Squaring excellence and equality

The focus on funding excellent science and promoting mobility is causing poorer countries and regions to haemorrhage talent to their science-rich neighbours

Philip Hunter

When the details of the European Union (EU)'s new Framework research funding programme became public, it was congratulated for its generosity, especially at a time when many of its member states were struggling economically. The so-called Horizon 2020 programme will run from 2014 to 2020 and is worth €80 billion; the 2015 payout is already much higher than many had anticipated. However, now that the cheers have died down, criticisms have ensued over the increasingly unequal distribution of money between member states. Complainants allege that the allocation of EU funding has acted to accelerate the widening economic divide since the credit crunch of 2008, with the wealthier nations of north and west Europe profiting at the expense of the poorer states in the south and east.

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The allocation of funds to certain countries has certainly been out of proportion to population size or GDP: Germany and the UK each received €1.1 billion in 2013, making them the top recipients of Framework funding that year—the last year for which data are currently available. The Netherlands, which has a population of 16.8 million, received €560 million, which was also roughly the amount Italy received, despite having almost four times the population of the Netherlands.

Poland fared significantly worse, receiving just €67 million, despite having a population of 38.5 million. Romania was close to the bottom with just €17 million for a population of 20 million people.

There is great divergence of opinion over the implications of this disproportionate distribution of funds: Should EU funding concentrate on scientific excellence, even at the expense of member states with a less developed research base, or should it focus on underdeveloped regions to lift all boats? Some commentators argue that the purpose of the Framework programmes was never intended, nor ever should be, to engage in social engineering or to enforce economic convergence within the EU. Yet, it is also necessary to improve research across the continent as a prerequisite for the innovation-based economy that the EU aspires to become.

Europe is not alone in facing these issues, but economic, linguistic and cultural divides exacerbate such problems on the continent. In the USA, most of the scientific capital and infrastructure is also concentrated in a few regions that inevitably also receive the greatest share of federal funding. But Europe has the additional problem of conflicting national priorities, according to Jordi Gallart, an analyst of technology policy at INGENIO, a joint Institute of the Spanish Council for Scientific Research and the Polytechnic University of Valencia. “The problem the [European] Commission has is that it has become a victim of its own rhetoric,” he said. “When you have a focus on excellence and also a rhetoric about the increasing disparity with the aim to facilitate regional integration, as well as social engagement and long-term sustainability, it may well be that those

objectives are not wholly compatible. So they usually end up having to fudge and that is not a criticism, but is inevitable.”

Whatever the intentions, research grants can anyway have unintended consequences. One example is the European Research Area (ERA), which was set up in 2000 with the aim to create a single zone within which students, researchers and ideas could circulate freely, increasing the mobility of scientists, stimulating collaboration and transferring skills across the EU. University recruitment has become more open and international than before, and many grants are portable so that people can move to different institutions to carry out the work. But the greater mobility of researchers has also triggered a haemorrhage of people from the south and east of Europe to the north and west, exacerbating the continental divide, according to Gallart. “Having a mobile grant just makes the disparity bigger,” he said. “People usually move to places like the UK or Denmark, not Greece or Poland.”

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There is no turning back on mobility though, which is now a key feature of several key EU funding instruments, such as the Marie Skłodowska-Curie Actions programme. Its objective is to encourage researchers to travel both between regions and disciplines, and applicants are barred

from applying for a fellowship from within a country if they have lived there for more than 12 months in the 3 years before the deadline for the given call. No such constraints apply to grants from the European Research Council (ERC), which has a budget of €13.095 billion to fund mostly high-risk “frontier” research. But, again, mobility is a fundamental aspect of those grants, as grant holders are free to move to another institution in any EU Member State or associated country.

One positive conclusion is that the education systems of the countries of the south and east do produce talented scientists who are appealing to the countries of the north and west. This came from a study of the situation in Greece [1], conducted in 2011 when the economy was already in difficulties, even if it had not yet

reached current crisis levels. “One abiding impression I took from Greece was that it had the talent but not the system in place to maximize that,” said Jonathan Grant, Director of the Policy Institute at King’s College London and co-author of the study. “In parts of the Middle East they have almost the opposite problem,” Grant said. “There is a lot of infrastructure investment, but they have struggled to recruit the talent. So we need to focus on whole ecosystems and on the longer term.”

There are other aspects, besides lack of infrastructure, that might hold back struggling countries and regions. “Apart from quality, there are many reasons why Spanish researchers, for example, will not be able to capture European funding, and these include lack of administrative support,” said Ismael Rafols, visiting Fellow at the University of Sussex, UK, who has also worked in Spain,

Japan and the USA. “If I prepare a grant application here in Sussex, you have administrative people who are so much more knowledgeable about European rules, but also have professional skills.” He pointed out that in Catalonia, an affluent region in the northeast of Spain, efforts have been made to improve administrative support, which has resulted in greater success in funding applications.

But some believe that achieving scientific parity between regions is impossible and not even desirable. Maria Nedeva, Head of the Innovation, Management and Policy Unit at Manchester Business School in the UK, argued that it is inevitable that Framework awards will amplify Europe’s north–south divide for science, but that this is not necessarily a bad thing. “Whether or not it is a problem depends on our vision of the European Union and European Science as

part of it," she said. "For example, if we are building European Science, it doesn't matter much how much Poland gets out of the Framework Programme. Their top scientists can contribute through not working in Poland, and Poland can benefit from the fruits of science. [...] We should start asking the serious questions of why scientists migrate and why Southern and Eastern European countries can't compete—and will get to issues of infrastructure and the level of development of the science base in these countries."

In the USA, the issue of convergence has been viewed more in terms of people than regions, to encourage groups underrepresented in science, which includes ethnic minorities and women. In some cases, this can indirectly support lesser known institutions outside the Silicon Valley, San Diego, New York, Boston or Chicago areas, but there is an insistence that proposals must be rewarded on merit, no matter how ethnically diverse the group involved, according to Cliff Gabriel, senior advisor in the Office of the Director, National Science Foundation (NSF). "The NSF provides a broad array of programs to support diverse researchers and institutions to enhance and sustain the nation's research enterprise," he said. "While a vast majority of NSF's programs have a disciplinary focus, in biology or engineering for example, some programs have demographic, institutional, or geographic foci. [...] However, while these programs target specific communities or institutions, proposals undergo merit review in accordance with NSF's practices, and only those proposals deemed meritorious are funded." Gabriel added that while the few leading universities are very successful in competing for funding, more than 1,800 institutions nationwide have won awards. He also pointed out that there are plenty of other funding sources, including federal agencies and industry.

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Most prominent among these is the NIH (National Institutes of Health), which set up

an Advisory Committee to the Director in 2012 to study the diversity in the country's biomedical research workforce. In response to the group's recommendations (<http://acd.od.nih.gov/Diversity%20in%20the%20Biomedical%20Research%20Workforce%20Report.pdf>), the NIH established the Enhancing the Diversity of the NIH-Funded Workforce programme, initially to explore strategies, for example by identifying the hallmarks of a successful research career at each phase of the training process. It has also been looking at the factors that influence emerging scientists, particularly those from underrepresented backgrounds, to enter or leave a research career. The programme's premise is that increased diversity and competitiveness will strengthen the US research base while reducing the nation's health gap between richer and poorer people.

The NIH's diversity programme, with a \$31 million budget in 2014, is also distributing funds to smaller regional institutions. "Nearly all of the institutions involved are those that have a primary mission to serve underprivileged individuals, mostly either Hispanic serving or historically black institutions," said Richard Morimoto, Director at the Rice Institute for Biomedical Research at Northwestern University in Evanston, IL, USA. The key challenge, Morimoto explained, is to support students beyond the period during which they receive NIH funding; his own laboratory has been involved in local schemes to support students from ethnic minorities. "If the objective is to increase the number of minority students in the academic and scientific workforce, then this can be directly measured by the number of students in PhD programs throughout the country, as post-doctoral fellows, and then finally on faculties," he said. "Too often, though, such efforts only stimulate the number of minority students who go to medical school. While this is not a failure, unfortunately physicians do not serve as undergraduate role models, mentors, or research advisors."

Morimoto was also doubtful whether the NIH's diversity programme would significantly strengthen research at regional centres for the very reason that they lack the resources to provide the required experience. "The problem is bandwidth," he said. "The best research institutions are also the ones who can provide the best

research opportunities and training. Of course, this is not to say that students cannot get opportunities in regions lacking major research efforts. But the problem is that such regions, institutions and faculty are also struggling at the same time and have very few extra resources to train additional students."

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Morimoto's argument is that it is better to focus on excellence and bring students to centres where they can experience the best resources and teachers in their field, rather than worry about spreading money. He added that the various major funding sources, including the NSF, Howard Hughes Medical Institute (HHMI) and the Gates Foundation, could do more between them to coordinate their resources dedicated to stimulating both geographical and human diversity in research.

Currently, the various funding bodies tend to operate autonomously, although some have made significant contributions to diversifying the USA's science base and bringing in people from diverse backgrounds. The HHMI focuses on the upstream pipeline by supporting science education at the undergraduate and community college levels with grants directed at students from underprivileged backgrounds. It staged a 2014 competition challenging universities to develop and implement strategies that would increase the number of undergraduate students from diverse backgrounds, involving 4- or 5-year grants. The HHMI has also announced a new competition to stimulate colleges and universities to build lasting capacity to provide opportunities for "first-generation" students from families that have not been engaged with higher education before (<http://www.hhmi.org/programs/initiative-for-universities>).

The Gates Foundation is more focused on research priorities for developing nations and does not fund infrastructure. But, unlike the HHMI, it is investing in education with a broader span, extending to the start of primary education. Its declared focus is on

creating opportunities for students from low-income and all racial or cultural backgrounds, starting in Washington State where its headquarters are (<http://www.gatesfoundation.org/What-We-Do/US-Program/Washington-State/Education-Pathways>).

By contrast, Europe puts greater emphasis on funding research infrastructures. The primary sources of money are the EU's Structural and Cohesion Funds, which have a total budget of €336 billion for the 7 years from 2014 to 2020 inclusive. Of this, around €50 billion have been made available for research and innovation related projects, including new laboratory buildings. The challenge lies in coordinating this funding with Horizon 2020 to stimulate science in some of the less developed regions, without compromising the drive for scientific and technological competitiveness across the whole EU.

The EU has acknowledged this issue by setting up a small programme, called Stairways to Excellence (<https://ec.europa.eu/jrc/en/research-topic/stairway-excellence-s2e>), that helps applicants dovetail the two funding sources. However, the programme

mainly benefits research teams that have already been awarded structural funds on their own merits. One problem with southern European countries is that their research and funding systems need fundamental reform, according to Rafols: "Another reason southern Europe is not doing that well is that these countries have academic feudalism," he said. "The scientific system in Spain and Italy is still based on 20th century centralized and extremely inefficient hierarchies. There is a lack of flexibility that really hinders the system at all levels." The implication is that structural funding for these countries should be tied to reform of their system to increase the incentive for the scientists on the ground to apply.

There is growing awareness of these issues among the EU's peripheral countries, and efforts are being made to improve the physical and cultural infrastructure to stimulate local research and attract funding. These efforts are visible, for instance, in Portugal's latest roadmap for research infrastructure (http://ec.europa.eu/research/infrastructures/pdf/pt_roteiro-fct2014.pdf), which was designed to provide equipment, resources and training aimed at recruiting and retaining scien-

tists in core areas. One example is that Portugal has established a branch of the European Marine Biological Resource Centre (EMBRC). Among their proposed actions is the intent to train scientists to find partnerships and apply successfully to European programmes, with the aim of doubling both Portugal's scientific output and funding by the end of Horizon 2020. Furthermore, the roadmap targets regions that until now have done badly in terms of R&D spending, research infrastructures and personnel.

While it remains to be seen whether Portugal can achieve these goals, it is already a step in the right direction, highlighting how research excellence and convergence can be compatible. The challenge now for Europe, through the respective 2014–2020 programmes, is to coordinate the different funding programmes so that they reinforce each other to reduce regional divisions.

References

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