

UK life science company formation: Patterns of growth in UK regions and the role of biotechnology incubators

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Abstract: This study examines the regional distribution of new life science company formation and highlights ‘hotspots’ of where new activity is relatively intense. The analysis indicates that there are generally two types of region, the first type contains life science clusters that were established during the early 2000s and the second type displayed little or no significant life science activity during this period. This study analyses survey data (n= 580) and evidences new patterns of life science company activity within peripheral UK regions. The study shows that new life science activity is occurring away from the traditional ‘Golden Triangle’ of London, Cambridge and Oxford. New life science company activity can be found in peripheral regions such as the East Midlands, Yorkshire and Humberside, the North West and in Scotland.

The evidence contained in this study suggests that new UK life science company activity is supported by the presence of UK biotechnology incubators. During the early 2000s there were only a handful of biotechnology incubators in the UK, by 2012 there over twenty-five. This study provides evidence to suggest that UK biotechnology incubators play an important role in supporting new life science companies. Since the early 2000s, biotechnology incubators have appeared in the same regions that display significant levels of new life science company activity. Furthermore, significant proportions of new life science companies are located in biotechnology incubators within regions that displayed little or no significant life science activity during the early 2000s. This study demonstrates that biotechnology incubators have an important role to play in supporting regional innovation systems, especially within peripheral regions in the UK.

1. Introduction

Since the 1990s public policy makers and private investors have been creating biotechnology incubators with the aim of obtaining a foothold in what many presume is one of the hottest future industries. Start-ups and early stage life science companies require access to specialist premises, services and technical support not traditionally

available on science parks and business parks. The life science industry comprises the medical technology sector and the biotechnology sector (BIS 2010). This study investigates recent patterns of new company growth within the UK life science industry and examines the regional distribution of new life science company formation whilst

highlighting ‘hotspots’ of where new activity is relatively intense. This study investigates the twenty-five new UK biotechnology incubators that have appeared since 2001 and analyses the growth of new life science companies alongside the emergence of new biotechnology incubators at a regional and city level. The analysis provides observations that suggest biotechnology incubators in the UK play a significant role in supporting new life science company formation in traditional regions i.e. London and the South East, and more peripheral regions such as the East Midlands, Yorkshire & Humberside and the North West.

2. New UK life science company activity & UK Biotechnology incubators during the early 2000s

The UK has historically been strong within the worldwide pharmaceutical industry arena and many large pharmaceutical companies have based their research and development sites in the UK. A strong science base in the UK is evident when we look at the number of large pharmaceutical companies setting up operations in the UK. For example GSK in Stevenage and Ware, AstraZeneca at Alderley Park near Manchester and Loughborough, ROCHE in Hertfordshire, BASF in Nottingham, Merck, Sharp & Dohme Corporation (MSD) in Scotland to name a few. In 1998, six of the world’s top ten largest pharmaceutical companies had operations in the UK (Cooke 2001), although according to Swan et al (1998) despite the presence of these pharmaceutical heavyweights the UK was slow to develop a thriving biotechnology sector.

2.1 Emergence of the UK biotechnology sector

The emergence of the biotechnology sector as a new segment of the pharmaceutical industry, according to Pisano (2006) began with Genentech. This company was founded in 1976 and was the first commercial firm to fully exploit the potential of genetically engineered science. Subsequently biotechnology companies utilised their ability to embrace new technologies and successfully commercialise intellectual property and transfer knowledge from universities to the private sector. This enabled biotechnology firms, in some instances due to their smaller size and less bureaucratic environment to outperform large pharmaceutical research and development departments (Pisano 2006). The structure of a biotechnology firm is quite different to that of a vertically integrated pharmaceutical company that

retains research and development in-house and relies heavily on finding the next ‘block-buster’ drug.

2.2 Biotechnology company activity early 2000s

According to Shimasaki (2009) the science of biotechnology encompasses any application of engineering and technology applied to the life sciences and usually refers to the use of living organisms in the making of a product. In 1996, using a narrow definition of the biotechnology sector, there were 221 specialist biotechnology companies in operation in the UK. Using a more broad definition i.e. including consultancy and services there were 460 firms employing as many as 40,000 people according to Lawton-Smith et al (1999). By 1999 the number of specialist UK biotechnology firms had increased to 270, according to Cooke (2001), the biotechnology industry firms were mainly located in clusters found in Cambridge (50 firms), Oxford (50 firms) and Surrey (37 firms) together with Scotland (over 50 firms) and Wales (15 firms). This historical evidence suggests that in these traditional biotechnology regions during the late 1990s the UK possessed a strong pharmaceutical industry base and an emerging life science industry.

There was relatively very little in the way of life science activity in peripheral regions such as the Midlands, Yorkshire & Humberside and the North West. Cities within these regions did not possess clusters of biotechnology company activity in the analysis of UK biotechnology clusters undertaken by Swan in 1998 and Cooke in 2001 (Swann et al 1998 p-214). This earlier analysis of biotechnology clustering across the UK showed that Nottingham, Sheffield, Leeds and York possessed less than 3% of the total number of UK biotechnology companies, indicating that these areas did not display clusters of life science activity in the late 1990s and early 2000s. According to Sainsbury (1999) these cities did not yet possess the company base (both start-ups and more mature biotechnology companies) which characterise clusters.

2.3 Biotechnology incubators early 2000s

During the late 1990s and early 2000s there were only a handful of biotechnology incubators designed to facilitate new biotechnology companies in operation throughout the UK (Sainsbury 1999 & Cooke 2001). Hence their presence did not appear to play a significant role in the growth of the life science industry or biotechnology sector in the UK during this period.

In the late 1990s biotechnology incubators were based in Manchester, Babraham (Cambridge), Oxford, London, Cardiff and Edinburgh. Established UK biotechnology incubators were often geographically connected to research institutes or universities and since the late 1990s and early 2000s had played a limited role in contributing to the biotechnology sector. Few studies had been carried out on UK Biotechnology incubators. During the late 1990s and early 2000s biotechnology incubators were rarely mentioned in academic literature.

The rare group of studies that include biotechnology incubators in the UK are centred on London and the South East of England. For example Lawton-Smith (2004) concentrates on Oxfordshire, Capser (2003) concentrates on the Cambridge. Reports detailing the biotechnology sector released by the Office of Business Innovation and Skills (BIS) and the Department of Trade and Industry (DTI) use case studies based on activity in the South East of England. However Cooke (2002) observed that Manchester Biosciences incubator established in the late 1990s had three goals. The first was to manage all aspects of university-owned intellectual property relating to life sciences, including licensing deals, spinoffs, and joint ventures. The second was to manage the Manchester Incubator for young biotechnology companies and the third was to provide mentoring and incubation for university spinoffs.

More recent studies suggest that biotechnology incubators do not make a significant contribute to supporting the emergence of new life science related companies. Oakey (2012) did not undertake an empirical study of biotechnology incubators however a review of the current literature by Oakey (2012) suggested that incubators play a limited role in supporting technological collaboration to improve research and development management within the high technology sector. One motivation of our study is to broaden the horizon and elucidate biotechnology incubation technology in the whole regional spectrum of the UK.

3. Limitations of current research

Our review of the literature on biotechnology incubation reveals several gaps of research. Firstly

there is a lack of general studies on biotechnology incubation in the UK. The main interest of currently published academic research is on rather general characteristics of incubation types such as business incubator, technology incubators, university based incubators and incubators located on science parks. Biotechnology incubation is a rather recent phenomenon, therefore has not yet received attention from researchers. Thus, motivated by this gap in knowledge, this study will evidence the growth of new life science company activity and the emergence of new biotechnology incubators in the UK.

4. Methodology

We built two datasets to analyse patterns of new company growth within the UK life science industry. This allows us to analyse UK biotechnology incubators and their main characteristics. The desk based ‘UK life science start-up 2005-2012 survey’ provides a long term view on life science start-up companies across the UK and includes 580 UK life science companies established between 2005 and 2012. The survey examines the start-date of companies, their sector type, the region in which the company is based, the biotechnology incubator (if any) they are based in and the amount of external finance that has been secured by new life science start-up companies.

4.1 UK life science company survey

The ‘UK life science start-up 2005-2012’ survey provides contextual data to help understand some of the wider external influences that impact upon biotechnology incubation. For example regional trends and growth patterns of new biotechnology and medical technology start-up companies and regional comparisons of external venture capital investment secured by new life science companies. Data sweeps for new life science companies were carried out in 2010, 2011 and 2012 using the same methodology and systematic approach to data collection.

Table 1 – UK life science start-up survey Data sources

Data sources ('UK life science start-up 2005-2011 survey')	
Companies House DVD- Rom Directory	OBN News Feeds
Companies House Direct Web Check Service	One Nucleus News Feeds
Technology Strategy Board	UK Science Park Association (UKSPA)
Biotechnology incubator Websites	Investment Websites e.g. ‘Growth Business’
Bio incubator tenant pipelines	Venture Capital fund portfolios (total 25)
Universities Websites	Venture Market Index
University technology transfer offices (total 38)	Development Agency Websites
UK Biotechgate Database	Science, technology & Business Park’s websites
UK Bioincubator Forum (UKBIF)	Bio Trinity showcase companies
FAME	SpinoutsUK.co.uk database

Each data sweep consists of a 5 year period for example the 2010 sweep sought companies that starting trading between 1st January 2005 and 31st December 2010, the 2011 sweep found companies starting trading between 1st January 2006 and 31st December 2011 and so on. This provides a method to repeat the data collection exercise for missing companies that started trading in later years. Companies that started trading closer to the time of the sweep are harder to find, older companies have been active for longer and leave a more obvious trail.

The main criteria that needed to be met for a company to be included in the dataset were that the company must be of an entrepreneurial nature, based in the UK and founded between the period of the data sweep i.e. 2005-2009, 2006-2010, 2007-2011. The company must also be research or product focused, excluding consultants and advisers. The company must be sufficiently established. Non-operational entities that are companies in name only are excluded. Subsidiaries of other companies are also excluded. Table 1 provides an overview of the sources used to populate the dataset.

4.2 UK biotechnology incubator survey

The desk based 'UK biotechnology incubator survey' provides a detailed examination of the characteristics of 22 UK biotechnology incubators, the types of technical support on offer, physical details of the incubator such as size, and a breakdown of the incubator 'tenant mix' in terms of business model, company type and start-date. The survey provides a snap-shot of the industry taken between December 2011 and January 2012 and contains data on 357 tenants companies. It is supplemented by 12 semi-structured interviews with CEO's and Directors of UK biotechnology incubators.

The survey concentrates on one aspect of the life science industry, UK biotechnology incubators and includes all UK biotechnology incubators in operation during January 2012, it is designed to provide information on individual tenant characteristics and attributes for every UK biotechnology incubator and their tenant companies. Tenant company characteristics provided by the UK biotechnology incubator survey include the start date of a company, sector type (i.e. biotechnology or medical technology) and business model utilised by each individual company.

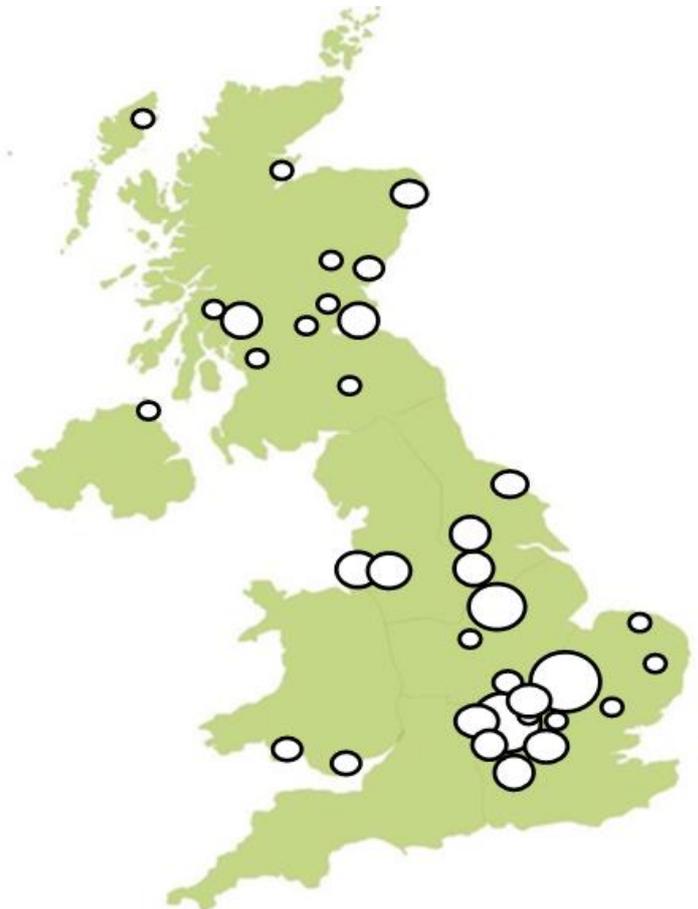
The 'UK biotechnology incubator' survey also examines the various types of supportive environments that biotechnology incubators provide. This includes provision of soft

infrastructure and business support, technical support and equipment, financial support such as access to VC networks or investor readiness programmes.

5. Patterns of new company growth within the UK life science industry

To provide an overview of the life science start-up firms the 'UK life science start-up 2005-2012' assesses start-up activity in the life science sector between 2005 and 2011. The purpose of this survey is to provide contextual to place the classification of UK biotechnology incubators. Some 580 new biotechnology and medical technology companies have been established in the UK since 2005 throughout the UK. Nearly two thirds (62.1%) are biotechnology start-ups and the remaining 37.9% are medical technology start-ups. Figure 1 shows that London and South East have the largest proportions of new life science start-up companies and there are significant numbers of new life science companies in peripheral regions such as the East Midlands and the North West.

Figure 1 - Geographical distribution of new life science companies (sweep 1)



5.1 New life science company growth in peripheral regions

The number of life science start-ups is highest in the South East, East and London. This is to be expected due to the established biotechnology clusters operating in these regions (Sainsbury 1999, Cooke 2001), however these are not the only regions that display high levels of new life science activity.

A major observation we can discern from figure 1 is that the geographical distribution of new biotechnology company activity is not restricted to the traditional East and South East of England or the 'Golden Triangle'. There are still significant levels of growth in these traditional biotechnology 'hot-spots'. After all, clusters of biotechnology activity have been present in these regions for over 15 years (Cooke 2001, Swann et al, 1998). Another significant observation contained in figure 1 shows that there are relatively high levels of new life science company formation in peripheral regions of the UK such as the East Midlands and Yorkshire & Humberside (along the M1) and in the North West between Liverpool and Manchester (along the M56).

5.2 Growth along the 'M1 Corridor'

Figure 1 shows the development of new life science activity along the 'M1 Corridor' and clearly demonstrates the significant number of new life science companies in the Midlands and South Yorkshire & Humberside. Figure 1 shows that there is significant new life science activity in these localities, despite the lack of biotechnology clusters in these regions in the early 2000s.

The East Midlands and Yorkshire & Humberside regions contain emerging biotechnology sectors and display a significant amount of new growth in life science company numbers from a low baseline. The major cities within the East Midlands and Yorkshire & Humberside, i.e. Nottingham, Sheffield and Leeds are home to Russell group universities with a strong science base. These cities are also within relatively close proximity to one another. Nottingham, Sheffield and Leeds are within 70 miles of one another and connected by good transport links such as the M1 motorway and the Midland Mainline railway. Furthermore, it is a 30 minute drive from Leeds to York where there is a biotechnology incubator based on York Science Park. Newly established and growing biotechnology clusters in the East Midlands and Yorkshire & Humberside form a corridor of activity along the M1 motorway.

Combining the number life science companies in the East Midlands and Yorkshire & Humberside is

plausible due to the relatively close geographical distribution of biotechnology companies within their major cities. The 'M1 Corridor' of activity contains a greater number of biotechnology companies than the North West, West Midlands, Wales or the North East. Figure 1 shows that the number of new life science companies that started trading between 2005 and 2012 located along the 'M1 corridor' (122) is almost equal to the number of new life science companies in Scotland (130) and London (135). This finding may seem surprising but demonstrates that there is significant level of new life science company activity in localities other than the regions that had established biotechnology clusters in the late 1900s and early 2000s.

6. UK Biotechnology incubators

Since 2001 a new generation of biotechnology incubators has appeared in UK cities. Along with the appearance of these biotechnology incubators, new concentrations of life science company activity developed. Table 2 shows that there are at least 19 UK biotechnology incubators that have been established since 2001. There has been a five-fold increase in UK biotechnology companies from the later 1990s to the early 2010s evidenced in previous sections combined with the appearance of new life science activity in localities that did not display life science activity in the late 1990s may be to some extent, supported by the introduction of biotechnology incubators.

6.1 Location of UK Biotechnology incubators

UK biotechnology incubators are usually co-located with anchor institutions such as hospitals, universities, science parks or located in former pharmaceutical company research and development sites or. For example, The Imperial Incubator (London) and Queen Mary Bio (London) are on university sites, C-Tric (Northern Ireland) and Cardiff Medicentre (Wales) are co-located on Hospital sites and York Biocentre is co-located on York Science Park. BioCity Nottingham is based in the former BASF/Boots pharmaceutical research and development site; BioCity Scotland is located in the former pharmaceutical research and development site that once belonged to MERCK (Motherwell) and BioPark Hertfordshire is located at the site that was once owned by ROCHE (Welwyn).

Table 2 - UK Biotechnology incubators

Incubator	Biotechnology Incubator description	Region	Start date
London Bioscience Innovation Centre	LBIC is owned and managed by the Royal Veterinary College (RVC). LBIC's clients range from entrepreneurial start-ups to more established UK businesses and overseas subsidiaries.	London	2001
BioCity Nottingham	BioCity Nottingham is said to be one of Europe's largest bioscience incubators. Launched in 2003, the 129,000 sq. ft. award winning site currently hosts 70 companies and nearly 500 employees. A former BASF site.	East Midlands	2003
Tetricus Bioscience incubator	Tetricus Science Park based at Porton Down in Wiltshire, offers state-of-the-art laboratory facilities and specialist support to new and growing science companies.	South West	2003
Mersey Bio Incubator	Merseybio Incubator is a purpose built state-of-the-art facility for developing biotechnology businesses. owned by Liverpool University and run by 2Bio ltd.	North West	2004
BioPark Hertfordshire	BioPark is managed by Exemphas on behalf of the University of Hertfordshire had been developed with funding from the East of England Development Agency. A former ROCHE research facility.	South East	2006
Cardiothoracic bio Incubator (Papworth)	Provides an environment purpose built to pioneer new developments in diagnostic technology and medical treatments of disease promoting closer collaboration between academia, the N.HS and business	East	2006
Imperial Incubator	The Imperial Incubator is a purpose built and provides office and laboratory space for early-stage companies offering access to Imperial College's research base, technology transfer and funding networks	London	2006
Sheffield Bio Incubator	The Sheffield Bioincubator is a purpose built facility providing the ideal environment for entrepreneurial bioscience to flourish into successful business with close proximity to existing tenants and the Sheffield universities.	Yorks. & Humberside	2006
University of Bradford	The Bioscience Business Incubator offers physical or virtual space to emerging companies The facilities are split between the Institutes of Cancer Therapeutics and Pharmaceutical Innovation.	Yorks. & Humberside	2006
Queen Mary Bio science innovation centre	The Queen Mary BioEnterprises Innovation Centre in London E1 is one of the largest purpose-built spaces in London for start-ups and more mature companies in science and technology. The 3 upper floors provide 39,000 sq. ft. of laboratory space.	London	2008
Stevenage Bioscience Catalyst	Provides "Access to world class resources and including superb high specification laboratories, funding and a vibrant community for biotechnology growth and development" based at GSK Site	East	2012
BioCity Scotland	BioCity Scotland is a joint venture with Roslin Biocentre founded in 2012. It has since become the centre for a wide range of research, training, events and thought leadership. A former MERCK facility.	Scotland	2012
BioHub	Based on Astra Zenica Alderley Park research and development research site.	North West	2013
MediCity (Nottingham)	Based on Boots (Beeston) Nottingham research and development site	East Midlands	2013
C-TRIC	This purpose built facilities primary objective is to reduce both the time to market and the costs associated with research and development of innovative health technologies, medical devices and therapeutics.	Northern Ireland	2009
Institute of Life Sciences (ILS) (Swansea)	The ILS is a purpose-built medical research facility. It is a collaboration between Swansea University and the Welsh Government, Abertawe Bro Morgannwg University, Health Board, IBM and industry partners.	Wales	2007
DiagnOx	DiagnOx was established to help improve the commercialisation of UK diagnostics research services tailored to meet the needs of the sector.	South East	2001
Norwich Bioincubator	This incubator contains 12 laboratories providing support services that include biological, chemical and radiological waste management.. Tenants can test out a concept for a molecular biology based business.	East	2002
York Bio Centre	The York Biocentre is a state of the art facility for biotechnology start-up and growth companies based in York Science Park.	Yorks. & Humberside	2009
Newcastle Bio incubators	Former Centre for Excellence in Life Science (CELS) operated biotechnology a bioincubator at the 'Centre for life..	North East	

These various types of anchor institutions provide biotechnology incubators with access to different kinds of infrastructure support services and various types of life science knowledge.

6.2 Size of UK biotechnology incubators

Biotechnology incubators can vary from a 300sq. metre facility that can provide laboratory and write up space for between 6 and 8 tenant companies to facilities with up to 12,000 sq. metres with space for over 70 tenant companies. UK biotechnology incubators can be categorised on the basis of size i.e. small, medium and large. Small biotechnology incubators (300 to 2000sq. metres) include Cardiff Medicentre, DiagnOx, Leeds Bioincubator, LBIC, Mersey BIO and Papworth Cardiothoracic biotechnology incubator. A relatively high proportion of small incubators are university based and hospital based biotechnology incubators.

Medium size incubators (2000 to 7000 sq. metres) can support between 10 and 23 tenant companies. They include BioPark Hertfordshire, Edinburgh Bioquarter, ILS Swansea, Queen Mary Bio, Roslin Bio in Edinburgh, UMIC, Sheffield Bio Incubator, Stevenage biocatalyst, Norwich Bio and York Bio. A significant proportion (45%) of UK biotechnology incubators can be categorised as medium sized.

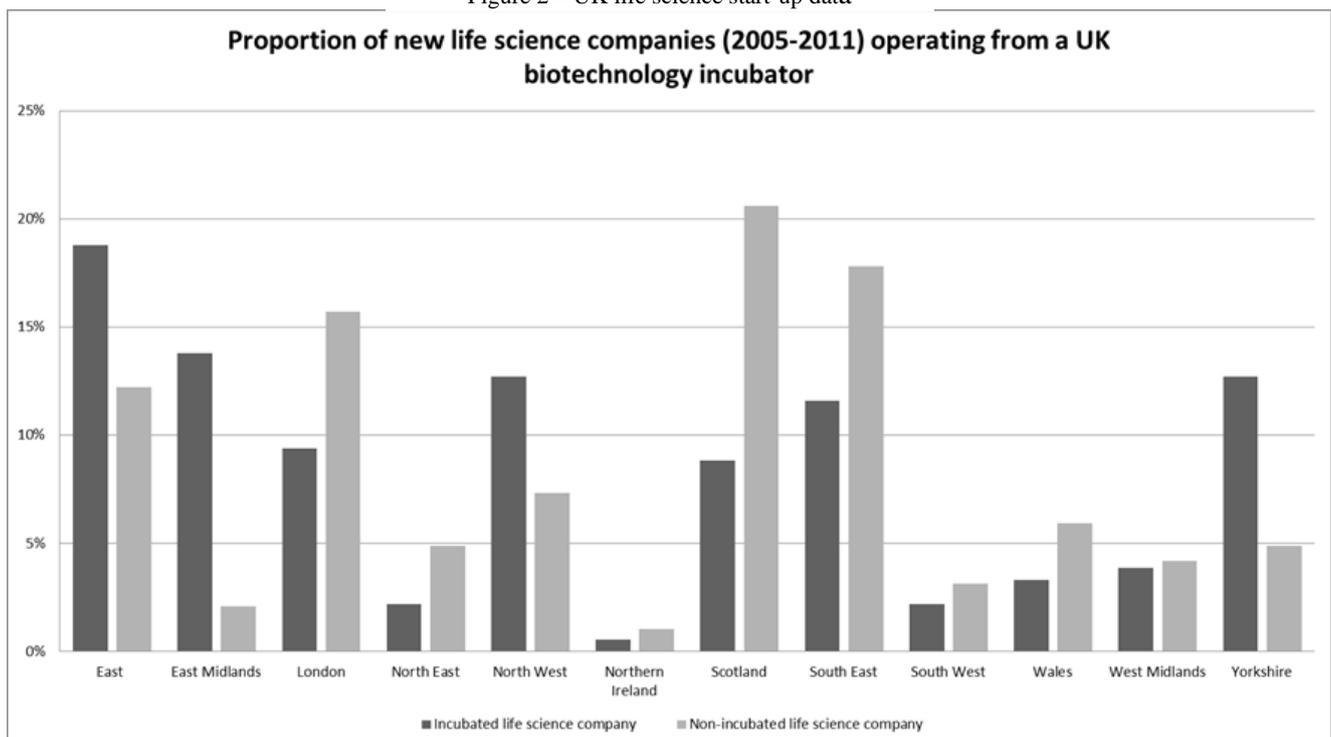
Large incubators (over 7000s q. metres) include Cambridge based Babraham incubator Babraham, BioCity Scotland and BioCity Nottingham.

The two largest biotechnology incubators are BioCity Scotland and BioCity Nottingham and they are both stand-alone incubators of over 12,000 sq. metres in size. The two largest stand-alone biotechnology incubators are located in geographic areas that are not close to sources of life science knowledge i.e. universities or research institutes. These are not purpose built they are former large pharmaceutical drug research and development sites that have been regenerated to reuse existing laboratories.

7. New UK life science companies operating from a UK biotechnology incubator

Of the 580 new UK life science start-up companies (2005-2012) 39% have been based in a biotechnology incubator at some point in time. There have been fluctuations in the number of start-ups based in biotechnology incubators over the years, 2005 saw only 20%. New start-up companies based in a biotechnology incubator increased quite sharply in 2006 to 56%. This increase corresponds with an increase in the size of the UK's largest biotechnology incubator 'BioCity Nottingham' and the opening of medium size BioPark. The percentage of start-ups based in incubators then gradually decreased between 2007 and 2009 to 23%, and has remained at this level up until 2011 when the numbers started to increase again.

Figure 2 – UK life science start-up data



7.1 New life science company activity in traditional biotechnology regions

The previous section of this study established that traditional biotechnology regions such as London, South East and Scotland are regions that possessed established biotechnology clusters in the late 1990s. These regions also have higher proportions of new life science companies that are not based in a biotechnology incubator. One explanation is that London, the South East and the East of England have had time to develop a sufficient infrastructure and sustainable clusters that have the ability to support the growth of new life science companies without the additional intervention from a biotechnology incubator. According to Sainsbury (1999) London and the South East already possessed the soft infrastructure that could support new life science companies in the late 1990s.

Figure 2 uses data from the 'UK life science start-up 2005-2012' survey to indicate the proportion of new life science companies that operate from a UK biotechnology incubator. It is immediately apparent from figure 2 that there are pronounced regional variations in the percentage of new life science companies located in biotechnology incubators. London, Scotland, South East and Wales display high proportions of new life science companies that are not located within a biotechnology incubator.

7.2 New life science company activity in peripheral regions

The East Midlands, North West and Yorkshire & Humberside are regions with high proportions of new life science companies that are located within a biotechnology incubator. Figure 2 shows that regions with higher proportions of new life science companies located within a biotechnology incubator are much more likely to exist in peripheral regions i.e. outside of Oxford, Cambridge and London i.e. 'beyond the golden triangle' (Smith & Ehret 2012). A plausible explanation is that regions with new and emerging life science clusters are trying to 'catch-up' with established regions and biotechnology incubators are seen as way of achieving this.

8. UK biotechnology incubators and new life science activity

This study shows that since 2001 a new generation of biotechnology incubators has appeared in UK cities, along with the appearance of

these biotechnology incubators, new concentrations of life science company activity developed. These second generation biotechnology incubators (see table 2) consist of both purpose built biotechnology incubators and biotechnology incubators that regenerate former large pharmaceutical drug research and development sites. This study also shows that new life science activity has occurred in peripheral regions as well as traditional biotechnology regions.

Table 3 highlights geographic locations that display significant proportions of activity of new life science companies. Table 3 also shows the total proportion of national life science activity (biotechnology sector and medical technology sector) for each UK region, this provides an indication of the level of new life science activity within that region. The table then shows the proportion of life science activity at a localised city level, this provides an indication of where life science activity appears within a region. Table 3 also indicates whether or not a biotechnology incubator or Russell Group university is located near new life science activity This begins to illustrate the importance of centres of scientific excellence and biotechnology incubator support in the development of life science cluster in the UK.

8.1 Local concentrations of new life science activity

Table 3 shows that concentrations of new life science activity are likely to be near a biotechnology incubator and this is evident for over 75% of new UK life science activity. It seems that new regional life science activity is underpinned by geographic localities within regions that display high proportions of life science activity may be to some extent, supported by the introduction of biotechnology incubators.

There are some localities within regions that display a high concentration of new life science companies and localities within the same region that display little or no activity. For example Table 3 shows that in Scotland, new life science companies are widely dispersed throughout the region, 59% of new life science companies are based in three localities Aberdeen, Glasgow and Edinburgh. In the East of England a high proportion of new life science companies are located in Cambridge, near the Babraham institute.

Regional perspective		Local perspective			
% of total national activity		% of total regional activity		Biotechnology Incubator	Russell Group University
Scotland	15	Aberdeen	15		
		Edinburgh	21	Roslin Bio BioCity Scotland, Edinburgh Bio Quarter	University of Edinburgh
		Glasgow	23	BioCity Scotland	University of Glasgow
		Dundee	11		
Yorkshire & Humberside	8	Leeds	19	Leeds Innovation centre	University of Leeds
		Sheffield	38	Sheffield Bioincubator	Sheffield University
		York	31	York Biocentre	
		Bradford	12	Bradford BioIncubator	
East Midlands	7	Nottingham	96	BioCity Nottingham	Nottingham University
North East	4	Newcastle Upon Tyne	75	Newcastle biomedical/ Centre for Life	University of Newcastle
North West	10	Liverpool	29	Mersey Bio	University of Liverpool
		Manchester	35	UMIC	University of Manchester
		Bristol	40		
Wales	6	Swansea	56	ILS	
		Cardiff	33	Cardiff Medicentre	Cardiff University
West Midlands	5	Birmingham	53	Birmingham research park	Birmingham University
		Coventry	35		University of Warwick

Table 3 –New UK life science activity a regional and local perspective (Sweep 1)

Table 3 shows that in the North East, one city, Newcastle-Upon-Tyne represents 75% of new life science companies that started trading between 2005 and 2009. In Wales 89% of new life science companies are based in Swansea or Cardiff. In the West Midlands 88% of new life science companies are based in Birmingham and Coventry. It seems that there are concentrations of life science activity in particular localities within regions, and in many instances there is a biotechnology incubator present within these localities.

8.2 New life science company local activity in peripheral regions

The distribution of new life science companies in the East Midlands is quite revealing with a staggering 96% of new life science companies based in Nottingham. Table 3 shows that a very high proportion of new life science activity within this region is concentrated in one local area. Nottingham represents nearly all new life science activity in the East Midlands with Derby and Leicester playing an almost insignificant role in the location of new life science companies. In fact 81% of new life science companies in Nottingham are located within two miles of a Russell group university and located within a biotechnology incubator. This may not be a reflection of the ability of Derby and Leicester to create new life

science companies themselves. It is plausible that new life science companies in the East Midlands simply choose to locate in Nottingham.

This concentration of new life science companies in Nottingham is the start of the ‘M1 Corridor’ of life science activity that occurs between Nottingham and Leeds. 96% of the East Midlands life science start-ups are based in Nottingham, 37 miles North along the M1 Sheffield possessed 38% of new life science companies and Leeds a further 35 miles North with 19% of new life science companies in Yorkshire & Humberside regions. When the distribution of new life science companies within the cities contained in the East Midlands and Yorkshire & Humberside are analysed in detail, it becomes apparent that there are significant numbers of new life science companies in cities along the ‘M1 corridor’ Furthermore it is as apparent that a biotechnology incubator is present at each locality.

To summarise there are variations in the number of new life science company formation across the UK at both a regional and city level. A key finding is that where there are relatively high levels of new life science activity, there is likely to be a biotechnology incubator present, especially in peripheral regions. An explanation for high concentrations of new life science companies in cities is the availability of resources that can support new life science activity. It seems that localised concentrations of new life science companies in cities are supported by the presence of a biotechnology incubator.

9. Conclusions

This study provides evidence to suggest that regions displaying relatively high proportions of new life science activity within their cities usually contain a biotechnology incubator within that same city. According to the 'UK life science start-up 2005-2012' survey over 75% of the total national activity of new life science companies are located in a city with a biotechnology incubator. The East Midlands, West Midlands, Yorkshire & Humberside, North West and North East are UK regions that do not have a long established life science industry and did not have established biotechnology clusters in the late 1990s (Cooke 2001). Hence, these regions do not have an established infrastructure that could support new life science companies.

The findings in this study show that there is a continued growth of new life science companies in traditional biotechnology regions such as London and the East of England. Most noticeable is the new growth of life science companies in peripheral regions of the UK such as the East Midlands, Yorkshire & Humberside, West Midlands and to some extent the North West. In addition to this new life science company activity, there are a high proportion of new life science companies that are located within a biotechnology incubator. Within these peripheral regions biotechnology incubators seem to play a greater role in supporting new life science companies and may have been the catalyst to initiate new clusters of activity.

Contained in this study is an example of an agglomeration displaying a relatively new concentration of life science activity with a high proportion of new life science companies located in several biotechnology incubators along 'M1 Corridor' (From Nottingham J25 to Leeds J35). The findings show that high proportions (96%) of new life science companies in the East Midlands are concentrated in Nottingham and that a high proportion of new life science companies in the East Midlands are located within a biotechnology incubator. Similarly, there are local 'hotspots' of new life science company activity and high proportions new life science companies based within a biotechnology incubator in Sheffield, Leeds and York.

The evidence suggests that in some cases regions with an established biotechnology cluster can still be reliant on biotechnology incubators to support new life science companies. The East of England is an example of such activity. A possible explanation is that traditional regions that are undergoing an expansion in the life science industry may potentially outgrow their native support infrastructure and require biotechnology incubators to provide additional support to facilitate new life

science company growth. A major finding of this study suggests that biotechnology incubators may have an important role to play in developing concentrations of life science activity in localities where quite recently there was little new life science company activity.

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