9

THE INTERPLAY BETWEEN POLICY AND FUNDING

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Background

There has been a sustained increase in the number of PhD graduates globally, across most disciplines for at least the last decade. The 2019 Organisation for Economic Co-operation and Development (OECD) study 'Education at a Glance' reports that 1.1% of 25- to 64-year-olds held a doctoral degree in 2018 across OECD countries and that this figure has grown by about 8% between 2013 and 2017 (1). In the UK, data from the UK Higher Education Statistics Agency 2016/17 shows a similar overall increase in qualifying doctoral researchers of 9% from 2012/13 to 2016/17 (2).

But have such changes been planned in both funding and policy terms? Increased investment in STEM (1) and PhD training specifically (2) is often used and cited as an essential ingredient for national growth. The relationship, though, is not uncontested, and in particular when it comes to thinking about how many PhD researchers should be in the system, there is a hotly contested debate about whether there are too many or not (3), whether a PhD is really required for all roles doctoral researchers ultimately take up and whether the success of a nation's economy can explicitly be linked to research capability (4, 5). These are complex issues to unpick.

National, charitable and institutional funders all support doctoral training for different reasons; some have a national responsibility for capacity building, others want to catalyse skills development in specific areas and others support doctoral training because it is a relatively low-cost investment. Individual motivations for undertaking a PhD also vary (6). Whilst the stated aspiration of many starting PhD training is often to continue a career in academic research, the reality is that, as in many sectors, competition for limited places means this is not a reality for the majority (7). We also know that many careers require and/or benefit from PhD-level skills but that the parity of esteem in which these careers is held varies widely. The

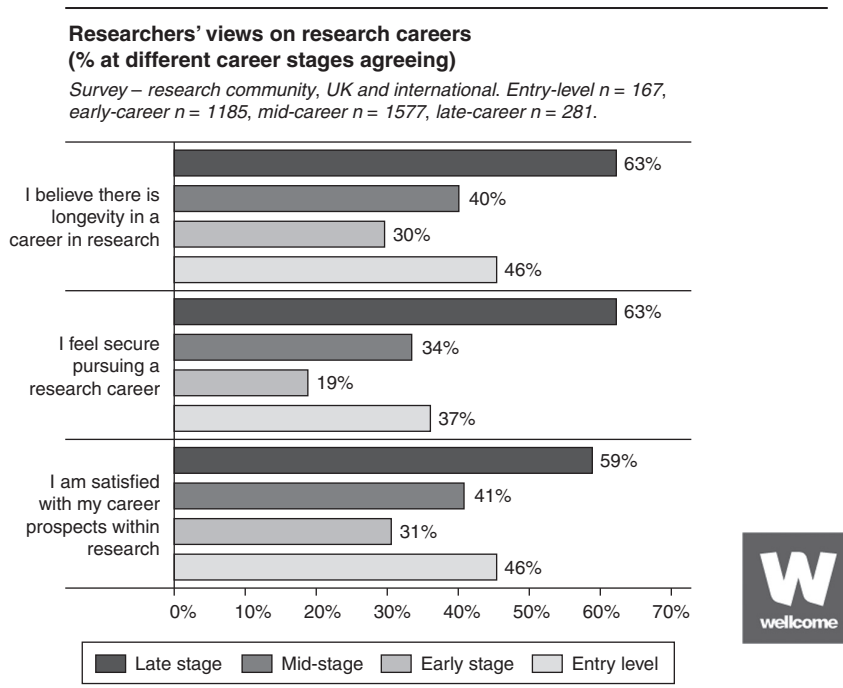

FIGURE 9.1 Researchers' views on research careers

issues are nicely summarised in a blog from the PLoS early career researcher community and Meredith Walker's summary of discussions with Shirley Tilghman (8).

If there is debate about doctoral training, is all well in the wider research system? Here too there are signs that the system is creaking. The recent report from Shift Learning and Wellcome shows that there is a complex network of incentives from government, funders and institutions that seem to focus on quantity of outputs, and narrow concepts of 'impact', rather than on quality. The reported consequence is an intense pressure to publish, with too little value placed on how results are achieved. There is concern that whilst competition is to some degree inevitable, the current system is often aggressive and harmful. Researchers, at all levels, appear to have a worrying lack of confidence and satisfaction in their career prospects (Figure 9.1).

In such a complex landscape, how then should funders approach policy setting in doctoral training?

Wellcome and PhD training: a brief history

Wellcome is a global independent foundation, accountable to society for delivering its mission. For many decades Wellcome has supported PhD training in a variety of different ways. Our current support includes UK-based four-year programmes

in basic science and public health, programmes for UK clinical academic training and studentships in the humanities and social sciences. Whilst we mostly fund in the UK, we also fund some doctoral training in lower- and middle-income settings predominantly through the Developing Excellence in Leadership Training and Science in Africa (DELTAs) and the Wellcome DBT India Alliance.

Whilst the principles are similar across all Wellcome's approaches to doctoral training, this chapter focuses on Wellcome's UK doctoral training programmes for basic science, as an illustrative case study.

In 1986 Wellcome changed its approach to funding UK biomedical PhD students. Prior to 1986 doctoral candidates would identify a supervisor and jointly apply for a Fellowship direct to Wellcome. After 1986 Wellcome moved to making larger awards direct to institutions. Each year directors of the Wellcome basic science PhD programmes would recruit a cohort of around five doctoral candidates who would be trained as a cohort over four years. Programme funding included realistic research costs, a generous travel allowance and stipends equivalent to a salary. Wellcome's rationale for funding doctoral training in 1986 was to contribute to supporting the next generation of biomedical researchers.

Wellcome's programmatic approach to PhD funding changed very little over the next few decades. We continued to stress the importance of ensuring programmes were well funded to highlight the value of training doctoral students in cohorts and providing four (rather than three) years' full support for doctoral trainees.

Wellcome's 2017 review of UK biomedical PhD training

In 2017, as part of a regular cycle of scheme reviews, Wellcome's UK biomedical PhD programme funding scheme was reviewed. Evaluations of this kind are a part of the normal governance cycle for most funders. They provide an opportunity to see if schemes are fulfilling their objectives and inform decisions as to whether to continue funding and, if so, at what level and in what form.

Methods

The review (10) was undertaken in four parts summarised in Figure 9.2.

Review findings

The review highlighted a number of concerns with the doctoral training landscape in the UK which are summarised below. These concerns, as the literature shows, are not restricted to the UK.

Not all doctoral experiences are equal. Doctoral training numbers have increased across all disciplines in the UK in the past decade. This increase in part comes from increased investment by research funders, sometimes targeted in specific areas. Approximately 50% of all doctoral candidates in the UK are either self-financed (including international students who may be sponsored by their home country) or

	What	*Method*
1	Global literature review	
2	Analysis of UK datasets from the Higher Education Statistics Agency (HESA) and Wellcome Career Tracker	JACS 3.0 codes from HESA 2012/13 - 2015/16 relevant to biological and biomedical sciences and Wellcome Basic Science Career Tracker from waves 1 and 2 (PhD completion in 2009 and 2010 respectively).
3	Semi-structured interviews with the research community	Using a core question set a number of interviews were undertaken with PhD supervisors and students, university administrators, other funders and key opinion leaders, Wellcome-funded PhD programme directors, Wellcome Governors and staff.
4	Online survey	A web-based survey was hosted by Qualtrics containing qualitative and quantitative questions. Questions were shaped by semi-structured interviews. The survey was open to new entrants between 28 November and 19 December 2017. For those already enrolled on the survey tool by 19 Dec 2017, it was left open for an additional week to allow for completion of surveys that had been started but not finished. The survey was disseminated via email, social media (Facebook, Twitter, LinkedIn) and Wellcome's website. 3467 people started the survey. 2703 completed the survey (78% conversion).

FIGURE 9.2 Constituent parts of the 2017 Wellcome review of PhD training and key findings

do not pay PhD training fees. Those who don't pay fees are often research assistants. The other roughly 50% of doctoral researchers are funded by funding agencies, most often through programmes with an emphasis on cohort-based training.

Data on the careers of doctoral researchers are incomplete and of very mixed quality both pre- and post-graduation. This is also highlighted in a recent paper from Hancock *et al.* (11). The concern from the perspective of researchers is that a lack of information available to students and prospective students hampers their ability to make informed career decisions. This lack of reliable, useable data also means that the evidence base available to policy makers and funders is unreliable and incomplete.

Career transitions are hard and not all careers are equally valued. There is increasing recognition that doctoral training has a role in society over and above training the next generation of research leaders. The review revealed there are concerns that the current system is not appropriately structured or incentivised

FIGURE 9.3 Areas in which support for PhD students could be improved

to ensure the necessary guidance, support and opportunities for effective career transitions are in place.

Aspects of the culture of doctoral training are unhealthy and potentially damaging. These issues also mirror many of those highlighted in the recent Shift Learning report, 'What researchers think about the culture they work in' (9). Concerns specifically highlighted in the PhD review (Figure 9.3) include increased incidences of poor mental health; insufficient time and emphasis on rigorous scientific enquiry including pressure to publish; increased instances of discrimination; a need for enhanced support for training in data sciences, statistics and good research practice; and variations in the quality of supervision.

Combined, these issues suggest that whilst most doctoral researchers are satisfied with their overall work–life balance, this seems to have decreased steadily over the past 20 or so years with lower scores amongst those who have completed their doctorate more recently (Figure 9.4).

Conclusions

Over the past couple of decades there have been several very positive changes in the way PhD training is supported by funders and institutions alike. For example, the majority of UK institutions now invest in core central support for doctoral training. There are, however, some worrying signs that positive changes are not evident in all parts of the system. These concerns are particularly keenly felt around supervision, career advice, burdensome administrative requirements by funders, lack of support (financial and practical) for career transitions, misalignment of expectations for the purpose of PhD training, concerns about equity, diversity and inclusion (including the adverse impacts of bullying and harassment and lack of

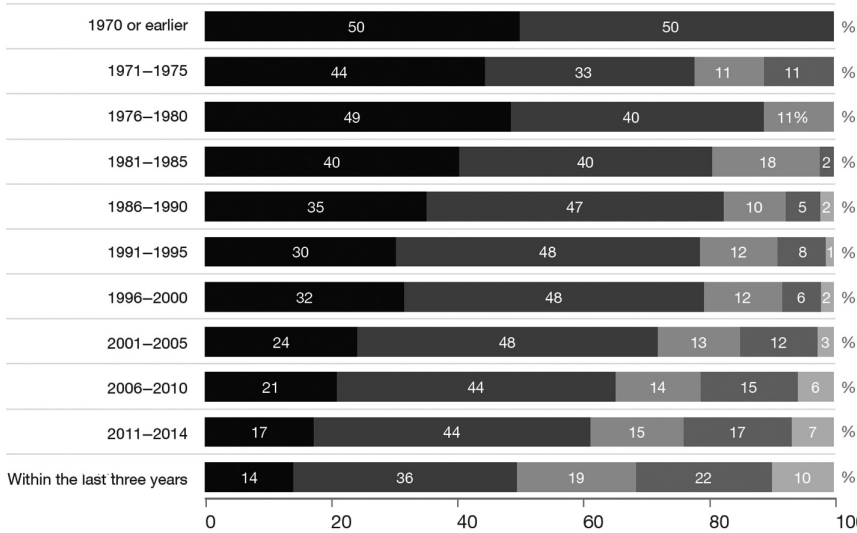

FIGURE 9.4 Percentage of respondents: PhD-qualified individuals; broken down by year of completion of PhD asked, 'As a PhD student, how satisfied were you with your work–life balance?'

psychological safety) and observed increases in reports of mental health issues. This concerning list reflects a wider set of issues which have the potential to undermine the research system. So potentially serious are the consequences that inaction is not an option, for any of us.

If a career in research is to be attractive and sustainable, if we are to benefit as a society from individuals with research expertise, then these ominous concerns must be addressed in a systematic way. The current status quo is not sustainable, or fit for purpose.

Where to start? Should we simply change our policies? Is it sufficient for us to identify where, as funders, our policies and actions contribute and then change these? And what part do researchers, supervisors and institutions play in creating the current environment? The honest answer to these questions is that we cannot work in isolation to change culture. Change requires iteration between all parts of the system (Figure 9.5). Individual beliefs and values affect cultural norms, and the interplay between these and organisational structures is real. A policy made in isolation and without understanding the system in which it will operate is doomed to be ineffective at best and could have serious unintended consequences and be damaging at worst.

As the open research community have found, system change does not happen quickly. It is a long game and requires collaboration across all parts of the system. Brian Nosek, the Director for the Centre of Open Science, comments that to make change happen, you need to understand the system and make change possible, easy and rewarded (12).

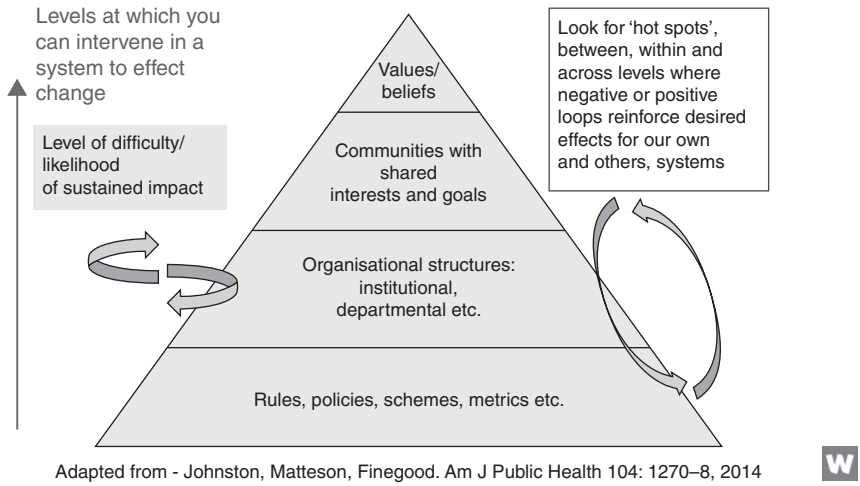

FIGURE 9.5 Levels at which you can intervene in a system to effect change

So what did we at Wellcome do about funding for PhD training? We learned from our review just how unreliable baseline data are, and how hard it was to identify the upstream determinants of the issues identified. We did not want to wait until data were robust to take action, as that could take years. Instead we took the opportunity afforded by the review to adopt an experimental approach to improving the culture of PhD training.

Our revised approach (13) included an explicit requirement for applicants to evidence not only how they would provide the best possible training in research but also how they would improve culture. Applicants were required to commit to several things, including publishing data to support career choices; supporting, as a signatory to DORA, the San Francisco Decoration On Research Assessment (to encourage supervisors and students to submit to research platforms that allow trainees to get credit for their work in a timely manner); evidencing how they would approach attracting a broader diversity of candidates from a wide range of backgrounds and disciplines; evidencing approaches to protect students' mental health; and making a commitment to come together as a community of practice and to share practice amongst themselves in an open and transparent manner.

Consistent with our wish to move to a more positive culture, we deliberately restructured our approach to peer review. Our panel included not only scientific experts but also experts with ethics, career development and educational expertise. For the first time we asked applicants to evidence how they understood their own baseline data relevant to research culture.

In order to maximise our understanding of the impact of this revised approach, we are building social sciences research into our evaluation of our new way of working from the outset. This will enable us also to build an evidence base both qualitative and quantitated to help us understand individual and collective

experiences, how emerging cultures are experienced and the social and cultural factors that contribute to (or hamper) the emergence of positive cultures within PhD programmes.

This approach is an important step in understanding how policy is implemented and experienced on the ground. It will provide valuable insights on ways to optimise partnerships for effective policy making, in this case to improve the culture of doctoral training. The issues highlighted in this chapter are reflective of wider concerns about the culture of the research system (9). It is imperative that across the research system funders, policy makers, publishers and institutions better understand the system in which they work and how their approaches are experienced. We can do this, for example, through building social sciences evaluations explicitly into the way we evolve practice.

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