

# Scottish mathematical sciences research funding – an Edinburgh Mathematical Society position paper for SFC

**Summary.** Post-REF changes to the REG allocation process present SFC with an opportunity to better support Scottish mathematical sciences research – to enable it to thrive, rather than wither.

## 1. Mathematical sciences is IMPORTANT

EPSRC (in partnership with the Council for the Mathematical Sciences) commissioned Deloitte to produce in 2012 an independent study<sup>1</sup> of the **economic benefits of mathematical sciences research**.

### Key findings:

- 10% of UK jobs (2.8 million) stem from mathematical sciences research;
- 16% of UK gross value added (GVA) – about £208 billion;
- the productivity of mathematical science occupations is double the UK average;
- UK mathematical science accounts for:
  - 4% of world researchers;
  - 6% of articles;
  - 11% of citations;
  - 14% of highly cited articles.

## 2. Importance for Scotland

- Mathematical science research plays an essential strategic role in underpinning the economic, scientific and engineering base in Scotland - e.g.
  - new radiotherapy protocols for cancer treatment
  - the epidemiology of pandemics
  - the analysis of oil and gas flow
  - climate modelling and prediction
  - management and control of financial risk . . .
- Research in the mathematical sciences in Scotland is currently strong
  - the majority of the research assessed in RAE2008 was either world-leading or internationally excellent;
  - Scotland is second in the world ranking of mathematical sciences citations per research paper, ahead of both USA and England (Times Higher, 7 May 2009)
- Curiosity-driven mathematical science research is also strong in Scotland – this has the potential to make a major impact over longer time-scales.
- **But** low funding has undermined and threatened the previously strong position.

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<sup>1</sup>Deloitte, Measuring the Economic Benefits of Mathematical Science Research in the UK (November 2012).

### 3. SFC research funding

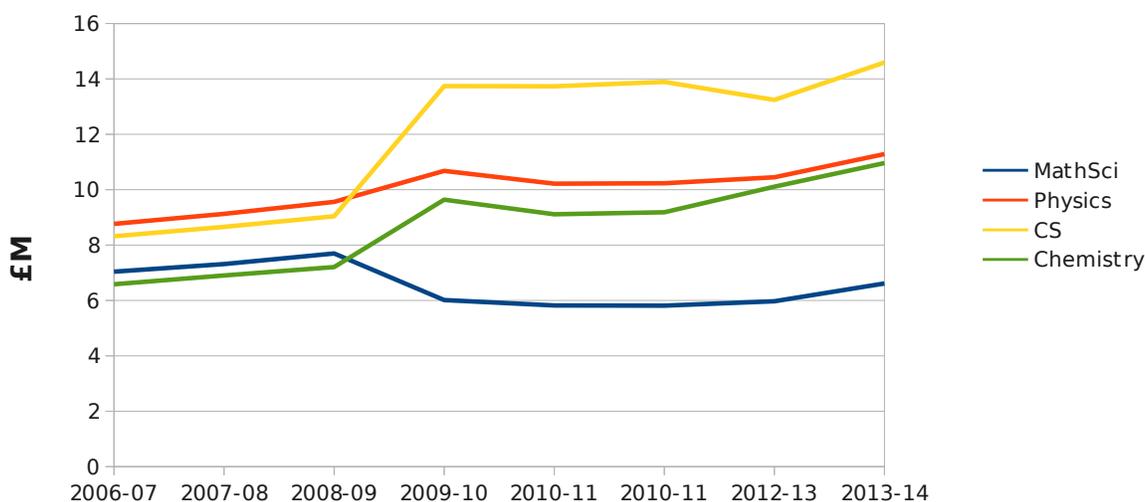
- Mathematical Sciences funding is **much lower** than for comparable disciplines.
- One reason is that the research cost weight is  $C = 1.2$  – other STEM disciplines have  $C = 1.6$ , and rUK uses  $C = 1.6$  for most mathematical sciences research.
- This underfunding is **damaging the health of the discipline** – staff numbers are declining:

Cat A staff (FTE)	RAE 2008	REF 2014	% change
Panel B – UK	12,234	13,352	9.1%
Math Sci – UK	1,924	1,931	0.3%
Math Sci – Scot	249	235	-5.5%

#### Staff volume (RAE 2008 and REF 2014)

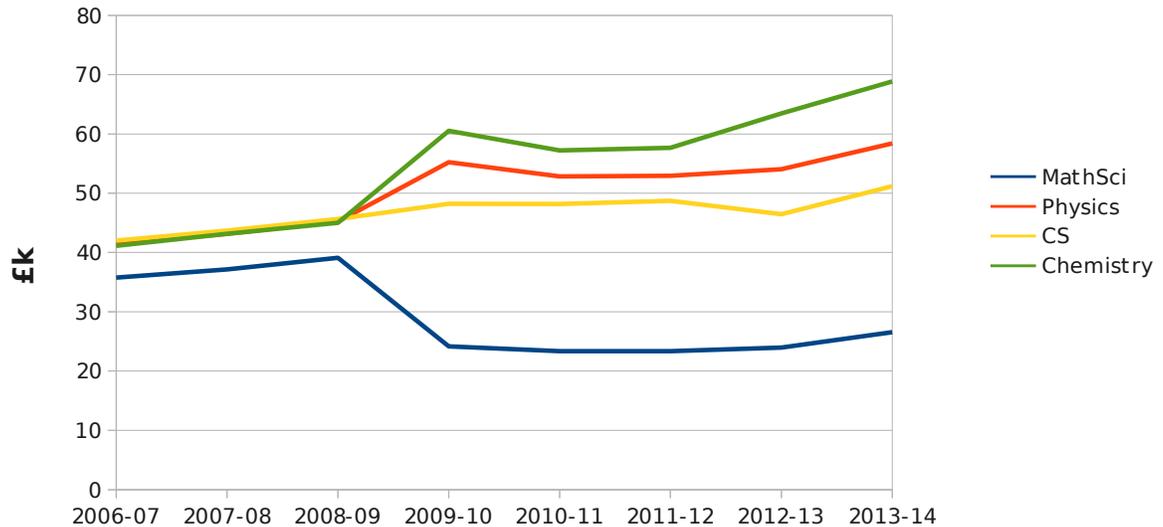
- Underfunding also makes it hard to compete with larger English institutions (e.g. for CDTs and grants) which feeds back negatively in the REG as detailed in the next item.
- The change in funding model (from QR to REG) after RAE2008 severely cut Scottish mathematical sciences research funding, as shown in the figure below. This was due to the switch to a one-stage process (which removed SFC's ability to strategically allocate funds to different UoAs and to iron out inconsistent grading between panels, and scaled mathematical sciences research by a factor of 0.75 compared to other STEM disciplines because of the difference in research cost weights), as well as to a significant increase in the proportion of funding allocated on the basis of so-called “minor volume indicators”, which are approximately 45% of the total REG in 2013-14.

#### Research funding by discipline



- The reduction in research funding per Category A staff has been even greater, as shown below.

## Research funding by staff FTE



### 4. Conclusion and recommendations

When making changes to the REG allocation process, SFC has the opportunity to better support Scottish mathematical sciences research – to enable it to thrive, rather than wither, and to regain its place as an international leader.

- If a big change is made to the system we suggest a return to a two-stage process with strategic control by SFC of overall allocations to UoAs or groups of UoAs, since in general the universities neither reallocate REG income between disciplines, nor take the systematic differences between RAE/REF UoA panel assessments into account.
- If a one-stage process is maintained, then we suggest that parameters be changed to bring about an overall reduction in the influence of “minor volume indicators” to swing the balance back towards the quality of academic staff, providing baseline funding to underpin the development of excellent groups across all disciplines. We would also like to see the research cost weight for mathematical sciences to be increased to the same value as that used for other STEM disciplines. On a smaller scale, stopping the double counting of PDRA bodies and the grant money that pays for them, along with eliminating game playing like reclassifying MSc degree programmes as MRes in order to increase the PGR headcount for what are really one-year taught programmes would allow some more investment in places offering genuine quality research and PhD training.

Specifically for the mathematical sciences, a swing back to rewarding quality rather than grant winnings and/or a significant increase in the cost factor for our UoA would give us the research base income we need to help us attract and retain the high quality researchers we need to remain globally competitive.