Let’s get clinical

Building a global life sciences hub

November 2020

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Introduction

The life sciences sector is at the heart of economic and social prosperity in the UK and has vital strategic importance. Not only does the sector contribute over £70 billion a year in turnover and employ 240,900 people across the country, it is central to the innovation climate and ensures that cutting-edge science translates to improvements in people's quality of life, health and wellbeing – all of which has a direct impact on improving UK productivity.[1]

The UK is already a world-leader in life sciences, and it is an area of strong competitive advantage for the UK in the global economy. With the caveat that figures and data could now be different following COVID-19, foreign direct investment amounted to £1.1bn in 2018 – the highest in eight years and the most in Europe.[2] UK exports of pharmaceutical products had a value of $33.3bn in 2017.[3] The UK's pharmaceutical manufacturing sector boasts 40% higher productivity levels than Germany and 80% higher than France and the UK has the largest pipeline of biotech products in Europe.[4] Moreover, the UK's medical technology sector employs 127,400 people in 3,860 companies, with a combined turnover of £24 billion.[5]

The life sciences sector has long played an invaluable role in improving patient outcomes and the quality of care in the UK. Vaccines are an excellent example of how the sector's contribution has improved life expectancy in the UK by largely removing the threat of infections that had previously been very common throughout the population. For instance, while there were 50,804 notified cases of diphtheria in England and Wales in 1941, there was just one case in 2014.[6]

A sector critical to resilience and improving the health of all…

As the UK tackles the ongoing threat of COVID-19 and looks to gradually restart the engines of the economy, the link between a strong life sciences sector and the country's resilience has arguably never been so clear. The virus has had a devastating impact on human life, put the NHS and its staff under considerable pressure and the cost of supporting jobs and businesses throughout the crisis has stretched public finances.

These unprecedented circumstances have placed a huge responsibility on the life sciences sector to deploy its expertise and capability to find solutions and support efforts to get the country's economy back up and running. Throughout the pandemic, life sciences firms have certainly risen to this responsibility, and have been playing a vital role in developing innovative treatments and diagnostics, working tirelessly to identify a suitable vaccine, and supporting the NHS on the ground.[7]

As we look ahead, it is clear the UK has some significant health challenges and issues to overcome. The UK's population continues to grow and age,[8] Alzheimer's, Multiple Sclerosis, many cancers, and orphan diseases continue to pose a considerable threat. Moreover, the COVID-19 pandemic's disproportionate impact on BAME individuals has shone a light on health inequalities that have existed in the UK for decades.[9] For us all to live healthier lives for longer we need to diagnose disease earlier, making the most of new technology, medicines and therapies, such as AI, digital healthcare and gene therapy. The life sciences sector is at the heart of these efforts.

Now is the time to proactively grow the UK's life sciences sector…

Whilst the UK starts from an enviably strong base to tackle these challenges, we must not be complacent about our position as a leading life sciences destination. Life Sciences is a global industry and the UK faces stiff competition from other high-class centres. Singapore is investing billions to establish itself as a global R&D hub and the 'gateway' to South East Asia's healthcare market. Moreover, Singapore's 'Emerge Stronger' initiative includes a package of measures to bolster the country's global competitiveness in the face of COVID-19, including several provisions to strengthen its manufacturing sector.[10] Closer to home in Europe, Switzerland is attracting leading digital healthcare firms, having implemented several measures to establish itself as a major developer of blockchain technology.[11] With COVID-19 having further highlighted life sciences' importance to resilience, the global competition for life sciences investment only looks set to intensify in the coming years.

The government must do all it can – in partnership with industry – to ensure that the UK remains firmly at the top table for life sciences investment. Taking action now is critical. Figures show that nominal spend on UK R&D by pharmaceutical companies has declined by 16% since 2011 (up to 2018).[12] The UK also lags behind significantly on uptake of new medicines. For every 100 EU patients who receive a new medicine in its first year of launch, only 15 UK patients receive the same medicine.[13]

This report aims to provide a snapshot summary of the UK's current attractiveness and direction of travel as a life sciences destination. We have rated the UK on five key metrics:

1. **Government backing of the sector**
2. **Strength of the research and innovation framework**
3. **A flexible healthcare system keeping pace with changing patient needs**
4. **Access to talent**
5. **Stability and competitiveness of the taxation system**

Each area is placed into one of the following ratings:

1. **World leading**
2. **Facing increasing international competition**
3. **Needs improvement to compete**

We have also made an assessment of the direction of travel in each area based on current measures and policy in place. To stay ahead of the pack, we recommend that the UK should strive to be world class in at least three of the five metrics, with no red-flags.

We have also included insights and best practice from other global life sciences centres (USA, Switzerland, France and Singapore) and highlighted where we feel the UK could usefully learn from them in order to maintain and improve the UK's attractiveness as a marketplace for life sciences.[14]

Executive summary

	Direction of travel indicator
	Strong measures in place to improve UK's current performance.
	Some measures to improve UK performance are in place but are not strong enough to substantially affect the direction of travel of the UK's performance **OR** more time needed to make an accurate assessment of the direction of travel.
	UK falling-behind internationally without decisive action.

Chapter	Summary
Government backing of the sector	**RATING: Facing increasing international competition**  Government commitment to the sector has been good overall. The Life Sciences Industrial Strategy (LSIS) provides a solid basis for growth and a clear ambition for the UK to be a world-leading destination for the sector. With the global competition for life sciences investment set to intensify following COVID-19, it is essential that momentum is maintained on its implementation. More should be done to ensure LSIS' implementation is joined-up across government and is properly integrated with other aspects of the Industrial Strategy.

Strength of the research and innovation framework	**RATING: Facing increasing international competition**  The UK has a world leading life sciences ecosystem and its powerful research base has underpinned the growth of the sector. However, with international rivals strengthening their research and innovation credentials, it is crucial that the UK continues to demonstrate itself as a leading place to develop the most cutting-edge advances that will benefit patients. The commitment to create a new UK ARPA research agency is a significant step forward. The UK should invest in its clinical trials infrastructure and deliver an ambitious end-to-end research and innovation system.

A flexible healthcare system keeping pace with changing patient needs	**RATING: Needs improvement to compete**  As a large single healthcare system, the NHS is in a unique position to provide patients with the latest and most effective medicines and treatments. However, the UK continues to lag behind many international rivals on medicines uptake and medtech investment, and innovation is generally not given the priority it deserves. While this is the case, there are positive signs that change is underway. The NHS has demonstrated remarkable flexibility and an ability to quickly mobilise to tackle COVID-19. More generally, the Accelerated Access Collaborative could play a key role in ensuring that new medicines, diagnostics and medical technologies are available on the NHS more quickly. There are also several initiatives in place to drive forward much needed digital transformation of the NHS and use its vast repository of data to propel the development of patient-centred healthcare breakthroughs in the UK.

Access to talent	**RATING: Facing increasing international competition**  Given the central importance of STEM for the life sciences sector, much more must be done to plug the STEM skills shortages to meet current and future skills needs. The Apprenticeship Levy has had a negative impact on apprenticeship numbers across the economy and funding for higher apprenticeships – a specific need for life sciences – is under threat. Reform of the Levy to ensure it can meet future skills needs is essential, and the government must also act swiftly on the findings of the Science and Industry Partnership's life sciences skills strategy. The government's publication of the new immigration system was generally positive for the sector, but further action is needed to make the UK a magnet for international life sciences talent.

Stability and competitiveness of the taxation system	**RATING: Facing increasing international competition**  The UK ranks highly on the quality of its taxation system and regulatory quality, with the Patent Box regime having proved a key pillar for the UK's attractiveness to life sciences firms. The R&D tax credit is a vital element of this picture and if its scope is widened to reflect modern research practices, it has the potential to be an engine for life sciences business investment in the UK.

"The government must do all it can – in partnership with industry – to ensure that the UK remains firmly at the top table for life sciences investment."

Government backing of the sector

Summary

Government commitment to the sector has been good overall. The Life Sciences Industrial Strategy (LSIS) provides a solid basis for growth and a clear ambition for the UK to be a world-leading destination for the sector. With the global competition for life sciences investment set to intensify following COVID-19, it is essential that momentum is maintained on its implementation. More should be done to ensure LSIS' implementation is joined-up across government and is properly integrated with other aspects of the Industrial Strategy.

Why it matters

A solid partnership between government and business lays the foundation for investment in the UK by life sciences firms. The COVID-19 pandemic has strengthened the status of life sciences sector as a strategically important economic sector. In this context, it is critical that positive rhetoric by government to encourage investment is matched by a clear plan for delivery with buy-in from across government departments, business and the NHS.

Where we are

Over the last few years, we have seen government take clear steps to promote the UK's life sciences sector, most notably through the LSIS and subsequent Sector Deals, a flagship of the government's Industrial Strategy. Launched in 2017, the Sector Deal aims to enhance the UK's position as a world leading destination for life sciences. A second Sector Deal was announced in December 2018.[15]

Life Sciences Industrial Strategy at a glance…

- sustaining and increasing funding for basic science to match international competition;
- ensuring the fiscal environment supports growth and attracts manufacturing investment;
- adopting the Accelerated Access Review to work to secure faster patient access to innovative new treatments and technologies;
- setting an ambition for the UK to be in the top quartile of comparable countries when it comes to the patients getting the most innovative medicines;
- improving the collection of health data and developing and delivering a skills action plan;
- including a migration system that allows for the recruitment and retention of highly skilled workers.

The LSIS set the right ambition in terms of enhancing the UK as a world leading destination for life sciences and have been embraced by industry. Specific areas where real progress has been driven by the LSIS are the establishment of the Medicines Manufacturing Innovation Centre, the Blueprint project to sequence the whole genomes of all 500,000 Biobank participants and the development of the Accelerating Detection of Disease Programme.

While this is the case, much of the onus of the strategy so far has been on business investment and commitments, with less in the form of new government policy proposals. There are several areas where more needs to be done, many of which are highlighted throughout this CBI report.

COVID-19 has highlighted the importance of resilient supply chains…

LSIS highlighted the benefits of sustaining medicines manufacturing facilities in the UK and called for ten large and ten smaller new facilities to be attracted to the UK. Much work is already being done in this area; the Medicines Manufacturing Industry Partnership (MMIP) have been working with the Office for Life Sciences (OLS) to develop proposals to improve resilience in UK medicines supply.[16]

More broadly, Made Smarter is clearly demonstrating its role in strengthening the manufacturing sector's resilience and productivity by driving forward efforts to promote increased innovation and technology adoption across manufacturing. 300 North West SME manufacturers secured support, including specialised advice and £1.6 million of funding, in the first year of the Made Smarter programme pilot in the region up to January 2020.[17] The government's recent £147 million investment – backed by further investment from industry – is very welcome, but more should be done to ensure the programme benefits a greater number of companies across the country.[18]

The experience of COVID-19 has highlighted – perhaps more than ever – the critical role of effective supply chains to the UK's economic resilience. The pandemic led to growing concerns in countries around the world on over-reliance on global supply chains for critical medicines, medical products and vaccines and the need for stronger supply chains to maintain national health and resilience.

Life sciences is a global industry and state protectionism runs counter to how the industry operates. However, the UK's shortages of critical equipment such as PPE and ventilators during the COVID-19 pandemic has clearly strengthened the case outlined in the LSIS for policy measures to support more medicines and medical technology manufacturing in the UK. As countries scramble to attract life sciences manufacturing investment post-COVID, efforts to increase productivity of firms through improving the uptake of innovation and new technology will send a strong signal.[19]

Delivery of LSIS should be done across government and properly integrated with other aspects of the Industrial strategy…

The House of Lords Science and Technology Committee's report on the implementation of the LSIS highlighted the importance of joint working and spreading ownership of the strategy across government is critical if commitments are to become reality.[20] However, there is evidence that cross-departmental working to progress the ambitions of the LSIS within the machinery of government could be improved.

The Life Sciences Council – the industry-government body responsible for ensuring the UK continues to be a global leader in life sciences – is well attended by the Department of Health and Social Care (DHSC) and BEIS However, there is no minister from the Treasury or from the Department for Education (DfE) in membership.[21] It is also notable that the government's accountability framework with NHS England and NHS Improvement – which set out their joint objectives and budgets for 2019 to 2020 – made no mention of life sciences.[22]

There's a challenge in delivering a Sector Deal, in ensuring that it's not only about a short-term business intervention, but also a longer-term vision. Some of the deals' work is linked to the Ageing Society Grand Challenge, which includes a £146 million commitment to medicines manufacturing. However, it's a missed opportunity that the link between Ageing Society, and the Life Science Sector Deals is not explicit. Moreover, the deals only fleetingly mention the opportunity to link the AI and Data Grand Challenge mission of early diagnosis and treatment of chronic diseases by 2030 – both areas the sector has positively impacted. Government and businesses need to ensure that Sector Deals positively link to other aspects of the Industrial Strategy, to help focus on meeting the Grand Challenge missions.[23]

Overall, government commitment to the life sciences sector is good, but it is essential that momentum is maintained. The success of the sector deals will be dependent on a long-term commitment to delivering on its aims, with a consistent cross-departmental approach regardless of future changes and successive governments.

Insights from overseas

France: a renewed effort to establish themselves as a life sciences hub…

- The French Government has made a renewed effort to position France as a leader in life sciences. The 2018 Strategic Council for the Healthcare Industries (CSIS) was well received by France's life sciences sector as having set out a clear roadmap to improve the country's competitiveness in the industry, based on a pragmatic, logical and sequential approach.[24]

- A series of major policy decisions were agreed including accelerating clinical trial authorisation procedures, creating a Health Data Hub to optimise the use of nationally available health data and developing a sector of excellence for biotechnology and innovative therapy medicines.

- To break short termism, the government also adopted a three-year forward view on regulatory parameters to provide a more predictable and stable operating framework to attract foreign investment to the country. [25]

Singapore: strong public commitment to collaborating with industry to improve health…

- The Singaporean Government has made a strong public commitment to improving the nation's health and working with the pharmaceutical sector to do so. Eight of the world's top ten pharmaceutical companies have facilities in Singapore, manufacturing four of the top ten medicines by global revenue.[26] In 2017, a memorandum of understanding (MoU) was signed in between a number of pharmaceutical companies and the Agency for Science, Technology and Research (A*Star) and the National University of Singapore (NUS), a manufacturing initiative, known as Pharma Innovation Program Singapore (PIPS). It aims to improve and transform the manufacturing operations and technologies of the industry, focussing upon continuous manufacturing, bio-catalysis, process analytical technology, advanced process control, and enhanced pharmaceutical operations.

- The government's Economic Development Board (EDB) is seeking to establish Singapore the 'gateway to Southeast Asia's digital healthcare market'. More than 60 multinational Med tech companies already operate in Singapore.[27]

Switzerland: commitments to provide world leading environment for life sciences sector…

- The Swiss Federation has made public commitments to providing the best conditions for biomedical research and technology and guaranteeing access to new medicines. This includes bilateral agreements to provide Swiss pharmaceutical companies with privileged access to the domestic and labour market within the EU as well as to EU research funding programs. Switzerland and the EU have held negotiations aimed at maintaining the framework conditions for market access, research partnerships, and the recruitment of specialists.[28]

USA is at risk of losing its life sciences crown as other countries step-up…

- The USA is viewed as one of the most competitive countries for life sciences and is home to six of the ten world's largest pharmaceutical firms, and also six of the world's largest medical device companies. U.S. pharmaceutical firms invest more in R&D as a share of the sector's value added — 43.8 percent — than any other industry. They invest a higher share of R&D than any other nation in the world,

accounting for more than half of all private-sector pharmaceutical research and development among OECD countries.[29]

- However, concerns have been raised about the federal government's lukewarm support of the industry in recent years.[30] This has included cutting federal biomedical research in real terms and increasingly considering pricing policies that would hurt innovation and U.S. life-sciences competitiveness. The United States only recently stopped taxing the foreign income of American companies at what was considered an uncommonly high rate.[31]

- The USA is also falling further behind international rivals in providing innovation-focused tax incentives, such as an innovation box or a competitive research and development tax credit – an issue exacerbated by the 2017 tax reform.[32]

Key success measures

- The government adopts a long-term vision and strategy, underpinned by benchmarks

Recommendations

The government should ensure that implementation of the LSIS is joined-up across government and integrated with other relevant aspects of the Industrial Strategy; government should be held to account on ensuring that the UK is a world leading destination for life sciences.

- Progress on the implementation of the LSIS should be monitored regularly by the Life Sciences Council. The Secretary of State for Health and Social Care should make an annual statement to Parliament setting out current performance.

Strength of the research and innovation framework

Summary

The UK has a world leading life sciences ecosystem and its powerful research base has underpinned the growth of the sector. However, with international rivals strengthening their research and innovation credentials, it is crucial that the UK continues to demonstrate itself as a leading place to develop the most cutting-edge advances that will benefit patients. The commitment to create a new UK ARPA research agency is a significant step forward. The UK should take steps to improve its clinical trials infrastructure and deliver an ambitious end-to-end research and innovation system.

Why it matters

A life sciences ecosystem driven by cross-border collaboration between business, government, higher education institutes, research funders and the wider healthcare system is vital to the successful research, development and marketing of new innovations at pace and scale. A strong clinical trials infrastructure, supported by international co-operation in medicines authorisation is also important to making access to medicine quicker, cheaper and safer for patients.

For example, the global personalised medicine market is expected to increase over 11% for the period 2017-2024, with the help of advances in healthcare analytics, artificial intelligence (AI), and blockchain. The shift towards personalised healthcare will need new multiple stakeholders across multiple countries to develop new platforms and deliver targeted breakthroughs to patients.[33]

For the UK to maintain its attractiveness as a global life sciences hub, it is crucial that it continues to build on its ability to develop the most cutting-edge advances that will benefit patients.

Where we are

The UK has an impressive and world leading life sciences ecosystem and its powerful research base has underpinned the growth of the sector. As well as playing a key role in bringing the latest medical advances to patients and the NHS, clinical research in the UK also supports the economy. In 2018/19 the annual economic benefit of clinical research in the UK was £2.7 billion, supporting 47,000 jobs and bringing £28.6 million in savings and £335 million income to the NHS.[34]

Global healthcare firm, MSD, recently announced that it will build a new state-of-the-art Discovery Research Centre and UK Headquarters in London. A key factor behind the investment was the UK's status as a "key player in discovering and developing innovative therapies that save and improve lives both here and around the world."[35]

Universities sit at the heart of the UK's clinical research ecosystem…

The UK's universities play a crucial role in supporting its strong life sciences research ecosystem. Oxford and Cambridge Universities are two of the world's most respected medical research universities.[36] British universities overall have an 18% share of the top 1% most cited life sciences academic citations, ranking only behind the USA.[37]

Importantly, universities provide key partners for NHS hospitals and together create strong Academic Health Science Centres and Networks that allow the NHS to participate in cutting-edge clinical research. The National Institute for Health Research (NIHR) facilities in Birmingham and Manchester are two such examples.[38] These centres and networks have allowed the UK to build on the strength of the established Golden Triangle of Oxford, Cambridge and London – often cited as being the best place in the world to do discovery science – and have enabled a welcome spread of innovation across the regions.

UK has an opportunity to raise its game on clinical trials…

An ABPI report found that the UK is ahead of the rest of Europe for early-stage clinical research into new medicines and vaccines, with more than 600 commercial clinical trials taking place in the NHS. Cancer research is the UK's strongest area, but it is also a world-leader in research for heart disease, immunology and conditions affecting the nervous system. However, once the research moves into the later stages – often phase three that sees large numbers of patients benefiting from a new medical trial – the UK drops into third place in Europe behind Germany and Spain and fifth globally behind the US and Canada. The UK has an opportunity to become the best place in the world to trial and bring new medicines to the market if it is able to improve its performance at the latter stages of research.[39]

The UK's exit from the EU presents opportunities for the UK to be a better place to do clinical research if it can improve its ability to set up effective trials. The Medicines and Medical Devices Bill currently making its way through legislative process is a welcome step forward.[40] Among the aims of the Bill outlined in the Queen's Speech included removing unnecessary bureaucracy for the lowest risk clinical trials and enabling the MHRA to develop innovative regulatory approaches to respond quickly to developments such as artificial intelligence in treatments.[41] This could have a positive impact, both in terms of supporting the life sciences sector and ensuring UK patients get faster access to the most innovative treatments.

Aside from the Bill, the Combined Ways of Working approach has led to much improvement in the approvals process and has been welcomed by industry.[42] However, the efficiency of the trials process continues to be held back by sites not collaborating and using opportunities to set-up trials in parallel.[43] Ensuring the consistent and unified adoption of a single cost/contact process across NHS trial sites will be vital if the UK is to capitalise on this opportunity to improve its clinical trials process.

Cross-government R&D strategy is essential…

Government spends $3 billion a year on health R&D and life sciences industry spend is also high, with the pharmaceutical sector alone spending £4.3 billion.[44] While this is the case, figures show that spend on UK R&D has declined by pharmaceutical companies by 16% since 2011.[45] Greater support from government can ensure that the UK is in a better position to take advantage of innovation trends and remain a destination of choice for innovative businesses to develop new medicines and services.

Government has set out the right intentions by committing to raise UK investment in R&D to 2.4% of GDP by 2027 and 3% in the long term. The boost of £22 billion to R&D announced at the 2020 Budget was a welcome step towards this ambition. The

opportunities of meeting the R&D target are clear. The ABPI has found that meeting it could help the life sciences sector contribute £8.5 billion of growth to the economy by 2025, plus an additional 31,400 more jobs.[46]

Radical strategic approach needed to boost innovation adoption…

As outlined in Section 1, there are initiatives in place to help firms adopt new technology and innovation, but this support is piecemeal. It is important that Made Smarter continues to receive funding and support from the government so more firms can benefit from it. However, funding is just one part of the solution; for embedded change to accelerate productivity and drive recovery forward, a more strategic approach to government support is essential.

The CBI has therefore recommended that BEIS should establish Accelerate UK – a new UKRI council with strategic responsibility for innovation adoption across UK business. Accelerate UK would establish a clear home for innovation adoption in government, bringing together existing initiatives such as Made Smarter, Be the Business and Growth Hubs, sitting alongside Innovate UK as a primarily business facing council. Its creation would signal the importance of innovation adoption, addressing a policy blind spot and the missing component needed for an end-to-end research and innovation system.

UK ARPA could take UK research ecosystem to the next level…

The commitment to the creation of a new UK ARPA research agency is an opportunity to take a higher-risk approach to funding innovation. Given the NHS' significant buying power and unique repository of patient data, there is clear potential for the UK ARPA to make breakthrough developments in health and life sciences incredibly marketable.[47] For this model to work it requires long-term funding, the flexibility to pursue high risk innovation projects with a clear customer and a robust business engagement plan to promote and incentivise partnership working with industry. Proportionate IP legislations and contractual flexibility will be vital to making this work and business should be given regular opportunities to invest in products created by the new agency.[48]

Participation in cross-border research programmes has proved invaluable…

UK participation in Horizon2020 and previous European Framework Programmes has been hugely beneficial for British businesses alongside the research community. These Framework Programmes allow businesses and education centres to work together across borders on shared priorities. They are an important source of long-term funding and provide unique collaborative opportunities. In themselves, these benefits are significant. Cross-border working, for example, is now essential in bringing together capabilities in multiple areas, including life sciences. In negotiating its new relationship with the EU, government must commit to seeking continued involvement with EU Framework Programmes so that businesses and universities can continue to access and benefit from all parts of the programme.

Insights from overseas

France: implementing its first multi-year research plan…

- Most publicly funded research in France is conducted in university-affiliated labs run by research agencies and sector-specific bodies, such as INSERM for life sciences. Scientists in France have long complained that research budgets fluctuate with political administrations.[49]

- To address this issue, the French Government announced last year that it will implement a national, multi-year research plan for the first time. The government suggests that it will protect research funding, boost the recruitment of early-career scientists and help France to stand out in an increasingly competitive global research landscape.[50]

Singapore: using 5-year innovation plans…

- Under the last five-year Research, Innovation and Enterprise (RIE) 2015 Plan, the Singapore government committed S$16 billion over 2011 to 2015 to establish Singapore as a global R&D hub. The government sustained its commitment to research, innovation and enterprise, and invested S$19 billion for the RIE2020 Plan over 2016 to 2020.[51] S$4 billion in public sector research funding was committed to the Health and Biomedical Sciences Domain.[52]

- Mechanisms are in place to enable firms to forge partnerships with key opinion leaders, institutes, emerging biotechs, as well as clinical and contract research organisations to rapidly advance pipeline assets.[53]

- As part of Singapore's 'Emerge Stronger' programme, the country launched the Singapore Institute of Manufacturing Technology (SIMTech) Innovation Factory – a co-working space for local companies to innovate and design their own unique products. It is hoped that the new space will enable firms to gain a competitive edge through innovation.[54]

Switzerland: leading in life sciences business R&D investment…

- Part of Switzerland's growing success is its ability to commercialise discoveries, particularly within the Basel region. Much of this is down to the fact that the country leads in business investment in life sciences R&D. For example, Swiss medtech manufacturers and suppliers spend up to 30% of their turnover on R&D, while the global average is a 6.7%.[55]

- The Swiss National Science Foundation (SNSF) and life science accelerators like *Switzerland-Innovation* provide strong funding to federal research institutions such as the University of Geneva, the University of Lausanne and the *École polytechnique fédérale de Lausanne* (EPFL). This landscape makes Switzerland a powerhouse of health innovation. The Swiss government has implemented legislative measures to consolidate Switzerland's status as a blockchain-friendly country.[56]

- Switzerland plays host to the University of Basel, which is among the top ten European institutions for life sciences, and ETH Zurich, one of the world's most prestigious universities for science and technology. There are also various specialist institutions, such as the Friedrich Miescher Institute in Basel, which concentrates on fundamental biomedical research. Academic salaries are some of the best in Europe, and staff retention is high.[57]

US ARPA at a glance…

For over five decades ARPA organisations in the United States have been at the forefront of conducting cutting edge research. APRA focuses on producing innovation in an agile, fail fast environment, with government acting as a key customer for the outcomes of successful projects.

The creation of a similar model in the UK presents an opportunity to fund riskier but higher reward research, while providing a new boundary pushing model and culture for government supported innovation. Moreover, while the UK is strong in basic scientific research, this model could vastly improve its performance when it comes to translating research into commercially viable technologies.

If done right, the agency can help develop the UK's brand for innovation, attract the best and brightest talent, as well as tackle the challenges we face through high impact R&D.

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Key success measures

- Government and life sciences industry spend on R&D
- Quality of clinical research and trials infrastructure

Recommendations

The establishment of a UK Advanced Research Projects Agency (UK ARPA) has the potential to supercharge the UK's research ecosystem and enable the UK make breakthrough developments in health and life sciences incredibly marketable. Government must focus on three areas to unlock these benefits and make UK ARPA a success.

1. The new agency cannot be a flash in the pan, so long-term funding is non-negotiable for success: government must have a long-term framework for funding and ensure that it uses its funding power to catalyse regional growth.

2. Creating a new culture for developing high-reward innovation should be prioritised: the new agency must operate within a strong innovation ecosystem, establishing close links with UKRI, while developing products with a clear focus on the customer.

3. Business and government engagement must lay at the heart of UK ARPA's strategy: this will create a new global innovation brand for the UK, allowing us to

compete for the best talent. But proportionate IP legislations and contractual flexibility will be vital to making this work and business should be given regular opportunities to invest in products created by the new agency.

The UK should be the best place in the world to trial and bring new medicines, diagnostics and devices to market:

- Ensure the consistent and unified adoption of a single cost/contact process across NHS trial sites, including across the devolved nations.

Use funding announced at Budget to deliver an ambitious end-to-end research and innovation strategy that grows support for development, commercialisation and adoption:

- HM Treasury should use the Spending Round to announce a financial framework with the objective of providing long term certainty for business research and innovation investment.

- UKRI and DIT should develop a compelling high-level pitch on 'why the UK is the best place to locate and grow your R&D activity' and strengthen international communication of this pitch to court international investment.

- BEIS should establish Accelerate UK – a new UKRI council with strategic responsibility for innovation adoption. Accelerate UK would establish a clear home for innovation adoption in government.
    - Rather than adding another body to a fractured landscape, Accelerate UK would be tasked with strategic join up with existing initiatives, such as Be the Business, Made Smarter and Growth Hubs, to bring support for innovation adoption under one clear banner – improving business navigation of a fragmented system and enabling strategic planning and delivery.

- In the wake of COVID-19, BEIS and UKRI must continue action to protect R&D capabilities and minimise scarring effects, ensuring that businesses and universities have the confidence and capability to restart disrupted R&D activities.

Ensure the UK maintains continued involvement with EU Framework Programmes following its exit from the EU.

- HM Treasury should earmark sufficient funding at the next Spending Round to associate fully in Horizon Europe.

A flexible healthcare system keeping pace with changing patient needs

Summary

As a large single healthcare system, the NHS is in a unique position to provide patients with the latest and most effective medicines and treatments. However, the UK continues to lag behind many international rivals on medicines uptake and medtech investment, and innovation is generally not given the priority it deserves.

While this is the case, there are positive signs that change is underway. The NHS has demonstrated remarkable flexibility and ability to quickly mobilise to tackle COVID-19. More generally, the Accelerated Access Collaborative could play a key role in ensuring that new medicines, diagnostics and medical technologies are available on the NHS more quickly. There are also several initiatives in place to drive forward much needed digital transformation of the NHS and use its vast repository of data to propel the development of patient-centred healthcare breakthroughs in the UK.

Why it matters

The UK's growing and ageing population means its healthcare system will need to meet increased demand and changing healthcare needs. It is crucial that the life sciences sector and healthcare system continues to keep pace by developing new and innovative medicines and products and making them accessible to patients quickly. This requires leadership from the government and action from the NHS to embrace new approaches, innovations and new technologies.

The critical role of the NHS in driving innovation in the UK's healthcare system was strongly emphasised in the LSIS. There are clear opportunities in this space particularly given NHS' unique ability to act as a single healthcare system to help ensure the approval and uptake of medicines and medtech.

Innovation is becoming increasingly data-driven, with the global explosion in data production and advances in analytics tools fuelling new discoveries at unprecedented rates. If used effectively and ethically, the NHS' vast repository of data could enable the UK to be a world leader in innovation and data-driven healthcare. Enabling industry access to these datasets could underpin key developments including Big Data, AI and Personalised Medicine, and create wider economic benefits for the UK.[59]

Where we are

Much work needed to improve patients' access to latest medicines and treatments...

The COVID-19 pandemic has highlighted the potential of the NHS to drive forward large-scale change and new approaches in a short space of time to benefit patients. The conversion of London's ExCel Centre into the 4,000 bed Nightingale hospital in just nine days, not to mention the rapid adoption of digital GP consultations are just two examples of this.

More generally, however, the NHS' structure and processes have long held it back from meeting its huge potential to bring UK patients the latest and most effective medicines, treatments and products they deserve. The procurement process is currently very difficult to navigate for firms providing services and products for NHS patients due to the complex purchasing structures. Moreover, the focus on cost control and lack of co-ordination between the various bodies that make up the NHS means that the adoption and spread of innovations is not given the priority it requires.

Currently for every 100 EU patients who receive a new medicine in its first year of launch, only 15 UK patients receive the same medicine.[60] The UK's investment in some crucial medical technology equipment is also currently lacking. For example, according to the King's Fund, the UK lags far behind other high-performing health systems in investing in MRI and CT scanners.[61] The government's announcement last year to invest £200m in this area is welcome, but more must be done to improve the UK's performance on medical diagnostics and early-diagnosis.[62]

The National Institute for Health and Care Excellence (NICE) has an important role to play in terms of bringing forward new health innovations and is internationally recognised for its rigorous approach to the development of evidence-based guidance. However, it is important that NICE adapts its processes to account for cutting-edge medical innovations coming to market and ensure it keeps pace with new developments. NICE is currently undergoing a review of its assessment methodologies; it will be crucial for the organisation to work with industry and other stakeholders to ensure these methods are fit for the future of medicine.[63]

Harnessing the power of industry to deliver better patient outcomes…

The LSIS and subsequent Sector Deals were centred on the fact that delivering outstanding patient outcomes depended on the close collaboration between the government, NHS and industry. A report from the ABPI found that while there are some excellent examples of cooperation between the NHS and the life sciences industry to deliver this shared objective, but that this needs to become more common and larger in scale. The report adds that the idea that collaboration with industry and research is mission critical has not been universally adopted, and there remains a danger that this activity will be seen as a 'nice to have' rather than a 'must do.'[64]

The government has taken some positive steps to better harness the resources of industry to spread innovation in UK healthcare. The NHS Long Term Plan includes exciting opportunities for industry to work with the NHS to accelerate the benefits of advances such as personalised medicine and genomics so that they can be offered to patients.[65]

Moreover, several recommendations from the Accelerated Access Review (AAR) were introduced as part of the Life Sciences Sector Deals to develop ways of making the most innovative and effective medicines, diagnostics and medical technologies available on the NHS more quickly. In response to the Review's independent report, the government set up the Accelerated Access Collaborative, bringing together the key players from across the NHS, research and industry to identify potential innovations and help to support the NHS in England to make best use of them. The new body establishes a single point of contact for

innovators, links up with the needs of clinicians and patients, establishes a testing infrastructure, agrees a joint funding strategy for health innovation and supports the NHS to achieve faster adoption and spread. It will be vital that health organisations and systems feed into this work.[66]

NHS has an opportunity to be a world leader in data-driven health…

Industry already plays an important role in the development of new healthcare technologies which draw upon the NHS' unique datasets. However, when compared with countries leading the way in this area like the USA and Singapore, it is clear there are greater opportunities for the UK in maximising the use of NHS data ethically and securely.

A report by the *Reform* think-tank found that a lack of clarity on how patient data should be used by industry, in conjunction with insufficient national guidance on the types of partnerships that could by developed has led to a patchwork on the ground. The absence of a national framework has been identified as a key challenge for industry. In an Academic Health Science Network survey about AI technologies in health and care, 34 per cent of private sector respondents said the lack of clarity over 'appropriate business models for AI development and deployment' was a key factor affecting AI's potential.[67] Greater clarity is likely to lead to both greater innovation and improved societal trust in the technology, by offering greater clarity for businesses and patients alike.

The government and NHS have set-out a strong commitment to address some of these issues. The NHS Long Term Plan and the Department of Health and Social care set out ambitious digital projects for the NHS. Health Secretary Matthew Hancock has unequivocally linked the government's commitment for the UK to be a life sciences world leader with the more effective use of NHS data to "advance the needs of the medical research community…find new treatments and save more lives".[68]

Businesses' licence to innovate must be matched by the highest standards of data protection

Firms recognise that public trust will underpin the success of data-driven healthcare technologies, which will help to make decisions about people that could be lifechanging. CBI research shows that the way a company treats personal data is a top concern for customers, making it clear that delivering potentially game-changing innovations will depend on maintaining public trust and empowering people.

Firms continue to underline the benefits of aligning with GDPR, with an adequacy decision from the EU vital to help safeguard the UK's data economy. Businesses also want to engage on opportunities for the current data regime to better support innovation, to ensure that the UK can enjoy the full benefits of innovative data-driven technologies. In 2020, the CBI is responding to the UK government's National Data Strategy. Our response will explore how the UK can remain at the front of the data revolution, with a regime that supports data-driven innovation and cutting-edge technologies whilst also driving public trust.

[69]

Several excellent initiatives are now underway to improve the UK's performance on data-driven health and it is important for that these efforts continue apace. Section 2 of this report outlined the huge potential of the new UK ARPA to commercialise data-driven breakthrough developments in health and life sciences. In addition, Health Data Research UK (HDR UK) is uniting health data assets across the UK to make health data research and innovation happen at scale. The non-profit, independent organisation is supported by 10 funders and brings together 22 research institutes across the UK.[70] HDR UK has recently played a leading role in the Randomised Evaluation of COVID-19 Therapy (RECOVERY) trial. This is run by scientists at the University of Oxford – using data from NHS Digital's Secondary Uses Service (SUS+) and other data sets – to help assess the effectiveness of a number of potential treatments for COVID-19.[71]

Moreover, the new NHSX organisation brings together teams from the Department of Health and Social Care, NHS England and NHS Improvement together into one unit to drive forward digital transformation in the NHS. Crucially, the organisation works to control the design of research collaborations to make sure that benefits are returned to the NHS and the UK public.[72] NHSX faces a complex task, but it could make a big difference very quickly if it can set basic standards and provide a platform for innovation diffusion.[73]

An important priority for the long-term success of NHSX and other digital health initiatives will be ensuring that the NHS is an attractive place for professionals to start and build a career in digital technology. A report from the Nuffield Trust found that much more needs to be done to provide appropriate career pathways and pay frameworks that make sure the NHS can attract the necessary staff. Without this, there is a risk that the ambitious digital projects set out in the Future of Healthcare and the Long Term Plan will be unachievable.[74]

Insights from overseas

France: optimising use of health data and improve its performance on access to new medicines…

- In 2018 the French government and Strategic Council for the Healthcare Industries reached an agreement to boost the attractiveness of France as a destination for pharmaceutical companies. Key to this was a commitment to ensure rapid patient access to innovative therapies, reducing the lead time for patient access to newly marketed medicines and set time for ensuring compliance with the 180-day lead time set by the European Directive. French times are the longest in Europe.

- To provide rapid patient access to the most innovative medicines the government has committed to extending the Temporary Authorisation For Use (ATU).

- The 2018 CSIS meeting saw France announce the creation of a Health Data Hub to optimise the use of nationally available health data.[75]

Singapore: a regional leader in health data innovations…

- Singapore is leading the way in South East Asia for access to health data and patient-centred digital innovations. The city state rolled out a National Electronic Health Record system in 2011 that enables patient records to be shared across the healthcare system, Singapore is now moving data to the cloud. More than 40,000 healthcare workers already use H-Cloud to access medical records.

- Singapore is also working closely with the private sector to pioneer patient centred innovations. For example, Philips has joined forces with a major general hospital and health alliance to pilot telemedicine for heart failure patients.[76]

- Singapore suffered a major data breach in 2018 with 1.5 million patient records stolen. This highlights the critical importance of ensuring data innovation goes hand-in-hand with data security.[77]

Switzerland: a global hub for cutting-edge medical technology…

- Switzerland is a world-leader in medical technology which is playing an increasingly important role in developing patient centred innovations and making diagnosis, analysis, and treatment easier. The combination of first-class research facilities and a highly developed healthcare system that demands the right products and stimulates innovation makes Switzerland an extremely attractive location for research, development and production in the medtech sector.[78]

US: R&D investment in new therapies under threat…

- Cellular and gene therapy related research and development is advancing rapidly in the United States, and hundreds of trials are underway.[79]

- Innovations based on the use of data are well established in the USA and activity is not just limited to large firms. For example, between 2010 and 2013, more than 200 businesses had developed innovative healthcare applications.[80]

- Companies that pursue medicines for rare diseases receive benefits such as seven-year market exclusivity, faster Food and Drug Administration (FDA) review and waived fees, and exception from the Affordable Care Act branded medicine pharma fee for orphan-only medicines. However, the 2017 tax reforms halved the Orphan Drug Credit for research into rare diseases. While the full impact of this change is yet to be seen, this could have a significant effect on R&D investments in new therapies.[81]

Key success measures

- Patients' access to new medicines, products and treatments
- A framework or programme to responsibly use health data for the development of new patient centred innovation

Recommendations

The NHS should be unrivalled as a national champion for bringing innovative medicines, treatments, healthcare technology and services to patients:

- With a single clear thread through the Life Sciences Industrial Strategy and alignment across government departments through arms-length bodies such as NICE and NHS England, the NHS should act as an anchor customer pioneering and championing the rapid availability of new innovative medicines, treatments and services by patients and local NHS, balancing the need for a sustainable and thriving life science ecosystem with cost effectiveness – without constraint by a race to the bottom on cost.

The UK should aim to be a world leader in data-driven healthcare:

- Existing Initiatives to drive digital transformation in the NHS and responsibly use health data to propel the development of patient-centred healthcare breakthroughs in the UK should continue apace.

- Improve the attractiveness of the NHS as a place for digital professionals to start and build a successful career.

Access to talent

Summary

Given the central importance of STEM for the life sciences sector, much more must be done to plug the STEM skills shortages to meet current and future skills needs. The Apprenticeship Levy has had a negative impact on apprenticeship numbers across the economy and funding for higher apprenticeships – a specific need for life sciences – is under threat. Reform of the Levy to ensure it can meet future skills needs is essential, and the government must also act swiftly on the findings of the Science and Industry Partnership's life sciences skills strategy.

The government's publication of the new immigration system was generally positive for the sector, but further action is needed to make the UK a magnet for international life sciences talent.

Why it matters

As the LSIS report rightly emphasised, the future prosperity of the life sciences sector is highly dependent on its ability to train and recruit a workforce equipped with critical STEM skills. As a highly diverse industry, life sciences depend on a broad skills base, covering areas such as biomedical science, engineering, high-value manufacturing and mathematics. As mentioned in the above section of this report, the Topol Review also highlighted the ever-increasing importance of digital skills to the long-term competitiveness of the UK's life sciences industry.[82]

Life sciences is the highest investor in R&D in the UK and if the government is to achieve its ambitions, it is essential that the sector continues to invest. To be able to do this with confidence, access to highly skilled people is key.

Science is borderless and international people and skills are integral to research collaboration and underpin scientific development across medicines, genomics and synthetic biology. It is essential that the life sciences sector can recruit overseas workers to fill a wide variety of roles, from scientists and lab technicians, to entrepreneurs, marketing and regulatory experts. Easy, seamless mobility of staff between the UK and EU is equally vital in order to facilitate innovation. This is also a critical factor for many international life sciences firms deciding to base their European headquarters in the UK.

Where we are

STEM shortages must be plugged to meet current and future skills needs…

An ABPI report identified the rapidly evolving field of genomics – the basis for a whole host of potential medical discoveries – as a priority area as far as filling industry skills gaps are concerned. Several other areas of need identified by the ABPI and Topol include computational disciplines, informatics, data science, immunology and bioinformatics.[83]

Building on this research, the Science and Industry Partnership (SIP) with key partners including the ABPI and the BioIndustry Association (BIA), published the Life Sciences 2030 Skills Strategy in February 2020. The new Strategy – a deliverable from the Life Sciences Sector Deal 2 – set out to build a clear evidence base of the status of life science skills and future scenarios to 2030, focusing on medicines manufacturing, as well as other key emerging technologies, such as AI to identify the provision required. The report forecasts the sector's demand for 133,000 skilled scientific staff through to 2030 – all in highly specialised roles across the sector. The recommendations have been endorsed by Minister for Business and Industry, Nadhim Zahawi and it will be important for the sector to continue working with government to put them into action.[84]

STEM is fundamental to the current and future skills needs of the life sciences sector identified by this research. Yet the UK is falling behind Europe and the rest of the world in terms of numbers of students studying many STEM subjects. Despite the number of UK undergraduates studying STEM subjects increasing by 16% over the last decade (compared to an overall increase across all subjects of 13%) undergraduate numbers for EU students increased by 52% and non-EU students (worldwide) increased by 63%.[85]

In addition to high quality STEM graduates, apprenticeships also have a vital role to play in tackling the skills challenge and increasing home grown talent in the life sciences sector. The government has sought to increase uptake through the Apprenticeship Levy, which came into effect in 2017. However, the evidence shows that the levy is having a negative impact on apprenticeship numbers across the economy.[86]

Moreover, the life sciences sector has a specific need for higher level (Level 8) apprenticeships, yet these have been put on hold by the Institute for Apprenticeships and look set to be dropped altogether. Maintaining the funding for levy funded higher apprenticeships in science is important – not doing so could mean universities will cease courses they cannot afford to deliver. Reform of the Apprenticeship Levy is therefore vital, and a review should be held into how it can evolve to meet the skills challenges facing life sciences and other sectors for the coming decade.

Further action needed to make the UK a magnet for international talent…

The government has rightly acknowledged the importance of world leading scientists to the life sciences sector in public statements on the future of the immigration system. The UK already has a system for fast-tracking some high-skilled foreign science professionals and several science professions are included on the shortage occupation list.[87]

While this acknowledgement is welcome, the life sciences sector's ability to carry out world-leading research and development in the UK is supported by a wide variety of roles which are not readily available in the UK labour market. For example EEA nationals are essential to plug skills gaps in translational medicine, clinical pharmacology and novel therapies.[88] Specific roles such as Qualified Persons for Pharmacovigilance (QPPV) are also highly competitive, in which the UK competes against other EU states from a limited pool in recruitment processes that take up to 12 months to complete. If the UK diverts from EU regulation in this area, these roles will become even more difficult to fill as demand increases significantly. [89] It is vital that the sector is able to continue to access this skills pool from abroad if the UK is to maintain its position as a life sciences centre.

It is welcome the government has lowered the salary threshold to £25,600 and added further flexibility for people with a PhD in STEM subjects or roles on the shortage occupation list. This should enable the life sciences sector to hire people to fill key roles such as laboratory technicians and junior researchers. It will be important to ensure that the new system operates in a simple and timely way for businesses and we await further detail on the application process. Short-term mobility of staff and travel for researchers to collaborate across borders is vital for the UK's life sciences industry. The UK-EU future economic relationship must protect such mobility.

The proportion of non-UK employees working in biopharmaceutical companies in the UK ranges from 17% to 41%, with SMEs employing significantly higher proportions. Businesses currently access people and skills from outside the EU through the combination of a highly restrictive non-EU immigration system, via the Tier 2 visa route and EU free movement. The current Tier 2 visa system is a prohibitively complex, time consuming and expensive process to navigate. This makes it inaccessible to most companies. Small and medium-sized companies are particularly badly affected.[90]

Insights from overseas

Switzerland: a popular destination for life sciences professionals…

- Coupled with a high standard of living and a pool of talent that spreads across three countries, Switzerland is seen as an attractive location for international life sciences businesses.[91]

- Nevertheless, accessing local talent is a key challenge in Switzerland so attracting global talent is a key priority.[92] Visa systems are complex and can prevent businesses from getting the staff they need.[93]

France: a lower proportion of non-national talent…

- France has a much lower proportion of non-national talent, partly because recruitment programmes in the sector often operate closely with public research laboratories, engineering schools and universities, all of which remain essentially national structures.[94]

Singapore: opening the doors to international talent…

- Singapore's Economic Development Board announced in July 2019 that it will launch a two-year pilot programme to provide "high potential technology firms to access business networks and the talent needed to set up new teams in the country. The pilot, which commenced in Q4 2019 set out to target companies in growth areas including medtech, biotech, digital, agritech and fintech.

- Qualifying firms have the Employment Pass (EP) applications of "core team members" facilitated under the programme, the agencies said. These include professionals with skills in "frontier technology" such as Data Science, Artificial Intelligence, Cybersecurity and the Internet of Things.[95]

- The pilot was welcomed by businesses in the sector. Many believe it is necessary to given that the rapid growth of medtech has outstripped the availability of local talent needed to support it.[96]

US: a long-term plan to improve access to STEM education…

- The Trump administration has signalled a recognition of the importance of STEM skills as a driver of jobs and prosperity. The US government published a federal

five-year strategy in 2018 to improve access to high-quality STEM education and to make the country a global leader in STEM literacy, innovation, and employment.

- The government has re-chartered the Committee on STEM Education under the National Science and Technology Council (NSTC) to provide leadership for the nation in achieving the plan's goals. It has also directed agencies to prioritise STEM workforce education and training in their fiscal year 2020 budget requests.[97]

Key success measures

- Access to STEM skills critical to life sciences roles
- Provision and quality of early talent programmes (apprenticeships, student placements, graduates, PhDs and post-doctorates)
- An approach to migration and mobility that supports the life sciences sector

Recommendations

The UK should build a reputation for the best home-grown skills and talent in life sciences:

- In line with the Life Sciences 2030 Skills Strategy, establish a leadership group comprised of industry, government and key stakeholders to be charged with overseeing the Strategy's delivery.
- Turn the Apprenticeship Levy into a Skills and Training Levy that will support higher levels of investment in training.
- Use the National Skills Fund to ensure it can match the scale of the reskilling challenge.

The UK should be a magnet for international life sciences talent:

- Roles on the Shortage Occupation Lists should qualify for a work visa without meeting skill or salary thresholds.
- The new immigration system must be accessible and affordable to employers of all sizes.
- Negotiate a mobility framework between the UK and the EU which preserves mobility for staff and researchers on the same basis as now.

Stability and competitiveness of the taxation system

Summary

The UK ranks highly on the quality of its taxation system and regulatory quality, with the Patent Box regime having proved a key pillar for the UK's attractiveness to life sciences firms. The R&D tax credit is a vital element of this picture and if its scope is widened to reflect modern research practices, it has the potential to be an engine for life sciences business investment in the UK.

Why it matters

Taking the decision to invest in the UK as a life sciences company requires not only assessing the direct factors which underpin life sciences success but the broader business environment.

The levels of business taxation and the regulatory environment are key determinants of business competitiveness. They shape the entrepreneurial climate for businesses to start-up and scale-up. International companies use them as factors for evaluating whether to invest and do business in the UK – a key enabler of future productivity growth. A stable and competitive tax and regulation climate facilitates more investment and innovation. All this adds up to more jobs being created and maintained, thus driving up living standards.

Where we are

R&D tax incentives must reflect modern research practices…

The UK currently ranks highly in terms of its tax system and regulatory quality.[98] Tax incentives represent a significant part of the UK government's support for private sector, with R&D investment, accounting for 61% of government support for business R&D in the UK in 2015.[99] The UK offers a suite of tax incentives for R&D investment including the R&D tax credit, Research and Development Allowances (RDAs) and the UK Patent Box Regime. These tax incentives incentivise different parts of the R&D process: the R&D tax credit is used to incentivise businesses undertaking R&D activity, RDAs are used to incentivise capital R&D investment and the UK Patent Box is used to incentivise the commercialisation of R&D.

The Patent Box Regime is a particular area where the UK stands out globally for the Life Sciences sector. The regime has long proved a key pillar of the UK's attractiveness for life sciences firms and it is essential that the government maintains this competitive advantage. For example, in 2012, GSK cited the UK Patent Box policy in its planned advanced manufacturing investment in the UK.[100] However, there is still much room for improvement in supporting later-stage development. Almost 40% of R&D investment across the UK economy is early-stage, compared to over 60% in Japan.[101]

The R&D tax credit is a vital element of this picture; pound for pound, the R&D tax credit drives more investment by business than it costs the Government, according to the CBI's

Untapped Investment report. The government should ensure the tax credit properly reflects the economy that we have. With this in mind, it is crucial that its scope is widened to reflect modern research practices, such as data-driven costs and the growing trend of subcontracting R&D activity. The tax credit could be the motor to propel the UK forward as a leading life sciences hub – but only if it keeps pace with the changing nature of R&D.

Insights from overseas

Switzerland: modernising its tax system and introducing a patent box…

- Switzerland offers a range of tax incentives at national and regional level to encourage growth. For instance, start-ups are partially exempt from corporate and capital taxes at a cantonal level for up to ten years, and pharmaceutical products are subject to just 2.5% VAT.[102]

- Switzerland has modernised its corporate tax system in recent years. The goal is to provide an attractive tax environment for companies and to ensure that taxation arrangements are in line with internationally established tax practices. A core element of the reform is the introduction of a patent box regime in accordance with the OECD standard. In the box, net profits from domestic and foreign patents and similar rights are to be taxed separately with a maximum reduction of 90% (rate at cantonal discretion).[103]

France: taking positive steps to improving the competitiveness of its tax system…

- France has also made positive changes to its tax system that has increased its competitiveness. This has includes making paying taxes less costly for business by decreasing the corporate income tax rate, increasing the rate of the competitiveness and employment tax credit (CICE) and decreasing the rates for the territorial economic contribution as well as social security contributions paid by employers.[104]

Singapore: favourable to start-ups…

- Singapore ranks second in the World Bank's Ease of Doing Business Index. Singapore also ranks 4th globally and 1st in the region for institutional protection of intellectual property in The World Economic Forum's Global Competitiveness Report.[105]

- The government has made starting a business easier by abolishing the corporate seals in 2019.[106]

- New companies and start-ups also qualify for tax exemption in their first three years.[107]

US: tax reform has mixed implications for life sciences firms…

- The passage of the Tax Cuts and Jobs Act of 2017 signalled the most comprehensive change to U.S. tax policy in decades. The corporate tax rate was reduced from 35 to 21 percent and lowered the rate for repatriating monies back to the US.[108] This could give life sciences additional resource to make capital investments, operational improvements, increase their benefits for hiring and retention, and engage in M&A activity.[109]

- The tax reform also requires businesses to amortise research expenses over a longer period. Previously, firms had the choice of taking an immediate deduction or capitalising the amounts and amortising over five years. The research credit was left mostly untouched throughout recent legislative process, but the new

requirement that research expenditures be capitalised and amortised between five and 15 years is likely to have a huge impact on life sciences organisations heavily invested in those activities.[110]

Key success measures

- Stability and competitiveness of the tax and regulation climate
- Strength of IP protections
- Position in World Bank Ease of Doing Business Index

Recommendations

Deliver the world's most competitive R&D tax credit:

- Ensure that the R&D tax credit keeps up with modern practices by widening the scope of eligibility for the R&D tax credit in the following ways:

    1. **Include subcontracted R&D within eligible spend** to better reflect a growing trend in the partnering and diversification of R&D activity, matching what is already offered by 20 OECD countries, including the US and Japan.
    2. **Include data-driven costs, multi-disciplinary roles and upfront work to define research questions as eligible R&D expenditures.** This would accelerate the UK's ambition to be at the forefront of the data revolution and innovative research practices, including developing and using real-world-evidence.
    3. **Include R&D capital expenditure** to encourage businesses to locate R&D facilities in the UK and make it easier to grow a research business here.
    4. **Introduce a scale-up transition mechanism to help businesses that are seeking to grow in the UK**, but currently face a sharp drop in R&D tax credits when they move from the SME scheme at a critical point in their growth.
    5. **Include costs for upskilling and retraining staff** to better support wider objectives as well as ensuring staff for R&D have the necessary skills.

- Review the availability of data on R&D expenditure to ensure the effectiveness of the R&D tax credit continues to be monitored appropriately.

- The government should ensure the R&D tax credit is internationally recognised as world-class by regularly benchmarking the UK's regime against international peers. This will guarantee it is the UK that secures private sector R&D investment and its associated benefits.

Summary of recommendations

Government backing of the sector

The government should ensure that implementation of the LSIS is joined-up across government and integrated with other relevant aspects of the Industrial Strategy; government should be held to account on ensuring that the UK is a world leading destination for life sciences.

- Progress on the implementation of the LSIS should be monitored regularly by the Life Sciences Council. The Secretary of State for Health and Social Care should make an annual statement to Parliament setting out current performance.

Strength of the research and innovation framework

The establishment of a UK Advanced Research Projects Agency (UK ARPA) has the potential to supercharge the UK's research ecosystem and enable the UK make breakthrough developments in health and life sciences incredibly marketable. Government must focus on three areas to unlock these benefits and make UK ARPA a success:

1. The new agency cannot be a flash in the pan, so long-term funding is non-negotiable for success: government must have a long-term framework for funding and ensure that it uses its funding power to catalyse regional growth.

2. Creating a new culture for developing high-reward innovation should be prioritised: the new agency must operate within a strong innovation ecosystem, establishing close links with UKRI, while developing products with a clear focus on the customer.

3. Business and government engagement must lay at the heart of UK ARPA strategy: this will create a new global innovation brand for the UK, allowing us to compete for the best talent. But proportionate IP legislations and contractual flexibility will be vital to making this work and business should be given regular opportunities to invest in products created by the new agency.

The UK should be the best place in the world to trial and bring new medicines, diagnostics and devices to market:

- Ensure the consistent and unified adoption of a single cost/contact process across NHS trial sites, including across the devolved nations.

Use funding announced at Budget to deliver an ambitious end-to-end research and innovation strategy that grows support for development, commercialisation and adoption:

- HM Treasury should use the Spending Round to announce a financial framework with the objective of providing long term certainty for business research and innovation investment.

- UKRI and DIT should develop a compelling high-level pitch on 'why the UK is the best place to locate and grow your R&D activity' and strengthen international communication of this pitch to court international investment.

- BEIS should establish Accelerate UK – a new UKRI council with strategic responsibility for innovation adoption. Accelerate UK would establish a clear home for innovation adoption in government.

    - Rather than adding another body to a fractured landscape, Accelerate UK would be tasked with strategic join up with existing initiatives, such as Be the Business, Made Smarter and Growth Hubs, to bring support for innovation adoption under one clear banner – improving business navigation of a fragmented system and enabling strategic planning and delivery.

- In the wake of COVID-19, BEIS and UKRI must continue action to protect R&D capabilities and minimise scarring effects, ensuring that businesses and universities have the confidence and capability to restart disrupted R&D activities.

Ensure the UK maintains continued involvement with EU Framework Programmes following its exit from the EU.

- HM Treasury should earmark sufficient funding at the next Spending Round to associate fully in Horizon Europe.

A flexible healthcare system keeping pace with changing needs

The NHS should be unrivalled as a national champion for bringing innovative medicines, treatments and healthcare technology and services to patients:

- With a single clear thread through the Life Sciences Industrial Strategy and alignment across government departments through arms-length bodies such as NICE and NHS England, the NHS should act as an anchor customer pioneering and championing the rapid availability of new innovative medicines, treatments and services by patients and local NHS, balancing the need for a sustainable and thriving life science ecosystem with cost effectiveness – without constraint by a race to the bottom on cost.

The UK should aim to be a world leader in data-driven healthcare:

- Existing Initiatives to drive digital transformation in the NHS and responsibly use health data to propel the development of patient-centred healthcare breakthroughs in the UK should continue apace.

- Improve the attractiveness of the NHS as a place for digital professionals to start and build a successful career.

Access to talent

The UK should build a reputation for the best home-grown skills and talent in life sciences:

- In line with the Life Sciences 2030 Skills Strategy, establish a leadership group comprised of industry, government and key stakeholders to be charged with overseeing the Strategy's delivery.

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- Use the National Skills Fund to ensure it can match the scale of the reskilling challenge.

The UK should be a magnet for international life sciences talent:

- Roles on the Shortage Occupation Lists should qualify for a work visa without meeting skill or salary thresholds.
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Stability and competitiveness of the taxation system

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    2. **Include data-driven costs, multi-disciplinary roles and upfront work to define research questions as eligible R&D expenditures.** This would accelerate the UK's ambition to be at the forefront of the data revolution and innovative research practices, including developing and using real-world-evidence.
    3. **Include R&D capital expenditure** to encourage businesses to locate R&D facilities in the UK and make it easier to grow a research business here.
    4. **Introduce a scale-up transition mechanism to help businesses that are seeking to grow in the UK**, but currently face a sharp drop in R&D tax credits when they move from the SME scheme at a critical point in their growth.
    5. **Include costs for upskilling and retraining staff** to better support wider objectives as well as ensuring staff for R&D have the necessary skills.

- Review the availability of data on R&D expenditure to ensure the effectiveness of the R&D tax credit continues to be monitored appropriately.

- The government should ensure the R&D tax credit is internationally recognised as world-class by regularly benchmarking the UK's regime against international peers. This will guarantee it is the UK that secures private sector R&D investment and its associated benefits.

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Produced by Andy Williams
To share your views on this topic or ask us a question, contact:

Andy Williams
Senior Sector Adviser
andy.williams@cbi.org.uk