The Russell Group of Universities

ST/08-09/131

SUBMISSION OF EVIDENCE FOR THE HOUSE OF LORDS SCIENCE AND TECHNOLOGY SELECT COMMITTEE INQUIRY: SETTING SCIENCE AND TECHNOLOGY RESEARCH FUNDING PRIORITIES

The Russell Group is an association of 20 major UK research-intensive universities. Collectively Russell Group universities receive around two thirds of Research Council grant income and QR funding[1] and the 2008 RAE showed that nearly 60% of the world-leading 4* research was undertaken in Russell Group universities. Russell Group universities also educate around 308,000 FTE undergraduates each year in a research-led teaching environment and support around 60% of the UK's PhD students.

Russell Group universities are international institutions, whose research and teaching has a major impact on the UK economy. Russell Group universities[2]:

- Have an estimated total economic output of £25.3billion per annum
- Are responsible for supporting 237,000 jobs UK-wide
- Are a successful UK export industry, with overseas earnings of £3billion per annum

Research is an international endeavour. Leading universities across the globe not only collaborate with each other on a huge range of projects, but also compete with each other for academic talent, the brightest students and increasingly for R&D investment from the private sector, charitable and other sources. Whilst the UK is second only to the US in terms of research productivity and punches well above its weight, this position is increasingly being challenged as a result of very substantial increases in investment in research across Europe and in Asia.

The Russell Group believes that maintaining an environment within the UK which is conducive to science, research and innovation is essential not only for the success of the UK economy but for maintaining the UK's international standing and position as a global research leader. As such UK research funding policy needs to take account of international as well as national and regional drivers.

1. What is the overall objective of publicly funded science and technology research?

Science and technology research generates many beneficial outputs and impacts which underpin the UK's long-term economic growth, economic well being and quality of life.[3] These include:

[1] The most recent figures for Research Council grants in 2006-07 show that 69% of grants were awarded to Russell Group universities (source: HESA); data from HEFCE shows that Russell Group universities received 66% of QR funding in 2008-09.
[2] Data derived from the Universities UK report "The Economic Impact of HEIs"
[3] As set out in the Department for Business, Innovation and Skills's Economic Impact Reporting Framework, 2008.

- Generating new knowledge and understanding
- Training and continuing professional development of highly-skilled people
- Capacity building in new and emerging disciplines, as well as sustaining progression in well established areas
- The development of new or improved products and services
- Establishment of new businesses
- New or improved public policy and public services
- Attracting inward investment from global business

Examples of quality of life impacts include the benefits of medical research on improving public health, research to understand, prevent and mitigate environmental risks and hazards, and social research contributes to improving social cohesion.

Research, particularly basic research, is a speculative and high-risk endeavour. The time period between investment in research and economic impact can be lengthy, often of the order of decades[4]. The Government therefore has an important role to play in the funding of research, and particularly basic research, which the private sector is less inclined to fund due to the distance from market. Provision of public funds ensures that the widest breadth of research disciplines can be supported. This is important not only because we do not know where the opportunities and challenges of tomorrow may arise but because many multinational companies believe that effective, integrated interdisciplinary research offers the greatest potential for innovation - "future innovation is particularly likely at the interface between traditional disciplines"[5].

Government support is also important in creating the right conditions, regulatory environment and incentives to enable excellent research and innovation to flourish. This in turn enables the UK's leading universities to provide world-class teaching and invest in world-class research attracting talent and investment to the UK.

As the recent CBI's recent report "Stronger Together: Businesses and Universities in Turbulent Times" shows, employers are increasingly looking for high-quality graduates with good employability skills. Public investment in research enables Russell Group universities to provide distinctive research-led teaching which encourages a culture of enquiry-based, independent learning in a world-class environment. Research-led learning actively engages students in their learning experience, encouraging them to pursue new knowledge and to develop independence of thought, critical thinking, entrepreneurial skills and the ability to handle a wide range of challenges.

As the Secretary of State for Business, Innovation and Skills has said in the current economic climate investment in research and science 'should be at the centre of the Government's economic recovery plans for a prosperous, sustainable future'[6].

2. Are the existing objectives and mechanisms for the allocation of public funds for research appropriate? If not, what changes are necessary?

The Russell Group believes that adequate, sustainable public funding for research allocated via a dual support funding model is essential for maintaining the diversity, breadth, and quality of

[4] MRC, Wellcome Trust and AMC funded study "Medical Research: What's it Worth?"
[5] Council for Industry and Higher Education "International Competitiveness" (2006)
[6] June 2009 Speech by Lord Mandelson at the Science Museum.

research in the UK. The current allocation of funding to the higher education funding bodies and Research Councils on a three year spending cycle, coupled with a Research Assessment Exercise (or Research Excellence Framework exercise) every 6-7 years provides a degree of stability enabling universities to plan their research activities effectively. This model also provides a sound basis on which universities can forge research collaborations and partnerships, with other universities in and outside of the UK and with businesses, charities and other partners. As a report by the Higher Education Policy Institute noted "The close alignment between the money allocated to universities via the Funding Councils and the Research Councils shows that that the dual support system is working to support the best research in those universities best placed to undertake it.[7]

Dual support provides separate and distinct sources of funding for university research, which are highly complementary:

- Research Council funding supports world-class research across all academic disciplines, with grants awarded for specific research projects based on independent, expert peer review. This funding supports innovative, excellent research, as well as sustaining progression in established disciplines, capacity building in emerging areas, training of researchers, investment in strategic priorities and maintaining national capacity
- QR funding[8], as an un-hypothecated funding stream, complements the ring-fenced project- and programme-based funding allocated via the Research Councils. Awarded as a block grant to universities it enables institutions to invest strategically, providing the stable, core funding base for novel research. QR funding facilitates institutional flexibility which, as a World Bank report observes, is "vital if institutions are to adapt to the changing environment."[9]

As Lord May of Oxford has said, "without some form of such a dual support system…effective management of a university's overall research programme is impossible[10], likewise the former Secretary for Innovation, Universities and Skills said "The dual support system is the foundation of the UK's excellent international standing in research - something that can only be more important in the future. We have consistently underlined its importance."[11]

In an environment of increasing international competition, the Russell Group continues to emphasise its strong backing for the dual support system.

Earlier this year Research Councils UK and Universities UK published a review of the impact of the introduction of full economic costing (FEC) of the HE sector[12]. This concluded that measures of HEI sustainability (financial, physical and human resources) have improved, in major part due to the introduction of FEC, although it is too early to determine the full impact. Specifically, imbalances between the QR block grant funding for research and project-based research (from the Research Councils and others) have been stabilised.

The report also explored in detail issues around the charitable funding for research, which comprises around 22% of research income to UK HEIs. Charitable research funders have a clear principle of funding the directly incurred costs but not the indirect costs of a research

[7] Higher Education Policy Institute, *What future for Dual Support?*, 2004.
[8] Quality-related research funding.
[9] The World Bank, *Constructing Knowledge Societies: New Challenges for Tertiary Education*, 2002.
[10] The Royal Society, Anniversary Address 2003.
[11] http://www.dius.gov.uk/speeches/denham_uuk_110908.html
[12] RCUK/UUK Review of the Impact of the Full Economic Costing of the UK HE Sector (April 2009)

project, such as the salary of the principal investigator, estate and support costs. Whilst many charities have adopted a flexible approach and shown a willingness to contribute to some indirect cost elements, there is remains a shortfall in FEC payments for such research. This is addressed via the Charities Research Support Fund in England and similar support funding in Wales, Scotland and Northern Ireland, which provides an additional element of QR funding for excellent research funded by the charitable sector. This Government funding is essential to ensure that research charities continue to invest leading UK universities.

The results of the 2008 RAE demonstrated that Russell Group universities continue to excel both in terms of the consistently high quality of researchers and also in the sheer volume of excellent research. However, the new methodology introduced in the 2008 RAE and subsequent allocation of QR funding in England saw a much wider dispersal of research funding across the HE sector than in earlier RAEs. A number of Russell Group universities saw a decrease of QR funding in cash terms of between 1% and 13%. In real terms, in 2009-10 half of the Russell Group of universities saw either a flat or reduced allocation of QR research funding compared to 2008-09. This means that despite a 5.6% increase in QR funding, only half of the Russell Group universities received any benefit from this increase despite the fact that most improved their performance, in some cases significantly e.g. LSE and the University of Manchester.

Now more than ever the UK's research-led institutions have a crucial role to play in helping the country to survive the economic downturn and stimulate a recovery. It is vital that they are given the right conditions and level of funding to continue to flourish. The Russell Group welcomes the proposals published this week to support and incentivise excellent research which delivers benefits to the economy and society through the new Research Excellence Framework. We will be responding to the proposals in due course.

3. Is the balance of Government funding for targeted versus response-mode research appropriate? What mechanisms are required to ensure that an appropriate and flexible balance is achieved? Should the funding of science and technology research be protected within the Research Councils or Government Departments? How will the current economic climate change the way that funds are allocated in future?

As indicated above, the Russell Group believes that an effective and balanced dual support system is fundamental to ensuring an appropriate and flexible balance in research funding. The creation of the Department for Business, Innovation and Skills, which brings together the responsibility for the two sides of the dual support system within one Government Department should provide a more effective means to manage funding for research. The ring fencing of the Science Budget is a key feature of the national research funding landscape, protecting long-term investments in research from short-term political pressures. A commitment to maintaining the ring fence will be fundamental to demonstrating the Government's continuing commitment to basic research and maximising the longer-term economic and societal benefits that this research generates.

Research funded by Government Departments is primarily commissioned for specific policy purposes and funded on a contractual basis. Whilst Departments and Research Councils collaborate to co-fund basic research in key policy areas, it is important to continue to maintain departmental R&D budgets to avoid further erosion of Science Budget funding for basic research.

Research Councils employ a spectrum of research funding methods from entirely responsive mode to more targeted or strategic initiatives. A diversity of funding approaches is necessary and important. Responsive mode funding provides a means to pursue new and novel ideas which are entirely investigator driven, and whereas more directed funding supports basic, investigator driven research in areas where there is a need to grow national capacity or respond to user-driven needs for fundamental research.

The challenge is to maintain an appropriate balance of research funding between these different approaches. It is the Research Councils who determine the balance of their investments between different disciplines and different modes of delivery. The Councils, and their strategic advisory bodies, include representatives from the university community who alongside user representatives provide advice on the balance of investment. A high-level of academic engagement in this decision-making process is essential given the varying structures, sizes and needs of different academic communities and the different areas of research. In this context we welcome the recent re-affirmation by the government of its commitment to the Haldane principle[13] – that decisions on how to spend research funds should be made by researchers, rather than Government.

However, the continuing decline in Research Council success rates indicates that there is increasing pressure on the Research Councils' responsive mode funding and an increasing proportion of excellent proposals are going unfunded. As the UK public sector faces a time of financial constraint, there are concerns that there could be pressure to further target Research Council funding towards areas of research which could deliver short-term economic benefits at the expense more fundamental, unfashionable or unorthodox research.

Curiosity-driven research has generated some of the most significant returns to the UK economy and society. We have conducted an analysis of analysis of 123 case studies from 16 Russell Group universities and these show that the direct and measurable returns on basic research can be tremendous, and that for the case study examples the economic returns associated with basic research appear to be greater than those associated with applied research, or research targeted at a specific outcome[14].

Some examples include:

- **Avacta – University of Leeds**: Basic biotechnology research led to the development of expertise in molecular detection technologies, which is now commercialised through Avacta. Avacta's technologies are at the forefront of drug invention, and the company has achieved considerable commercial success, currently valued at £57m.
- **Cambridge Display Technology and Plastic Logic – University of Cambridge**: Fundamental research into the physics of conducting organic polymers led to the unexpected discovery of organic electroluminescence from polymers.
    - Cambridge Display Technology Ltd was founded on the basis of this discovery, and has so far raised over $170m through investments and sale of stock.
    - In addition, Plastic Logic Ltd was formed, and currently employs a staff of 90. So far over $150m from venture capital funding in Europe, Asia and the US has been raised.

[13] John Denham, "Staying ahead: Investing in research in the downturn", speech at the Royal Academy of Engineering, 19 February 2009.
[14] Forthcoming Russell Group publication

- **Transitive Corporation – University of Manchester:** Transitive Corporation was founded in 2000, to commercialise the outputs of basic computer science research at the University of Manchester. Technology which has been developed allows for software applications to be easily translated across different computing systems. Transitive has developed relationships with Apple and IBM, and have over 15 million customers worldwide. The company has secured external investment to the value of US$30m.
- **Bioluminescence – Cardiff University**: Over 20 years of research into the way in which living creatures can generate their own natural lights or 'bio-luminescence' enabled the development of important new tools for medical and health research, now routinely used, and the formation of Molecular Light Technology Ltd. In 2003, the company was acquired by Gen Probe Inc for $7.2m.

It is essential that any consideration of targeting further investment to strategic research priorities involves close dialogue with the research community as well as potential users. Such dialogue needs to be part of the ongoing debate about the responsiveness of the research base to new opportunities and user-driven research needs. A balance needs to be struck in ensuring the research base is responsive to the needs of today, while ensuring it is sufficiently strategically placed to meet the longer-term requirements of tomorrow.

4. **How is publicly-funded science and technology research aligned and coordinated with non-publicly funded research (for example, industrial and charitable research collaborations)? How can industry be encouraged to participate in research efforts seeking to answer social needs?**

It is excellent research which has the greatest impact over time. Evidence shows that there is a positive relationship between the quality of university research and collaboration with industry, and that those departments and institutions with more research income tend to engage more frequently with industry.[15] Research has also shown that institutions with a high critical mass of research activity, such as Russell Group universities, tend to attract the high levels of external research sponsorship[16].

Universities and businesses collaboration takes many forms, including partnerships which are focused on long-term fundamental research, as well as more problem solving and near market research activities. We believe that one of the most effective ways to encourage and align public sector investments in research with business and charitable funding is by creating an environment which enables and incentivises a variety of research partnerships and the exploitation of research findings. For example, the Higher Education Innovation Fund (HEIF) is important in enabling Russell Group universities to build and maintain linkages with business and the community to more effectively exploit public investments in research.

We consider there is room to develop policies to address the substantial investment gap between identifying promising research results and the successful commercialisation of research ideas. The difficulty of predicting impact at the outset of a research programme means that seeking to enhance research impact through directed funding may be problematic; yet ensuring that universities have the necessary capacity to exploit the opportunities that emerge from their research has resulted, and will continue to result, in significant returns.

[15] Noted in Este, P. D., and Patel, P., "University-industry linkages in the UK: What are the factors underlying the variety of interactions with industry?" *Research Policy*, 36 (2007) 1295-1313.
[16] Professor Ewan Page, "A Review of Volume Indicators", HEFCE, 1999.

For example, proof of concept funding is an essential stage in the development of many emergent technologies from initial prototype to the stage where they are able to attract investment from venture capital firms or other commercial interest. Proof of concept funding can therefore play an important role in bridging the gap between the initial invention or research idea and demonstrating commercial viability. Our case study research showed that 57% of projects had received proof of concept or seed funding during their early development.

The Technology Strategy Board's Collaborative R&D programme specifically seeks to align public sector and private investments in specific priority areas. Whilst Russell Group universities are involved in a substantial number of these programmes, TSB funding for collaborative research is still too often focused on a small number of sectors, rather than exploiting the opportunities for research involving the social sciences, arts and humanities.

The Government's Foresight programme and the Horizon Scanning Centre, which investigates the challenges and opportunities arising from emerging areas of science and technology, also provides a useful platform for bringing together universities, business, charities and funding agencies to explore complex multidisciplinary issues of both social and economic importance.

5. To what extent should publicly funded science and technology research be focused on areas of potential economic importance? How should these areas be identified?

Evidence suggests that the highest quality research, particularly basic research is likely to have the greatest economic and social impact over time. It is the breadth and depth of subject coverage across the UK's research base which is one of its great strengths, and ensures that UK universities are well placed to deliver knowledge and skills to meet the needs of the economy and society, and especially to capitalise upon to new breakthroughs and respond rapidly to unexpected challenges. As Lord Drayson has observed:

"we need to maintain a broad base in science, because we don't know where the challenges are going to come from…and because the synergies from a broad based excellence in science promote world class leadership and interdisciplinary breakthroughs. Only with a diverse range of skills and deep reservoirs of knowledge will we have the flexibility to provide the expertise required in different fields."[17]

Studies such the Council for Industry and Higher Education's report on "International Competitiveness: Businesses Working with UK Universities" make it clear that multinational companies are looking to the Government to continue to invest in basic research since "maintaining the flow of ideas and their conversion through innovation is at the heart of our future competitiveness." Therefore, we believe that public funding should continue to be available to support excellence research across all academic disciplines, including targeted support to maintain capacity in strategically and vulnerable important subjects, in order to support not just the areas of inquiry which might be identified today as having "economic potential" today, but to seize the unpredictable opportunities which lie in the future.

[17] Lord Drayson, "To what extent should UK funding for science and innovation be focussed?", Foundation for Science and Technology lecture, Royal Society, 4 February 2009.

As the scale and complexity of the global challenges we face increase, maintaining the breadth of the UK's research base is increasingly important to enable universities to participate in national and international interdisciplinary collaborations. For example the Human Genome project is an example of a long-term, large-scale interdisciplinary project in which new fields and ways of working emerged and new research careers were developed[18]. A recent report from *The Lancet* and UCL Commission on Climate Change which identified climate change as "the biggest global health threat of the 21st century"[19] noted the importance of interdisciplinary research to identify approaches to tackle the problems presented by climate change – engineers, political scientists, lawyers, geographers, anthropologists, economics and philosophers were involved in identifying the critical challenges presented by climate change and setting out ways to address these. Therefore we support a strong multidisciplinary focus for funding in order to best advance knowledge and to maintain the UK's long-term research capacity. Harnessing the expertise of researchers from diverse disciplines to provide multi-faceted solutions to the complex and unprecedented challenges we face is a crucial priority for the UK – and indeed for countries across the world.

6. How does the UK's science and technology research funding strategy and spend compare with that in other countries and what lessons can be learned? In this regard, how does England compare with the devolved administrations?

For the UK's world-class universities to remain world-class, and hold their own against our major competitors, they need stable, sustained funding streams which allow them to invest in research for the future and enables continued excellence.

UK universities are relatively under-funded compared to major international competitors. Many nations are currently making unprecedented investments in higher education with a view to producing the new knowledge and developed the skilled people which help their businesses innovate in response to the economic downturn. Compared to the UK's investment of 1.3% of GDP[20] in higher education and research[21]:

- the US invests 2.9% of GDP, Canada 2.6 and South Korea 2.4[22];
- the European Union has a target of spending 3 % of GDP by 2010;
- China is now the second higher investor in R&D in the world after the US[23], and aims to spend 2% of GDP by 2010 and 2.5% by 2020.

Specific investments include:

- The US's recent fiscal stimulus package included over $17 billion for research. With a massive injection of new federal funds into research, it will be even more difficult for the UK to keep pace with the US. The US also announced nearly $16 billion in student grants and $200 million to help working college students, demonstrating its commitment to get even more people into university and to continue to expand student growth.

- The 2009 EU budget included €60 billion for research, innovation, employment and regional development programmes (45% of the total budget). Of this, €12 billion has

[18] http://sciencecareers.sciencemag.org/career_development/previous_issues/articles/2007_11_23/science_opms_r0700032
[19] *The Lancet* and University College London Institute of Global Health Commission, *Managing the Health Effects of Climate Change*, May 2009.
[20] The UK spends more than only 7 comparator countries in the OECD: Belgium, the Czech Republic, Germany, Hungary, Iceland, Ireland and Spain; it spends the same as 5 countries: Austria, France, the Netherlands, Norway and Mexico.
[21] OECD, *Education at a Glance*, 2008.
[22] Ibid.
[23] Demos, The Atlas of Ideas: China: The next science superpower?, 2007.

been allocated to increase the EU's competitiveness – this includes funds for research which see an 11% increase. Funding for innovation has also increased by 22%.

- Universities Australia is seeking a $1.2 billion budgetary increase, arguing that this will help to pump-prime the economy, to be spend on teaching, research, and increasing the participation of indigenous, rural or poor students. They are also seeking fast-tracked off-budget funding of $1 billion from the new $8.5 billion Educational Investment Fund to address a backlog in infrastructure spending.

- Brazil is seeing record levels of investment in R&D[24] and has become one of the fastest-growing countries in the world in terms of scientific publications.

- The Swedish Government's committed in October 2008 to increase R&D funding by 20% over the next four years

It is notable that many countries, such as the US, Australia, China, India and Germany, are also increasingly choosing to concentrate resources for research in order to develop or sustain their leading universities. Examples include:

- The French Government, as well as recently granting autonomy to 20 universities, has established Operation Campus. This will direct funding to alliances of leading universities forming 'super-campuses', in an effort to make France's universities more internationally competitive.

- Germany's Excellence Initiative concentrates funding at clusters of excellence to support leading research and strengthen the higher education institutions[25].

- In 1998, China announced its goal of building world-class universities. Its strategy is to concentrate resources on a small number of institutions to enable them to become internationally excellent. Following high levels of central government investment, China's ten historic universities have been climbing rapidly in the top 500 international league table rankings for universities, whilst UK universities have remained steady.

- South Korea's World-Class University project provides 830 billion won (around £4 billion[26]) in funding for 18 universities, to support their international competitiveness.

- In recent years, Taiwan has significantly increased funding for its Academia Sinica Institution - around 12% of the annual R&D budget in 2009. This is a concerted effort to foster a world-class research institution which can carry out leading research and attract the best staff and students from around the world.

[24] Currently around 1% of GDP, to be increased to 1.5% by 2010, with a commitment to then maintain spending at double 2006 levels.
[25] The Excellence Initiative was established as part of Germany's Innovation Campaign for publicly-funded science to ensure that Germany remains a world leader in research. The DFG's (which runs the Initiative jointly with the Germany Science Council) website states: "The aim of the Excellence Initiative is to make Germany a more attractive research location, making it more internationally competitive and focussing attention on the outstanding achievements of German universities and the German scientific community." The Initiative has 3 funding lines: clusters of excellence between institutions, to promote leading research; institutional strategies to promote top-level university research; and graduate schools to train doctoral students. (http://www.dfg.de/en/research_funding/coordinated_programmes/excellence_initiative/general_information.html)
[26] http://www.xe.com/ucc/convert.cgi

The significant investment in research by emerging and established competitor countries means the UK is facing unprecedented competition. In a time of expected fiscal constraint it is therefore important that research funding strategies and policies are focus on, and foster excellence across both sides of the dual support system.

Nationally, the higher education funding bodies of Scotland, Wales and Northern Ireland choose to allocate funding to research in a different way to HEFCE and to each in order to address the aims and priorities of each Devolved Administration. A Universities UK Report published in December 2008 provides a comparative analysis which is reproduced below.

Table 6.7

Spending on quality research by higher education funding bodies, 2006/07 [32]

	Total allocation to higher education institutions	QR research allocation	QR allocation as percentage of total spending	Percentage variation from GB average
HEFCE	5,564,049	1,318,765	23.7	+0.4
HEFCW	344,083	60,889	17.7	-5.6
SFC	917,087	175,743	19.2	-4.1
GB total	6,685,219	1,555,397	23.3	
DELNI		43,657		
UK Total		1,621,131		

All figures in £ 000s.

Source: UUK, 'Devolution and higher education'

Whilst differences in approach are necessary to reflect the different needs of each country, it is important that funding mechanisms in each country are sufficiently convergent in their approach and messages to researchers to ensure consistency and alignment of incentives to underpinning research excellence.