



Building up the PhDs

Prof Colm Harmon, Dr Liam Delaney and Martin Ryan of UCD argue we must fight any potential market failure in our fourth-level education.

For the next number of years, Ireland will embark on an ambitious programme to become a high-end research-intensive knowledge economy. The *Strategy for Science Technology and Innovation* released in 2006-2013 outlines the mechanisms by which this will take place. At the heart of this strategy is the commitment to double the number of PhD students and postdoctoral researchers operating in Irish universities and to substantially expand the linkages between PhD researchers in universities and industry.

The training and supply of PhD researchers is a critical issue for business, Government and academia in Ireland and all throughout Europe. A recent issue of the *Europe4Researchers* newsletter describes how the EU has five full-time researchers for every nine in the United States, and 10 in Japan. Also, the comparative lack of researchers in Europe is particularly visible in business, with almost one-third fewer researchers employed in this sector compared to the US. The irony is that EU countries still produce more science and engineering graduates – including those with PhDs – than the US and Japan.

However, unemployment among doctoral researchers in the EU is relatively high, while their salary remains low in comparison to other professionals with a similar education. Why? *Europe4Researchers* suggests that there is insufficient demand for researchers by the business sector.

Thus, a key issue is the potential that some market failure could be occurring in Europe's graduate labour markets if the business sector is not hiring PhDs because they are not trained in the right subfields of science, engineering and technology.

In Ireland, successive reports of the Expert Group on Future Skills Needs state that Ireland needs more doctoral candidates, especially in technical disciplines including engineering, information technology, mathematics and the physical sciences. It is important to know what specifically attracts or discourages graduates from these

disciplines.

If market failure is occurring, then one solution is for greater co-operation between the business sector, Government and academia to ensure that information about labour market opportunities cascades down to students who are just embarking on their PhD courses. Given the importance of commercialised innovation, patenting and technical progress for the development of the Irish economy, it may be strategically sensible to offer incentives to PhD students who choose research topics of importance to the economy. Thus, when thinking about increasing the number of PhD students and postdoctoral researchers, the issue is not one of numbers but one of matching the topics and the wider societal, public and private sector context.

Substantial research, particularly in the US, points to what can go wrong when the focus is merely on increasing numbers. Research from the Cornell Higher Education Research Institute evaluates the Graduate Education Initiative (GEI) that provided \$85m in financial support towards PhD education in the US. This initiative was criticised for failing to directly address more fundamental issues on departmental levels in the American universities, such as ensuring match between supervisor and student, or match between student and PhD topic. In a further twist, the Cornell evaluation describes how generous financial support may even have induced students to persist with an unloved topic for longer than they might otherwise have done.

This is an incredibly important line of enquiry as there is a fine balance between incentivising students to choose PhD topics that have economic applications, and ensuring that students choose topics they are interested in and sufficiently motivated to complete. If Ireland wants to set the pace in Europe and compete with the US in this arena, then it needs to understand the combination of factors that are either attracting or distancing graduates from opportunities in fourth-level Ireland, the

disciplines in which they choose to work and the topics on which they want to concentrate.

Increasing amounts of attention are being placed on the outcomes of PhD education all around the world. Every few years since 2001, *Science* has conducted a survey in which life scientists from the United States report their income and job satisfaction. The US Survey of Doctorate Recipients (SDR) gathers information from individuals who have obtained a doctoral degree in a science, engineering or health field. The SDR is conducted every two years and is a longitudinal survey that follows recipients of research doctorates from US institutions until age 76. The US Survey of Earned Doctorates began in 1957–58 – it is a census of all individuals receiving a research doctorate from a US institution. All

individuals, as they receive their research doctorate, are asked to complete the survey.

Bender and Heywood (2006) uses this study to examine “educational mismatch” between individuals’ PhD education and their subsequent employment. The primary indicator of mismatch in the SDR comes from responses to the following question: “Thinking about the relationship between your work and your education, to what extent is your work related to your doctoral degree?” The possible responses are “closely related”, “somewhat related” and “not related”. The researchers then examined the determinants and consequences of the degree of mismatch. In particular, the degree of mismatch was associated not only with lower wages but also with lower job satisfaction and higher job turnover. Put simply, mismatch is bad for the economy and also for the people involved as it reduces their wages and their job satisfaction. The results of these studies have focused attention in the international higher education research community on the importance of considering potential strategies for ensuring optimal career matches for PhD students.

The results of this and related studies point to very varying degrees of matching in different disciplines. Ultimately, the issue is one of ensuring maximum return on the investment put into fourth-level Ireland, both in terms of economic outcomes and also in terms of improvement in the quality of life of the people involved. The Government recently announced a new

strategy for science, technology and innovation, which will involve among other things a doubling of the number of doctoral researchers over the next 10 years. It is important that the lessons from abroad are heeded. If doctoral candidates expect to work solely in academia or solely abroad, then the return on Government investment will be disappointing. Many challenges lie on the road ahead, including a projected sharp decline in the cohort of school-leavers (and thus potential researchers) and a need to retain indigenous researchers in Irish enterprise. Thus, while the strategy offers a strong possibility to transform the Irish economy, much will depend on how we deal with the very complex human resource issues involved.

The need for more data on doctoral candidates’ career outcomes in Europe is one of the key conclusions of the EUA Doctoral Programmes Project (EUA, 2006). A project currently being conducted by the European Universities Association (EUA) is intended to provide comparative data on doctoral candidates’ career outcomes from institutional records kept in European universities. Researchers at the UCD Geary Institute will conduct a study on fourth-level Ireland over the next three to four years. This project is the first longitudinal study of postgraduate researchers in the world – it will develop a large web-based survey system to examine the progress of individuals through the fourth-level sector in the Republic of Ireland. The

research to be conducted at the Geary Institute will provide insights into the potential supply of researchers, what researchers want to achieve in their careers, and what policies are needed to ensure that Ireland sets the standard in Europe and competes on a strong footing with other research destinations. ❖

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