# Universities Scotland briefing for Scottish Government debate: Scotland as a Science Nation

November 2019

## Scotland as a Science Nation: key messages

There's lots to be proud of in so far as Scotland's current contribution to science:

- Scotland performs beyond its size. Scotland produces 12% of the UK's research with 8% of the UK's population and 10% of its researchers.
- And, its quality of our research base that really sets Scotland apart. More of Scotland's research publications are up there in the world's top 1% of most cited publications than anywhere else in the UK or EU. Highly cited work is a mark of the impact of the research.

These comparative strengths are at risk because of funding pressures facing Scotland's university sector. Our immediate priorities for science (and research) are:

- To see a 2% real terms increase in the Research Excellence Grant (REG) at the forthcoming Scottish Government budget for 2020/21. See section 4.
- To ensure that Scotland's researchers re supported to be competitive in leveraging research grants from other sources. If the Scottish Government committed to pass on the consequentials that arise from increased public investment in research and development for England's universities to Scotland's universities it would be a great leveller between research teams in Scotland and England. In 2019/20 we estimate there were upwards of £18 million of consequentials that could have gone to Scottish research teams. More information in section 4.

It's really important that Scotland performs strongly in science but we also have research strengths in the arts and social science. The application and potential of science to society can be far greater if it is combined with the arts and social sciences. A big feature of the future of research is about interdisciplinarity and the ability of diverse disciplines to work together to solve challenges (see section 3 for more details).

## 1. Scotland as a Science Nation: the facts

- Scotland produces more academic publications per researcher than any other country in the report, at 0.53 publications per researcher compared to the UK's 0.38.
- Scottish research is cited more often by academics around the world than any of the comparator nations. In fact, Scottish publications were on average 88% more cited than the world average. Citations are considered the best way to measure the impact of research within the academic and science community.
- We have more publications in the top 1% most cited publications in the world than any other UK nation or EU comparator country.

- Scotland's research with industry (joint academic-corporate publications) is highly impactful. Scotland's Field-Weighted Citation Impact is 3.51. The UK average (2.64) and our patent to article ratio is higher than the rest of the UK.[1]
- Scotland's science research is international: over 89% of active researchers based in Scotland published at least one article under a non-Scottish affiliation during 1997-2016 with 49.4% of Scotland's publications having an international co-author during 2007-2016.
- The number of people graduating with STEM degrees increased by 9% over the last two years and 11% over five years[2].
- The UK Government has ambitions to spend 2.4% of its GDP on R&D. In 2017, the UK spent 1.69% of its GDP on R&D, whilst in the same year, the Scottish Government spent 1.63% of its GDP on R&D.
- Scotland's universities have slipped from a 15.6% share of UKRI funds six years ago to a 14% share in 2017/18. That difference of 1.6 percentage point is worth tens of millions of pounds to Scotland as well as the jobs that come with it.

## 2. There are many routes for collaboration between universities and the business and scientific community

- 45% of innovation-active companies surveyed see universities as collaborative partners in delivering their innovation projects. The 45% figure is higher than the corresponding figure for public agencies and commercial R&D partners.
- Scotland's universities work with 20,000 business on their innovation needs every year.

Some examples of collaboration include:

- Scotland's eight **Innovation Centres,** which are partnerships between industry and higher education, are all based around STEM industries and disciplines. To take one example, the Industrial Biotechnology Industrial Centre (IBioIC), based in Glasgow. It supports 130 companies, 50 different research projects working with 18 of Scotland's 19 universities. It's hosted at the University of Strathclyde. One of the strategic research projects that IBioIC is part of is looking at how to improve the efficiency of biomass supply chains. Another, is looking at how to incentivise the conservation of biodiversity of coastal ecosystems.
- Science, and STEM subjects across the board, lend themselves well to **spin-out and start-up** companies from universities. Scotland is the most successful part of the UK for spin-out company formation[3] and there has been a big increase in the number of spin-offs to come out of universities, without HE ownership from 55 to 95 between 2016/17 and 2017/18.[4]
- **Interface** matches business innovation needs with university expertise. Some examples of this partnership delivering benefits to business include: A partnership between Johnstons of Elgin with Heriot-Watt University to analyse their energy usage across the main business units of

[1] The figures in the first three bullet points are from Elsevier (2019) A Metrics Based Assessment of Scotland's Science Landscape

[2] HESA Student Record (2019) For this purpose, STEM draws on JACS code 3,6,7 & 9 which is: biological sciences, physical sciences, maths and engineering and technology. Graduates in medicine or subjects allied to medicine have not been included in these STEM graduate numbers

[3] HESA, HE Business & Community Interaction 2016/17, figures for active formal spin outs.

[4] HESA, HE-BCI

dyes, weaving, logistics, finishing and yarns. Current Health partnered with West of Scotland to develop a non-invasive way of testing the hydration levels of patients in hospital. Spotting dehydration in hospital patients is a big challenge and Current Health wanted to track hydration within its wearable medical device.

Later this week, we expect Professor Muscatelli's Review on the economic impact of universities to be published. Commissioned by the Scottish Government, we expect the Review to focus in on the role of university research and development as a driver for economic growth and to make recommendations. Universities Scotland looks forward to the report and will look to respond quickly to its findings.

## 3. Scottish HE has worked hard to build critical mass in science subjects

- Back in 2003, Scotland pioneered something called "research pooling" where universities shared staff, facilities and equipment to build critical mass and excellence in core science areas such as chemistry, life sciences, imaging, energy technology, informatics and computer science, which each had their own initiative to "pool". Drawing upon the collaborative ethos across the Scottish sector, 'pooling' continues to be a success and contributes to excellence and high quality partnership across Scotland and with institutions across the rest of the UK and beyond.
- Research pooling has just been the subject of an independent review, led by Professor Louise Heathwaite, with a report published in 2019 looking to set the future path. She points to the future of research as being interdisciplinary rather than subject focused and driven by challenges (such as decarbonisation). Her central recommendation is that to make Scotland a research powerhouse there should be a major investment to build on the critical mass achieved by the research pools, orientated towards cross-disciplinary research challenges.
- Universities have welcomed the report and recognise that this is future for research. It complements the approach taken in the "Global Challenge Research Fund" led by the UK Government which focuses interdisciplinary research teams around the challenges faced by developing nations and the Industrial Strategy Challenge Fund which brings together research and business to tackle the current major societal and industrial challenges such as healthy ageing and industrial decarbonisation.
- The Funding Council is considering how it responds to this report. It will take new investment to ensure that Scotland takes full opportunity of closer, interdisciplinary collaborations. However, the Council has stated previously that it does not have the capacity to make new strategic investments and, as noted in section 4, Scottish Ministers have not yet decided whether to pass on the 2019/20 consequentials from increased investment in research in England.

## 4. University research faces funding challenges

- Universities don't profit from working with the business community on research and innovation. We do it because it's one way to translate university research into practical benefit and it supports growth in Scotland's economy. The data from Audit Scotland shows that

university research is only funded at 80% of the full economic cost[5] with research funding from industry covering only 72.5% of full economic costs[6].

**Public funding for the Research Excellence Grant.**

- The main research grant for Scotland's universities – the Research Excellence Grant - has been cut by 12% in real terms since 2014/15. We're asking for a two per cent real terms increase to the Research Excellence Grant in the next Scottish Government budget.
- The Research Excellence Grant offers a strong return on investment. At present, for every pound of public funding invested by the Scottish Government, Scotland's universities leverage another £3, bringing in additional resource to Scotland, from the UK and other sources, bringing high-value jobs and economic benefit with it.
- A few years ago, Scotland's strength in winning highly competitive research grants was such that we brought a 15.6% share of all UKRI funds[7]. Now that share has fallen to 14%. Our competitive edge has slipped and that difference of 1.6 percentage points means tens of millions of pounds that is no longer coming back to Scotland.

**An uneven playing field with scientists and researchers in England**

- England's universities have seen their public funding for research and innovation increase. That creates consequential funding for Scotland that could be passed onto Scotland's researchers, which would give them a level playing field when competing for research bids from UKRI and other sources, to leverage more funds into Scotland.
- We ask all parties to supporting passing on the consequential funding that comes to Scotland from increases in research and development funding for universities in England to universities in Scotland.
- Funding for university research in England's universities is Barnett-able. Scotland's universities are asking the Scottish Government to pass on the in-year consequentials from the additional investments in researchers in England's universities to researchers in Scotland's universities. This would give Scotland a level playing field when going into compete against universities in the rest of the UK.
- The Scottish Government did pass on the in-year consequentials in 2018/19 but hasn't done so this year. We estimate that this year's consequentials would have been worth around £18 million to Scotland's universities.
- It's entirely at the Scottish Government's discretion whether it wants to pass on those consequentials or spend them in other areas. With the prospect of a big spending commitments in a post-election budget, whoever forms the next UK Government, Scotland's universities can't afford to slip further behind.

**Horizon Europe.**

- As we come to the end of Horizon 2020, a scheme that has been brilliant for Scotland's science sector, we have no assurances about Scotland's status in the successor scheme.

[5] Audit Scotland (2019) Finances of Scottish Universities pg 16
[6] Audit Scotland (2016) Audit of Higher Education in Scottish Universities p 28
[7] Data for 2013/14. Universities Scotland (2019) The Future of Scotland's Universities. Figure 7.

- Scotland's HEIs have performed very well in Horizon 2020. Horizon 2020 made almost €80 billion of funding available from 2014 to 2020. The data shows that the UK has performed very well in the 'excellent science' pillar of Horizon 2020, securing 19.4% of all funding from the start of the programme to September 2018. Looking at Horizon 2020 participations within the UK, seven Scottish HEIs were in the top performing 50 UK institutions securing €390M from the start of the programme to March 2018.
- The uncertainty about future participation is hugely worrying for scientists on an individual level and for universities. We want to be at the heart of Europe's most successful research programme and there's a risk that might not happen. We need the flow of talent to come to Scotland and without Horizon we will be a much poorer proposition for the world's best scientists.

## 5. How Scotland can thrive further as a Science Nation

**What the sector will do:**

- Continue to be an active participant in supporting government activity in this area.
- Work with the Scottish Funding Council, Scottish Government and others to ensure that the next generation of research pools, many of which are focused on science, deliver for Scotland.
- Consider its response to the Muscatelli Review (published on Wednesday 27 November).

**What the Scottish Government can do:**

- Halt the downward trajectory of university research funding by increasing the research budget by 2% in real terms in the forthcoming Scottish Government Spending budget.
- Commit to support Scotland's researchers by passing on the consequential funding from increased investments in university research and development in England. This should boost Scotland's leverage potential which has always delivered returns of at least 1:3 on the rate of investment.
- Increase investment to ensure the recommendations of the review of research pools are met.

**What the next UK Government can do:**

- Ensure that the UK is at least an associate member of Horizon Europe in a post-Brexit arrangement and seek to guarantee this status as soon as possible.
- Design an immigration system post-Brexit that ensures the free flow of talent to Scotland and which builds on announcements over the summer (from Mr Johnson as Prime Minister at the time) that started to acknowledge the role that international talent will always play in Scotland's science and research landscape. We'd hope to see post-election plans go further than existing announcements.

**ENDS**

Further information:
Duncan McKay, Senior Public Affairs and Communications Officer
T: 0131 225 0714 E: duncan@universities-scotland.ac.uk