

The background of the cover is a dense field of overlapping, semi-transparent spheres. Most are a vibrant red, while several are a bright blue. The spheres vary in size and focus, creating a sense of depth and movement. The overall effect is reminiscent of a microscopic view of cells or a data visualization of a complex network.

Strength and opportunity 2011

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



This is the third annual report which analyses the information contained in the Bioscience & Health Technology Database.

Contents

Foreword	1
Executive Summary	2
Introduction	7
Bioscience & Health Technology Database 2011	8
Chapter 1: Global Sector Market Overview	10
1.1 Medical Technology Market	10
1.2 Medical Biotechnology Market	10
1.3 Industrial Biotechnology Market	11
1.4 Pharmaceutical Market	11
Chapter 2: Medical Technology Sector	12
2.1 Sector Definition	12
2.2 Sector Overview	12
2.3 Turnover, Employment and Segmentation	12
2.4 Company Size and Activity	18
2.5 UK Profile	20
2.6 Medical Technology Pipeline and Sector Investment	24
2.7 Trade	25
2.8 Geographical Distribution of Medical Technology Companies	26
Chapter 3: Medical Biotechnology Sector	28
3.1 Sector Definition	28
3.2 Sector Overview	28
3.3 Turnover, Employment and Segmentation	29
3.4 Company Size and Activity	33
3.5 UK Profile	35
3.6 Medical Biotechnology Pipeline	38
3.7 Sector Investment	39
3.8 Geographical Distribution of Medical Biotechnology Companies	40

Chapter 4:	Industrial Biotechnology Sector	42
4.1	Sector Definition	42
4.2	Sector Overview	43
4.3	Turnover, Employment and Segmentation	43
4.4	Company Size and Activity	48
4.5	UK Profile	51
4.6	Geographical Distribution of Industrial Biotechnology Companies	52
Chapter 5:	Pharmaceutical Sector	54
5.1	Sector Definition	54
5.2	Sector Overview	55
5.3	Turnover, Employment and Segmentation	55
5.4	Company Size and Activity	58
5.5	UK Profile	60
5.6	Geographical Distribution of Pharmaceutical Companies	63
Appendix I –	Acknowledgements	65
Appendix II –	Database Construction – Methodology and Segmentation	67
Appendix III –	Segmentation Reference Chart	69
Appendix IV –	References	72

Foreword

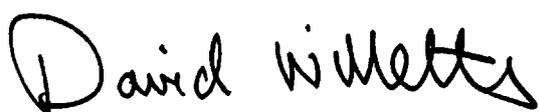
The UK is home to a world-leading high-tech Life Sciences industry which is crucial to driving social prosperity and economic growth. Working in collaboration with Government, the NHS and regional networks, the UK Life Sciences industry helps deliver high quality healthcare through the development and commercialisation of innovative medicines, medical technologies and services. Life Sciences business working in the area of industrial biotechnology can assist in providing solutions for many of the challenges facing the world such as improving sustainability and de-carbonising our economy.

The UK's strengths in Life Sciences are evident in the individual sectors that make up the industry. The UK's medical technology sector is highly diversified and innovative. It produces a range of products from high tech equipment for advanced imaging and diagnosis to surgical instruments. In recent years the pharmaceutical sector has increasingly applied biotechnology to enhance the discovery, development and testing of new medicines. Biotechnology is also being used in industrial applications to make a wide variety of products from tyres to plastics, which will help reduce the UK's dependence on non-renewable feedstocks.

Understanding the profile of the UK life sciences industry is key to creating a supportive and collaborative environment where innovation flourishes and industry continues to succeed. In 2008 the Department for Business, Innovation and Skills together with the Department of Health and UK Trade and Investment created the Bioscience & Health Technology Database to provide better industry data on companies active in the UK. Analyses of the data were published in December 2009 and December 2010 entitled *Strength and Opportunity: The landscape of the medical technology, medical biotechnology and industrial biotechnology enterprises in the UK*. These data have become important evidence to inform Government's policies and promotional activities. They have also increasingly been used by non-governmental organisations including industry and trade bodies.

We are delighted to present this latest commentary which shows an updated picture of the continued strength of these sectors, and features the pharmaceutical industry for the first time. Overall, the commentary portrays a Life Sciences industry of over 4,500 companies, spread throughout the UK, employing approximately 166,000 people and generating a turnover of over £50 bn.

We would like to acknowledge the valuable contribution made by all those who have participated in this work.



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



Earl Howe
Parliamentary Under Secretary of State
for Quality
DEPARTMENT OF HEALTH

Executive Summary

The UK life sciences sector has shown strength and resilience in 2011 against the background of a global recession. **Figure 1** gives an overview of the relative turnover, employment and company numbers in each of the four life sciences sectors covered in the database in 2011 – medical technology, pharmaceuticals, medical and industrial biotechnology. In total these four sectors generate a turnover of over £50bn and employ 166,000 people in 4,500 companies. The pharmaceutical sector is the largest contributor to turnover and employment, followed by the medical technology sector. The medical and industrial biotechnology sectors have emerged relatively recently as separate industrial sectors which is reflected in the lower number of companies and turnover.

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

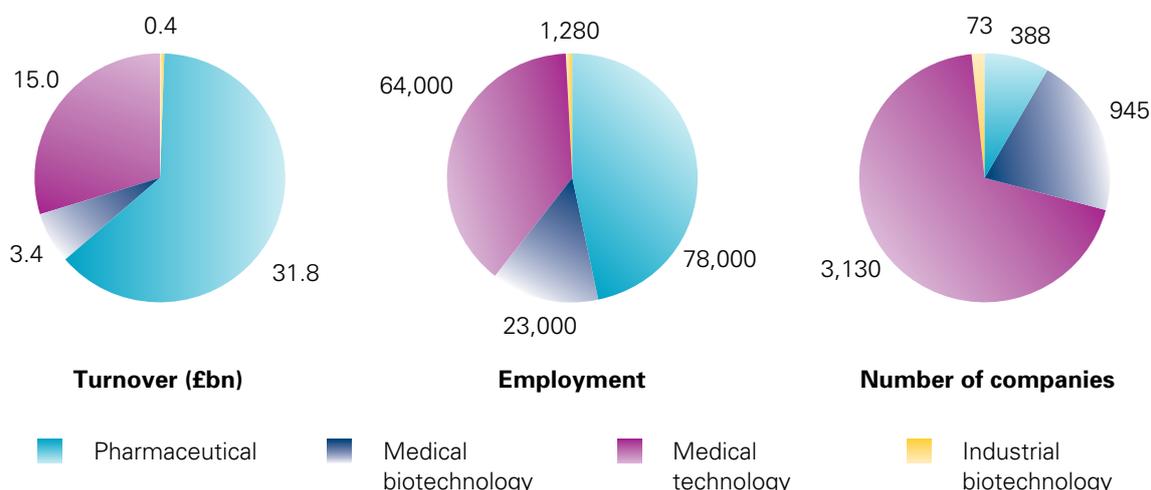
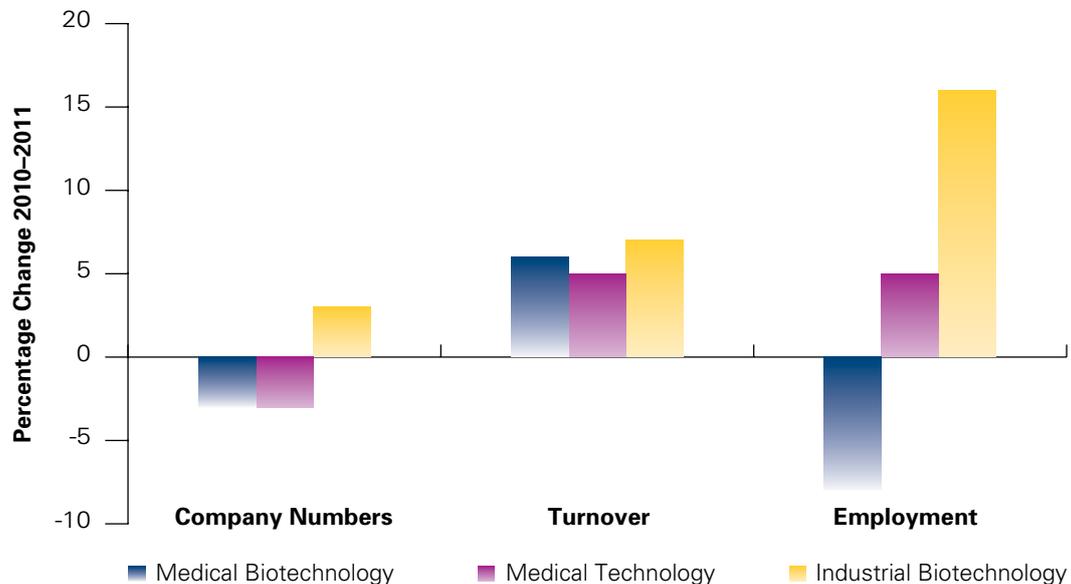


Figure 2 shows that the number of companies has declined slightly in two life sciences sectors due to mergers & acquisitions and companies ceasing trading. Employment has increased in both medical technology and industrial technology and decreased in medical biotechnology. Turnover comparisons demonstrate an excellent performance with medical biotechnology posting 6% growth in one year, medical technology achieving a 5% growth and industrial biotechnology showing 7% growth. The increase in company numbers, turnover and employment in the industrial biotechnology market suggest that this relatively young industry is growing and continuing to invest to drive future growth. 2011 is the first year that the commentary includes data of pharmaceutical companies; therefore the database is unable to provide trend data for this sector.

Figure 2. Company numbers, turnover and employment for the UK medical technology, medical and industrial biotechnology sectors between 2010 and 2011



Medical Technology Sector

The UK medical technology sector has the largest number of companies of all the sectors covered in this commentary. In 2011 there were over 3,000 medical technology companies in the database with a combined annual turnover of £15bn. These companies employ almost 64,000 people in the UK. There has been a 4.6% drop in total numbers of companies over 2009 – 2011. This represents 187 company cessations, while a total of 40 companies were created over this period.

The overwhelming majority of these companies are small and medium sized enterprises (SMEs) with 99% of companies employing less than 250 people. This percentage is higher than the average for the European medical technology sector (80%). The distribution of total turnover within the sector shows that 87.5% of all medical technology companies, for whom financial data is available, have a turnover in the range of £100,000 – £5,000,000.¹ However, the UK is headquarters to one company in the Top 30 global medical technology companies defined by turnover (Smith and Nephew).² The overall picture of the UK sector is of a range of small companies with fewer than 100 employees and a turnover of less than £5m.

The largest segment of the industry by turnover continues to be single use technology (syringes, dialysis kits etc.), followed by wound care and management, orthopaedic devices and professional services. Together these top 4 segments have combined sales of almost £5bn or a third of the total UK sector turnover.

The professional services segment employs the largest proportion of individuals with 6,856 employees. The other top employment areas within medical technology are in

¹ The medical technology industry in Europe, Eucomed, May 2011

² Medical Devices: Managing the Mismatch, WHO, 2010

vitro diagnostics, single use technology, assistive technology and wound care. Together all of these segments cover 43% of the sector employment.

Analysis of the trends in turnover shows that, for the 1,731 companies for which data has been available for the last three years, their total turnover has increased by 5% between 2010 and 2011 and by 6% over the 2009-2011 period. In 2011 the education and training, wound care, and neurology segments have shown the highest percentage increase in turnover, between 23-32%. Employment trends show an increase of 5%, with employment in anaesthetic and respiratory technology, in vitro diagnostic technology and radiotherapy equipment growing between 15-27% in 2011.

Comparison of data over the last three years begins to show segments that have consistent growth, including in vitro diagnostics with an increase in the number of employees of 5% and 17% between 2009-10 and 2010-11 respectively. The radiotherapy segment enjoyed growth of 10% and 15% over the same periods. While the wound care and management segments reported a decrease in turnover of 14.1% in 2009-2010, this trend has been reversed in the last year with an increase of 30%.

The medical technology sector is widely distributed across the UK, as in 2010. Three locations, the West Midlands, the South East and East of England account for 40% of all employment.

Medical Biotechnology Sector

In 2011 the UK medical biotechnology sector had 945 companies with a combined annual turnover of £3.4bn. They employ close to 23,000 individuals. The sector trends, based on 411 companies where data is available for the last three years, show resilient growth in turnover. Over the period 2009-2011 the sector turnover increased 14%, achieving growth of 6% in the last year. All sub-segments except advanced therapy medical products (ATMP) have trends of increasing turnover, with companies specialising in antibodies leading the way. Although some sub-segments show increasing employment over 2010-2011, employment in antibodies decreased by over 10% and specialist services by 9%.

As described in previous years' commentaries the medical biotechnology sector has developed through outsourcing with some companies operating in a "virtual" mode, using staff employed by other organisations rather than their own full time employees. Product and technology platform companies tend to focus on their core capabilities and outsource non-core activities. It should be highlighted that the figures for turnover are likely to underestimate the total economic activity within this relatively young sector because companies are investing heavily in research and development and may have no or low sales. Indicative of this is that the total European financing of biotechnology in 2010 was €2.8bn, with the UK receiving the highest number of individual investments.³

3 Ernst and Young, Beyond Borders, Global biotechnology report 2011

This outsourcing approach has created a large and important class of specialist service companies, with 620 companies employing 14,188 people and producing a combined turnover of £2bn. Specialist consultants are the largest sub-segment with 405 companies offering a range of services including intellectual property advice, drug development expertise and good manufacturing practice (GMP) consultancy. Specialist suppliers are the second largest sub-segment with 332 companies offering products and services including equipment, consumables, contract manufacturing and clinical trials.

Among the companies developing new therapeutic products, those focused on small molecules represent the largest sub-segment containing 117 companies, with a combined turnover of £0.6bn. The next largest sub-segments are those developing therapeutic proteins and antibodies. For those companies where information is available, the two most common therapeutic categories are oncology and infection.

The sector has seen a year-on-year 3% decrease in the number of companies over 2009-2011, which may be due to a number of reasons including company failure and merger and acquisition. The sector is currently dominated by SMEs with 98% of companies employing less than 250 staff and 57% of all companies being less than 10 years old. The blood and tissue sub-segment has seen the largest decrease in company numbers.

While most locations in the UK have activity in medical biotechnology, there is a concentration of companies in the South East and East of England, Scotland and the North West. In terms of employment the East of England has a significant share of the total UK number, with 32% of the total.

The pipeline of new products under development by companies in this sector remains broad and well populated, with a snap-shot showing 841 products in discovery and development (preclinical through to regulatory filing). The pipeline is almost equally distributed between small molecules and the newer therapies based around protein and other large molecules.

Industrial Biotechnology Sector

The UK industrial biotechnology sector consists of 73 companies with a turnover of £379m and employing 1,280 people. The biofuels and specialist services segments make up 62% of all companies in this sector. The total number of companies has not changed significantly since 2009. Four segments, specialist services, fine and specialty chemicals, food & drink and biofuels make up the majority of the sector's turnover (97%) and employees (91%).

In 2001 there was a 16% rise in employment numbers in 2011, mainly in the biofuels, food & drink and specialist services segments, which reversed a 3% decline in the previous year. The sector turnover trend was also up by 7% from 2010, with the main contributors being biofuels, fine & specialty chemicals and specialist services.

The sector is dominated by SMEs with 44% being over 10 years old and 39% being between 4 and 9 years old. A high proportion (55%) of industrial biotechnology companies have manufacturing activities and 69% are engaged in R&D. Examining the types of technology that companies are employing, fermentation, use of biomass and biotransformations are found to be the most prevalent.

Given the relatively small size of the sector, it is difficult to draw conclusions on whether particular locations in the UK have high concentrations of activity. The data shows that Wales, the South East and the North East of England have a relatively larger number of companies compared to other parts of the UK, although the patterns for employment and particularly turnover do not match this distribution. It should be noted that the life sciences database only contains companies whose main business is in products and services that depend on biotechnology. Activity across the UK where companies are utilising bio-based technology to make products or services but this does not constitute a major proportion of their total turnover is not captured in this analysis.

Pharmaceutical Sector

The pharmaceutical sector in the UK has a total of 388 sites occupied by 365 companies, employing 77,795 people with a combined turnover of £31.8bn. Of the Top 50 global pharmaceutical companies⁴ 37 have a total of 60 sites in the UK which employ 52,000 staff and represent 83% of the total sector turnover.

Small molecules are the dominant final product type by employment and turnover. This is reflected in the global sales of pharmaceuticals where 67% of sales are derived from small molecules and the remainder from biologics.⁵ Specialist services is the second most important product type for employment followed by vaccines. The former product type includes companies providing contract manufacturing and clinical research services. The examination of employment at manufacturing sites only reinforces the importance of small molecules. Along with vaccines and therapeutics proteins these sites employ 90% of all employees at active manufacturing sites.

Of all companies, only 19% (74 companies) have more than 250 employees and collectively employ 89% of the UK pharmaceutical sector workforce. This differs from the medical biotechnology and technology sectors where only 1-2% of companies have this number of employees. The majority of all pharmaceutical companies (52%) have turnovers greater than £5m. The sector has 67% of companies that have been operating for 10 years or more, which reflects the relative maturity of the pharmaceutical industry.

All locations across the UK benefit from activity in the pharmaceutical sector. The South East of England has a high concentration of employment, with 35% of all employees present at sites here. The four locations of South East and East England, North West England and London contain three-quarters of all employees in the sector. Manufacturing activity has a degree of concentration in the South East and East of England, North West England, Scotland and North East England.

4 Evaluatepharma, World Preview 2016 "Beyond the Patent Cliff", June 2011

5 Evaluatepharma, World Preview 2016 "Beyond the Patent Cliff", June 2011

Introduction

The UK life sciences industry is renowned for its creativity, exceptional research base and outstanding talent boasting a history of discovery and a reputation for turning innovative ideas into trusted healthcare solutions. Strong collaboration between industry, academia, the NHS and Government is core to the UK success in maintaining and growing R&D in the life sciences industry, as well as delivering benefits for patients in the UK and around the world. The industry flourishes in a trusted and supportive regulatory and financial environment where innovators are supported by effective policies.

The UK pharmaceutical sector has more than 300 companies, employing over 75,000 people and with a total annual turnover of just under £32 billion.⁶ £4.6bn was spent on pharmaceutical R&D in the UK in 2010, over 28% of the total industrial R&D spend across all sectors of the economy. The medical technology and medical biotechnology sectors represent over 4,000 companies employing over 86,000 people with an annual turnover of around £18.4bn; medical technology employs 64,000 and has a turnover of £15bn while medical biotechnology employs 23,000 and has a turnover of £3.4bn. The UK industrial biotechnology sector consists of 73 companies with a turnover of £379m and employing 1,280 people. This does not include industrial biotechnology activities carried out by chemicals or energy companies (such as BP) whose main business is not in products and services that depend on biotechnology.

Facilitating effective and evidence based policy development that is benefiting businesses requires comprehensive industry data that improves policy makers' understanding of the medical technology, medical biotechnology, pharmaceutical and industrial biotechnology sectors. Such information is also needed to promote the UK's Life Sciences industries to investors, procurers and influencers. That is why the Department for Business Innovation and Skills (BIS), the Department of Health (DH) and UK Trade and Investment (UKTI), in collaboration with industry and regional and national networks developed the Bioscience and Health Technology database which contains comprehensive data of companies that are active in the UK in these sectors.

Commentary and analysis documents were published in December 2009 and December 2010. This report is the third in the series. It uses the updated 2011 dataset supplemented by data from other sources and allows policy makers to compare updated data against last year's information to see how these sectors are changing. It also features the pharmaceutical industry for the first time. The detailed analysis of each sector is contained in individual chapters.

⁶ Source: Bioscience and Health Technologies database (BIS/DH/UKTI) Note: figures for the life science industries from this database are generally higher than those derived from ONS statistics as the latter counts companies whose primary activity is manufacturing and does not separately identify companies which focus on R&D activities or which provide services.

Bioscience & Health Technology Database 2011

This year's annual update of the database has seen a number of changes to improve the accuracy and scope of the data. The key change to the scope of the data has been the inclusion of the pharmaceutical sector companies. The definition of this sector and how it relates to the Medical Biotechnology sector is explained in the following section.

The 2011 database contains information on 4,827 individual sites, of which 370 are additional companies which were discovered as a result of a more extensive survey of science parks and university spin-out information. Only 13 companies were formed since the last annual update, which reaffirms that the major factor behind the increase in the number of sites in the database is the inclusion of pharmaceutical companies. This year no companies were removed from the database due to re-examination of their activities deeming them out-of-scope.

The database now contains detailed and segment information on four industry sectors that have a common dependence and growth based in the exploitation of biotechnology and medical technology. Together these four sectors have a turnover of just over £50bn and employ over 166,000 people across the UK.

Sector Definitions and Changes between 2010 and 2011 Analysis

The original database and annual updates provided detailed information on three key UK industry sectors which utilise bioscience and related technologies to generate economic value; these sectors were medical biotechnology, medical technology (medical devices) and industrial biotechnology.

In early 2010, it was decided to extend the database to include the pharmaceutical sector and apply the same bottom up approach and segmentation methodology to this sector. This inclusion will give a more holistic view of the industries whose foundation is based on the exploitation of biological and medical science.

To ensure a degree of consistency between existing definitions of the pharmaceutical industry and the definition used for the database, consultation with industry associations was carried out. This included a review of the definition of medical biotechnology used for the database as there was deemed to be an inevitable overlap between the pharmaceutical and medical biotechnology sectors. These new definitions looked at maintaining the commonly accepted description of the "pharmaceutical" sector while recognising that this sector and that of medical biotechnology had become overlapping in the last 10 years. An additional consideration and constraint was to adopt definitions that did not require complete re-building of the existing database.

This method of distinguishing between the pharmaceutical and medical biotechnology sectors primarily separated large multinational pharmaceutical companies discovering and developing new chemical or biological entities from the smaller companies carrying out the same kind of discovery and development activities.

The agreed definitions are summarised in the table below:

Sector	Criteria
Pharmaceutical	Companies with an annual global turnover of >\$1bn (>£632m at last 3 yrs average exchange rate) OR Contract manufacturers of small molecules (even if turnover is <\$1bn) OR Wholesalers or distributors of Pharmaceutical Products (even if turnover is <\$1bn) OR Clinical Research organisations with turnover of >\$1bn (>£632m at last 3 yrs average exchange rate)
Medical Biotechnology Sector	Companies with annual global turnover of <\$1bn(<£632m at last 3 yrs average exchange rate) OR specialist suppliers to this sector OR Clinical Research Organisations with annual (UK) turnover of <\$1bn(<£632m at last 3 yrs average exchange rate)

This change in segment definition required 107 records to be moved from the original (pre-2011) medical biotechnology sector to the pharmaceutical sector; the majority of these were contract manufacturers of small molecules.

Global Sector Market Overview

The medical technology, medical biotechnology, pharmaceutical and industrial biotechnology sectors in the UK are linked either by their focus on a common marketplace (healthcare) and/or by their use of common technologies. From an economic perspective they are important in that each sector typically produces higher value products and services for markets which are or have the potential to be global in scale and require innovation for continuing success.

1.1. Medical Technology Market

The medical technology market is estimated to be worth £150-170bn worldwide with growth rates forecast at 10% per annum over the next 5-6 years and a market size approaching £300bn by 2015.⁷ This growth is driven by the ageing of the world's population and the per capita income increases in healthcare expenditure across developed countries.

Overall medical technology expenditure is 6% of total healthcare expenditure in Europe, and is increasing with new innovations expanding the capability of the technology.⁸ The USA is the largest market worth just over £70bn and has a strong supply base with the majority of the world's largest medical technology companies originating in the country. Europe is the second largest market worth £57bn with a supplier base of 11,000 companies employing some 435,000 people.⁹

1.2. Medical Biotechnology Market

The explosion of knowledge and understanding of biology including genetics, biochemistry and physiology has enabled innovative companies to develop new, effective and safe treatments for diseases such as cancer and diabetes. The application of new biological techniques has allowed major pharmaceutical companies and start-ups to identify new targets for small and large molecule based drugs.

Therapies based on small molecules represent the largest proportion of sales in the global pharmaceutical market. However, drugs developed from large molecules are the fastest growing group, currently accounting for 18% of global pharmaceuticals sales, with 33% of the Top 100 pharmaceutical products classified as biotechnology.¹⁰ The global market for biopharmaceuticals or biologics was estimated at \$149bn (approximately £94.17bn, at last 3 years average exchange rate) in 2010 and is forecast to grow at a rate of 9.9% over the next 5 years.¹¹ In 2011 there were 11 biotechnology products approved by the FDA out of a total of 36 approvals.

7 The Medical Device Market: United Kingdom", March 31st 2009, Espicom Business Intelligence

8 Eucomed Medical Technology Brief, May 2007

9 <http://www.eucomed.org/~media/7804F449C2154F8E9207E8E57B19DD4B.ashx>

10 EvaluatePharma, World Preview 2016 "Beyond the Patent Cliff", June 2011

11 Biologic and Therapeutic Drugs: Technologies and Global markets, BCC Research, 2011

In Europe the medical biotechnology sector is a major employer with 96,500 people employed in approximately 2,200 companies. The industry is research intensive, with European companies spending around £6.6bn per annum on research and development.¹²

1.3. Industrial Biotechnology Market

The industrial biotechnology market is relatively new and emerging with the potential to achieve sales of £150-£360bn in the chemical sector alone by 2025, from a base worth an estimated £35-£53bn world-wide.¹³ This strong growth potential is driven by the ability to provide alternative production processes for oil or gas based chemicals. For example, the use of biological processes to produce ethanol or new polymers for plastics has the potential to contribute to the reduction in the dependence of the world's economies on relatively high carbon consuming processes. Around the world, governments are investing significant resources in underpinning research. The OECD reported that twenty-one governments budgeted to invest £280m into biofuels research alone in 2007.¹⁴

1.4. Pharmaceutical Market

The global sales of prescription and over-the-counter (OTC) drugs (based on the combined sales of the Top 500 pharmaceutical companies) were \$707bn in 2010, growing by 2.8% from 2009. The value of global sales, including biologics but excluding sales from "traditional" technologies, were \$577bn (approximately £364.67bn at last 3 years average exchange rate). The global pharmaceutical industry has become increasingly concentrated over the last 10 years with a series of mergers and acquisitions resulting in the Top 20 companies commanding 68% of the global prescription sales in 2010.

The industry is a strong innovator and invests heavily on research and development to bring new medicines to the market. In 2010 it is estimated that global R&D spend by pharmaceutical companies (which will include biologics) was \$127bn which represents a 1.5% growth on 2009, a significantly lower annual increase than seen during 2008, when double digit increases were the norm. The industry is forecast to increase R&D spending at 2.5% per annum over the next 5 years. The research activity continues to produce a stream of new molecule entities, with an average of 18 compounds approved by the FDA over the last 5 years.

The oncology market is the largest therapeutic category with 8.5% market share in 2010. Anti-diabetics, anti-rheumatics, vaccines and anti-virals complete the Top 5 categories.

The industry is a major employer worldwide and the Top 50 companies employ approximately 1.2m worldwide and have operations in nearly every country.

12 Biotechnology in Europe: 2006 Comparative Study, Critical I

13 Maximising UK Opportunities from Industrial Biotechnology in a Low Carbon Economy, A report to government by the Industrial Biotechnology Innovation and Growth Team, May 2009

14 OECD Biotechnology Statistics 2009

Medical Technology Sector

2.1. Sector Definition

For the purpose of the database, companies included 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 into the sector. Professional services companies represent a vital part of the overall supply chain and a significant portion of the overall sector employment. The definition of this sector used by the database is wider than that typically adopted which tends to primarily focus on the regulatory definition of a medical device. However, in the context of analysing the overall economic impact and trend of the medical technology sector, it is useful to include companies that provide vital services to companies whose primary activity is the development, manufacturing and selling of medical technology.

2.2. Sector Overview

In 2011 the UK medical technology sector within the Bioscience & Health Technology Database had 3,113 companies, which employ close to 64,000 people and have a combined annual turnover of £15bn. Single use technology, wound care, orthopaedic services, professional services and consultancy, and in vitro diagnostics are the five largest segments, all with turnovers greater than £1bn. There has been a 3% decrease (-110 companies) in the number of medical technology companies between 2010 and 2011, although it should be noted that there have been 9 companies formed in this period.

The sector is widely distributed across the UK, with the highest concentrations of turnover and employment in the West Midlands, East of England and the South East of England. The sector continues to be dominated by SMEs which make up 99% of all its companies.

2.3. Turnover, Employment and Segmentation

The total turnover within each segment is shown in **Figure 3**. Single use technology, wound care and management, orthopaedic devices and professional services are the top 4 segments by turnover, with combined sales totalling almost £5bn in 2011 (in vitro diagnostic technology dropped out of the 2010 top 4). These four top segments make up 40% of the total UK turnover in medical technology compared to 38% in 2010.

The comparative analysis between 2010 and 2011 is based on 1,731 companies for which financial data is available for 2009, 2010 and 2011; this represents 56% of the total medical technology companies within the database. Analysis of the best and worst performing segments by turnover (**Figure 4**) shows that the education and training segment has seen the highest increase (32%), followed by wound care and management (30%) and neurology (23%). Conversely, the segments which have

seen the largest drops in turnover are radiotherapy equipment (31%), medical imaging/ultrasound (22%) and hospital hardware (18%).

Figure 3. Turnover by medical technology segment in the UK

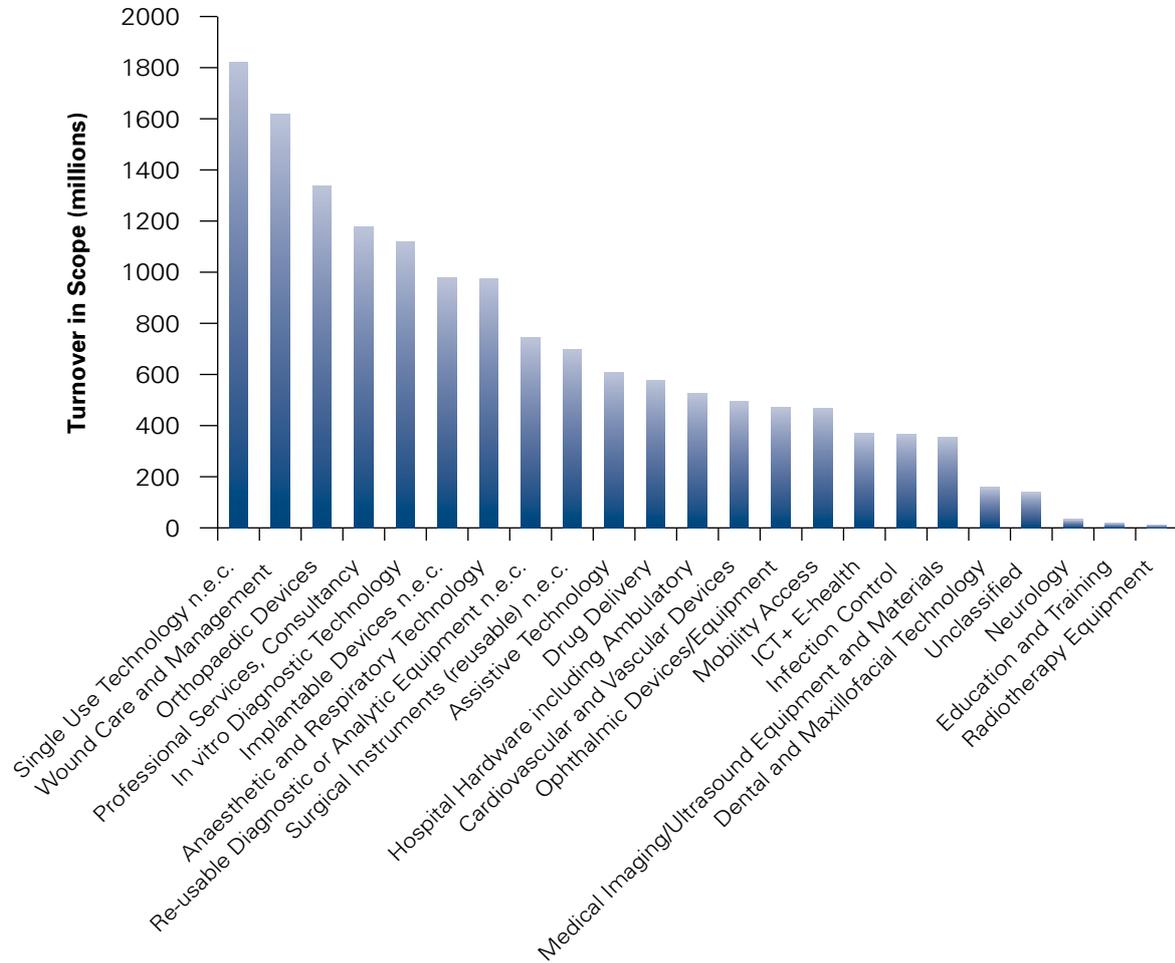
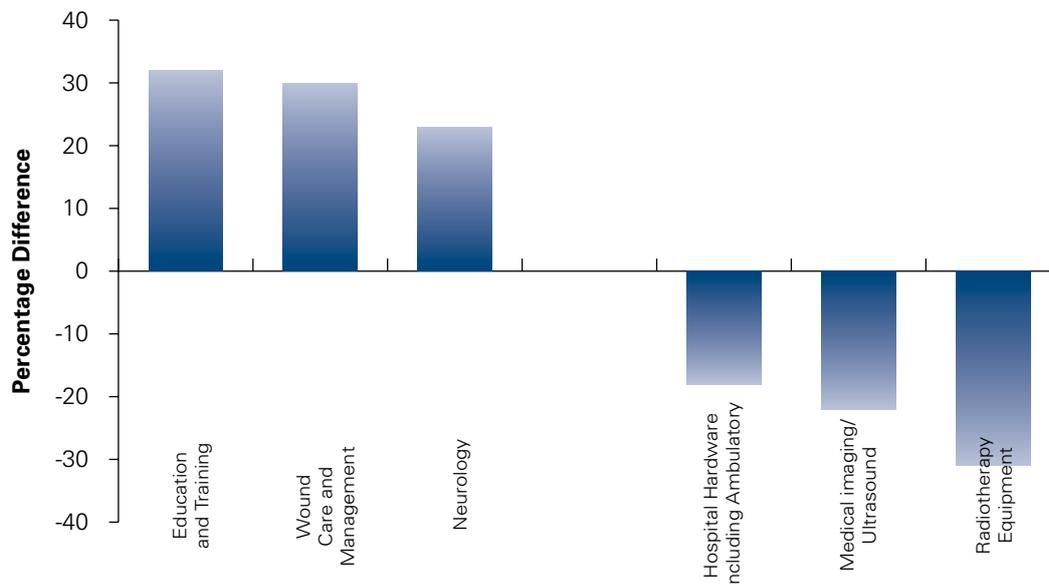


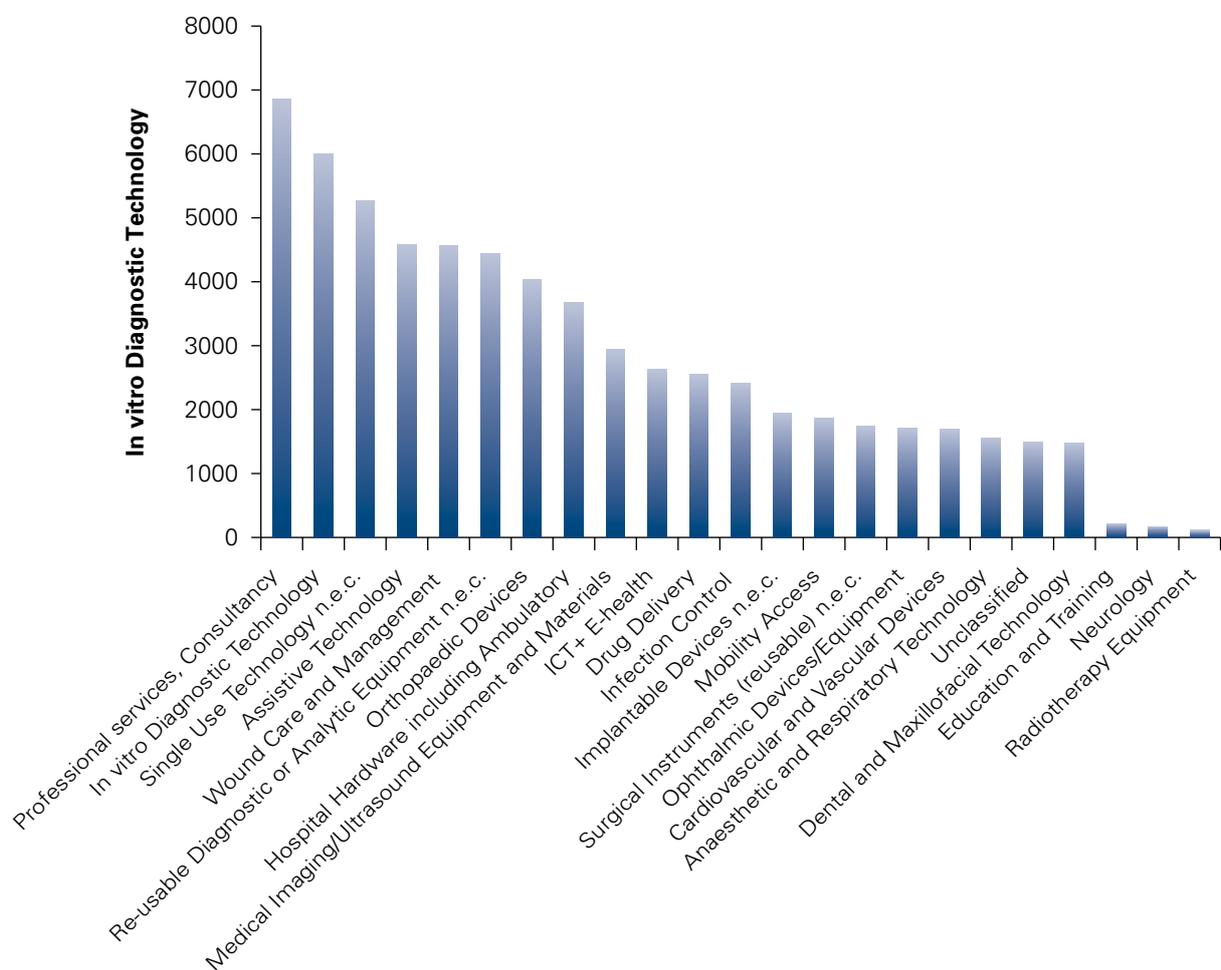
Figure 4. Turnover by medical technology: top and bottom 3 segments



The distribution of employment across all the segments (**Figure 5**) is not consistent with that seen for turnover. As in the 2010 commentary, professional services employ the largest proportion of individuals with 6,856 employees. Professional services cover 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 activities within professional services by employment are companies offering consultancy, regulatory advice, legal services and the provision of servicing and maintenance representing 15%, 2%, 1% and 1% respectively of all employment in the sector.

The other top employment areas within medical technology are in vitro diagnostic technology, single use technology and assistive technology. These segments, along with wound care, diagnostic equipment, orthopaedic devices, hospital hardware and medical imaging have similar numbers of employees ranging between 3,700 and 6,000 and form the bulk of employers in the medical technology sector.

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



The comparison of the employment numbers in medical technology between 2010 and 2011 is based on the same 1,731 companies that were used to determine trend analysis for turnover and is illustrated in **Figures 6** and **7**. These figures show that employment has increased by 5% across the medical technology sector. There are 10 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 which has seen a 27% increase, followed by in vitro diagnostic technology with 17% and radiotherapy equipment with 15% increases.

The segment that has seen the steepest decline in employment figures is infection control, with a 18% reduction. This is followed by hospital hardware (11% decrease) and mobility access (10% decrease).

Figure 6. Medical technology employment: segments with increased employment

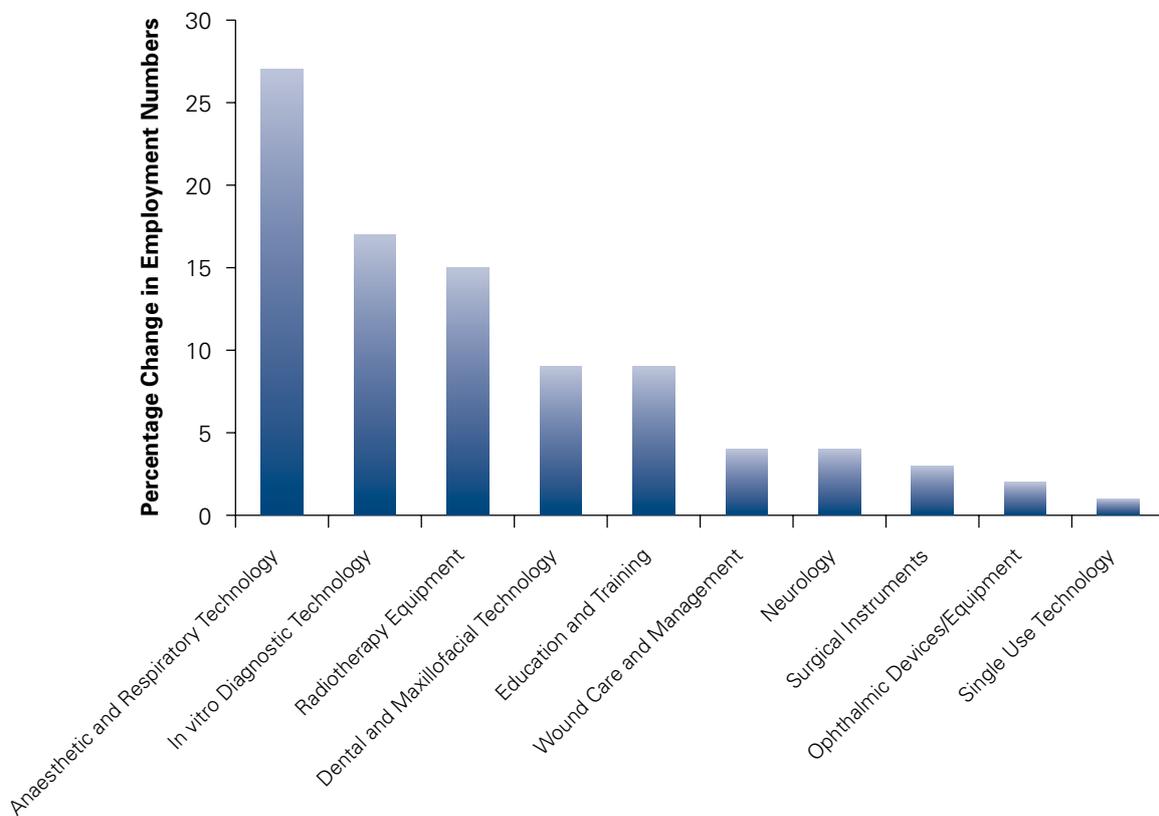
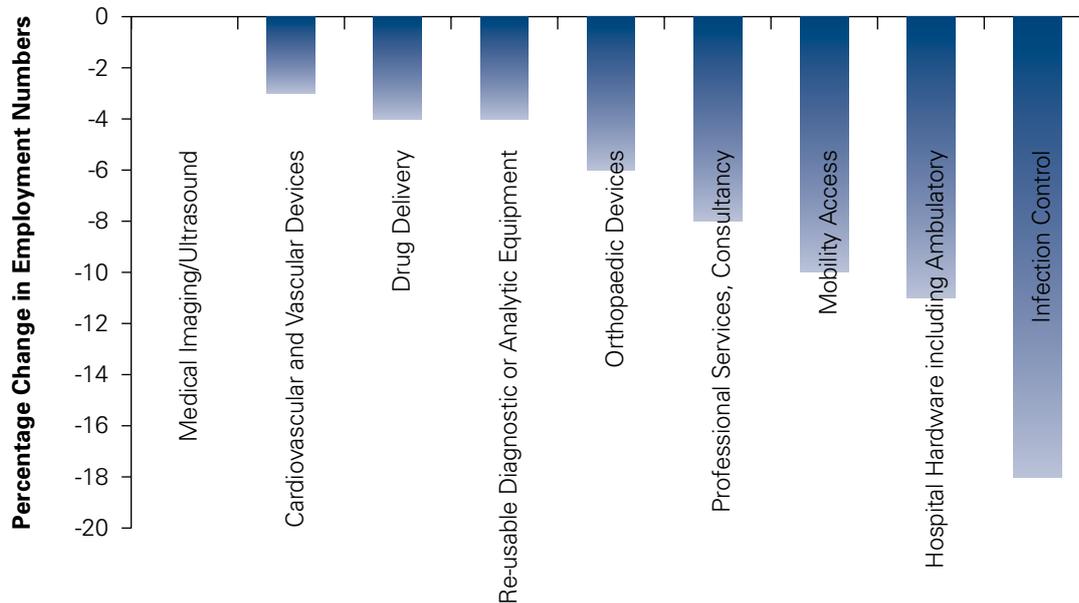


Figure 7. Medical technology employment: segments with static or decreased employment

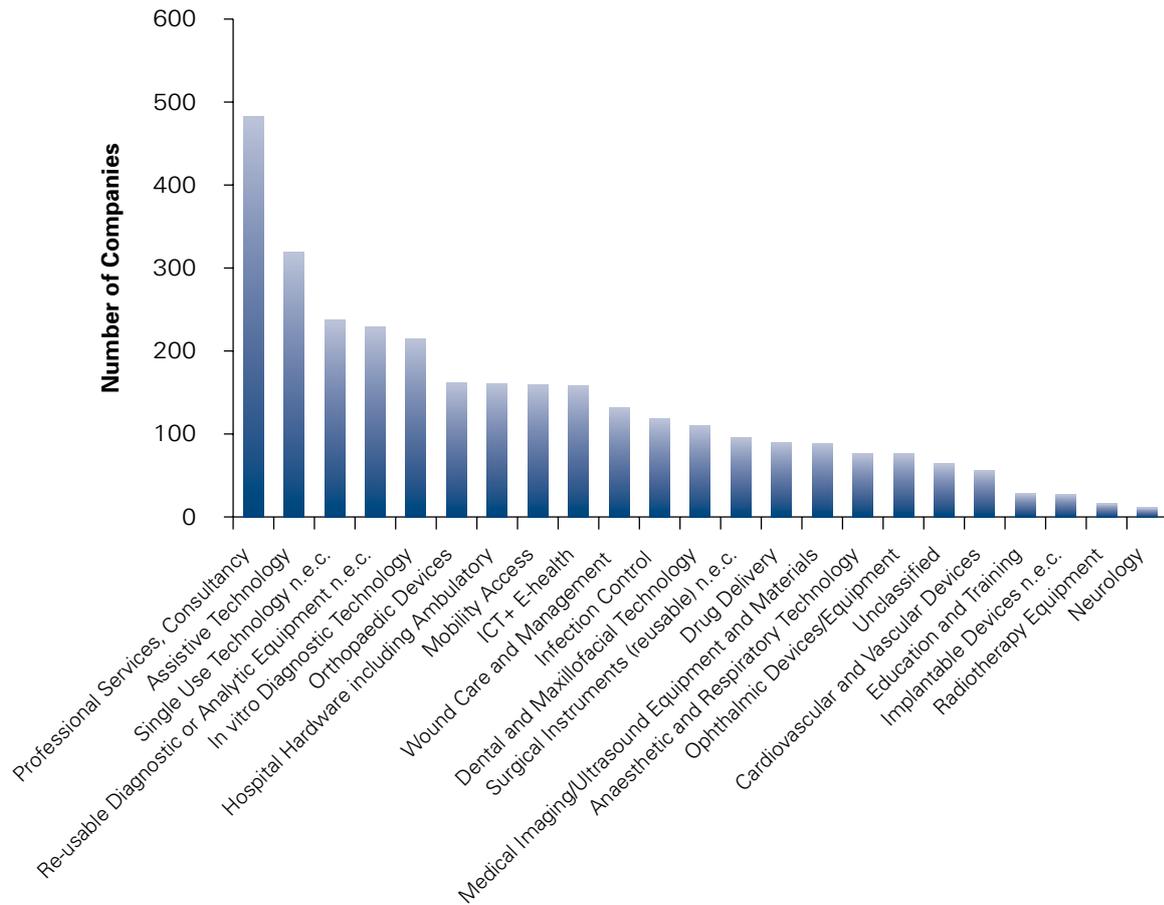


The comparison of both turnover and employment trends does not show any obvious correlation. Although hospital hardware has seen a dramatic decrease in both turnover and employment (18% and 11% respectively), the radiotherapy equipment sector has shown the largest single reduction in turnover (31%) while seeing a significant (15%) increase in employment.

Comparison across three years (2009-2011) has shown a number of sectors that are continuing to grow in employee numbers. In vitro diagnostics showed steady growth in 2010 (5%) continuing into 2011 (17%), and radiotherapy equipment increased (10%) in 2010 and in 2011 (15%). The wound care and management sector was reported to have suffered one of the largest decreases in turnover in 2010 (a reduction of 14%) but has significantly grown in 2011, with turnover increasing by 30%.

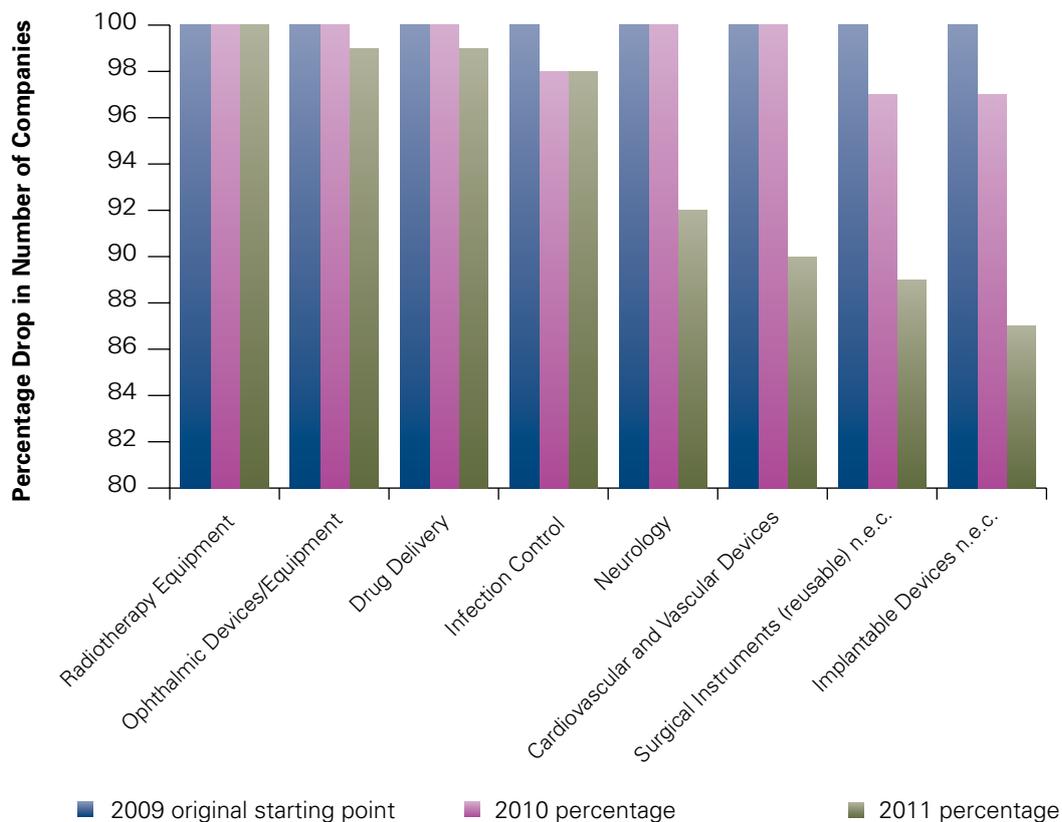
The distribution of the number of companies across segments gives another picture of the sector as a whole as shown in **Figure 8**. Once again, as the previous two years, the professional services and consultancy segment has the highest number of companies. The ordering of segments by company numbers has only seen very slight changes throughout the 3 years, but none of these changes have represented a significant shift in the medical technology company distribution within the UK. The total number of medical technology companies has decreased by 5% between 2009 – 2011. This represents 187 company cessations, while a total of 40 companies have been created in this time.

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



The total number of companies involved in medical technology has declined 3% between 2010 and 2011. This overall number masks the creation of 9 new companies. The start-ups figure is lower than the average of 28 per year (in 2009) highlighted in a recent report¹⁵ but is not inconsistent with other sectors in the current economic climate. No individual segment has increased in overall company numbers in 2011 (as in 2010) while a number have shown a decrease over the same time frame. **Figure 9** shows the 4 highest and 4 lowest performing segments between 2009, 2010 and 2011. The radiotherapy equipment segment has remained consistent in total company number in all three years but it should be emphasised that this is due to equal numbers of company cessations and creation and not due to a purely static segment. Segments that have shown the smallest decreases in total numbers are those involved in ophthalmic devices, drug delivery and infection control. Conversely neurology, cardiovascular devices, surgical instruments and implantable devices have seen the largest drops in total company numbers.

15 Opportunity: UK Life Science Start-up report 2010; Mobius Life Sciences, Nottingham Biocity

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

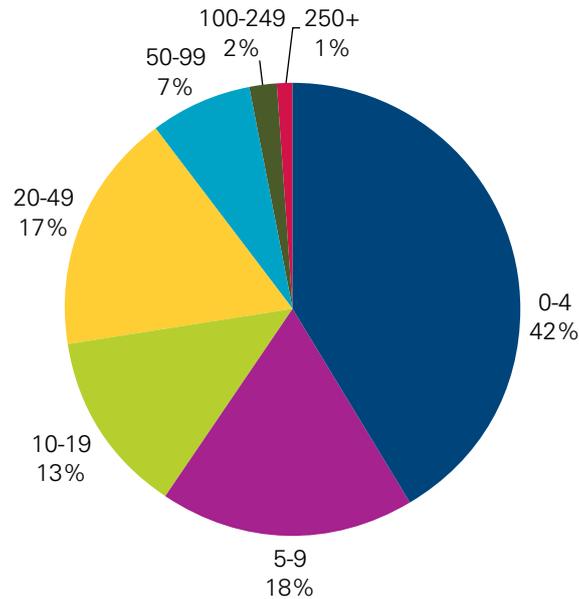
2.4. Company Size and Activity

The vast majority of companies in the medical technology sector are small to medium sized enterprises (SMEs), with less than 250 employees. The overall distribution is shown in **Figure 10**. In the UK, the data available for 2011 shows that 99% of medical technology companies are SMEs, which is consistent with the figure from both 2009 and 2010. Within the sector 60% are micro-companies (employing less than 10 people), which compares to 67% in 2009 and 63% in 2010. This decrease of 7% in the numbers of very small companies shows that companies are continuing to grow even in the current economic climate. In the UK there are 93 medical technology companies that have 100 or more employees. This employee per company distribution is similar to that for industry overall in the UK where 99.8% of all companies have less than 250 employees.¹⁶ However, the medical technology sector still has a lower percentage of micro-companies; 60% compared to 90% for all UK manufacturing.¹⁷

¹⁶ Small and Medium Enterprise Statistics for UK and the Regions, BIS: <http://stats.bis.gov.uk/ed/sme>

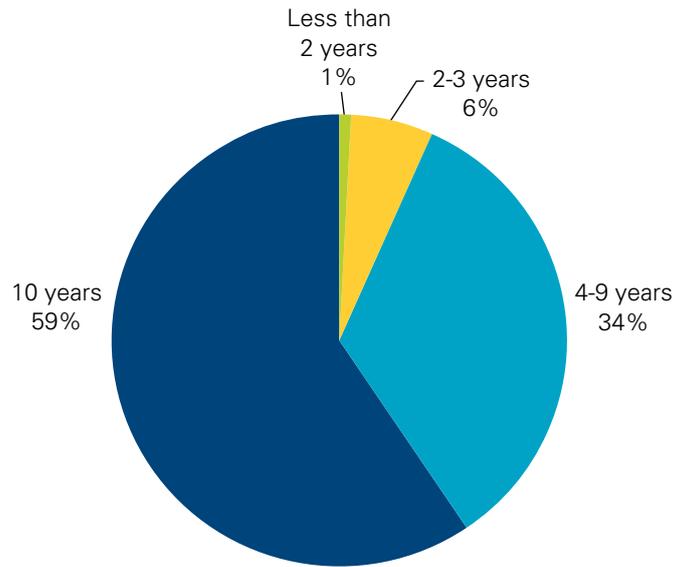
¹⁷ Small and Medium Enterprise Statistics for UK and the Regions, BIS: <http://stats.bis.gov.uk/ed/sme>

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



The distribution of total turnover within the sector shows that 87.5% of all medical technology companies, for whom financial data is available, have a turnover in the range of £100,000 – £5,000,000. The UK is home to 466 companies in this sector that have an annual turnover of over £5,000,000, up from 425 in 2010.

The age profile of companies within the medical technology sector (**Figure 11**) shows that the majority of companies are well established, with 52% of all medical technology companies being over 10 years old. Radiotherapy equipment (13%) and implantable devices (4%) have the greatest proportion of very young companies (less than 2 years old) while ophthalmic devices (75%) and reusable surgical equipment (68%) have the greatest proportion of established companies (10 years or more). This distribution of these long established companies has not changed since 2010.

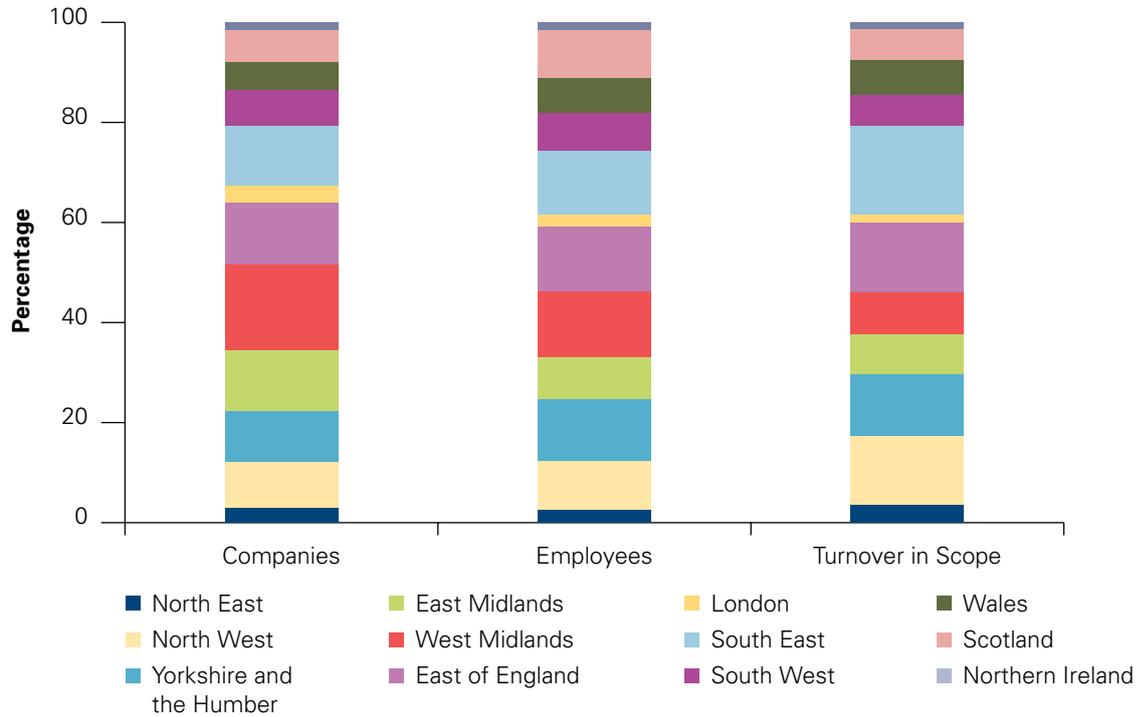
Figure 11. Profile of UK medical technology sector by company age

2.5. UK Profile

All parts of the UK have company activity within the medical technology sector.

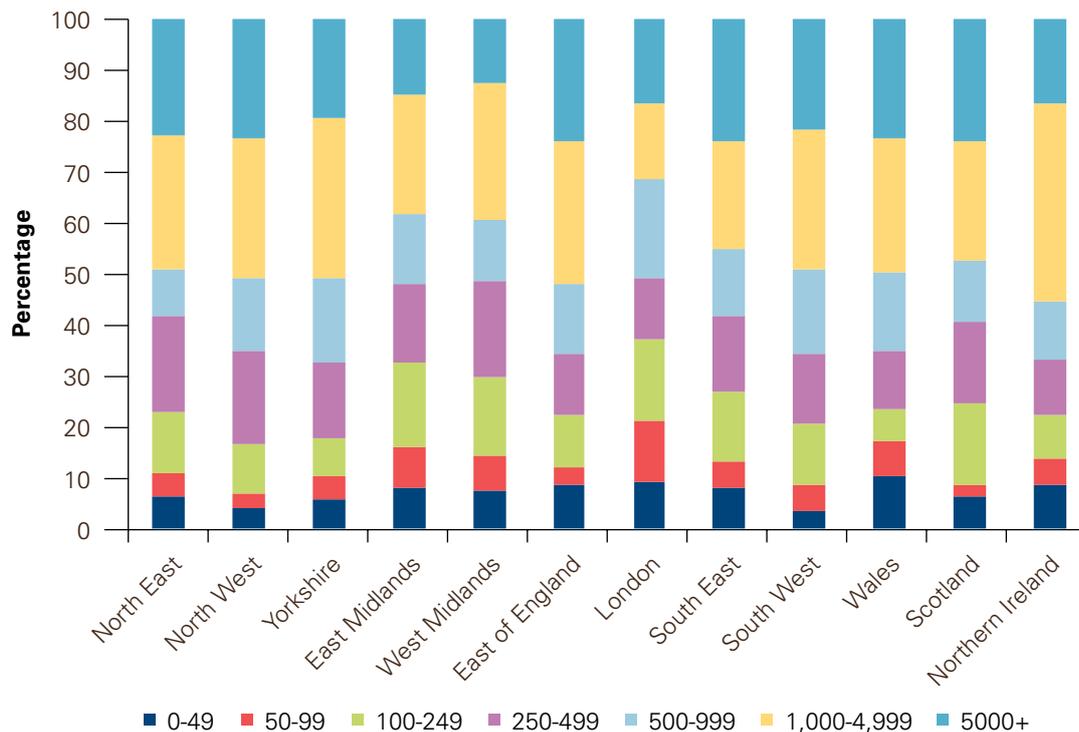
Figure 12 displays a combination of turnover, employees and number of companies within the medical technology sector in the UK. The distribution shows that there is no clear link between the number of companies within a region and the number of employees or turnover. However, as in previous years, a significant proportion of the turnover in scope (18%) within medical technology is generated from companies based in the South East of England despite this area only having 12% of the total number of companies.

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



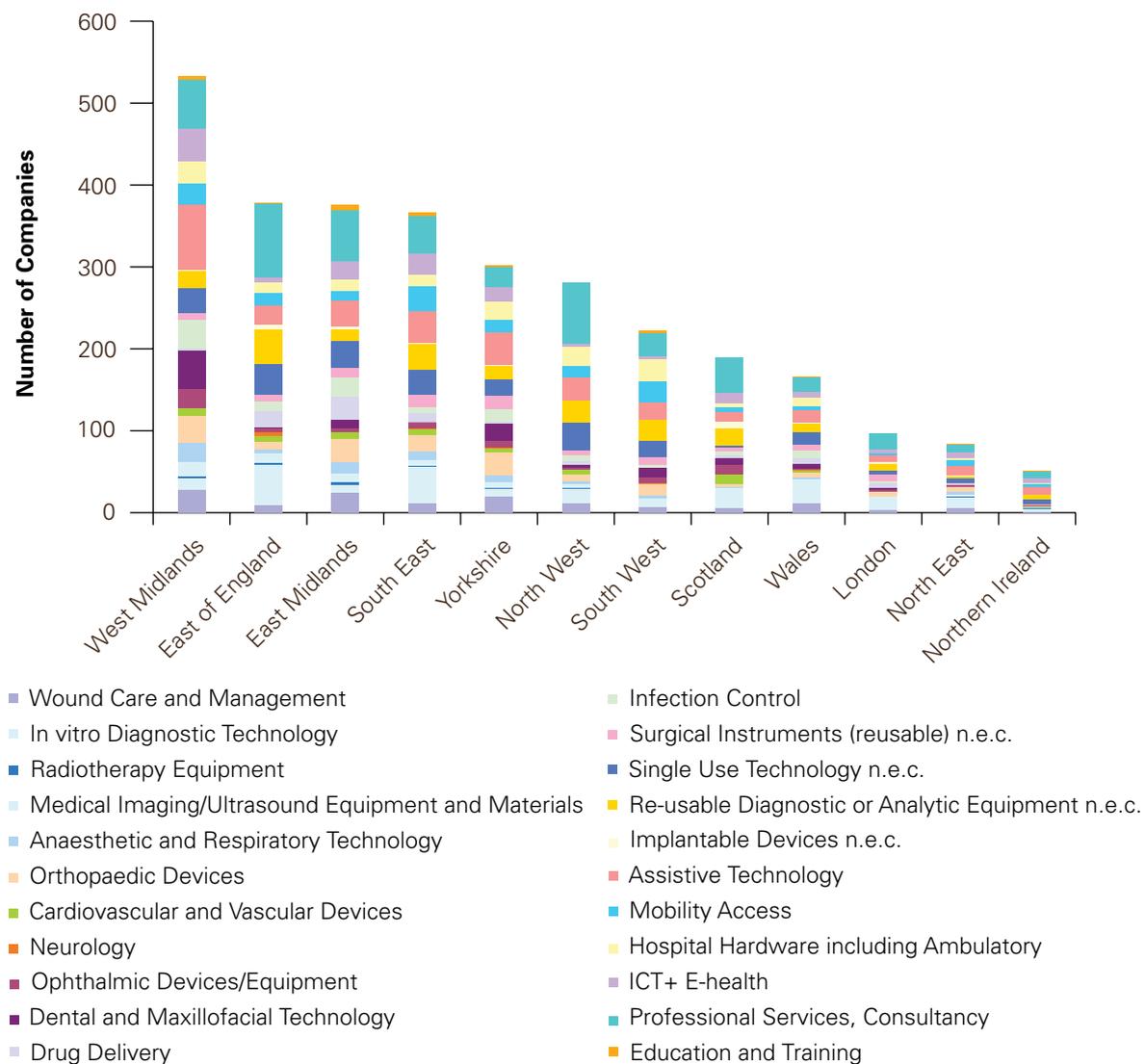
The geographical distribution of companies by turnover is shown in **Figure 13**. All UK areas have companies in all turnover ranges. All geographical areas have between 22% and 43% of companies with turnovers of over £1m a year.

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



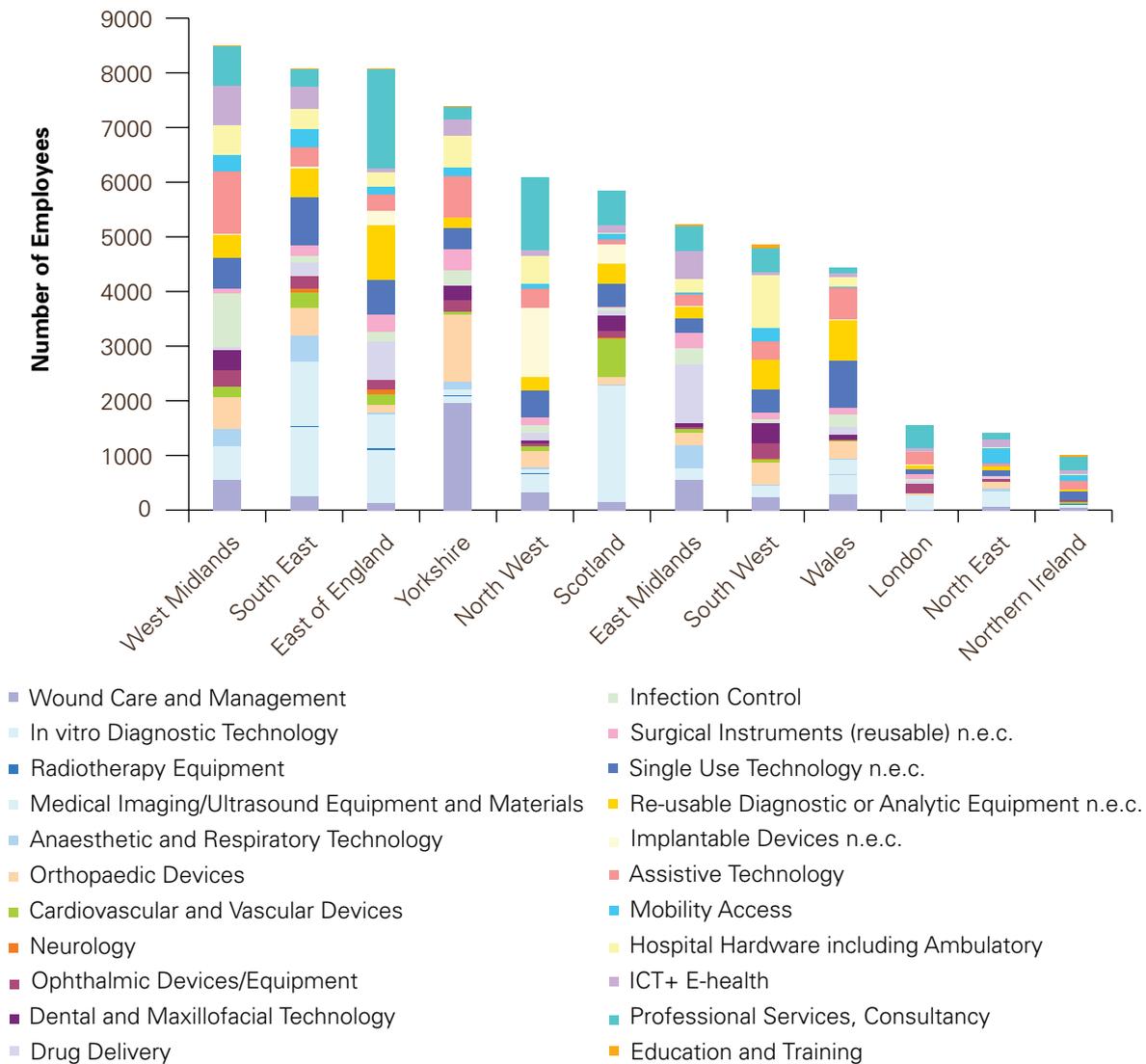
The methodology used by the database enables the identification of activities across the medical technology sector in the UK. Figure 14 shows that the West Midlands continues to have the highest number of medical technology companies, as it did in 2009 and 2010. However, the East of England now has more companies than the East Midlands, these areas having switched position since 2010. Together these three regions account for a significant portion of the entire UK medical technology sector, 43%. This percentage share has slightly increased (1%) since 2010. Most areas in the UK have companies active in all segments. The West Midlands has the highest number of orthopaedic device companies and together the East of England and South East England have a large proportion of the UK's single use technology companies.

Figure 14. Number of medical technology companies per segment

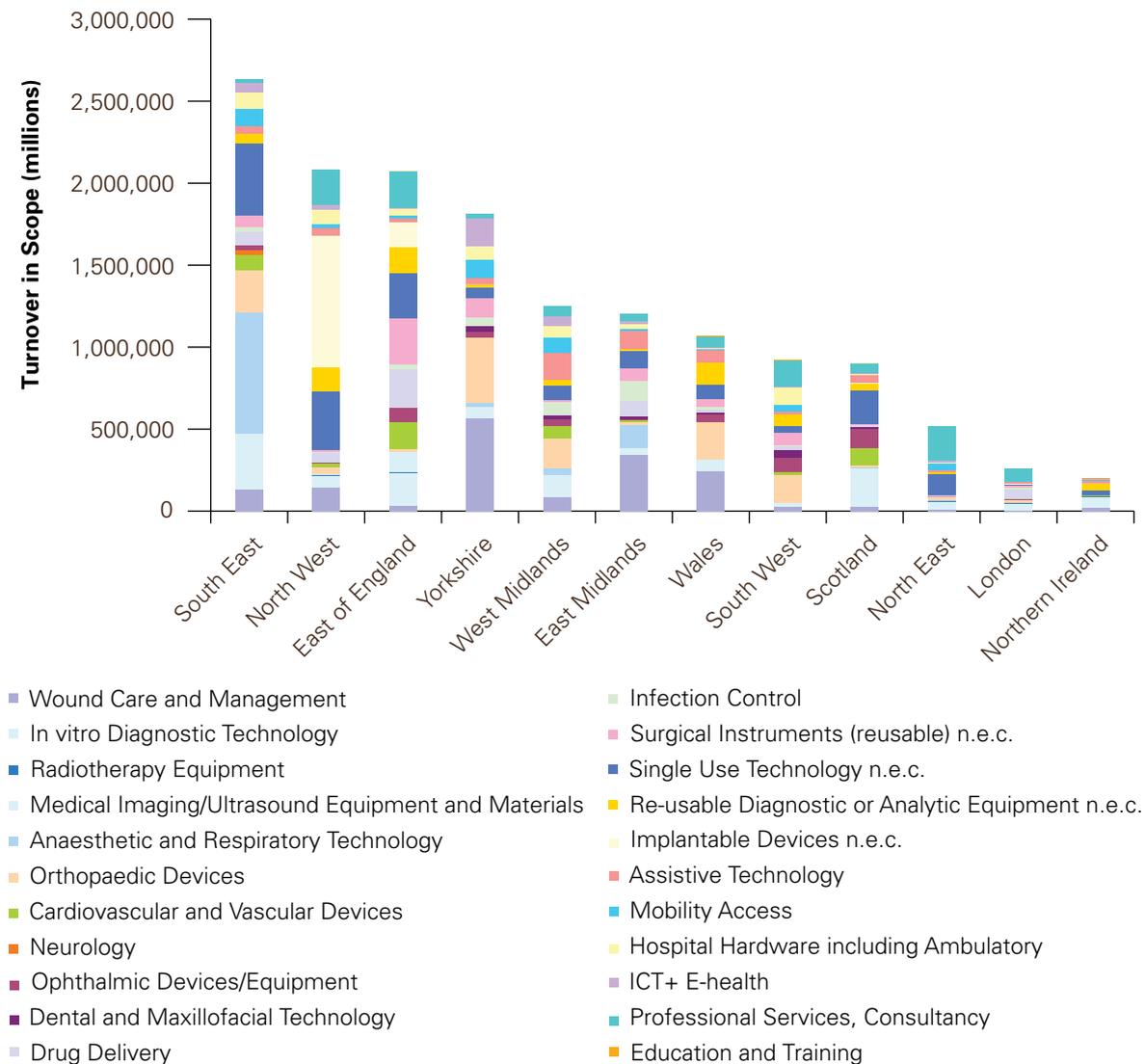


The employment pattern across these companies (detailed in **Figure 15**) shows that the highest employment numbers in the medical technology sector are in the West Midlands, followed by the South East and the East of England. This is different to the distribution seen in 2010, when the South East of England had the majority of the country's workforce in medical technology. The West Midlands account for the majority of the medical technology workforce (14%) while the South East and East of England account for 13% each. These three geographical areas represent 40% of the total employment in this sector.

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



Mapping the total turnover shows a different ordering. **Figure 16** illustrates that companies based in the South East and North West have the highest turnovers. This distribution is different to 2010 – while the South East still boasts the highest turnover in the sector, the North West has replaced the East of England in second position. As in 2010, the West Midlands do not have matching levels of employment and turnover in this sector.

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

2.6. Medical Technology Pipeline and Sector Investment

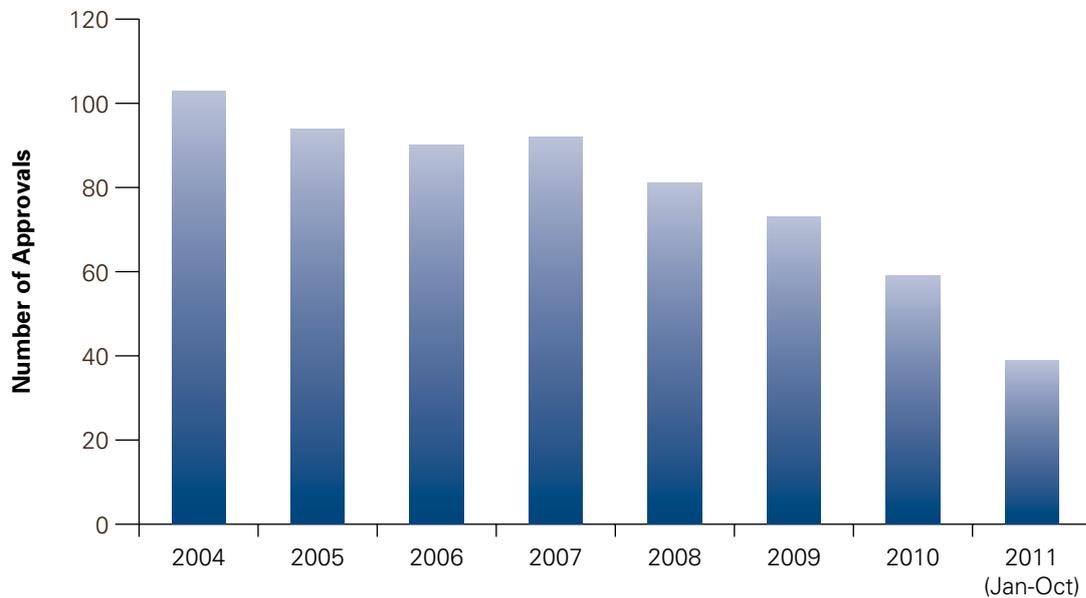
The medical technology industry is characterised by a high rate of product innovation and short life-cycles for some segments. One measure of the health of the UK industry is to look at the number of devices from UK-headquartered companies that have been approved for marketing in the world's largest medical technology market, the USA.

The BioPharm Insight¹⁸ database shows that for UK companies, 39 devices received approval between January and October 2011 (**Figure 17**). This is an 11% decrease from the approval rates seen for the same time period in 2010. Between 2010 and October 2011 there have been a total of 98 devices approved. Between 2004 and 2008 the numbers of approvals were consistently around 80-100 per annum. The trend since 2008 illustrates a decrease of approvals per annum. The available 2011

18 BioPharm Insight, 2011

data is consistent with this trend as it is the trend seen in the US and Germany over the same time period.

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

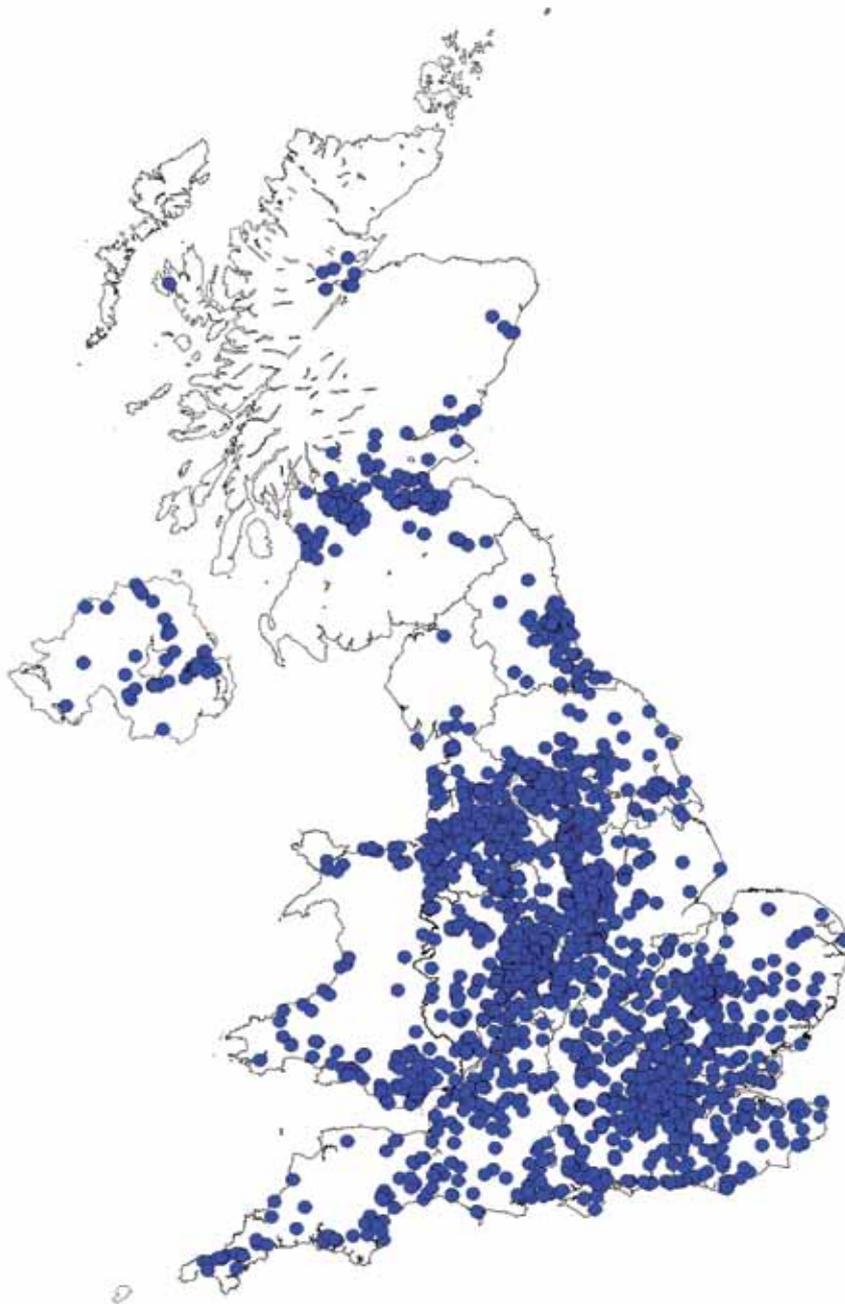


2.7. Trade

The UK market for medical technology and supplies is estimated to be £5.6bn¹⁹ in 2011. Espicom estimates that there will be a real annual growth of 3.6% in dollar terms over the next five years. This will take the overall market to £6.7bn by 2016. The growth of the UK medical device market is predominantly import led and this import market has seen a decrease in value in recent years. Its value in 2010 was lower than that recorded in 2006.

2.8. 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 3,113 companies.
- This is a 3% decrease in company numbers from last year.
- They have a combined in-scope turnover of £15bn.
- Total number of employees is 64,000.
- 99% of companies have less than 250 employees.
- 87.5% have turnovers in the range of £100k to £5m per annum.
- The UK is home to 466 companies with turnovers in excess of £5m per annum.
- 52% of all companies are over 10 years old.
- Exports for the first ten months of 2011 are down 11%.

Top 3 segments in the sector		
By turnover	By employment	By no. of companies
Single use technology	Professional services	Professional services
Wound care	In vitro diagnostic technology	Assistive technology
Orthopaedic devices	Single use technology	Single use technology

Medical Biotechnology Sector

3.1. Sector Definition

The definition of this sector has changed since 2010 due to the inclusion of the pharmaceutical sector within the database. While this has not altered the segmentation used within the medical biotechnology part of the database, it has resulted in a change in some of the companies that were classified as being active in the medical biotechnology sector in 2010. A total of 107 companies which formed part of the medical biotechnology sector in 2010 have now been reclassified as pharmaceutical companies. This change of classification has been considered when comparing the medical biotechnology data to that detailed in the 2010 commentary document.

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 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). 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 analysed according to the primary activity from which the majority of their turnover and employment is derived.

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 technology employed.

3.2. Sector Overview

In 2011 the UK medical biotechnology sector within the Bioscience & Health Technology Database contained 945 companies, which employ close to 23,000 individuals and have a combined annual turnover of £3.4bn. This includes 325 or 34% of the sector companies that have at least 1 major activity in the development, manufacturing or selling of therapeutic products. Specialist services, small molecules and the antibodies sectors are the three largest with turnovers of £2bn, £0.6bn and £0.2bn respectively. There has been a 3% decrease (-35 companies) in

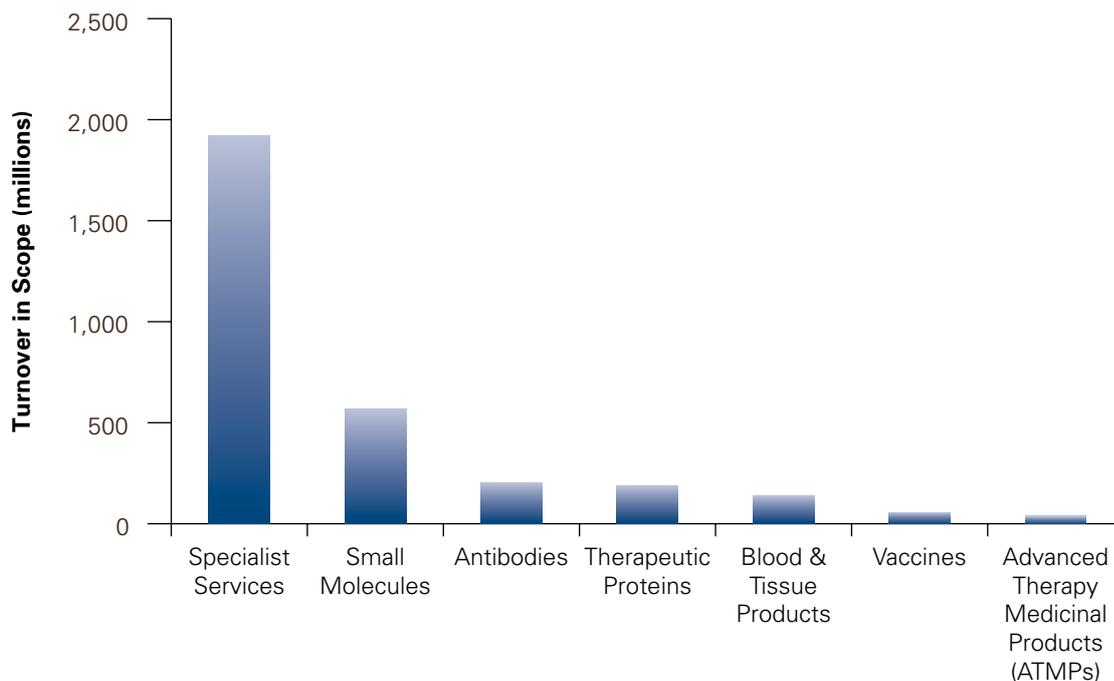
the number of medical biotechnology companies between 2010 and 2011, however there have been 4 new companies created within the same period.

The sector is widely distributed across the UK, with the highest concentrations of turnover and employment in the East and South East of England and Scotland. The sector is dominated by SMEs which make up 98% of companies in the sector.

3.3. Turnover, Employment and Segmentation

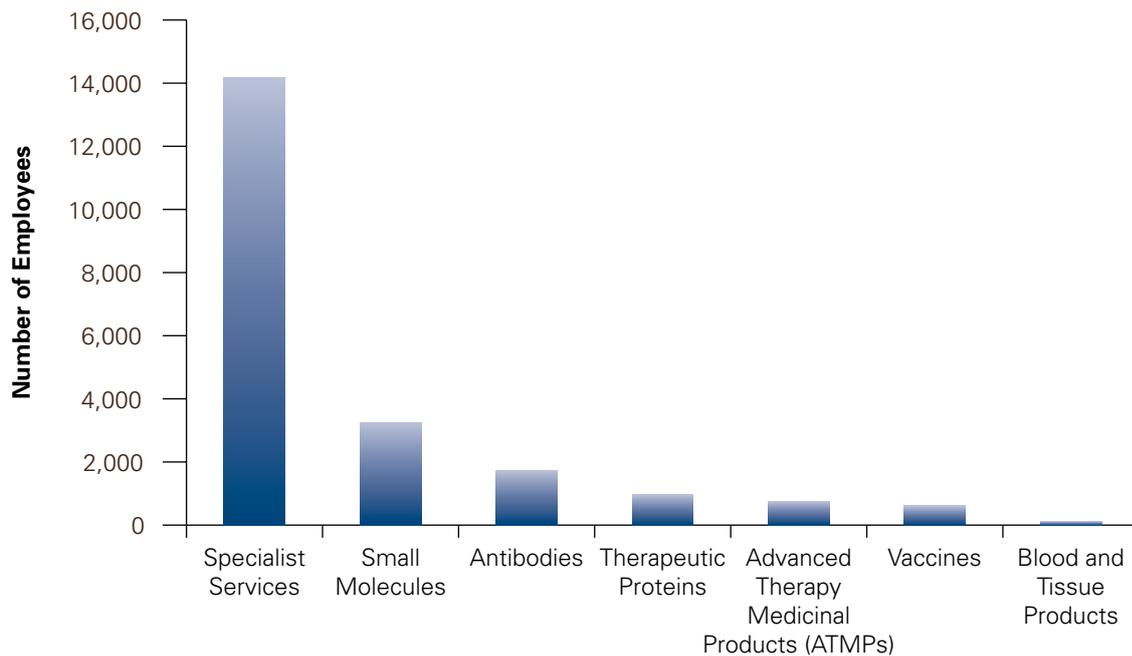
The distribution of the medical biotechnology sector's £3.4bn turnover across the individual segment is shown in **Figure 18**. Consistent with the data reported in 2010, the segment with the largest turnover is the specialist services segment. This consists of companies providing regulatory advice, general consultancy and specialist analytical services. For companies involved in developing, manufacturing or marketing final products, the largest segment remains small molecules (even after the removal of pharmaceutical companies) which has a turnover of £0.6bn. All other segments have a combined turnover of £0.6bn.

Figure 18. Turnover in UK medical biotechnology companies by segment



The largest employer in medical biotechnology with 14,188 employees continues to be companies involved in the provision of specialist services (65% of total workforce). Small molecule companies employ 3,261 people (15% of the total sector employment), while antibody companies employ 1,744 people (8% of the total sector employment). The pattern of employment by segment is consistent with that seen in both 2009 and 2010.

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



The structure of the medical biotechnology sector is further reflected in the number of companies per segment displayed in **Figure 20**. Specialist services continue to dominate the sector with 620 companies – 68% of all companies in the sector (up from 63% in 2010). Also shown in Figure 20 is the change in companies per segment between 2009, 2010 and 2011. There has been an overall fall of 3% from 2010 and 2009. Irrespective of the sector reclassification, all segments have experienced a decline in company number between 2010 and 2011.

Figure 20. *Number of UK medical biotechnology companies by segment*

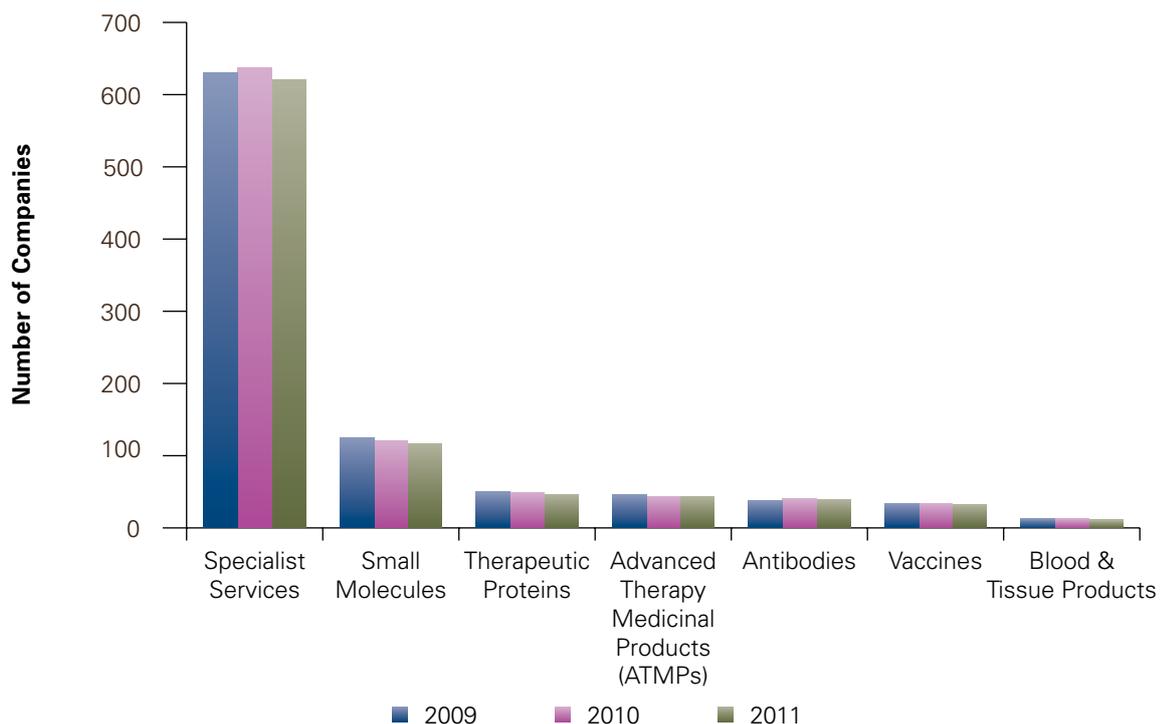


Figure 21 shows the percentage changes in medical biotechnology companies from 2010 to 2011 in percentages and by segment. Once again blood and tissue products show the largest fall in company numbers, consistent with the fall from 2009 to 2010. However, it should be noted that this relatively large percentage loss in blood and tissue products represents an actual loss of only 2 companies, while in other areas such as specialist services a much smaller percentage loss actually represents a larger actual loss of 20 companies.

Figure 21. *Change in UK medical biotechnology company numbers by segment*

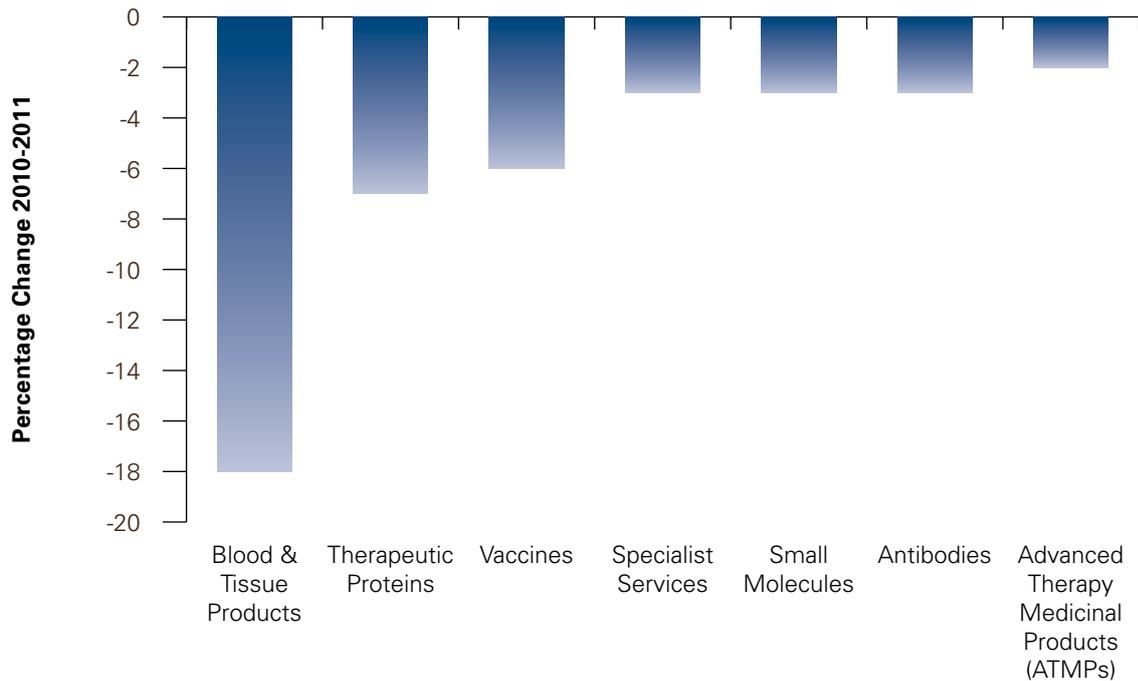
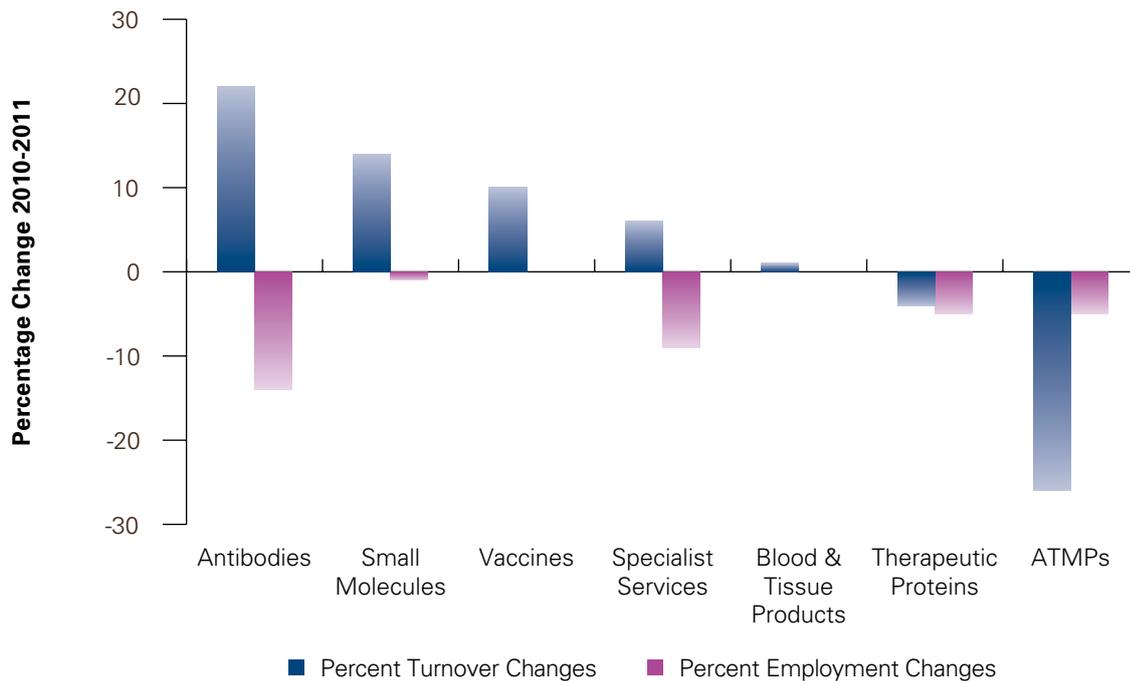


Figure 22 shows turnover and employment trends by segment. The comparative analysis between 2010 and 2011 is based on 411 companies for which financial data is available for 2009, 2010 and 2011; this represents 44% of the total medical biotechnology companies within the database.

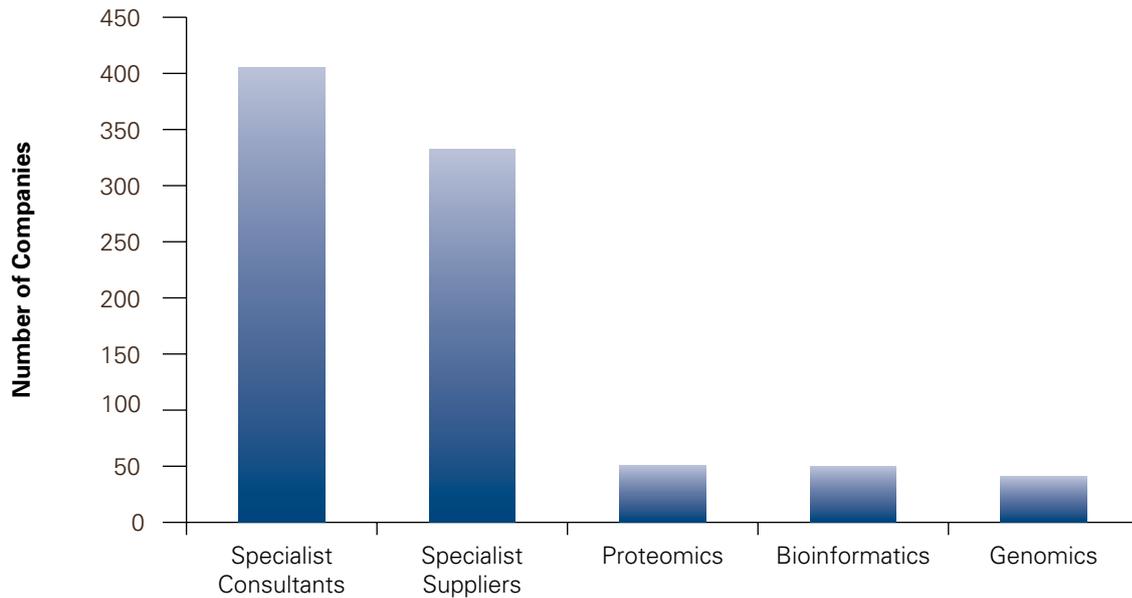
Antibodies, small molecules, vaccines and specialist services all show a significant increase in turnover but with the exception of vaccines this does not correspond to increases in employment. Therapeutic proteins and ATMP companies show a decrease in both employment number and turnover.

Figure 22. Change in UK medical biotechnology company turnover and employment by segment



The specialist service segment continues to be the largest sub-sector and therefore of significant economic importance. **Figure 23** gives a breakdown of the services offered by these companies. Specialist consultants are the largest sub-segment with 405 companies offering a whole range of services including intellectual property advice, drug development expertise and good manufacturing practice (GMP) consultancy. Specialist suppliers are the second largest sub-segment with 332 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 23. *Distribution of UK medical biotechnology specialist services companies by sub-segment*



3.4. Company Size and Activity

The UK medical biotechnology sector is dominated by SMEs with 98% of the companies having less than 250 employees. **Figure 24** shows that over half the companies in the sector have fewer than 5 employees. This suggests that the majority of the sector is made up of micro-companies. However, it should be noted that 15 medical biotechnology companies have employment figures of over 250 individuals.

Figure 24. *Distribution of UK medical biotechnology companies by employees*

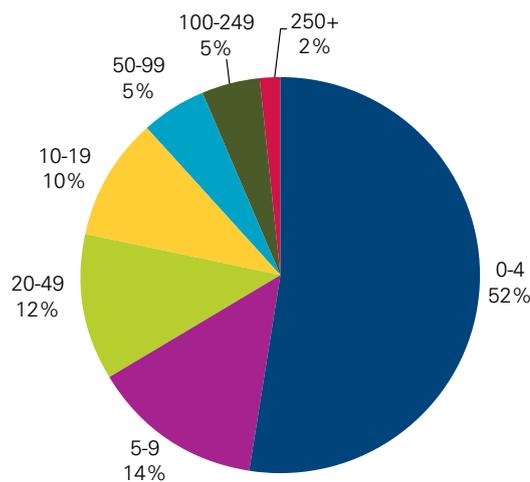


Figure 25 displays the age range of medical biotechnology companies and this shows a healthy mix of young and older companies. 43% of companies are over 10 years old, indicative of the UK having a sustainable medical biotechnology industry sector.

Figure 25. *Distribution of UK medical biotechnology companies by age*

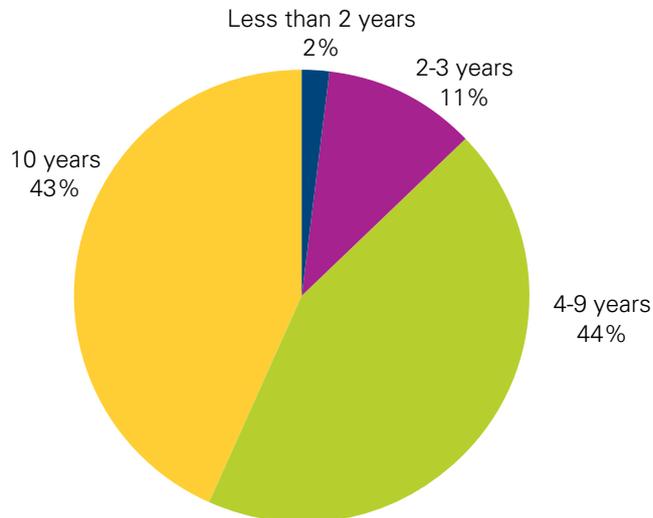
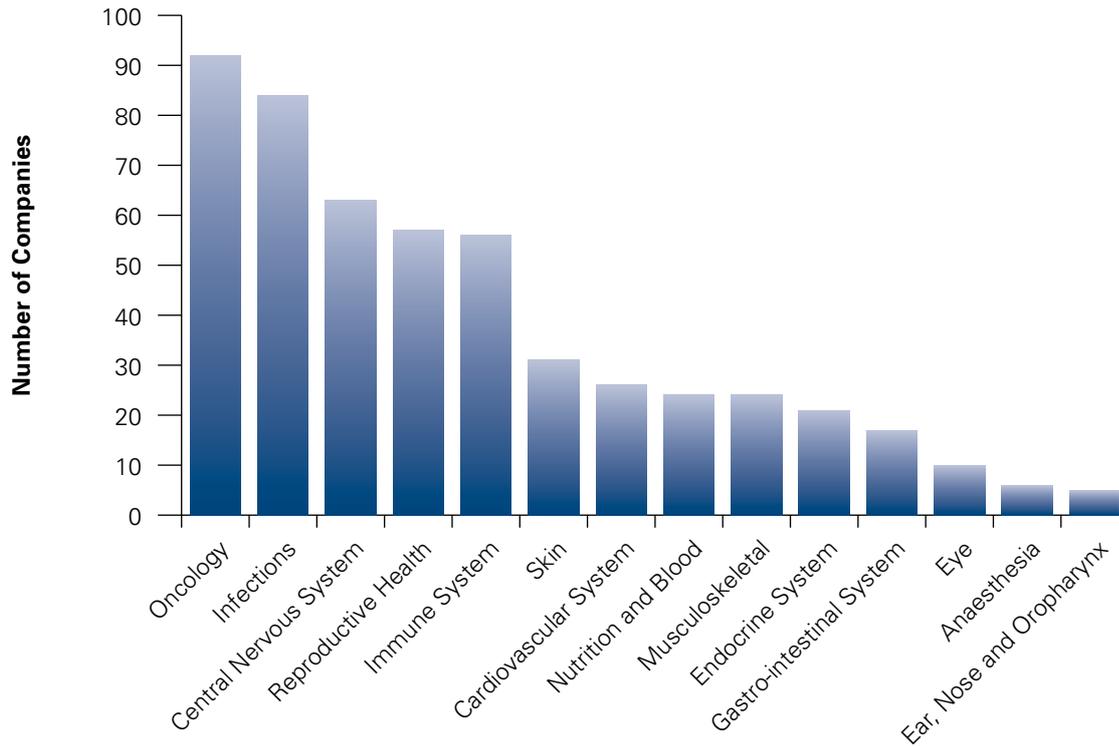
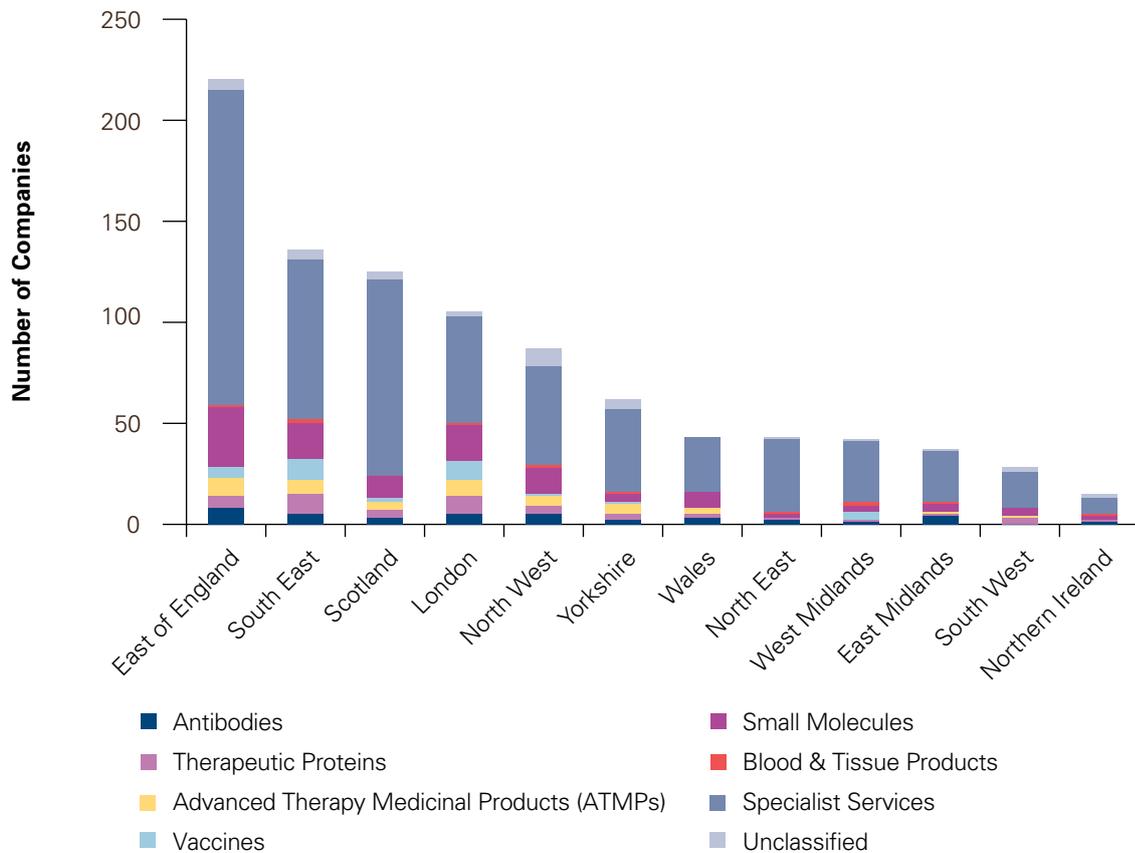


Figure 26 shows, for those companies where information is available, the main therapeutic category being targeted. Oncology and infections are the top 2 therapeutic areas with over 80 companies having activity in each area. Central nervous system has fallen to 3rd place since 2010 and it is followed by reproductive health and the immune system in 4th and 5th places, respectively.

Figure 26. Distribution of UK medical biotechnology companies by therapeutic area

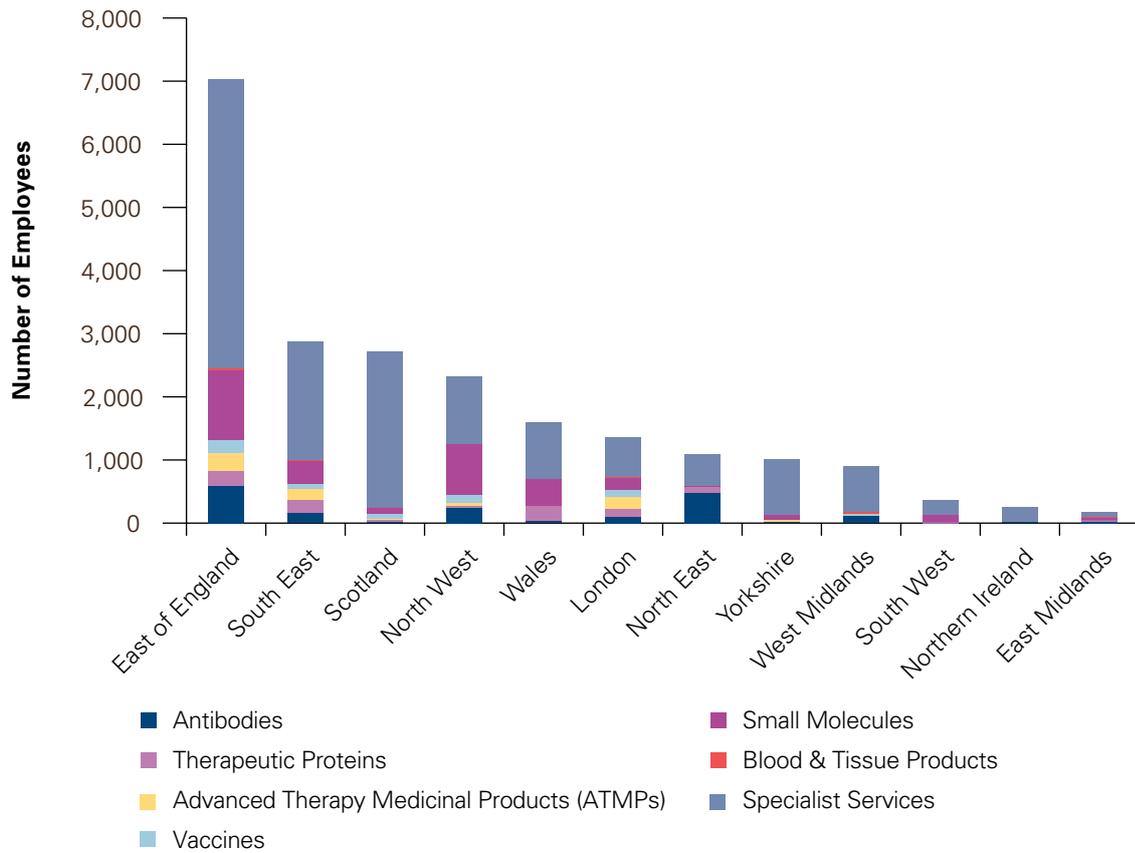
3.5. UK Profile

Figures 27, 28 & 29 show the distribution of the economic activity across the UK's medical biotechnology sector. This is expressed as the number of companies, turnover and employment by location and segment. The East of England continues to contain the most medical biotechnology companies, as it did in 2009 and 2010. The South East and Scotland are 2nd and 3rd respectively, also consistent with the distribution seen in both 2009 and 2010. Together these three regions account for over 50% of all medical biotechnology companies within the UK (51%). Most areas in the UK have companies active in all segments. The East of England has the highest concentration of small molecule companies (as in 2010) while the South East contains the largest number of vaccine companies. In 2011 no sector within medical biotechnology has seen an increase in total company numbers.

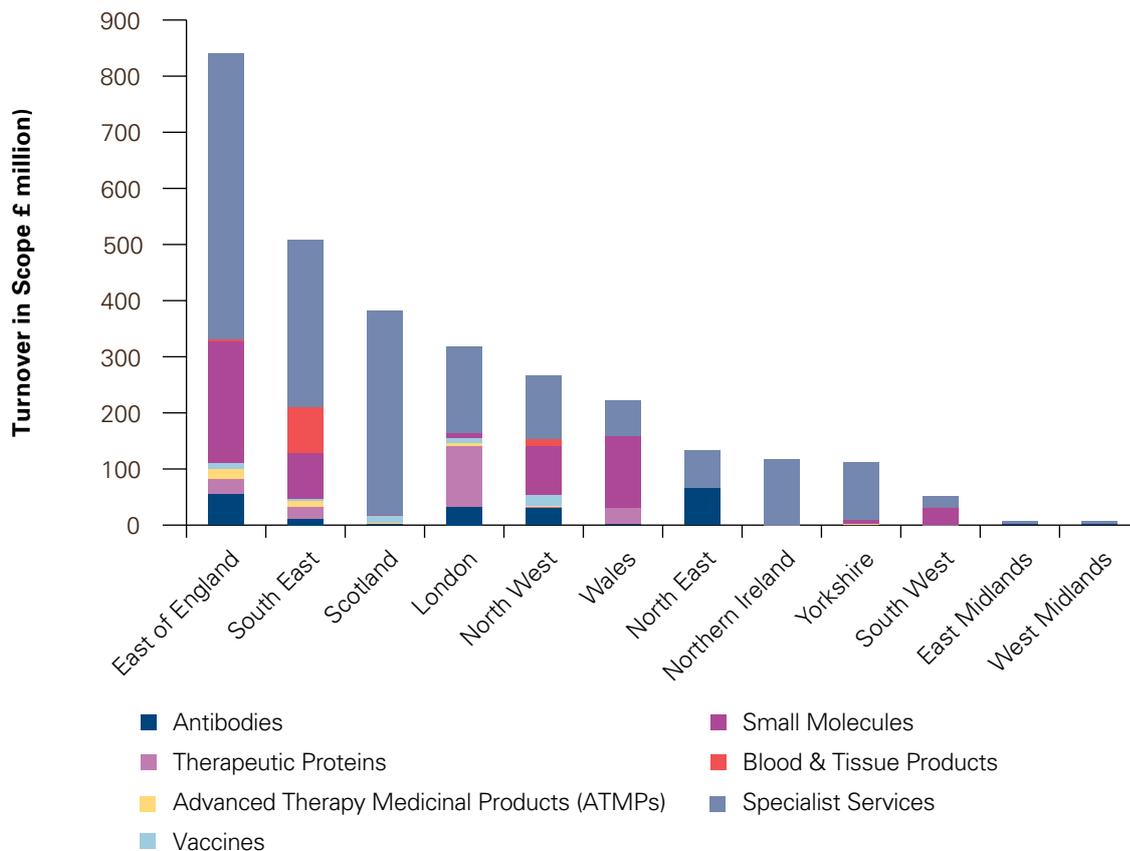
Figure 27. Number of companies in the UK medical biotechnology sector by segment

The employment pattern across these companies (detailed in **Figure 28**) shows that the highest employment numbers in the medical biotechnology sector are in the East of England, followed by the South East and Scotland. This is consistent with the distribution of total company numbers and is also consistent with the distribution seen in 2009 and 2010. The East of England accounts for the majority of the medical biotechnology workforce (32%) while the South East and Scotland account for 13% each. Together these three geographical areas account for 58% of the total employment in this sector.

Figure 28. *Employees in the UK medical biotechnology sector by segment*



Mapping the total turnover shows the same ordering for the top sub-sectors as that seen for total company numbers but different to that of employment. **Figure 29** shows that companies based in the East of England, South East and Scotland have the highest turnovers.

Figure 29. Turnover in the UK medical biotechnology sector by segment

3.6. Medical Biotechnology Pipeline

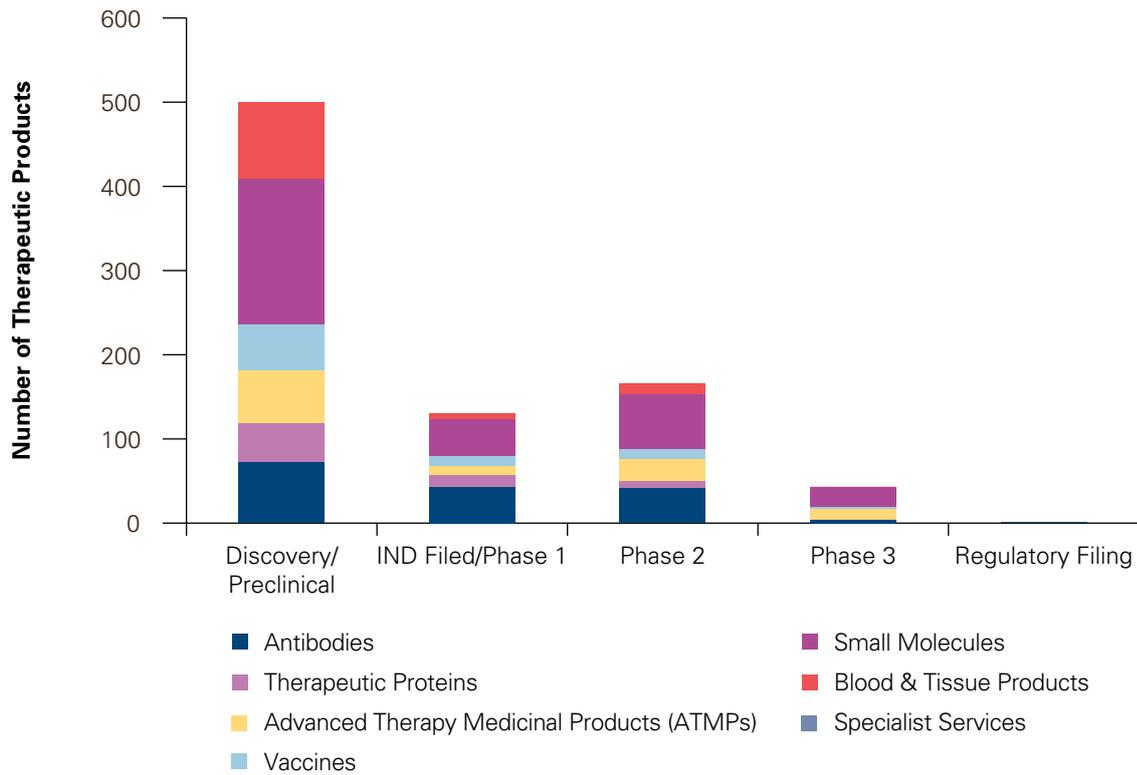
The health of the medical biotechnology sector is often measured by the pipeline of products in development, particularly those that are in clinical trials. The 2011 global biotechnology report by Ernst and Young²⁰ reported that the total number of drugs in clinical development in Europe has grown steadily over the past 5 years, a pattern that is continuing. The UK has continuously been in the lead, accounting for approximately 20% of the total products in clinical development in Europe. This is consistent with the figure reported in 2010.

The BioPharm Insight²¹ database, cross referenced with companies in the database, produced a snap-shot of the pipeline which is shown in **Figure 30**. The total number of products in development is 841, the majority of which continue to be small molecule drugs. The total number of antibody, protein, vaccines and advanced therapies products (gene therapy, cell therapies etc.) in development is 423.

20 Ernst and Young, Beyond Borders, Global biotechnology report 2011

21 BioPharm Insight, 2011

Figure 30. UK medical biotechnology pipeline



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

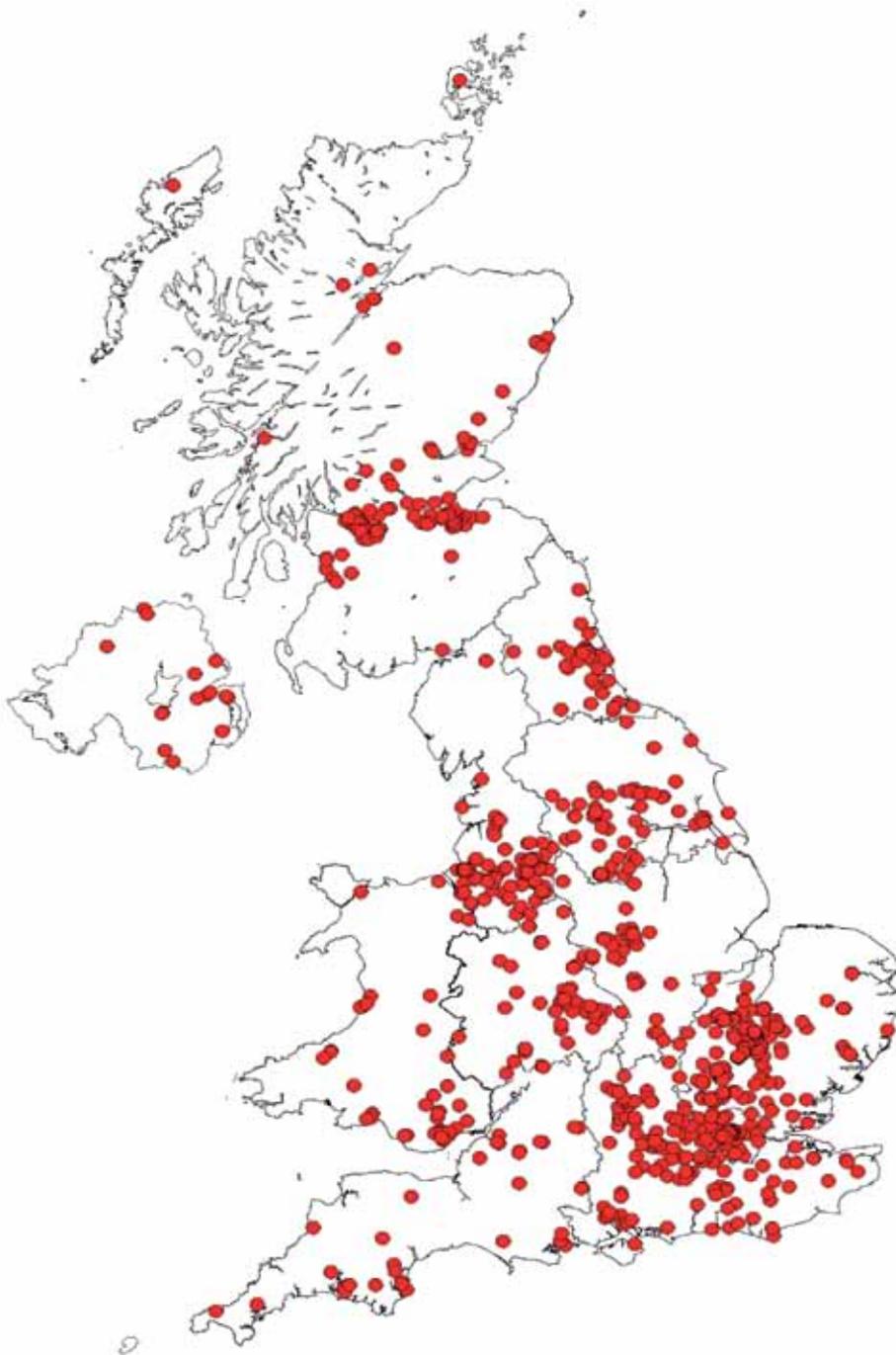
3.7. Sector Investment

The investment community has historically seen biotechnology as having high potential to generate significant return on investment and this has continued to be the case in recent years. In 2010 a report by Ernst and Young stated that the total investment into all European biotechnology sectors, of which medical is the largest, from all the financing sources reached over €2.8bn.²² The report found that the UK had the largest number of individual financings in Europe and was second only to Switzerland in the total amount of venture capital raised; this is consistent with data from 2009.

²² Ernst and Young, Beyond Borders, Global biotechnology report 2011

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 945 companies, of which 325 or 34% are directly involved in therapeutic development and manufacture.
- This is a 3% decrease in number of companies from 2010.
- These companies have a combined turnover of £3.4 billion.
- Total number of employees close to 23,000.
- 98% of companies have less than 250 employees.
- 5.3% of therapeutic companies are focused on oncology or infection.

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 industrial biotechnology (IB) sector contains 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. Therefore, activity across the UK where companies are utilising bio-based technology to make products or services which does not constitute a major proportion of their total turnover (ie Shell) is not captured in this analysis.

This definition is based on the technology or process involved in the production of the final product that makes up the majority of a company's turnover. Thus the database focuses on those companies in the value chain that develop the key technologies that underpin the UK industrial bio-economy. These technologies 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 simplistically by four main areas:

Agro-industry > Technology > Bioprocessing > Customers

In previous years the database contained information on the central part of the value chain; the IB technology developers and users. After consultation with the database sponsors and industry representatives, the scope of the database has been expanded this year to include more of the value chain associated with the sector.

An "agro-industry" segment has been added to the database to capture the biotechnology being applied to enhance biomass as an IB feedstock. In addition, the database now includes "plant biotechnology for food" and "animal biotechnology for food". This wider definition including food production is one recently adopted by NESTA.²³ At the other end of the value chain it is anticipated that biotechnology derived alternatives to petrochemical derived chemicals will be used by industry to manufacture everyday products. To capture companies using these "biomonomers", a separate segment has been created, "biomonomer user".

23 Financing Industrial Biotechnology in the UK, October 2011

4.2. Sector Overview

In 2011, the UK industrial biotechnology sector consisted of 73 companies with a turnover of £379m employing 1,280 people. Industrial biotechnology is an emerging sector, and estimates of the UK industrial biotechnology market by 2025 range from £4 billion to £12 billion.²⁴ The integration of industrial biotechnology into mainstream industrial production has the potential to contribute to the UK economy's productivity, environmental and low carbon targets over the next 20 years.

Table 1 in page 52 details that of the 73 companies, 24 are in the biofuels sector and a further 21 are providing specialist services. These two segments of companies make up 62% of all companies operating in the sector.

Four segments (specialist services, fine and specialty chemicals, food & drink and biofuels) make up the majority of the sector by turnover (97%) and employees (91%).

There was a 16% rise in employment numbers to 1,280 in total in 2011, with the increase mainly occurring in the biofuels, food & drink and specialist services segments. The sector turnover trend was also up by 7% with the main contributors being biofuels, fine & specialty chemicals and specialist services.

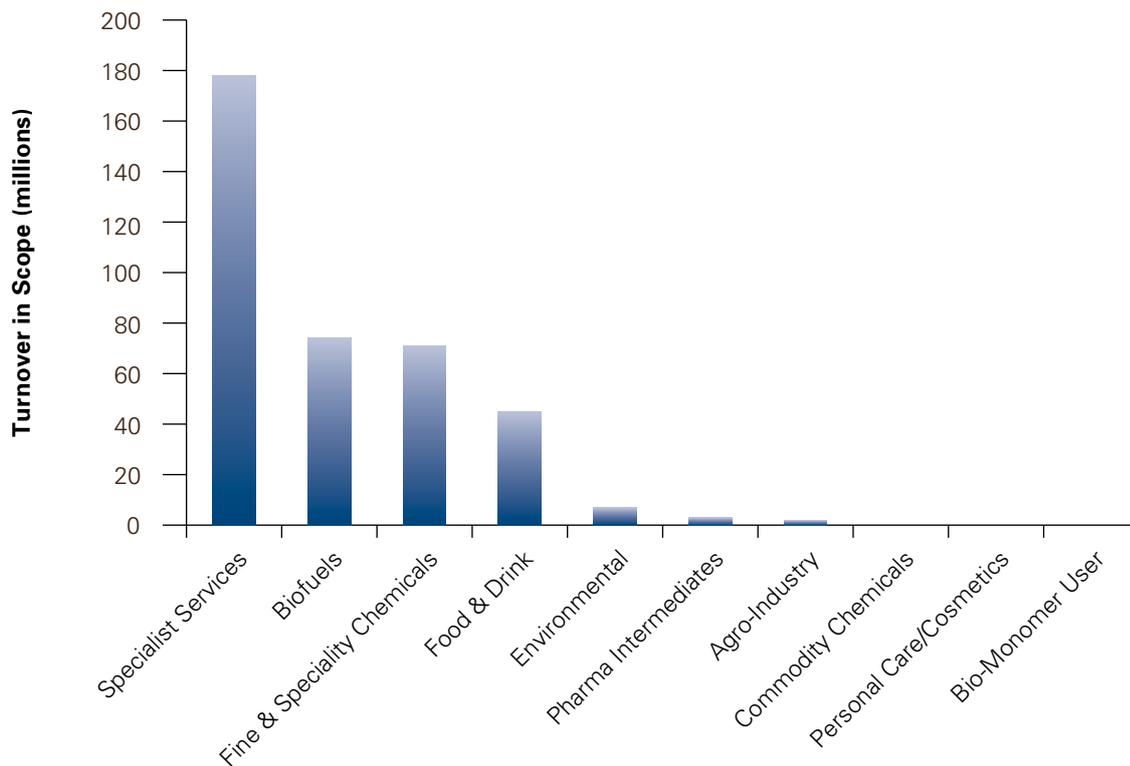
The sector is dominated by SMEs with 44% over 10 years old and 39% between 4 and 9 years old. A high proportion (55%) of all the industrial biotechnology companies identified has manufacturing activities and 69% are engaged in R&D.

Just five companies were identified in the new agro-industry segment, probably due to the narrow definition of biotechnology used. No companies were found to be primarily specialising in using biomonomers for polymer manufacture.

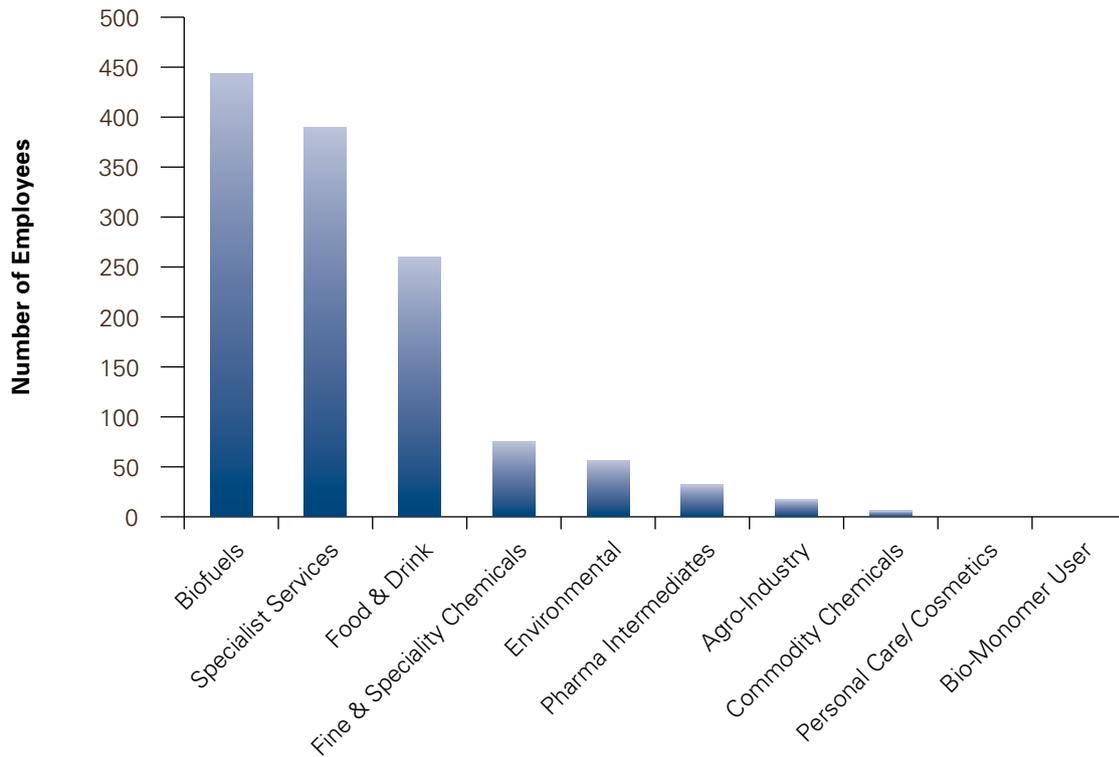
4.3. Turnover, Employment and Segmentation

The total sector turnover is £379m and **Figure 31** shows that the top 3 segments in terms of turnover are specialist services, biofuels, and fine & specialty chemicals. The largest segment, accounting for 47% of the total turnover, is specialist services. This includes companies offering contract R&D, manufacturing and other specialist services to both companies captured in the database but also to larger companies who are exploring or developing in-house bio-based process for existing products. Four segments – specialist services, fine and specialty chemicals, food & drink and biofuels – make up 97% of the sector turnover.

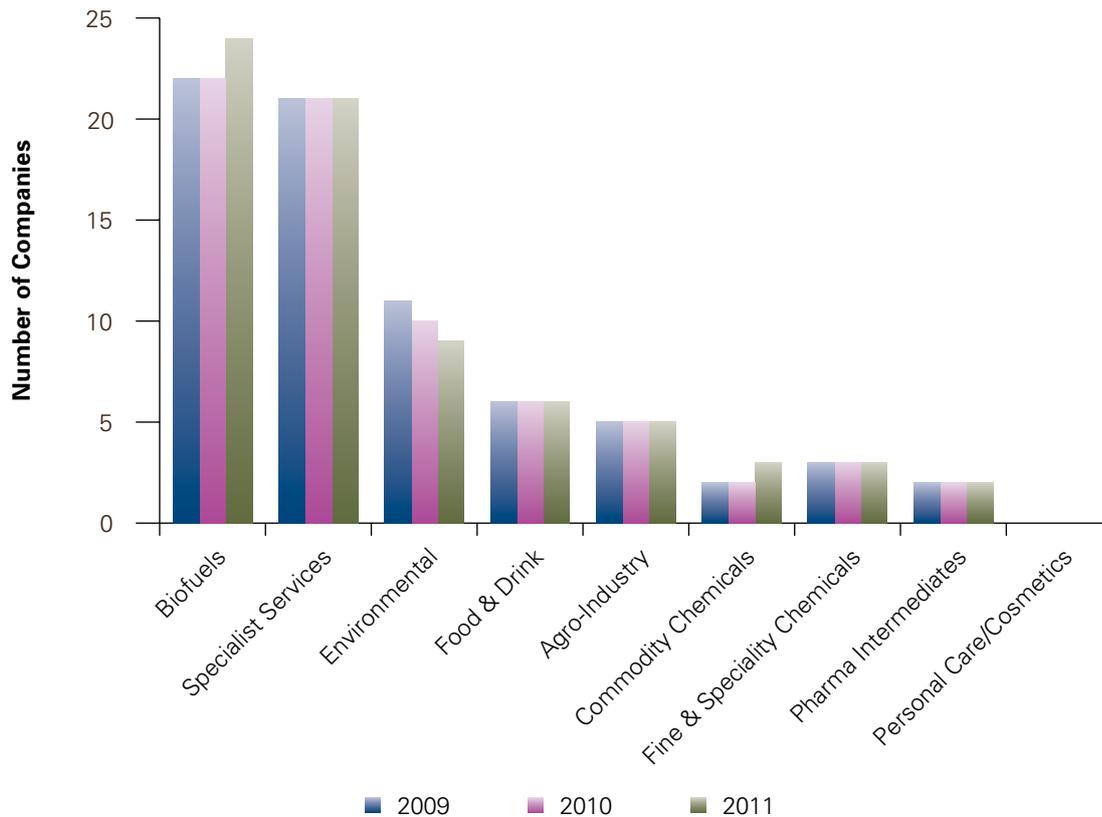
24 IB 2025 Maximising UK Opportunities from Industrial Biotechnology in a Low Carbon Economy: A report to government by the Industrial Biotechnology Innovation and Growth Team May 2009

Figure 31. UK industrial biotechnology sector turnover by segment

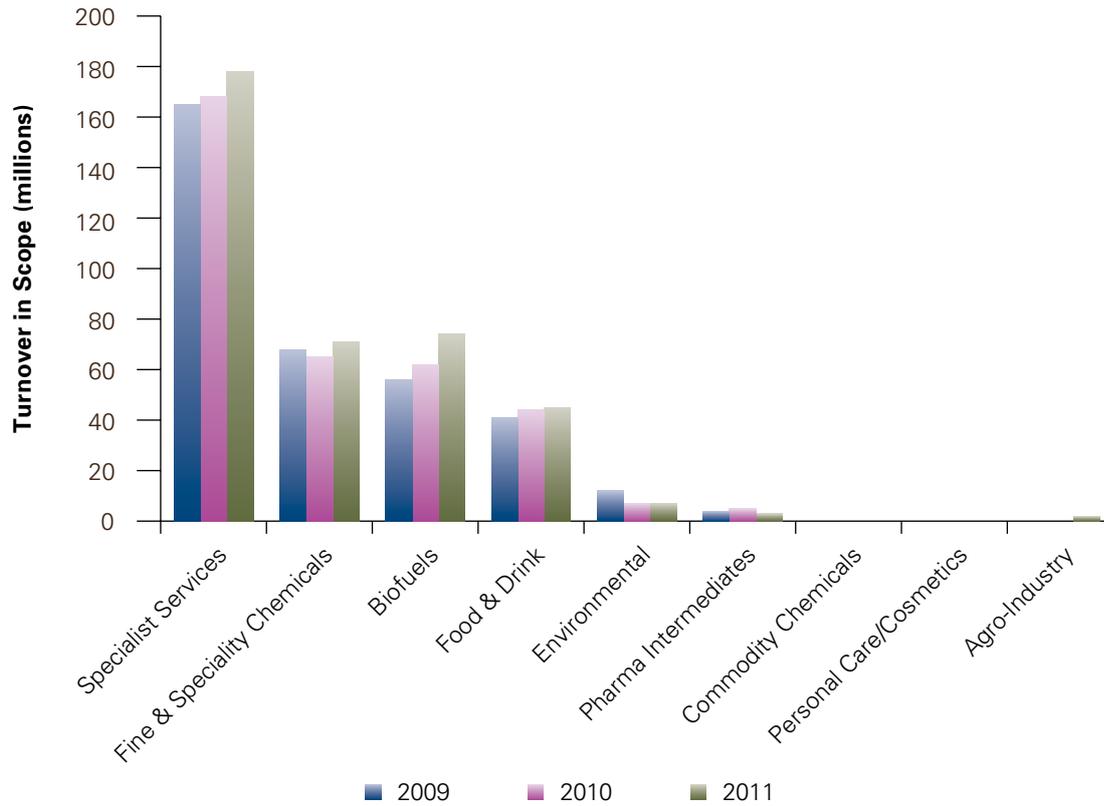
The total number of people employed in the sector in 2011 was 1,280, an 8% increase from 2010. **Figure 32** shows the distribution of employment by segment and highlights the importance of specialist services, biofuels and food & drink which together account for 85% of all sector employment.

Figure 32. UK industrial biotechnology sector employment by segment

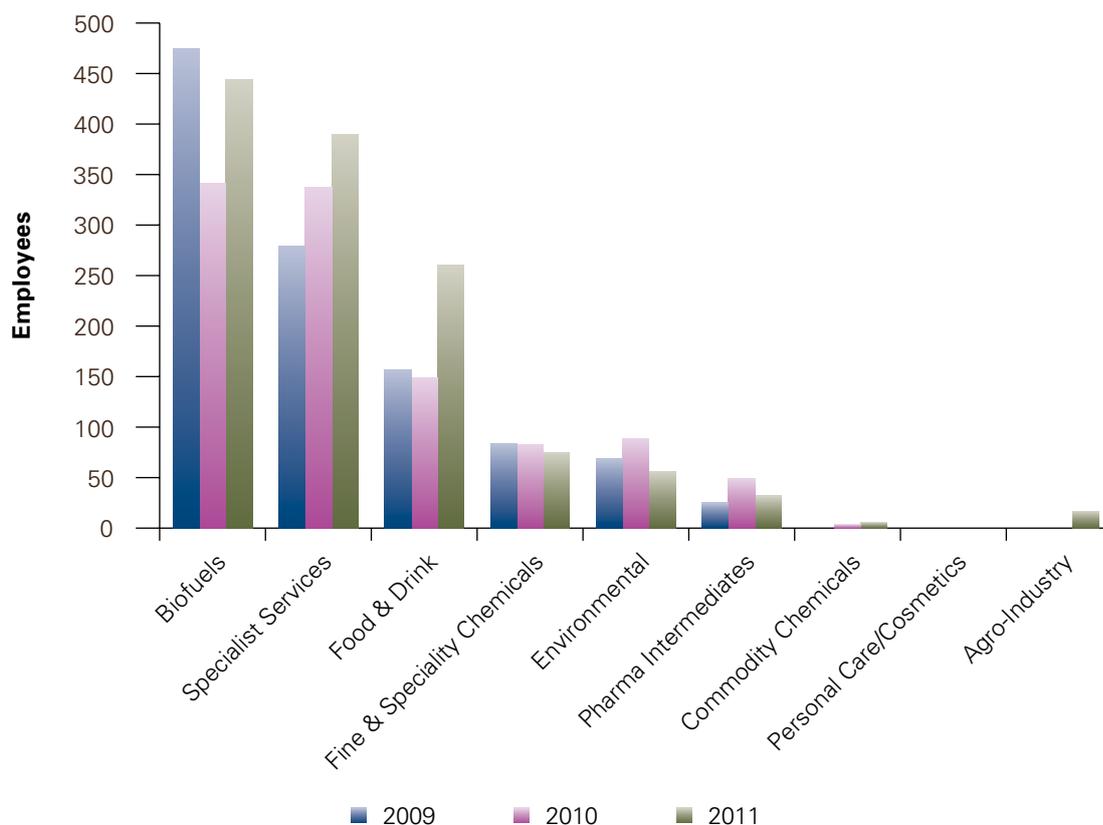
The distribution of companies by segment shows a similar concentration in specialist services, biofuels and food & drink. The biofuels segment has the highest number of employees and the highest number of companies but a lower relative turnover. This can be explained by the mixture of a few large industrial scale biofuel operations and small biofuels companies without significant turnovers.

Figure 33. Companies by segment in the UK industrial biotechnology sector

The total number of companies in the UK IB sector has not changed significantly over the three years: 72 (2009), 71 (2010) & 73 (2011). The biofuels and commodity chemicals sectors have increased slightly, while the environmental segment has lost some companies. The decrease in companies can be due to either companies closing or to merger/acquisition activity.

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

The above graph shows the total sector turnover in each year based on data from those companies with turnover figures available for the last three years. This illustrates that the IB sector turnover was flat between 2009 and 2010 but increased by 7% between 2010 and 2011.

Figure 35. *Employment by segment in the UK industrial biotechnology sector*

The above graph displays the total sector employment in each year based on data from those companies with employment figures available for the last three years. This shows that the industrial biotechnology sector employment declined by 3% between 2009 and 2010 but increased by 16% between 2010 and 2011.

4.4. Company Size and Activity

Most companies in the sector have fewer than 250 employees and are classified as SMEs. 83% of the companies are 4 years or older. This may indicate that some industrial technologies have been applied for a number of years and are relatively mature; for example fermentation and biotransformation have been used for many years in niche applications for the production of antibiotics and fine chemicals.

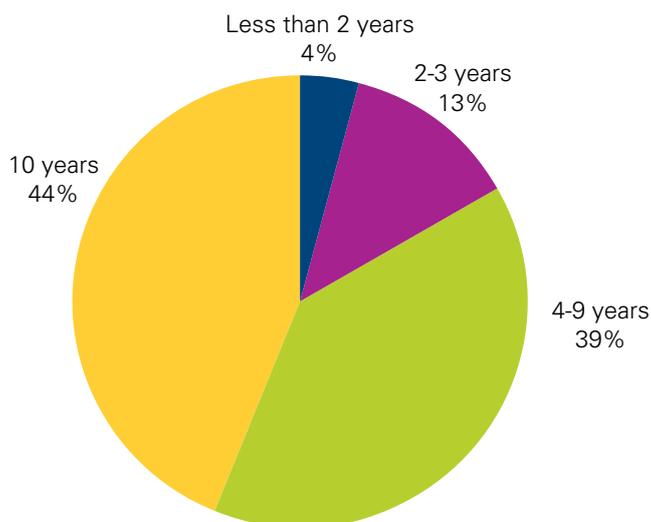
Figure 36. Profile of the UK industrial biotechnology companies by age

Table 1 displays more detail of the 73 companies within each segment by the specific technology or technologies they are using and also by the functions they carry out within the company. For example, in the biofuels segment, the technology that is most frequently used is enzyme development followed by fermentation. In this example a number of companies are offering their customers a service to develop a specific enzyme to meet their processing or product needs, such as an enzyme to carry out a specific chemical conversion or an enzyme that operates in low temperature detergents. The table also shows that many specialist service suppliers are undertaking R&D, either to develop their own products or as a contract service. The most commonly employed technology throughout the industrial biotechnology sector overall is fermentation, probably because it is the most mature technology.

Most of the companies in this sector are undertaking R&D activities and many have manufacturing operations. This suggests there is a healthy infrastructure of companies developing in the UK able to provide businesses with the core IB technologies required to fully realise the potential of the sector.

The number of companies producing chemicals using biotechnology (commodity, fine & speciality and pharma intermediates) is still quite small, totaling just 8. There are 24 companies producing biofuels, an industry that has been incentivized by specific government interventions.

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

Primary Application	Technology									Business Activity					
	Number of Companies	Biomass	Plant	Whole Cell Development	Fermentation	DSP	Enzyme Development	Biotransformation	Non-Healthcare Analytics	R&D in house	R&D contract	Manufacturing in house	Manufacturing contract	Supply chain	Sales/Distribution
Biofuels	24	9	2	4	13	1		2		18	1	13		2	
Specialist Services	21	1		3	4	3	7	3	2	11	6	5	2	6	1
Environmental	9	1			5			2	1	5		6	1	6	
Food & Drink	6	1		1	1	1		1	1	1		5	1	3	1
Agro-Industry	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2		1		2	
Commodity Chemicals	3	2						1		3		3			
Fine & Speciality Chemicals	3				1			1		2	1	1	1		
Pharma Intermediates	2							1			1		1	1	
Personal Care/ Cosmetics	0														
Biomonomer user	0														
Totals	73	14	2	8	24	5	7	11	4	42	9	34	6	20	2

As any given company can use more than one technology and more than one business model, it is not possible to add up the technologies and business models horizontally to give a number of companies in the "Number of Companies" column. In some cases technology information was not available so the technologies are less than the number of companies (e.g. pharma intermediates).

In terms of the new segments added in the 2011 annual update (agro-industry and biomonomer users) only 5 companies were found, all in the agro-industry segment. These comprised of the following sub-segments:

Level 2 Segment	Companies
Plant Biotech for IB	1
Plant Biotech for food	0
Animal Biotech for food	4

The small number of companies and low economic indicators for the agro-industry segment may be partially due to the narrow definition of biotechnology used for data collection. A wider definition may include a number of the multinational plant science companies with a presence in the UK which do not employ genetic modification techniques in their British facilities.

No companies were found in the biomonomer user segment. This may be a false picture and could change with a more detailed examination of the chemical industry in the future.

4.5. UK Picture

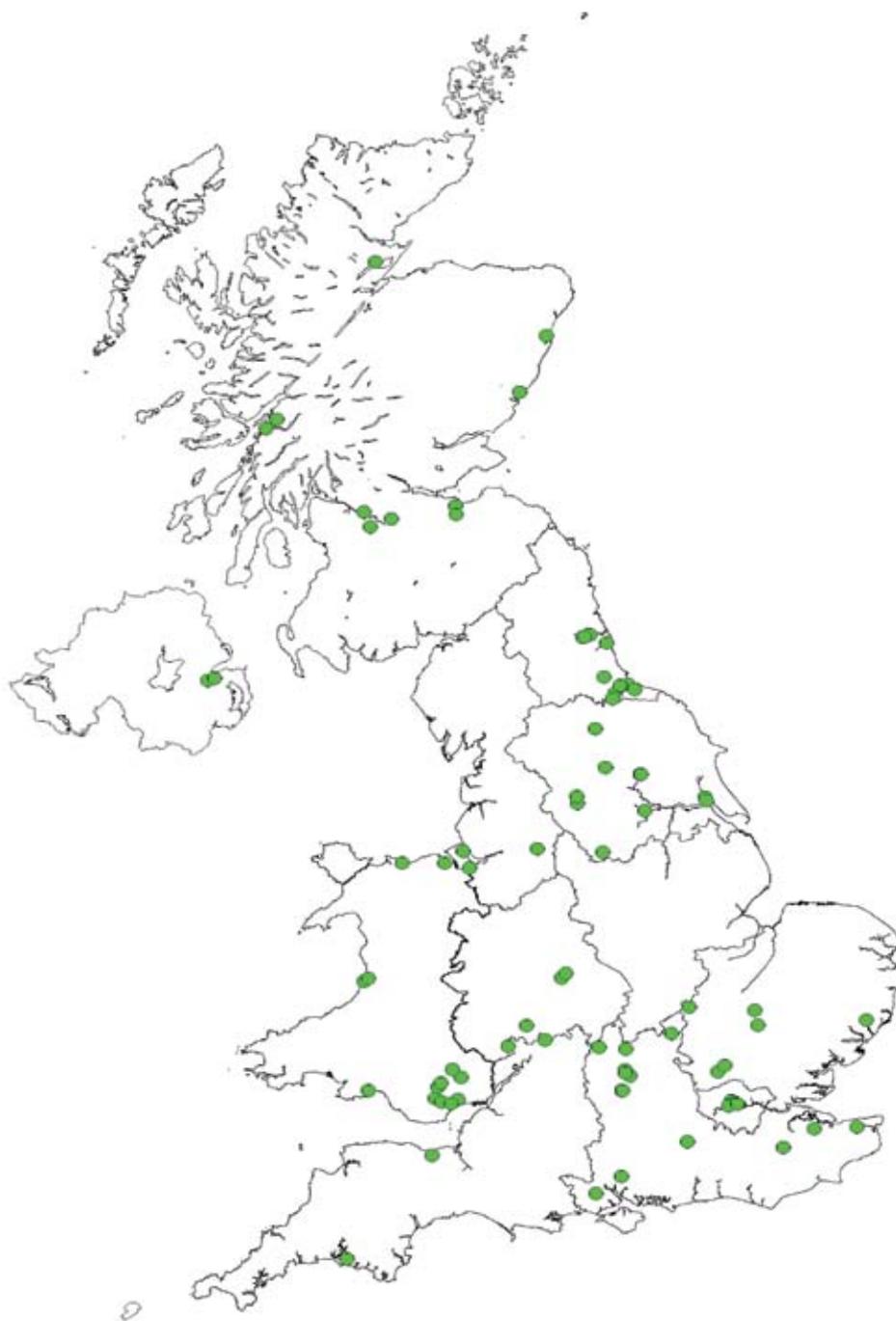
The industrial biotechnology sector is relatively small, therefore the turnover and employment of an individual company makes a significant impact on the UK distribution. The number of IB companies across the UK is relatively even with peaks in Wales (13) the South East (13) and North East England (12). Turnover is dominated by companies in the North West and in Yorkshire & Humberside.

Figure 37. Geographical distribution of the UK 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 73 companies with a combined in-scope turnover of £379m.
- The sector employs 1,280 people.
- 83% of companies have been established for 4 years or over.
- The specialist services sector has 47% of the total turnover.
- The top 4 segments: specialist services, fine & specialty chemicals, biofuels and food & drink make up 97% of the sector turnover.

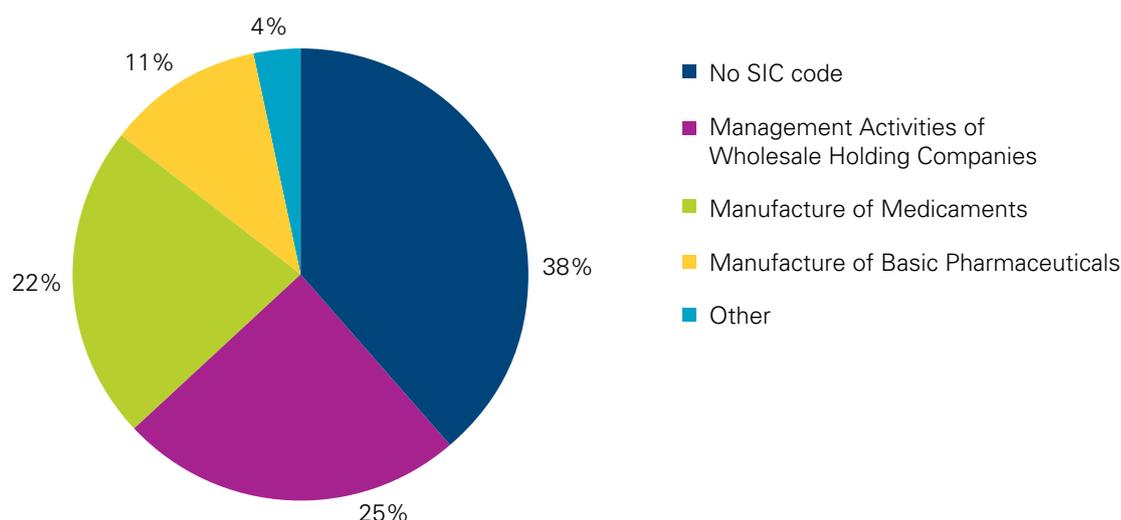
Pharmaceutical Sector

5.1. Sector Definition

This sector includes “major” pharmaceutical companies, large contract research organisations, companies whose only business activity is the distribution of pharmaceutical products and companies whose only activity is the manufacture of small molecules on a contract basis. The key criterion used to define size is the turnover in scope of the company (for a definition of scope see Appendix II).

The approach to the definition and collection of pharmaceutical data in the database is different from that in the ONS Annual Business Survey which uses a different methodology and classifies companies using the Standard Industrial Classification (SIC) system. An example of the difference in the datasets is shown in **Figure 38** which analyses the percentage of company turnover in the database by SIC code. Only 33% of the turnover of the pharmaceutical sector in the database is accounted for by SIC codes which cover the manufacture of pharmaceuticals. Of all the companies which have been segmented in the sector, 38% had no SIC code recorded from the data extracted from Dun and Bradstreet. Further analysis of the companies show that many of these are classified primarily as wholesalers of pharmaceuticals or research and development agencies in the SIC system rather than pharmaceutical manufacturers. These companies can still have a large amount of pharmaceutical manufacturing activity but derive the largest part of their turnover from activities other than manufacturing.

Figure 38. Analysis of pharmaceutical sector turnover in database by SIC classification



5.2. Sector Overview

In 2011, the pharmaceutical sector had a total of 388 sites occupied by 365 companies, employing 77,795 people with a combined turnover of £31.8bn. Of the Top 50 global pharmaceutical companies²⁵, 37 companies have sites in the UK, employing 52,000 staff at 60 sites and representing 83% of the total sector turnover.

The data shows that, in terms of employment, small molecules are the dominant product type. This is reflected in the share of global sales of traditional pharmaceuticals as opposed to biologics, with the former representing 67% of global pharmaceutical sales in 2010.²⁶ Specialist services are the second most important product type for employment followed by vaccines.

19% or 74 individual companies have more than 250 employees. These companies employ 89% of the UK pharmaceutical sector workforce. 67% of these companies have been operating for 10 years or more, reflecting the relative maturity of the pharmaceutical industry.

All regions across the UK benefit from activity in the pharmaceutical sector. The South East has a high concentration of employment with 35% of all UK employees. The four locations of South East and East of England, North West and London contain three-quarters of all employees in the sector. Manufacturing activity is concentrated in the South East and East of England, the North West, the North East and Scotland.

5.3. Turnover, Employment and Segmentation

The total turnover for the 388 pharmaceutical company sites in the UK is £31.8bn. This figure includes companies whose prime activity is the wholesale or distribution of pharmaceuticals, clinical research organisations (CROs) and companies whose activity is primarily in generics. As explained in 5.1, the turnover and employment figures from the database are significantly higher than those in the pharmaceutical manufacturing category of the ONS Annual Business Survey.

The complexity of the finances of the large pharmaceutical companies and their multiple sites and offices has made it difficult to assign turnover for certain companies accurately to either individual sites or therapeutic categories. Where this has been possible, for example because the information is available in the public domain, turnover has been assigned. Where definitive information is not available and turnover is attributed in companies' records to a head-office, the turnover has been assigned to that location. This approach has primarily affected the records for large multi-site pharmaceutical companies.

²⁵ Evaluatepharma, World Preview 2016 "Beyond the Patent Cliff", June 2011

²⁶ Evaluatepharma, World Preview 2016 "Beyond the Patent Cliff", June 2011

Pharmaceutical companies in the top 10 global ranking²⁷ (Pfizer, Sanofi, Novartis, GSK, Roche, Merck, AstraZeneca, Abbott, Teva, Johnson & Johnson) account for £19.6bn or 62% of the total UK turnover of the sector. The combined turnover of all sites with a turnover greater or equal to £100m each is £19.3bn. These sites are mainly owned by companies in the Top 10. Of the Top 50 pharmaceutical companies as defined in a recent report published by IMAP (*Financing Industrial Biotechnology in the UK*, October 2011), 37 have sites that are located in the UK and they employ here 52,000 of their global 1.2m workforce. These 37 companies own more than one UK site each, 60 sites in total, with a total turnover of £27bn or 83% of the UK pharmaceutical turnover.

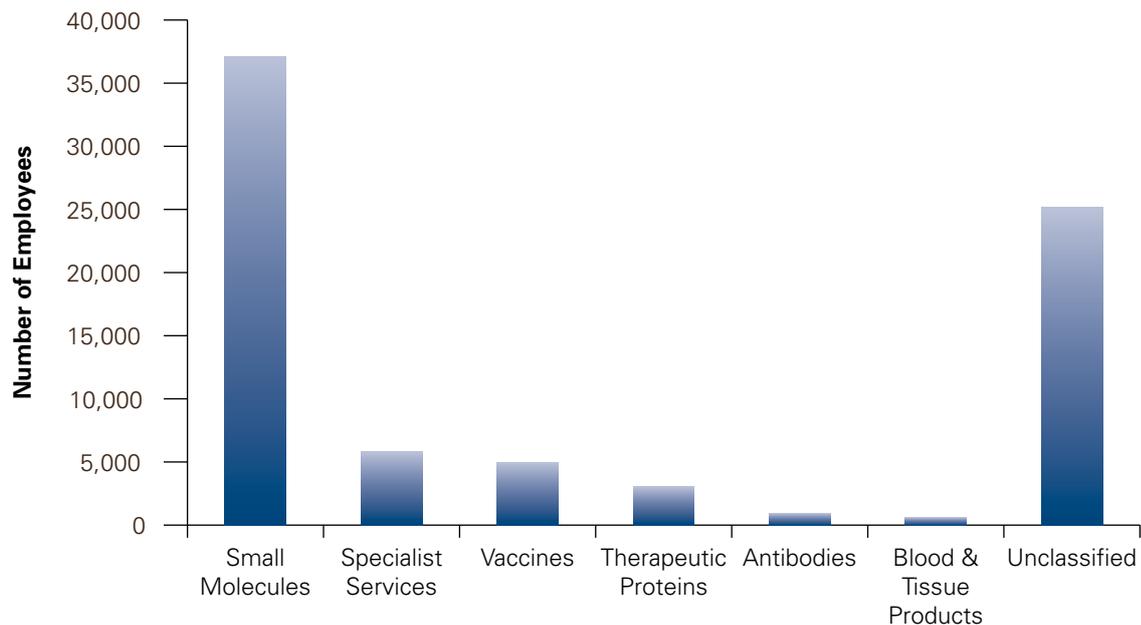
The employment data has been easier to assign to a site, and by looking at the primary activity of a site it has been possible to assign a therapeutic activity. In total the 388 UK pharmaceutical sites employ 77,795 people in roles spanning research & development, manufacturing, sales and distribution, finance, marketing, regulatory functions, and quality control/assurance. These roles are some of the highest value in terms of GVA per employee with the industry averaging £192,000 GVA per employee.²⁸

Figure 39 shows employment within the pharmaceutical sector by sub-segment across all sites. Assigning employment to one category has not been possible when a site is large and contains multiple activities; therefore, employees have been allocated to the unclassified sub-segment. Examination of the sites in the unclassified sub-segment suggests that the majority of employment at these sites is in areas such as sales, marketing and headquarter functions. An example is Pfizer's Walton Oaks site which has 1,432 employees who support a number of business functions across Pfizer.²⁹ Within the limitations of data allocation, the information in **Figure 39** does indicate the continuing importance of small molecules (primarily chemical compounds produced by organic chemistry or in some cases fermentation or bio catalytic processes) to the pharmaceutical industry, followed by companies that provide specialist services to the industry. The latter group of companies undertake activities such as specialist regulatory advice, business consultancy, and engineering expertise.

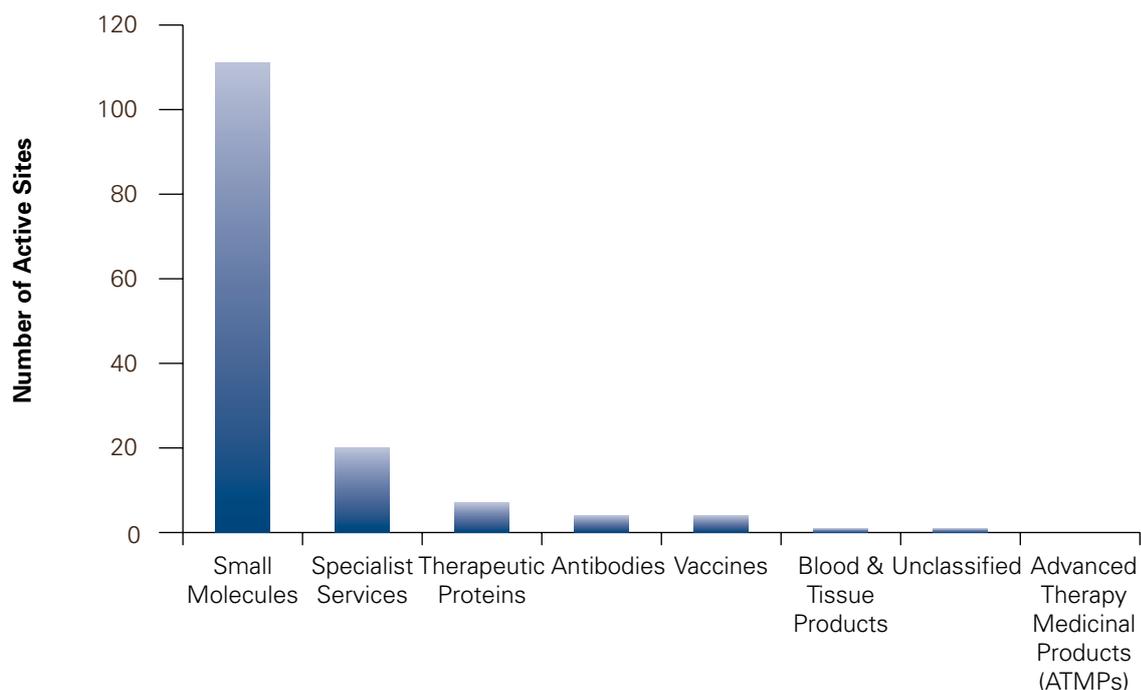
27 EvaluatePharma, World Preview 2016 "Beyond the Patent Cliff", June 2011

28 The Association of the British Pharmaceutical Industry

29 http://www.pfizer.co.uk/sites/uk/about_us/what_we_do_at_pfizer/Pages/Locations.aspx

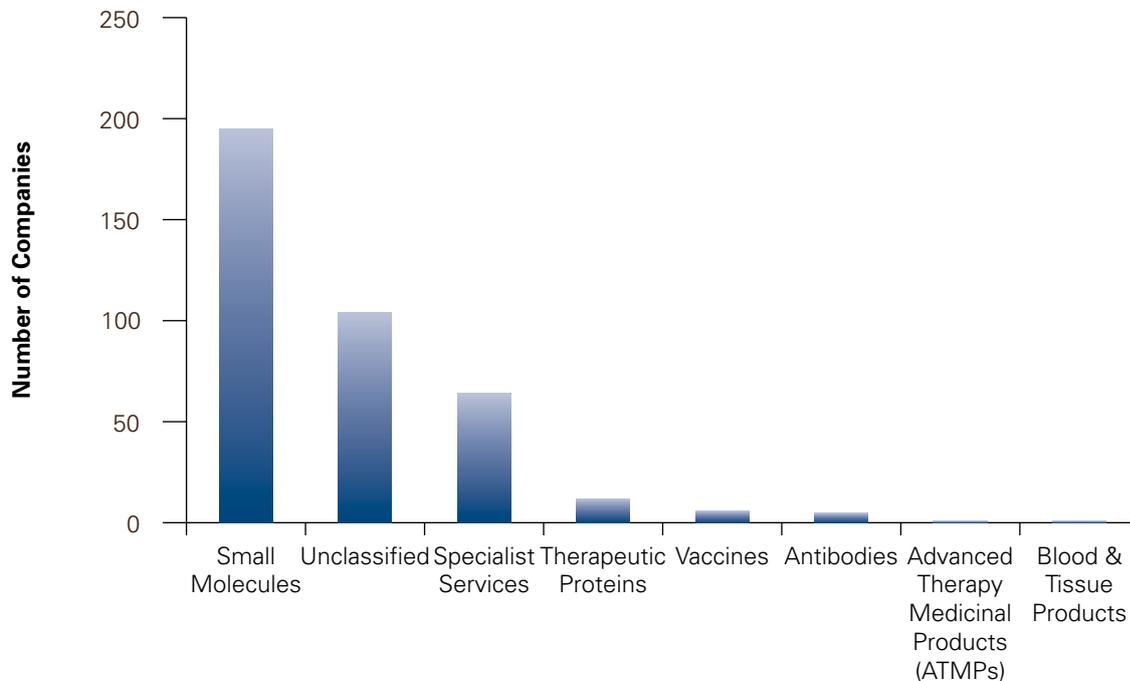
Figure 39. *Employees in the UK pharmaceutical sector by segment*

Examination of company websites, publications and other sources has made it easier to identify the most important sub-segments in manufacturing activity at a site. These are small molecules, vaccines and therapeutic proteins. Sites where manufacturing is carried out primarily involving these three categories employ 90% of the workforce at active manufacturing sites. Activities at manufacturing sites include the production of intermediates, final actives, formulated and packaged products.

Figure 40. *Number of active manufacturing site by segment*

As expected, the segmentation of the number of companies by category of final product mirrors that for employment, with companies where activity is dominated by small molecules (research, development, manufacturing etc.) representing 50% of all companies, as shown in **Figure 41**.

Figure 41. Number of companies in the UK pharmaceutical sector by segment

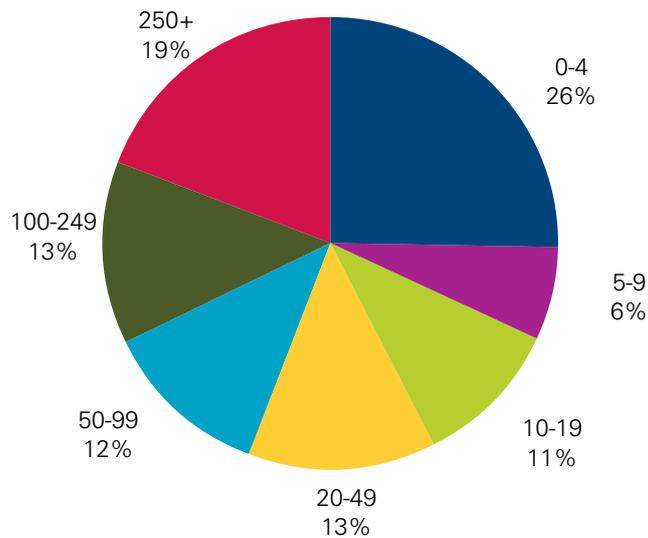


5.4. Company Size and Activity

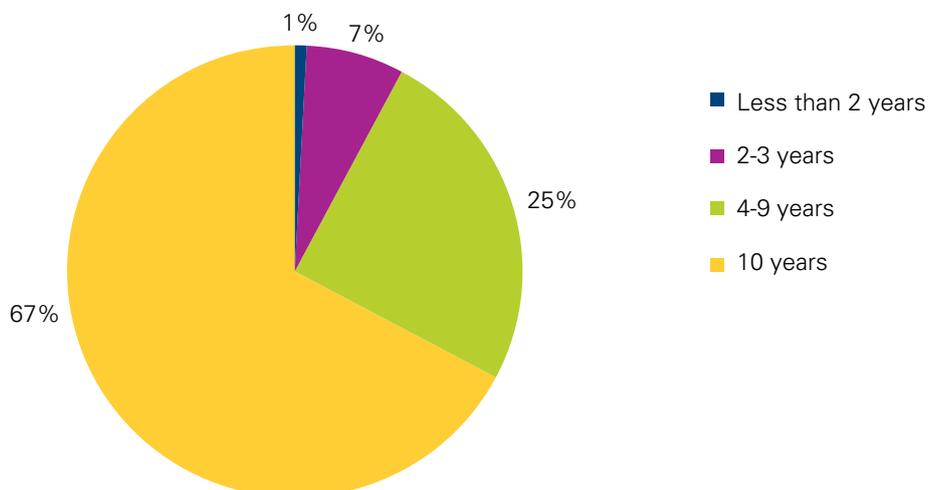
The pharmaceutical industry globally is dominated in terms of turnover and employment by 10 companies and this concentration has increased in the last 5 years through consolidation after a round of mergers and acquisitions.

In the UK, the sector has a high proportion of companies with more than 250 employees and these companies employ 89% of the total workforce. In comparison to the medical biotechnology and technology sectors where just 1-2% of companies have more than 250 employees, 19% of the pharmaceutical companies are large, as shown in **Figure 42**.

The same concentration of the pharmaceutical sector in the top global companies can be seen in the UK, where companies that rank in the top 10 globally employ 55% of the UK pharmaceutical workforce. The global nature of the industry is illustrated by the ownership of the pharmaceutical companies in the UK; for every three companies that are UK owned four others are foreign owned. This differs from the medical biotechnology and industrial biotechnology sectors where for every two UK-owned companies only one is foreign owned.

Figure 42. *Distribution of pharmaceutical companies by employee numbers*

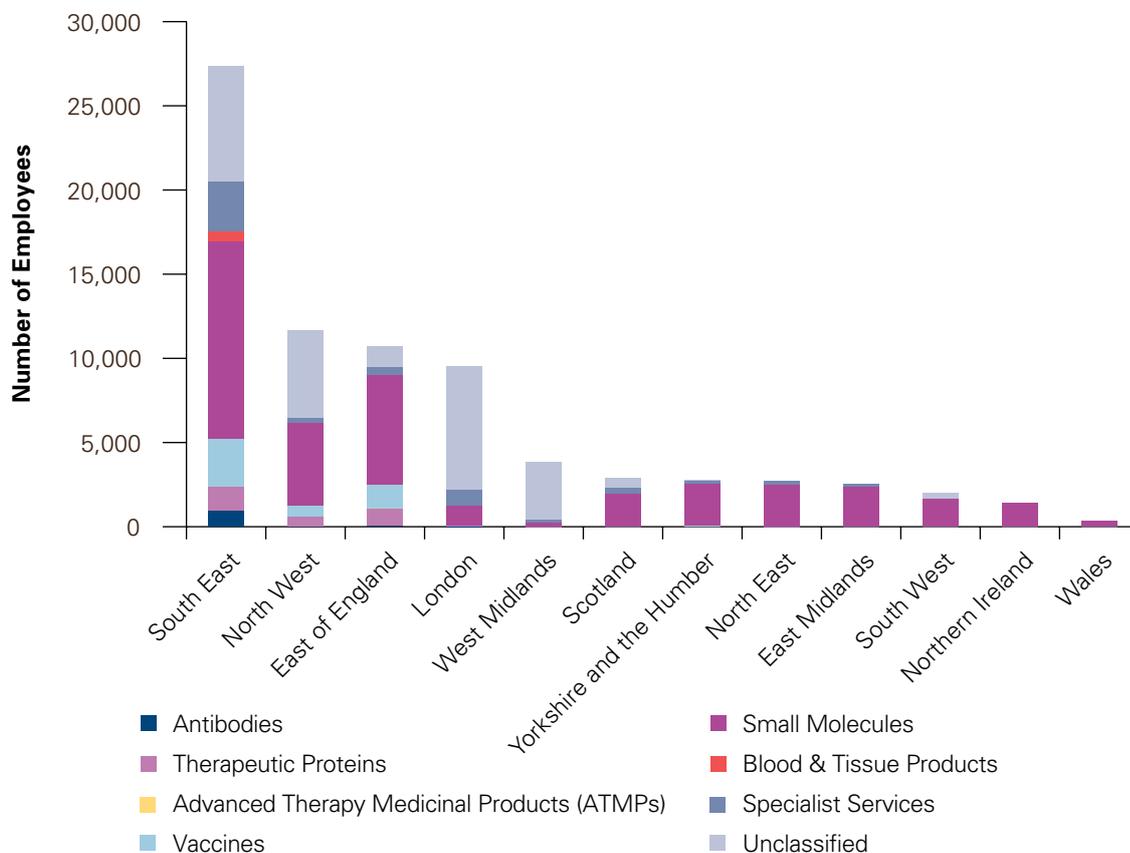
The company size prevalent in the industry may be a reflection of the age of the industry which has grown rapidly since the early 1900s to become one of the world's major industries. **Figure 43** shows that 67% of companies in the UK pharmaceutical sector are over 10 years old and only 1% are less than 2 years old. From October 2010 to September 2011 3 companies were formed, 2 of them in the small molecules segment. Over the same period 3 companies were recorded as having ceased trading.

Figure 43. *Profile of the UK pharmaceutical sector by company age*

5.5. UK Profile

The turnover of the UK Pharmaceutical sector has been analysed by site and the data on how this is distributed across the country reviewed. Multi-national pharmaceutical companies with many UK registered offices and sites often report sales through one office. It would be difficult and potentially misleading to distribute turnover for these companies across their multiple sites to give a geographical picture. However, it has been possible to collate information on employees per site and **Figure 44** illustrates the distribution by location for all UK pharmaceutical sites. This shows that 35% of all UK pharmaceutical employees are based at sites in the South East (which excludes London). The four locations of the South East, North West, East of England and London contain just over three quarters of all the sector's employees.

Figure 44. *Distribution of employees at UK pharmaceutical sites by location*



It has been possible to assign 68% of employees at sites to a sub-segment or major type of product activity. This analysis shows that employment associated with small molecules is broadly distributed across the UK with concentrations in the South East and East of England and the North West. These three geographical regions also have practically all of the employment associated with therapeutic proteins, antibodies, and vaccines. The unclassified sub-segment contains either sites which did not fit into any of the product types, or where it was not possible to allocate that site employment to one sub-segment.

The South East, North West and East of England remain important in terms of employment distribution across sites that have manufacturing activity as shown in **Figure 45**. London drops down the ranking which reflects the low number of sites with any manufacturing located in London. Scotland and the North East move up the ranking suggesting that manufacturing is prevalent in their pharmaceutical sites. This analysis excludes sites that have no manufacturing so sites wholly devoted to research and development will be excluded, like those devoted to sales only or sites that have both of these activities.

Figure 45. Distribution of employees at UK pharmaceutical manufacturing sites by location

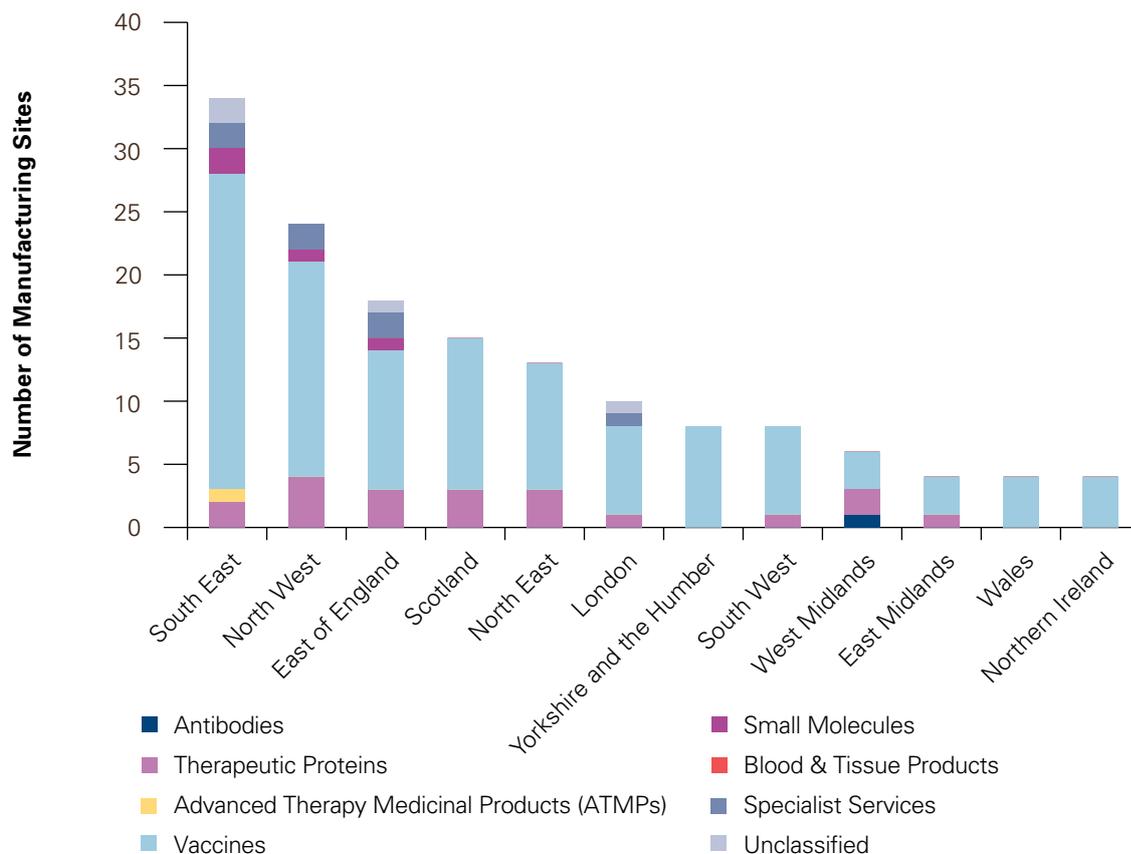
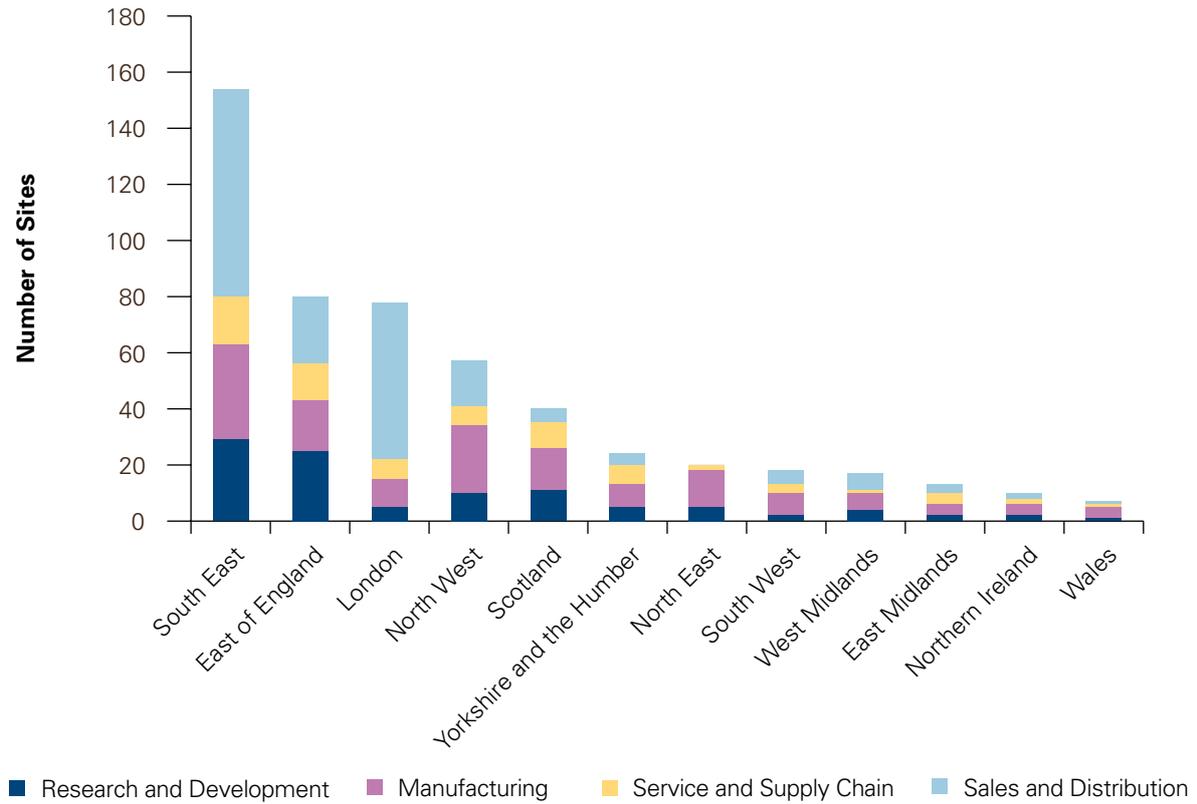


Figure 46 shows the type of business activity occurring at an individual site (note that a site may be counted more than once if there are multiple activities). This analysis indicates that certain types of activity associated with the pharmaceutical sector are prevalent in certain locations. For example, there are a high proportion of sites in London with sales and distribution activities. This is unsurprising given that a number of UK and overseas firms locate their head offices or major administration offices in or around London, which would include the South East.

The South East and East of England, North West, Scotland and the North East have a prevalence of sites where manufacturing is carried out. The South East and East of England is a focus for R&D activity along with significant activity in Scotland and the North West.

Figure 46. Business activity distribution of UK pharmaceutical sites by location



5.6. Geographical distribution of pharmaceutical companies

Map 4 Geographical distribution of pharmaceutical companies



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UK Pharmaceutical Sector – profile

- A total of 365 companies with a combined turnover of £31.8bn.
- Total number of employees 77,795 in 388 sites.
- Of the Top 50 global companies 37 have sites in the UK.
- 19% of companies have more than 250 employees and employ 89% of the total workforce.
- Small molecules is the major product/service type followed by specialist suppliers to the sector and vaccines.
- 52% of companies have turnovers of £5m or more per annum.
- 67% of all companies are over 10 years old.
- Geographical R&D and manufacturing employment is centred in the South East and East of England, the North West, Scotland and the North East.

Acknowledgements

The Department for Business, Innovation and Skills (BIS), the Department of Health (DH) and UK Trade and Investment (UKTI) 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	Centre of Excellence for Life Sciences (CELS)
North West	Medilink North West
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
Yorkshire & Humber	Medilink Yorkshire & Humber
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 (BIS), the Department of Health (DH) and UK Trade and Investment (UKTI) would like to acknowledge the assistance given by the owners of these data sources.

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

Business Information has been 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 led by Cels Ltd. 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 the activity within sector or sectors is included.

Segmentation

Prior to collecting data on the companies in the four 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 pharmaceutical. Subsequent levels (Levels 1 & 2) provide further analysis for each sector. See the Segmentation Reference Chart that is included in Appendix III.

To date, the delivery team have 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 on 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 & Development (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

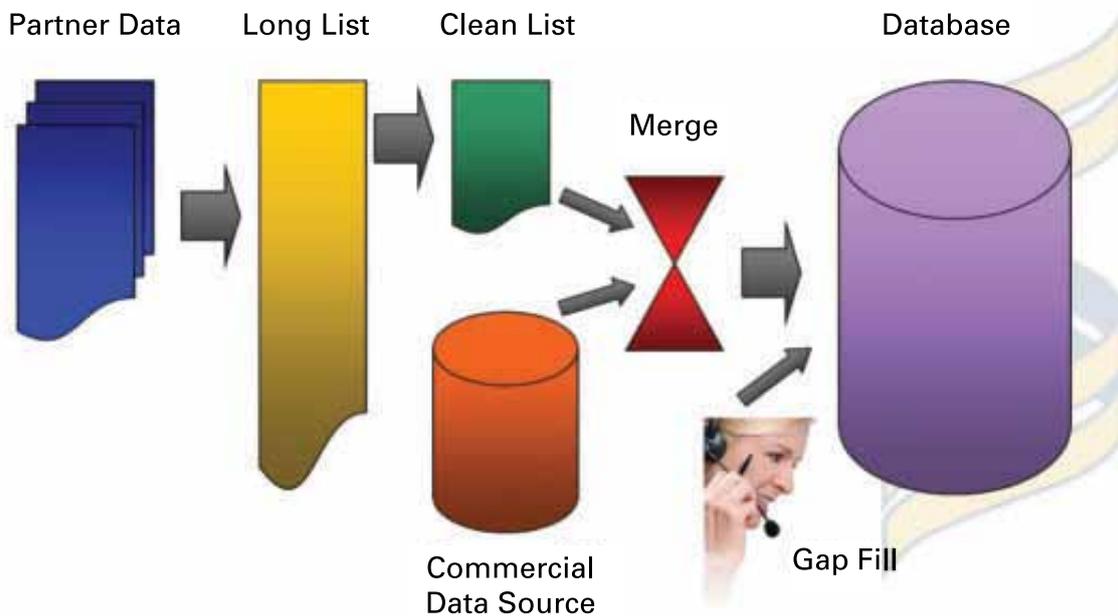
Industrial Biotechnology	
Code	Description
IBA	Biofuels
IBB	Environmental
IBC	Food & Drink
IBD	Commodity Chemicals
IBE	Fine & Speciality Chemicals
IBF	Pharmaceutical Intermediaries
IBG	Personal Care/Cosmetics
IBH	Specialist Services
IBZ	Unclassified

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 4,500 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

In subsequent years, we will 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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