Science budget and Industrial strategy: Royal Statistical Society evidence to the House of Commons Science and Technology Select Committee inquiry

Summary

1. The Royal Statistical Society (RSS) welcomes that the Committee's inquiry will focus on a breadth of issues regarding the science budget and the Government's industrial strategy. Our response focuses, in particular, on the distribution and demands of the data economy, with regard to the Committee's question of 'what further measures the Government should take to use its spending and facilities to strengthen innovation, research and associated 'place-based growth'.'

2. With the growth of 'big data', digital technology, and new data sources, the potential to innovate with statistics, data science and artificial intelligence (AI) is assured. However, strong growth in the data economy is unfortunately accompanied by major skills shortages. The UK is lagging far behind international competitors, which are equipping themselves better for the vital data-driven industries of the future. The UK should use the opportunity presented by the increase to the science and research budget, and the creation of UK Research and Innovation (UKRI) to take a lead on statistical science, data science, and artificial intelligence.

3. There is a strong case for master's degrees in Statistical Science, and a real opportunity to develop responsibility for this as well as for doctoral and post-doctoral training as part of the UKRI's strategy. We are supportive of the recommendations of the recent review by Hall and Pesanti, 'Growing the artificial intelligence industry in the UK', which has highlighted the scope for industry-funded master's courses. Master's courses should be attractive for part-funding by industry, but there is no single body with the remit to monitor and encourage this. Research and innovation should strengthen capabilities to work with data which is generated by, and is essential to, the Fourth Industrial Revolution and a new wave of technological change. We recommend that the UKRI should set out actions to coordinate statistical training for R&D.

4. Statistical science is needed across all research, internationally (e.g. through the Global Challenges Research Fund) as well as across all regions of the UK. In the UK, quantitative and mathematical specialties have tended to be limited by the 'centres of excellence' model. Not enough people are attaining PhD-level experience of statistical science, or the level of PhD plus some postdoctoral experience. The same problem applies to senior academics who train PhD students. The approach to mathematical science that supports methodology needs to be deliberately widened by UKRI and the Research Councils. Methodology also needs to be strengthened in the development of data science. The Alan Turing Institute has been established as the UK's national institute for data science and artificial intelligence; the Institute now needs to expand its network for statistical capacity-building beyond its London base.

5. Government and universities should signal their support for statistical qualifications and training in schools and colleges. There is a concerning deficit of participation in mathematics, and a lack of practical experience of using data and technology to learn about statistics and data science in relevant subjects. Schools need a strong case to offer a range of post-16 mathematical courses, and to develop practical teaching of statistics and data science across a range of other subjects.

Supporting evidence

6. In their reporting on the global economy and the growth of data flows, McKinsey have described a new era of digital globalisation. However, they have pointed out that very few of the countries participating in the technological revolution have adequately supported their workers and communities to participate as the economy changes in this regard [1]. They strongly recommend developing clearer paths to new roles.

9. The supply of skills has not kept up with demand. The overall number of graduates from mathematical science degrees (undergraduate and postgraduate) has declined, and mathematics, statistics and computation have been listed as 'vulnerable capabilities and skills' within the UK's bioscience and biomedical research base [2]. Evidence of the skills gap across the research base was noted by this Select Committee's predecessor in 2016, in a report on the Digital Skills Crisis, which recommended that "the Government needs to establish an effective pipeline of individuals with specialist skills in data science, coding and a broader scientific workforce that is equipped with a firm grounding in mathematics, data analysis and computing [3]."

10. Jo Johnson MP, the Minister of State for Universities, Science, Research and Innovation, has spoken publicly about the UK's concentrated public investment in the 'golden triangle' (which refers to leading universities in London, Oxford and Cambridge) [4]. For statistics and data science, we see strong grounds for more widely-distributed spending. The demand for data use and analysis is present across all UK regions, as well as internationally. Deloitte have reported that mathematical science is crucial to the economy, they estimated that in 2010, mathematical science research contributed £208 bn Gross Value Added (around 16% of the UK's total GVA), and employed 2.8 million people (around 10% of total UK jobs) [5]. In 2016, 'statistical analysis and data mining' was the number one skill most often demanded by UK employers on LinkedIn [6]. And Nesta have reported that most regions of the UK have increased high tech, creative and digital employment; this sector's share of jobs is highest in the South East, London, the East, North West, and Scotland, where it accounts for between 10 per cent and 13 per cent of all jobs [7]. In additional research, they found that two thirds of data-active companies struggle to fill at least one data analyst vacancy [8].

11. Oral evidence to the Research Integrity inquiry convened by this Select Committee on 24th October 2017 provides ample discussion of the importance of trained statistical instructors for research degrees [9]. Typically, science students in universities and in schools are taught statistical tools and techniques, but lack understanding of principles that underlie them. The witnesses submit that coverage of the principles of statistics should be essential: it's highly likely that students exposed to statistical tools or tests without such training will go on to misapply them.

12. In addition to the demand for more specialised industry-supported master's courses, and for doctoral and postdoctoral training, initiative needs to be taken to address concerning deficits of participation in key subject areas. Schools and teachers require strong signals of support from government and from universities, to offer a range of post-16 options in mathematics and statistics, and to also offer strong practical experience of using data and digital technology in other subjects [10]. Steps have been taken in all nations of the UK to

offer some support to education providers (see point 13 below), but this needs to be a consistent and high-level priority.

13. In Northern Ireland, the national innovation strategy has led to new teaching resources using open data being offered to schools. Mathematics and numeracy are also a cross-cutting priority for the curriculum up to the age of 14. In Scotland, data handling and quantitative reasoning are included within the Scottish Government's new skills strategy for science, technology, engineering and mathematics. In Wales, the Welsh Government's National Literacy and Numeracy Framework expects all learners aged 5 to 14 to develop numerical reasoning (using number skills, using measuring skills, and using data skills). Additionally, the Hazelkorn Review has recommended more joined up governance of education pathways in Wales from post-16 through to higher education [11].

14. In England, a recent Review by Professor Sir Adrian Smith has recommended actions to widen participation in post-16 mathematics [12]. The Review concluded that there is not yet the appropriate range of education pathways post-16, and that it is crucial to support mathematical courses and teaching. In response, the Government has announced funding for a Level 3 Mathematics Support Programme, which incorporates Core Maths, AS and A level Mathematics, and Further Mathematics [13]. The Review also highlights the importance that universities encourage a breadth of provision for school and college students, by signalling the value of mathematical qualifications at A Level (or equivalent), AS Level, and below, as preparation for science, social science, clinical and research degrees.

About us

The Royal Statistical Society (RSS) is a learned society, professional and membership body with around 8000 members, which works to advocate the key role of data and statistics in society. Our strategic and charitable goals include supporting the use of statistics and data in the public interest, we also support education for statistical literacy, statistics as a profession, and the strength of statistics in academia and research.

References

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Response submitted 31 October 2017