RSB Policy Briefing:

Arguments in favour of public investment in UK research and innovation: Autumn 2016

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The UK as a global centre of excellence in life science

- The UK is an acknowledged centre of excellence – this benefits the people of the UK and improves lives worldwide, growing our resilience and influence. We must continue to build on recent gains and guard against erosion of the strong foundation of our science base.

- We have the population to help build a knowledge-, skills- and innovation-powered economy that delivers growth as well as improving lives by adding non-monetary value and quality of life benefits (financial and human capital). Science performance of UK 15-year old boys and girls is higher than the OECD average.[1] Similarly, with 43.5% of 24-65-year olds achieving at least a tertiary education qualification, the UK attainment is higher than the OECD average.[2] However, to truly capitalise on these strengths we also need to attract talented people from overseas to maintain and grow valuable research base and industry momentum.[3]

- The university research sector has invested in building excellence. The REF 2014 rated 76% of the submitted work as world-leading or internationally excellent.[4] The corresponding figure in Biological Science was 83%.[5] In achieving this, research has become increasingly international and collaborative. In 1981 UK science output was 90% domestic, whereas today <50% of papers are purely domestic. This is a growth in volume as well as proportion.[6]

[1] 521 vs 502 for boys and 508 vs 500 for girls. From: OECD (2016), Science performance (PISA) (indicator). doi: 10.1787/91952204-en (Accessed on 03 October 2016)
[2] Average highest level of education attained (tertiary, 34.97%). From: OECD (2016), Adult education level (indicator). doi: 10.1787/36bce3fe-en (Accessed on 03 October 2016)
[3] CaSE, Campaign for Science and Engineering (2016). Immigration: Keeping the UK at the heart of global science and engineering. (p. 35) http://www.sciencecampaign.org.uk/resource/caseimmigrationreport2016.html (Accessed 03 October 2016)
[4] REF, Research Excellence Framework (2014a). Research Excellence Framework 2014: the results. (p. 3) http://www.ref.ac.uk/media/ref/content/pub/REF%2001%202014%20-%20full%20document.pdf (Accessed on 13 October 2016)
[5] REF, (2014b). REF2014: Unit of assessment summary data. http://www.ref.ac.uk/media/ref/results/AverageProfile_5_Biological_Sciences.pdf (Accessed on 13 October 2016)
[6] Digital Science (2016), Digital Research Reports: The implications of international research collaborations for UK universities. (p. 2) https://figshare.com/articles/Digital_Research_Report_The_Implications_of_International_Research_Collaboration_for_UK_Universities/3029749 (Accessed 13 October 2016)

- UK foreign direct investment (FDI) capital expenditure in the life sciences has more than doubled between 2011 and 2015.[7] Overseas investment in the UK is important to the country's future success and it is vital to keep the UK attractive of such investment after the UK has left the EU.[8]

- The UK biomedical life sciences sector invests heavily in the UK, with over £4bn invested in 2014,[9] and with an export value and trade surplus of £30bn and £3bn, respectively.[10] The UK biomedical life sciences industry "encompasses almost 5,000 companies employing 180,000 people in the UK, generating an annual turnover of £60 billion".[11]

- In 2014, UK spending on R&D was 1.7% of GDP, which is less than the OECD average (2.38% of GDP) and the 2.9% spent by Germany.[12] Public investment in funded research dropped below 0.5% of GDP in 2015, which is below the G8 average – and less than any G8 country has invested in R&D in the past 20 years.[13] Public investment encourages private investment, and the economic benefit alone of investing in R&D is added to by societal returns that are twice or three times private returns. To continue the current level of public investment risks UK R&D excellence; productivity cannot grow from its current high level without support.

- In 2011-2012 the government invested £450m in agri-food R&D[14]; in 2012-2013 private investment in UK agri-tech was almost £500m[15]. The UK agricultural sector is worth in excess of £14bn and employs more than 500,000 people, contributing £9bn to the UK economy annually.[16] The 2016 Agri-Tech Catalyst awarded £16m to projects addressing global agricultural challenges.[17]

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[7] OLS, Office For Life Sciences (2016), Life Sciences Competiveness Indicators. (p. 16) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/523269/BIS-16-236-Office-for-Life-Sciences-OLS-life-science-competitiveness-indicators-report-May-2016.pdf (Accessed 13 October 2016)

[8] DIT, Department for International Trade (2016), UK remains number one investment destination in Europe. https://www.gov.uk/government/news/uk-remains-number-one-investment-destination-in-europe (Accessed on 03 October 2016)

[9] OLS, Office For Life Sciences (2016), Life Sciences Competiveness Indicators. (p. 25) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/523269/BIS-16-236-Office-for-Life-Sciences-OLS-life-science-competitiveness-indicators-report-May-2016.pdf (Accessed 13 October 2016)

[10] The Association of the British Pharmaceutical Industry (ABPI) and BioIndustry Association (BIA) (2016), Maintaining and growing the UK's world leading Life Sciences Sector in the context of leaving the EU: UK EU life sciences transition programme report, for the UK EU life sciences steering committee, 6th September 2016. (p. 3) http://www.abpi.org.uk/our-work/library/industry/Documents/UK-EU-Steering-Group-Report.pdf (Accessed on 13 October 2016)

[11] STC, Science and Technology Committee (2016-2017), EU regulation of the Life Sciences. (p. 2) http://www.publications.parliament.uk/pa/cm201617/cmselect/cmsctech/158/158.pdf (Accessed on 13 October 2016)

[12] OECD (2016), Gross domestic spending on R&D (indicator). doi: 10.1787/d8b068b4-en (Accessed on 03 October 2016)

[13] Science is Vital (2015), UK investment in science drops below 0.5% of GDP. http://scienceisvital.org.uk/2015/03/13/press-release-uk-science-funding-gdp/ (Accessed on 13 October)

[14] HM Government (2013). A UK strategy for agricultural technologies. (p. 3) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/227259/9643-BIS-UK_Agri_Tech_Strategy_Accessible.pdf (Accessed on October 14 2016)

[15] HM Government (2016). £16 million for new technologies to improve global food production and security. https://www.gov.uk/government/news/16-million-for-new-technologies-to-improve-global-food-production-and-security (Accessed on October 14 2016)

[16] HM Government (2016). £16 million for new technologies to improve global food production and security. https://www.gov.uk/government/news/16-million-for-new-technologies-to-improve-global-food-production-and-security (Accessed on October 14 2016)

[17] *Ibid.*

In the context of Exiting the EU

- As the UK prepares to exit the EU it must build new capacity, relationships and agreements to preserve its internationally relevant and excellent science base.

- The UK receives over £1bn annually from the EU in competitive R&D funding. There is an urgent need to mitigate potential loss of this funding to the research ecosystem given that analysis has shown a decline of £1bn in Research Council funding could cost £10bn in GDP losses.[18]

- The UK is the top destination for European foreign direct investment (FDI).[19]

- The UK is more reliant on EU science funding than higher investors, such as Germany, and without funds now obtained from the EU, the current UK science base will not remain financially self-sufficient.[20]

- Research income from the EU went up 169% during the decade spanning 2003-2004 to 2013-2014,[21] amounting to over £8 billion between 2006-2015.[22] Research Councils provide the largest proportion of research income to universities.[23] UK collaborations with the EU have grown faster than other international collaborations, and EU co-authors on UK papers increased from 43% in 1981 to >60% after 2011, with collaborative papers being more highly cited.[24]

- In 2014, the UK exported 54% of its pharmaceuticals to the EU – contributing the equivalent of £32m to the UK economy each day.[25] In 2015 44% of the total value of UK life science goods export was to EU nations.[26]

- The UK is a world-leader in biomedical research, yet 40% of competitive science funding of Oncology and Carcinogenesis is from EU funds.[27] Other life sciences core disciplines are more heavily reliant on competitive EU research funding, with 67% of funds for Evolutionary Biology coming from the EU.[28]

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[18] Haskel (2010), How much does publicly funded research contribute to UK economic growth? http://www.ceriba.org.uk/pub/CERIBA/CeribaPublicfundedresearch/Haskel_publicly_funded_research_and_economic_growth.pdf

[19] DIT, Department for International Trade (2016), UK remains number one investment destination in Europe. https://www.gov.uk/government/news/uk-remains-number-one-investment-destination-in-europe (Accessed on 03 October 2016)

[20] Digital Science (2016), Digital Research Reports: Examining implications of Brexit for the UK research base. (p. 4) https://figshare.com/articles/Digital_Research_Report_Examining_Implications_of_Brexit_for_the_UK_Research_Base_pdf/3383368 (Accessed on 13 October 2016)

[21] Universities UK (2015), Patterns and trends in UK higher education 2015. (p. 34) http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2015/patterns-and-trends-2015.pdf (Accessed 13 October 2016)

[22] Digital Science (2016), Digital Research Reports: Examining implications of Brexit for the UK research base. (p. 4) https://figshare.com/articles/Digital_Research_Report_Examining_Implications_of_Brexit_for_the_UK_Research_Base_pdf/3383368 (Accessed on 13 October 2016)

[23] Universities UK (2015), Patterns and trends in UK higher education 2015. (p. 35) http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2015/patterns-and-trends-2015.pdf (Accessed 13 October 2016)

[24] Digital Science (2016), Digital Research Reports: The implications of international research collaborations for UK universities. (p. 3) https://figshare.com/articles/Digital_Research_Report_The_Implications_of_International_Research_Collaboration_for_UK_Universities/3029749 (Accessed 13 October 2016)

[25] BIS, Department of Business, Innovation and Skills (2016a), Written evidence submitted by the Department of Business, Innovation and Skills (UKL0028). http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/science-and-technology-committee/impact-of-european-regulation-on-uk-life-sciences/written/30399.html (Accessed on 03 October 2016)

[26] *Ibid*. (p. 9)

- In 2013-2014, 16% of UK university academic staff were non-UK EU nationals (17% in STEM).[29] Of senior lecturers, 13.6% were from the EEA, as were 12.1% of team leaders and 10.7% of professors.[30] Overall, EU, EEA and international staff account for 7% of senior management (research, teaching and administrative roles) at UK universities.[31]

- In 2014-2015, 4.5% of undergraduate students and 8.6% of postgraduate students (taught and research) at UK universities were from the EU (5.9% of total students being from the EEA).[32]

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[27] Digital Science (2016), Digital Research Reports: Examining implications of Brexit for the UK research base. (p. 7) https://figshare.com/articles/Digital_Research_Report_Examining_Implications_of_Brexit_for_the_UK_Research_Base_pdf/3383368 (Accessed on 13 October 2016)
[28] *Ibid.* (p. 7)
[29] CaSE, Campaign for Science and Engineering (2016). Immigration: Keeping the UK at the heart of global science and engineering. (p. 25) http://www.sciencecampaign.org.uk/resource/caseimmigrationreport2016.html (Accessed 13 October 2016)
[30] Universities UK (2016), Higher education in facts and figures 2016. (p. 19) https://issuu.com/universitiesuk/docs/uukj4591_facts_and_figures_24.08.16/1?e=15132110/38156569 (Accessed 13 October 2016)
[31] *Ibid.* (p. 19)
[32] *Ibid.* (p. 9)