Department of Education

Scoping revisions to the Graduate Outcomes survey

With a specific focus on postgraduate research students

A report for UKRI

Sally Hancock and Paul Wakeling

April 2025

University of York
York YO10 5DD
york.ac.uk

Contents

Executive summary

1. This report, commissioned by UKRI, provides a consideration of how to improve postgraduate research (PGR) studentship outcome monitoring through changes to HESA's Graduate Outcome (GO) survey. It is informed by the evaluation framework developed by SQW (2024), and examines the extent to which the GO survey, in its current or a revised form, can generate evidence against nine evaluation questions on UKRI's investment in PGR studentships.

2. The GO survey, introduced by HESA in 2018, collects data on graduates' activities 15-months after graduation. It covers activities such as paid employment for an employer, self-employment, voluntary or unpaid work and further study. There is a main survey, which all graduates receive, and, of relevance to this report, an opt-in bank of questions that are currently distributed to UKRI-funded PGR graduates only.

3. Our report presents three strands of analysis. Firstly, we assess the current GO survey against the evaluation questions developed by SQW. Secondly, we review international research on doctoral career pathways in brief, and examine the survey practices of other nations, to consider the value of a longitudinal follow-up survey. Finally, we present a summary of our interview discussions with a focused set of stakeholders identified by UKRI. All aspects of the research received approval from the Department of Education Ethics Committee, University of York.

4. We recognise that UKRI and other stakeholders hold diverse perspectives on the value of the GO survey and bring varied suggestions for a revised set of questions. Table 2 examines how the nine evaluation questions developed by SQW align with main and opt-in components of the existing GO survey. Coverage of the evaluation questions is mixed; ranging from fully to not addressed by the survey questions. We do not propose that all potential additional questions are incorporated into the next version of the GO survey. Rather, we list these potential questions so that UKRI can develop a prioritised list of changes to test and refine.

5. In order to support UKRI with this task, we conclude the report with a set of recommendations for enhancing the GO survey, informed more broadly by the insights of the wider literature, the stakeholder discussions, and our knowledge of survey methodology.

6. In summary, these recommendations are:

    1. The UKRI opt-in module questions should be extended as a mandatory component for all PGR graduates completing the GO survey.

    2. Enhanced detail on the conditions of doctoral training should be covered in the opt-in module questions in order to better distinguish the effects of support and the discrete components of doctoral training on PGR outcomes.

    3. In relation to the evaluation questions developed by SQW:

        a. 4b, 4d, 4e are fully addressed in the main survey or opt-in module and require no revisions to the existing GO survey.

        b. 1d, 3a, 4c, 5c are partially addressed in the main survey or opt-in module. Here we would prioritise the value of strengthening evidence in relation to 4c, on the extent to which PGRs secure a diversity of roles held in the R&I

workforce, and move effectively between R&I roles, by collecting information on multiple contemporaneous employment, restricted to two sources of paid employment.

c. 1b and 1c are not currently addressed in the main survey or opt-in module. UKRI should trial a prioritised selection of the potential additional survey questions identified in table 2 to avoid detrimentally lengthening the survey.

4. A longitudinal follow-up survey should be conducted, ideally at 5 years following graduation. For meaningful comparative analysis, it will be important to maintain consistency between the questions asked at 15 months and a later time point. The follow-up survey may also usefully include questions on: career breaks: whether undertaken and the duration of these; family formation; the number of jobs held in the intervening period; whether intervening jobs were research-active; and, barriers to career progression.

5. As PGR stakeholder engagement with the GO survey is relatively limited, there should be ongoing efforts to raise awareness of its value for monitoring doctoral outcomes. Stakeholders wish to see the inclusion of the following questions to the survey: [If working part-time]: Do you want to work more?; Do you wish to continue your main employment in the long-term?; Was the PhD qualification helpful to secure your main employment?; Has the PhD qualification enhanced your progression in your main employment?; Are you research active?; What percentage of time in your main employment is spent on research?

6. The opening question to the UKRI opt-in question bank - Thinking about the research degree you completed in YYYY/YY, what was the main reason you decided to undertake it? - does not obviously inform the evaluation questions and the value of its continued inclusion should be considered.

7. Opportunities for data-linkages between the GO survey and other data sources should continue to be explored. This approach received widespread support from the stakeholders and thinking on potential models for this is being led by others in the sector (Boddy & Mellors-Bourne, 2024).

Analysis

There are three strands to the following analysis. Firstly, we assess the current GO survey against the evaluation questions developed by SQW. Secondly, we review international research on doctoral career pathways in brief, and examine the survey practices of other nations, to consider the value of a longitudinal follow-up survey. Finally, we present a summary of our interview discussions with a focused set of stakeholders identified by UKRI.

Review of the current Graduate Outcomes survey

In the first part of our analysis, we consider the extent to which the evaluation questions developed in SQW's Impact Evaluation framework (2024) can be evidenced by the existing GO survey. We have limited our analysis to the questions identified by SQW as most suited to answering through the GO survey. These questions are listed below in table 1.

Evaluation questions
1b. To what extent, and how, have UKRI studentships enhanced discipline-specific knowledge and skills for supported individuals?
1c. To what extent, and how, have UKRI studentships enhanced research skills for supported individuals?
1d. To what extent, and how, have UKRI studentships enhanced personal, interpersonal and career-related skills for supported individuals (e.g., planning and communication)?
3a. To what extent, and how, have UKRI studentships led to expanded networks among students (with peers, academic institutions and industry/sectors)?
4b. To what extent have UKRI studentships led to an increased number of doctoral graduates working in the R&I workforce (academic, private sector, public sector, third sector)?
4c. To what extent, and how, have UKRI studentships enabled doctoral graduates to secure employment in a diversity/range of roles in the R&I workforce, and to move effectively between roles?
4d. To what extent have UKRI studentships increased the extent to which graduates apply doctoral knowledge and skills in post-degree work?
4e. To what extent have UKRI studentships improved near-term employment rates for supported individuals (all, and by characteristics)?
5c. To what extent, and how, have UKRI studentships led to the generation of new and novel research and knowledge?

Table 1. Evaluation questions proposed by SQW (2024; p.15 & 51).

The analysis which follows, set out in table 2, identifies relevant questions from the main and opt-in components of the existing survey. Where the evaluation questions are not met by the existing survey, we suggest potential alternative questions to answer these. It should be noted that this part of our analysis is focused on the alignment of the current survey and the evaluation questions proposed by SQW. It does not take into account the insights of the wider literature, the stakeholder discussions or

our knowledge of survey methodology. We do not propose that it would be practical or desirable to extend the survey to include all potential additional questions identified here. In the discussion section of this report, we put forward a prioritised set of recommendations for enhancing the survey, based upon the three strands of our analysis. We similarly encourage UKRI to reflect on prioritising these evaluation questions, and to consider a proportionate approach to revising the GO survey.

In approaching this analysis, we have assumed the adoption of SQW's recommendation that the main survey and opt-in questions are extended to all PGR graduates. We have colour-coded table 2 to denote if an evaluation question is:

- *not* currently addressed in the main survey or opt-in module (Red: 1b; 1c);
- *partially* addressed in the main survey or opt-in module (yellow: 1d; 3a; 4c; 5c); or
- *fully* addressed in the main survey or opt-in module (green: 4b; 4d; 4e).

Where potential additional questions are suggested, question phrasing, answer values and scales are designed to match the existing survey where possible.

Evaluation question	Existing survey questions	Assessment	Potential additional questions
1b. To what extent, and how, have UKRI studentships enhanced discipline-specific knowledge and skills for supported individuals?	N/A	**Not addressed in main survey or opt-in module** To assess the enhancement of discipline-specific knowledge and skills, additional self-report questions would be required. The potential additional questions we have identified are informed by the Statement of Expectations for Doctoral Training and the Researcher Development Framework. Since 1b. focuses on graduates' discipline-specific knowledge and skills, we have not contextualised these questions in terms of main employment or activity.	To what extent did your research degree enable you to develop in-depth subject area knowledge? To what extent did your research degree enable you to develop in-depth subject area skills? *The GO survey has three response sets which could be applied as answer values:* 1. *A 3 point scale: 1 A great extent; 2 Some extent; 3 Not at all; 4 Don't know* 2. *A 5 point scale: strongly agree; agree; neither agree nor disagree; disagree; strongly disagree [requires question to be phrased as a statement]* 3. *A 10 point scale: not at all to extremely developed*
1c. To what extent, and how, have UKRI studentships enhanced research skills for supported individuals?	N/A	**Not addressed in main survey or opt-in module** To assess the development of research skills, additional self-report questions would be required. The potential questions identified are informed by the Statement of	To what extent did your research degree enable you to develop working knowledge of responsible research and innovation, such as ethics, reproducibility, research integrity and open research methodology?

		Expectations for Doctoral Training and the Researcher Development Framework. Since 1c focuses on graduates' research skills, we have not contextualised these questions in terms of main employment or activity.	To what extent did your research degree enable you to develop analytical and data management skills? To what extent did your research degree enable you to develop the skills to apply research in different contexts? To what extent did your research degree enable you to realise routes to impact, such as opportunities for knowledge exchange, commercialisation and entrepreneurship? To what extent did your research degree prepare you to lead or contribute to the development of research funding applications? To what extent did your research degree enable you to access research funding since completion of [LEVEL] course at [PROVIDER NAME] 15 months ago? *The same potential response sets as 1b.*

1d. To what extent, and how, have UKRI studentships enhanced personal, interpersonal and career-related skills for supported individuals (e.g., planning and communication)?	In the job that you were doing during CENSUS WEEK, how often did you work autonomously? [WRKAUTO] In the job that you were doing during CENSUS WEEK, how often did you work as part of a team? [WRKPART] In the job that you were doing during CENSUS WEEK, how often did you work under close supervision? [WRKSUPER]	**Partially addressed by UKRI-student opt in module** Responses to WRKAUTO, WRKPRT and WRKSUPER can assist with assessing the extent of professional autonomy reported by employees and their engagement in team work. These responses can be compared between UKRI-funded and all other PGR graduates. For a more detailed assessment of personal, interpersonal and career-related skills, we have identified additional questions informed by the Statement of Expectations for Doctoral Training and the Researcher Development Framework. Since 1d focuses on graduates' skills-set, we have not contextualised these questions in terms of main employment or activity.	To what extent did your research degree enable you to develop effective personal qualities (e.g. perseverance, self-confidence, self-reflection)? To what extent did your research degree enable you to develop skills for effective self-management (e.g. time management, work-life balance, responsiveness to change?) To what extent did your research degree enable you to develop skills for professional and career development (e.g. career management; networking, responsiveness to opportunities)? To what extent did your research degree enable you to develop skills for effective interdisciplinary working? To what extent did your research degree enable you to develop skills such as effective communication and project management? To what extent did your research degree enable you to develop skills for effective public engagement?

			To what extent did your research degree enable you to develop skills for effective collaboration across private, public, and third sectors? *Answer values for all questions: 1 A great extent; 2 Some extent; 3 Not at all; 4 Don't know*
3a. To what extent, and how, have UKRI studentships led to expanded networks among students (with peers, academic institutions and industry/sectors)?	To what extent did your research degree involve collaborating with researchers from other disciplines? [COLLSUBDIFF] To what extent did your research degree involve collaborating with others outside of academia? [COLLOUT] During your research degree, did you have any periods studying or undertaking research outside the UK? [INTLMOB] During your research degree, did you carry out a work placement or internship? [PLCINTSHP]	**Partially addressed by UKRI-student opt in module** Responses to COLLSUBDIFF, COLLOUT, INTLMOB and PLCINTSHP can inform an assessment of the extent that cross discipline and sector collaborations, international or work/ industry placements were undertaken during doctoral study. We have identified an additional set of questions to indicate whether such activities are ongoing at the time of the survey. Given the limited relevance of these questions to those who are unemployed, travelling, caring or retired at the time of the survey, we suggest these questions are asked only by those selecting the following answers to [MIMPACT]: And which	In the main activity that you were doing during CENSUS WEEK, to what extent do you collaborate with researchers within your discipline? In the main activity that you were doing during CENSUS WEEK, to what extent do you collaborate with researchers from other disciplines? In the main activity that you were doing during CENSUS WEEK, to what extent do you collaborate with researchers from academic institutions? In the main activity that you were doing during CENSUS WEEK, to what extent do you collaborate with researchers working outside of academia?

		of these activities do you consider to be your most important activity in the [census week]? - Paid work for an employer - Self-employment/ freelancing - Running my own business - Developing a creative, artistic or professional portfolio - Voluntary/unpaid work for an employer An estimate of whether these activities are 'expanded' among UKRI-funded may be achieved through a comparison of UKRI graduates' responses to all other PGR graduates.	In the main activity that you were doing during CENSUS WEEK, to what extent do you collaborate with researchers based outside of the UK? *Answer values for all questions:* *1 A great extent; 2 Some extent; 3 Not at all; 4 Don't know*
4b. To what extent have UKRI studentships led to an increased number of doctoral graduates working in the R&I workforce (academic, private sector, public sector, third sector)?	*Employment* What is the name of the company/organisation that you were working for? [EMPNAME] What does the company/organisation you were working for mainly do? [EMPDUTIES] What was your job title? [JOBTITLE]	**Addressed in main survey** Responses to EMPNAME and EMPDUTIES (for employees) or BUSEMPNAME, BUSEMPDUTIES, BUSEMPPLOC, BUSEMPPCODE, BUSEMPCITY and BUSEMPCOUNTRY (for self-employed) can assist with the allocation of a Standard Industrial Classification (SIC) code to classify industry of employment.	

	What did you mainly do in your job? [JOBDUTIES] *Self-employment* What is the name of your business or the main business you were working for on [census week]? [BUSEMPNAME] What does your business or the main business you were working for on the [census week] mainly do? [BUSEMPDUTIES] In which country is your place of work or activity? [BUSEMPPLOC] What is the postcode for your place of work or activity? [BUSEMPPCODE] What is the (nearest) city or town for your place of work or activity? [BUSEMPCITY] Please specify the country. [BUSEMPCOUNTRY] What was your job title during [census week]? [BUSJOBTITLE]	Responses to JOBTITLE and JOBDUTIES (for employees) or BUSJOBTITLE and BUSJOBDUTIES (for self-employed) can inform the allocation of a Standard Occupation Classification (SOC) code to classify occupational roles. Information on SIC and SOC can be used to identify whether the graduate is employed in the research and innovation workforce. The identification of R&I workers could follow the occupations listed in the Research and Innovation workforce survey. Rates of current and prior R&I employment can be compared for UKRI-funded and all other PGR graduates to assess for differences between these groups. It is also possible to compare PGR graduates rates of R&I employment with graduates of different levels of higher education qualifications.	

	What tasks did you undertake during [census week] in your work or activity? [BUSJOBDUTIES]		
4c. To what extent, and how, have UKRI studentships enabled doctoral graduates to secure employment in a diversity/range of roles in the R&I workforce, and to move effectively between roles?	What activities were you doing in [census week]? [ALLACT01-11] Were you working one or more job? [MULTIJOB]	**Partially addressed in main survey** ALLACT01-11 indicates the range of activities a graduate is doing during the census week. MULTIJOB indicates whether a graduate is employed in more than one job. However, graduates only provide details about their main employment even if they report holding multiple jobs. No information is collected on prior employment held in the 15 months since completing the research degree. To generate a fuller picture of the range of roles undertaken, particularly effective movement between roles, we identify additional filter questions to record: 1. Prior remunerated employment undertaken in the 15 months since completing the research degree 2. Multiple remunerated employment held during the census week	*Prior employment* In addition to the main activity that you are doing during CENSUS WEEK, how many paid jobs have you held since completion of [LEVEL] course at [PROVIDER NAME] 15 months ago? [Answer values: 0, 1, 2, 3, 4, 5 or more] IF: 1, 2, 3, 4, 5 or more Which one of the following have you most recently done? - Paid work for a different employer - Self-employment/ freelancing - Running my own business - Developing a creative, artistic or professional portfolio - Voluntary/unpaid work for an employer - Other (please specify) Graduate to complete the relevant block of questions (Employment or Self-employment) for the most

		As noted in 4b, SIC and SOC information on prior and multiple employment can be used to identify R&I workers.	recent position. *Multiple employment during census week* Were you working one or more job? [MULTIJOB] [Answer values: 01 One job; 02 More than one job] IF 01: More than one job How many paid jobs do you currently work? [Answer values: 0, 1, 2, 3, 4, 5 or more] Graduate to complete the relevant block of questions (Employment or Self-employment) for one position additional to main employment.
4d. To what extent have UKRI studentships increased the extent to which graduates apply doctoral knowledge and skills in post-degree work?	In the job that you were doing during CENSUS WEEK, how often did you use general disciplinary knowledge? [DISKNOW] In the job that you were doing during CENSUS WEEK, how often did you interpret, critically evaluate research findings? [RSCHFIND]	**Addressed in opt-in module** The frequency of which UKRI-supported graduates report the use of general, disciplinary and research knowledge and skills in their post-degree work can be compared with the responses of all other PGR graduates.	

	In the job that you were doing during CENSUS WEEK, how often did you use the research skills developed as a research student? [RSCHSKILDEV] In the job that you were doing during CENSUS WEEK, how often did you use the general skills developed as a research student? [GENSKILDEV] In the job that you were doing during CENSUS WEEK, how often did you draw on detailed knowledge on which your research degree was based? [KNOWBASE]		
4e. To what extent have UKRI studentships improved near-term employment rates for supported individuals (all, and by characteristics)?	What activities were you doing in [CENSUS WEEK]? - Paid work for an employer [ALLACT01] - Self-employment/ freelancing [ALLACT02] - Running own business [ALLACT03]	**Addressed in main survey** The proportion of UKRI-supported graduates in paid employment, self-employment/ freelancing or running their own business can be compared with that of all other PGR graduates.	
5c. To what extent, and how, have UKRI studentships led to the generation of new and novel research and knowledge?	In the job that you were doing during CENSUS WEEK, how often did you conduct research? [CONDRSCH]	**Partially addressed in opt-in module** Responses to CONDRSCH will enable a comparative analysis of the frequency of which research is	Since the completion of [LEVEL] course at [PROVIDER NAME] 15 months ago, which of the following outputs has your work fed into? - New knowledge from

		conducted in the roles held by UKRI-supported and all other PGR graduates. Though it may be assumed that conducting research leads to the generation of new and novel research and knowledge, specific detail on this is limited. This may be extended with the introduction of additional self-reporting questions to further characterise the generation of research and innovation outputs. The R&I outputs listed in the next column correspond to those recorded by the Research and Innovation workforce survey. A comparative analysis of these outputs between UKRI-supported and all other PGR graduates could be undertaken.	research or experimentation, discussed with colleagues - Publications in academic journals - Other types of publications (trade journals, opinion magazines, research reports and newspapers) - Data collection, datasets, databases or data models - Making information more readily available through reviewing, documenting, or archiving - Sharing new or existing knowledge through education, training, mentoring or knowledge exchange - Influencing government policy - Intellectual property and licensing - A new business, including start-ups and spin-outs - Commercialising research or new technology without seeking intellectual property - Medical products or interventions - Artistic and creative

			products or services - Software and technical products - Other new or significantly improved products - New or significantly improved services - New or significantly improved processes for producing or supplying goods or services - Prototypes of new products or processes - Other outputs (please specify)

Table 2. Analysis of the alignment between the evaluation questions, the GO survey and potential additional questions

Developing a longitudinal dimension to the Graduate Outcomes survey

The second part of our analysis is concerned with the recommendation from SQW to develop a bespoke follow-up GO survey, distributed to doctoral graduates who consent to be recontacted in their initial response. Our consideration of this proposal is informed by a review of current international research literature on doctoral career pathways, and the practices of organisations administering PhD career surveys outside of the UK.

We share the view that introducing a longitudinal dimension to the GO survey will significantly strengthen understanding of the returns to investment in doctoral study. However, we suggest a different timeline for the follow-up survey than that proposed by SQW. In their report, SQW endorse that 'this follow-up survey is undertaken approximately two years following the GO survey fieldwork period. This would provide data at around (just over) three years following graduation (i.e., 15 months post-graduation for the GO survey, and 24 months later for the follow-up survey).' (SQW, 2024; p.52). Reflecting on this, we note that a follow-up survey at 39 months post-graduation would i) be administered sooner than the former Destinations of Leavers from Higher Education Longitudinal (LDLHE) survey ii) would provide a shorter-term capture of outcomes compared to other international surveys of PhD career pathways and iii) based on the insights of current research, is unlikely to record doctoral graduates' first non-training employment position. We therefore advise the **introduction of a follow-up survey at 5 years (60 months) post-graduation** to improve the quality of data collected on doctoral outcomes in the UK.

International research on doctoral career pathways
Most national studies of doctoral career paths characterise academia as a declining and minority employer of doctoral graduates. In the immediate years following graduation, aspirations for academic careers remain high among doctoral graduates; evidenced by the considerable numbers employed in temporary, fixed-term postdoctoral positions (Kim et al., 2022; Walters et al., 2021). Beyond this, however, in many countries - including the UK - non-academic occupations have become the dominant or 'traditional' career for doctoral graduates (Alfano et al., 2021; Carreiro et al., 2014; Edwards et al., 2023; Hancock, 2023; Jöns & Deakin-Smith, 2024; Mironos et al., 2015; Passaretta, 2019; Read et al., 2024). Yet securing a career route outside of academia can take time. Examining labour market outcomes across Europe, Skovgaard Pedersen (2014) found that doctoral graduates undertaking non-academic employment needed to be similarly patient in securing permanent roles as those working within the academic system.

For this reason, the early employment of doctoral graduates is increasingly recognised to be a poor indication of future employment; with the first non-training position providing a more robust prediction of occupation at ten years post-PhD (Allum et al., 2014; Brown et al., 2023). For doctoral graduates, this non-training position may not appear until 4-5 years post-graduation. In Canada, for example, Walters et al. find that 'doctoral graduates of most fields, especially those with degrees in the sciences, arts, and humanities, are more likely to be in temporary forms of academic employment than they are as full-time professors, 3-to-4 years after graduation' (2021; p.969). Postdoctoral training contracts may be a necessary basis for an academic career, but they are no longer sufficient. The risk, then, is that a follow-up survey timed 3 years post-graduation continues to capture a training role that is in fact the precursor to a significant change in career direction.

Further significant is that, for many PhD holders, the immediate years following graduation coincide with a deteriorating interest in academic careers, a growing inclination towards non-academic opportunities and a shift in career plans (Goldan 2023; Huang 2024; Skakni et al., 2019; Waaijer, 2017; Wei et al., 2024). A follow-up survey positioned too soon following graduation is therefore likely to be limited both in terms of meaningful data collection on actual employment transitions, but also in

understanding doctoral graduates' long-term career plans and the value of research degree training in realising these.

Transitions into non-academic employment are experienced differently by distinct types of PhD graduates. Many studies demonstrate that STEM (Science, Engineering, Technology and Mathematics) PhD graduates are typically swiftly absorbed into research-related employment across public and private sectors (Goldan et al., 2023; Hancock, 2023; Huang, 2024; Kindsiko & Vadi, 2018; Mathur et al., 2018; Rönkkönen et al., 2024). However, transitions can be lengthier and more protracted for Humanities, Arts and Social Science (HASS) PhDs, who are more likely to report precarious and self-employment (McAlpine & Austin, 2018; Truong, 2017; Walters, 2021). HASS PhDs working outside of academia are also less likely to be employed in roles explicitly involving research, so assessing the impact of research training on such 'transfer' careers arguably benefits from a longer period of reflection (British Academy, 2020). Female PhDs report lower rates of initial employment (Main, 2021; Palumbo & Cavallone, 2023) and higher rates of part-time working, particularly in academia (Peri-Rotem, 2019; Heinisch, 2020; Waaijer et al., 2016). An additional benefit of a delayed follow-up survey is the capacity to assess whether such differences dissipate or persist in the years following graduation.

Career surveys of doctoral graduates

The European University Association Council for Doctoral Education (EUA-CDE) identified four approaches to tracking the careers of doctoral graduates (Leysinger et al., 2020). These are: a) early graduate surveys and exit polls (often administered at the level of programme or institution); b) national graduate surveys; c) surveys based on register data; and, d) digital alumni platforms. In this section we review survey practices belonging to group b, which are conducted to provide insight into the employment situation of doctorate graduates some time after completion of the degree programme. Many such national surveys do not focus uniquely on doctoral graduates, but are distributed to all leavers from higher education. In table 2.1, we focus our consideration to surveys designed specifically for doctoral graduates, and the timings of data collection. In addition to national surveys, we identify two multinational initiatives. A more comprehensive account of international approaches to tracking researcher careers, including non-survey methods, can be found in Boddy & Mellors-Bourne (2024).

Survey	**Region/ country**	**Organisation**	**Design**
Career Tracking Survey of Doctorate Holders	Nine institutions across Europe (in Netherlands, Germany, Romania, Croatia, Luxembourg, Austria, France)	European Science Foundation	**Survey** of the careers of doctoral graduates up to seven years after graduation. Distributed twice: in 2015 and 2017.
DocEnhance Survey of Doctorate Holders	Nine institutions across Europe (in Norway, Germany, Greece, Netherlands, Portugal, Slovakia, Spain, Italy, Czech Republic)	Funded by Horizon 2020 (Science with and for Society programme grant); informed by the above European Science Foundation survey	One time **survey** of the careers of doctoral graduates up to five years after graduation.

Survey of the Doctorate Population	Catalonia	AQU Catalunya	**Survey administered every three years** of doctoral graduates who completed their PhDs at Catalan universities 3-4 years earlier. The latest survey (2023) was the sixth study. The survey covers satisfaction and assessment of doctoral studies, and employment outcomes.
IPDOC (Survey on the Professional Situation of PhDs)	France	French Ministry of Higher Education and Research (MESRI), the Conference of University Presidents, the Directors of French Engineering Schools.	**Survey** of the careers of doctoral graduates one, three, and five years after graduation. It is offered every year to all French institutions, and it is mandatory every two years.
The National Academics Panel Study (Nacaps)	Germany	German Centre for Higher Education Research and Science Studies (DZHW)	**Multi-cohort panel study** of doctoral candidates and doctoral graduates. Every two years a new year group of doctoral candidates is recruited into the panel study. Respondents are first surveyed annually, and then every two years. Careers are followed for up to 15 years after graduation.
The Labour Market Position of PhD Graduates	Netherlands	Centre for Science and Technology Studies (CWTS)	One time **survey** of the careers of doctoral graduates up to 5.5 years after graduation
Survey of Doctorate Recipients (SDR)	United States	The National Center for Science and Engineering Statistics (NCSES) within the U.S. National Science Foundation, with support from the National Institutes of Health.	**Biennial survey** of science (includes social science), engineering, and health doctoral graduates who have earned a doctoral degree from a U.S. academic institution and are less than 76 years of age. Individuals are sampled from the Survey of Earned Doctorates (SED), an annual census of research doctorate recipients from U.S. academic institutions in the last 12 months.

Table 3. Career surveys of doctoral graduates

Consistent across the career surveys included in table 2.1 is the monitoring of doctoral graduates' employment circumstances up to a minimum of 5 years following completion of their programme. The surveys administered in the Netherlands, Germany and the United States exceed this timeframe; with the latter two providing multiple snapshots of doctoral graduates' employment situation. While multiple snapshots would also be ideal in the UK context, if only one follow-up is possible, an optimal time for this would seem to be 5 years post-graduation. This observation further corresponds to the insights provided by current research, which note that the most useful and valid data on career pathways emerges several years following doctoral completion.

It is, nevertheless, worth relating here the limitations of national surveys identified by the EUA-CDE (Leysinger et al., 2020, p.7). Response rates can be low, and extensive sets of questions will deter respondents from completing the survey. By contrast, register-based data offer a more representative outlook of current employment, but cannot provide a qualitative assessment of the value of research training. It is further noteworthy that doctoral graduates with informal working arrangements are least likely to respond to employment surveys, and that those who are internationally mobile or change their contact details may be difficult or impossible to reach in a follow-up.

Stakeholder perspectives on the Graduate Outcomes survey

In the final part of our analysis, we conducted interview discussions with the following stakeholders:

- The British Academy;
- Cancer Research UK;
- The Careers and Research Advisory Centre (CRAC);
- HESA/ JISC;
- The Leverhulme Trust;
- The National Institute for Health and Career Research (NIHR);
- The Royal Society;
- The UK Council for Graduate Education (UKCGE); and
- The Wellcome Trust

We also approached the Department for Science, Innovation & Technology (DSIT), but colleagues there reported not to use the GO survey. Interview discussions covered: organisations' experiences of using the GO survey, including a consideration of strengths and limitations of the existing survey and alternative sources of information consulted on PGR career outcomes; strategic evaluation priorities for reforming the existing survey; the coverage of employment variables; recording prior and multiple employment; a longitudinal follow-up survey; and, overarching recommendations to enhance the monitoring of PGR outcomes. In this section, we synthesise the most salient considerations arising from these discussions.

Experiences of using the GO survey for monitoring PGR outcomes
Experiences of using the GO survey to monitor PGR employment varied across the stakeholders. Beyond HESA/ JISC, two stakeholder organisations reported using GO survey data extensively, and having purchased data for the specific purpose of analysing PGR employment outcomes. One organisation regularly engaged with publicly available data to monitor PGR outcomes. Two stakeholders reported very limited engagement with the GO survey, and a further three organisations had never consulted GO survey data for information on PGR outcomes.

Those with most experience of the GO survey regarded its strength as being the single, largest, most systematic and regular data source for the early employment destinations of doctoral graduates; and

noted its uniqueness in providing this. Stakeholders commented on the value of being able to consider outcomes data by variables including qualification level and subject area. However, stakeholders were more forthcoming on the perceived limitations of the GO survey. Such reflections were volunteered both by those with extensive experience of using the data, and from those justifying limited to no engagement with the GO survey for examining PGR outcomes. Most prominent was the observation that the GO survey is a single survey point of early employment outcomes. Most stakeholders expressed an interest in later employment outcomes and the potential for tracking individual careers. Secondary to this, a number of stakeholders voiced concern that the response rate for PGRs was relatively low. Several stakeholders reflected on the challenge of contextualising outcomes data in relation to important individual differences before and during doctoral study. Examples of these included information on employment predating the PhD, and the specific conditions of doctoral training, such as the funding received and whether the programme was cohort-based. Being unable to differentiate PhD graduates in this way was deemed to undermine the extent to which the impact of investments in doctoral training could be robustly evidenced. A small number of stakeholders mentioned the importance of monitoring PGR outcomes in relation to equality, diversity and inclusion, which can be facilitated by linking survey data to demographic information from the Student Record. A minority of stakeholders emphasised the importance of enriching qualitative data on career decision-making (enabling factors and barriers) through the survey.

We asked stakeholders about other sources of information they consulted on PGR outcomes. One mentioned the Longitudinal Education Outcomes (LEO) dataset, particularly for information on graduates' earnings. Three stakeholders commissioned their own 'career tracker' studies to follow the trajectories of their funded researchers. Researchfish was used by two stakeholders to track the career development of past award holders. ORCID was also mentioned by two stakeholders, although the varying completeness of these records was acknowledged.

Identifying strategic evaluation priorities for reforming the GO survey
During the interviews, stakeholders considered the evaluation questions developed by SQW in relation to their own strategic priorities for understanding the return to investment in PGR studentships and research awards across the piece. Evidence of investment leading to an **increase of students working in R&I workforce** emerged as a clear priority for the GO survey to capture (identified by 7 stakeholders). This was followed by a prioritisation of evidence that investment had **increased employment in a diversity of roles in the R&I workforce**, **increased the application of doctoral knowledge and skills in post-degree work**, and **enabled movement across R&I roles** - albeit it was noted that movement would be most meaningfully captured by a follow-on survey (each identified by 4 stakeholders). Three stakeholders prioritised evidence on the **enhancement of personal, interpersonal and career related skills** and two identified the **enhancement of research skills**. Of note, stakeholders questioned the validity of evaluating the **enhancement of discipline-specific knowledge and skills** and **expanded networks** through the GO survey, perceiving this to be too removed from the survey's purpose. Similarly, evaluating the **generation of new and novel research and knowledge** through the GO survey was deemed to be problematic: some stakeholders believe such contributions can be inferred for those employed in R&I roles, while others pointed to data sources such as ORCID and the Overton Index for providing more accurate information on these outcomes. Stakeholders noted that the GO survey provided information on the near-term employment rates for doctoral graduates, but did not highlight this as a priority measure.

Main employment, prior and multiple employment
Stakeholders viewed the variables collected on main employment to provide a helpful insight into the jobs of PhD holders. A small number of additional questions were put forward. These were:

- [If working part-time]: Do you want to work more?
- Do you wish to continue your main employment in the long-term?

- Was the PhD qualification helpful to secure your main employment?
- Has the PhD qualification enhanced your progression in your main employment?
- Are you research active?
- What percentage of time in your main employment is spent on research?

In light of evaluation question 4c (on employment in a diversity of roles in the R&I workforce and to move effectively between roles), we asked stakeholders for their thoughts on whether there would be value in collecting data on prior employment - in other words, remunerated employment undertaken in the intervening period between programme completion and the 15 month survey. Support for this was lacking, for the largely pragmatic reason that the information acquired would be of perceived limited value and overly burdensome for respondents. Several respondents noted that the 15 month survey was already an early indicator, and that meaningful job moves prior to this point were unlikely to have occurred. It might, therefore, be a more important consideration for a later follow-up survey. Others raised methodological concerns, relating to recall bias and the accuracy of information submitted. Some stakeholders suggested that asking for the number of jobs held prior to the main employment role, and whether these jobs were research active, would be sufficient. Stakeholders' reservations were consistent with our discussion with HESA/JISC colleagues, who noted that former questions on prior employment were removed from the current survey at the request of statutory customers. One stakeholder suggested the potential importance of collecting employment history prior to doctoral training, particularly in terms of academic and research-active employment.

For many stakeholders, the issue of prior employment prompted a related discussion on the potential for GO survey to collect information on multiple contemporaneous employment. There was, in contrast, strong support for this, for a variety of reasons. Several stakeholders mentioned that fractional employment was increasingly a reality for doctoral graduates employed within the higher education sector. A number of stakeholders stated that there was good evidence that fractional employment impacted certain groups of doctoral graduates more than others. Portfolio careers were considered to be particularly prominent among Arts and Humanities PhD holders. Here stakeholders emphasised the importance of normalising such pathways to dispel the notion of a single, linear career progression following the PhD. For other stakeholders supporting researchers in applied fields such as public health, capturing multiple employment would better enable the GO survey to capture 'a modern view… of different types of researchers'. Examples here included clinician scientists, who hold dual clinical and academic/ research roles. For some stakeholders, capturing such career profiles was deemed essential, since an integral aspect of demonstrating a return to investment was the development of research informed by practice. Restricting questions on multiple employment to two main sources of remunerated employment was suggested by interested stakeholders as a proportionate approach to elicit such profiles.

A longitudinal follow-up survey

Stakeholders communicated unanimous support for a follow-up to the 15-month GO survey. This position was explained in terms of the early information recorded by the current survey, and the perceived value of tracking individuals for a longer time frame to better capture career trajectories and progression. Some stakeholders noted that the return to investment in studentships, whether measured in terms of R&I employment or graduate earnings, can take varying times to realise across different subject areas; and that a later time point would therefore provide a more valid estimation of the return to investment. Several stakeholders mentioned the importance of a later measure in being able to detect the impacts of career breaks for maternity and paternity leave. Perspectives on the timing of a longer-term measure centered around a range of 3-5 years post-completion. Stakeholders acknowledged that PhD holders working in the higher education sector were unlikely to secure a permanent academic position within three years. There was a consensus that most careers are at the

point of becoming established at 4-5 years post-completion. Six of the stakeholders identified 5 years as the optimal time for a follow-on survey. Some noted, however, that a more delayed follow-up would likely have a negative impact on survey response rates, and there would need to be thought on how to approach this and keep graduates connected. Two stakeholders queried whether multiple lighter-touch follow-ups, focused only on main employment and research-activeness, might yield higher response rates, and by extension, enhanced quality of data. Stakeholders identified a number of additional questions appropriate to the later timing of the follow-up survey, to address:

- Career breaks: whether undertaken and the duration of these
- Family formation
- Number of jobs held in the intervening period
- Whether intervening jobs were research-active
- Barriers to career progression

Overarching recommendations to enhance the monitoring of PGR outcomes

When asked for overarching recommendations to improve the monitoring of PGR outcomes, stakeholders were keen to restate the value of a follow-up survey which enabled longitudinal tracking between the two time-points. Five stakeholders reinforced this viewpoint at the close of the interview discussions. A further five stakeholders expressed that the optional survey questions should be extended to all PhD graduates, in order to undertake meaningful comparative analysis both across the sample of PhD graduates, and between different levels of higher education qualifications. Three stakeholders mentioned the importance of enhancing data collected on the conditions of doctoral study, so that the effects of training investments could be better understood, and outcomes can be contextualised against the doctoral experience. One stakeholder highlighted the potential impact of better outcomes data on the recruitment and retention of PhD students and postdoctoral researchers; advising that funders should be prepared to mitigate the barriers to career progression in the R&I workforce that an enhanced survey may uncover. Four stakeholders reflected on the limitations of surveys as a method for tracking the careers of PhD holders, citing high costs and falling response rates which undermine data quality. These stakeholders raised the possibility of linking GO survey data to other sources, such as LEO, LinkedIn, ORCID and the Research and Innovation Workforce survey; and noted that this was a rapidly evolving area, with CRAC leading the debate on potential future models (Boddy & Mellors-Bourne, 2024). Several stakeholders remarked that data purchases are a significant cost for organisations, and that revising the survey in some of these ways would greatly incentivise their engagement with the GO survey.

Discussion and recommendations

We have assessed the current GO survey against the evaluation questions developed by SQW, reviewed relevant research literature and the survey practices of other nations to consider the value of a longitudinal follow-up survey, and conducted interviews with a focused set of stakeholders identified by UKRI. In this final section, we consider how these insights can inform potential revisions to the GO survey for the purpose of better monitoring PGR outcomes.

Our recommendations are further informed by our knowledge of survey methodology, and the imperative to analyse PGR outcomes in relation to other levels of higher education qualifications. In order to develop meaningful evidence on whether PGRs are, for example, more likely to work in the R&I workforce, earn more or report high career satisfaction, comparable data on these variables is needed from all graduates completing the survey. There is, therefore, a strong rationale to ensure that the main survey questions remain consistent for all graduates from higher education. Questions that are uniquely relevant to PGRs should be covered in the opt-in module. However, this opt-in module must be extended to all PGR graduates - not just UKRI-funded graduates - in order to enable meaningful comparisons across PGR respondents.

Should all PGR graduates complete the opt-in module there will be a greater need to differentiate across this group in order to robustly evaluate the impact of funding and the particular conditions of doctoral training on outcomes. GO survey responses can be linked to information in the Student Record, enabling data to be analysed by important variables including sex, ethnicity, disability, parental education and occupation, doctoral subject, major source of funding, and higher education institution. It would also be helpful to identify PGRs who were funded through a larger research grant rather than a direct studentship. It would be highly valuable to distinguish PGRs on different training routes - traditional, cohort-based, professional - and to elicit individual engagement with discrete components of doctoral training - for example, the doctoral project, supervision, transferable skills courses, research methods training, placements, industry collaborations.

Our assessment of the current GO survey against the evaluation questions suggested that most of these can be fully or partially met through the existing main survey or UKRI opt-in bank. Where evaluation questions are not currently well served, we do not propose that all potential additional questions are integrated into the survey. We recommend a pragmatic approach to modifications, reflective of UKRI and other stakeholders' priorities. Attempting to include all potential additional questions would generate an extremely lengthy survey, which would likely cause survey fatigue among participants, undermining the quality of submitted responses and survey completion rates. There are also cost implications for bringing additional questions to the survey. As noted, any additional questions should be integrated into the opt-in bank.

There is compelling evidence from the research literature, practices of other nations, and stakeholder discussions that a longitudinal follow-up survey would be of significant value to enhancing our understanding of PGR outcomes. Stakeholders in particular reported relatively limited engagement with the 15-month GO survey data, but were unanimous in their support for a later time point. While multiple snapshots would be ideal, a single follow-up survey would optimally be scheduled for 5 years post-graduation. There are, however, several issues relating to the practical deployment of a follow-up survey which require further consideration. Participants in the previous LDLHE survey consented to be recontacted when completing the initial DLHE survey. A similar approach would involve adding this question to the opt-in bank at 15 months. A follow-up survey could be facilitated online, through telephone contact, or both - with different cost implications. Maintaining valid contact details and willingness to participate in the follow-up over the intervening period may present a further challenge.

Recommendations

1. **The UKRI opt-in module questions should be extended as a mandatory component for all PGR graduates completing the survey.**

2. **Enhanced detail on the conditions of doctoral training should be covered in the opt-in module questions in order to better distinguish the effects of support and the discrete components of doctoral training,** many of which are innovations introduced in the two decades following the Roberts Report (2002) and more recent reviews of doctoral training (e.g. EPSRC, 2021; ESRC, 2021). It would be valuable to distinguish PGRs on different training routes - traditional, cohort-based, professional - and to elicit engagement with discrete components of doctoral training - for example, the doctoral project, supervision, transferable skills courses, research methods training, placements, and industry collaborations. This will generate stronger evidence on the impact of funding and programme reform on PGR outcomes.

3. **In relation to the evaluation questions developed by SQW:**

    a. **4b, 4d, 4e are fully addressed in the main survey or opt-in module and require no revisions to the existing GO survey.**

    b. **1d, 3a, 4c, 5c are partially addressed in the main survey or opt-in module.** UKRI should prioritise these broad evaluation questions and, within each evaluation question, the potential additional survey questions identified in table 2. From the stakeholder discussions, we note that only a minority of stakeholders prioritised evidence on **the enhancement of personal, interpersonal and career related skills (1d).** On the whole, stakeholders did not prioritise **the enhancement of personal, interpersonal career-related skills (3a)** as an outcome to be best evidenced through the GO survey. Similarly, stakeholders related scepticism that **the generation of new and novel research and knowledge (5c)** could be reliably evidenced through the GO survey. We note the potential of other data sources such as ORCID and the Overton Index to provide more accurate information on these outcomes. We also note that introducing a question on this to the GO survey is duplicative of the Research and Innovation workforce survey. **Evidence that PGRs secured employment in a diversity of roles in the R&I workforce** and **could move effectively between R&I roles (4c)** was identified as a priority for a majority of stakeholders. In table 2, we identify enhanced data collection on prior and multiple employment as a potential approach to better capture the diversity of roles and movement across R&I organisations. On the basis of stakeholder discussions and previous changes to the GO survey, we recommend that collecting information **on multiple contemporaneous employment** would be of greater value than information on prior employment at the 15-month survey. Restricting questions on multiple employment to two main sources of paid employment (including self-employment) would be a proportionate approach to trial.

    c. **1b and 1c are not currently addressed in the main survey or opt-in module.** In table 2, we suggest potential additional questions for investigating the **enhancement of discipline-specific knowledge and skills (1b)** and **research skills (1c)**, informed by the Expectations for Doctoral Training and the Researcher Development Framework. UKRI should prioritise the potential additional survey questions identified in table 2, as piloting all such questions will diminish the quality of data and survey response rates. We further note that stakeholders did not identify these outcomes as

priorities for the GO survey. Indeed several stakeholders questioned the validity of evaluating the enhancement of discipline-specific knowledge and skills through self-report questions. While the enhancement of research skills was observed to be an important outcome from doctoral study, a number of stakeholders reflected that this could be inferred by higher rates of PGR graduates being employed in the R&I workforce (4b), compared to other leavers from higher education.

4. **A longitudinal follow-up survey should be conducted, ideally at 5 years following graduation.** There is compelling evidence from the research literature on the value of this. It would more closely align the UK with the data collection of other national systems, and correct some of the diminishment to tracking research careers following the replacement of the DLHE and LDLHE surveys with the single GO survey. A follow-up survey would offer a more stable measure of a number of outcomes, including R&I employment and movement between R&I roles. Stakeholder support for a later follow-up survey was unanimous. For meaningful comparative analysis, it will be important to maintain consistency between the questions asked at 15 months and a later time point. However, through the stakeholder discussions, we recommend a number of additional questions that would be relevant to ask at a later time point:
    a. Career breaks: whether undertaken and the duration of these
    b. Family formation
    c. Number of jobs held in the intervening period
    d. Whether intervening jobs were research-active
    e. Barriers to career progression

   As we have noted, perspectives on the practical deployment of a follow-up survey varied. This matter will require further reflection on the costs and benefits of different approaches.

5. **As PGR stakeholder engagement with the GO survey is relatively limited, there should be ongoing efforts to raise awareness of its value for monitoring doctoral outcomes.** Several stakeholders identified aspirations for the GO survey, such as considering doctoral outcomes by demographic characteristics or measuring the application of doctoral knowledge and skills in employment, which are already achievable through linkage to the Student Record or well covered by the survey. Nevertheless, stakeholder discussions did generate a set of additional questions that may be beneficial for UKRI to consider. To recap, these were:
    a. [If working part-time]: Do you want to work more?
    b. Do you wish to continue your main employment in the long-term?
    c. Was the PhD qualification helpful to secure your main employment?
    d. Has the PhD qualification enhanced your progression in your main employment?
    e. Are you research active?
    f. What percentage of time in your main employment is spent on research?

   We note that there is a degree of duplication between e) and f) on research activeness and the percentage of time dedicated to research, and existing opt-in questions measuring how often, over a week, employed respondents: conduct research; interpret, critically evaluate research findings; use the research skills developed as a research student; and, draw on detailed knowledge on which the research degree was based. However, there is a clear difference in the directness of the existing and suggested questions about research, and the simplicity of data yielded.

6. **The opening question to the opt-in question bank - Thinking about the research degree you completed in YYYY/YY, what was the main reason you decided to undertake it? [MRSCHDEG] - does not obviously inform the evaluation questions and its ongoing inclusion should be considered**, particularly if, through this work, other questions are deemed more valuable to extend the opt-in module. Stakeholders did not highlight a need for

greater data on PGRs' motivations; indeed, this is a topic well addressed by the existing literature. In terms of survey methodology, there are also inherent weaknesses with a question asking about historic motivations. Specifically, this question risks recall bias (where inaccurate information on motivations for doctoral study are given) and post-hoc rationalisation (where information on motivations for doctoral study are selected for their consistency with the graduates' activity at the time of survey).

7. **Opportunities for data-linkages between the GO survey and other data sources should continue to be explored.** This approach has broad support across the stakeholders and current thinking on this is set out more fully in Boddy & Mellors-Bourne (2024).

References

Alfano, V., Gaeta, G., & Pinto, M. (2021). Non-academic employment and matching satisfaction among PhD graduates with high intersectoral mobility potential. *International Journal of Manpower,* 42(7), 1202-1223.

Allum, J.R., Kent, J.D. & McCarthy, M.T. (2014). *Understanding PhD Career Pathways for Program Improvement: A CGS Report.* Washington, DC: Council of Graduate Schools.

AQU Catalunya. (2023). 2023 Survey of the doctorate population. https://www.aqu.cat/en/doc/Estudis/il-titulats/Enquesta-IL-2023/Enquesta-Doctors-IL-2023-EN

Boddy, P. & Mellors-Bourne, R. (2024). *Towards a Systematic Tracking of Researcher Careers: A Scoping Review and Development Plan*. https://www.mpls.ox.ac.uk/files/researcher-t-d/towards-systematic-tracking-of-researcher-careers-a-scoping-review-and-development-plan.pdf/view

Boman, J. (2017). *2017 Career Tracking Survey of Doctorate Holders Project Report*. European Science Foundation (ESF). https://www.esf.org/fileadmin/user_upload/esf/F-FINAL-Career_Tracking_Survey_2017__Project_Report.pdf

Boman, J., Beeson, H., Sanchez Barrioluengo, M., & Rusitoru, M. V. (2021). *What comes after a PhD? Findings from the DocEnhance survey of doctorate holders on their employment situation, skills match, and the value of the doctorate*. ESF. https://zenodo.org/records/7188085#.Y7hG1hXMJPZ

British Academy (2020). *The Career Pathways of Doctoral Graduates.* https://www.thebritishacademy.ac.uk/documents/2653/Career-Pathways-Doctoral-Graduates-Case-Studies.pdf

Brown, A. M., Meyers, L.C., Varadarajan, J., Ward, N.J., Cartailler, J.P., Chalkley, R.G., Gould, K.L. & Petrie, KA. (2023) From goal to outcome: Analyzing the progression of biomedical sciences PhD careers in a longitudinal study using an expanded taxonomy. *FASEB BioAdvances*, 5, 427-452.

Carriero, R., Zabetta, M.C., Geuna, A. & Tomatis, F. (2024). Investigating PhDs' early career occupational outcomes in Italy: individual motivations, role of supervisor and gender differences. *Higher Education*, 87, 1375–1392.

Department for Science, Innovation & Technology (DSIT). (2022). *Insights from the UK wide survey of the 2022 Research and Innovation Workforce: Technical Annex*. https://assets.publishing.service.gov.uk/media/63fe1a95d3bf7f25f3391113/UK_research_and_innovation_workforce_survey_2022_technical_annex.pdf

DZHW. (2024). National Academics Panel Study. https://www.nacaps.de/en/index_html

Edwards, K. A., Acheson-Field, H., Rennane, S. & Zaber, M.A. (2023). Mapping scientists' career trajectories in the survey of doctorate recipients using three statistical methods. *Scientific Reports*, 13, 8119.

Economic and Social Research Council (ESRC). (2021). *Review of the PhD in the Social Sciences: ESRC Response.* https://www.ukri.org/wp-content/uploads/2022/03/ESRC-110321-PhD-Review-Response.pdf

Engineering and Physical Sciences Research Council (EPSRC). (2021). *Review of EPSRC-funded Doctoral Education.* https://www.ukri.org/wp-content/uploads/2021/10/EPSRC-071021-ReviewDoctoralEducationSupport.pdf

Leysinger, C., Hasgall, A., & Peneoasu, A. M. (2020). *Tracking the careers of doctorate holders EUA-CDE Thematic Peer Group Report.* https://www.eua.eu/publications/reports/tracking-the-careers-of-doctorate-holders-eua-cde-thematic-peer-group-report.html

Goldan, L., Jaksztat, S. & Gross, C. (2023). Explaining employment sector choices of doctoral graduates in Germany. *Research Evaluation*, 32(1),144–156.

Hancock, S. (2023). Knowledge or science-based economy? The employment of UK PhD graduates in research roles beyond academia. *Studies in Higher Education*, 48(10), 1523–1537.

Heinisch, D. P., Koenig, J. & Otto, A. (2020). A supervised machine learning approach to trace doctorate recipients' employment trajectories. *Quantitative Science Studies*, 1 (1), 94–116.

Huang, F. (2024). Changes in doctoral graduates' employment and doctoral students' views of their future career in Japan in 2013–2018. *Higher Education Quarterly*, 78, 458–472.

Jöns, H., & Deakin-Smith, H. (2024). Mid-career outcomes of doctoral graduates from German universities explained through triadic thought. Globalisation, *Societies and Education*, 1–24.

Kim, D., Kim, S., Flores, A., & Palek, A. M. (2022). Are Primary Funding Sources and Debt Level Associated with Career Outcomes Among Recent STEM Doctoral Graduates? *The Journal of Higher Education*, 93(5), 792–817.

Kindsiko, E., & Vadi, M. (2018). Career patterns of doctoral graduates: Evidence from Estonia. *Trames Journal of the Humanities and Social Sciences*, 22, 105−123.

Main, J. B., Wang, Y., & Tan, L. (2021). The career outlook of engineering PhDs: Influence of postdoctoral research positions on early career salaries and the attainment of tenure-track faculty positions. *Journal of Engineering Education*, 110(4), 977–1002.

Mathur, A., Cano, A., Kohl, M., Muthunayake, N.S., Vaidyanathan, P., Wood, M.E. & Ziyad, M. (2018) Visualization of gender, race, citizenship and academic performance in association with career outcomes of 15-year biomedical doctoral alumni at a public research university. *PLOS ONE*, 13(5).

McAlpine, L. & Austin, N. (2018). Humanities PhD Graduates: Desperately Seeking Careers? *Canadian Journal of Higher Education*, 48(2), 1-19.

Mironos, A.A., Bednyi, B.I. & Ostapenko, L.A. (2015). Employment of PhD program graduates in Russia: a study of the University of Nizhni Novgorod graduates' careers. *SpringerPlus*, 4, 230.

National Academics Panel Study (NACAPS). Study Design. https://www.nacaps.de/en/studie/index_html#studiendesign

National Center for Science and Engineering Statistics. Survey of Doctorate Recipients (SDR). https://ncses.nsf.gov/surveys/doctorate-recipients/2023#methodology

Palumbo, R., & Cavallone, M. (2022). Unravelling the implications of learning experiences on doctoral degree holders' employment: empirical insights and avenues for further developments. *European Journal of Higher Education*, 13(3), 387–407.

Passaretta, G., Trivellato, P. & Triventi, M. (2019). Between academia and labour market—the occupational outcomes of PhD graduates in a period of academic reforms and economic crisis. *Higher Education*, 77, 541-559.

Peri-Rotem, N. (2019). Gendered Career Pathways among Doctoral Graduates in the United Kingdom. *Social Sciences*, 8(11), 317.

Read, H., Pugh, A., Riley, B. & Bramley, G. (2024). *A review of the economic and social value produced through funding PhD students.* https://pure-oai.bham.ac.uk/ws/portalfiles/portal/225219358/NCIA_Economic_and_Social_Impacts_of_PhDs.pdf

Roberts, G. 2002. SET for Success: The Supply of People with Science, Technology, Engineering and Mathematics Skills. London: HM Treasury.

Rönkkönen, S., Virtanen, V., García-Morante, M., McAlpine, L., Castelló, M., & Pyhältö, K. (2024). STEM PhD holders working outside academia: the role of social support in career transition. *European Journal of Higher Education*, 1–20.

Skakni, I., Calatrava Moreno, M. del C., Seuba, M. C., & McAlpine, L. (2019). Hanging tough: post-PhD researchers dealing with career uncertainty. *Higher Education Research & Development*, 38(7), 1489–1503.

Skovgaard Pedersen, H. 2014. New Doctoral Graduates in the Knowledge Economy: Trends and Key Issues. *Journal of Higher Education Policy and Management*, 36 (6): 632–645.

SQW. (2024). UKRI's investment in Studentships: Impact Evaluation Framework. A report to UKRI.
Truong, V.D. (2017). The career paths of social marketing doctoral graduates. *Journal of Social Marketing*, 7(1), 18-50.

UK Research and Innovation (UKRI). (2024). *Statement of Expectations for Doctoral Training.* https://www.ukri.org/wp-content/uploads/2024/01/UKRI-300124-StatementExpectationsDoctoralTrainingJanuary2024.pdf

Vitae. (2010). *Researcher Development Framework.* https://vitae.ac.uk/wp-content/uploads/2025/01/Researcher-Development-Framework-RDF-Vitae-4.pdf

Waaijer, C. J. F. (2017). Perceived career prospects and their influence on the sector of employment of recent PhD graduates. *Science and Public Policy*, 44(1), 1–12.

Waaijer, C. J. F., Belder, R., van Bochove C. A.,Sonneveld, H., & van der Weijden I.C.M. (2015). *Survey on the Labour Market Position of PhD Graduates: Development of a Novel Questionnaire*. CWTS Working Paper, CWTS-WP-2015-001. https://scispace.com/pdf/survey-on-the-labour-market-position-of-phd-graduates-677l5pgxdw.pdf

Waaijer C.J.F., Sonneveld H., Buitendijk S.E., van Bochove C.A., van der Weijden I.C.M. (2016). The Role of Gender in the Employment, Career Perception and Research Performance of Recent PhD Graduates from Dutch Universities. *PLoS ONE*, 11(10).

Walters, D., Zarifa, D. & Etmanski, B. (2021). Employment in Academia: To What Extent Are Recent Doctoral Graduates of Various Fields of Study Obtaining Permanent Versus Temporary Academic Jobs in Canada? *Higher Education Policy*, 34, 969–991.

Wei, L., Shen., W. & Chen, H. (2024). On Trends and Influencing Factors of Engineering PhD Graduates Corporate Employment - Analysis Based on Two National Surveys. *Research in Higher Education of Engineering*, 03.