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Analysis of Demand for STEM Skills

The Council for the Mathematical Sciences (comprising the Institute of Mathematics and its Applications, the London Mathematical Society, the Royal Statistical Society, the Edinburgh Mathematical Society and the Operational Research Society) is pleased to present its response to the Department for Innovation, Universities and Skills' call for evidence on the demand for STEM skills.

The CMS welcomes the programme of analysis to be conducted by DIUS, and believes that an understanding of the current and future demand for STEM skills is essential to determining the policies that should shape the future of the higher educational sector.

Our response focuses on mathematical sciences and cross-refers to reports of the CMS, Government and others which provide evidence in the areas covered by the DIUS inquiry. We welcome continuing dialogue with the Department as this programme develops.

The current labour market position of people with STEM Qualifications, in terms of their earning and occupations

1. Mathematics graduates are highly sought-after and are well-placed in tables of comparative earnings.[1][2][3] Indeed, it has been suggested that individuals lacking mathematical skills stand to lose £136,000 in income over the course of their lifetime.[4]

2. Mathematical sciences graduates enjoy a wide range of occupations, demonstrating the value of analytical skills in every sector of the economy[5]. There is a particularly wide variety of industrial themes which make use of mathematics.[6]

The current and prospective supply of STEM qualifications

3. Mathematics is now recognised as being a strategically important and vulnerable subject (SIVS), with vulnerability defined as being a mismatch between supply and demand.[7] Much has been done recently to encourage young people to study mathematics at university, including the HEFCE-funded 'more maths grads' project.[8] It is anticipated that projects such as this will help to improve the future supply of mathematics graduates.

4. There is currently a shortage of specialist mathematics teachers[9], which has an undesirable effect on the numbers of students choosing to study mathematics at A-Level and at university, risking the future supply of mathematics graduates, and of course, future mathematics teachers.

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[1] Universities UK: *Research Report: The Economic Benefits of a Degree* (February 2007)
[2] NC O'Leary and PJ Sloane: "The Return to a University Education in Great Britain", *National Institute Economic Review* (2005, 193: 75-89)
[3] Department for Education and Skills: *The Supply and Demand for STEM Skills in the UK Economy* (2006)
[4] Wolf, A: *Does education matter? Myths about education and economic growth* (2002, pp.35-36), as quoted in Reform: *The Value of Mathematics* (June 2008)
[5] Confederation of British Industry: *Taking Stock: CBI education and skills survey 2008* (April 2008)
[6] See, for instance, the list of minisymposia at the 2008 European Consortium for Mathematics in Industry conference at www.ecmi2008.org
[7] HEFCE: *Strategically important and vulnerable subjects* (June 2005)
[8] www.morematsgrads.org.uk
[9] Royal Society: *The UK's science and mathematics teaching workforce* (December 2007)

5. There have recently been increases in the number of students studying mathematics at A-Level and it is hoped that this trend will continue. However, we believe that the numbers at A-level have still not returned to the levels of the 1990s.[10]

6. The prospective *demand* for mathematics skills is referred to in a recent report by the Organisation for Economic Co-operation and Development (OECD)[11], in the context of an increasing capacity to collect and store information:

> *The ubiquity of powerful microprocessors and the advent of inexpensive data storage have led to an ever-expanding capability to collect data. But the useful integration of such data in an industrial context requires that they be processed, preferably in real time, and transformed into information and knowledge… Mathematical concepts and methods play a growing role for biotechnology and medical technology. An avalanche of data and information at molecular and cellular levels has launched a technological revolution. Better quantititative understanding of biochemical and biophysical process is initiating innovative technologies producing drugs, biological materials or artificial tissues. Mathematical tools enable the design of new compounds and processes with prescribed functional properties.*

A recent CBI report[12] is more explicit:

> *The demand for highly numerate and analytical STEM-skilled individuals is expected to grow dramatically in the future as the UK continues to develop as a knowledge economy.*

Employer views of the value of STEM skills, and how this varies across STEM disciplines and by level of qualification

7. A recent CBI report[13] describes the value of STEM skills to employers across a broad range of sectors in the UK economy; the CBI's survey found that 59% of employers were having difficulty in recruiting enough STEM-skilled individuals to meet their needs

8. The CMS is aware of a recent survey by CORMSIS (The Centre for Operational Research, Management Science and Information Systems, based at the University of Southampton) which attempted to assess the demand amongst their existing industrial contracts for analytical skills at various levels. The results are not publicly available at this stage, although DIUS might contact Gillian Groom[14] at CORMSIS for further information. The results may be an indicator to what might be achieved through a larger survey

The feasibility of constructing projections or modelling scenarios of future demand or employment patterns for those with STEM qualifications

9. Modelling both supply and demand is tricky – given substantial changes in qualifications routes at GCSE, A-level, etc. – but also the way young people respond to the expectations (or perceived expectations) of employers. The latter is driven by the market as can be seen by the effects of the economy on, for instance, demands by the City for STEM skills and the consequences, say, for teacher training application.

Council for the Mathematical Sciences
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[10] AQA data from 1990 gives over 79,748 mathematics entries at A-level (including further mathematics). The equivalent figure in 2008 is 73,684 (JCQ, via www.journalofphysics.org/activity/policy/Statistics/Education%20Statistics/page_2620.html)
[11] Organisation for Economic Co-operation and Development Report on Mathematics in Industry (July 2008)
[12] Confederation of British Industry: *Taking Stock: CBI education and skills survey 2008* (April 2008)
[13] Ibid.
[14] Email: g.groom@soton.ac.uk