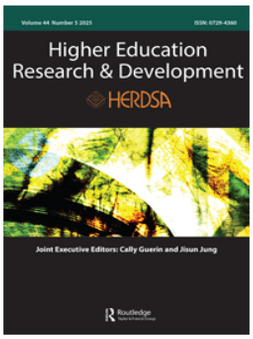


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# PhD graduates pursuing careers beyond academia: a scoping review

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**ABSTRACT**

As the issue of PhD graduates (PhDs) pursuing careers beyond academia gains attention, the existing literature remains disparate and fragmented. In this scoping review, we examine how this phenomenon has been studied over the last two decades. Drawing on 71 publications, we used science mapping and content analyses to synthesise findings and identify research gaps. Eight dominant *research foci* emerged: outcomes of doctoral education, industry-oriented PhD programmes, career development initiatives, PhDs' career choices/intentions, PhDs' employment, transitions to non-academic sectors, labour-market demand, and employer perceptions of PhDs. This literature primarily reflects Western perspectives, emphasises STEM fields, and highlights broad trends concerning PhDs' career preferences and destinations. Most publications draw on descriptive methods, suggesting an exploratory and under-theorised field. Gaps remain in understanding PhDs' subjective experiences (particularly from social sciences and underrepresented groups), non-academic stakeholders' perspectives, and the effectiveness of institutional career-support mechanisms. Future research should prioritise these areas to identify best practices in preparing PhDs for diverse careers. However, our findings show that a cultural shift within academia is needed to normalise diverse career paths, alongside formal institutional support and stronger collaborations with non-academic sectors. This paper advances the discussion on equipping PhDs for an increasingly complex and competitive career landscape.

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**KEYWORDS**
PhD graduates; PhD holders; careers beyond academia; career outside academia; non-academic career

## Introduction

In many countries, the number of PhD graduates (PhDs) now exceeds the number of available academic positions, making access to professorships highly competitive

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(OECD, 2024). For instance, in Australia (ABS, 2016), around 42% of PhDs work in the tertiary education sector, while in the USA (AAUP, 2022) and Canada (CCA, 2021) only 20–25% of PhDs ultimately secure tenure-track positions. In Europe, the situation is similar, with figures on PhDs working in academia ranging from 31% in the Netherlands (Statistics Netherlands (CBS), 2020) and 19% in the UK (Vitae, 2016) to 9.5% in Italy (ADI, 2019). These statistics suggest that careers beyond academia are now the norm rather than the exception (Sinche, 2016) and that most PhDs will ultimately leave academia (OECD, 2023).

In this conjuncture, universities face growing pressure to rethink doctoral education. They are urged to equip graduates with the knowledge and skills needed for diverse types of jobs (OECD, 2021). While most universities encourage PhD students to develop transferable skills, doctoral education is still primarily focused on training academic researchers (OEDC, 2023). Indeed, many PhD students receive little support during their postgraduate years to prepare for careers beyond academia (van der Boon et al., 2018). Some are even discouraged from doing so, as leaving academia is sometimes regarded as a failure (Kereselidze & Skakni, 2023; Vitae, 2016). Such experiences may negatively impact PhDs' preparation for subsequent stages of their careers, particularly if they had no work experience prior to the PhD (Skakni, 2018).

### *Preparing PhDs for diverse careers*

The need to reform doctoral education has been a subject of increasing debate in the field of higher education (Nerad, 2020). Studies have been conducted on the diversifying profiles of those who engage in doctoral training for reasons ranging from personal growth or pursuing intellectual challenges to more pragmatic, career-oriented motives (Gardner, 2008; Guerin et al., 2015; Horta et al., 2024; Skakni, 2018). This research highlights that PhD students' diverse backgrounds and motivations require tailored supervision and support, including career development (Skakni & Inouye, 2023). In this regard, issues related to diversity, equity, and inclusion are increasingly being considered, notably the obstacles faced by women, particularly those belonging to minority or marginalised groups, in accessing academic positions and maintaining productive careers (Crumb et al., 2020; Locke et al., 2023; Rosa, 2021).

Furthermore, PhD students' career choices, particularly their interest in academic careers, have often been examined with an emphasis on how they are socialised in academic culture (Austin & McDaniels, 2006; Gardner & Doore, 2020; Weidman et al., 2001). Recently, it has been acknowledged that an increasing number of PhDs deliberately choose to work outside academia (e.g., Li & Horta, 2022). However, there is limited understanding of how current doctoral programmes prepare PhDs for non-academic roles (OECD, 2023). As a PhD degree alone does not guarantee employment (Jackson & Michelson, 2015), what makes PhDs employable beyond academia has also received limited attention (Weber et al., 2018).

Nevertheless, the growing demand for PhDs outside academia is evidenced by numerous white papers, briefs, and recommendations published by national and international authorities in recent years (e.g., OEDC, 2021, 2023; Turk-Bicakci et al., 2014; van der Boon et al., 2018; Vitae, 2016). However, how employers outside academia perceive PhDs' profiles and skills, as well as what they seek in these highly qualified workers,

deserves further examination (Muurlink et al., 2024). Overall, the existing literature on PhDs pursuing careers beyond academia is disparate and scattered in terms of research foci and disciplinary fields, providing only a fragmentary picture of the situation.

### *Purpose of the paper*

This paper is intended to provide an overview of the research foci through which the issue of PhDs pursuing careers beyond academia has been examined over the last two decades. Our objective is to identify areas for future research and highlight the implications of existing and emerging research for higher education policy and practice. By further delineating this phenomenon, we aim to contribute to the ongoing global conversation on preparing PhDs for diverse careers. We hope to provide valuable insights for university administrators, heads of PhD programmes, career advisors supporting junior researchers, as well as PhDs themselves.

## Methods

Given the emerging interest in PhDs pursuing careers beyond academia, a scoping review was chosen to comprehensively assess the literature's breadth and research foci from which this issue has been studied. Scoping reviews are exploratory and descriptive by nature, and typically used to map emerging fields by synthesising existing knowledge and highlighting research gaps (Levac et al., 2010; Peters et al., 2020). Unlike systematic literature reviews, scoping reviews do not aim to evaluate methodological limitations or biases in the selected studies (Peters et al., 2020). Nonetheless, they require rigorous, transparent, and replicable procedures (Arksey & O'Malley, 2005).

Drawing on Arksey and O'Malley's (2005) framework, refined by Levac et al. (2010), we undertook a five-step procedure: (a) identifying the research questions; (b) identifying relevant studies; (c) selecting studies; (d) charting the data; and (e) collating, summarising, and reporting the findings.

### *Identifying the research questions*

To capture a comprehensive view of the literature on PhDs pursuing careers beyond academia, we formulated the following research questions that guided the search strategy (Arksey & O'Malley, 2005).

RQ1: What do we know about how universities prepare PhDs for careers beyond academia?

RQ2: What do we know about PhDs' career trajectories and work experiences beyond academia?

RQ3: What do we know about how PhDs are perceived in employment sectors beyond academia?

### *Identifying relevant studies: databases and search strategies*

In January 2022, we searched Scopus, ERIC, and Web of Science to cover major education and social sciences journals. Keywords, chosen based on relevant publications

on the topic and the authors' expertise in the field (McAlpine et al., 2021; Skakni, 2018), were focused on PhDs' training, career trajectories, and employment. The search string (here, in Scopus) was,

> (TITLE-ABS-KEY('PhD holder*' OR 'PhD*' OR 'PhD graduate*' OR 'doctora* graduate*' OR ''doctora* holder*' OR 'post-PhD*') AND TITLE-ABS-KEY('academic career*' OR 'career* beyond academia' OR 'career* outside academia' OR 'industry') AND TITLE-ABS-KEY ('career development' OR 'Career prepara*' OR 'Career goal*' OR 'challenges' OR 'training' OR 'employa*' OR 'career trajector*')) AND (LIMIT-TO (LANGUAGE, 'English')

### *Selecting publications: inclusion and exclusion criteria*

We developed inclusion and exclusion criteria based on our research questions, focusing on publications examining (a) university support initiatives for careers beyond academia, (b) PhDs' trajectories and work experiences outside academia, and (c) perceptions of PhDs and the PhD degree beyond academia. The search criteria included English-language journal articles, books, and book chapters published between 2000 and 2021 with an empirical focus; commentaries, editorials, and notes were excluded (Table 1 shows refined criteria). To our knowledge, no scoping or literature review addressed PhDs' careers beyond academia at the time of our search. We identified one relevant review on employers' perceptions of PhDs, which was included in our corpus.

**Table 1.** Inclusion and exclusion criteria.

| | Criteria |
|---|---|
| Included if focus on: | - Institutional initiatives preparing PhDs for diverse careers - Academia-industry partnerships (*with implications for PhDs*) - PhDs in non-academic sectors (public/par-public, private, third space) - Challenges PhDs face entering non-academic sectors - PhDs' skills/competencies - PhD skills demand across sectors - Employers' perception of PhDs |
| Excluded if focus on: | - Academic careers - PhD students' experience during their programmes - PhD student-supervisor relationships - Master's/undergraduate students - PhD programme description/implementation |

### *Identification and screening process*

All search results – 703 unduplicated – were downloaded, and irrelevant items (e.g., medical papers) were removed, leaving 258 items. We read the abstracts, and items that did not meet our criteria were excluded, resulting in 112 items. After reading the full texts, those not meeting our criteria were excluded, resulting in 36 items. We manually reviewed their reference lists, finding an additional 67 relevant items. Of these, 21 journal articles and 14 national/international policy reports met our inclusion criteria and were added, bringing the final corpus to 71 publications. Figure 1 shows the literature search and filtering process.

### *Charting the data: extraction and classification process*

Each publication's core attributes were extracted and organised systematically. The 71 items were divided among the first, second, and last authors, who analysed them. Data were organised in an Excel spreadsheet to capture fields including authors, year, title, keywords, abstracts, and key findings (see supplementary material A).

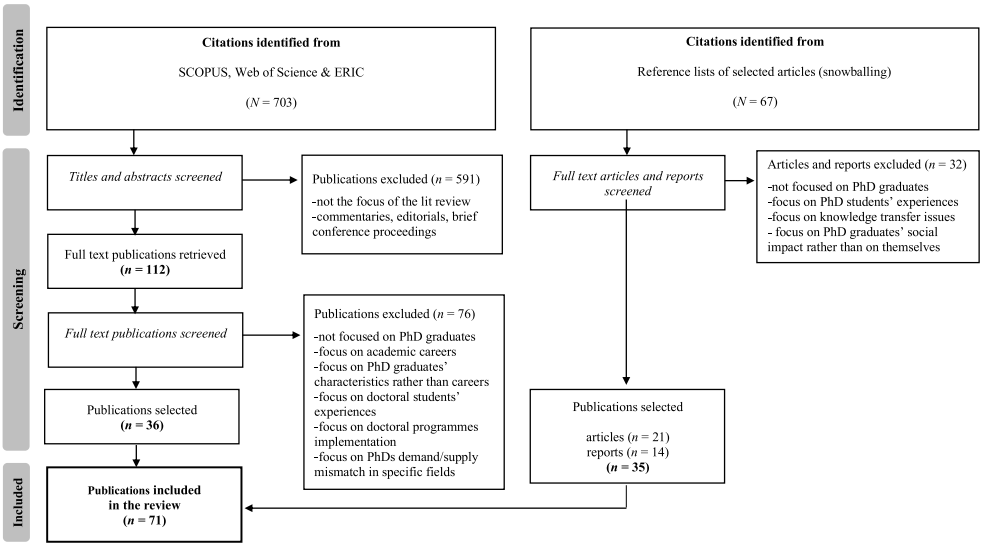


**Figure 1.** Flow chart of the publications filtering process. Inspired from The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. https://doi.org/10.1136/bmj.n71.

## *Collating and summarising the data: analysis procedure*

To map the key research foci and assess the gaps in the literature, we adopted a two-stage procedure including science mapping methods and qualitative content analysis.

In the first stage, we applied science mapping methods to synthesise the most recurrent terms – and their relationships – within the 71 publications. These methods utilise bibliometric tools to identify patterns and clusters of topics through classification techniques and spatial representations (Waltman et al., 2010; Zupic & Čater, 2015). Using VOSviewer, which relies on natural language processing, we (a) extracted terms from the titles and abstracts of the articles and reports selected, (b) standardised terms (e.g., abbreviations, spelling, synonyms), (c) calculated co-occurrence scores among terms, and (d) clustered terms by co-occurrence. To ensure quality, we set a term occurrence threshold of at least seven mentions in titles or abstracts (van Eck, 2011), yielding 64 terms. We assessed their relevance to our research questions, excluding non-meaningful terms (e.g., factor, importance, number). Ultimately, 53 terms were included.

Finally, we used association strength estimates to generate a two-dimensional map of terms and clusters (Waltman et al., 2010). This network map revealed four topic clusters: PhDs' career preparation, PhDs' competencies, PhDs' career destinations, and industry-oriented training. The terms within each cluster are detailed in the Findings section. This preliminary exploration of recurring terms guided the subsequent analysis stage.

This second stage entailed a deductive-dominant qualitative content analysis (Armat et al., 2018) of the 71 items to identify how these publications address our three research questions. Using the qualitative software MaxQDA.22, we initially classified the publications deductively, according to the research questions they respond: RQ1 (universities' support for PhDs' career preparation), RQ2 (PhDs' career trajectories/work experiences),

and RQ3 (non-academic sectors' perspectives on PhDs). The first and last authors discussed the classification until reaching a consensus.

Subsequently, the first author conducted a detailed coding of half the corpus (30 articles/seven reports), using additional codes from the science mapping: PhDs' career preparation, PhDs' competencies, PhDs' career destinations, and industry-oriented training. The second author reviewed these codes to ensure consistency.

An inductive approach was then used to examine the coded publications deeply, revealing new codes (e.g., motivations for hiring PhDs) and subcodes. All co-authors discussed these insights, refining code definitions collectively. Ultimately, this iterative process yielded eight codes and four subcodes, applied systematically by the first author across the entire corpus (see final codebook in supplementary material B).

Overall, the science mapping revealed broad topic clusters, whereas the qualitative content analysis enabled a deeper exploration of the corpus, revealing key research foci shaping how the issue of PhDs pursuing careers beyond academia has been studied.

## Limitations

As with any literature review, the core concern of our study – PhDs pursuing careers beyond academia – along with the specific research questions, selected keywords, and databases, inevitably influenced the search results and item selection. Additionally, we manually reviewed reference lists from initially selected articles, which may have led to the omission of relevant publications. Only English-language sources were considered, potentially overlooking valuable studies in other languages. By concentrating on the selected publications' research foci, we primarily provided a descriptive overview of their findings. Given the exhaustive nature of some of the reports selected, we did not address all their topics; instead, we highlighted their most salient. Lastly, consistent with the purpose of scoping reviews, we did not assess the scientific quality of the publications, which leaves room for a future systematic literature review once the body of research becomes more substantial (Peters et al., 2020).

## Findings

This section presents the findings of the scoping review. First, a description of the corpus provides a situated overview of the nature and extent of publications (Peters et al., 2020) on PhDs pursuing careers beyond academia over the 21-year period covered. This is followed by science mapping results and the findings from content analysis, structured as a narrative synthesis (Popay et al., 2006) addressing our research questions. Together, these findings highlight key trends, research gaps, and implications for policy and practice (see Supplementary File D).

### *Description of the corpus*

The selected corpus, comprising 57 journal articles and 14 national/international reports (see supplementary material A), indicates a developing interest in PhDs pursuing careers beyond academia over the past 21 years. An increase in publications in 2010–2012 and 2020 suggests a recent surge of interest in this issue (Figure 2).


**Figure 2.** Number of articles and reports published per year (2000–2021).

Most studies originate from North America (44%) and Europe (44%), with 37% focusing on the US, 17% on the UK, and 13% on Australia. While many publications cover diverse disciplines (48%), when the focus is on a specific disciplinary field, STEM fields (30%) predominate, followed by humanities and social sciences (15%) and health sciences (7%). In this regard, national/international reports are more likely to span multiple fields than journal articles. In terms of target population, 53% of articles/reports include PhDs as the population studied, followed by PhD students (20%), employers (16%) and others (11%) (e.g., university administrators).

Quantitative methods are dominant (62%), with qualitative and mixed methods accounting for 23% and 15%, respectively. Only 40% of the studies applied explicit theoretical or conceptual frameworks (i.e., clearly stated and referenced theories/concepts), many of which were grounded in career development theories (e.g., social cognitive career theory) or sociological concepts (e.g., habitus). The highest number of articles were published in the fields of higher education and educational research (47%) and economics, policy, and innovation (25%), as detailed in supplementary material C.

### *Topic clusters*

The science mapping analysis identified four topic clusters based on the most recurrent terms across the 71 publications (see Figure 3 and online supplementary material[1]):

1. ***PhDs' career preparation*** *(*Red, *n = 16*): This largest cluster reflects publications on PhDs' career preparation during doctoral years, with terms including 'PhD student', 'training', 'career preparation', 'career option', 'academic career', and 'non-academic career'. The prominence of 'survey' indicates reliance on quantitative methods.
2. ***PhDs' competencies*** (Green, *n = 14*): This cluster emphasises PhDs' competencies, featuring terms such as 'skills', 'experience', 'development', 'researcher', 'work', and 'outcome'. The association with the term 'report' suggests many findings derive from large-scale national/international reports.

3. ***PhDs' career destinations*** (Blue, *n* = *12*): Publications here explore career destinations for PhDs, frequently including terms like 'PhD holder', 'sector', 'employment', 'labour market', 'job', and 'role'. The presence of the terms 'employer' and 'interview' indicates that employers' perspectives and qualitative approaches are common within this cluster.
4. ***Industry-oriented training*** (Yellow, *n* = *11*): This cluster, largely STEM-focused, reflects publications on PhD training programmes oriented towards industry needs. Key terms include 'graduate', 'industry', 'science', 'doctoral education', 'doctoral program', and 'engineering'.

These results provide a general glimpse into the topics prevalent when studying PhDs pursuing careers beyond academia, along with the predominant methodological approaches. In this regard, although 'qualitative research' is part of the third cluster (blue), its relatively central position on the map (see the online interactive map) suggests its use across all clusters. However, it does not appear prominent, suggesting qualitative studies are still emerging and integrating various research streams. Furthermore, three clusters highlight key stakeholders (PhD students, PhDs, employers), which helps identify overlooked groups.

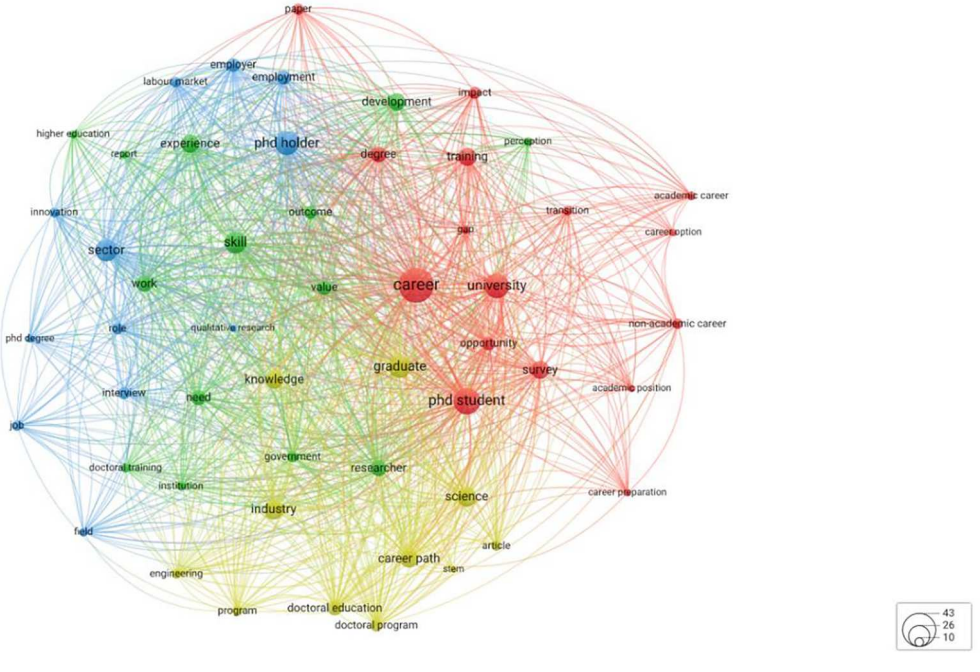


**Figure 3.** Most recurrent terms used in the publications comprised in the corpus.

## *Research foci*

The qualitative content analysis revealed eight research foci in the literature, each addressing the issue of PhDs pursuing careers beyond academia in distinct respects. The predominant foci include PhDs' career choices and intentions (30%) and PhDs'

employment (22%), followed by outcomes of doctoral education (14%), labour-market demand for PhDs (12%), and employers' perspectives on PhDs (8%). Industry-oriented PhD programmes (7%), career development initiatives (5%), and transitions into non-academic sectors (2%) garnered less attention.

Our corpus shows no clear evolution of research foci over time, but certain tendencies are identifiable. Since 2000, authors have consistently focused on 'PhDs' employment' and 'PhDs' career choices and intentions', with the latter also representing the research focus most often associated with theoretical/conceptual frameworks. The 'employers' perspective' has only been addressed since 2008, while the least utilised research focus (transitions into non-academic sectors) appears in the most recent publications (from 2021).

## What we know so far

This section provides a narrative synthesis of the findings (Popay et al., 2006) structured around our three research questions. For each question, we highlight the most prevalent research foci addressing PhDs pursuing careers beyond academia from 2000 to 2021. The following subsections provide an in-depth exploration of these recurring framings.

## RQ1. What do we know about how universities prepare PhDs for careers beyond academia?

The literature addressing this question ($n = 24$) highlights three central research foci: outcomes of doctoral education, industry-oriented PhD programmes, and institutional career development initiatives aimed at preparing PhD students for diverse careers. These strands reflect distinct approaches to examining how universities support diverse PhD careers and highlight a growing emphasis on the need for doctoral education to better align with a rapidly changing employment landscape.

### Outcomes of doctoral education

The first research focus (n = 13) captures how PhDs skills and knowledge developed through doctoral training are perceived and valued in relation to careers beyond academia.

#### *Skills and expertise developed during PhD programmes*

Studies in this area explore PhDs' perspective on the relevance of their doctoral training across career contexts. For instance, Kyvik and Olsen studied PhDs in Norway and found that while those working outside academia considered doctoral knowledge relevant to their roles, they viewed coursework as less applicable. In non-research settings, generic skills like analytical thinking and complex problem-solving were highly valued. Similarly, Sinche et al. identified time management, rapid learning ability, and project management as crucial skills for success in non-research careers. Bryan and Guccione found that UK PhDs valued abstract cognitive skills – e.g., critical thinking, argument construction – which were seen as essential for many non-academic roles.

In STEM fields specifically, Lee et al. reported that subject-specific knowledge is important for academic and public research careers, whereas generic skills are more beneficial in non-research roles. In the US, Cui and Harshman found that technical expertise, communication, and teamwork were essential for chemistry PhDs pursuing industry careers. As for PhDs from HSS fields, they report that teamwork, time management, and interpersonal skills, along with data analysis and critical thinking, are indispensable in non-academic roles.

### *Preparedness for careers beyond academia*

Another strand focuses on the perceived gap between doctoral training and PhDs' readiness for careers beyond academia. For example, Helm et al. found that US PhDs often perceived their doctoral training as lacking in non-academic skill development and career guidance. Sharmini et al. noted that UK and Australasian doctoral curricula often fail to provide sufficient skill-development opportunities for non-academic roles. Similarly, Randall et al. observed that US PhD programmes offer limited opportunities for developing skills applicable beyond academia. However, Mitic and Okahana noted a positive relation between research skills acquired during doctoral years and job readiness within and outside academia. Nevertheless, Di Paolo and Mane, as well as Bender and Heywood, found that some PhDs experience a mismatch between their skills and expectations for jobs in non-academic sectors.

## Industry-oriented PhD programmes

This second research focus (n = 6) reflects a growing interest in programme-level initiatives aimed at strengthening PhDs' connections to non-academic employment through structured collaboration with industry. This literature body highlights how hands-on industry experience during doctoral training enhances career preparedness.

Industry-oriented programmes often involve partnerships in which PhD students split their time between a company and university, with both institutions contributing resources and supervision to the project. Such collaborations expose PhDs to both academic and commercial environments, expanding their career options. Manathunga et al. studied Australian PhD programmes promoting collaboration among government, industry, and academia, finding that PhDs gained teamwork, intellectual property awareness, and leadership skills – all valuable in non-academic contexts. In Europe, Borrell-Damian et al. highlighted industry-oriented programmes' benefits, such as exposing PhDs to varied work environments and priorities. Similarly, Lee and Miozzo noted that industry-based PhD projects enhance socialisation into industry cultures, providing an advantage for PhDs entering the private sector. Conversely, Grimm examined an industry-oriented PhD programme in Germany and found that academic thesis supervisors, unlike industry representatives, perceived limited benefits from training PhDs in industry settings.

## Career development initiatives

The third research focus relates to university – or national-level initiatives explicitly supporting PhDs' career development. Although this is one of the least studied areas in our

corpus (n = 5), these contributions highlight initiatives through which institutions seek to enhance career preparedness beyond traditional academic training. Edge and Munro categorised these initiatives into supplementary, immersive, and transformative, each offering different levels of engagement.

- *Supplementary initiatives* include optional workshops, seminars, and online resources offered in parallel to doctoral work, usually by university career centres. These initiatives are designed to be easily accessible and require a minimal time commitment.
- *Immersive initiatives* involve hands-on experiences in non-academic roles through short-term positions, research internships, and mentorship programmes. Jackson et al. examined the IMNIS programme, which connects PhD students with industry leaders in Australia. Participants reported gaining industry knowledge, collaboration opportunities, and insights into non-academic careers. Similarly, Main et al. found that early-career management training (ECMT) programmes in STEM fields in the US helped PhDs enhance management and leadership skills, with notable benefits for women.
- *Transformative initiatives* integrate career development directly into doctoral programmes, encouraging PhDs to engage with non-academic sectors as part of their training. Brandt et al. examined the US BEST programme, featuring career panels, skill-building workshops, and internships. Contrary to initial assumptions, participating in this programme did not reduce PhD students' productivity or extend time to degree, indicating that transformative initiatives can improve career readiness without negatively impacting academic performance.

## RQ2. What do we know about PhDs' career trajectories and work experiences beyond academia?

The most represented literature in our corpus (n = 49) explores PhDs' career trajectories and work experiences after graduation. Three key foci emerged: (1) PhDs' career choices and intentions, (2) their employment outcomes, and (3) transition into non-academic careers. These strands reflect how the literature has addressed the changing landscape of PhDs' career trajectories and the complex interplay of individual and structural factors shaping them.

### PhDs' career choices and intentions

In the first research focus (n = 27), a central concern is the evolving nature of PhDs' career intentions during and after their doctoral training. Many studies highlight that individuals often begin their doctorate with aspirations of pursuing academic careers. However, the literature also points to significant shifts in these intentions over time. Some studies report increased interest in academia, while others highlight a decline in academic aspirations due to shifting personal priorities or a changing view of academia. In contrast, postdocs generally remain committed to academic careers, with fewer exploring options beyond academia. PhD students, however, often consider diverse career paths but may lack awareness of non-academic options or delay career planning until late in their doctorate.

This literature also highlights how a combination of individual preferences and broader contextual influences shapes career intentions. On the one hand those primarily interested in industry careers often report a strong preference for job stability, competitive salaries, and work–life balance. In contrast, those with a greater 'taste for science' (Roach & Sauermann, 2010) – marked by a desire for intellectual autonomy and basic research – are more inclined towards academia. Moreover, interest in applied work and societal impact motivate PhDs to pursue careers beyond academia. In a rare qualitative study on HSS PhDs' career trajectories, Guerin found that lifestyle considerations, competitive academic job markets, and dissatisfaction with university culture also drive individuals to choose careers beyond academia.

Disciplinary background and research interests further shape career intentions. For instance, Fritsch and Krabel found that German PhDs' intentions to enter the private sector are linked with the commercial applicability of their dissertation topic. Moreover, PhDs' entrepreneurial aspirations are shaped by a complex interplay of personality traits (e.g., risk tolerance) and prior experience in the private sector or engagement in industry collaborations.

Finally, relational and institutional factors affect career choices. Relationships with supervisors and principal investigators can play a role in shaping PhDs' career decisions, while access to structured career development support is positively associated with greater awareness of opportunities beyond academia.

## PhDs' employment outcomes

The second research focus (n = 20) examines PhDs' employment, with an emphasis on employment rates, work sectors, and the roles they assume across settings. It explores how doctoral training translates into career outcomes and how these vary by demographic and disciplinary background.

### *PhDs' employment rates*

Multiple studies show that PhDs generally maintain high employment rates over time, although women and younger PhDs tend to fare worse in some countries. While gender appears to have limited impact on overall employment across sectors, women's entry-level salaries are often lower, and their salary progression slower compared to men. However, these disparities are less pronounced among PhDs than other degree holders. Over time, PhDs often advance to higher-level positions easily.

### *PhDs' employment sectors and roles*

Another recurring concern is the specific employment settings PhDs enter. Tracking PhDs' employment outcomes has become a key priority in many countries. Several years post-graduation, PhDs typically achieve positive labour-market outcomes, although this is often preceded by a period of uncertainty.

Globally, 40–50% of PhDs work outside academia. Employment trajectories can vary depending on institutional prestige and degree type. Whereas graduates from prestigious institutions are more likely to secure academic positions, those from applied PhD programmes often pursue non-academic careers.

A number of publications highlight trends according to PhD disciplinary field. For instance, PhDs from STEM and health sciences fields are more frequently employed outside academia, often in research-intensive roles across public and private sectors. In the US, Stephan found that many STEM PhDs work in industries such as IT, publishing, and technical services. In Australia, McCarthy and Wienk noted that public-sector employment for STEM graduates includes hospitals and health services, while private-sector opportunities span banking, finance, mining, energy, and pharmaceuticals.

In contrast, PhDs from HSS fields predominantly remain in academia, although not always in tenure-track positions. When employed outside academia, HSS PhDs often occupy roles in the non-profit, business, or government sectors. McAlpine and Austin found that these graduates can be freelance writers, editors, managers, e-learning developers, museum curators, and communication officers. Within academia, many HSS PhDs work in non-research or administrative positions.

### Transition into non-academic careers

The third focus we identified – PhDs' transition beyond academia – is notably under-researched in our corpus. Only two publications address it directly, suggesting a significant gap in understanding how those trained in academia adapt to new professional environments. Germain-Alamartine et al. found that the personal networks that PhDs build independently help match their scientific expertise with labour-market needs. Skakni et al. identified a phenomenon of organisational culture shock in which PhDs entering non-academic workplaces report difficulties adapting to new norms, values, and workplace dynamics that differ from academia.

## RQ3. What do we know about how PhDs are perceived in employment sectors beyond academia?

The literature addressing our third question (n = 17) concerns how PhDs are perceived beyond academia. It explores the labour market demand for their skills, and employers' views on their suitability for non-academic roles. These publications reveal a complex picture of PhDs' alignment with labour-market expectations and organisational cultures.

### Labour-market demand for PhDs

A key focus in this body of work (n = 11) is the uneven demand for PhDs across sectors. While some industries actively recruit them, others show limited recognition of their added value. For instance, Garcia-Quevedo et al. investigated private-sector demand for PhDs in Spain, revealing that companies collaborating with universities are more likely to hire PhDs, particularly in technology-intensive industries. Similarly, Edge and Munro examined the Canadian labour market, noting that while many PhDs do not secure professorships, they face low explicit demand for PhD degrees outside academia and often encounter challenges in obtaining full-time, well-compensated positions. Moreover, motivations for hiring PhDs differ across sectors and contexts. Purcell et al. found that in the UK, non-academic employers often recruit HSS

PhDs for their research skills, frequently employing them as researchers. In Finland, Haapakorpi noted that PhDs outside academia are predominantly employed in R&D positions, where they perform complex tasks or hold roles related to their research expertise. Employers also expect hiring PhDs to foster university collaboration and enhance their organisation's reputation.

However, sector-specific studies highlight nuanced trends. Wallace et al. explored PhDs' employability in US genetic counselling-related fields and found that PhDs are expected to perform distinct tasks compared to master's degree holders, suggesting a niche role for PhDs in this area. Similarly, Blickley et al. examined conservation science roles across government, non-profit, and private sectors, reporting that PhDs are particularly valued for their disciplinary expertise and interpersonal skills. Several studies also emphasise that employers in non academic settings value *soft skills*, such as communication, teamwork, and problem solving as well as project management skills.

## Employers' perspectives on PhDs

A second research focus (n = 7) concerns employers' perceptions of PhDs' suitability for non-academic roles. While many value their technical and intellectual strengths, some studies highlight mismatches between employers' expectations and PhDs' profiles and that certain employers doubt that PhDs pursue non-academic careers out of genuine preference rather than limited alternatives.

Moreover, in Belgium, De Grande et al. reported that PhDs often underestimate the importance of transferable skills for industry roles, while employers emphasise the need for a balance of scientific knowledge, analytical skills, and interpersonal abilities. McCarthy and Wienk examined Australian employers' perceptions, finding that while PhDs are rated highly for technical skills, adaptability, and employability, they are rated slightly lower in collaborative abilities. In a broader European context, Wille et al. identified a duality in employer perceptions. PhDs are sometimes criticised for lacking skills in management, commercial awareness, and adaptability, as well as being overly specialised or disconnected from 'the real world'. Conversely, they are praised as motivated and skilled innovators with strong subject knowledge, cognitive abilities, and communication skills.

Interestingly, employers' perceptions tend to change with experience. Some studies suggest that organisations unfamiliar with doctoral training may be reluctant to hire PhDs, but their perceptions become more positive once they have done so. For instance, Rubio and Hooley and Wallace et al. noted that after employing PhDs, many organisations reported higher satisfaction and a greater likelihood of hiring PhDs in the future.

## Discussion

This scoping review provides an comprehensive overview of the research foci that have shaped the study of PhDs pursuing careers beyond academia over the past two decades. Drawing on science mapping and qualitative content analyses, we examined 71 publications, including 57 journal articles and 14 national/international reports.

A central insight from our review is that the field remains predominantly shaped by Western perspectives, with a strong emphasis on PhDs who have already transitioned beyond academia. There is comparatively limited attention to other key stakeholders

(e.g., current PhD students, university administrators, employers). Methodologically, most publications rely on large-scale survey data, particularly in STEM fields, with few employing mixed and qualitative designs and theoretical/conceptual frameworks. This prevalence of descriptive approaches suggests a field that is still largely exploratory and under-theorised.

The most prevalent strand of literature (n = 49) relates to PhDs' careers and work experiences beyond academia. These publications primarily document PhDs' career choices and the sectors – private, government, and public – where they find employment, highlighting that STEM PhDs are more likely to hold research positions in these areas, while HSS PhDs often occupy non-research roles. While this work provides valuable labour-market insights, it often lacks depth in examining the lived experiences of PhDs in non-academic roles, including their daily tasks, the challenges they face, and how they navigate organisational cultures.

A second, less developed strand (n = 24) examines how universities prepare PhDs for careers beyond academia. Most publications focus on transferable skills gained during doctoral training. However, the literature also raises concerns about inadequate institutional career support, with many PhDs reporting limited access to formal guidance and non-academic career development during their studies. These discussions focus largely on STEM, with limited attention to SSH fields or institutional efforts to embed career development into doctoral programmes.

Finally, a smaller body of literature (n = 17) examines employer perceptions of PhDs and the broader demand for their skills outside academia. These publications reveal sometimes conflicting perspectives. While organisations with established ties to universities are more inclined to hire PhDs, and those with experience integrating PhDs tend to rate them positively, some employers also raise concerns about their adaptability and fit for non-academic work environments. These findings suggest a perception gap between how PhDs are trained and potential employers view them.

## *Implications for future research*

This scoping review's findings point to critical literature gaps that warrant further investigation. To address these gaps and advance our understanding of PhDs' careers beyond academia, we outline four key areas for future research.

### *Disciplinary differences in PhD employment*

Our analysis reveals a significant need for deeper, more nuanced exploration of how disciplinary background influences PhD employment outcomes beyond academia. The existing literature is disproportionately focused on STEM graduates, resulting in limited knowledge about the career trajectories of PhDs from HSS. Future studies should investigate the full spectrum of HSS PhDs' roles, particularly roles unrelated to research or teaching (e.g., in cultural institutions, NGOs, policy, and entrepreneurial ventures) (OECD, 2023). Additionally, while prior studies have underscored the field-specific value of PhDs in certain sectors, further research is needed to unpack sector-specific employers' expectations and hiring rationales. Such work could illuminate how PhDs from different disciplines are perceived and valued across employment sectors and how these perceptions align (or clash) with the skills and dispositions cultivated during doctoral training.

### *Institutional career development mechanisms*

Another important gap in the literature concerns the impact of career support developed at national and university levels on PhDs' career outcomes. Future studies should document and compare institutional initiatives designed to prepare PhDs for diverse careers, with particular attention paid to how these mechanisms address PhDs' needs and expectations across fields, backgrounds, and aspirations (Gardner, 2008; Nerad, 2020). Including the perspectives of key institutional actors (e.g., university administrators, career centre staff, doctoral supervisors) could shed light on barriers and best practices for strengthening PhDs' career readiness and adaptability. Such research would help institutions develop evidence-based initiatives tailored to their PhDs' actual needs.

### *Non-academic stakeholders' perspectives*

Our findings underline the importance of understanding the perspectives of non-academic stakeholders such as employers across sectors who recruit PhDs; supervisors in industry-oriented doctoral programmes who bridge academic and applied research environments; and career advisors who support PhDs in navigating transitions beyond academia. These actors play complementary roles in shaping how doctoral training translates into competencies valued in the broader labour market (Muurlink et al., 2024). Employers and industry supervisors provide insight into recruitment needs and workplace expectations, while career advisors act as translators; they help PhDs articulate their skills and guide institutions in aligning training with employment realities. Future research should explore their perspectives to inform more targeted preparation, improve onboarding and retention practices, and foster stronger university-industry collaboration (Skakni & Inouye, 2023).

### *PhDs' subjective career experiences*

A last significant gap identified in our review is the scarcity of qualitative and mixed-methods studies capturing PhDs' subjective experiences, particularly those of underrepresented groups – such as graduates from the Global South and those from marginalised communities who frequently leave academia after graduation (Turk-Bicakci et al., 2014). Considering these voices is crucial in order to grasp the full complexity of PhDs' career paths, which are shaped not only by individuals' agency but also by wider structural and cultural influences. In addition, longitudinal qualitative studies offer a promising avenue for exploring the subjective aspects of PhDs' careers in greater depth, from transitions across roles and sectors to access to promotion. Such approaches are likely to reveal the emotional, social and professional dimensions of career movement that are often hidden in aggregate data. Our review also points to the need for conceptual/theoretical frameworks that examine how individual career choices interact with broader socio-political, economic, and institutional forces, therefore offering more nuanced insights into the conditions shaping PhDs' career trajectories.

## *Implications for policy and practice*

Our scoping review underlines the need for clear policies and guidelines for the career development of PhDs at national and university levels. Governments and universities need to recognise that preparing PhDs for diverse career options requires a cultural

shift within academia (Skakni & Inouye, 2023). Universities should promote this shift by openly valuing diverse career outcomes, embedding transferable skills development into doctoral training, and normalising career paths beyond traditional academic trajectories (OECD, 2024).

The literature also highlights the potential of collaborations between non-academic sectors and PhD programmes, particularly in HSS fields. For example, establishing partnerships with industries such as policy institutions, media and technology sectors can expose PhDs to different professional contexts and cultures and better prepare them for successful transitions. Practical initiatives such as apprenticeships and structured policy-engagement programmes can also significantly ease workplace adjustments and enhance PhDs' professional adaptability (OECD, 2023; Skakni & Inouye, 2023).

Finally, university career centres should intensify collaboration with external stakeholders to better understand and communicate sector-specific employment opportunities and recruitment practices. Enhancing awareness of the transferable skills developed through doctoral training can empower PhDs and postdocs to make informed career choices while helping employers appreciate the unique contributions PhDs can bring to their organisations (OECD, 2023).

## Note

1. The online science map can be found here: VOSviewer Online.

## CRediT authorship contribution statement

1. Skakni: Conceptualization, Methodology, Investigation, Formal analysis; Writing-original draft; Funding acquisition; Project administration; Supervision
2. Kereselidze: Conceptualization; Methodology; Investigation; Formal analysis; Validation; Writing-original draft
3. Parmentier: Formal analysis; Writing-original draft
4. Delobbe: Validation, Writing – review & editing; Funding acquisition; Project administration
5. Inouye: Conceptualization; Methodology; Investigation; Data curation; Formal analysis; Writing-original draft

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## References

American Association of University Professors (AAUP). (2022). *The academic workforce*. https://data.aaup.org/academic-workforce/

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, *8*(1), 19–32. https://doi.org/10.1080/1364557032000119616

Armat, M. R., Assarroudi, A., & Rad, M. (2018). Inductive and deductive: Ambiguous labels in qualitative content analysis. *The Qualitative Report*, *23*(1), 219–221. https://doi.org/10.46743/2160-3715/2018.2872

Associazione Dottorandi e Dottori di Ricerca in Italia (ADI). (2019). Dottorato di ricerca: Niente di nuovo sul fronte occidentale. https://dottorato.it/sites/default/files/survey/indagine-adi-2019.pdf

Austin, A., & McDaniels, M. (2006). Preparing the professoriate of the future: Graduate student socialization for faculty roles. In J. Smart (Ed.), *Higher education: Handbook of theory and research* (pp. 397–456). Agathon Press.

Australian Bureau of Statistics (ABS). (2016). Census of population and housing, 2016. https://www.abs.gov.au/websitedbs/censushome.nsf/home/2016

Council of Canadian Academies (CCA). (2021). *Degrees of success: The transition from postsecondary education to the labour market*. https://www.cca-reports.ca/wp-content/uploads/2021/01/Degrees-of-Success_FullReport_EN.pdf

Crumb, L., Haskins, N., Dean, L., & Avent Harris, J. (2020). Illuminating social-class identity: The persistence of working-class African American women doctoral students. *Journal of Diversity in Higher Education*, *13*(3), 215–227. https://doi.org/10.1037/dhe0000109

Gardner, S. K. (2008). "What's too much and what's too little?": The process of becoming an independent researcher in doctoral education. *The Journal of Higher Education*, *79*(3), 326–350. https://doi.org/10.1080/00221546.2008.11772101

Gardner, S. K., & Doore, S. A. (2020). Doctoral student socialization and professional pathways. In J. C. Weidman, & L. DeAngelo (Eds.), *Socialization in higher education and the early career. Knowledge studies in higher education* (pp. 113–127). Springer.

Guerin, C., Jayatilaka, A., & Ranasinghe, D. (2015). Why start a higher degree by research? An exploratory factor analysis of motivations to undertake doctoral studies. *Higher Education Research & Development*, *34*(1), 89–104. https://doi.org/10.1080/07294360.2014.934663

Horta, H., Li, H., & Chan, S. J. (2024). Why do students pursue a doctorate in the era of the 'PhD crisis'? Evidence from Taiwan. *Higher Education Quarterly*, *78*(2), 505–522. https://doi.org/10.1111/hequ.12467

Jackson, D., & Michelson, G. (2015). Factors influencing the employment of Australian PhD graduates. *Studies in Higher Education*, *40*(9), 1660–1678. https://doi.org/10.1080/03075079.2014.899344

Kereselidze, N., & Skakni, I. (2023). *PhD graduates' preparedness for careers beyond academia: The role of support communities*. 20th EARLI Biennial Conference. Thessaloniki, Greece: Aristotle University of Thessaloniki.

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, *5*(1), 1–9. https://doi.org/10.1186/1748-5908-5-69

Li, H., & Horta, H. (2022). Factors influencing PhD students' intentions to pursue careers in the government and nonprofit sectors: Evidence from a global survey. *Higher Education Research & Development*, *41*(6), 1946–1961. https://doi.org/10.1080/07294360.2021.1948975

Locke, M. L., Trudgett, M., & Page, S. (2023). Building and strengthening indigenous early career researcher trajectories. *Higher Education Research & Development*, *42*(1), 156–170. https://doi.org/10.1080/07294360.2022.2048637

McAlpine, L., Skakni, I., & Inouye, K. (2021). PhD careers beyond the traditional: Integrating individual and structural factors for a richer account. *European Journal of Higher Education*, *11*(4), 365–385. https://doi.org/10.1080/21568235.2020.1870242

Muurlink, O., Chen, L. A., Boorman, R., Pearson, D., & Cohen, G. (2024). Stakeholder perceptions of what industry wants from doctoral students: A systematic literature review. *Higher Education Research & Development*, *43*(4), 952–965. https://doi.org/10.1080/07294360.2023.2269871

Nerad, M. (2020). Governmental innovation policies, globalisation, and change in doctoral education worldwide: Are doctoral programmes converging? Trends and tensions. In S. Cardoso, O. Tavares, C. Sin, & T. Carvalho (Eds.), *Structural and institutional transformations in doctoral education. Issues in higher education* (pp. 43–84). Palgrave Macmillan.

OECD. (2021). Reducing the precarity of academic research careers. *OECD Science, Technology and Industry Policy Papers*. https://doi.org/10.1787/0f8bd468-en

OECD. (2023). Promoting diverse career pathways for doctoral and postdoctoral researchers. *OECD Science, Technology and Industry Policy Papers*. https://doi.org/10.1787/dc21227a-en

OECD. (2024). The state of academic careers in OECD countries: An evidence review. *OECD Education Policy Perspectives*. https://doi.org/10.1787/ea9d3108-en

Peters, M. D., Marnie, C., Tricco, A. C., Pollock, D., Munn, Z., Alexander, L., … Khalil, H. (2020). Updated methodological guidance for the conduct of scoping reviews. *JBI Evidence Synthesis*, *18*(10), 2119–2126. https://doi.org/10.11124/JBIES-20-00167

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., & Britten, N. (2006). *Guidance on the conduct of narrative synthesis in sytematic reviews*. Institute for Health Research.

Rosa, R. (2021). The trouble with 'work–life balance' in neoliberal academia: A systematic and critical review. *Journal of Gender Studies*, *31*(1), 55–73. https://doi.org/10.1080/09589236.2021.1933926

Sinche, M. V. (2016). *Next gen PhD: A guide to career paths in science*. Harvard University Press.

Skakni, I. (2018). Reasons, motives and motivations for completing a PhD: A typology of doctoral studies as a quest. *Studies in Graduate and Postdoctoral Education*, *9*(2), 197–212. https://doi.org/10.1108/SGPE-D-18-00004

Skakni, I., & Inouye, K. (2023). Preparing for the world outside academia: Avoiding organisational culture shock. In D. Eliott, K. Guccione, & S. Bengtsen (Eds.), *The hidden curriculum in doctoral education, and the development of researcher independence* (pp. 241–249). Palgrave.

Statistics Netherlands (CBS). (2020). Gepromoveerden op de arbeidsmarkt. https://www.cbs.nl/nl-nl/longread/statistische-trends/2020/gepromoveerden-op-de-arbeidsmarkt

Turk-Bicakci, L., Berger, A., & Haxton, C. (2014). *The nonacademic careers of STEM PhD holders*. American Institute for Research (AIR). https://www.air.org/sites/default/files/202106/STEM%20nonacademic%20careers%20April14.pdf

van der Boon, J., Kahmen, S., Maes, K., & Waaijer, C. (2018). *Delivering talent: Careers of researchers inside and outside academia*. League of European Research Universities. https://www.leru.org/publications/delivering-talent-careers-of-researchers-inside-and-outside-academia#

van Eck, N. J. (2011). *Methodological advances in bibliometric mapping of science*. Erasmus University Rotterdam.

Vitae. (2016). *What research staff do next*. (Report). https://www.vitae.ac.uk/vitae–publications/reports/vitae–what–do–research–staffdo–next–2016.pdf

Waltman, L., Van Eck, N. J., & Noyons, E. C. M. (2010). A unified approach to mapping and clustering of bibliometric networks. *Journal of Informetrics*, *4*(4), 629–635. https://doi.org/10.1016/j.joi.2010.07.002

Weber, C. T., Borit, M., Canolle, F., Hnatkova, E., & Pacitti, D. (2018). *Identifying and documenting transferable skills and competences to enhance early career researchers' employability and competitiveness*. European Council of Doctoral Candidates and Junior Researchers.

Weidman, J. C., Twale, D. J., & Stein, E. L. (2001). *Socialization of graduate and professional students in higher education: A perilous passage?* (ASHE-ERIC Higher Education Report). Jossey-Bass. https://eric.ed.gov/?id = ED457710

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, *18*(3), 429–472. https://doi.org/10.1177/1094428114562629