medical imaging and ultrasound (up by 46% and 28% respectively). Anaesthetic and respiratory technology is a relatively small segment where minor numerical differences can throw large percentage differences. This should not, however, diminish the importance of a very successful year for this segment.

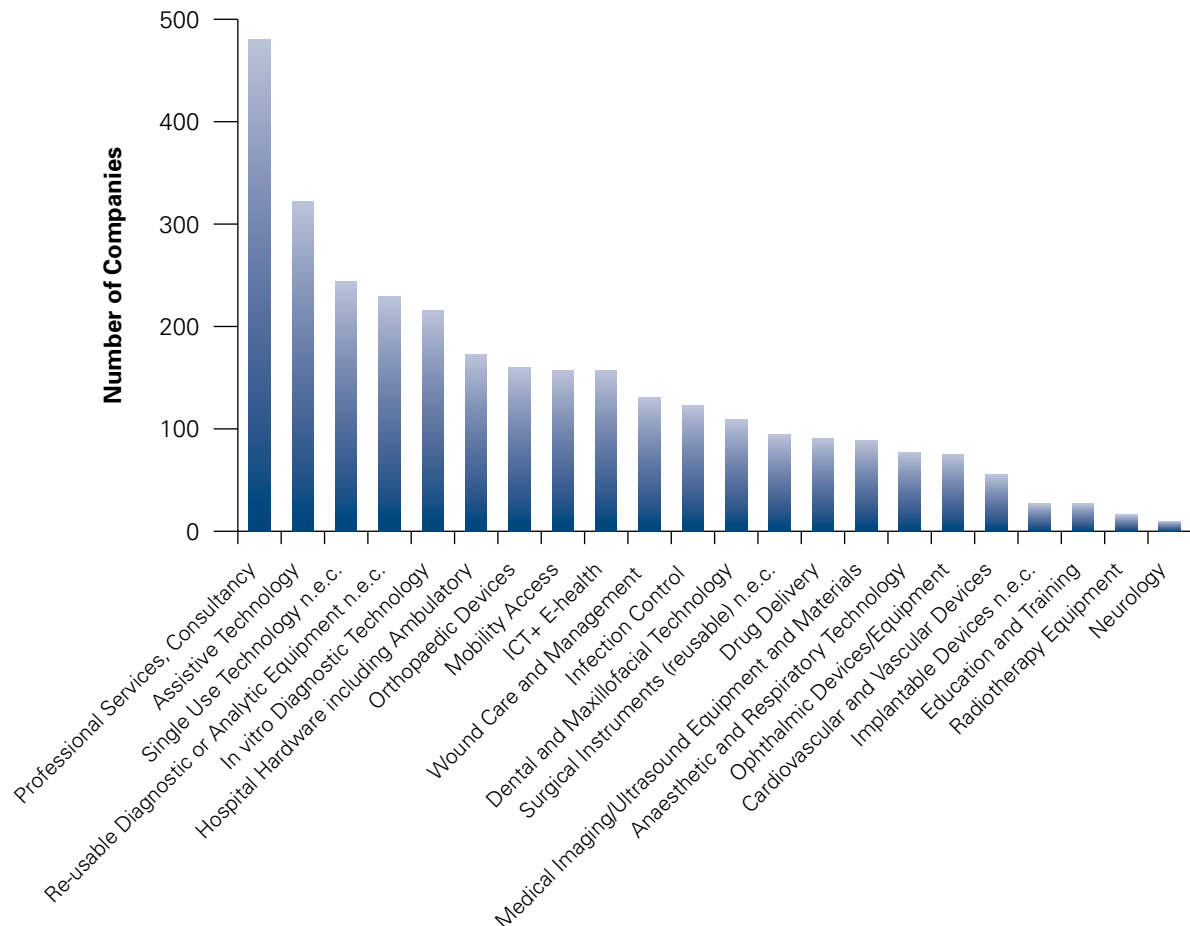
Education and training has seen the steepest decline in employment, down by 49%. Education and training is also a relatively small segment where small changes can result in large percentage differences. Drug delivery and dental and maxillofacial technology have both decreased by 13%.

Figure 6. Medical technology employment: segments with increased employment**Figure 7.** Medical technology employment: segments with static or decreased employment

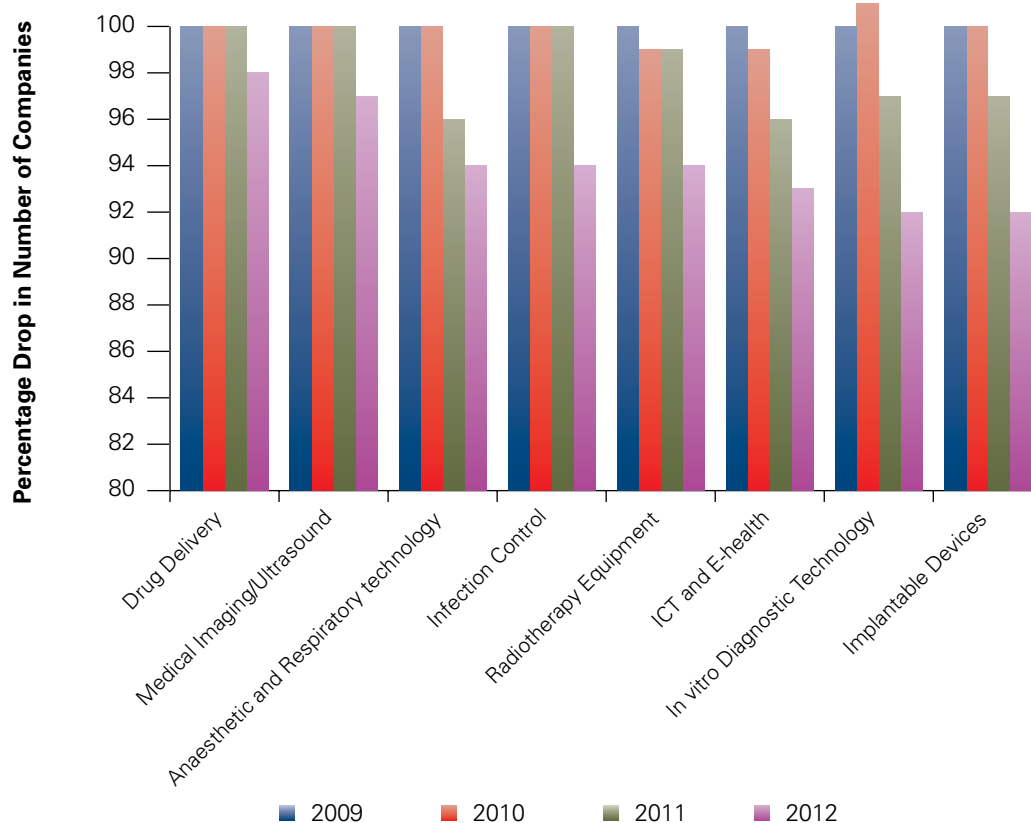
Changes in turnover do not echo those in employment, although companies working in education and training have seen a drop in both (down by 9% in turnover and down by 49% in employment). The dramatic increase in turnover in the radiotherapy segment could be explained by the significant increase in employment in 2001 without an accompanying increase in turnover that year.

The distribution of the number of companies in each segment is shown in **Figure 8**. As in the previous three years, companies providing professional services and consultancy form the largest medical technology segment. The top segments by company numbers have remained the same in the last four years.

Figure 8. *Company numbers by medical technology segment in the UK*

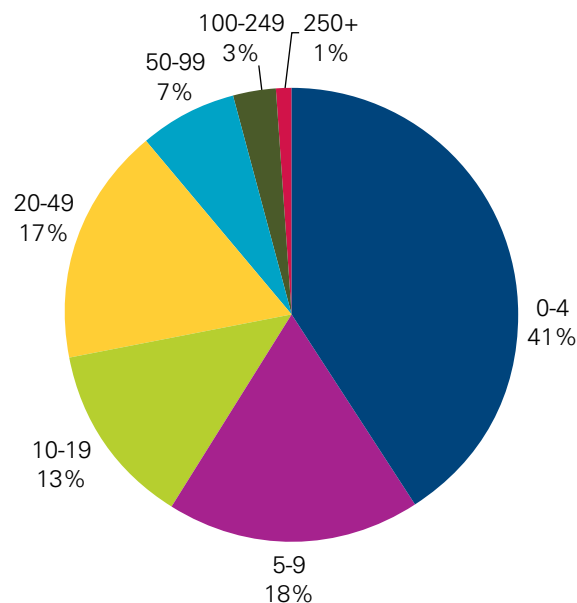


The number of companies in most segments has decreased in 2012, a trend that has been seen in previous years. **Figure 9** shows the 4 best and worst performing segments by company numbers between 2009 and 2012. The number of companies in the drug delivery sector remained stable until 2011 and then decreased by 2% in 2012. The number of companies working in medical imaging, anaesthetic and respiratory equipment, and infection control has decreased the least between 2% and 6%. Companies involved in radiotherapy equipment, ICT and e-health, in vitro diagnostic technology and implantable devices have seen the largest fall in total numbers, between 16% and 18%.

Figure 9. *Company number changes by medical technology segment in the UK*

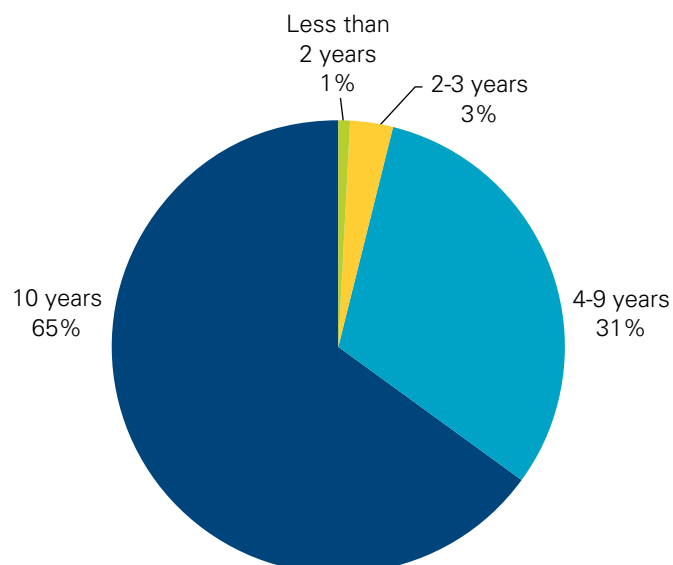
2.4. Company Size and Activity

The vast majority of companies in the medical technology sector (99%) are small to medium size enterprises (SMEs) with fewer than 250 employees. The overall distribution is shown in **Figure 10**. 59% are micro-companies (employing less than 10 people), down from 60% in 2011, 63% in 2010 and 67% in 2009. This trend might be because micro companies are more likely to fail in difficult economic conditions or because these small companies are growing in size and entering into a different band. The percentage of SME companies in the medical technology sector is similar to the UK average of 99.8%. However, 59% of medical technology companies are micro-businesses of fewer than 250 employees¹³, lower than the UK average of 90%.

Figure 10. *Distribution of medical technology companies by employee bands*

78.5% of all medical technology companies for whom financial data is available have a turnover in the range of £100,000 – £5m. Despite the difficult economic climate, 481 companies in this sector now have an annual turnover of over £5m, up from 466 in 2011 and 425 in 2010.

Figure 11 shows that the majority of medical technology companies are well established, 65% of all companies are over 10 years old, up from 52% in 2011. 82% of companies producing ophthalmic devices are over 10 years old, followed by surgical instruments (73%) and anaesthesia companies (72% over). 3% of education and training companies are between 2 and 3 years old.

Figure 11. *Profile of UK medical technology sector by company age*

Medical technology companies involved in research and development and/or manufacturing (including contract research and contract manufacturing organisations) have a combined turnover of over £5bn and employ over 25,000 individuals (33% of the sector turnover and 35% of the sector employment). 5% of the medical technology turnover is produced by companies involved in research and development, 27% is produced by companies involved in both research and development and manufacturing and 1% is produced by companies solely involved in manufacturing.

2.5. UK Profile

Medical technology companies are highly dispersed throughout the UK. **Figure 12** shows a combination of turnover, employees and number of companies per UK region. Unlike previous years there is a strong relationship in most areas between the proportion of companies in each region and their share of UK employment and UK turnover. The exceptions are the South East where a 12% of companies are responsible for a larger turnover share (17%) and the West Midlands where a large percentage of companies are responsible for a smaller turnover share.

Figure 12. *Distribution of turnover, employment and companies for the UK medical technology sector*



The geographical distribution of companies by turnover band is shown in **Figure 13**. Each of the regions host companies in all turnover ranges. Each of the regions has between 32% and 60% of companies with turnovers of over £1m a year.

Figure 13. *Percentage of medical technology companies by turnover band (in thousands) by UK region*

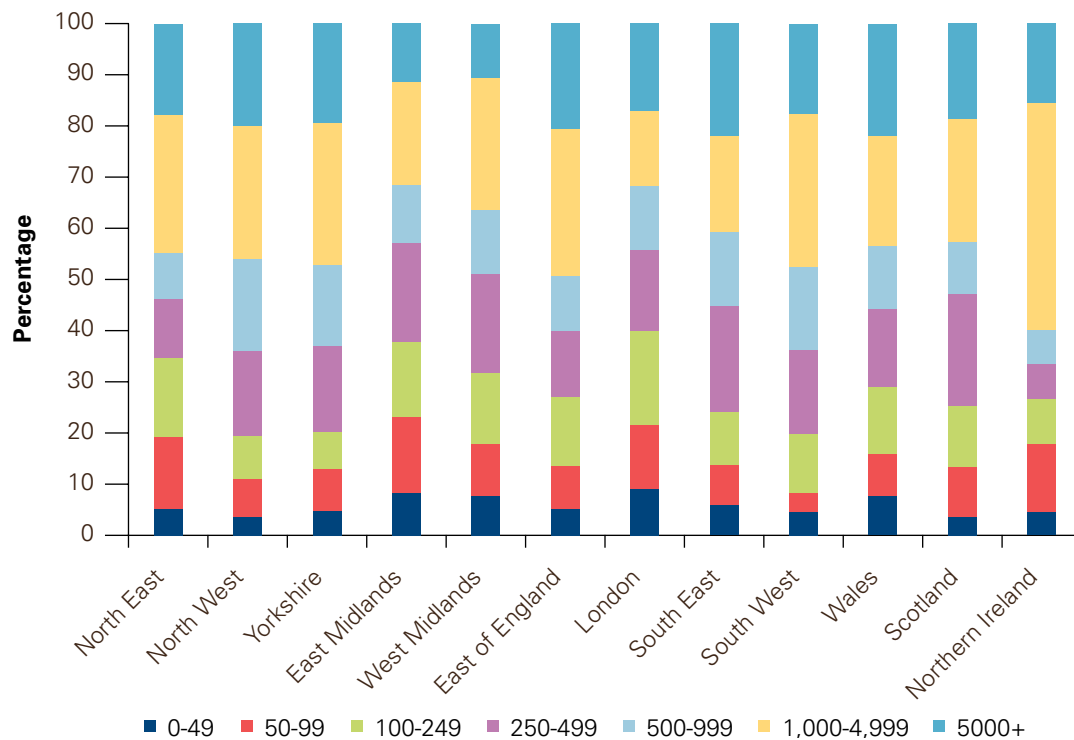


Figure 14 shows that the West Midlands hosts the majority of medical technology companies (over 550, consistent since 2009), but the gap between the West Midlands and the East Midlands is reducing and the East Midlands has now over 400 medical technology companies overtaking the East of England this year. These three regions account for 44% of the UK medical technology companies, a 1% increase since 2011.

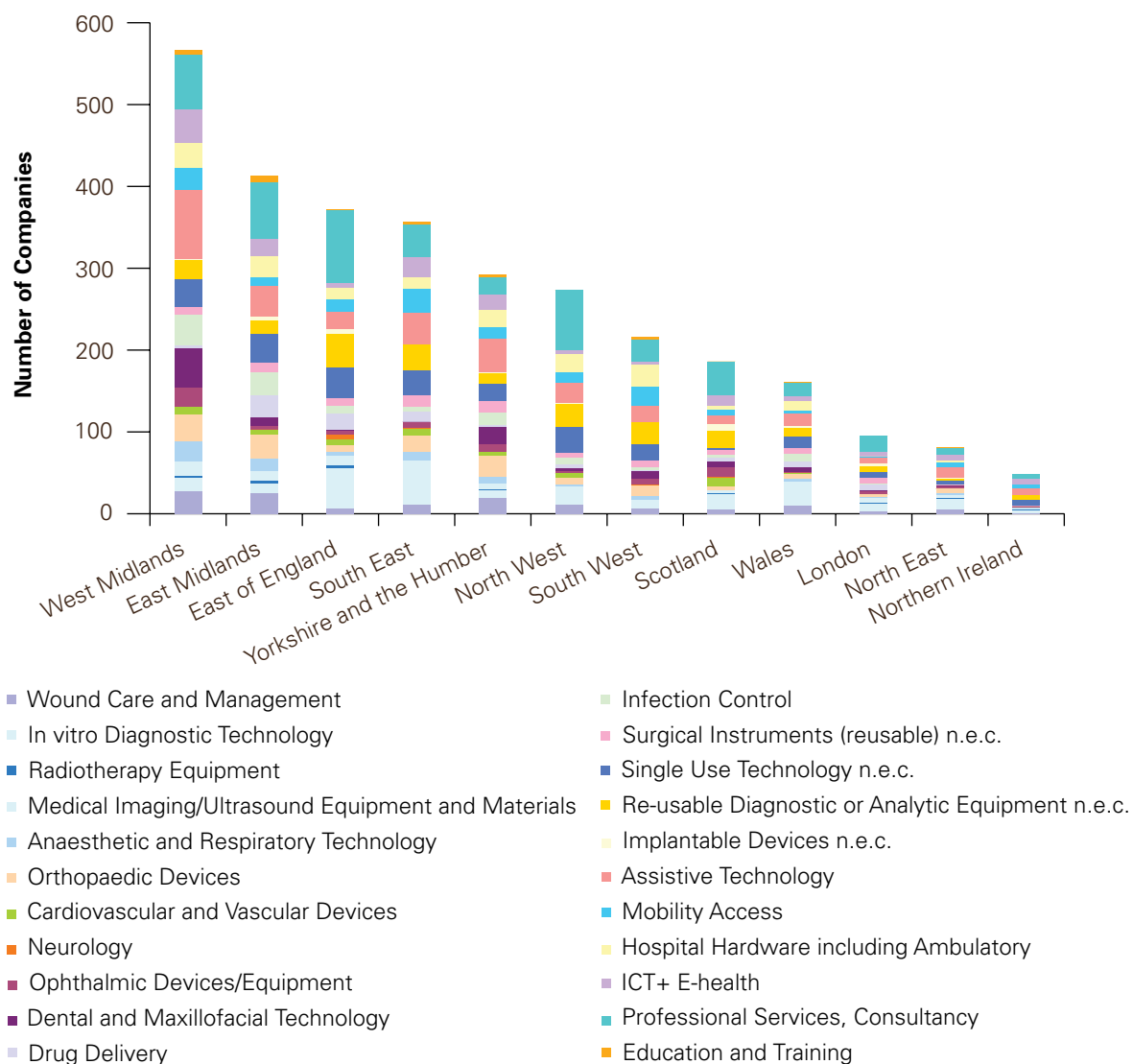
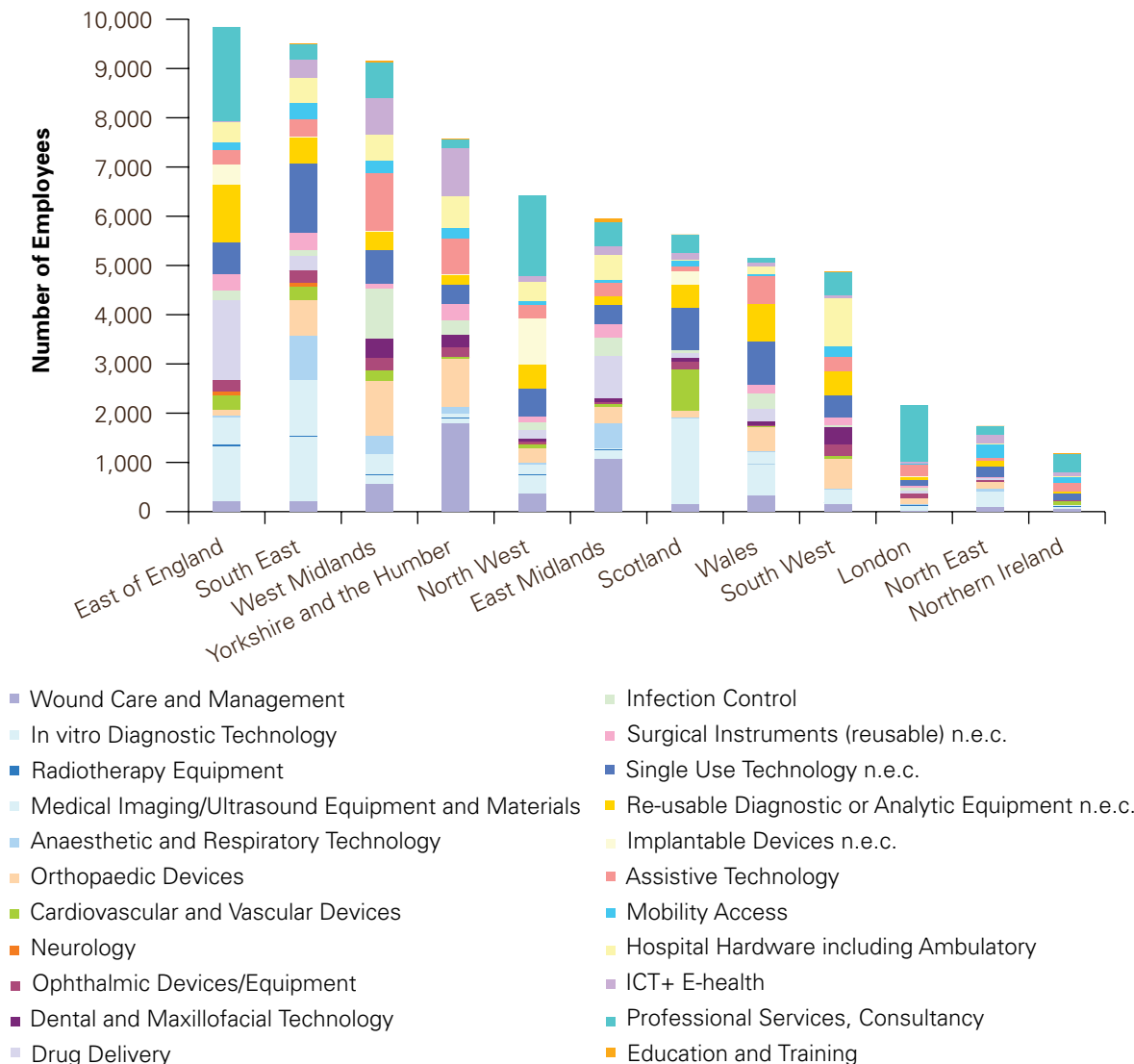
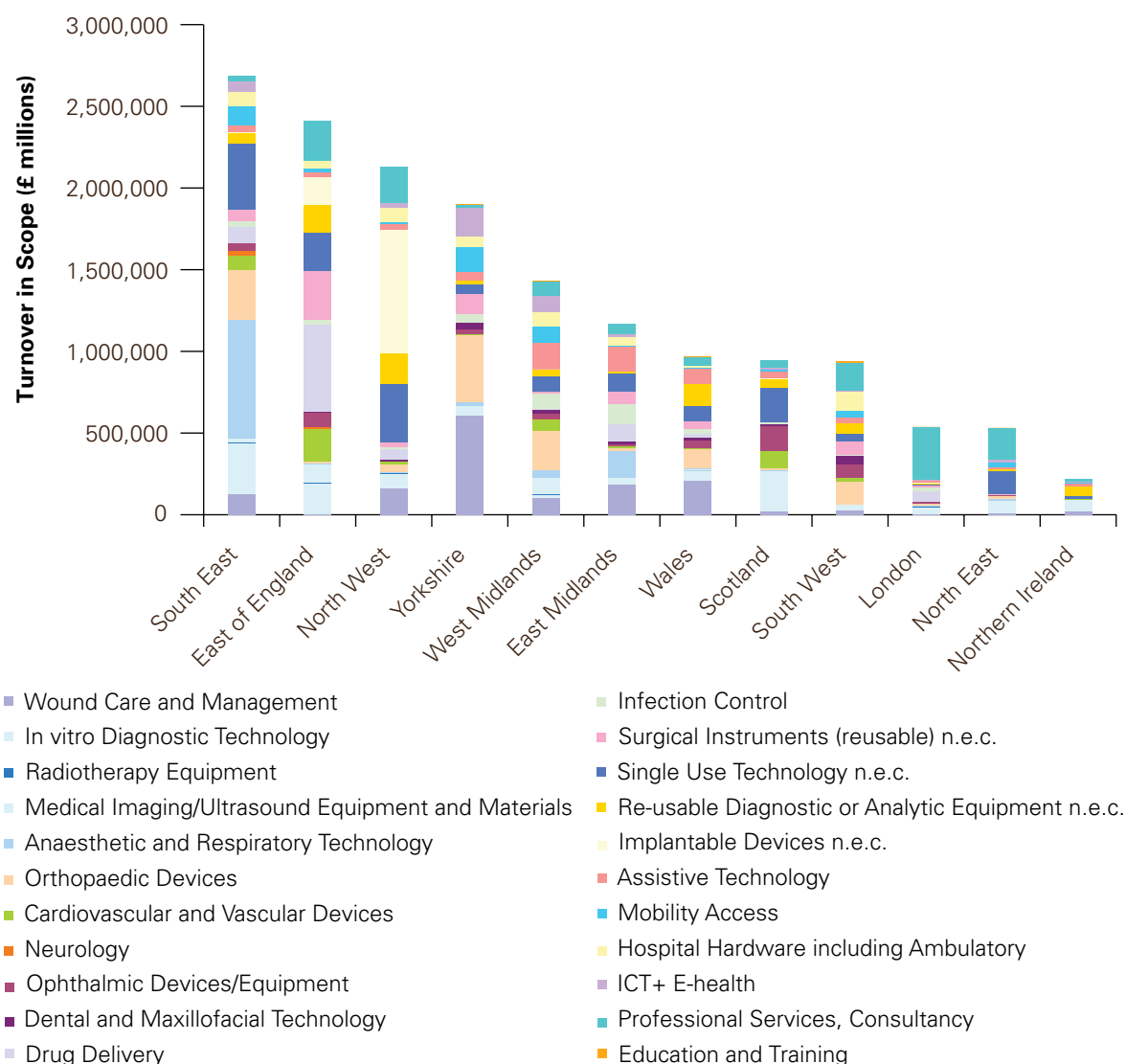
Figure 14. Number of medical technology companies per segment

Figure 15 shows that the highest employment in the sector is concentrated in the East of England, followed by the South East and the West Midlands. Unlike in 2011 when the West Midlands had the largest share of the country's workforce, the East of England and the South East account now for 14% of the employment each followed by the West Midlands (13%).

Figure 15. Total number of employees in medical technology companies per segment



The geographical distribution of turnover shows a similar picture to that of the geographical distribution of employment. In **Figure 16** the South East comes first by turnover followed by the East of England. As in 2011, the South East still boasts the highest turnover in the sector, but the East of England has replaced the North West in second position. As in 2011, the West Midlands is fifth by turnover but third by employment.

Figure 16. Total turnover per medical technology segment by UK region

2.6. Medical Technology Pipeline

The medical technology sector is highly innovative. One measure of the health of the UK industry is the number of devices from UK-headquartered companies that have been approved for marketing in the world's largest medical technology market, the USA. The BioPharm Insight¹⁴ database shows that 37 devices developed by UK companies received approval between January and August 2012 (**Figure 17**). If this pace of activity continues until the end of 2012 we would expect to see overall numbers of approvals similar to those in 2011 (around 60). These figures are still below numbers of approvals between 2004 and 2008, around 80-100 per annum.

A number of companies whose main activity falls within the medical technology space have been diversifying their portfolio of activities. Using the BioPharm Insight database we have identified over 100 products being developed by companies classed as medical technology (**Figure 18**).

The BioPharm Insight database has also shown that the number of medical biotechnology and pharmaceutical companies working on medical devices has increased.

Figure 17. *Number of medical devices for UK companies gaining approval in the USA*

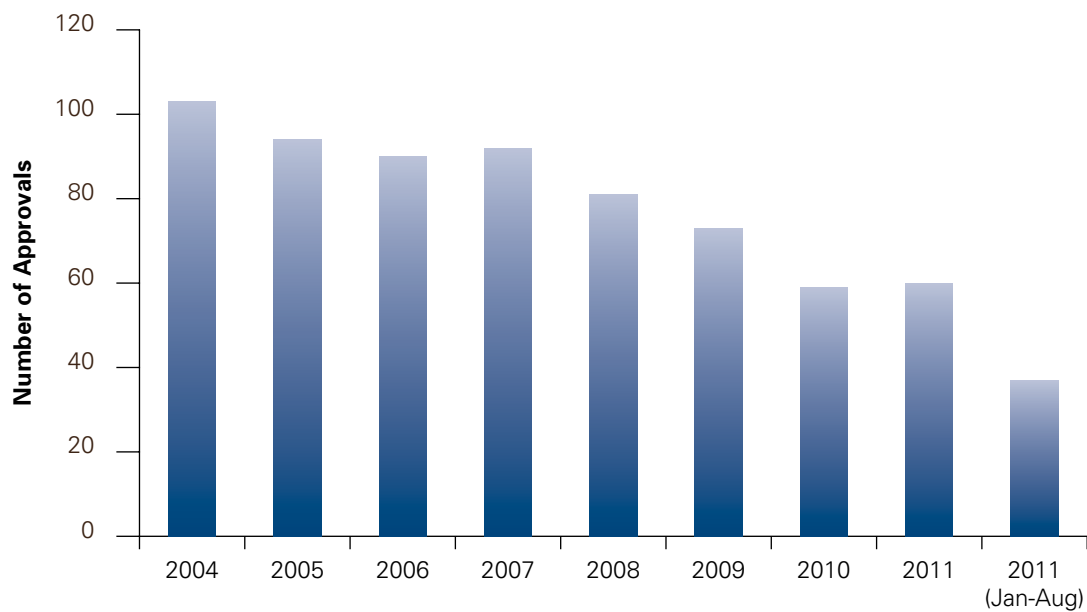
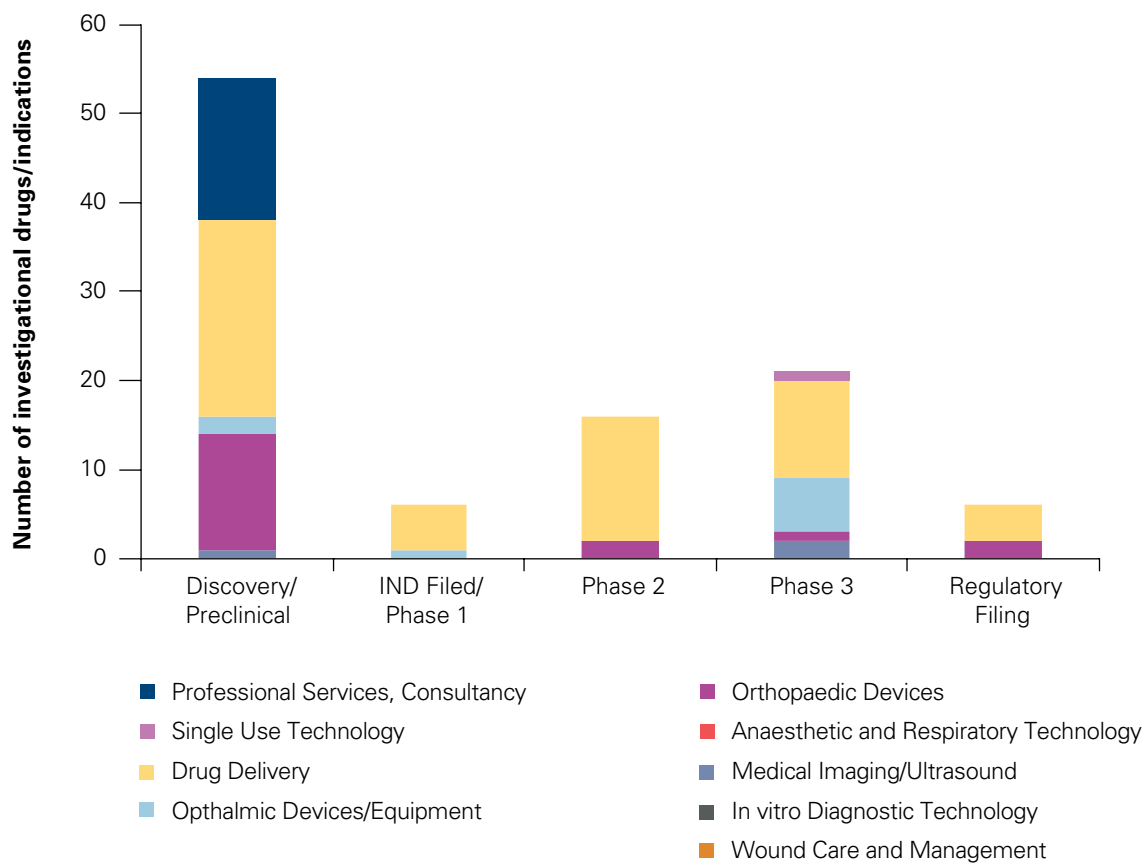
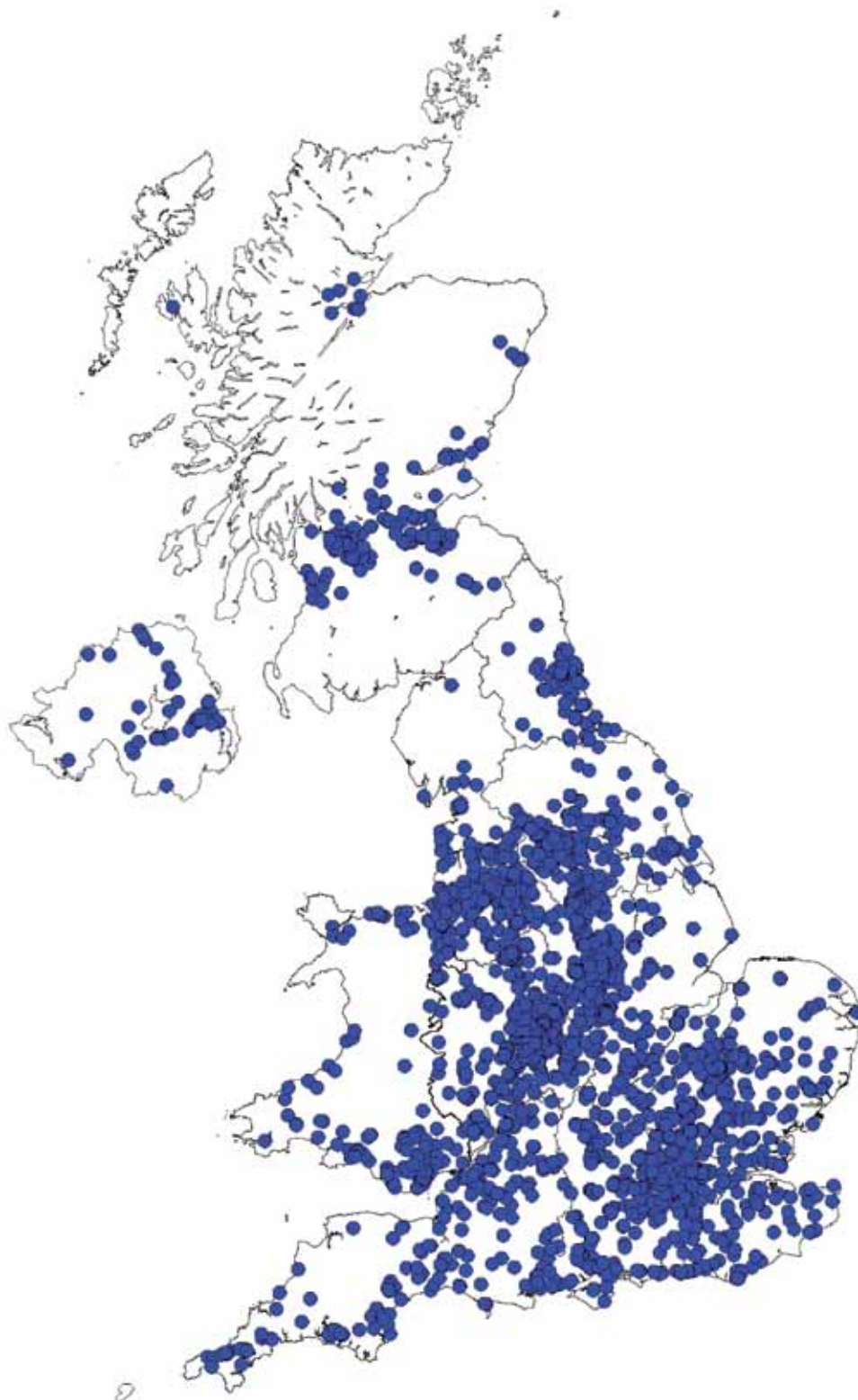


Figure 18. *UK medical technology companies drug pipeline*



2.7. Geographical distribution of medical technology companies

Map 1 Geographical distribution of medical technology companies



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UK Medical Technology Industry – profile

- A total of 3,129 companies, a 6% decrease in company numbers from 2011.
- A turnover of £16bn, a 1% increase from 2011.
- Total number of employees is 71,000, a 4% increase from 2011.
- The UK is home to 481 companies with turnovers in excess of £5m per annum.
- 78.5% of companies have turnovers in the range of £100k to £5m per annum.
- 33% of total medical technology turnover is generated by companies involved in research and development and/or manufacturing.
- 99% of companies have less than 250 employees.
- 65% of all companies are over 10 years old.

Top 3 segments in the sector		
By turnover	By employment	By no. of companies
Radiotherapy Equipment	Professional services	Professional services
Neurology	Single use technology	Assistive technology
Cardiovascular devices	In vitro diagnostic technology	Single use technology

Medical Biotechnology Sector

3.1. Sector Definition

Medical Biotechnology companies are classed as those:

- discovering or developing new therapeutics that achieve their principal action in or on the human body by pharmacological, immunological or metabolic means;

Or

- which offer specialised sector specific services;

And

- drug companies with an annual turnover of less than \$1bn.

The definition of this sector for the purpose of this report changed in 2010 due to the inclusion of the pharmaceutical sector in the database. While this has not altered the segmentation used for the medical biotechnology sector in the database, it has resulted in the re-classification of 107 of the companies listed as belonging to the medical biotechnology sector in 2010 as pharmaceutical companies in 2011 and onwards. This change of classification has to be borne in mind when comparing the medical biotechnology data in 2011 and 2012 to that reported in 2010 and previously.

The medical biotechnology sector in the database has been divided into seven segments based on the products or services they develop or offer (see appendix III). There are six product segments and a specialist service segment. The six segments are classified according to the technology employed rather than the condition treated – for example companies that develop, manufacture or sell medicines based on antibodies and small molecules. Companies have also been classified according to the traditional therapeutic categories, although the majority of the analysis presented is based on the technology employed.

The database allows companies to be classified as being active in more than one of these segments. In the majority of analysis presented here companies have been classified according to their primary activity, that is, that from which the majority of turnover and employment is derived.

3.2. Sector Overview

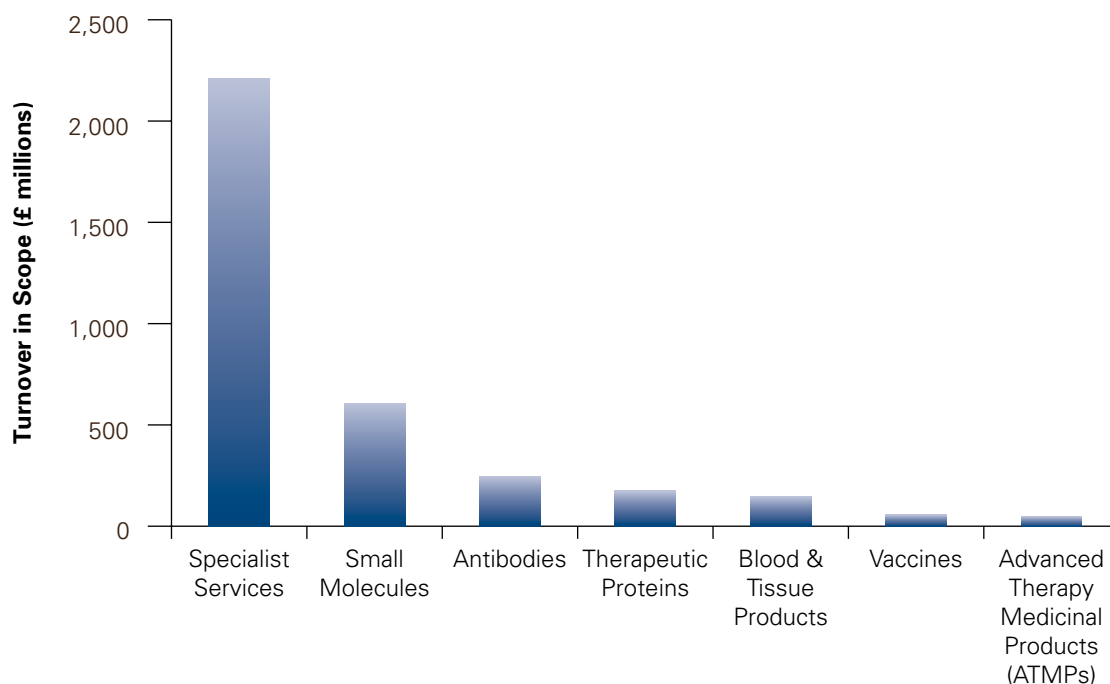
The UK medical biotechnology sector is comprised of 979 companies, employs close to 26,000 individuals and has a combined turnover of £3.7bn. Trend data based on a sample of 410 companies (42% of the total) for which financial data is available for the period of 2009-12 show a healthy increase of 5% in turnover and a 0.3% increase in employment between 2011 and 2012. Company numbers fell by 4%, 48 medical biotechnology companies have ceased trading between 2011 and 2012 and 3 new companies were created. SMEs make up 98% of companies in this sector.

Companies working in specialist services, small molecules and the antibodies form the three largest medical biotechnology segments with combined turnovers of £2bn, £0.6bn and £0.2bn respectively. The sector is widely distributed across the UK, with the highest concentrations of turnover and employment in the East of England, the South East and Scotland.

3.3. Segmentation Turnover and Employment

The distribution of the £3.7bn turnover of the medical biotechnology sector by individual segment is shown in Figure 19. As reported in previous years, the largest segment in terms of turnover is specialist services, which consists of companies providing regulatory advice, general consultancy and specialist analytical services. For companies involved in developing, manufacturing or marketing final products, the largest segment remains small molecules with a turnover of approximately £0.6bn, also consistent with previous years. The combined turnover of the rest of medical biotechnology segments is £0.67bn, up from £0.6bn in 2011.

Figure 19. *Turnover in UK medical biotechnology companies by segment*



The distribution of employment across segments in the medical biotechnology sector is detailed in Figure 20. The largest employer continues to be specialist services, with 16,410 employees (64% of total sector workforce). Small molecule companies employ 3,472 people representing 14% of the sector employment. Antibody companies employ 2,107 people, 8% of the total. The pattern of employment by segment is consistent with that seen between 2009 and 2011.

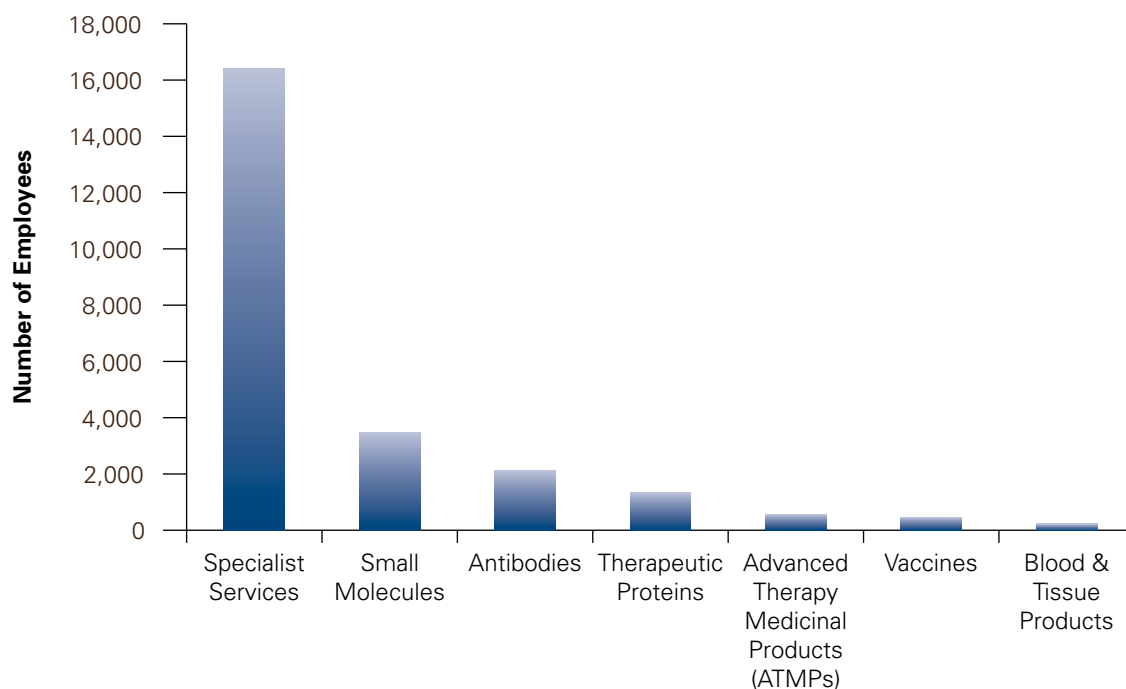
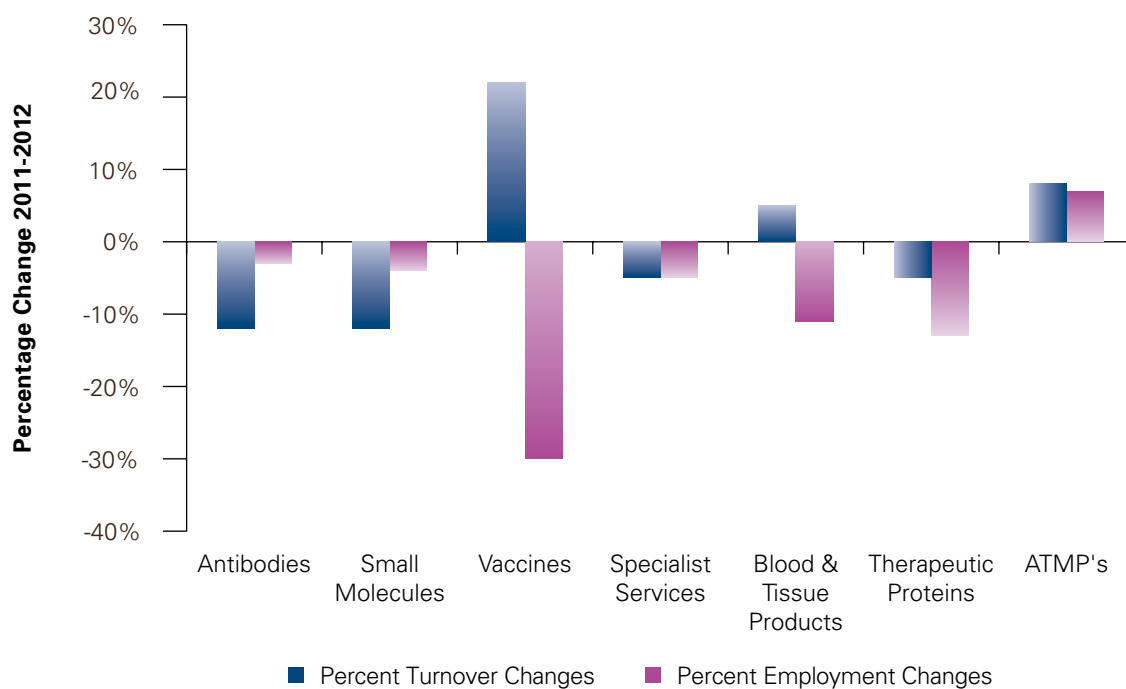
Figure 20. *Employees in UK medical biotechnology companies by segment*

Figure 21 shows turnover and employment changes between 2011 and 2012 by segment. Advanced therapy medicinal products (ATMPs), small molecules and specialist services have all increased in turnover, however only specialist services has increased in employment in 2012. Most segments have lost 10% or less staff, but employment in ATMPs has decreased by 30%.

Figure 21. *Change to the UK medical biotechnology company turnover and employment by segment*

As in 2011, companies providing specialist services form the largest segment in medical biotechnology segment. **Figure 22** gives a breakdown of the services offered by these companies. Specialist consultants are the largest sub-segment with 426 companies offering a whole range of services including advice on intellectual property, drug development expertise and good manufacturing practice (GMP) consultancy services. Specialist suppliers are the second largest sub-segment with 347 companies offering a range of equipment, consumables and contract services. Although the remaining three sub-segments are smaller, they are still significant in absolute numbers of companies, and provide a range of high technology analytical services.

Figure 22. *Distribution of UK medical biotechnology specialist services companies by sub-segment*

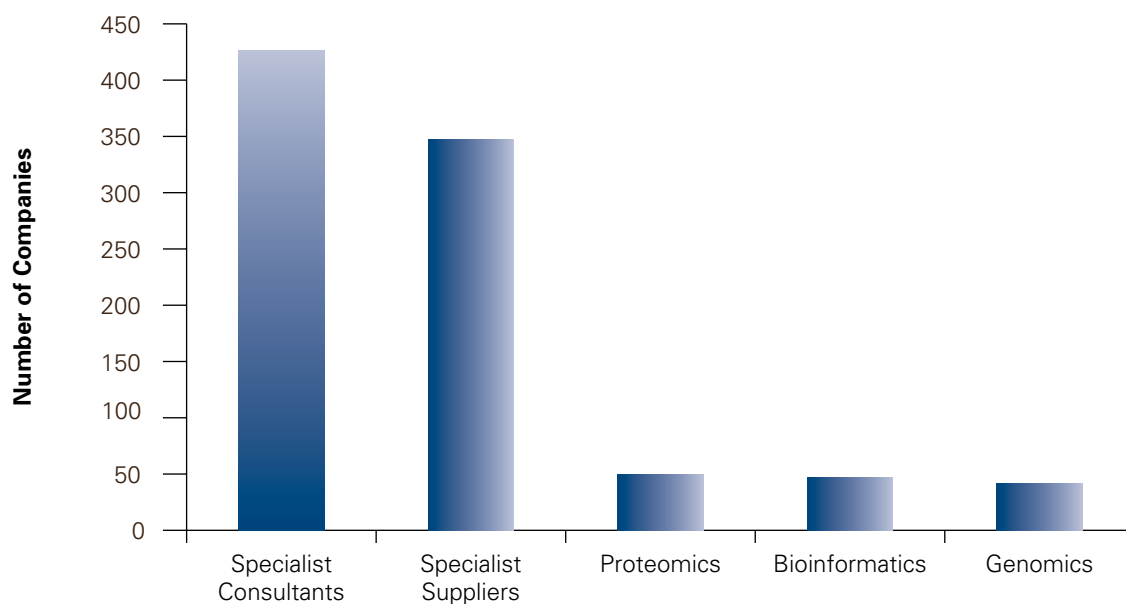


Figure 23 shows a comparison of the number of companies per segment between 2009 and 2012. Specialist suppliers continue to dominate the sector with 636 companies, 67% of all companies in the sector (down from 68% in 2011). The number of companies has fallen in all medical biotechnology segments between 2011 and 2012 except for blood and tissue product which has remained unchanged.

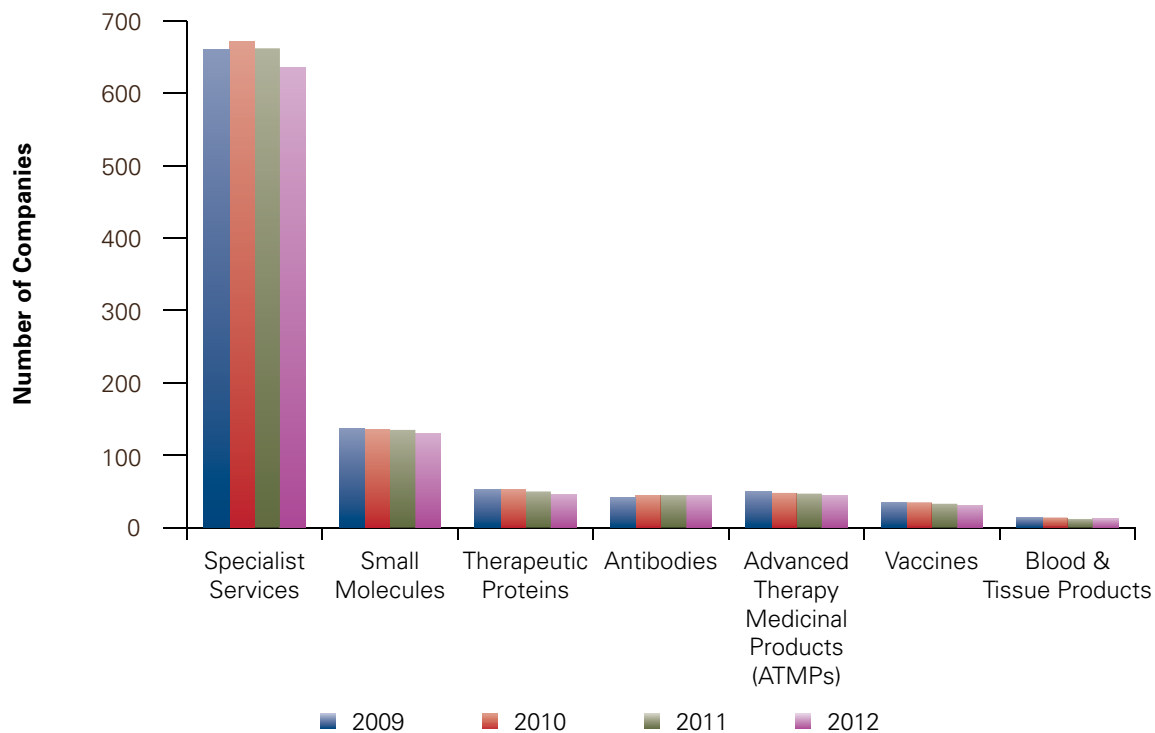
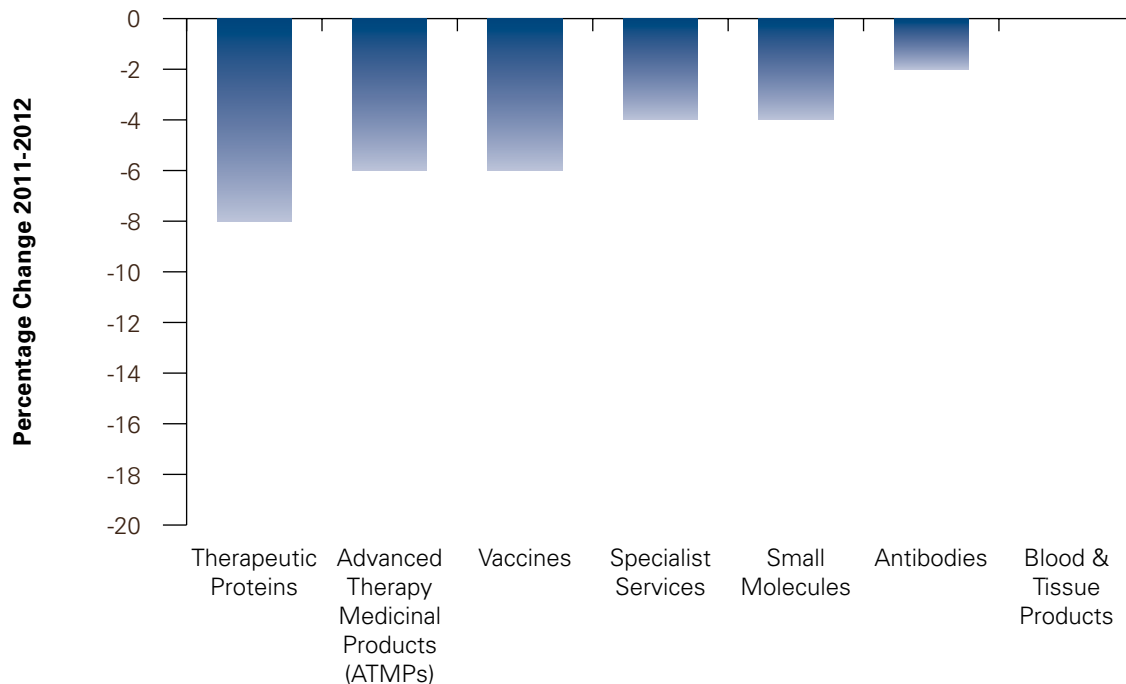
Figure 23. *Number of UK medical biotechnology companies by segment*

Figure 24 shows the changes in company numbers by segment in the last year. The number of companies working in therapeutic proteins has fallen by 8% (4 companies). The number of companies providing specialist services has fallen by 3%, but due to the large size of the segment it only amounts to 26 companies. Blood and tissue products have historically seen the highest level of company losses but in 2012 this remained unchanged.

Figure 24. *Percentage change in UK medical biotechnology company numbers by segment*



3.4. Company Size and Activity

The UK medical biotechnology sector is dominated by SMEs with 98% of the companies having fewer than 250 employees. **Figure 25** shows that over half (53%, up from 52% in 2011) of the companies in the sector have fewer than 5 employees. Only 21 medical biotechnology companies employ over 250 individuals.

Figure 25. *Distribution of UK medical biotechnology companies by employee bands*

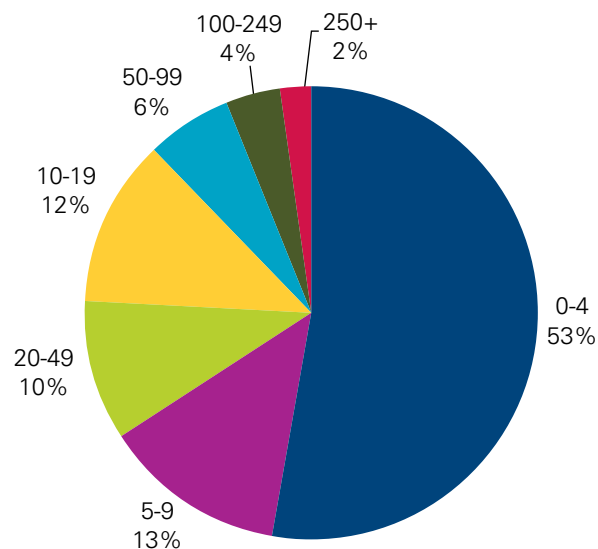


Figure 26 displays the age range of medical biotechnology companies by age and shows a healthy mix of young and older companies. 49% of the companies are over 10 years old.

Figure 26. *Distribution of UK medical biotechnology companies by age*

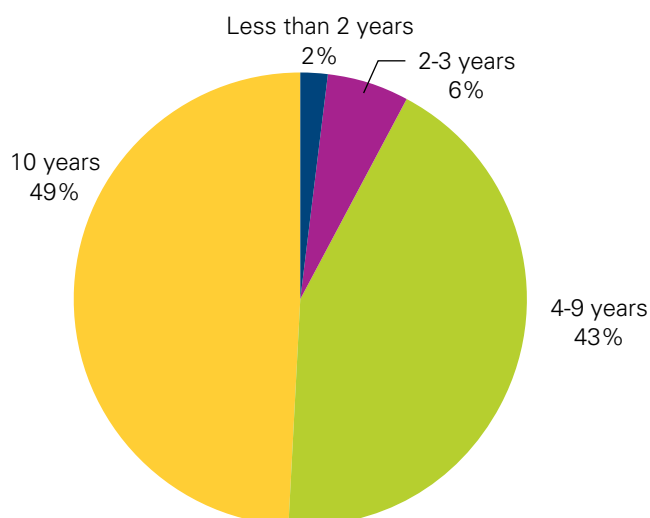
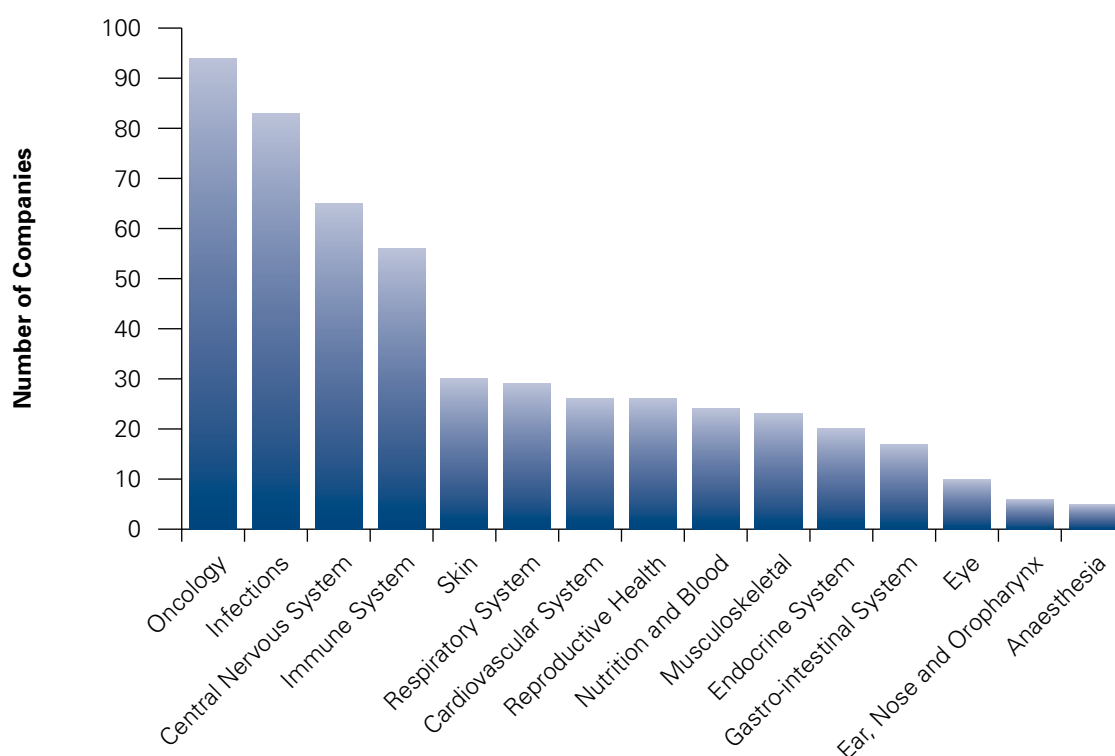


Figure 27 shows, for those companies where information is available, the distribution of medical biotechnology companies by specific therapeutic area (a company can have activity in multiple therapeutic areas). As in 2011, oncology and infections are the top 2 therapeutic areas with over 80 companies active in each area. The Central nervous system is the 3rd and the immune system is the 4th.

Figure 27. *Distribution of UK medical biotechnology companies involved in specific therapeutic areas*



Medical Biotechnology companies involved in research and development and/or manufacturing (including contract research and contract manufacturing organisations) have a turnover of almost £2bn and employ nearly 14,000 individuals. They account for 46% of the medical biotechnology sector turnover and 54% of the sector employment. 21% of the medical technology turnover is produced by companies that focus only on research and development, 25% by companies involved in both research and development and manufacturing and 1% is produced from companies solely involved in manufacturing.

3.5. UK Profile

Figures 28, 29 and 30 show the distribution of economic activity in medical biotechnology across the UK. This is expressed as the number of companies, turnover and employment by location and segment. As in 2011, most medical biotechnology companies are located in the East of England followed by the South East and Scotland. Together these three regions host 50% of all medical biotechnology companies in the UK, down from 51% in 2011. Most regions host companies working in the full range of medical biotechnology segments. As in previous years, the East of England has the highest concentration of small molecule companies.

Figure 28. *Number of companies in the UK medical biotechnology sector by segment*

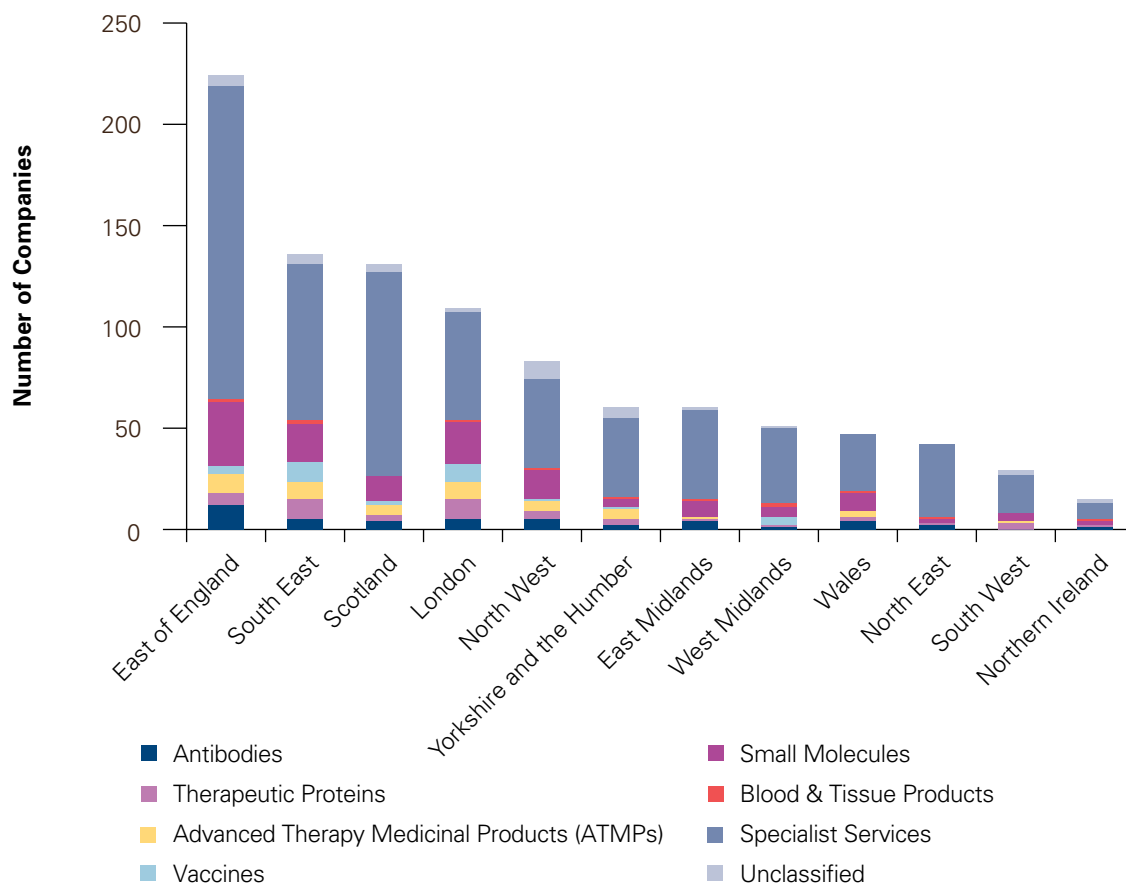


Figure 29 shows that the highest employment in the medical biotechnology sector is in the East of England (27% of the workforce, down from 32% in 2011), followed by the South East (13%) and Scotland (11% down from 13% in 2011). Together these three regions provide 51% of the total employment in this sector, down from 58% in 2011.

Figure 29. *Employees in the UK medical biotechnology sector by segment*

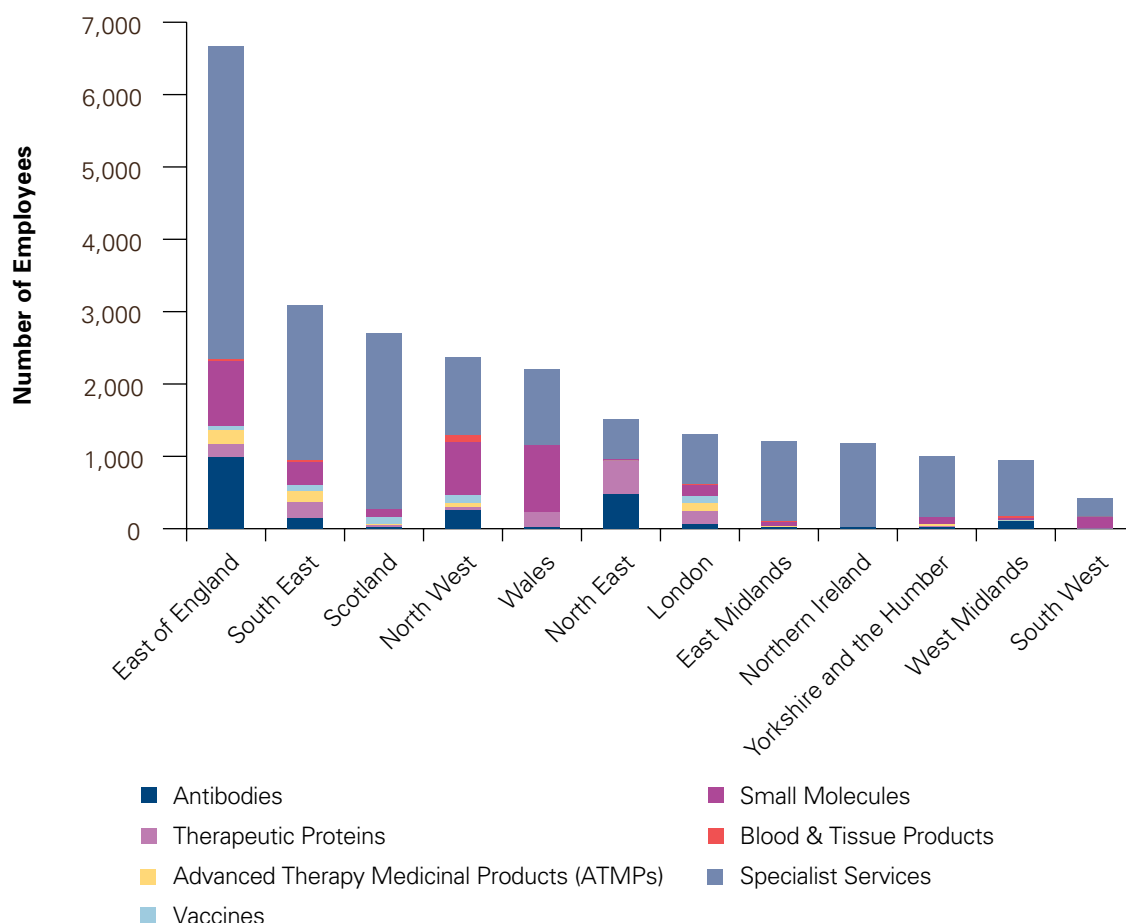
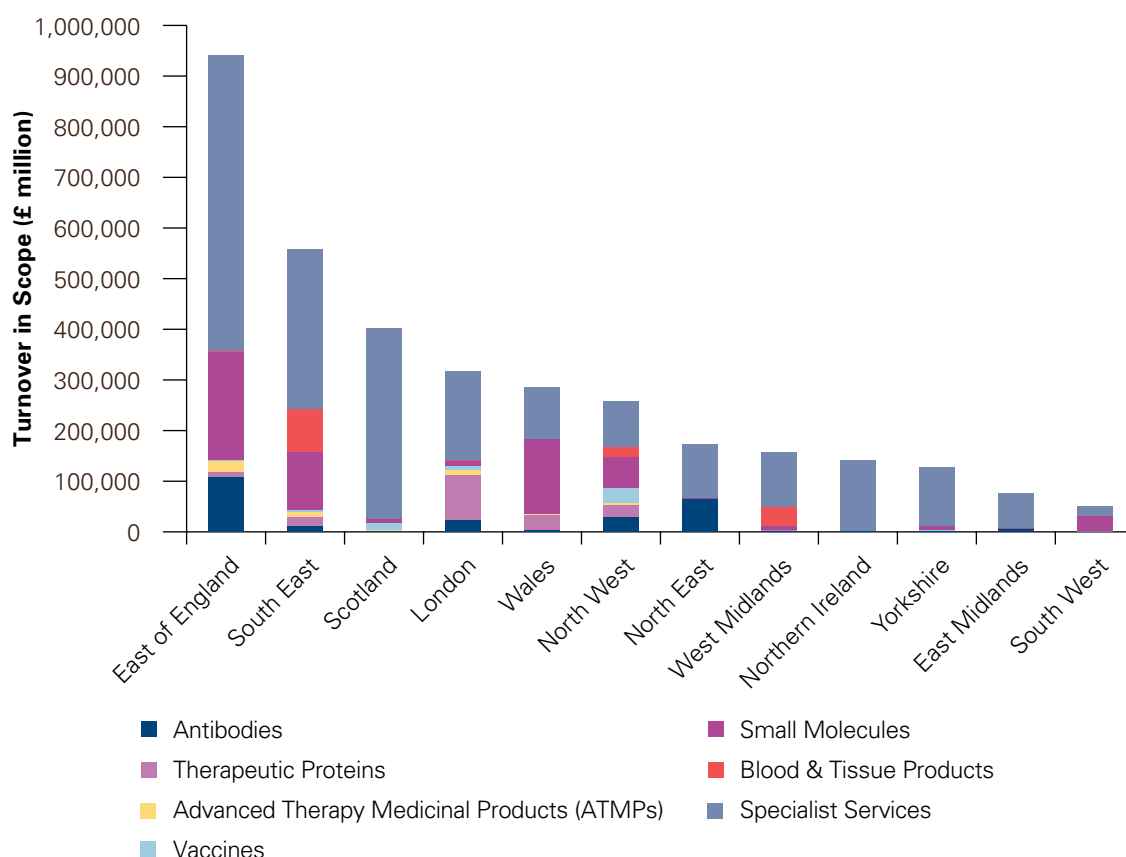


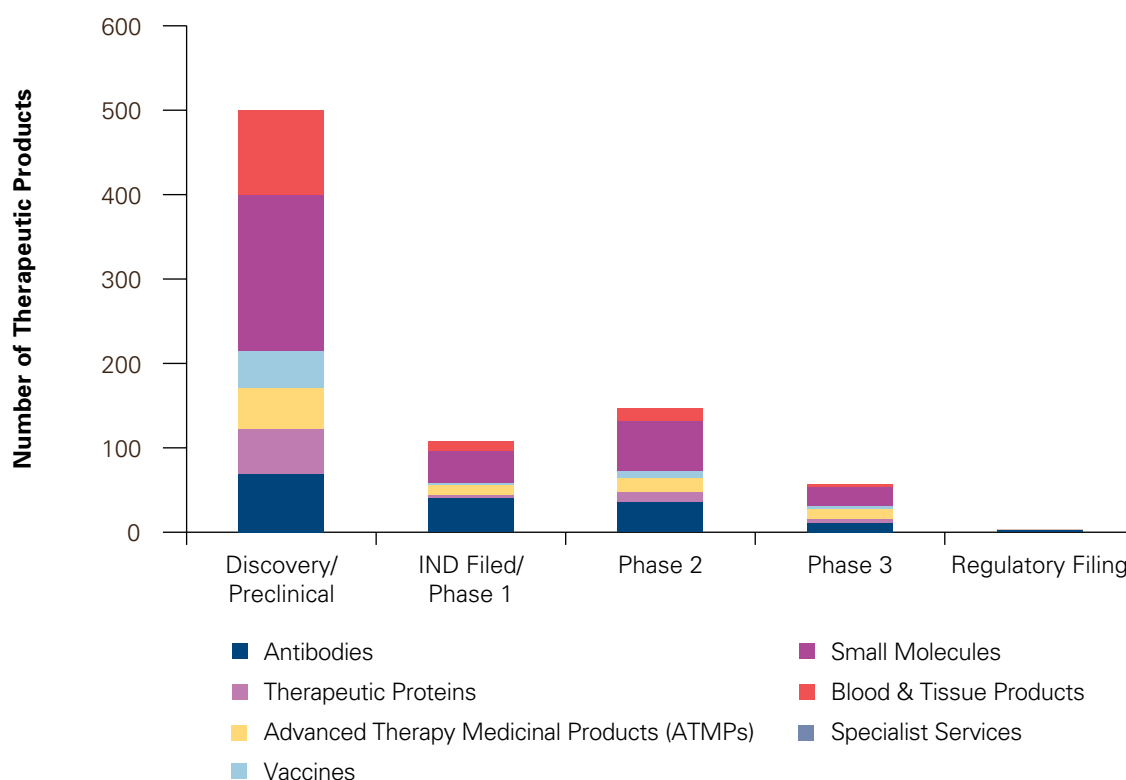
Figure 30 shows that the turnover distribution per geographical region by segment. It is similar to the geographical distribution of medical biotechnology companies per segment but different to that of employment. Companies based in the East of England, South East and Scotland have the highest turnovers in 2012. In 2011, London was in 3rd place by turnover and Scotland in 4th.

Figure 30. *Turnover in the UK medical biotechnology sector by segment*

3.6. Medical Biotechnology Pipeline

The health of the medical biotechnology sector is often measured by the pipeline of products in development, particularly those in clinical trials. The 2012 global biotechnology report by Ernst and Young¹⁵ details a continuing increase of drugs in clinical development worldwide and a steady growth in Europe. In addition, data from the clinical trials register¹⁶ indicated that there were 745 ongoing Phase I clinical trials in the EU and 47% of these are being conducted in France, Germany and the UK. It also reported that the number of trials in Phase I has increased significantly in recent years, from 25% in 2001 to around 40% in 2012.

Figure 31 shows a snapshot of the drugs pipeline in the UK drawn from data from the BioPharm Insight¹⁷ database, cross referenced with medical biotechnology companies in the Bioscience and Health Technology database. The total number of medical biotechnology products in development is 876 (up from 841 in 2011), the majority small molecule drugs (305 in all stages of development). The total number of antibody, protein, vaccines and advanced therapies products (gene therapy, cell therapies etc.) in development is 510.

Figure 31. *UK medical biotechnology pipeline*

The data in the above graph represents only those companies with UK headquarters identified in the Life Sciences database and found within the BioPharm Insight database.

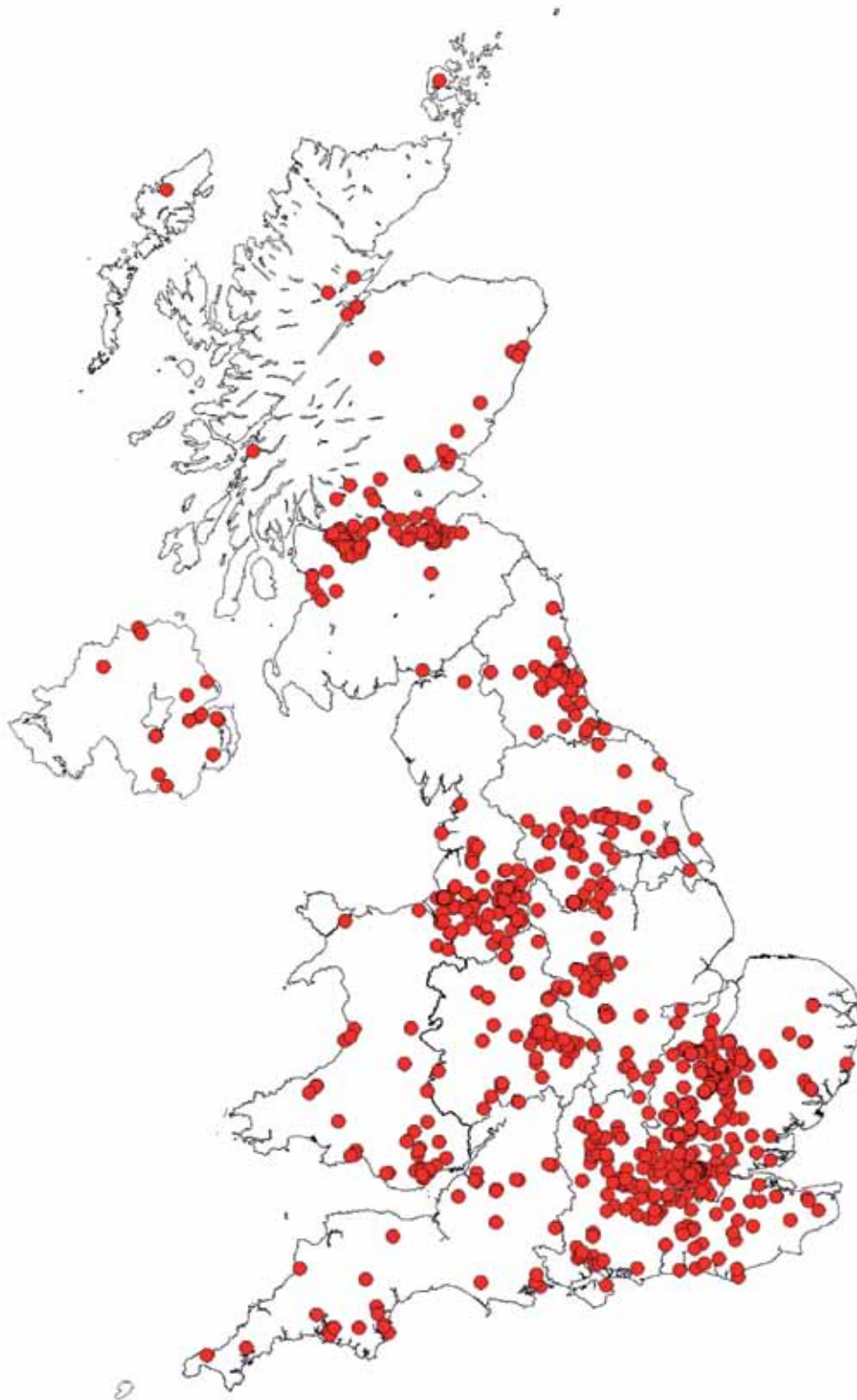
3.7. Sector Investment

The investment community has historically considered biotechnology an investment opportunity with a significant return but high risk. This has continued to be the case in recent years, although the current financial crisis has caused a large decrease in overall investment levels in both the US and Europe. Investment levels in the US bounced back in 2011 to pre-2008 levels (\$2.9bn in 2011 versus \$2.6bn in 2008)¹⁸ however, levels in Europe are still lagging behind.

In 2012 a report by Ernst and Young stated that the total investment in all European biotechnology sectors, of which medical is the largest, was over €2.9bn. The report found the UK to be the largest recipient of venture capital in Europe, second only to Switzerland.

3.8. Geographical distribution of medical biotechnology companies

Map 2. *Geographical distribution of medical biotechnology companies*



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UK Medical Biotechnology Industry – profile

- A total of 979 companies, a 4% decrease from 2011.
- These companies have a combined turnover of £3.7 billion, a 5% increase from 2011.
- Total number of employees is 25,662, a 0.3% increase from 2011.
- 307 companies are directly involved in therapeutic development and manufacture.
- 34.4% of therapeutic companies are focused on oncology or infection.
- 46% of total medical technology turnover is generated by companies involved in research and development and/or manufacturing.
- 98% of companies have less than 250 employees.

Top 3 segments in the sector		
By turnover	By employment	By no. of companies
Specialist services	Specialist services	Specialist services
Small molecules	Small molecules	Small molecules
Antibodies	Antibodies	Therapeutic proteins

Industrial Biotechnology Sector

4.1. Sector Definition

The definition of the industrial biotechnology (IB) sector used in this report refers to companies whose main business activity and turnover is derived directly from the development, manufacture and selling of products and services that use or contain biological material as catalysts or feedstock to make industrial products. As in the other sectors, companies using bio-based technology to make products or services which amount to only a minority of their turnover are excluded from this analysis. Thus the database focuses on those companies that develop the key technologies that underpin the UK industrial bio-economy. These include fermentation and biotransformation, as well as downstream processing (product purification and separation); technologies derived from plants; technologies using biomass and non-healthcare analytics.

The IB value chain can be represented by four main areas:

Agro-industry > Technology > Bioprocessing > Customers

In 2011 the scope of the database was expanded to include companies in the agro-industry area of the IB value chain, that is, companies that produce biotechnology applied to enhance biomass as an IB feedstock, as well as those that make “biotechnology for food” and “animal biotechnology for food”.

The industrial technology sector in the Life Sciences database has been divided into 8 segments based on the products or services they develop or offer (see appendix III). The database allows companies to be classified as being active in more than one of these segments. In the majority of analysis presented here companies have been classified according to their primary activity, that is, that from which the majority of turnover and employment is derived.

4.2. Sector Overview

The UK industrial biotechnology sector is comprised of 83 companies which employ just under 1,600 people and generate a turnover of £438m. While this turnover may appear small compared to other sectors, the added-value of products manufactured using the technology is considerably larger. For instance, it is estimated that the UK industrial biotechnology market for chemicals alone will be worth between £4 billion to £12 billion by 2025.¹⁹

Based on a sample of 79 companies for which financial data is available for the period of 2009-12 (95% of the total), the employment in the sector increased by 21% and its turnover by 15% between 2011 and 2012. In contrast with previous years, the total number of individual companies remained unchanged

Companies working in biofuels, specialist services and fine and speciality chemicals form the top 3 segments within the industrial biotechnology sector and account for 82% of its turnover.

The sector is composed of SMEs, the majority of which have been operating for 4 years or more. Most companies carry out R&D and manufacturing in-house. Biomass processing, fermentation and biotransformation are the most commonly used technologies.

Companies are dispersed across the UK and there is limited evidence of geographical concentration of companies or activity.

4.3. Segmentation Turnover and Employment

Figure 32 shows that, as in 2011, the top 3 segments by turnover are specialist services, biofuels, and fine and speciality chemicals. Together they account for 82% of the turnover of the sector. The largest segment (42% of the turnover) is specialist services. This segment is comprised of companies that offer R&D, manufacturing and other specialist services to other companies that use industrial biotechnology. While the top four segments per turnover remain the same as in 2011, the turnover of some of the smaller segments has increased, notably the agro-industry segment.

Figure 32. UK industrial biotechnology sector turnover by segment

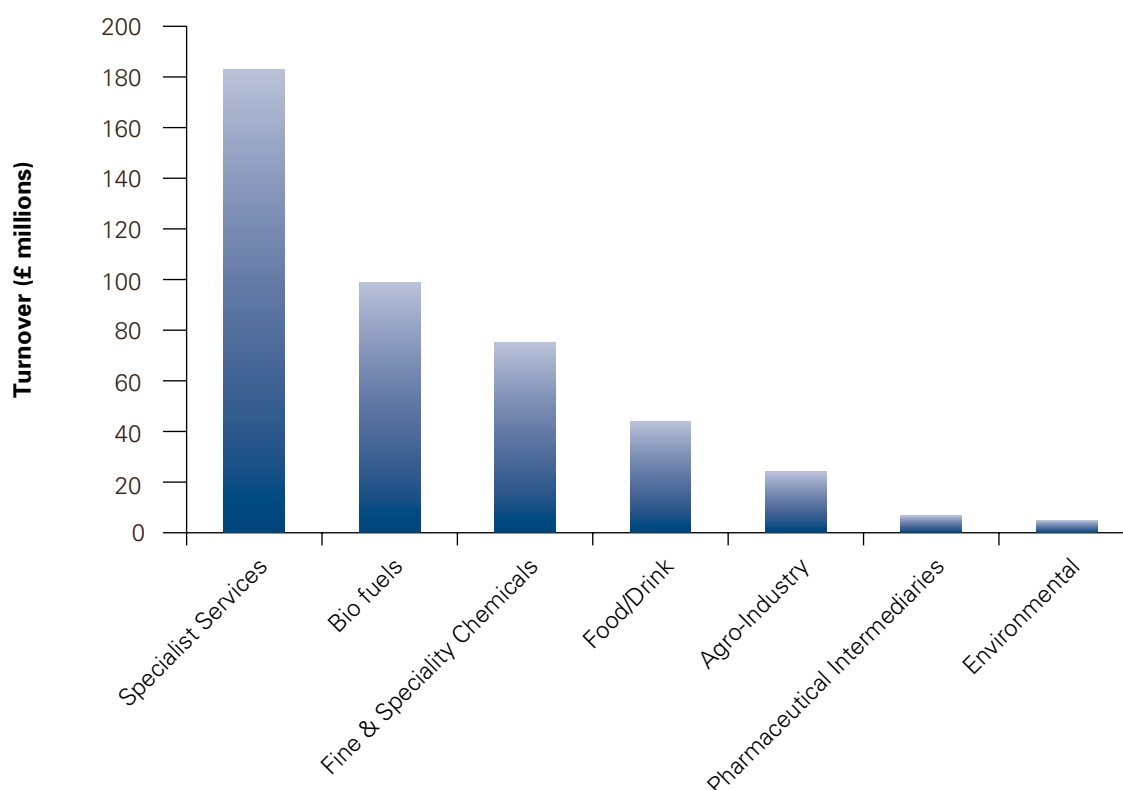


Figure 33 shows the distribution of employment by segment. Biofuels, specialist services and food and drink together account for 25% of all sector employment.

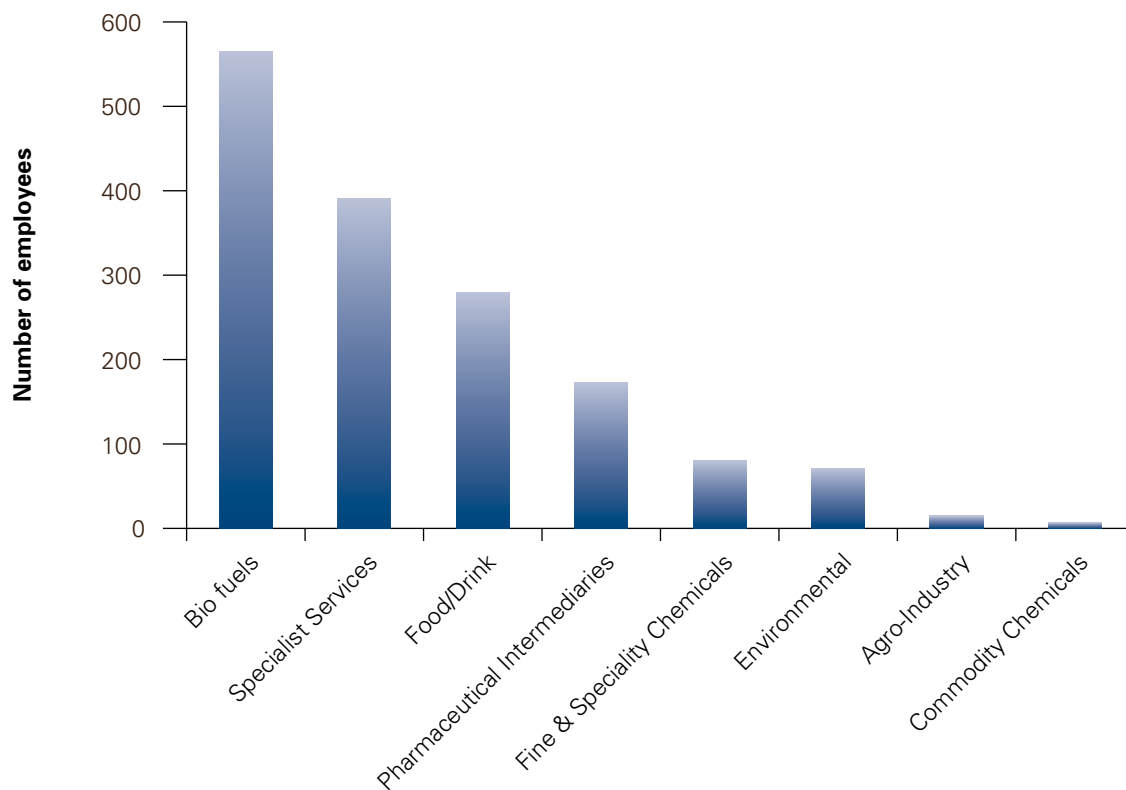
Figure 33. *UK industrial biotechnology sector employment by segment*

Figure 34 shows changes on the number of industrial biotechnology companies between 2009 and 2012. Biofuel companies are now the largest in number in the sector overtaking specialist services.

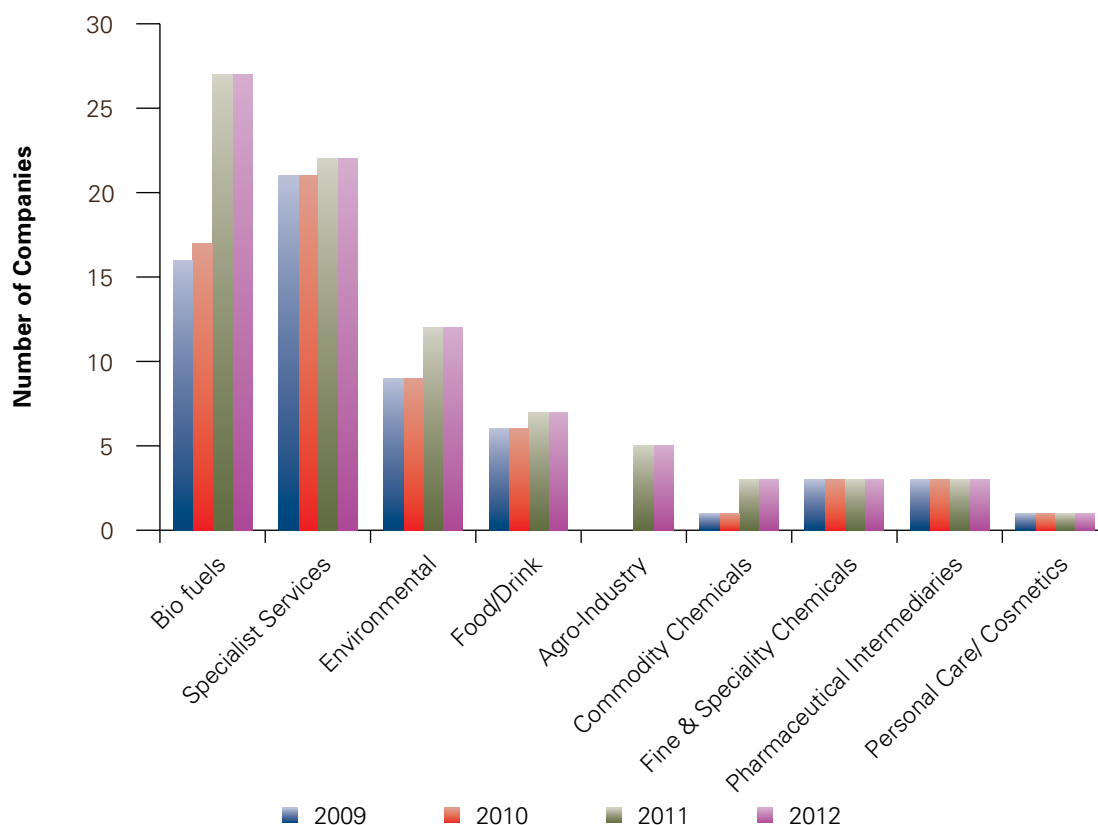
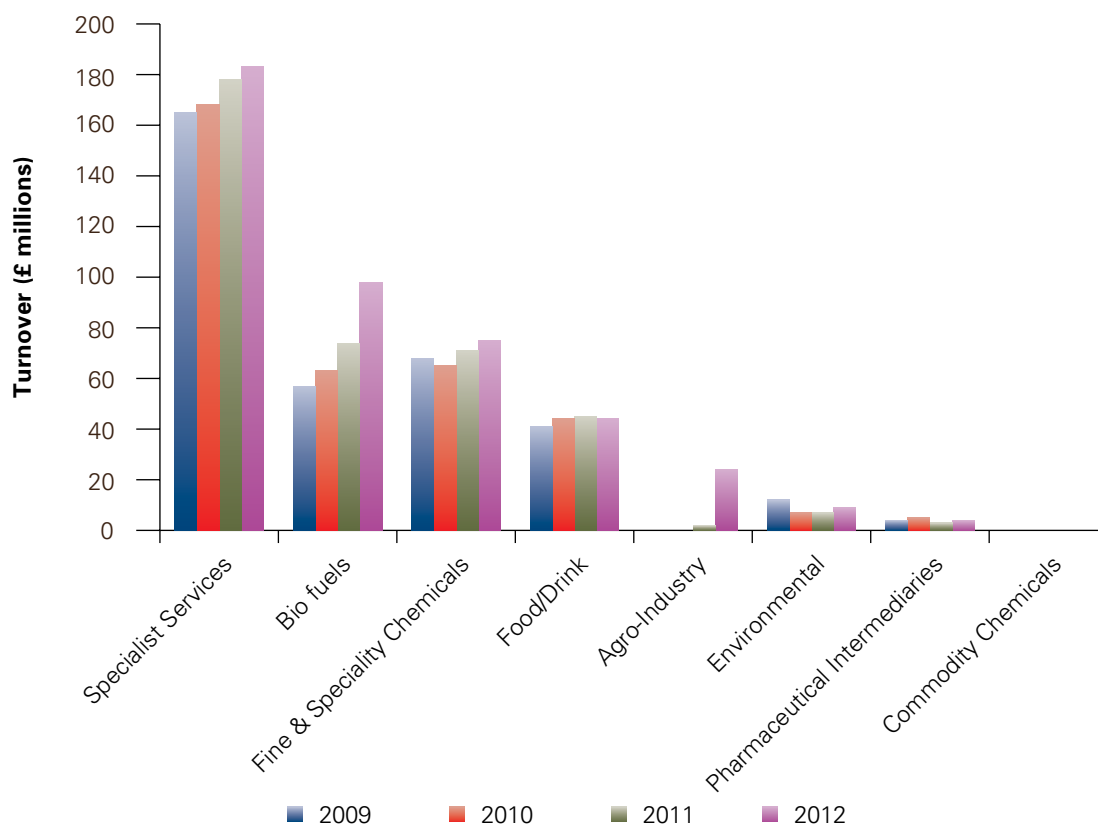
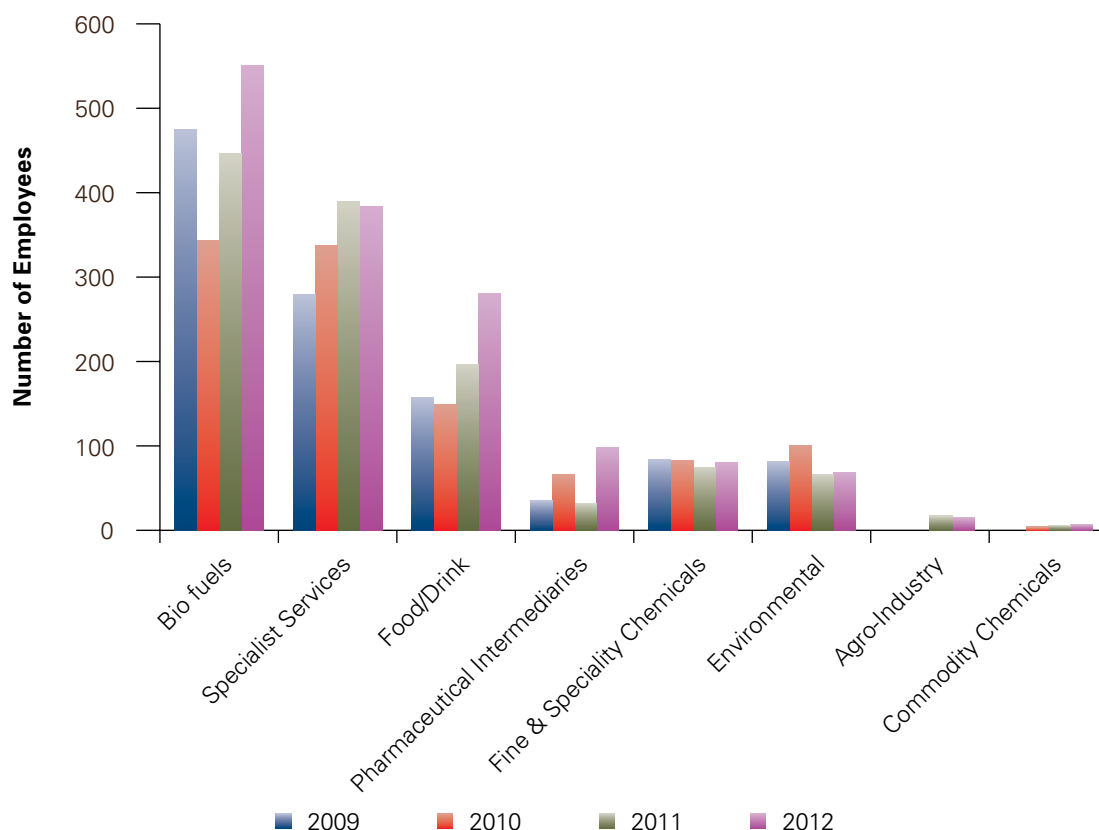
Figure 34. Companies by segment in the UK industrial biotechnology sector**Figure 35.** Turnover by segment in the UK industrial biotechnology sector

Figure 35 shows turnover changes by IB segment between 2009 and 2012. Biofuels has had the largest increase in turnover between 2011 and 2012 (up by 15%). Overall the sector turnover has increased by 26% since 2009. Specialist services, biofuels and fine and specialty chemicals have shown a consistent and significant growth throughout that period.

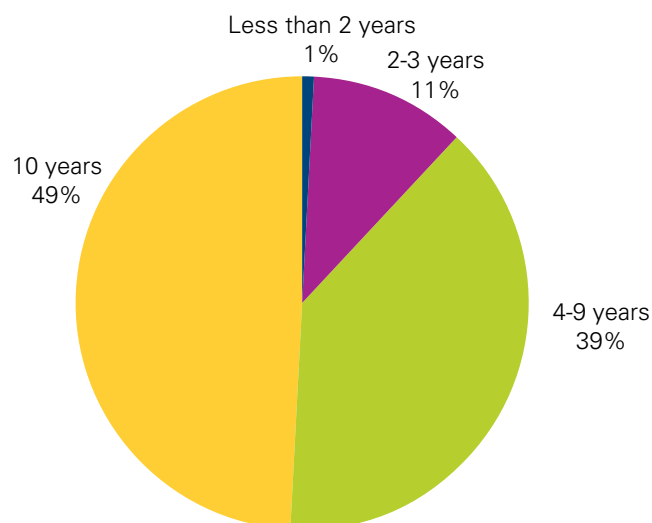
Figure 36 shows employment changes by IB segment between 2009 and 2012. Biofuels has had the largest increase in employment between 2011 and 2012

Figure 36. *Employment by segment in the UK industrial biotechnology sector*



4.4. Company Size and Activity

The IB sector is comprised of SME companies with less than 250 employees. No IB company has been found to employ more than 250 staff. The sector is, however, well established with 88% of IB companies older than 4 years and 49% older than 10 years. The application of biotechnology in the industrial sector is still developing and it is expected that the growth of UK industrial biotechnology companies will accelerate as the worldwide drive towards sustainable technologies and products steps up. For instance, it is estimated that only 5% of the current world-wide \$4 trillion of products made by chemical transformation have been manufactured using industrial biotechnology.²⁰

Figure 37. *Profile of the UK industrial biotechnology companies by age*

The core technologies that underpin industrial biotechnology have been in use for many years, hundred of years in the case of basic fermentation. As the understanding of and the ability to manipulate biological systems increases, the range of technologies applied to the production of industrial products also expands.

Table 1 analyses the frequency that technologies are used by the companies in the sector. It shows the wide range of technologies employed and the importance of fermentation, biotransformation and biomass processing. In the growing area of biofuels, processing of biomass (feed-stocks such as corn, maize, wood etc.) and fermentation (conversion of feed-stocks into bioethanol for example) are the most frequently used technologies.

The table also shows that a high proportion of companies are vertically integrated carrying out both R&D and manufacturing in-house.

Table 1 Frequency of technology applied or utilised and business activity for UK industrial biotechnology companies

Primary Application	Technology								Business Activity				
	Biomass	Plant	Whole Cell Development	Fermentation	Down Stream Processing	Enzyme Development	Biotransformation	Non-Healthcare Analytics	R&D in house	R&D contract	Manu. in house	Man contract	Supply chain
Biofuels	14	3	4	14	2	0	2	0	22	2	17	0	2
Specialist Services	2	0	3	5	3	8	3	2	13	6	5	2	8
Environmental	2	1	0	8	0	0	2	4	8	1	8	1	9
Food and Drink	1	0	1	1	1	0	1	2	2	0	5	1	2
Commodity Chemicals	3	0	1	1	0	0	1	0	5	1	5	0	1
Fine and Speciality Chemicals	0	0	0	1	0	0	2	0	2	2	2	2	1
Pharmaceutical Intermediates	0	0	0	0	0	0	2	0	1	2	1	2	2

4.5. UK Profile

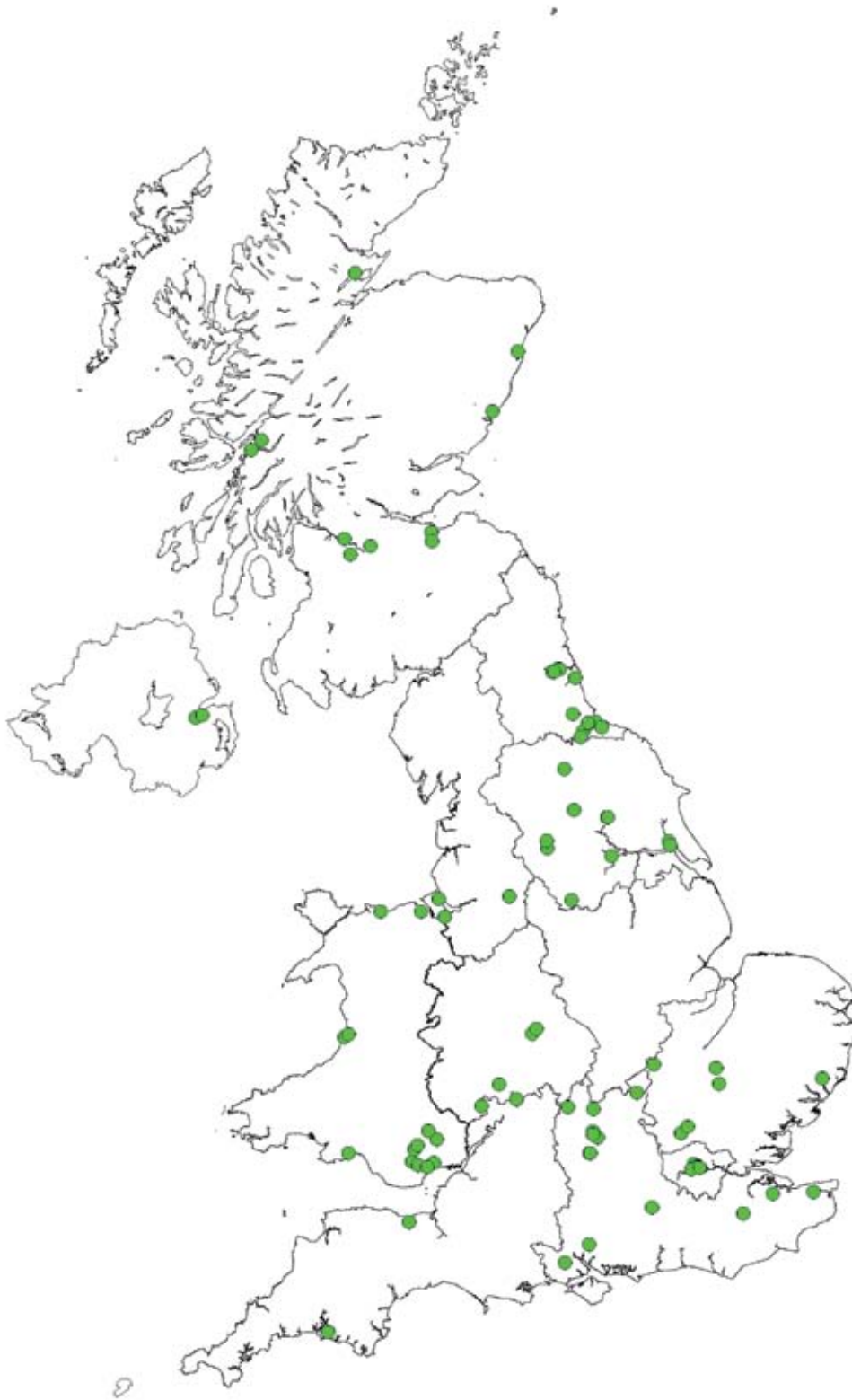
The industrial biotechnology sector is relatively small, therefore the turnover and employment of individual companies have a significant impact on the UK distribution of the sector. **Figure 38** shows the distribution of companies, turnover and employment of the sector across the UK. It illustrates a dispersed distribution with no clear geographical pattern. The emerging nature of this market and the relatively low number of companies in the database could explain the apparent disparity between the number of IB companies in a region and its turnover or employment.

Figure 38. *Geographical distribution of the UK's industrial biotechnology companies by number, turnover and employment*



4.6. Geographical distribution of industrial biotechnology companies

Map 3. *Geographical distribution of industrial biotechnology companies*



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UK Industrial Biotechnology Industry – profile

- A total of 83 companies.
- A combined turnover of £438m, a 15% increase since 2011.
- The sector employs 1,582 people, a 21% increase since 2012.
- The two largest segments in terms of both turnover and employment are biofuels and specialist services. The biofuels segment saw the largest increase in turnover and employment over the last year.
- Over 85% of companies have been established for 4 years or more.
- Biomass processing, fermentation and biotransformation are the most commonly used technologies in the sector.
- Most companies are carrying out R&D and manufacturing activities in-house.

Pharmaceutical Sector

5.1. Sector Definition

For the purpose of this report, the pharmaceutical sector consists of companies with a turnover of >\$1bn whose major activity is the research and development of therapeutic products irrespective of the underlying technology involved and all companies who are only manufacturing small molecule pharmaceuticals, contract service organisations and pharmaceutical wholesalers.

The pharmaceutical sector in the Bioscience and Health Technology database has been divided into 7 segments based on the products or services they develop or offer (see appendix III). The database allows companies to be classified as being active in more than one of these segments. In the majority of analysis presented here companies have been classified according to their primary activity, that is, that from which the majority of turnover and employment is derived.

5.2. Sector Overview

The UK pharmaceutical sector is comprised of 387 companies which employ just below 70,000 people and generate a turnover of £30bn. This includes companies whose prime activity is in the wholesale or distribution of pharmaceuticals, clinical research organisations (CROs) and companies whose activity is primarily producing generic pharmaceuticals. The sector's 387 companies include 17 companies ranked among the top 20 global pharmaceutical companies. These global companies are major contributors to the UK economy, employing 59% of the total sector workforce and contributing to 68% of the sector turnover.

Based on a sample of 371 companies for which data is available for the period of 2009-2012 (96% of the total), the sector has seen an overall decrease in turnover and employment of 5.4% (from £31.75bn to £30.05bn) and 9.7% (a fall of 7,518 jobs) respectively between 2011 and 2012. These decreases have been concentrated in the top global research-based pharmaceutical companies. They represent a very small percentage of their global employment and turnover but have an important impact in the UK and are a reflection of the global restructuring and financial challenges facing the sector. Data of UK pharmaceutical turnover should be viewed in the context of the 3% turnover growth in the sector between 2010 and 2011.

The overall number of pharmaceutical companies decreased between 2011 and 2012, from 388 to 387. Further analysis shows that 13 companies that existed in 2011 were only discovered and added to the database in 2012 (11 of these are in specialist services). The balance is made up of companies ceasing trading or merging.

24 companies account for 80% of the UK pharmaceutical employment. Within these top employers, 17 are research based pharmaceutical companies, one produces and sells generic pharmaceuticals, one is a wholesaler, three are contract research

organisations (CROs), another a contract manufacturing organisation (CMO) and one a global supplier of life science reagents. Outside of the top 20 companies, companies producing small molecules, specialist services and therapeutic proteins form the largest segments within the pharmaceutical sector in terms of employment and turnover. Therapeutic proteins and small molecules companies had small but significant increases in turnover.

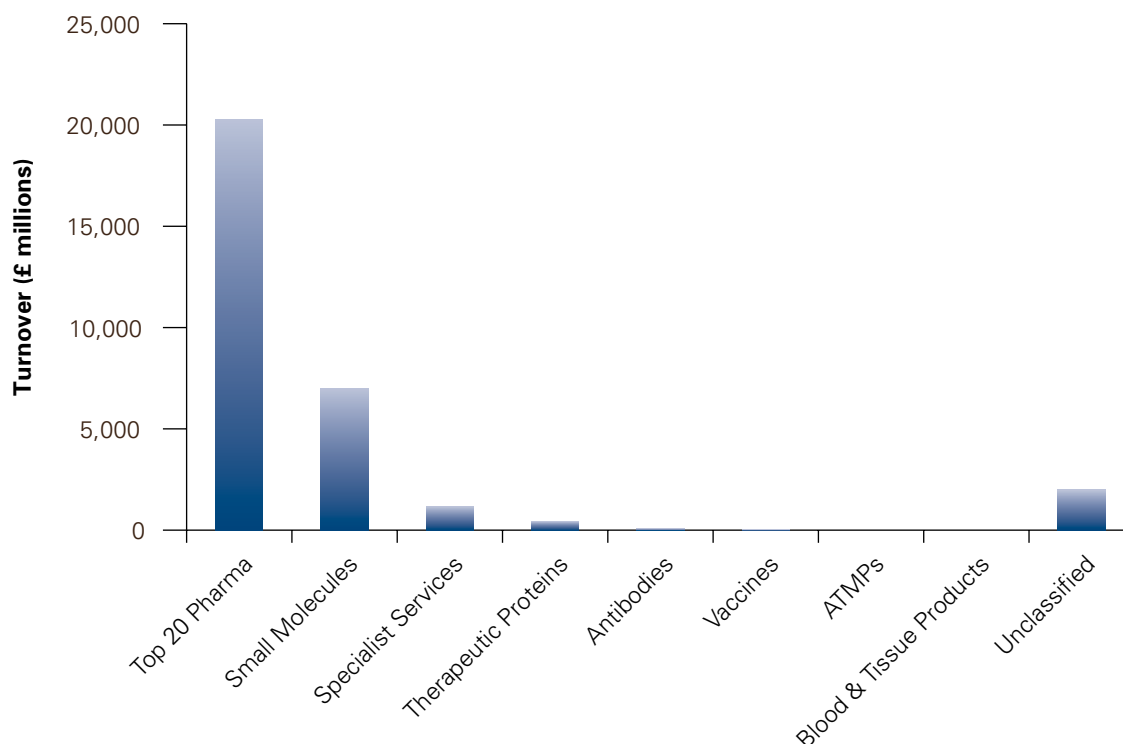
There is a concentration of pharmaceutical companies and economic activity in the South East including London, the area stretching from the Northwest across to Yorkshire and the Northeast and Scotland.

The sector remains one of the major sources of innovation in the UK and a significant investor in the discovery and development of new drugs. Cancer, infectious and respiratory diseases are the top 3 therapy areas in terms of number of pharmaceuticals in development.

5.3. Segmentation Turnover and Employment

The breadth of activity of global pharmaceutical companies makes distribution of their turnover across different pharmaceutical segments difficult. This is specially the case when turnover information is published per individual site or aggregated to the headquarters location. That is why **Figure 39** presents the top 20 pharmaceutical companies turnover in an aggregated form irrespective of the segment they belong to (small molecules, antibodies etc.) and the turnover of pharmaceutical companies outside the top 20 global companies by segment.

Figure 39. UK pharmaceutical sector turnover by segment



Further analysis of the underlying data for the global top 20 pharmaceutical companies sites seems to show that these companies are major generators of turnover in the vaccines and blood and tissue products segments. Companies in the global top 20 group providing specialist services account for 92% of the total turnover of this segment. No company with total company turnover of \$1bn has been found to generate significant revenue from producing advanced therapy medicinal products (ATMPs).

Bearing in mind that the pharmaceutical sector for the purposes of the Life Sciences database includes only companies with a turnover of \$1bn or more, the overall turnover of each segment within the sector, for example vaccines, should also include the turnover of that particular segment in the medical biotechnology sector.

Figure 40 shows the employment in the sector by segment. Small molecules, specialist services (which includes large contract research organisations) and therapeutic proteins are the top 3 segments by employment. Additionally, there is an unclassified segment that groups companies for which assignment to one activity was not possible. A number of these companies are UK sales, marketing and distribution sites.

Figure 40. *Employees in the UK pharmaceutical sector by segment*

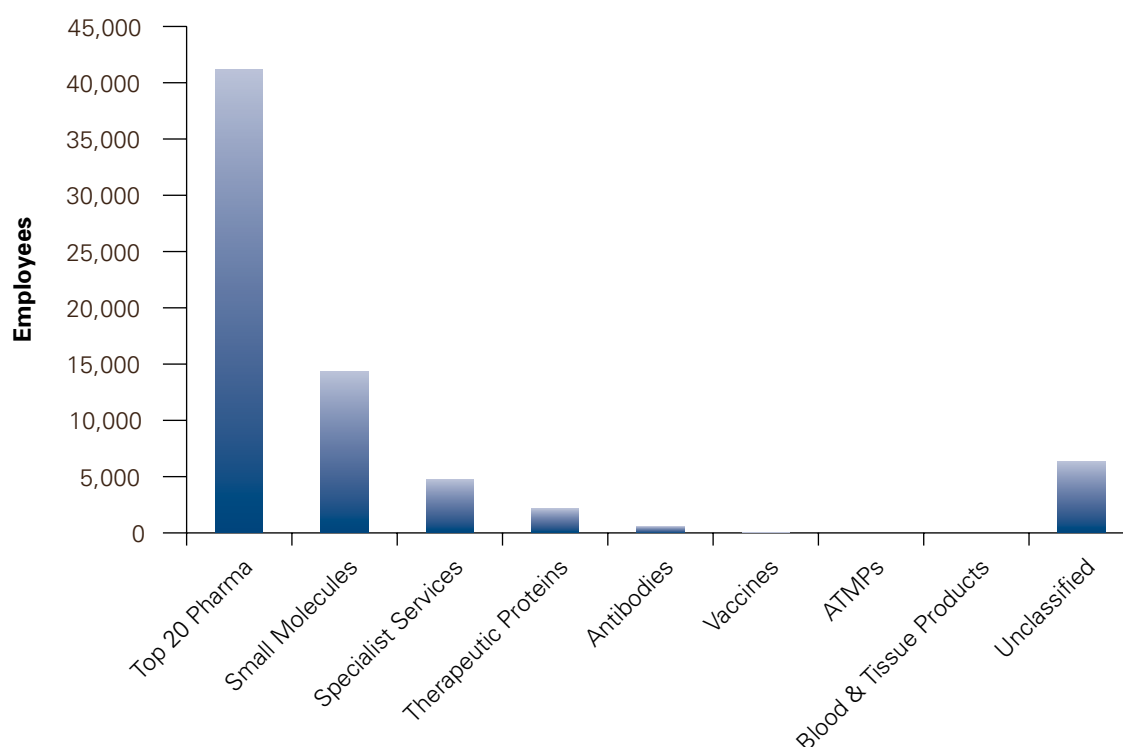
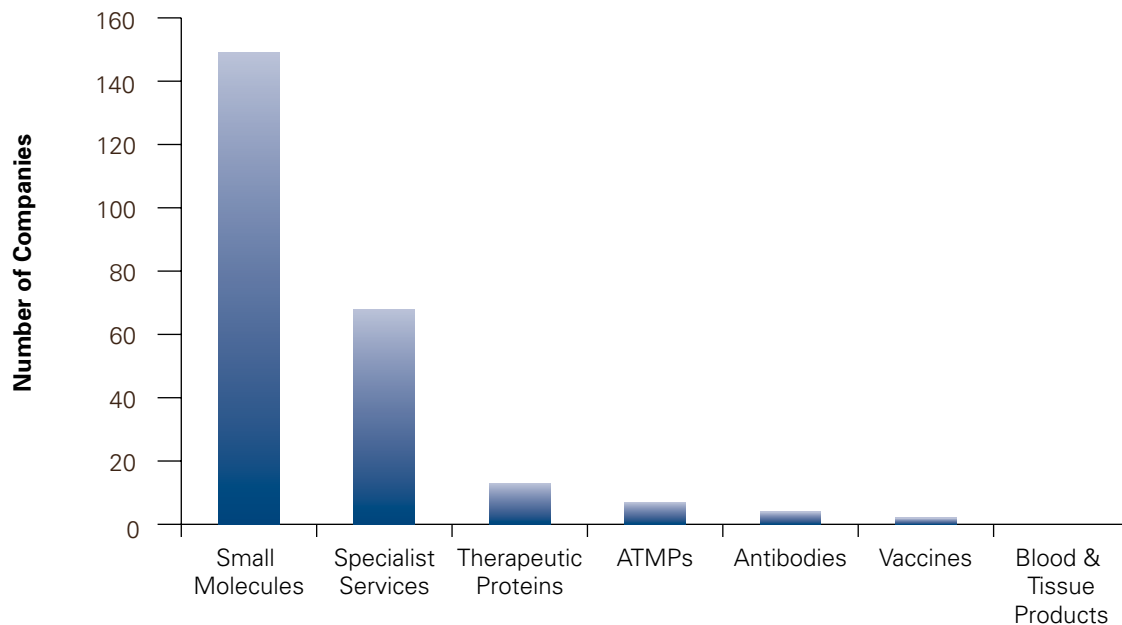


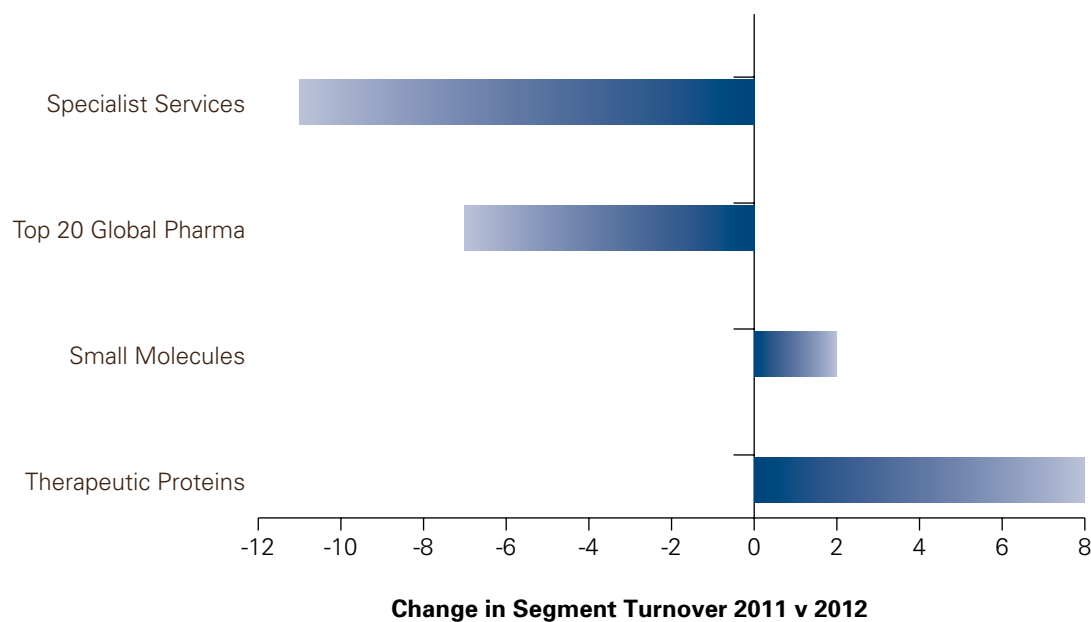
Figure 41 shows the number of pharmaceutical companies outside the global top 20 group per segment. The majority of the companies work in the areas of small molecules, specialist services and therapeutic proteins. The specialist services segment is formed by 68 companies and includes large CROs (such as Quintiles, Covance, Paraxel), specialist consumable suppliers (such as Life Technologies and Sigma-Aldrich) and a range of other large suppliers of products and services to the pharmaceutical sector.

Figure 41. Number of companies (excluding top 20 global pharmaceuticals) by segment



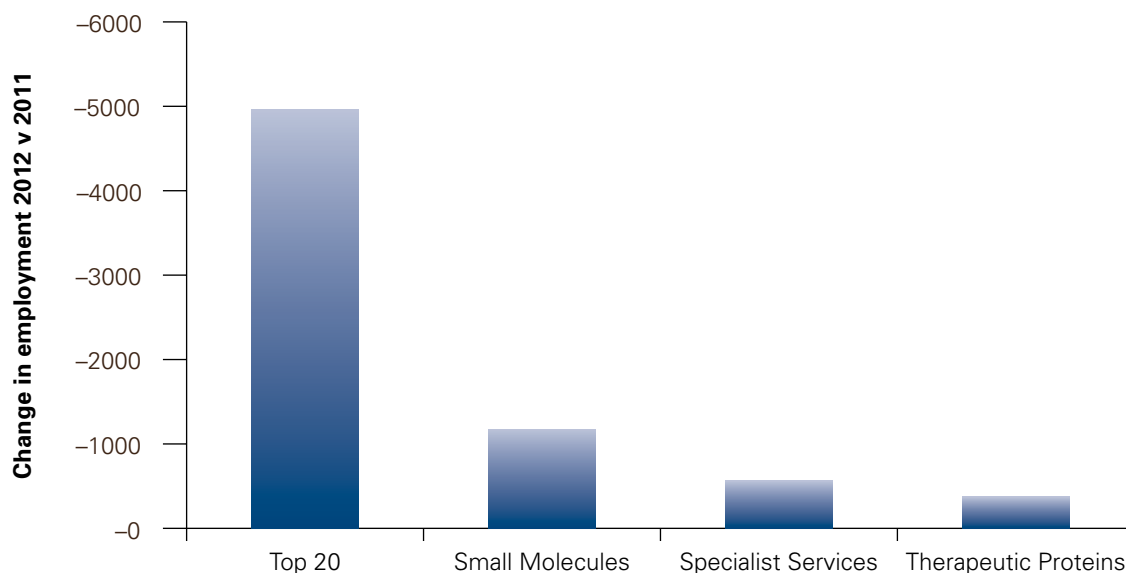
Analysis of turnover data from the sector by segment shows that increases of turnover in segments such as therapeutic proteins (up by 8%) and small molecules (up by 2%) have been overshadowed by a large fall in the reported turnover of the top 20 pharmaceutical companies (down by 7%) and specialist services (down by 11%). A number of companies in the specialist services segment have shown a gradual decline over 2-3 years.

Figure 42. Change in segment turnover 2011 v 2012



The major decrease of employment in the pharmaceutical sector in 2012 is concentrated in the top 20 global pharmaceutical company group. The top 20 global companies employ nearly 5,000 fewer people. Outside of these global companies there is a significant fall in employment in companies working in small molecules, specialist services and therapeutic proteins.

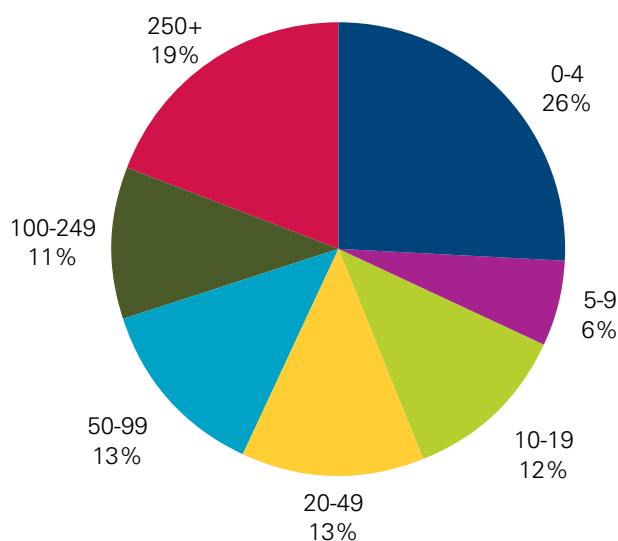
Figure 43. *Change in employment in selected pharmaceutical segments*



5.4. Company Size and Activity

The pharmaceutical sector has a relatively high proportion of companies with more than 250 employees (19%) compared to the UK's average (less than 5%). This can be explained by the global scale of operation that has characterised this sector in the last 20 years.

Figure 44. *Distribution of pharmaceutical companies by employee bands*

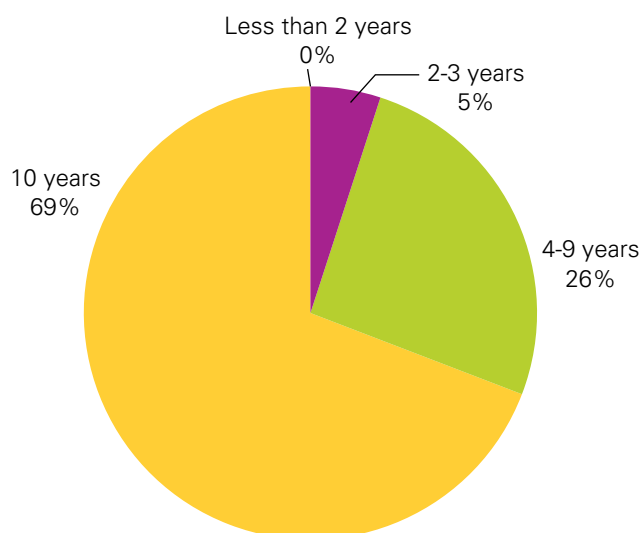


The distribution in the sector is highly concentrated with 24 pharmaceutical companies employing 80% the UK sector workforce. Of these top employers, 17 are global research-based pharmaceutical companies, one produces and sells generic pharmaceuticals, one is a wholesaler, three are CROs, another a CMO and one is a global supplier of life science reagent.

The global pharmaceutical industry is dominated by 10 companies (Pfizer, Johnson & Johnson, Novartis, Bayer, Roche, Merck, Sanofi, GSK, Abbott, AstraZeneca). The concentration in the pharmaceutical sector has increased in the last 5 years through mergers and acquisitions. This concentration explains that in the UK 10 companies contribute to 81% of the total UK turnover. Of these top 10 companies, 9 are research based global pharmaceutical companies and one is a pharmaceutical and healthcare products wholesaler.

The pharmaceutical sector by its definition is made up of large (>\$1bn) turnover companies and therefore it is not surprising that the age profile analysis in **Figure 45** shows that nearly 70% of all companies have been established for 10 or more years.

Figure 45. *The age profile of companies in the pharmaceutical sector*



The UK has 148 pharmaceutical manufacturing sites. These are owned by large pharmaceutical companies and employ 29,102 people or 42% of all employment in the sector. The majority of these sites (73%) are predominantly involved in small molecule activity.

5.5. UK Profile

Large pharmaceutical companies report their UK turnover through their sales subsidiary or HQ location which makes the geographical distribution of pharmaceutical turnover by location unrepresentative of the real distribution of the pharmaceutical economic activity across the UK. A number of companies report their turnover through headquarters located in the South East/London which gives a distorted view of the true location of economic activity derived from pharmaceutical research, development and manufacturing.

Figure 46 shows the number of company sites per segment across the UK. Most companies are located in the South East followed by the East of England and the North West. More broadly 3 UK areas concentrate the majority of pharmaceutical companies, London/South East/East of England, the Northwest/Yorkshire/Northeast and Scotland. Companies working in small molecules form the largest pharmaceutical segment and they can be found in each UK region. Companies working in newer therapeutic products are less dispersed and mainly focused in the South East. Companies in the therapeutic proteins and antibody segments are centered in the North West.

The UK distribution of employment at active manufacturing sites gives a different perspective on the distribution of pharmaceutical economic activity across the UK.

Figure 47 shows the distribution of nearly 30,000 employees that work at UK sites predominantly involved in pharmaceutical manufacturing. The cross-reference of the data underpinning figures 45 and 46 shows a concentration of companies with manufacturing employees in the South East followed by the Northwest and Northeast.

Figure 46. *Distribution of sites in the UK by segment*

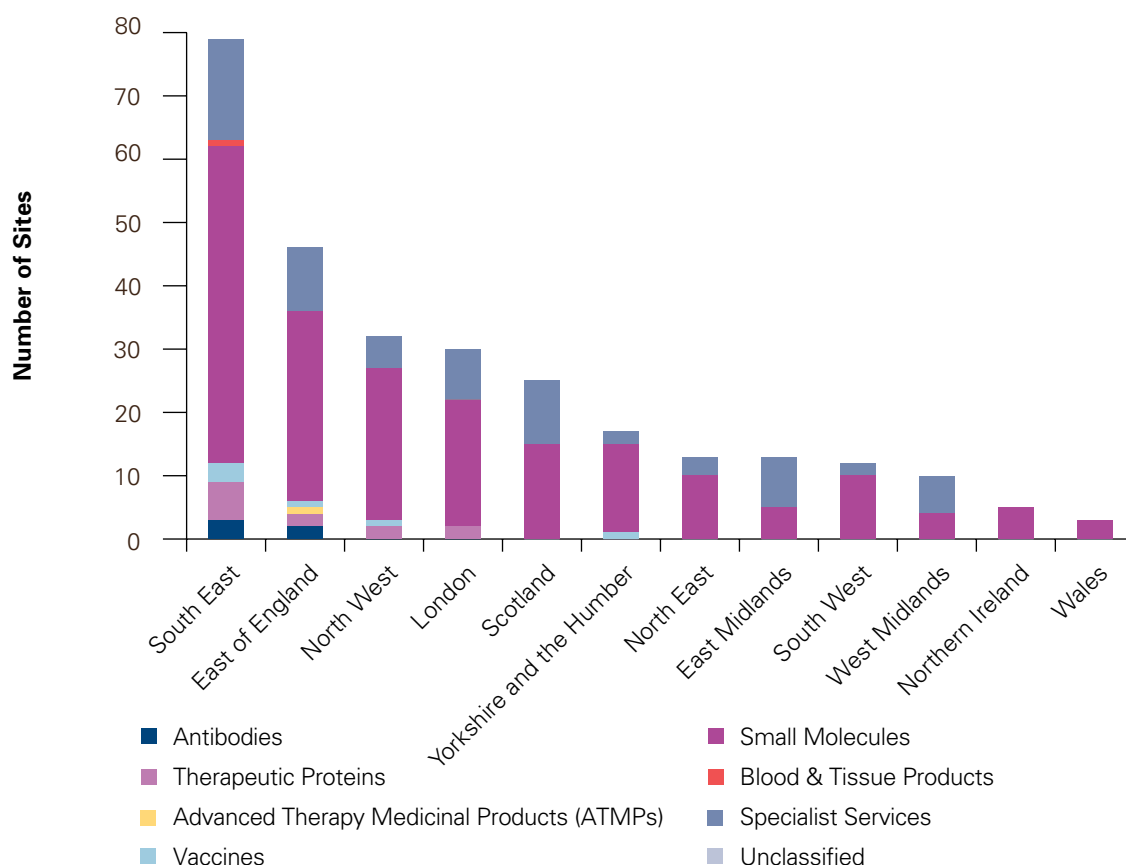
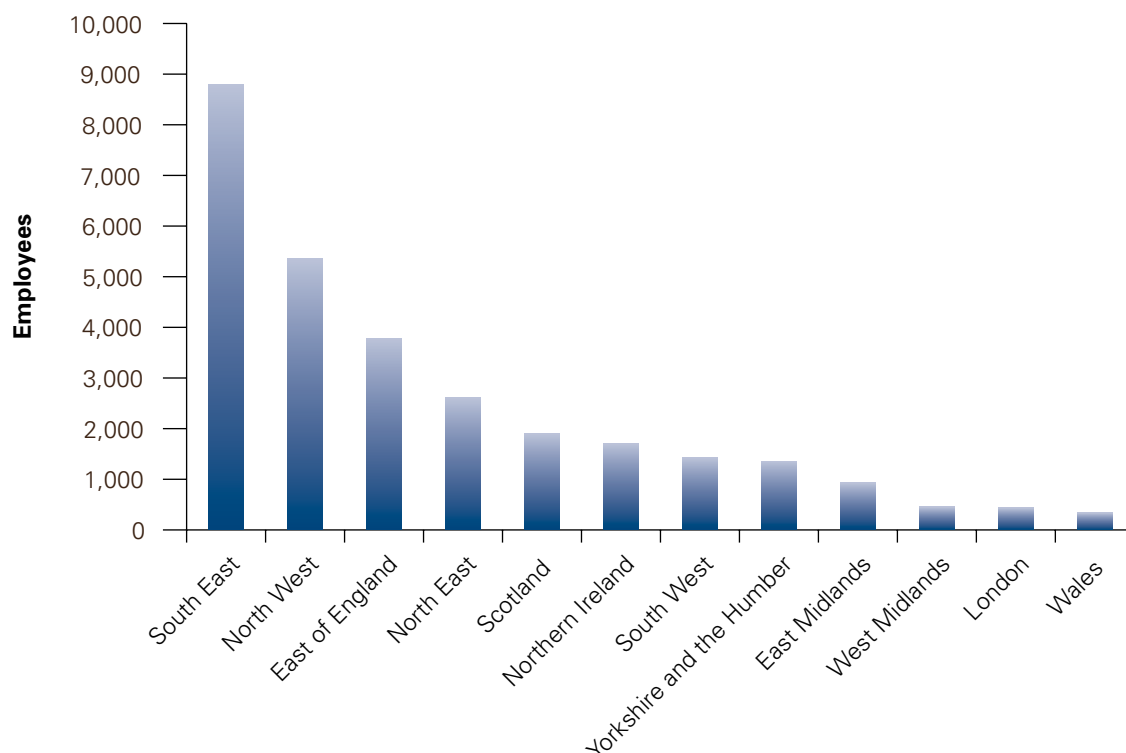
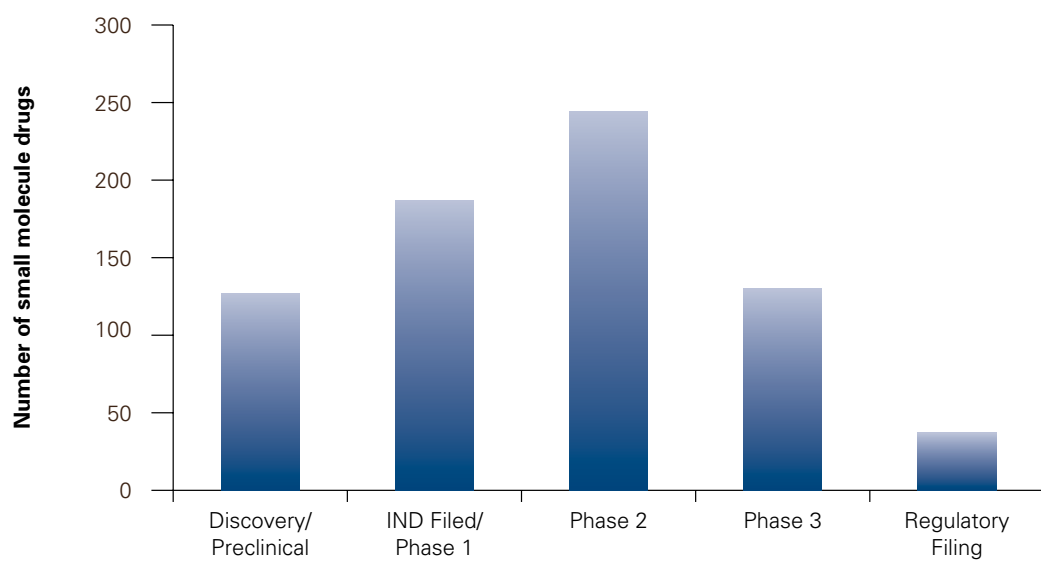


Figure 47. *Distribution of employees at UK pharmaceutical manufacturing sites by location*



5.6. Pharmaceutical Pipeline

The pharmaceutical sector is highly innovative and invests significantly in the discovery and development of new drugs. **Figure 48** shows the pipeline of small molecule drugs currently in R&D within the 387 companies in the UK pharmaceutical sector. The data underpinning this chart has been compiled by cross-referencing the pharmaceutical companies in the Bioscience and Health Technology database and data from the BioPharm Insight database in Sept 2012.²¹ In total there are 725 drugs in development. Cancer, infectious and respiratory diseases represent the top 3 therapy areas in terms of number of drugs in development.

Figure 48. *Drug pipeline of small molecule drugs for the pharmaceutical sector*

5.7. Geographical distribution of pharmaceutical companies

Map 4. *Geographical distribution of pharmaceutical companies*



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UK Pharmaceutical Sector – profile

- A total of 387 companies with a combined turnover of £30.0bn with top 20 global companies contributing 68% of turnover. Of companies in the top 20 global by turnover, 17 have major activities in the UK.
- A combined £30bn turnover, a 5.4% decrease from 2011.
- The sector employs 69,511 with 42% located on manufacturing sites, a 9.4% decrease from 2011.
- Restructuring in the global top 20 companies is the largest contributor to lower employment.
- Small molecules is the major pharmaceutical segment followed by specialist suppliers to the sector and therapeutic proteins.
- 19% of companies have more than 250 employees, a higher proportion than UK industry as a whole.
- The industry is concentrated with 10 companies accounting for 80% of the turnover and 24 for 80% of employment.
- Geographical R&D and manufacturing employment is centred in South and East of England, the North West, Scotland and the North East.

Acknowledgements

The Department for Business, Innovation and Skills, the Medical Research Council, the Biotechnology and Biological Sciences Research Council and UK Trade and Investment gratefully acknowledge the contribution of the following regional and national organisations in the compilation of the Bioscience and Health Technology Database.

Region	Organisation
East of England	One Nucleus
East Midlands	Medilink East Midlands
North East	Bionow
North West	Bionow
Northern Ireland	BioBusiness Northern Ireland (Medilink NI)
Scotland	Scottish Enterprise
South East	South East Health Technologies Alliance
Wales	Medilink Wales
Wales	Welsh Assembly Government
West Midlands	Medilink West Midlands
National	Association of British Healthcare Industries (ABHI)
National	Association of the British Pharmaceutical Industry (ABPI)
National	British Healthcare Trade Association (BHTA)
National	BioIndustry Association (BIA)
National	Biosciences Knowledge Transfer Network (KTN)
National	HealthTech and Medicines Knowledge Transfer Network (KTN)
National	British In Vitro Diagnostics Association (BIVDA)

The construction of the database used a variety of proprietary data sources that were provided under license. The Department for Business, Innovation and Skills, Medical Research Council and the Biotechnology and Biological Sciences Research Council and UK Trade and Investment would like to acknowledge the assistance given by the owners of these data sources.

Data on the medical technology and medical biotechnology pipelines sourced under licence from BioPharm Insight.

Business Information supplied under license by Dun & Bradstreet Limited and the FAME database from Bureau van Dijk Electronic Publishing.

The database construction, data integration, data analysis and commentary preparation was completed by a consortium lead by Bionow. The consortium included Click2 (database construction), Kepier Ltd and Lindum Ltd (data integration and analysis).

Database Construction – Methodology and Segmentation

Scope

The database covers the geographical area encompassed by nine regional areas in England and the Devolved Administrations of Northern Ireland, Scotland and Wales. Only companies that are a legal entity and are conducting economic activity and have employees are included, as well as companies that are wholly or partially owned by non-UK entities. In the case of companies that also carry out economic activity in sectors or segments that lie outside of the definitions of the sectors (medical technology, medical biotechnology and industrial biotechnology), only that activity within sector or sectors is included.

Segmentation

Prior to collecting data on the companies in the three sectors, a comprehensive classification or segmentation system was designed in collaboration with the data partners and industry experts. This segmentation system enables the activities of any company to be categorised or segmented, to describe the primary and other activities which fall within the scope of the scheme.

The Segmentation scheme has three distinct elements:

- Segmentation of Technology or Service
- Segmentation of Therapeutic Area
- Segmentation of Business Activity

Segmentation of Technology or Service

This is a four level classification scheme with each level providing greater detail or definition. The top level (Level 0) analyses the Technology or Service into the four primary sectors, namely medical technology, medical biotechnology, industrial biotechnology and pharmaceuticals. Subsequent levels (Levels 1 and 2) provide further analysis for each sector. See the Segmentation Reference Chart that is included in Appendix III.

To date, the delivery team has undertaken a segmentation analysis for each company to Level 1, with a significant number of companies analysed to Level 2.

Segmentation of Therapeutic Area

This classification was added in response to input from the data partners. Primarily aimed at providing useful analysis for the medical biotechnology companies, the Therapeutic Area segmentation scheme was devised using reference to a number of schemes currently adopted by other organisations. This single level scheme was devised to be compatible with the reference schemes.

Most medical biotechnology companies that are engaged in research are categorised to at least one Therapeutic Area.

Segmentation of Business Activity

This two level classification identifies which elements of Business Activity a company provides. Level 0 provides the analysis:

- Research and Development (R&D, including Design)

- Manufacturing

- Service and Supply Chain

- Sales/Distribution/Service/Repair

Level 1 subdivides each Level 0 segment into two further detail elements.

All companies have been analysed to Level 0.

The segmentation used to Level 1 is shown in Appendix III.

Segmentation Reference Chart

– Level 0 & Level 1

Medical Technology	
Code	Description
MTA	Wound Care and Management
MTB	In vitro Diagnostic Technology
MTC	Radiotherapy Equipment
MTD	Medical Imaging/Ultrasound/& Materials
MTE	Anaesthetic and Respiratory Technology
MTF	Orthopaedic Devices
MTG	Cardiovascular and Vascular Devices
MTH	Neurology
MTI	Ophthalmic Devices/Equipment
MTJ	Dental and Maxillofacial Technology
MTK	Drug Delivery
MTL	Infection Control
MTM	Surgical Instruments (reusable)
MTN	Single Use Technology nec
MTO	Re-usable Diagnostic or Analytic Equipment nec
MTP	Implantable Devices nec
MTQ	Assistive Technology
MTR	Mobility Access
MTS	Hospital Hardware including ambulatory
MTT	ICT+ E-health
MTU	Professional Services, Consultancy
MTV	Education and Training
MTZ	Unclassified

Pharmaceutical	
Code	Description
PHA	Antibodies
PHB	Therapeutic Proteins
PHC	Advanced Therapy Medicinal Products (ATMPs)
PHD	Vaccines
PHE	Small Molecules
PHF	Blood & Tissue Products
PHG	Specialist Services
PHZ	Unclassified

Medical Biotechnology	
Code	Description
MBA	Antibodies
MBB	Therapeutic Proteins
MBC	Advanced Therapy Medicinal Products (ATMPs)
MBD	Vaccines
MBE	Small Molecules
MBF	Blood & Tissue Products
MBG	Specialist Services
MBZ	Unclassified

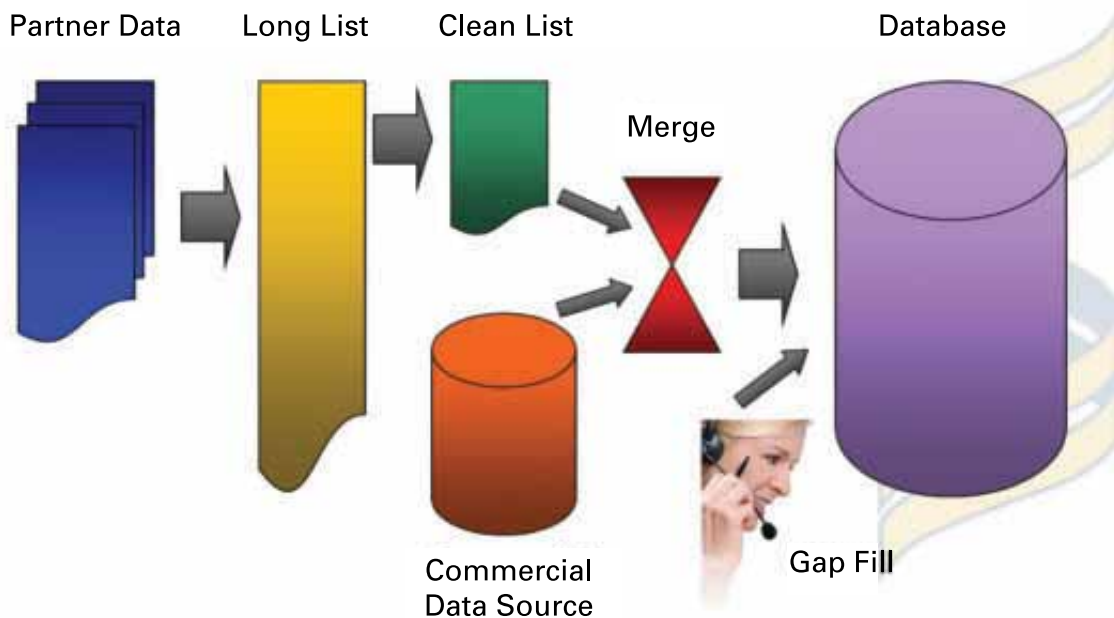
Industrial Biotechnology	
Code	Description
IBA	Biofuels
IBB	Environmental
IBC	Food & Drink
IBD	Commodity Chemicals
IBE	Fine & Speciality Chemicals
IBF	Pharmaceutical Intermediaries
IBG	Personal Care/Cosmetics
IBH	Specialist Services
IBZ	Unclassified

Therapeutic Area	
Code	Description
TA01	Anaesthesia
TA02	Cardiovascular System
TA03	Central Nervous System
TA04	Ear, Nose and Oropharynx
TA05	Endocrine system
TA06	Eye
TA07	Gastro-intestinal System
TA08	Immune System
TA09	Infections
TA10	Malignant Disease
TA11	Musculoskeletal
TA12	Nutrition and Blood
TA13	Reproductive Health
TA14	Respiratory System
TA15	Skin
TA16	Other

Methodology

An overview of the database construction methodology is shown in the figure below.

Database Population – Methodology Overview



Company identity and segmentation information was gathered from the data partners listed in Appendix I. These individual data sets were cleansed, sorted and rationalised into a single list of companies. Once this clean list of companies had been produced, the information was assessed and moderated to ensure consistency across the merged data set.

In order to add financial, employment and ownership data to the clean list, each company was matched with the datasets held by Dun & Bradstreet and Bureau van Dijke's FAME database. Once matched, information was drawn under licence from these commercial sources and added to the database.

A series of validation checks were undertaken to quality assure the data set. Where necessary, adjustments have been made to the data to reflect company structures and reporting practices.

Statistics

Over 7,000 individual records were gathered from the data partners, resulting in over 4,000 unique records for companies which fall within the definition of scope. Approximately half of these companies report information to Companies House and this was used directly.

Future Years

Subsequent years will involve work with the data partners to further refine the data set, whilst keeping abreast of changes in the sector (growth, decline, new starts, mergers, exits, etc.).

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