Economic (un)natural selection

Could the credit crunch 'weed out' weaker research projects, institutes or even countries, improving research quality overall?

The credit crunch could turn out to be 'kill or cure' for scientific research, weeding out the weak while favouring the strong. While many governments and research institutes are tightening their belts fiscally, some scientific sectors—and even countries—could well emerge fitter from this brutal (un)natural selection. At the same time, the economic crisis could intensify the inequality that is already present in the European research community. Increasing unemployment and the resulting extra burden on social security will force the poorer countries of Eastern Europe—including some of the newer European Union member states—to cut their already meagre research budgets, while wealthier nations, such as Germany and the UK, will be able to afford to stimulate key research areas.

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Indeed, some research fields, particularly within biomedical research, will benefit directly from stimulus packages. This is already happening in the USA, where President Barack Obama has proposed a stimulus package that would inject an extra US\$10 billion into the biomedical research budget of the National Institutes of Health (NIH; Bethesda, MA, USA) for 2009, which certainly poses a major challenge for the whole of Europe, according to Beata Konze-Thomas, Head of Coordinated Programmes and Infrastructure at the German central science funding agency, the Deutsche Forschungsgemeinschaft (DFG; Bonn, Germany). "I think it is a problem because if [the Americans] suddenly spend an extra US\$10 billion [they will] need the personnel to do the research, and for the last 6 or 7 years not that many people have gone to the US from Europe," she said. "Now the opportunities are increasing [and] people will

again start going to the US. [The Americans] probably need 15,000 people from Europe alone to do all the extra research this money will support."

The research-stimulus package will certainly give a huge boost to the projects that are funded directly by the NIH, increasing the NIH research budget by more than one-third to US\$39 billion in 2009, which, at least at first sight, European countries will be hard pushed to match. Yet, the impact in Europe might not be as marked as some fear, especially when the research picture across the whole of the USA, including universities, is taken into account. Unlike European countries, the USA has two tiers of universities: the large private ones such as Harvard (Cambridge, MA, USA) and Stanford (Palo Alto, CA, USA), which rely chiefly on massive endowments; and the public ones such as the University of California group, which are funded at the state level. The former have suffered from the crisis owing to the falling value of their multi-billion-dollar endowments (Wolinsky, 2009a), whereas the latter are likely to suffer funding cuts because the states themselves have run into financial difficulties.

According to Al Teich, Director of Science and Policy Programs at the American Association for the Advancement of Science (AAAS; Washington, DC, USA), "[b]oth public and private universities in the US have serious financial problems. [...] Harvard, for example, has had to scale back its ambitious plans for a new science campus across the Charles River from its main campus, which, hopefully temporarily, leaves a huge hole in the ground where a major building was supposed to go." However, he also pointed out that stimulus funds would probably be offered only to make up shortfalls in some instances: "No one, so far as I know, has been talking about a federal bailout for universities," he said.

Therefore, the jobs that the Obama bailout creates through extra NIH funding might ultimately be offset by job losses at universities that are forced to cut back on their

expenditure without federal funds to bail them out.

Yet, although Teich notes that the stimulus package will not solve all the short-term problems of American research any more than similar measures in Europe will, he points out that the election of Obama as President has introduced a longer term threat to European research. President Obama, Teich argues, has transformed the whole outlook of American science by replacing the backward policies of his predecessor with forward-looking new ones—of which the stimulus package is merely an unscheduled kick start. "President Obama sees science and technology as central to his administration's agenda, both long and short term," Teich commented. "He has said so repeatedly, including most recently in his speech to the National Academy of Sciences [Washington, DC, USA] on April 27. President Bush was not especially interested in science and technology, and it showed."

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The most immediate impact of Obama was to reverse the refusal of the previous administration to grant federal funds for human embryonic stem cell (HESC) research (Wolinsky, 2009b)—a policy that has helped the UK to establish pole position in this field. In fact, it was only the efforts of individual states that kept the USA in HESC research. California, for example, allocated state funds to create the California Institute for Regenerative Medicine (CIRM) in San Francisco, in order to manage HESC research while federal funds were unavailable. As Teich noted, however, the NIH resources, which

Obama has now made available for HESC work, dwarf state budgets.

"I don't have numbers for state expenditures on life sciences research, but it's safe to say that even though it's much larger that it was a few years ago, it's quite small compared to the federal level," Teich said. "California has the largest program—the California Institute for Regenerative Medicine funded the stem cell initiative of a few years ago—but, at a planned level of \$300 million a year for 10 years, it's tiny compared to NIH." Not surprisingly, shares in Californian stem-cell companies leapt when Obama lifted the eight-year ban on HESC research.

A part from the field of regenerative medicine, the Obama stimulus package and his generally positive approach to science will boost American research in several core areas, as well as opening up new areas of science, according to the NIH Acting Director Raynard Kington. "We have created a number of new programs that will spur new areas of research and trigger an almost immediate influx of research dollars into communities across the nation," he said. "For example, [the] NIH has created a new program called the Challenge Grant award, and to kick start this program, we have issued the largest Request for Applications in our history. This 220-page document lists numerous scientific topics in 15 broad scientific areas, including: bioethics, translational science, genomics, health disparities, enhancing clinical trials, behavioural change and prevention, and regenerative medicine—areas that would benefit from a jump-start or in which a scientific challenge needs to be overcome. We expect to devote at least \$200 million of these funds to this effort."

Kington admitted, however, that the scale of the credit crunch behoves the NIH to act quickly to preserve the research base of the country and to ensure that worthwhile projects do not falter. "This opportunity is too important for us to conduct 'business as usual'," he said. "It demands that we employ the best possible approaches to ensure progress in an accelerated time, with the most efficient and effective use of resources." By way of example, he pointed out that a lack of funding had caused the NIH to turn down 14,000 grant applications in its last round of review, even though they had been deemed of high quality and had been approved by advisory councils.

"We are now planning to fund those scientifically meritorious applications for two years, in cases where the scientific plan is appropriate for a 2-year award instead of the usual 4-year award," he said.

According to Professor John Beddington, Chief Scientific Advisor to the UK government, the message for Europe was that a similarly high priority must be given to science during the recession. "I whole heartedly agree with Peter Mandelson's [the UK Secretary of State for Business, Enterprise and Regulatory Reform] view that science is the ladder by which we will climb out of the recession," Beddington said. "Part of my role over the next few years will be to reiterate this point within [the UK government] to make sure that science and science funding is not a casualty of short-term pressures."

Rens Vandeberg, Programme Officer for the nanotechnology network of the national Dutch research funding agency, The Technology Foundation (STW; Eindhoven, the Netherlands), similarly points out that European countries must act immediately both to maintain key projects and the associated expertise during the recession, and to offset cutbacks in research funding from industry. Vandeberg suggested that, similar to the US government, the governments of leading European countries should increase research spending just to maintain their positions, as the Netherlands is already doing: "In the Netherlands, public funding agencies like the STW are employing several strategies to tackle the credit crunch. Firstly, planned investments will be speeded up; secondly, new programmes are being set up; and thirdly, if possible, budgets for existing programmes are being increased," Vandeberg said. "For example, STW reintroduced the so-called Casimir-scheme in which STW

enables scientists from industry to work at universities in STW-funded projects and covers the bigger part of their labour costs during the course of the project."

Europe also needs to attract foreign scientific talent to compensate for the inevitable loss of some of its young scientists to the USA, according to Konze-Thomas. She cited the DFG Excellence Initiative, which supports the highest quality research at institutes and universities, and is designed to make the country a magnet for the best scientists, including foreign post-doctoral researchers. "Altogether, 4,200 people have been brought into [German] research by this scheme, 30% of whom are not from Germany," she commented.

The scheme also highlights how, at least until the election victory of Obama, Europe was sometimes ahead of the USA in making new investments to promote science. The DFG Excellence Initiative was founded in 2005, two years before the first rumblings of the credit crunch, and the new US Grant Opportunity (GO) Program—which is part of the

response of the Obama administration to the recession—bears some strong resemblances to it. “[The GO Program] supports high impact ideas that require significant resources for a discrete period of time to lay the foundations for new fields of investigation,” Kington explained.

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Similarly, Europe did not wait for the credit crunch to strike before establishing the European Research Council (ERC; Brussels, Belgium) in 2007, which has a long-term plan to match the US National Science Foundation (NSF; Arlington, VA, USA) and the NIH in scale, funding major research programmes across the European continent. Unlike the European-level funding agencies that existed before it, the ERC funds whole research projects and not just cross-border or collaborative elements of existing projects, such as travel and conferences. The ERC is also intended to fund projects based on scientific merit, that have been selected by peer review, rather than allocating resources equitably between member states. The ERC is still in its infancy, having begun to allocate funds only in 2007 and so far distributing €850 million to 575 researchers out of more than 11,000 applicants. However, as the ERC President Fotis Kafatos pointed out recently, many runners up in the ERC peer-review process have since been supported by national funding agencies (Hudson, 2009). This trend highlights that Europe is not simply a mirror image of the US federal-versus-state funding model; European national governments are set to continue to have large roles in funding research for many years to come. Indeed, as Kafatos indicated, the ERC will achieve success not purely through direct funding, but also by working in partnership with national governments.

Even so, the fact remains that it will be some time before the ERC can match the NSF as a global funding force. Although

the ERC annual spending is set to accelerate—reaching €1.7 billion by 2013—the stated objective of Kafatos to sustain growth to match the NIH and NSF budgets by 2020 seems slightly over-optimistic.

Meanwhile, several European agencies—such as the European Science Foundation (ESF; Strasbourg, France)—continue to have a significant role in stimulating the cross-border and cross-discipline collaboration that is required to make European research more united, with less overlap and less redundancy. Although these European cross-border projects rely on national funding, the role of these agencies in producing coherent high-quality research across the continent has been recognized and, as the ESF Chief Executive Officer Marja Makarow noted, “[t]he ESF has obtained a substantial budget increase for 2009.” The ERC certainly wants to stimulate further the type of cross-border collaboration promoted by the ESF, in order to create a fertile European-wide hinterland to support world-class research.

Makarow also emphasized the importance of preserving or even increasing science budgets during the recession, citing the example of Finland, which suffered a severe recession in the early 1990s after the collapse of the Soviet Union. “[The Finnish recession] was due to the termination, literally overnight, of commercial deals between the two countries, resulting in a surge in unemployment, a wave of bankruptcies, and the wobbling of the banks in Finland,” she said. “The government made important decisions [about] R&D funding, and in record time, Finland was excelling at the top of global competitiveness statistics. Europe as a whole will lose unless a critical number of countries keep up their investment in knowledge building as the US administration has done.”

This message has certainly been taken on board by leading countries such as Germany and the UK, which both introduced stimulus packages of their own. In Germany, the fruits of this stimulus are already being distributed to organizations such as the Helmholtz Association (Bonn, Germany)—a community of 16 physical science, technical and biomedical research centres. The Helmholtz

Association will receive around €65 million from the first economic-stimulus package of the German government to invest in expanding and developing crucial research infrastructures, although this is a small fraction of the total €2.1 billion that it will receive in 2009 (www.helmholtz.de). “These additional funds are granted for short-term projects across all the Helmholtz Association’s Research Fields and have to be spent by the end of this year,” explained the Managing Director of the Helmholtz Association, Rolf Zettl. “Of this extra €65 million, €13 million will flow into health-related projects.”

Zettl is optimistic that the credit crunch will favour the life sciences, particularly health-related research. “There has certainly been a trend towards research into health and into energy and climate. That makes sense as these subjects have a direct influence on our daily lives,” he said. “Right now we are seeing that despite, or maybe even because, of the crisis, research projects are attracting investment and that the life sciences are playing an especially significant role in this.”

A general belt-tightening, coupled with the focused injection of cash for high-quality research, might ultimately benefit all sectors of science research by improving the overall quality and weeding out weaker, dead-end projects. Yet, as Howy Jacobs noted in his June Editorial in *EMBO reports* (Jacobs, 2009), it is important to realize that scientists cannot deliver ‘products’ on demand. As such, a focus only on projects guaranteed to generate revenue would be a mistake at the cost of vital investment into—also ultimately profitable—basic research.

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