BIA response to the Science and Technology Committee science funding inquiry

September 2018

UK BioIndustry Association

1. Key points

- The UK is globally recognised as a world leader in the life sciences. The sector has a great depth and breadth, and consistently invests more in R&D than any other in the UK. With £4.1bn invested in R&D in 2016, the sector will have a major role in the reaching the target for the UK to invest 2.4% of GDP in R&D. The government is therefore right to support the sector.
- The Industrial Strategy and the Life Sciences Sector Deal set out the life sciences as one of the key sectors central to the UK's economic future. As UKRI has been tasked with delivering the 2.4% target against these priorities, it has a vital role in delivering part of the Industrial Strategy.
- **Recommendation: UKRI should clearly set out in its strategy how it will work to deliver the sectoral priorities identified in the Industrial Strategy and Sector Deals.**
- To deliver targeted support to the sectors in the line with the Industrial Strategy and Sector Deal, UKRI and its constituent Councils need to employ tailored funding streams. In many cases, these already exist with proven effectiveness, such as the Biomedical Catalyst.
- **Recommendation: UKRI and its Councils should continue to commit to sector-specific funding programmes to provide consistency and confidence to researchers and innovators.**
- The Life Sciences Industrial Strategy and the newly formed Life Sciences Council provide the long-term vision for the sector and could deliver the high-level of engagement needed to ensure there is coordination between UKRI investments and the sector needs to avoid one-off ineffective investments.
- **Recommendation: The Life Sciences Council should have a formal role in the setting of UKRI funding priorities and strategy to ensure Industrial Strategy priorities are delivered.**
- The UK is in a competitive race to establish the global third bioscience cluster. To enhance its position, the development of a UK cluster should be at the centre of bioscience funding policy. While innovative bioscience companies are spread around the country, the centre of gravity of the UK's cluster will realistically be in the South East.
- **Recommendation: To maximise the value of public investments, UKRI funding should take advantage of and build on existing strengths, wherever it is based.**
- Innovate UK grants and the Biomedical Catalyst provide important funding for the sector. There is strong evidence to demonstrate the effectiveness of both. Through the Biomedical Catalyst, grants to businesses totalling £130m leveraged over £100m of additional private capital. In addition, those companies went on to raise over £1bn in further private finance.
- While funding programmes open to all scientific disciplines may encourage cross-disciplinary innovation that would otherwise risk not receiving funding, open funding programmes must not replace sector specific funding.
- **Recommendation: The government should commit to the continuation of the Biomedical Catalyst beyond 2020-21 and to delivering on its promise of a substantial increase in the budget of Innovate UK.**

- The ISCF is a welcome initiative and if implemented correctly will help boost the UK's global competitive advantage in life sciences. Increased transparency in the decision-making process for future ISCF waves would enable business to better engage with UKRI throughout the process and enable greater cooperation across the sector.
- **Recommendation: UKRI and its Councils should publish details on how its funding programmes, including the ISCF, are conducted and assessed, and the names of those on the assessment and decision-making committees.**
- To reach the 2.4% target, business R&D investment must increase. The UK's overall commercial environment has a vital role in encouraging business investment, including immigration rules, the tax regime, and the availability of finance.
- **Recommendation: The government should benchmark the R&D tax credits system to ensure it remains internationally competitive to attract investment, and its coverage of eligible costs remains relevant to R&D in the 21st century.**
- **Recommendation: The government should adjust the Patent Box rate to maintain at least ten percentage points difference between it and the standard corporation tax rate to ensure it remains internationally competitive to attract investment.**
- **Recommendation: As pension funds are well-placed to be patient investors in innovation and could contribute significantly to the 2.4% target, the government should work proactively to enable pension fund investment in innovative companies.**

2. Introduction

2.1. The BioIndustry Association (BIA) is the trade association for innovative life sciences in the UK. Our goal is to secure the UK's position as a global hub and as the best location for innovative research and commercialisation, enabling our world-leading research base to deliver healthcare solutions that can truly make a difference to people's lives.

2.2. Our members include:

- Start-ups, biotechnology and innovative life science companies
- Pharmaceutical and technological companies
- Universities, research centres, tech transfer offices, incubators and accelerators
- A wide range of life science service providers: investors, lawyers, IP consultants, and communications agencies

2.3. We promote an ecosystem that enables innovative life science companies to start and grow successfully and sustainably. The life science sector has a great depth and breadth: from a strong and emerging regenerative medicine and cell therapy sector, to specialist biomanufacturing companies developing therapies for cancer treatment, to personalised treatments and new antimicrobials. The sector also includes technologies such as engineering (synthetic) biology and industrial biotechnology, which are not only leading to new types of therapeutics but new production methods in a range of industries beyond medicine, from agriculture to clean growth. These innovations, made possible by our deepening understanding of biology, is a key part of the solution to the UK's productivity puzzle.

2.4. The BIA welcomes the opportunity to respond to the House of Commons Science and Technology Select Committee's timely inquiry into the balance and effectiveness of research and innovation spending. In this submission, we seek not to dictate what the correct balance of funding should be, but to comment on what factors UK Research and Innovation should take into account when determining funding priorities.

2.5. The UK is globally recognised as a world leader in the life sciences. The sector invests more in R&D than any other in the UK (£4.1 billion in 2016[1]). Beyond the benefits of better health outcomes for patients, improved living standards, and rewarding high-value jobs spread across the UK, this competitive advantage can support long-term sustainable economic growth across the whole country.

2.6. An independent analysis by PwC estimated that the sector contributed £30.4 billion to the economy in 2015 and supported 482,000 jobs.[2] The same analysis showed that workforce productivity in the sector is twice the UK average, with Gross Value Added (GVA) per employee equalling £104,000. The sector sustains high-quality jobs across the UK, with two-thirds outside London and the South East.[3]

2.7. The overall life science and business environment in the UK is vital for these benefits to continue to be realised. R&D in the sector is driven by the full life sciences ecosystem, involving SMEs, multinational companies, charities, universities and academics, venture capitalists, public funders, service providers and industry networks. The ecosystem can only thrive through a combination of factors, including a world-class science base, a strong STEM education system, a flexible immigration system that allows companies and organisations to access top global talent, and a business environment that encourages innovative companies to start and grow as well as attracting foreign investment. Government policy initiatives, such as the Life Science Industrial Strategy, Life Science Sector Deal, and the Patient Capital Review, adds to the strength of the ecosystem and sends a positive message globally that the UK government intends to support the sector in the long term. This helps attract foreign R&D investment and is particularly important with the uncertainties caused by Brexit.

3. The role of UKRI in delivering government priorities

3.1. In November 2017, the government published its Industrial Strategy White Paper with the objective to "create an economy that boosts productivity and earning power throughout the UK". It identified the five foundations of productivity: ideas; people; infrastructure; business environment; and places. It also prioritised specific sectors to receive targeted support through Sector Deals, one of which was life

[1] Office for National Statistics (2017), *Business enterprise research and development, UK: 2016*: https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/businessenterpriseresearchanddevelopment/2016 [Note the figure given is for the pharmaceutical sector and does not capture all areas of life sciences R&D]
[2] PwC (2017), commissioned by ABPI, BIA, BIVDA and ABHI, *The economic contribution of the UK life sciences industry*: https://www.abpi.org.uk/media/1371/the_economic_contribution_of_the_uk_life_sciences_industry.pdf
[3] HM Government (2017), *Strength and opportunity 2017*: https://www.gov.uk/government/publications/bioscience-and-health-technology-database-annual-report-2017

sciences. These are sectors of the economy that have the greatest potential to drive growth and prosperity.

3.2. As part of the ideas foundation, the government committed to raise UK investment in R&D to 2.4% of GDP by 2027. The Industrial Strategy Challenge Fund was created as a part of this foundation "to capture the value of innovation".[4]

3.3. UK Research and Innovation (UKRI) has been tasked with delivering these commitments, giving it an important role in delivering part of the Industrial Strategy. This has an important consequence for the determination of balance in research and innovation funding, as the Industrial Strategy, determined by central government, has established the sectors key to the UK's economic future. Moreover, it is not clear that UKRI was set up to, or should, make the strategic trade-offs needed between societal and economic investments between for instance, health and defence research. These broader discussions necessitate central government discussion above and beyond BEIS and should be resolved at the cabinet table.

3.4. **Recommendation: UKRI should clearly set out in its strategy how it will work to deliver the sectoral priorities identified in the Industrial Strategy and Sector Deals.**

3.5. To deliver targeted support to the sectors in line with the Industrial Strategy and Sector Deals, UKRI and its constituent Councils will need to employ tailored funding streams. In many cases, these already exist; for example, the Biomedical Catalyst (see Annex 1) has been established since 2011 and is proven as an effective funding programme. Where tried and tested mechanisms exist, they should be utilised as this reduces complexity for academic and industry applicants who are familiar with the programmes. In other cases, new programmes will need to be developed. The crucial factor is that they must be sector-specific to deliver the targeted support envisaged in the Industrial Strategy.

3.6. **Recommendation: UKRI and its Councils should continue to commit to sector-specific funding programmes to provide consistency and confidence to researchers and innovators.**

4. Ensuring UKRI decisions are informed by experts within sectors

4.1. The Life Sciences Industrial Strategy, published in August 2017 after an extensive consultation process coordinated by Professor Sir John Bell, brought the sector together under a unified vision for the future of UK life sciences. Several initiatives proposed in the Strategy were backed by the government in wave 1 of the ISCF and in the first phase of the Life Sciences Sector Deal in December 2017. Industry and government continue to work together on the implementation of the Sector Deal through the Life Sciences Council, a high-level steering group chaired by the Secretaries of State for Business, Energy and Industrial Strategy and Health and Social Care. The Council is supported by several working groups, including the Life Sciences Industrial Strategy Implementation Board.

[4] Government press release (2017), *Government unveils Industrial Strategy to boost productivity and earning power of people across the UK*, https://www.gov.uk/government/news/government-unveils-industrial-strategy-to-boost-productivity-and-earning-power-of-people-across-the-uk

4.2. The Life Sciences Industrial Strategy and the Life Sciences Council provide the long-term vision for the sector and could deliver the high-level of engagement needed to ensure there is coordination between UKRI investments and sector needs, and a strategic link between the ISCF competitions. This would avoid one-off ineffective investments in specific technology areas without follow-through, while maximising the effectiveness of ISCF funding. Aligning the industry priorities set out in the Life Sciences Industrial Strategy would encourage further private R&D investment, without which the 2.4% target cannot be reached.

4.3. **Recommendation: The Life Sciences Council should have a formal role in the setting of UKRI funding priorities and strategy to ensure Industrial Strategy priorities are delivered.**

5. Regional public funding of R&D

5.1 The Life Sciences Industrial Strategy sets out the vision – aligned with the BIA's[5] – for the UK to be a global life sciences hub. The US has the top two leading bioscience clusters in the world (Boston and the Bay area). While other states have attempted to create clusters of their own, they have failed to reach critical mass despite substantial investments. In Europe, many other countries besides the UK are competing to create the third global bioscience cluster, but it is unrealistic to imagine that all these potential clusters will make it. Given the US experience, one, perhaps two, will get there in the next ten years.

5.2 The UK is currently at the forefront of European bioscience.[6] To maintain and enhance this position, the development of a UK cluster should be at the heart of bioscience funding policy. There are innovative bioscience companies supporting thousands of highly skilled jobs spread all around the country (see Figure 1 below). However, realistically, the centre of gravity of the UK's bioscience cluster will be in the South East and will have a geographically-broad hinterland of support services.

5.3 The UK cluster allows companies and researchers to operate in an environment where there are multiple opportunities for interaction and collaboration. This environment allows world-leading research to thrive, attracts top global talent and the foreign investment required to reach the 2.4% target. To maximise the value of public investments, R&D funding should continue to take advantage of and build on existing strengths. Ultimately, the best value for the taxpayer will be achieved by supporting the best science, wherever it is based.

5.4 Recommendation: To maximise the value of public investments, UKRI funding should take advantage of and build on existing strengths, wherever it is based.

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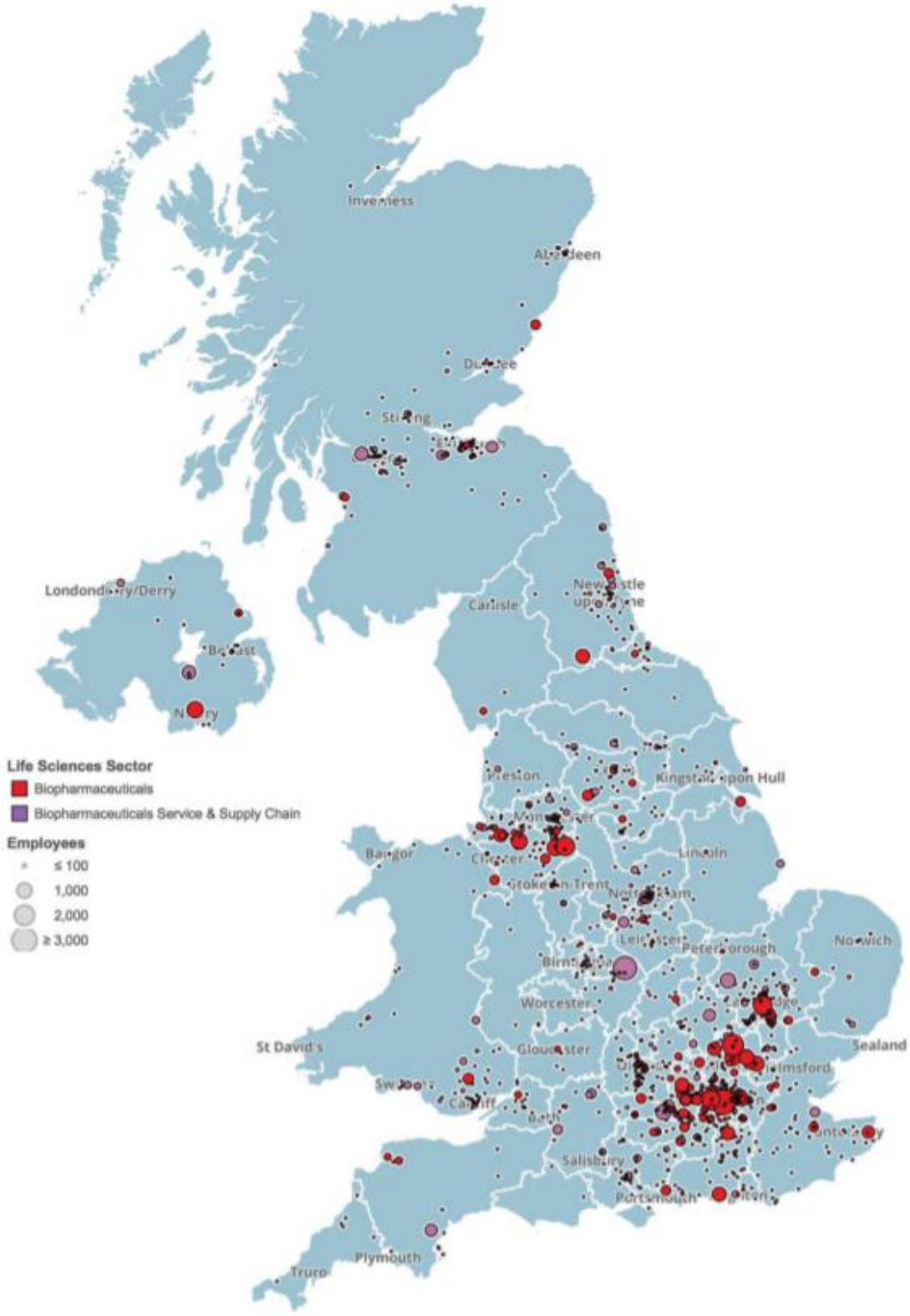
[5] BIA (2015), *A vision for the UK life sciences sector in 2025*: https://www.bioindustry.org/resource-listing/a-vision-for-the-uk-life-sciences-sector-in-2025.html

[6] BIA (2018), *Pipeline Progressing: The UK's Global Bioscience Cluster in 2017*: https://www.bioindustry.org/resource-listing/pipeline-progressing_webfinal-pdf.html

Figure 1: Map of the life science sector employment in the UK[7]



[7] HM Government (2017), *Strength and Opportunity 2017*, p. 30: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707072/strength-and-opportunity-2017-bioscience-technology.pdf

6. The effectiveness of public spending on R&D

6.1. Public investment boosts private R&D investment. For every £1 spent by government on R&D, private R&D output increases by 20p per year in perpetuity.[8] Public R&D investment increases private investment, which in turn increases the capacity of the private sector to utilise public funding. In this way, the effectiveness of the public investment is amplified. There are several public funding programmes available to UK life science companies (see Annex 1 for more details), including:

- Innovate UK technology grants
- Biomedical Catalyst
- Small Business Research Initiative (SBRI)
- Newton Fund
- Industrial Strategy Challenge Fund (ISCF)

6.2. **Innovate UK technology grants.** There has been a welcome increase in Innovate UK's technology grants expenditure of over 200% between 2011/12 to 2017/18, however, this was from a very low starting point of only £301m[9]. In addition, while Innovate UK's budget is set to increase from £714m in 2017-18 to £829m in 2018-19 and £906m in 2019-20, a significant proportion of these annual budgets has been allocated to ISCF wave 2: £91m in 2018-19 and £211m in 2019-20, which funds academic and business innovation.[10] Furthermore, the ISCF is now to be administered centrally through the UKRI. As such, the government has not yet delivered on its Autumn Statement 2016 commitment of a "substantial increase in grant funding through Innovate UK".[11]

6.3. Innovate UK has a formidable reputation with industry and has proven highly effective at delivering government support for strategically important areas of technology. Recent data on the valuations of companies that have been awarded Innovate UK grants, compiled by Beauhurst, shows that companies that have received both an Innovate UK grant and equity investment achieve a higher market valuation on average than companies that have only received equity investment.[12] The data also shows that Innovate UK grant recipients that have attended an accelerator programme are "more likely to progress to growth stage or exit, and significantly less likely to die". This extends to UK's scale-up companies as well: 18% of scale-ups that received Innovate UK grants continued to exit, compared to the average exit rate for scale-ups of 10%. The data demonstrates the effectiveness of Innovate UK grants to support innovative companies across all sectors.

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[8] Campaign for Science and Engineering (2014), *The Economic Significance of UK Science Base*: http://www.sciencecampaign.org.uk/resource/UKScienceBase.html

[9] This is half of the budget of the Medical Research Council at the time, and it should be noted that Innovate UK funds all sectors, not just life sciences.

[10] BEIS (2018), *The allocation of funding for research and innovation*: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731507/research-innovation-funding-allocation-2017-2021.pdf

[11] Hm Treasry (2016), *Autumn Statement 2016*: https://www.gov.uk/government/publications/autumn-statement-2016-documents/autumn-statement-2016#public-spending-2

[12] Beauhurst (2018), *The relationship between equity and Innovate UK grants*: https://about.beauhurst.com/blog/innovate-uk-grants-equity-accelerators/

6.4. **Recommendation: The government should commit to delivering on its promise of a substantial increase in the budget of Innovate UK.**

Case study 1: Puridify and Innovate UK

BIA member Puridify Ltd, a bioprocessing company formed in 2013 as a spin-out from University College London, has been the lead applicant on six successful Innovate UK grant awards totalling over £5m in project costs. These awards have come from several different Innovate UK competitions calls, including SMART, Technology-inspired innovation (Biosciences), and the Industrial Biotechnology Catalyst.

Puridify founder and CEO, Dr Oliver Hardick describes the importance of these Innovate UK grants to the company's development:

> "The Innovate UK grants supported Puridify through the life cycle of its early years, enabling the company to grow from two to over 20 employees and develop its technology. This led to the company being acquired by multinational GE Healthcare, which has grown the UK team and invested significant capital into the opening of a new UK manufacturing facility, from where our first product will be launched. We now have a long-term plan in place to continue investment in development and manufacturing from our UK facility creating high value products to export to a global market."

6.5. **Biomedical Catalyst.** There is robust evidence to demonstrate that investment into the bioscience sector through the Biomedical Catalyst is an excellent use of public funds. Through the Biomedical Catalyst, grants to businesses totalling £130 million leveraged over £100 million of additional private capital for the projects. In addition, those companies went on to raise over £1bn in further private finance.[13] It is important that the government commits to its continuation beyond 2020-21.

6.6. **Recommendation: The government should commit to the continuation of the Biomedical Catalyst beyond 2020-21.**

[13] BIA (2015), *The Biomedical Catalyst: making the case to continue*: https://www.bioindustry.org/uploads/assets/uploaded/11a19dc6-ed68-422d-ac3a3a2dce128718.pdf

Case study 2: KalVista and the Biomedical Catalyst

Over the last 6 years, KalVista Pharmaceuticals has been awarded approximately £5m through two Biomedical Catalyst grants. These grants, received in the company's early years, enabled KalVista's first drug discovery efforts that otherwise would have not been possible.

Since the initial award in 2012, KalVista has made substantial progress in its drug programmes and is even closer in bringing these innovative medicines to patients who need them. The company has subsequently raised over £75 million in equity financing and has returned approximately £20 million each year to the UK economy in the form of jobs and other spending. KalVista is now a publicly listed company in the US and recently announced a £600 million partnership with one of the world's leading pharmaceutical companies. Two-thirds of KalVista employees are based in the UK, and as the company grows, KalVista anticipates that the company will continue to maintain the majority of its operations in the country. The opening of the company's new facility at the Porton Science Park in September 2018 is just another step in this UK growth. KalVista's UK drug discovery and development group will be based in this new facility and will continue its work of developing new medicines for diseases with significant unmet need.

6.7. **ISCF.** Due to the recent awards to life science companies in waves 1 and 2, it is too early to analyse how efficient these challenges have been in leveraging private investment. However, consistency and continuity in funding should be applied to all funding streams: to maximise the efficiency of the ISCF, each wave should include funding for the life sciences sector and a strategic link should be made between the competitions so that they build upon one another.

6.8. The process behind each ISCF wave has been different to date. The opportunity for companies to submit Expressions of Interests (EOIs) for wave 3 was welcome. However, the process through which the EOIs were selected could be more transparent. For example, how the EOIs are evaluated and by whom are not yet public knowledge. This contrasts with the Research Councils' peer review panels and boards.[14] Increased transparency for future ISCF waves would enable business to better engage with UKRI throughout the process and enable greater cooperation across the sector as well as allow better alignment between UKRI-led work and overall and sector specific Industrial Strategies.

6.9. **Recommendation: UKRI and its Councils should publish details on how its funding programmes, including the ISCF, are conducted and assessed, and the names of those on the assessment and decision-making committees.**

6.10. **SBRI.** The small size and short timelines of SBRI contracts usually make them better suited to health devices, diagnostics, and health service delivery competitions rather than drug discovery. However, by offering companies contracts for achieving milestones (e.g. identifying a suitable candidate for a

[14] See e.g. MRC Research Boards and Panels: https://mrc.ukri.org/about/our-structure/research-boards-panels/

vaccine) as part of a longer drug development timescales, SBRI contracts could be used in a limited capacity for life sciences R&D.[15] However, as government departments are not the customers of these new treatments, SBRI contracts are unlikely deliver the same outcomes as Innovate UK and Biomedical Catalyst awards.

6.11. **Funding the ecosystem.** In addition to these funding programmes, the Catapult centres are valuable components of the life science ecosystem, helping to bridge the gap between invention and commercialisation by providing facilities[16] and technologies many SMEs could not afford on their own. It is important that their world-leading services are maintained, kept relevant to the needs of industry, and promoted widely to SMEs. The recent funding announcement of £780m to expand the Catapult centres across the UK was welcome.[17]

6.12. The Medical Research Council (MRC) and the Biotechnology and Biological Sciences Research Council (BBSRC) support the UK's science base by providing competitive research grants and career awards to scientists. The National Institute for Health Research (NIHR) also plays a valuable role supporting clinical research in the NHS. These organisations are well coordinated and form a core part of the UK's life sciences ecosystem. In the recent budget allocations, the MRC's and BBSRC's core budgets remain largely flat from 2017/18 through to 2019/20.[18] If the Research Councils become increasingly dependent on bidding for cross-UKRI funding to fund their priorities, there is a risk it will be harder for the Councils to meet their commitments to long-term projects and research institutes. Year-on-year dedicated funding for the MRC, the BBSRC, and NIHR is important to underpin the research base and crucial to maintain the UK's globally competitive life science ecosystem.

7. The effectiveness of government levers to encourage innovation

7.1. UK R&D investment as a percentage of GDP is currently around 1.67%, with public investment accounting for 0.46% and private investment accounting for 1.21%.[19] Private investment therefore accounts for 70% of UK R&D investment, or approximately a ratio of 1:2 public: private, which is consistent with many other developed countries.[20] The pharmaceutical sector is consistently the

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[15] Innovate UK has run one SBRI competition for vaccine development for tropical diseases. Innovate UK (2016), *New vaccines for global epidemics: development and manufacture*, https://sbri.innovateuk.org/competition-display-page/-/asset_publisher/E809e7RZ5ZTz/content/new-vaccines-for-global-epidemics-development-and-manufacture/1524978

[16] For example, the Stevenage Cell and Gene Therapy Manufacturing Centre and the Darlington National Biologics Manufacturing Centre provide production facilities for complex and advanced medicines.

[17] UKRI (2018), *Chancellor announces funding for Catapult network*: https://www.ukri.org/news/chancellor-announces-funding-for-catapult-network/

[18] BEIS (2018), *The allocation of funding for research and innovation*: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731507/research-innovation-funding-allocation-2017-2021.pdf

[19] Campaign for Science and Engineering (2018), *R&D target is clear but a plan is needed*: http://www.sciencecampaign.org.uk/news-media/press-releases/r-d-target-is-clear-but-a-plan-is-needed.html

[20] For example, in the United States and Switzerland, which invest 2.7% and 2.9% of GDP on R&D respectively, business investment accounts for 71.5% of the total spend in both countries. See UNESCO Institute for Statistics: http://uis.unesco.org/apps/visualisations/research-and-development-spending/

biggest R&D investor.[21] In 2016, the sector invested £4.1 billion into R&D.[22] This is approximately 18.5% of the total business R&D investment.

7.2. According to the Campaign for Science and Engineering (CaSE), to reach the government's 2.4% target, private and charitable investment must increase by 50% from around £22 billion in 2016 to £32 billion in 2027.[23] Business R&D investment increased by 5.6% (£1.2 billion) in 2016 compared to the previous year, suggesting this target is attainable.[24] In addition, fundraising by the UK's biotech sector is strong, demonstrating money will be available for sustained investment in coming years; recent BIA data shows UK biotech companies have already raised more than £1.5 billion in 2018, surpassing the 2017 annual total of £1.2 billion.[25] It is vital that this growth trajectory continues. However, the uncertainty of Brexit risks having a negative impact on business investment decisions.[26]

7.3. Public investment in R&D (conducted in both universities and businesses) is an effective lever to raise private investment but it cannot do this alone; the wider policy and commercial environment is equally important. The education system, immigration rules, transport and information infrastructure, tax regime, and the availability of finance are among the many areas of policy that we must get right if the UK is to achieve its R&D target. It is therefore right that the government employs a range of policy instruments to encourage innovation. Below we discuss the main ones for the life sciences sector.

7.4. **R&D tax credits**. The small and large business R&D Tax Credit schemes are often cited by BIA members as the most valuable form of innovation support offered by the government. Tax credits provide a minimal-bureaucracy system that rewards and amplifies companies' own investment in R&D. A 2015 government review of the regime estimated that for every pound spent on R&D tax credits, between £1.53 and £2.35 is additionally spent on R&D by UK companies.[27] The results are in line with previous international studies, which have found tax credits stimulate from around 0.3 to

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[21] Office for National Statistics (2017), *Business enterprise research and development, UK: 2016*: https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/businessenterpriseresearchanddevelopment/2016

[22] Ibid.

[23] Campaign for Science and Engineering (2018), *Research & Development funding across government*, p.3: http://www.sciencecampaign.org.uk/resource/case-submission-to-pac-r-d-across-government-inquiry.html

[24] Office for National Statistics (2017), *Business enterprise research and development, UK: 2016*: https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/businessenterpriseresearchanddevelopment/2016

[25] BIA (2018), *Biotech Financing Update June - August 2018*: https://www.bioindustry.org/resource-listing/biotech-financing-update-june---august-2018.html

[26] For example, GSK has estimated that the costs to implement the necessary operational changes due to Brexit is £70m over two to three years, with subsequent ongoing additional costs of around £50m per year. Giving evidence to the House of Commons Health Committee in December 2017, Phil Thomson, President, Global Affairs at GSK, said that the money used for Brexit preparations could be used for clinical trials or to expand GSK's cancer portfolio instead. See GSK (2018), Annual Report 2017, p. 55: https://www.gsk.com/media/4751/annual-report.pdf; and Health Committee (2017), Oral evidence: Brexit – medicines, medical devices and substances of human origin, HC 392, Q295: http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/health-and-social-care-committee/brexit-the-regulation-of-medicines-medical-devices-and-substances-of-human-origin/oral/76145.html

[27] HMRC (2015), *Evaluation of Research and Development Tax Credit*: https://www.gov.uk/government/publications/evaluation-of-research-and-development-tax-credit

around 3 times their value in R&D investment. As well as stimulating investment, R&D tax credits also form part of the wider tax regime which makes the UK an attractive location for R&D investment. They therefore contribute to achieving the 2.4% target by attracting globally mobile R&D investment that would otherwise locate elsewhere.

7.5. It is crucial to note that tax credits are particularly important for the survival of small companies with negative cash flows (i.e. pre-revenue), as they provide a non-dilutive source of finance. As the precise research project that will lead to innovation can be difficult to predict, R&D tax credits complement government grant-based schemes, such as the Biomedical Catalyst, by providing flexible funds for R&D that are not tied to a specific project. In this respect, tax credits and Innovate UK grants mirror the dual-funding system, which uses Research Council and Quality-Related block grants to support flexibility in academic research institutions and is enshrined in law through the Higher Education and Research Act 2017.

7.6. **Recommendation: The government should benchmark the R&D tax credits system to ensure it remains internationally competitive to attract investment, and its coverage of eligible costs remains relevant to R&D in the 21st century.**

7.7. **The Patent Box**. The Patent Box is another example of an industrial policy that has been highly effective in supporting R&D-intensive companies in the UK and ensuring that the products of R&D are exploited in the UK. Its policy intention was not to stimulate innovation *per se* but to "encourage companies to locate the high-value jobs and activity associated with the development, manufacture and exploitation of patents in the UK."[28] It enhances the international competitiveness of the UK tax system for high-tech companies that obtain profits from patents, which includes the life sciences sector, and is therefore a strong draw for international industry and investors. However, this must be seen in light of the rates in competitive countries, for example, Ireland (6.25%) and Belgium (6.98%). The lower rate of Corporation Tax under the Patent Box is 10% compared with the main rate of 20%. However, as the government makes welcome reductions in the headline Corporation Tax rate,[29] the relative value of the Patent Box decreases.

7.8. **Recommendation: The government should adjust the Patent Box rate to maintain at least ten percentage points difference between it and the standard corporation tax rate to ensure it remains internationally competitive to attract investment.**

7.9. **Patient Capital.** At a fundamental level, for companies to increase their investment in R&D to help reach the government's target they will require money to invest. And, due to the nature of R&D, that capital will generally need to be patient (long-term). The UK has historically lacked sufficient patient capital to support the growth of life science companies to become world-leaders. Addressing this challenge was the purpose of the Patient Capital Review, conducted by the Treasury throughout 2017.

[28] https://www.gov.uk/government/consultations/patent-box
[29] PM speech at the Bloomberg Global Business Forum: 26 September 2018: https://www.gov.uk/government/speeches/pm-speech-at-the-bloomberg-global-business-forum-26-september-2018

The BIA welcomed the government commitments in the outcome of the review, particularly the improvements to the Enterprise Investment Scheme (EIS) and its targeting to "Knowledge-Intensive Companies", the £6 billion additional finance for the British Business Bank to catalyse venture capital investment over the next ten years, and the commitment to work with the pension fund industry to address the concerns of businesses that pension funds do not invest in UK early-stage companies. With £2.2 trillion under management[30], UK pension funds are well placed to be significant patient investors in UK innovation. However, as the Patient Capital Review noted, they have moved away from investing in equity and investment in early-stage companies is minimal. Government action to address this – through addressing regulatory barriers and communicating the advantages of investing in innovative companies with great growth potential – would be low-cost for the taxpayer and deliver significant capital for innovation. The Committee should encourage the government to act quickly to increase private investment by pension funds.

7.10. **Recommendation: As pension funds are well-placed to be patient investors in innovation and could contribute significantly to the 2.4% target, the government should work proactively to enable pension fund investment in innovative companies.**

[30] OECD (2018), *Pension funds in figures:* http://www.oecd.org/daf/fin/private-pensions/Pension-Funds-in-Figures-2018.pdf

Annex 1: Funding programmes available to bioscience companies

Innovate UK technology grants

Innovate UK grants provide important funding to life science SMEs through core sector competitions, where competitions in the "Emerging and enabling technologies" and "Health and life sciences" categories are most relevant for life science companies. In addition, Innovate UK runs open funding programmes, which life sciences companies also can apply for. In 2017/18, the "Health and life sciences" core sector competitions awarded around £99m to companies.[31]

Biomedical Catalyst

The Biomedical Catalyst is a unique partnership between the Medical Research Council (MRC) and Innovate UK, and the current programme consists of £100m invested between 2016-17 and 2020-21. The Biomedical Catalyst aims to de-risk innovative science and commercialise ideas arising out of academia and industry, helping UK SMEs to develop into competitive and sustainable organisations. This accelerates the progress of novel products to market, facilitates onward investment and bridges "the valley of death".

Small Business Research Initiative (SBRI)

SBRI is a procurement programme where government departments challenge SMEs to come up with solutions faced by the public sector. SBRI awards are 100% funded contracts as opposed to grants. However, the contracts are usually smaller than grants, with £50-100k for phase 1 studies over 6 months and £250k-£1m for phase 2 studies over 18-24 months. Between 2009 and 2016, SBRI provided £352m in funding to 2164 different projects.[32] The NHS and the Department of Health accounted for 17% and 9% respectively, making health applications are significant proportion of SBRI contracts.

According to David Connell's review of the SBRI,[33] key examples of common competition themes within NHS England include:

- Improving the care of the diabetic foot ulcer – better prevention, diagnosis and treatment;
- Improving the efficiency and experience of outpatient services through better remote management of health and wellbeing;
- Child and maternal health – delivering safe, high quality, cost effective child and maternal health care;
- The GP of the Future – workload and demand management, diagnostics and earlier triage, self-care.

Similarly, the Department of Health has focused on care and devices contracts rather than drug discovery:[34]

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[31] Innovate UK (2018), *Annual Report & Accounts 2017/18*, p.86: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/724846/18.1000_InnovateR_A_Web_Final_v4.pdf

[32] David Connell (2017), *Leveraging public procurement to grow the innovation economy*, p. 43: https://www.gov.uk/government/publications/leveraging-public-procurement-to-grow-the-innovation-economy-an-independent-review-of-the-small-business-research-initiative-sbri

[33] Ibid, p. 96-7.

[34] Ibid, p. 101.

- Medicines management - supporting people to take the right medicines at the right time and as prescribed (up to £2m);
- Personal behaviour to address the impact of obesity and/or alcohol related health diseases (up to £2m)
- Renal - promoting patient empowerment and sustainability in kidney care, and managed in partnership with Devices for Dignity Health Technology Cooperative (D4D) (£3.6m);
- Enabling technologies for genomics sequence data analysis and interpretation (£10m) managed in partnership with Innovate UK and Genomics England.

Newton Fund

The Newton Fund builds research and innovation partnerships between UK and foreign organisations. The fund is part of the UK's official development assistance (ODA), or overseas aid budget, and consists of £735m to 2020/21, with partner countries providing matched funding.[35] The fund can help life science companies and particularly SMEs establish relationships with organisations in developing countries.

Industrial Strategy Challenge Fund (ISCF)

In wave 1, the "Leading-edge healthcare" challenge consisted of £181m with the aim to accelerate the development and patient access to new medicines and treatments, including new digital health products and technologies.[36] In wave 2, up to £210m is available through the "Data to early diagnosis and precision medicine" challenge, which aims to improve the use of data to support earlier diagnosis and the development of precision medicine;[37] whereas up to £98m is available through the "Healthy ageing" challenge, which aims to improve research and innovation that supports people as they age and their carers.[38] Expressions of interests for wave 3 are currently being evaluated by UKRI. Several life sciences calls were submitted.

[35] http://www.newtonfund.ac.uk/
[36] UKRI (2018), *Leading-edge healthcare*: https://www.ukri.org/innovation/industrial-strategy-challenge-fund/leading-edge-healthcare/
[37] UKRI (2018), *From data to early diagnosis and precision medicine*: https://www.ukri.org/innovation/industrial-strategy-challenge-fund/from-data-to-early-diagnosis-and-precision-medicine/
[38] UKRI (2018), *Healthy ageing*: https://www.ukri.org/innovation/industrial-strategy-challenge-fund/healthy-ageing/