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Research Report — Published Version

The importance of Open Science in Business Studies and Economics. An empirical study by the ZBW – Leibniz Information Centre for Economics

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THE IMPORTANCE OF OPEN SCIENCE IN BUSINESS STUDIES AND ECONOMICS

An empirical study by the ZBW – Leibniz Information Centre for Economics

ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

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The importance of Open Science in Business Studies and Economics

Report on the results of an online survey of business studies and economics researchers at German universities and research institutions in 2023

An empirical study by the ZBW – Leibniz Information Centre for Economics

August 2024

Abstract

This study examines Open Science practices among economic researchers at German universities and research institutions. A total of 314 scientists from different economic disciplines took part in an online survey to answer questions about their attitudes, applications, barriers, and incentives in relation to Open Science. The need for support in this area was also identified. The results show an increasing acceptance and implementation of Open Science methods, with significant differences between different types of institutions. The management of research data, the use of Open Access publications, and the integration of Open Data and codes into the publication process were identified as key aspects. The study provides a comprehensive insight into the current landscape and challenges of Open Science in economic research.

Keywords: Open Science, Open Science practices, Open Access, Open Data, reproducibility, transparency, science

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Summary

This quantitative study deals with the question of which Open Science practices are practised in business studies and economics at universities in Germany. A total of 314 academics from the subjects of business studies, economics, business informatics, industrial engineering and other economic subjects at universities, state universities of applied sciences, private universities of applied sciences and research institutions within and outside the Leibniz Association were surveyed. Information was collected on awareness, attitudes, application, barriers and incentives with regard to Open Science.

The main results are as follows:

What significance do Open Access publications have in literature research?
- The majority of economic researchers (63.3 per cent) specifically search for Open Access literature, with Google Scholar being the preferred search source.
- Professors at universities of applied sciences show the greatest interest in freely accessible publications with 77.4 per cent, followed by university professors with 62.7 per cent.
- The differences between the economic disciplines are small.

How important is the availability of data and code in literature research?
- The availability of data and code alongside scientific articles is important for 39 per cent of respondents.
- A differentiated analysis of the qualification levels shows that junior professors in particular consider the availability of research data and codes to be important: 77.8 per cent of them attach great importance to this aspect. In contrast, interest among doctoral students, private lecturers and postdocs is around 40 per cent and 33.7 per cent among professors.
- In terms of subject area, 47.7 per cent of economists and business economists attach particular importance to supplementary data and code, while this aspect is only relevant for around a third of business economists and general economists.

What significance does Open Access have for your own publishing behaviour?
- Open Access plays only a subordinate role in the publication behaviour of economic researchers overall. The majority of their own publications are not Open Access.
- Of all qualification levels, academic staff at universities publish by far the highest proportion of their journal articles, namely almost 40 per cent, directly in Open Access.
- Economists have a higher proportion of Open Access publications (31.9 per cent) than business economists (16.6 per cent).

What are the motivations for publishing in Open Access?
- The decision in favour of Open Access publications is mainly based on the motivation to make research results accessible to a broad public (81.4 percent) and the conviction that publicly funded research should also be publicly accessible (69.3 percent).
- External requirements also play an important role, with 50 per cent of respondents choosing Open Access due to journal requirements and 30.7 per cent due to the requirements of third-party funders. Institutional requirements are relevant for 27.1 per cent of respondents.
- The biggest obstacles for economic researchers to publish in Open Access are the high fees for authors (68.5 per cent), the publication policy of the preferred journals (52.0 per cent) and concerns about the quality of Open Access journals (20.1 per cent).

How do you work with economic research data?
- Of all respondents, the vast majority – 88.8 per cent – work with data.
- The study shows that the use of research data at universities (91.6 per cent) is significantly higher than at universities of applied sciences (66.7 per cent).
- Research assistants (92.7 per cent) use data more frequently than professors (81.6 per cent).
- The main reasons for using freely accessible data are easier handling (69.2 per cent) and the reproducibility of research (67.3 per cent).
- The preference for open research data varies depending on the type of institution and academic status, with university members and academic staff particularly emphasising the reproducibility of their research.

What software is used to process research data?
- Among respondents who work with research data, R is the most frequently used analysis software in economic research at 55.3 per cent, followed by STATA (49.2 per cent) and Excel (48.1 per cent).
- The use of free or open software is mainly motivated by the desire for independence (43.8 per cent) and to facilitate the reproducibility of research results (35.5 per cent).
- The preference for free software varies depending on academic position and institution, with financial and institutional constraints playing a particularly important role at universities of applied sciences and among academic staff.

Why is research data published?

- The majority of economic researchers who work with research data publish their data and codes (62.5 per cent) in order to strengthen the credibility of their research and make the results accessible to a wider audience.
- The main reason for not publishing data and code is the high cost (66.1 per cent), followed by concerns about potential competitive disadvantages (40.4 per cent) and the lack of demand from journals (37.4 per cent).

What barriers and incentives are there in business studies and economics with regard to Open Science?

- Most respondents recognise the fundamental benefits and necessity of Open Science.
- The biggest incentive here is the prospect that the citation frequency of their own publications could increase as a result of Open Science.
- The main obstacles to the implementation of Open Science practices are legal concerns (e. g. copyright and data protection) and financial constraints (e. g. costs for Open Access publications).
- Lack of time to familiarise themselves with Open Science practices and lack of recognition in the scientific community are other significant barriers that prevent researchers from making full use of Open Science.

1. Introduction

Over the past two decades, economic research has shifted noticeably from theory to empirical work. In their bibliometric analysis, Brice and Montesinos-Yufa (2019) identified a striking methodological shift in business studies and economics. Economists increasingly see themselves as providers of empirical evidence, a development that has been favoured by significant advances in computing power and technological innovations, which in turn have promoted the extensive use of empirical methods.

The publication landscape in leading economic journals has also changed dramatically: The number of articles in which authors use self-collected data, data sets provided by third parties or real data to simulate theoretical models has risen sharply in recent decades (cf. Hamermesh, 2013, Paldam 2021, Angrist et al. 2017). While the proportion of publications in purely theoretical economic journals was still 51 per cent in 1963, this had fallen to 19 per cent in 2011. In contrast, the proportion of empirically oriented articles rose to 81 per cent, as Vlaeminck and Podkrajac (2017) found. The citation frequency of empirical papers has increased even more than their publication volume, although the share of empirical papers in total citations only recently reached the 50 per cent mark (Vlaeminck, Podkrajac 2017).

Not only the number of empirical studies is increasing, but the appreciation of empirical economics compared to purely theoretical and model-oriented economics has also increased noticeably in recent years. While empirical economists used to occasionally be ridiculed as „applied statisticians", since the so-called „credibility revolution" about a decade and a half ago, they have enjoyed significantly more recognition (cf. Angrist, Pischke 2010). This increased respect manifests itself both within their discipline and in their role as advisors to political decision-makers. As Patzwaldt and Riphahn et al. (2019) emphasise, a key factor in the increased reputation of this new generation of economists is the increasing transparency of the data sets used.

In addition to the researchers themselves, renowned journals and professional associations, such as the Verein für Socialpolitik (VfS)[1] or the Verband der Hochschullehrerinnen und Hochschullehrer für Betriebswirtschaft (VHB)[2], are also campaigning for more credibility and transparency in economic research in Germany. They have adopted basic ethical rules with demands such as „Research should be transparent and comprehensible" and „In empirical work, [...] the data sets and programmes used to replicate the results should be made available"[3]. The demand for transparency and traceability in the economic sciences has become much more important in recent years and has major overlaps with the Open Science movement.

Open Science aims to improve transparency and traceability in research, especially in a digitally networked age. The core of this approach is openness: research results and methods are made fully and freely accessible from the idea generation stage through to publication. This enables other researchers to scrutinise the results and reuse them in their own studies. Open Science also breaks down the traditional boundaries of the „ivory tower" and promotes dialogue with social actors from politics, business, culture and wider society. This openness goes beyond the mere dissemination of research results and can also include the active participation of these stakeholders in research processes.

The ZBW – Leibniz Information Centre for Economics, as one of the pioneers in the field of Open Science and as a link between the international Open Science movement and the economic communities in Germany, is striving to strengthen this impetus. As a promoter of Open Science, the ZBW would like to further improve its services in support of Open Science and specifically align them to the needs of business studies and economics researchers in Germany. In this context, the present study was conducted to determine what role Open Science practices currently play in the everyday work of business economists and economists.

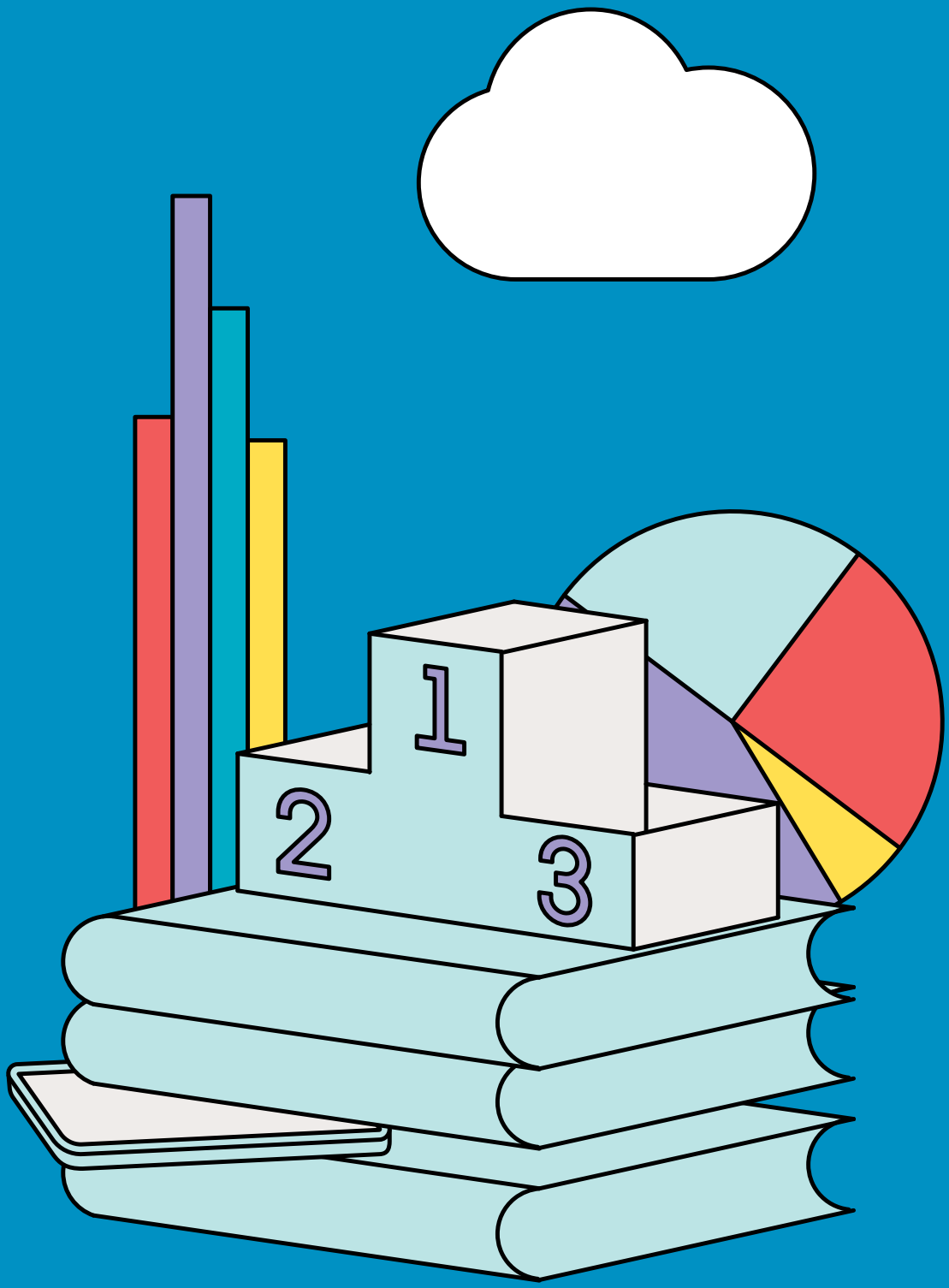
The study was conducted by the ZBW – Leibniz Information Centre for Economics and examines the following questions:

- What attitudes do economic researchers have towards Open Science?
- Which Open Science practices are used by economic researchers in Germany?
- What are the incentives and barriers to applying Open Science practices?
- What differences are there between different subgroups of economic researchers, e.g. subgroups depending on subject area, career level or institution?

1 https://www.socialpolitik.de [Last accessed: 18 April 2024]
2 https://www.vhbonline.org [Last accessed: 18.4. April 2024]; see also https://www.vhbonline.org/fileadmin/vhb/Themen/Ethik/GfP_Gesamtdokument_2018.pdf
3 https://www.socialpolitik.de/docs/ethikkodex.pdf [Last accessed: 18 April 2024]

The results report is structured as follows: After the presentation of the methodology of data collection and the description of the sample in the second chapter, the third chapter deals with the significance of open practices in our own work. Here, both the dissemination of Open Access publications as well as their accessibility and the role of Open Data in the publication process are analysed. The fourth chapter examines research data management in business studies and economics. It analyses how research data is used, the significance of open research data, and how analysis software and the publication of data and codes are handled in practice. The fifth chapter deals with the role of Open Science in the publication of research results, including analysing the publication output and the motivation of researchers to publish their work in Open Access. The sixth chapter looks at the barriers and incentives of Open Science that influence the adoption and implementation of Open Science practices in business studies and economics. Finally, the seventh chapter draws a conclusion and leads a discussion in which the main results are summarised and classified in relation to previous surveys.

Finally, we would like to express our sincere gratitude to Dr Martina Grunow, whose considerable support in creating the questionnaire contributed significantly to the quality and depth of this study. Her expertise and dedication were essential to the successful completion of our study.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2. Methodology

2.1. Study design and sample

For this empirical study on the use of Open Science among economic researchers, a nationwide survey was conducted in the form of an online questionnaire. These were structured online interviews with partially open response options. The survey was aimed at economic researchers at universities, state universities of applied sciences, private universities of applied sciences and research institutions within and outside the Leibniz Association. The sample for the data analysis of the results presented below consists of a total of 314 complete interviews. A further 70 people dropped out of the survey prematurely and were not included in the analyses of the results presented below. The complete interviews were also not compulsory, i.e. individual questions could be skipped, which means that the number of valid answers (n) for some questions is lower in some cases.

The sample was recruited on the basis of 11,526 people who were invited by email to take part in the survey with a total of 36 questions. The field period ran from 30 March 2023 to 5 May 2023 and the interview time was 5 to 10 minutes.

2.2. Description of the sample

The sample is made up as follows: In terms of academic qualification level, doctoral candidates make up the largest group with 42.3 per cent, followed by professors with a share of 31.4 per cent. Scientists after the doctoral phase make up a fifth of the respondents. The group of professors includes around 10 junior professors. Details are explained below, see Table 1.

When academic subgroups are considered in the following, doctoral students and postdocs are summarised as research assistants.

We examined and statistically analysed three further academic subgroups: Professors at universities of applied sciences, professors at universities and research assistants at universities. (*Methodological note: Research assistants at universities of applied sciences were not included as a further subgroup in this comparative analysis due to the negligible number of cases).

In terms of subject disciplines, economists and business economists are similarly represented in the sample at around one third each, which does not correspond to the 1:10 ratio of the basic population at German universities, but facilitates the comparative statistical analyses of these subgroups in our study. A much smaller proportion of respondents categorised themselves as belonging to the discipline of general economics. Approximately one tenth of respondents categorised their discipline as other. This includes a high proportion of business IT specialists and engineers. Details are explained below, see Table 2.

Of the survey participants, 68.7 per cent are employed at a university, 11.5 per cent at a university of applied sciences (UAS) and 16 per cent at a non-university research institute, with around half of this group working at institutes of the Leibniz Association. A further 1.6 per cent work at a private university. A further group of 1.3 per cent work at other institutions and 1 per cent of respondents did not specify their place of employment.

The following is an overview of the origin of the interviewees according to their qualifications:

Qualification	Number of respondents in per cent
Professor	28.5
Junior professor	2.9
Privat lecturer	1.6
Postdoc	19.2
Doctoral student	42.3
Other	3.8
n. a.	1.6

Tab. 1: Origin according to academic qualification; sample n= 314

The following is an overview of the origin of the interviewees by specialist discipline:

Specialised discipline	Number of respondents in per cent
Business studies	37.8
Economics	35.6
General economics	14.4
Other	11.9
n. a.	0.3

Tab. 2: Origin by discipline; sample n= 314

The following is an overview of the age of the respondents:

Age distribution	Number of respondents in per cent
under 25 years	1
25 - 30 years	29.2
31 - 35 years	17.9
36 - 40 years	10.3
41 - 45 years	9.6
46 - 50 years	5.4
51 - 55 years	7.4
56 and older	17
n. a.	2.2

Tab. 3: Age distribution, sample n= 314

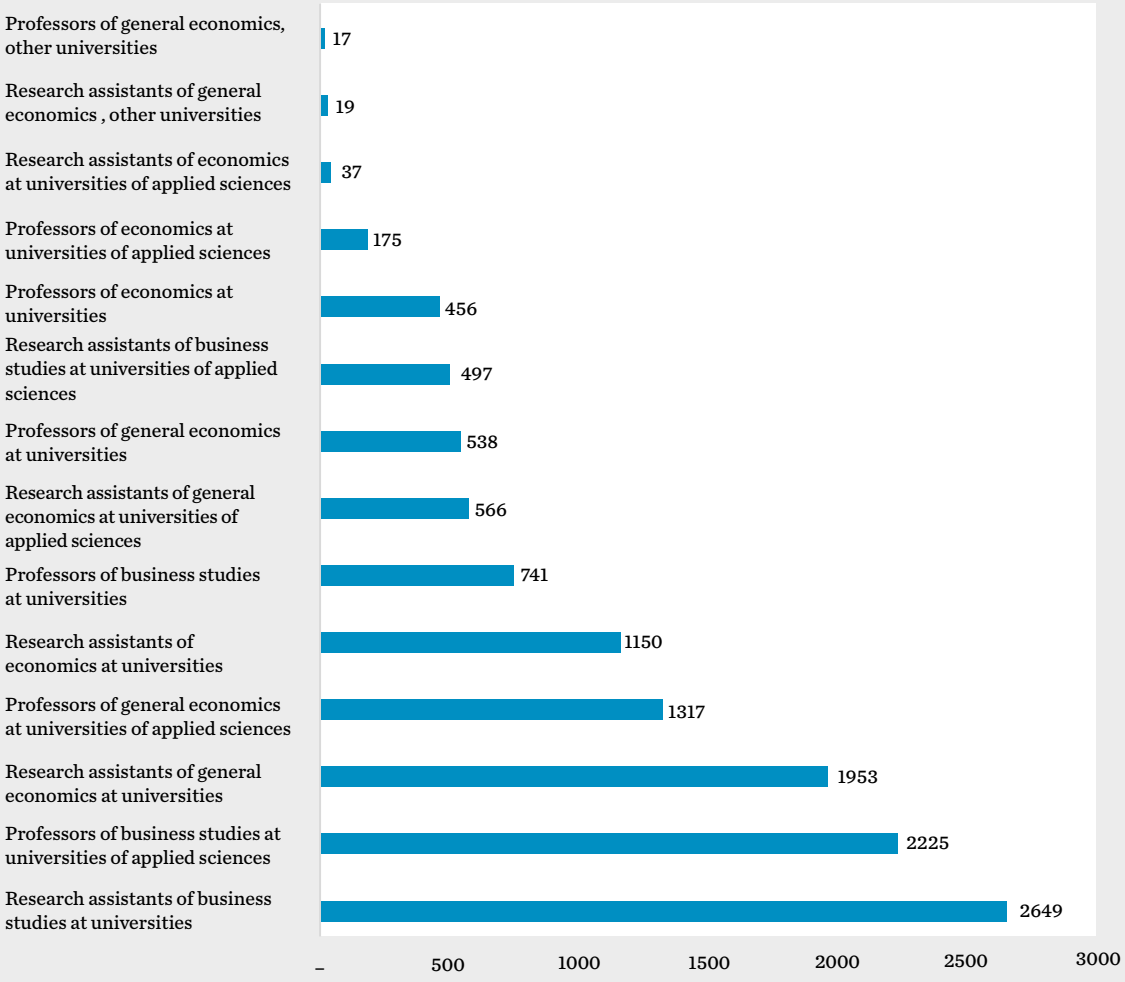
Distribution of the main status groups at university types	Number of respondents in per cent
Research assistants at universities	56.1
Professors at universities	18.2
Professors at universities of applied sciences	11.1
Research assistants at universities of applied sciences	1.1
Research assistants at non-university research institutions	10.0
Professors at non-university research institutions	3.6

Tab. 4: Origin by status group; sample n= 280

Regarding the population and the representativeness of the present sample:
According to university statistics[4], business studies accounts for the largest share with a total of 3,003 professorships (25 per cent at universities and 75 per cent at universities of applied sciences), followed by general economics with 1,872 professorships (29 per cent at universities and 71 per cent at universities of applied sciences). Economics has the smallest share of the economic community with a total of 639 professorships (71 per cent at universities and 29 per cent at universities of applied sciences).

For the distribution of the subgroups in the population, see the following overview:

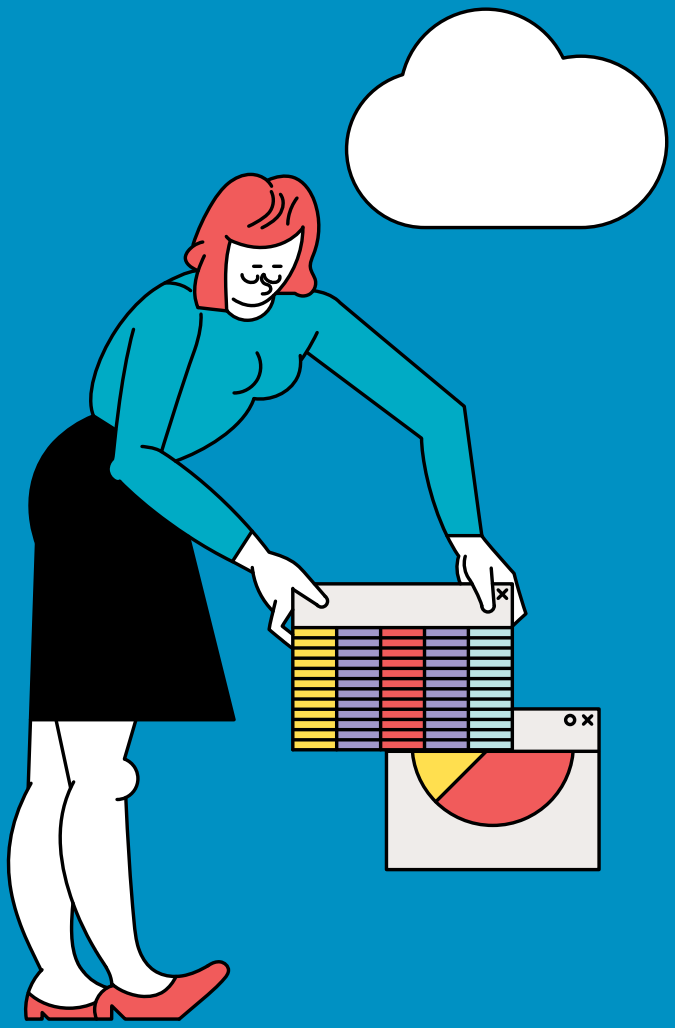
Academic Staff in economics at all higher education institutions



Source: German higher education statistics; Destatis Fachserie 11 Series 4.4; 2021 edition

If one compares the distribution of the present sample with the figures from the 2021 higher education statistics (Destatis), the present sample is not fully representative. The results are therefore only transferable to a limited extent. It is also conceivable that researchers with a positive attitude towards Open Science decided to participate in the study more often than average. However, this assumption cannot be verified.

4 https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bildung-Forschung-Kultur/Hochschulen/_inhalt.html [Last accessed: 8 April 2020]



3. Importance of open practices

Open Access publications play a central role in research today by providing immediate, free access to scientific findings. They promote the global visibility of research work, support an increased citation rate and facilitate interdisciplinary exchange (cf. Hopf et al. 2022). Open Access thus strengthens scientific communication and supports the principle of equal access to knowledge. The role of Open Access publications in economic research in Germany is presented in the following section.

3.1. Importance of Open Access publications in literature research

In the everyday practice of economic research, the majority of people specifically search for Open Access literature (see Fig. 1). 198 people, i.e. a clear majority of 63.3 per cent of respondents, actively prefer to search for freely accessible versions of publications.

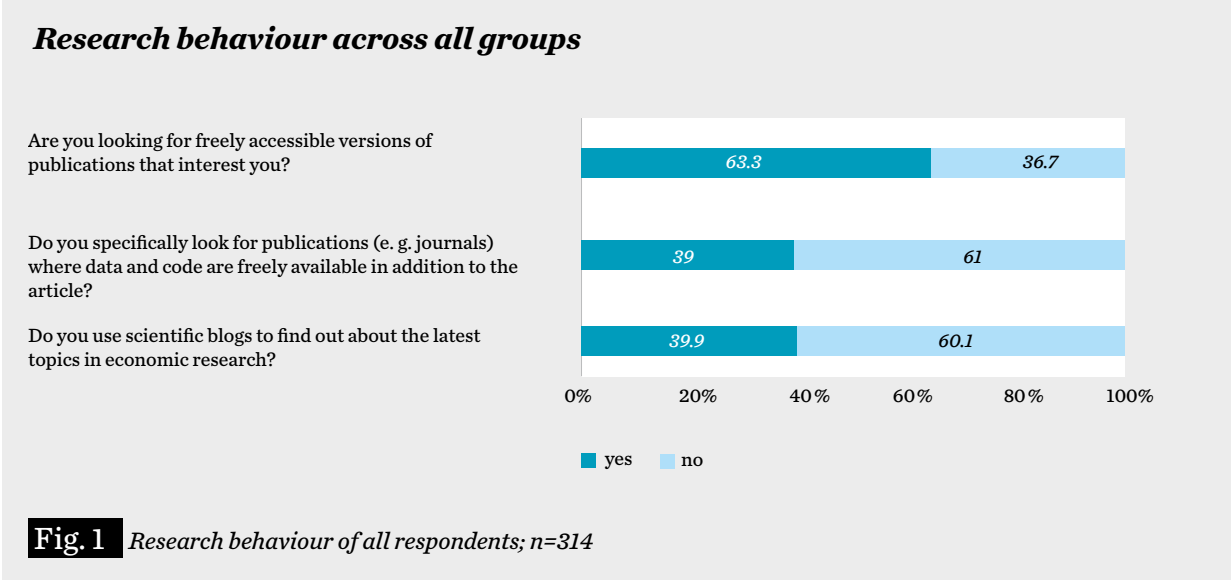


Fig. 1 *Research behaviour of all respondents; n=314*

When asked where they search, the vast majority of these people in the open response field (free text answers) named Google Scholar as the place they search (94 mentions), followed by a general search on the Internet (53 mentions) and a search on the ResearchGate network (27 mentions) (see Fig. 2).

An analysis of the different qualification levels reveals that a majority of 71.9 per cent of professors in particular specifically search for Open Access publications. A majority of doctoral students, namely 63.6 percent, as well as private lecturers (60 percent) show similar research behaviour. Exactly half of postdocs search for freely accessible publications. At 44.4 per cent, junior professors have the lowest proportion of targeted Open Access searches (see Fig. 3).

An analysis of the various economic disciplines reveals no significant differences in terms of specialisation. Among economists, 64.9 per cent stated that they specifically search for Open Access publications. Among business economists, the proportion of those who specifically search for Open Access publications was 61.9 per cent. In general economics, this proportion was 55.6 per cent.

An examination of the various subgroups within this study reveals that the proportion of professors at specialized higher education institutions and universities of applied sciences respectively who specifically search for Open Access publications is the highest at 77.4 per cent. Among university professors, 62.7 per cent also specifically search for freely accessible literature. Among research assistants at universities, the proportion is 59.2 per cent.

Where can you find these free versions?

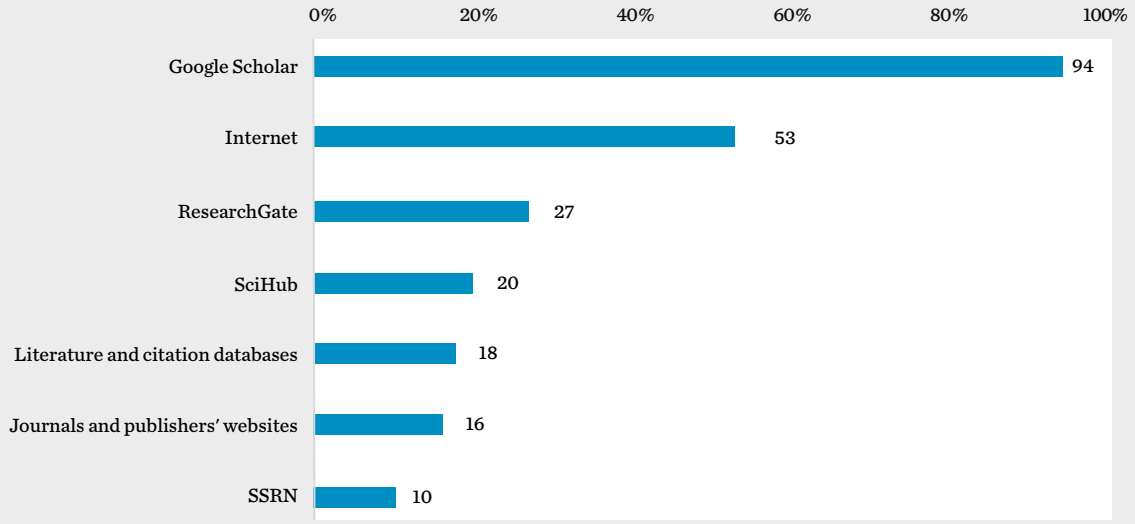


Fig. 2 *Free text answers with the most frequent mentions, multiple answers possible, n = 198*

Are you looking for freely accessible versions of publications that interest you?

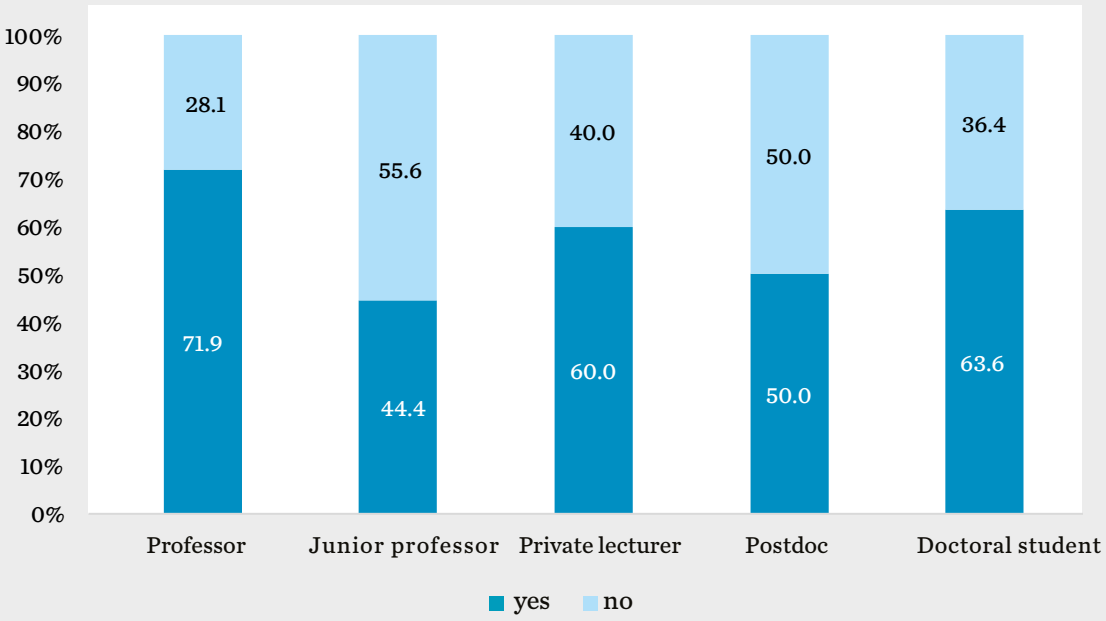


Fig. 3 *Search for Open Access publications by qualification level, n =295*

Research in academic blogs, which present current topics from economic research in a more accessible and often more discursive format, offers a supplement to traditional academic publications. These platforms enable researchers and interested parties to quickly find out about the latest findings and trends, exchange opinions and engage in discussions.

When it comes to the use of scientific blogs for information on current topics in economic research, 39.9 per cent of respondents use this resource, while 60.1 per cent state that they do not follow any scientific blogs.

A detailed analysis reveals significant differences between the academic subgroups: At 64.5 per cent, professors at universities of applied sciences consult academic blogs most frequently to find out about developments in economics. At universities, this proportion is 43.1 per cent among professors, while 30.6 per cent of academic staff at universities use this source of information.

3.2. Importance of Open Data and code in the search

The availability of data and code alongside scientific articles is playing an increasingly important role in the assessment and utilisation of publications. This reflects the practice and prioritisation of Open Science and shows how the reproducibility and verifiability of scientific findings are assessed in the business studies and economics.

39 per cent of respondents attach importance to publications providing additional data and code, while 61 per cent do not attach any importance to this aspect. However, a differentiated analysis of the various qualification levels reveals that junior professors in particular attach great importance to the availability of research data and codes: 77.8 per cent of them consider this to be essential. The level of appreciation at other qualification levels is generally around 40 per cent: 43.9 per cent of doctoral students, 40 per cent of private lecturers and 35 per cent of postdocs. At 33.7 per cent, professors show the least interest in the provision of research data and codes, the lowest value in all subgroups.

An analysis of various economic disciplines shows that almost half (47.7 per cent) of economists attach particular importance to the availability of data and code to supplement the article. In the field of business studies, around a third (34.7 per cent) of researchers pay attention to these additional materials, while in general economics the proportion is 35.6 per cent. This shows that the majority of respondents do not attach any particular importance to this aspect.

3.3. Importance of Open Access in one‘s own publishing behaviour

The publication behaviour of various subgroups was also analysed in this study. Participants were asked (as a free text entry) about the number of articles in peer-reviewed journals and edited volumes as well as working papers. With regard to the results presented below, it should be noted that many of the participants did not provide specific figures on their publications and therefore the number of cases (n) was correspondingly lower.

For peer-reviewed journal articles and edited volumes, we then asked how many of these are directly available in Open Access. In the case of working papers, only the total number was asked, as these are Open Access per se. Based on the information on journal articles and edited volumes, the percentage of publications available in Open Access was then calculated in relation to the total number of publications. Working papers were omitted from this analysis, as they represent a special case that is often not (yet) taken into account in academic reputation considerations.

The absolute value for the number of journal articles is given as an average of 17, the number of articles in edited volumes as 11. The Open Access share of articles in journals averages 35 per cent, that of articles in edited volumes 15 per cent.

With regard to the three academic subgroups analysed, it can be seen that professors at universities of applied sciences publish an average of 23.1 percent of their articles in peer-reviewed journals directly in Open Access. 8.2 per cent is the Open Access share for publications in edited volumes in this subgroup. Professors at universities make 27 per cent of their journal articles directly available in Open Access, while the Open Access share of their articles in edited volumes is 16 per cent. Academic staff at universities have the highest and lowest Open Access share, at 39 per cent and 7 per cent respectively (see Fig. 4).

This study also analysed the Open Access share of publications in the fields of economics and business studies (see Fig. 5). This results in a total of 88 surveys.

The proportion of Open Access articles in peer-reviewed journals shows significant differences between economics and business studies: at 37.2 per cent, the proportion of Open Access articles in economics is more than twice as high as in business research at 19.8 per cent.

The proportion of Open Access articles in anthologies or books is lower in both disciplines. Economics has a share of 19.4 per cent here, while business studies is represented with 10.1 per cent. These figures could indicate a preference for traditional publication channels in these media or the different availability of Open Access options. To summarise, the graph shows that economics has a higher proportion of Open Access publications than business studies, regardless of the publication medium. This difference is particularly pronounced in the case of peer-reviewed journals.

Proportion of Open Access publications by academic qualification and institution

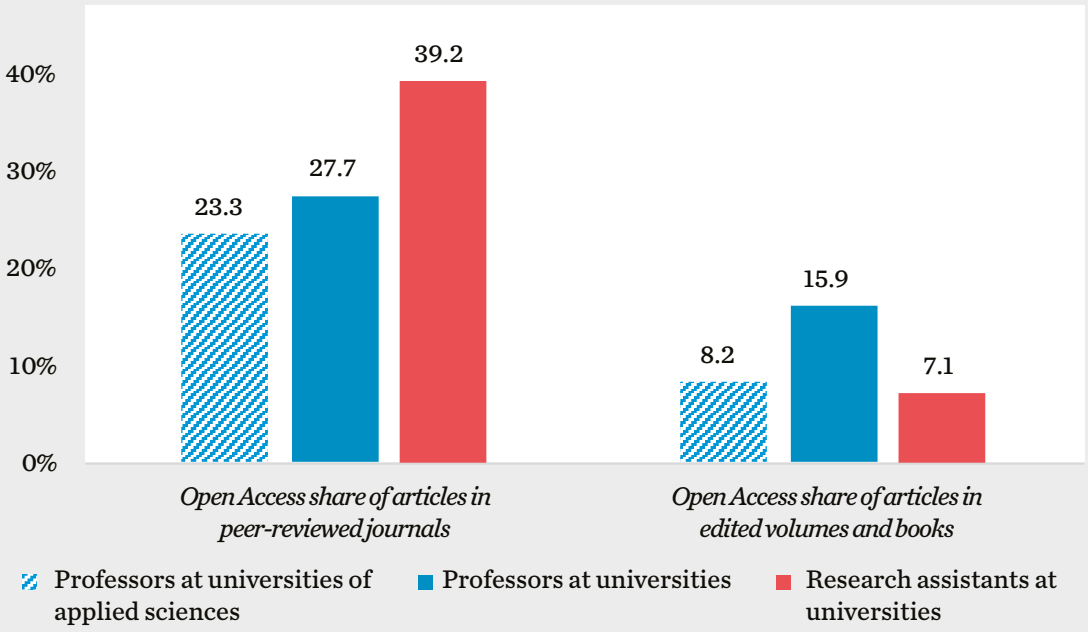


Fig. 4 *Proportion of Open Access publications by academic qualification and institution, sample n= 87*

Proportion of Open Access publications by subject area

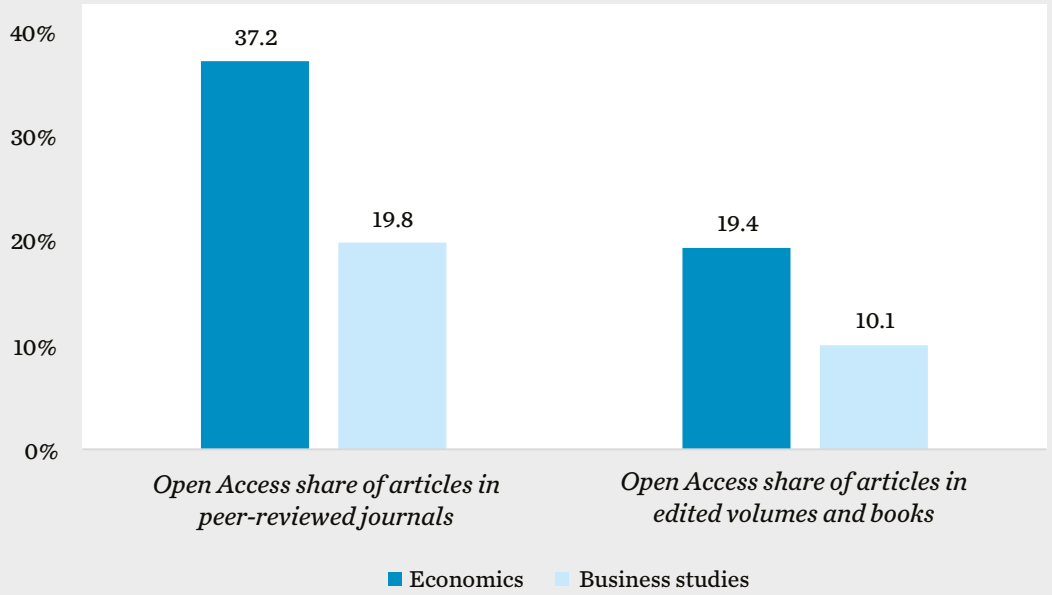
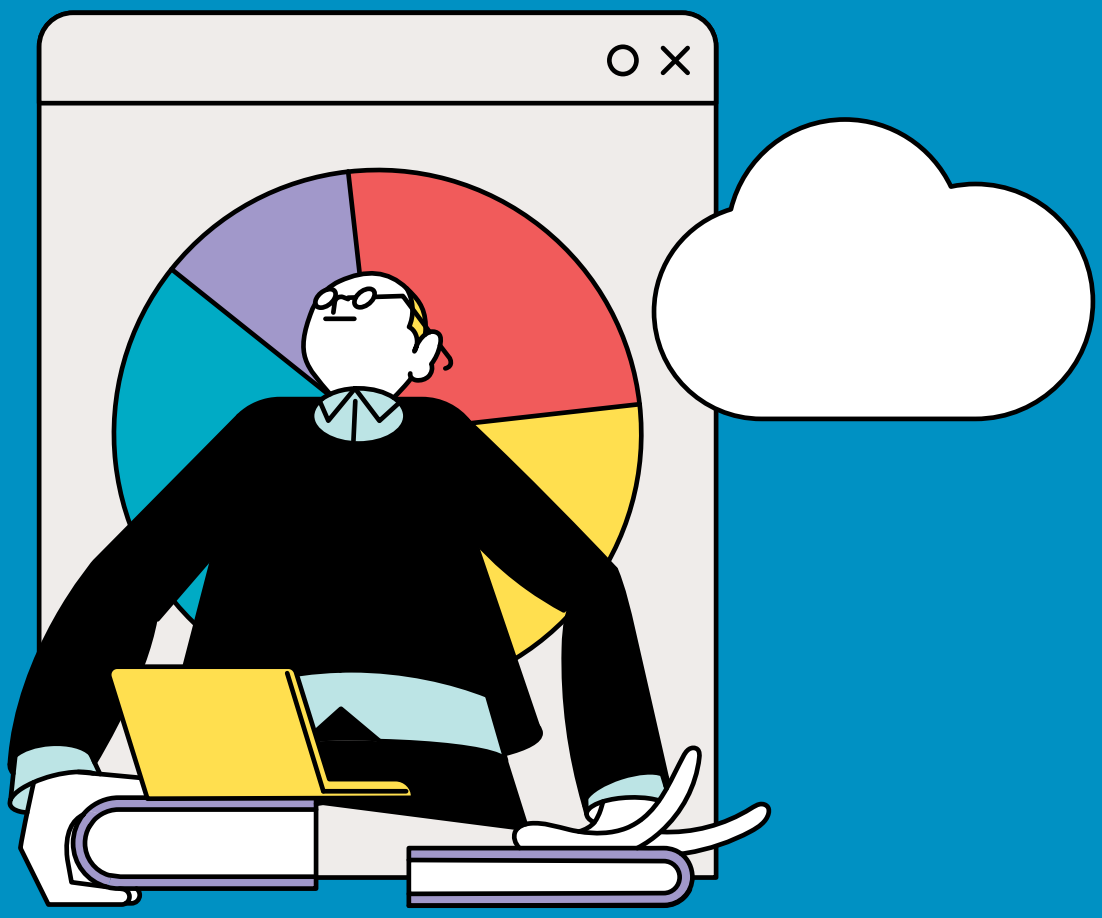


Fig. 5 *Proportion of Open Access publications by subject area, sample n= 88*



4. Research Data Management in business studies and economics

Research data management plays a crucial role in business studies and economics in order to ensure the integrity, accessibility and reusability of data. The following section describes how researchers in the business studies and economics handle their data, which methods and technologies are used and which challenges arise in practice.

4.1. Use of economic research data

Of all respondents, the vast majority – 88.8 per cent – work with data. An analysis of the different economic disciplines shows that data is used primarily in economics (92.8 per cent) and in general economics (91.1 per cent). In business research, the figure is 86.4 per cent of all respondents.

There are significant differences in the use of data in research between universities and universities of applied sciences. At universities, 91.6 per cent of respondents work with data, while only 8.4 per cent stated that they do not use data in their research. In contrast, the proportion of researchers using data at universities of applied sciences is 66.7 per cent, meaning that a third of respondents (33.3 per cent) do not work with data.

This study reveals an interesting difference between professors and research assistants with regard to the use of data in research. While 81.6 per cent of professors state that they work with data in their research, this proportion is even higher among research assistants at 92.7 per cent.

A detailed examination of the three academic subgroups analysed shows that the use of data in research varies between professors at universities of applied sciences, professors at universities and academic staff at universities (see Fig. 6). Among professors at universities of applied sciences, 61.3 per cent work with data, while 38.7 per cent state that they do not. In contrast, professors at universities report very high data usage at 96.1 per cent, with only 3.9 per cent not working with data. Research assistants at universities also show a high level of usage at 91.1 per cent, while 8.9 per cent do not use data in their research.

The results presented in the following subsections relate to the subgroup of researchers who work with research data (278 of the 314 participants).

4.2. The importance of Open Research Data in business studies and economics

According to this survey, 61.7 per cent of respondents who work with data do not attach any importance to it being freely accessible when selecting data, while free accessibility is important for just over a third (38.3 per cent).

If we ask those people who work with data and for whom free access to data is also important (106 people) about their reasons (multiple answers were possible), the following picture emerges for this subgroup of researchers (see Fig. 7): The main advantages cited for using freely accessible data (among these 106 respondents) are easier handling (69.2 per cent) and the reproducibility of research by others (67.3 per cent) – both of which can be described as intrinsic motivations. Extrinsic motivations are also relevant: 42.3 per cent prefer Open Data because they do not have funding for fee-based data, and a quarter of respondents (25 per cent) state that their institution does not have access to fee-based data.

The study of various disciplines within economics shows that free access to research data is particularly popular in the field of general economics: 53.7 per cent of researchers in this field value the availability of Open Data. There are no significant differences between business studies and economics. In economics, 39.2 per cent of researchers pay attention to open accessibility when selecting data for secondary use, compared to 33.3 per cent in

Working with data by academic degree and institution

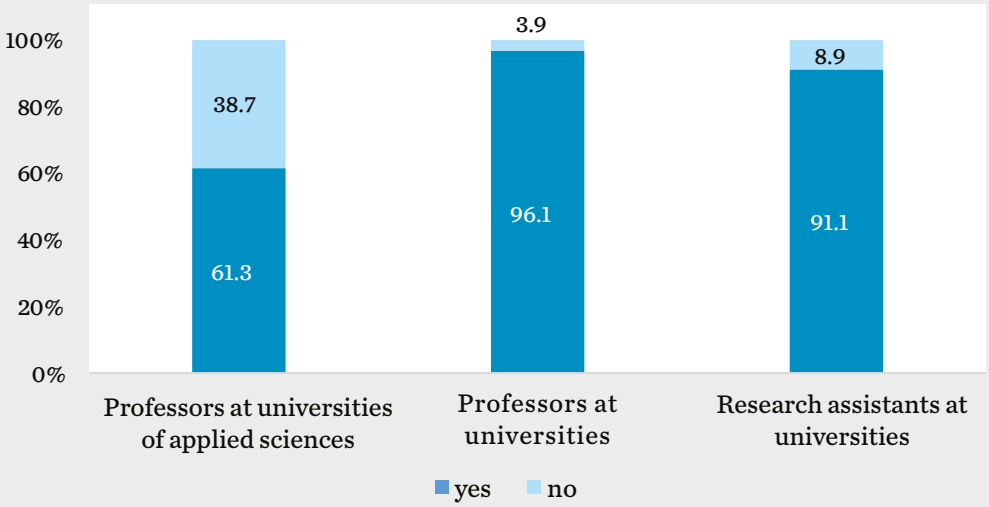


Fig. 6 *Working with data by academic degree and institution, sample n = 211*

business studies. This means that Open Access to research data plays a rather subordinate role for the majority of economics researchers.

The survey data shows that the consideration given to the free accessibility of research data in the selection process varies greatly depending on the type of institution. At universities, 37.80 per cent of respondents make sure that data is freely accessible, while 62.2 per cent do not. At universities of applied sciences and specialized higher education institutions, the proportion of those who value Open Access is 58.3 per cent, compared to 41.7 per cent who do not. At Leibniz Association research institutes, 29.2 per cent of respondents attach importance to Open Access to data, compared to 70.8 per cent who do not. Research institutes outside the Leibniz Association show similar patterns, with 38.5 per cent favouring Open Data and 61.5 per cent not doing so.

Reasons for using open research data

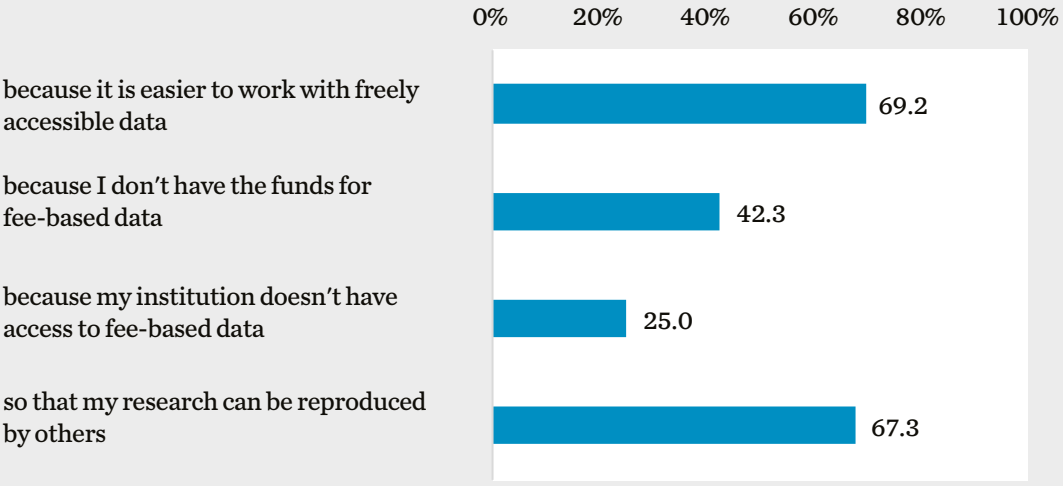


Fig. 7 *Reasons for using open research data; n=106; multiple answers possible*

The prioritisation of freely accessible research data varies depending on the academic position in the sample (see Fig. 8). 42.3 per cent of professors pay attention to open accessibility. Among private lecturers, the proportion of those who pay attention to Open Data is 40 per cent. At 39.7 per cent, doctoral students are in the middle of those who pay attention to Open Data access. At 33.3 per cent, junior professors are less inclined to consider Open Data access. At 28.6 per cent, postdocs are the least inclined to use freely available data.

When selecting your research data, do you make sure that it is freely accessible?

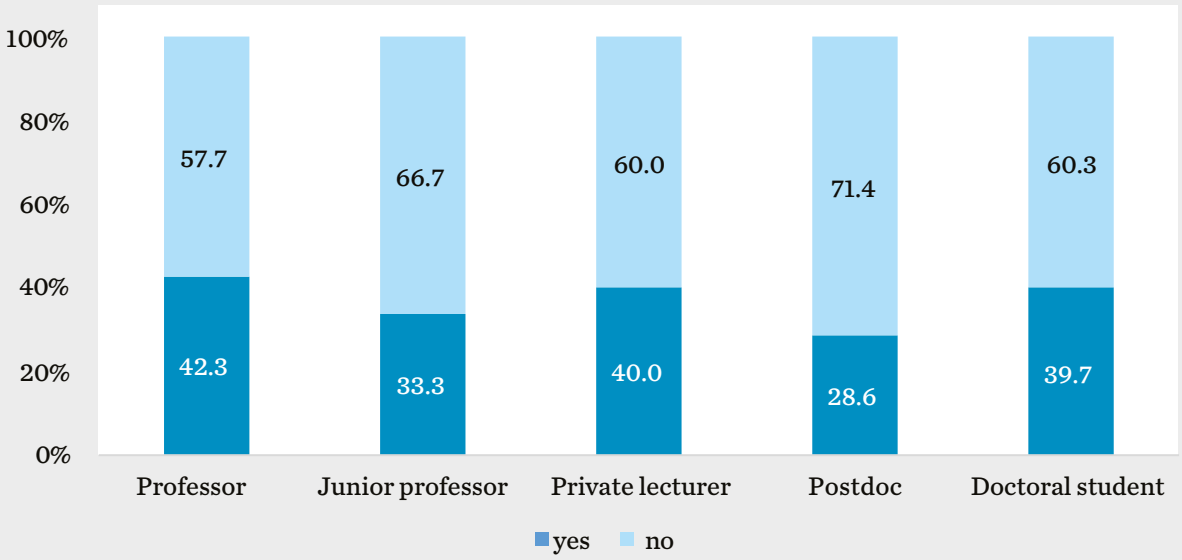


Fig. 8 *Prioritisation of freely accessible research data according to academic status (in percent); n=276*

These figures indicate that Open Data access is not yet a consistent priority in academic research, with the highest consideration for professors and the lowest for postdocs.

Analysing the respondents according to age shows differences in the preference for open research data across different age groups. In the 25 to 30 age group, 39.5 per cent value Open Data, while 60.5 per cent do not. Appreciation falls to 34.5 per cent among 31 to 35-year-olds and drops to 30 per cent in the 36 to 40 age category. An increase can be observed between the ages of 41 and 45 at 37.9 per cent. At 18.8 per cent, the 46 to 50 age group shows the least interest in Open Data. Among 51 to 55-year-olds, 42.1 per cent attach importance to Open Data. Among the over 56s, the figure is 53.8 per cent, which indicates a higher appreciation in this age group. The data indicates that the older age groups and the under-25s in particular favour Open Access to research data, while this is less pronounced in the middle age categories.

Within the disciplines of economics, business studies and general economics, a total of 94 people both work with data and pay attention to its Open Accessibility. The analysis of the reasons revealed that the ease of use of Open Data is a primary reason for their use (see Fig. 9). This applies in particular to business research with 75 per cent and economics with 72.5 per cent, while in general economics 59.1 per cent emphasise this aspect. Financial restrictions are also a determining factor: 40 per cent of respondents from economics and 40.6 per cent from business studies stated that they had no funds to access fee-based data. In general economics, this proportion is as high as 54.5 per cent.

Restricted access to fee-based data from their own institution was cited by 34.4 per cent of business economists, 15 per cent of economists and 27.3 per cent of representatives of general economics as a reason for using Open Data. Ensuring the reproducibility of their research by third parties was emphasised by 72.7 percent in the field of general economics, 68.8 percent in business research and 60 percent in economics (see Fig. 9). These findings emphasise the importance of financial and institutional conditions as well as the significance of transparent and open scientific practice for the preference for Open Data.

An analysis of institutional affiliation reveals the following picture when it comes to the reasons for using Open Data (see Fig. 10): 68.5 per cent of university members report easier handling, 38.4 per cent report a lack of funds for fee-based data and 16.4 per cent report a lack of access to this data at their institution. 75.3 per cent use Open Data to ensure the reproducibility of their research.

At specialized higher education institutions and universities of applied sciences (UAS), ease of use is a decisive factor for 69.2 per cent, while 61.5 per cent have no funding for fee-based data and 46.2 per cent state that their institution does not have access to it. The reproducibility of research is a less frequently cited reason here at 38.5 per cent.

Reasons for using Open Data in economic disciplines

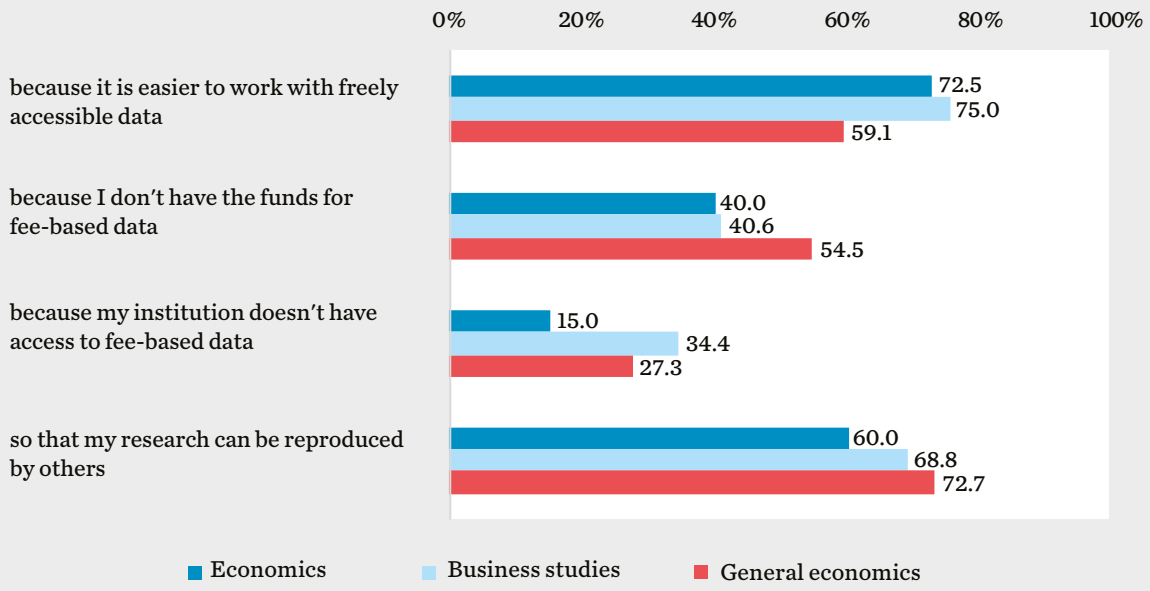


Fig. 9 *Reasons for using Open Data in economic disciplines (in per cent), n= 94, multiple answers possible*

For members of the Leibniz Association's research institutes, easier handling (57.1 per cent), lack of funding (42.9 per cent) and lack of access through their institution (28.6 per cent) are relevant, while 42.9 per cent cite the reproducibility of their research as a reason for using Open Data.

80 per cent of respondents from research institutes outside the Leibniz Association stated that handling Open Data is easier. Here, 40 per cent have no funding for fee-based data, and 60 per cent report a lack of access through their institution. For 60 per cent, the reproducibility of their research is a reason for using Open Data.

When analysing the reasons for the use of Open Data, some special features stand out:

- At universities, the desire for research to be reproducible is the strongest reason for using Open Data at 75.3 per cent, a significantly higher value compared to other types of institution.
- Among specialized higher education institutions and universities of applied sciences (UAS), the proportion of those who use Open Data due to a lack of financial resources is particularly high at 61.5 per cent. Equally noteworthy is the high percentage (46.2 per cent) that do not have access to fee-based data through their institution.
- Research institutes in the Leibniz Association are least likely than other institutions to cite ease of use as a reason for their preference for Open Data (57.1 per cent). Research institutes outside the Leibniz Association achieve the highest value here at 80 per cent. In addition, the proportion of respondents whose institutions do not have access to fee-based data is comparatively high at 60 per cent.
- These data suggest that the preferences and constraints leading to the use of Open Data vary by institution type, with particular challenges in the availability of funding and access at UASs and non-university research organisations.

The comparative analysis of the three academic subgroups analysed (UAS professors, university professors and research assistants at universities) shows interesting differences in the motivations for using Open Data. This is based on the responses of 81 people from these three subgroups who both work with data and pay attention to its free accessibility (see Fig. 11):

- 60 per cent of **university of applied sciences professors** state that the easier handling of freely accessible data is a reason for using it. This is the strongest motive in this group. 50 per cent cite financial restrictions, while 30 per cent cite a lack of access to fee-based data through their institution as a reason. Likewise, 50 per cent emphasise the importance of the reproducibility of their research.
- 63.2 per cent of **university professors** emphasise the easier handling of Open Data, while financial reasons and institutional access restrictions play a subordinate role in this group at 26.3 per cent and 15.8 per cent respectively. The reproducibility of their research is a concern for 84.2 per cent of university professors and represents the greatest motivating factor within the group and in the subgroup comparison.
- **Research assistants at universities** (this group includes doctoral students and postdocs) have the high-

Reasons for the use of Open Data in the different types of organisation

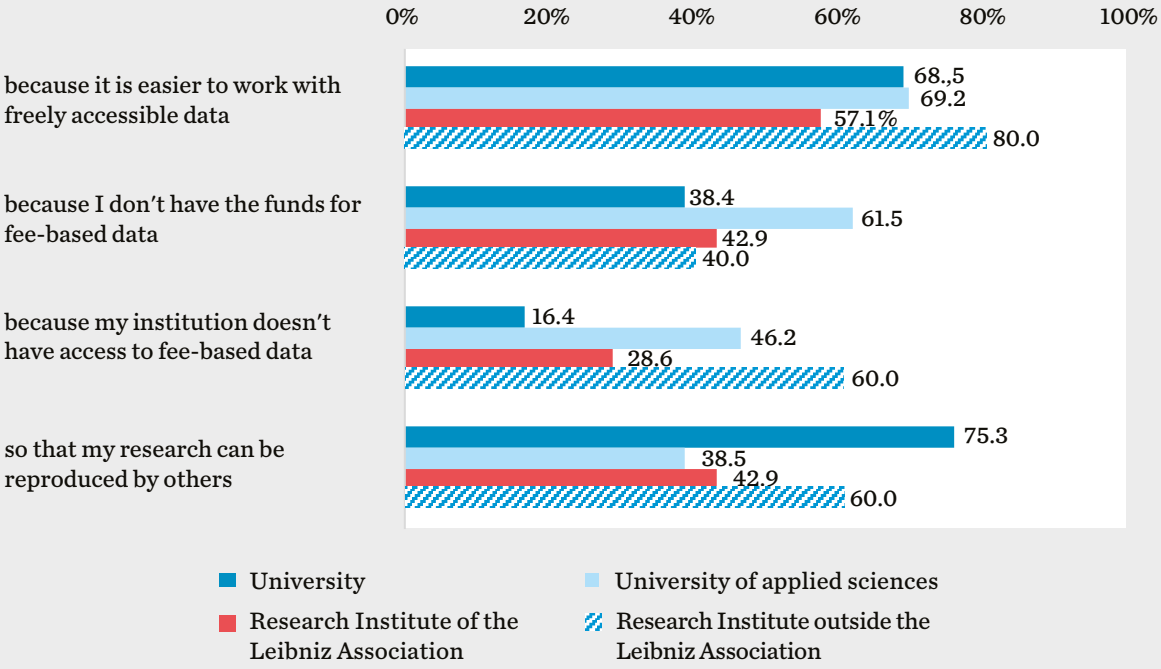


Fig. 10 *Reasons for the use of Open Data in the different types of organisation, n= 103, multiple answers possible*

est preference for easier access to Open Data at 71.2 per cent and also place great value on the reproducibility of their research at 71.2 per cent. At 44.2 per cent, they are also much more likely to have no funding for fee-based data, while 17.3 per cent state that their institution does not provide access to it.

Overall, the data suggests that academic status influences which aspects of Open Data use are considered most important. Young researchers and those in non-permanent positions seem to use Open Data more out of necessity and conviction, while established academics may prioritise differently due to established practices or better resources.

4.3. Use of analysis software for research data

Research software, especially free and open software, plays a central role in modern science. It promotes transparency, collaboration and the reproducibility of research results. The use of such tools fundamentally transforms research practices. The results of the study on the use of analytical software in economic research are presented below.

The questions on the use of analysis software were again only presented to those participants who actually work with data. This applies to only 278 people out of a total of 314 participants. The participants were able to select several alternative answers (i.e. several software alternatives). The sum of the percentages in the text or in the figure therefore does not add up to 100 per cent.

The survey results on software use in data analysis show that R is the most frequently used software at 55.3 per cent. It should be noted that R is also the only free software among those listed. This is followed by STATA, which is used by 49.2 per cent of respondents. Excel, a widely used tool for a variety of tasks, is used by 48.1 per cent for data analyses. SPSS, a specialised statistics programme, is used by 32.4 per cent of participants. Matlab, which is used in particular in technical and engineering fields, is used by 9.5 per cent of respondents (see Fig. 12).

This data may indicate that the preference for certain software depends on accessibility, familiarity and perhaps also industry-specific standards. R and STATA are popular in the scientific community, which may explain their leading position. Excel shows its strength as a general purpose tool that is widely used in practice despite its lack of specialisation in complex statistical procedures. The lower use of Matlab could indicate that it is less favoured for

Reasons for the use of Open Data in the different status groups in the institutions

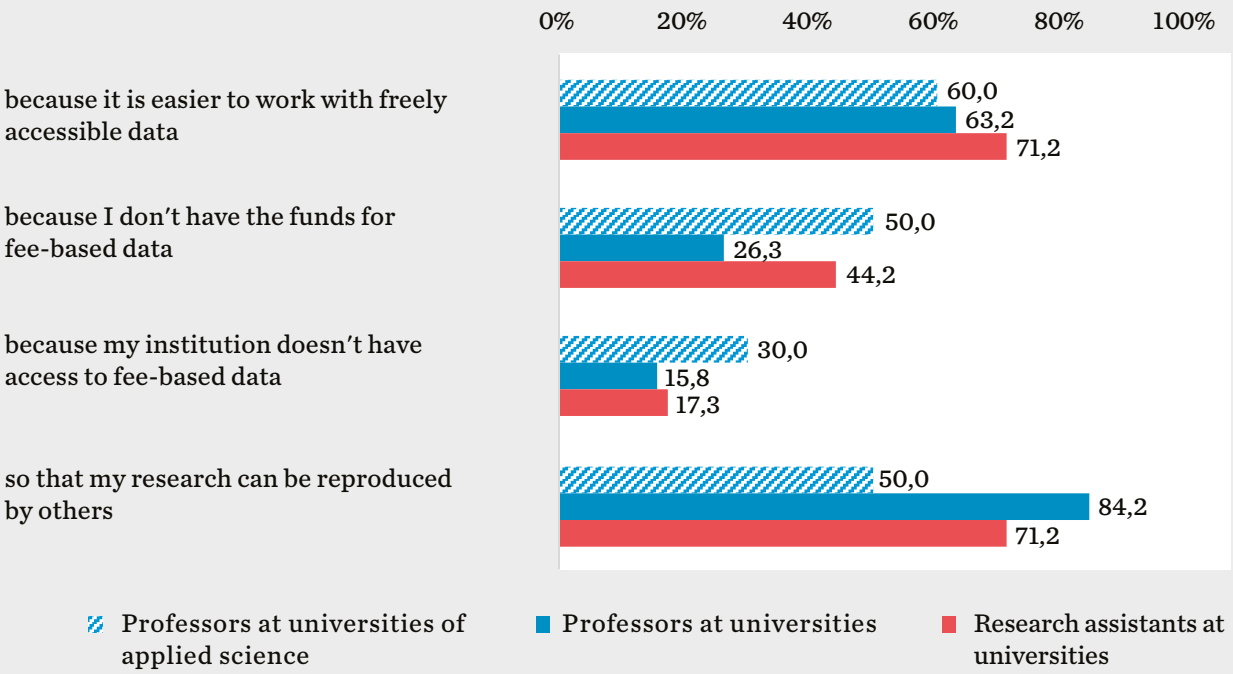


Fig. 11 *Reasons for the use of Open Data in the different status groups in the institutions, n = 81, multiple answers possible*

general data analysis or that there are more specific applications that are not required by all respondents.

Under other software used, Python was also mentioned 43 times and MaxQDA ten times as a free text response, which corresponds to 12 per cent and 2.8 per cent of respondents respectively.

The survey also sheds light on the reasons why researchers use free or open source software. Of those surveyed, 31.5 per cent stated that they do not use free or open source software (see Fig. 13). A minority of 12.7 per cent use free software because they lack the funds for paid software, and 7.6 per cent report that their institution does not have access to paid software. A high proportion of respondents (43.8 per cent) prefer free software in order to remain independent. Facilitating the reproducibility of their research results is another important motive for 35.5 per cent. Finally, 31.7 per cent follow the standard practice in their community.

The multiple responses to the various reasons suggest that the use of free software is influenced by a combination of personal preferences, financial considerations and community standards. In particular, the independence and reproducibility of research results should be emphasised, as they are essential aspects of scientific practice.

When analysing the three academic subgroups (see Fig. 14), there are clear differences in the reasons for using free or open source software between professors at universities of applied sciences, professors at universities and research assistants at universities (a total of 196 people who work with data).

Among **professors at universities of applied sciences**, only 11.1 per cent do not use free or open source software. The main reasons for using it are financial restrictions (44.4 per cent), lack of access to paid software through their institution (27.8 per cent) and the pursuit of independence (61.1 per cent). A third (33.3 per cent) follow the standard of their community.

At **universities**, 31.7 per cent of **professors** do not use free software. The reasons for using it are distributed differently here: 4.9 per cent have no funds for paid software, no one reports a lack of access to paid software through the institution, 39 per cent value the independence that using it brings, and 43.9 per cent emphasise the reproducibility of their research results. At 22 per cent, the standard of the community plays a lesser role.

Which software do you use for data analysis?

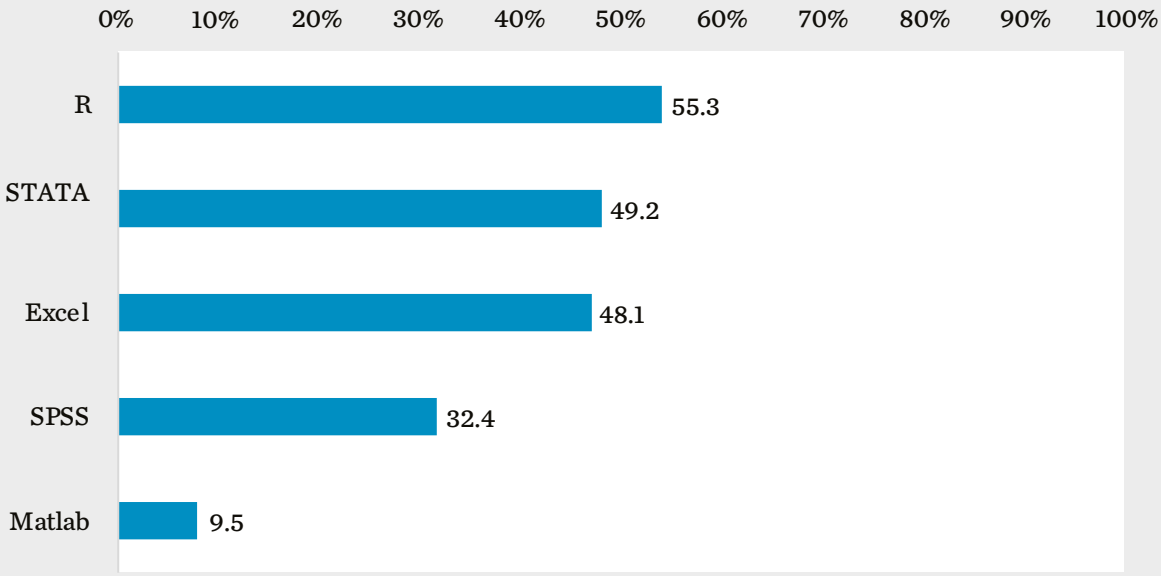


Fig. 12 *Use of software for analysing research data; n= 278, multiple answers possible*

Among **academic staff at universities**, 27.7 per cent do not use free software. 15.3 per cent cite financial restrictions and 8.8 per cent a lack of access to paid software through their institution. Almost half (48.2 per cent) value the independence that free software offers. The reproducibility of their research results and adaptation to the community standard are also important factors, at 41.6 per cent and 46.7 per cent respectively.

The results indicate that the use of free software in the academic world is influenced by practical considerations such as independence and reproducibility as well as by financial and institutional conditions, with academic staff at universities showing a particularly high appreciation for the reproducibility and standards of their community.

Why do you use freeware or free software?

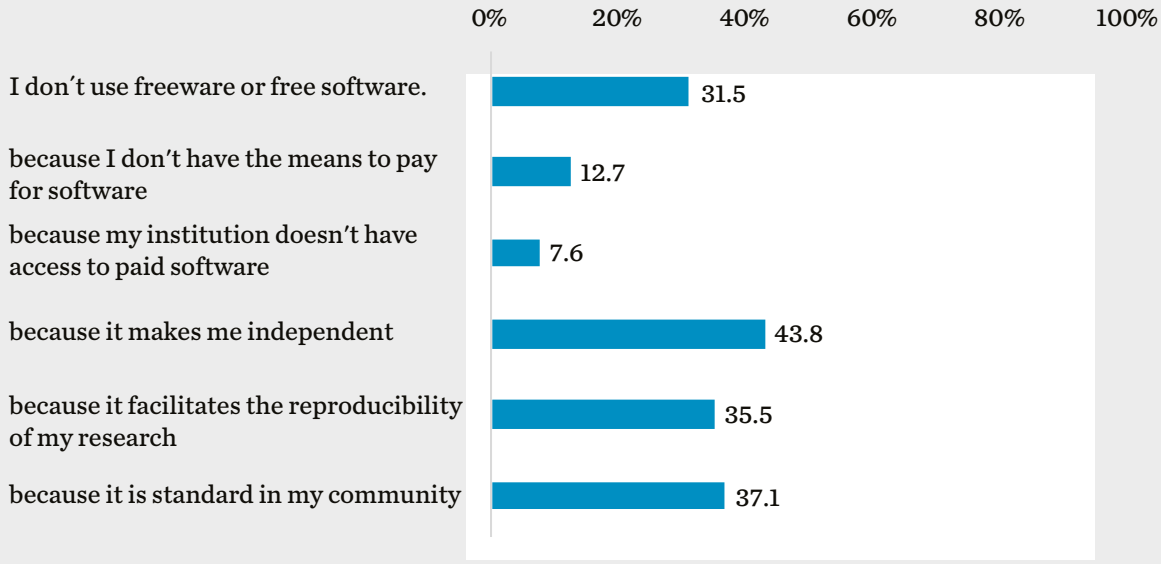


Fig. 13 *Reasons for using free software in economic research, n=278, multiple answers possible*

Reasons for using free software for data analysis by academic qualification and institution

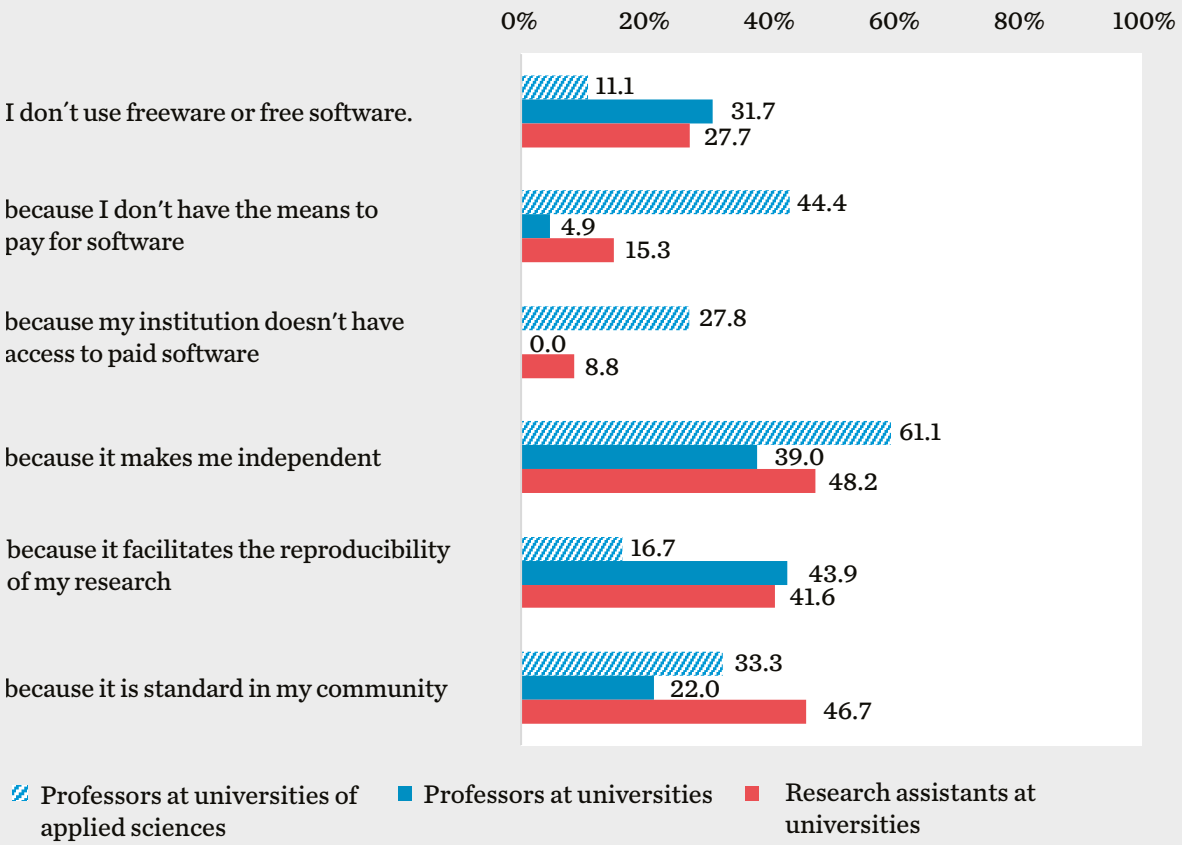


Fig. 14 *Reasons for using free software for data analysis by academic qualification and institution, n=196, multiple answers possible*

The study suggests various conclusions about the use of free or open source software in academic research:

- **Independence is a key motive**: The data indicates that independence from commercial software providers plays an important role for many researchers. This is particularly emphasised among professors at universities of applied sciences, where the desire for independence is most pronounced at 61.1 percent. This is also a significant factor for academic staff at universities, at 48.2 per cent.
- **Promote reproducibility**: The reproducibility of research results is a particularly important aspect for professors and research assistants at universities. Almost half of professors at universities (43.9 per cent) and a similarly high number of research assistants (41.6 per cent) use free software to facilitate the reproducibility of their work.
- **Community standards shape the choice of software**: For a considerable number of respondents (33.3 per cent of professors at UAS and 46.7 per cent of academic staff at universities), it is important to adhere to the standards commonly used in their community. This could indicate the advantages of sharing tools and easier collaboration.
- **Financial and institutional restrictions**: Although not the main reasons, financial constraints and lack of institutional access to paid software play a role, particularly at universities of applied sciences.

In summary, it can be seen that the decision in favour of freeware or free software in the academic world is influenced by a mixture of personal beliefs (such as independence and reproducibility), the prevailing norms of the scientific community and practical considerations (such as cost and access). In particular, the emphasis on reproducibility and community standards among academic staff may indicate that younger or less established researchers are adopting and driving new academic norms and practices.

4.4. Publication of research data and codes

Of the respondents who work with data, the majority (62.5 per cent) publish their data and codes (where legally possible). 37.5 per cent of these respondents do not do so. The survey results show that 76.2 per cent of respondents

are willing to publish their data and codes in order to strengthen the credibility of their research - this is the largest proportion of respondents (see Fig. 15). A further 61.3 per cent would like to make their research results accessible to a wider audience, which in both cases indicates intrinsic motivation. In addition, 59.1 per cent stated that the guidelines of their preferred journals require them to publish, and 33.5 per cent reported that the requirements of their third-party funders prompted them to publish.

These findings indicate that the decision to disclose data and codes is influenced both by external requirements and by the drive to promote transparency and trustworthiness in scientific work (see Fig. 15).

In the survey, researchers working with data (n = 278) were asked about their reasons for not publishing their data and codes (see Fig. 16). The results show that the main reason for two thirds of respondents (66.1 per cent) is the effort involved in publication. A high number of participants, 40.4 per cent, expressed concerns about potential competitive disadvantages, while 37.4 per cent stated that publication of data and code is not required by the journal of their choice. A smaller group of 26.5 per cent see no added value in publishing for their scientific career and 20.9 per cent see no additional benefit. These results could indicate that, in addition to the fulfilment of external requirements, personal assessments of the costs and benefits play a significant role in the decision not to disclose research data.

A comparative analysis of the three academic subgroups analysed (professors at universities of applied sciences, university professors and academic staff at universities; n = 206) with regard to their motives for publishing data and codes (insofar as this is legally possible) reveals the following picture (see Fig. 17):

Among **professors at universities of applied sciences**, 27.8 per cent state that they would publish data and codes if publication was required by their chosen journal, while 33.3 per cent would do so if required by their third-party funding provider. A clear majority of 72.2 per cent would like to make their research results more widely accessible, and an equally high proportion see publication as increasing the credibility of their research.

The trend is similar for **university professors**, although a higher proportion of 56.5 per cent state that they publish due to journal requirements. The requirements of third-party funding bodies are cited as a reason by 34.8 per cent. The availability of research to a wider audience is a concern for 60.9 per cent, while a remarkable majority of 84.8 per cent state that this increases the credibility of their research.

Research assistants at universities show the highest willingness to publish data and codes based on journal specifications (60.6 per cent). Third-party funding bodies have less influence here (28.9 per cent). The desire to make research results accessible to a wider audience is relevant for 66.2 per cent, while 76.1 per cent would agree to publication in order to increase the credibility of their work.

Overall, it is clear that the reasons for publishing scientific data and codes are complex and depend on the role and institutional affiliation of the researchers. While external requirements such as journal guidelines and third-party funding requirements play a role, the need to make research results accessible and increase credibility is a strong motivator across all academic positions.

The comparative analysis of the three academic subgroups on the reasons for not publishing their data and codes shows the following results (see Fig. 18):

Among **professors at universities of applied sciences**, 43.8 per cent stated that a lack of pressure from their chosen journal was a reason for not publishing, while the largest proportion (62.5 per cent) felt that the effort involved was too great. None of the respondents see a competitive disadvantage as a reason, 12.5 per cent do not recognise any additional benefit and 25 per cent do not believe that publication would add any value to their academic career.

For professors at universities, the predominant reason against publication is the excessive effort involved (71.1 per cent). In addition, 42.1 per cent see a possible competitive disadvantage, and 26.3 per cent do not believe that it would add value to their academic career. 28.9 per cent do not feel obliged to publish due to journal requirements and 18.4 per cent cannot see any additional benefit.

The majority of **academic staff at universities**, 61.0 per cent, also consider the costs to be too high. Almost half, namely 47.5 per cent, fear a competitive disadvantage, and 30.5 per cent see no added value in terms of career advancement. A third, 37.3 per cent, see the non-requirement by journals as a reason, and 21.2 per cent see no additional benefit.

These data reflect a landscape in which the decision not to publish scientific data and codes is influenced not only by journal guidelines, but also by individual considerations such as personal cost, feared competitive disadvantages and perceived lack of benefit for one's own scientific work.

Why would you publish your data and codes – as far as legally possible?

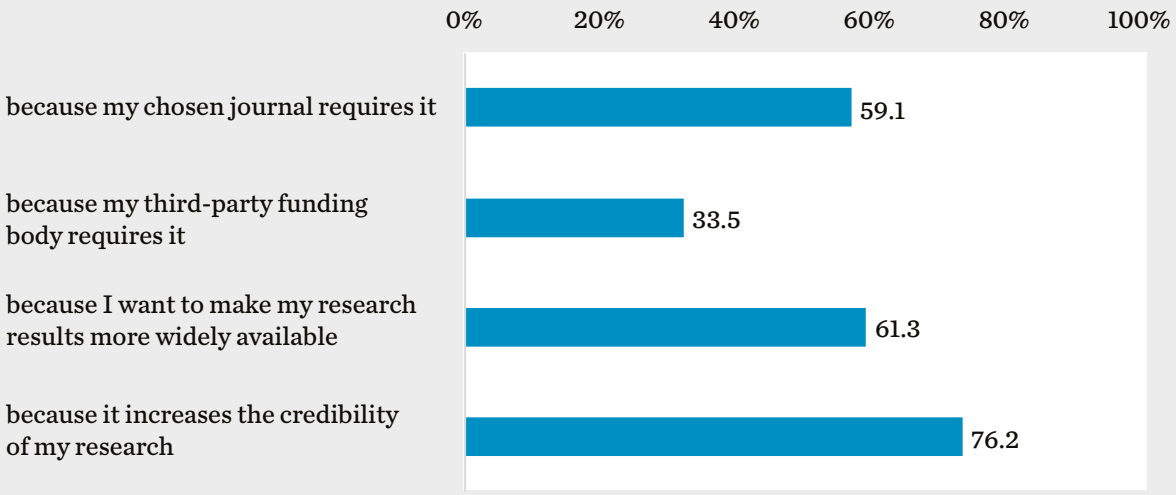


Fig. 15 *Potential reasons for publishing data and codes, n = 278, multiple answers possible*

Why not publish your data and codes – as far as legally possible?

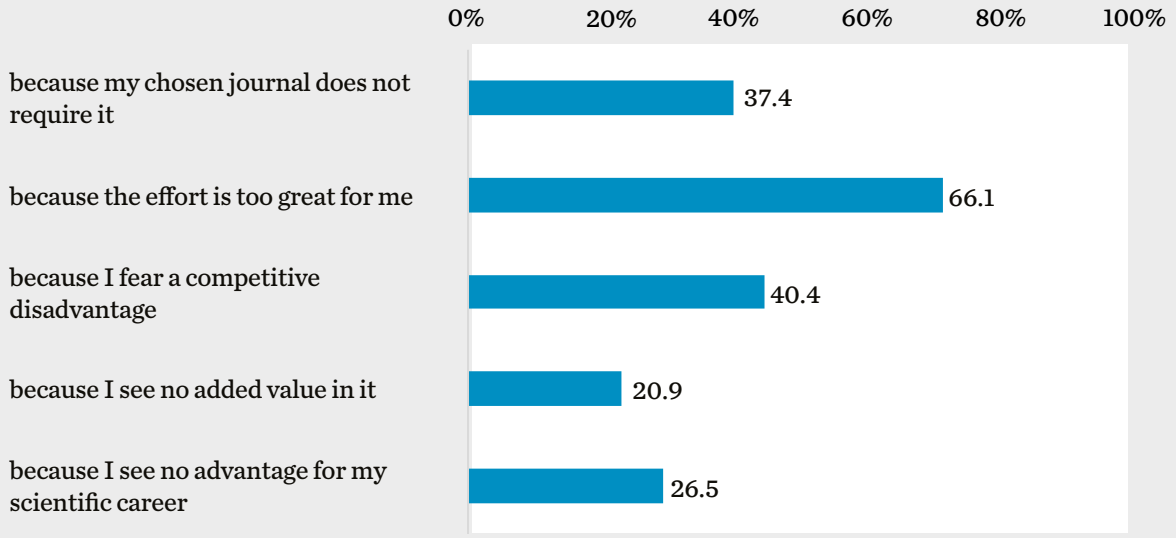


Fig. 16 *Potential reasons for non-publication of data and codes, n = 278, multiple answers possible*

The results of the survey suggest that external incentives such as publication requirements from scientific journals or demands from third-party funding bodies play a lesser role than the internal assessments of effort and benefit. The majority of respondents cited personal effort as the main reason for not publishing. Concerns about competitive disadvantages and the perception that publication offers no direct additional benefit or added value for one's own career are further decisive internal factors. Overall, the data suggests that personal assessments and individual cost-benefit considerations are stronger drivers of respondents' behaviour than external incentives.

Potential reasons for publishing data and codes by academic qualification and institution

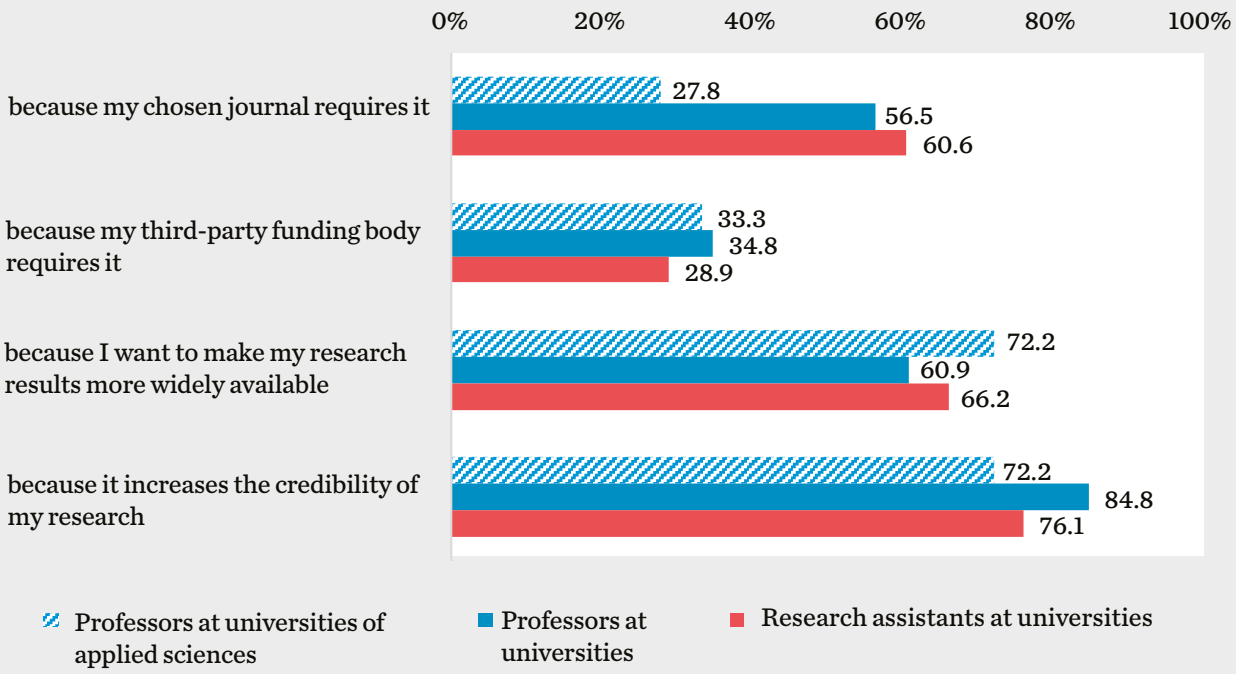


Fig. 17 *Potential reasons for publishing data and codes by academic qualification and institution, n = 206, multiple answers possible*

Potential reasons for non-publication of data and codes by academic qualification and institution

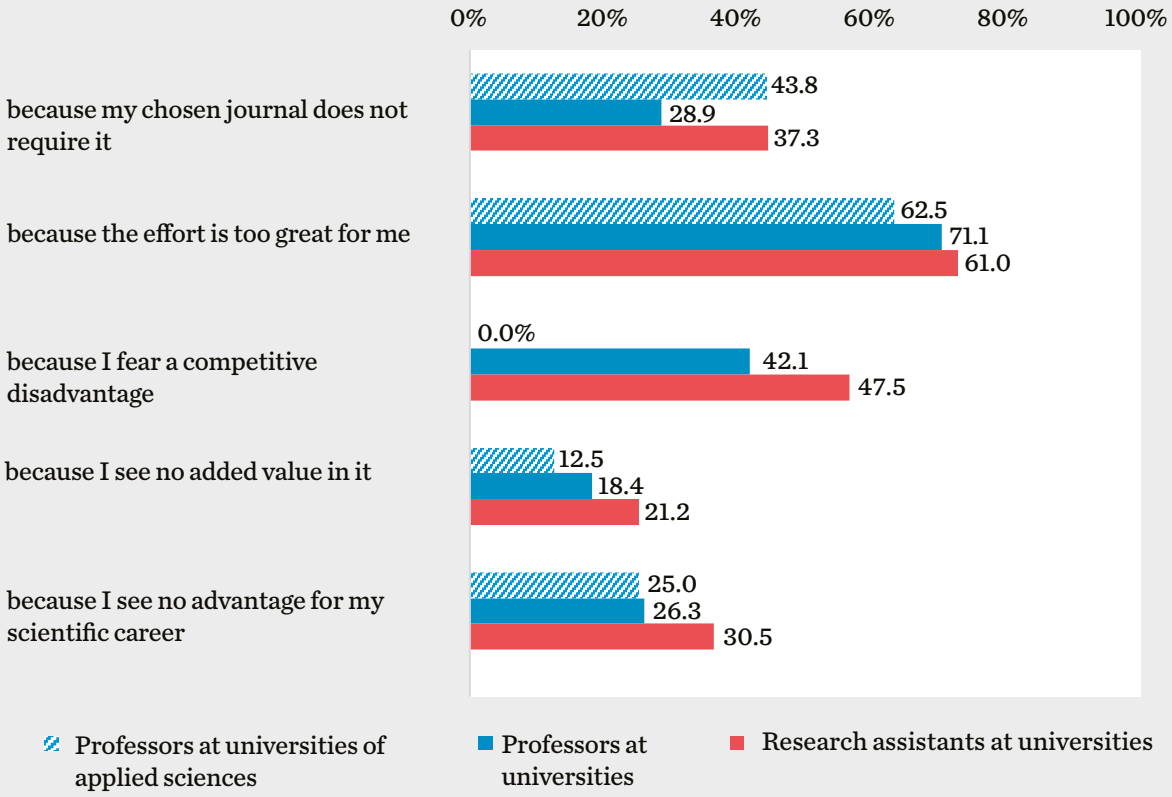
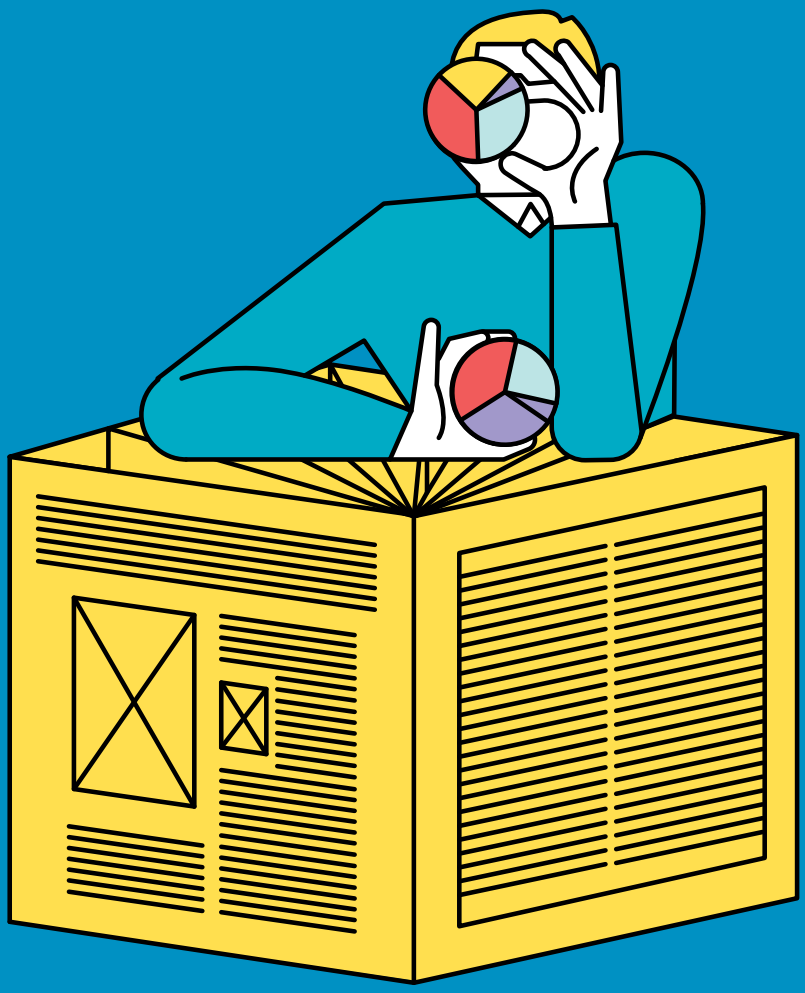


Fig. 18 *Potential reasons for non-publication of data and codes by academic qualification and institution, n = 172, multiple answers possible*



5. The role of Open Science in the publication of research results

5.1. Publication output

In this study, the publication behaviour of various academic subgroups (university professors, professors at universities of applied sciences, academic staff at universities) was examined, with a particular focus on the proportion of Open Access. It was found that university professors not only have the highest average number of publications (62.0), but also publish the largest proportion of their works (25 per cent) in Open Access. In comparison, professors at universities of applied sciences publish an average of 23.1 works, 13 per cent of which are Open Access. Academic staff at universities report an average of 7.9 publications, of which 20 per cent are Open Access publications (see Chapter 3.1).

5.2. Motivation for publishing in Open Access

The data collected clearly shows that the decision in favour of Open Access publications is largely determined by the researchers' motivation to make their results accessible to a broad public. At 81.4 per cent, the vast majority of respondents stated that they wanted to publish their research in Open Access for this reason. This emphasises the importance that scientists attach to the dissemination and exchange of knowledge.

External requirements also play a decisive role: half of the respondents (50 per cent) publish in Open Access because the chosen journal prescribes this. Slightly less than a third (30.7 per cent) reported that their publication decision was influenced by the requirements of third-party funding bodies. The institutional context is also relevant, as 27.1 per cent of respondents state that their institution prescribes Open Access publication.

Another significant motivation is the conviction that publicly funded research should also be publicly accessible; 69.3 per cent of respondents support this viewpoint. This reflects a growing awareness of the social responsibility of science and research and shows that the principles of transparency and accessibility are firmly anchored in academic culture.

This shows that external incentives as well as personal convictions and perceived social obligation influence researchers' decisions. While external incentives, such as requirements from journals, third-party funders and research institutions, are important factors, the intrinsic motivation to share knowledge and ensure the public accessibility of research results are the driving forces behind Open Access publication.

The comparative analysis of the three academic subgroups (see Fig. 19) on the various motives for publishing their research papers in Open Access reveals the following picture:

- Among **professors at universities of applied sciences**, 46.7 per cent show a preference for Open Access if this is supported by their chosen journal. 13.3 per cent state that the requirements of third-party funding bodies are decisive for them, and 6.7 per cent publish in Open Access in order to follow the guidelines of their institution. However, it is worth noting that a clear majority of 80.0 per cent would like to make their research results accessible to a wider audience. Similarly, almost half (43.3 per cent) see public funding of their research as a reason for making it publicly accessible.
- 62.0 per cent of **university professors** report that their decision in favour of Open Access depends on the publication practices of their preferred journals. For 38.0 per cent, pressure from third-party funders plays a role, while 26.0 per cent cited their institution's guidelines as a reason. At 84.0 per cent, the motivation to share their research results more widely is even more pronounced than in the case of professorships at universities of applied sciences. There is a significant difference between UAS professors and university professors. 76 per cent of the latter are of the opinion that publicly funded research should also be publicly

Reasons for publishing in Open Access according to academic qualification and institution

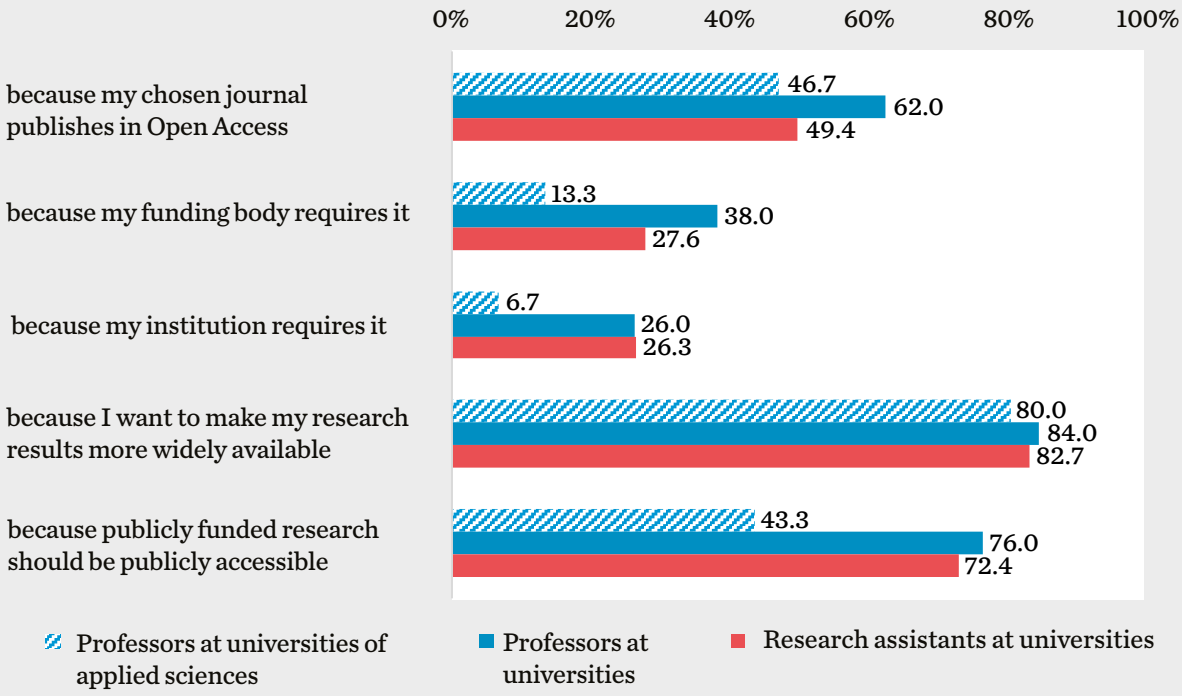


Fig. 19 *Reasons for publishing in Open Access according to academic qualification and institution, n= 236, multiple answers possible*

accessible, while only 43.3 per cent of professors at universities of applied sciences hold this view.

- 49.4 per cent of **academic staff at universities** say that their publication decisions are influenced by the Open Access policy of the journals. For 27.6 per cent, the requirements of third-party funders are decisive, and for 26.3 per cent, the requirements of their institution are decisive. A strong majority of 82.7 per cent would like to make their research results available to a wider audience, and 72.4 per cent emphasise the need for publicly funded research to be available to the public.

These results illustrate that the decision to publish in Open Access is driven by both external pressure and a personal belief that research should be widely and freely accessible, especially if it has been publicly funded.

5.3. Reasons against publishing in Open Access

The survey results on the reasons against Open Access publication also offer revealing insights: At 68.5 per cent, the majority of researchers say that author paying charges (APCs) are a key barrier, which raises the question of how financial barriers affect access to OA publications. Over half of the respondents (52.0 per cent) reported that the journal they had selected was not Open Access. Almost a fifth of participants (19.8 per cent) see no reason for an Open Access publication if the results are already freely available as a working paper. The quality of Open Access journals is questioned by 20.1 per cent of respondents, which reflects the concerns of some scientists regarding the credibility and scientific reputation of these forms of publication. A minority of 8.1 per cent see no additional benefit in Open Access publications, while 12.8 per cent see no added value for their academic career.

The detailed comparative analysis of the three academic subgroups (n = 212) on their reasons for not publishing in Open Access reveals the following picture (see Fig. 20): The funds for author fees (Article Processing Charges, APCs) represent the greatest obstacle for all three subgroups. Particularly among professors at universities and academic staff, the proportion of those who do not publish in Open Access due to fees is very high at 71.4 per cent and 67.6 per cent respectively.

This reason is also significant among professors at universities of applied sciences (60.7 per cent). The publication policy of the selected journals also plays a significant role. More than half of professors at universities (57.1 per

cent) and academic staff (52.1 per cent) and almost half of professors at specialized higher education institutions and universities of applied sciences (46.4 per cent) state that their decision against Open Access is due to the fact that their preferred journal does not publish in Open Access.

A smaller proportion of respondents see no reason for Open Access publication, as their results are already freely available as working papers - this applies to 25 per cent of professors at universities of applied sciences, 19 per cent of university professors and 17.6 per cent of research assistants at universities.

Concerns about the quality of Open Access journals are expressed by a notable minority: 21.4 per cent of professors at universities of applied sciences, 19.0 per cent of university professors and 21.1 per cent of academic staff at universities express doubts in this regard. The perceived lack of additional benefits or added value for the academic career through Open Access publications is decisive for a smaller proportion of respondents.

Reasons for not publishing in Open Access, by academic qualification and institution

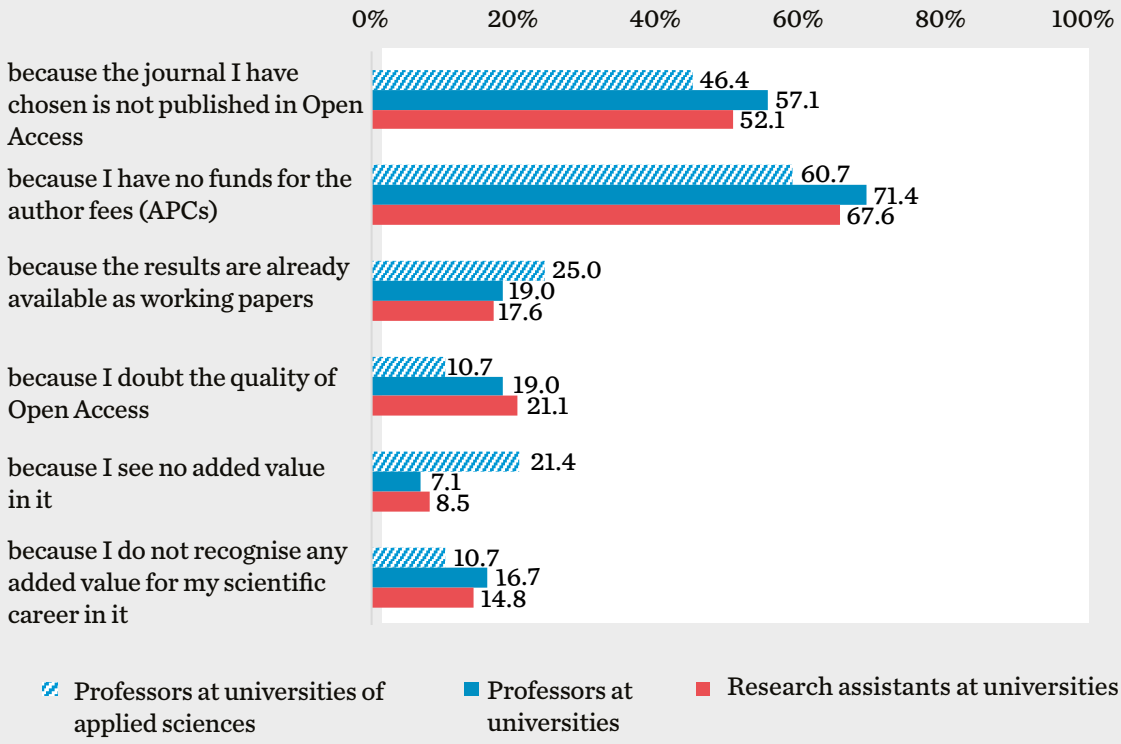


Fig. 20 *Reasons for not publishing in Open Access, by academic qualification and institution, n= 212, multiple answers possible.*

In summary, it can be concluded from the results that the main reasons against Open Access are of a financial nature, followed by non-requirement by favoured journals and quality concerns. Less significant, but still relevant for some researchers, are the perceived lack of additional benefits and the lack of career-enhancing added value of Open Access publications.

5.4. Secondary publications

In this survey, the awareness of the possibility of secondary publication of scientific work among scientists in economics and business studies was also determined. The possibility of secondary publication allows authors to republish their previously published works under certain conditions, often in Open Access repositories or institutional archives, which can increase the accessibility and visibility of their research.

The data collected shows that a majority of economists (55.0 per cent) are familiar with the option of secondary publication, while a slightly lower proportion of business economists (45.3 per cent) are aware of this option. Conversely, this means that 45.0 per cent of economics and 54.7 per cent of business research respondents state that they are not aware of the possibility of secondary publication.

It is interesting to note that half (51 per cent) of respondents are familiar with the concept of making publications freely accessible after an embargo period. Professors at universities in particular (76.5 per cent) are familiar with this concept, while less than half of professors at universities of applied sciences (45.2 per cent) and only 37.6 per cent of academic staff at universities state that they are aware of the concept, which indicates a need for more information and training. The embargo period is a fixed period of time during which access to scientific works is only possible via subscriptions or individual purchases before they may be made publicly available elsewhere as a so-called secondary publication. This practice is particularly relevant in the Open Access movement, as it offers a compromise between immediate Open Access and the possibility for publishers to generate revenue from the publications.

These results could indicate that there is a need for information regarding secondary publication within the economic sciences. In business studies in particular, there appears to be greater potential for educational work to increase awareness and utilisation of this publication option.

The difference in awareness between the two disciplines could be influenced by various factors, including the culture of the scientific community, research funding policies and institutional guidelines. Secondary publication is an important aspect of the scholarly communication system and can significantly support the dissemination of research results.

47 per cent of the three academic subgroups surveyed (university professors, professors at universities of applied sciences, academic staff at universities) are familiar with the concept of "secondary publication". (see Fig. 21): The majority of respondents in all three subgroups have not yet utilised the right to secondary publication. Among professors at universities of applied sciences, the proportion of those who have not used the right is 64.3 per cent; among professors at universities, it is 64.1 per cent. Among academic staff at universities, 84.7 per cent stated that they had not made use of this right.

Overall, these figures could indicate that the awareness or necessity of using the right to secondary publication is lower among academic staff at universities than among professors. Another reason for the low utilisation of the secondary publication right is certainly also due to administrative hurdles, as there are different conditions for self-archiving with publishers and in some cases the conclusion of an author addendum is necessary.

The data on the distribution of different platforms for secondary publication provides the following picture: 57.9 per cent of respondents who work with secondary publications state that they use their own institution's repository for secondary publication. A repository that specialises in the respective discipline is used by 36.8 percent of respondents.

Social networks serve as a medium for secondary publication for 28.9 per cent of participants. Their own website is used for this purpose by 31.6 per cent of respondents.

These figures show a preference for institutional and disciplinary repositories over social networks and personal websites. The use of institutional repositories may be due to direct accessibility for the institution's target audience and possibly support from the institution itself. The use of disciplinary repositories could promote professional networking and visibility in the respective disciplinary community.

The choice to use their own websites and social networks may indicate a desire for greater control over publication and the possibility of a broader or more diverse reach. These options may offer more flexibility in the presentation and dissemination of research findings.

Have you already used the option of self-archiving to make your own publications available?

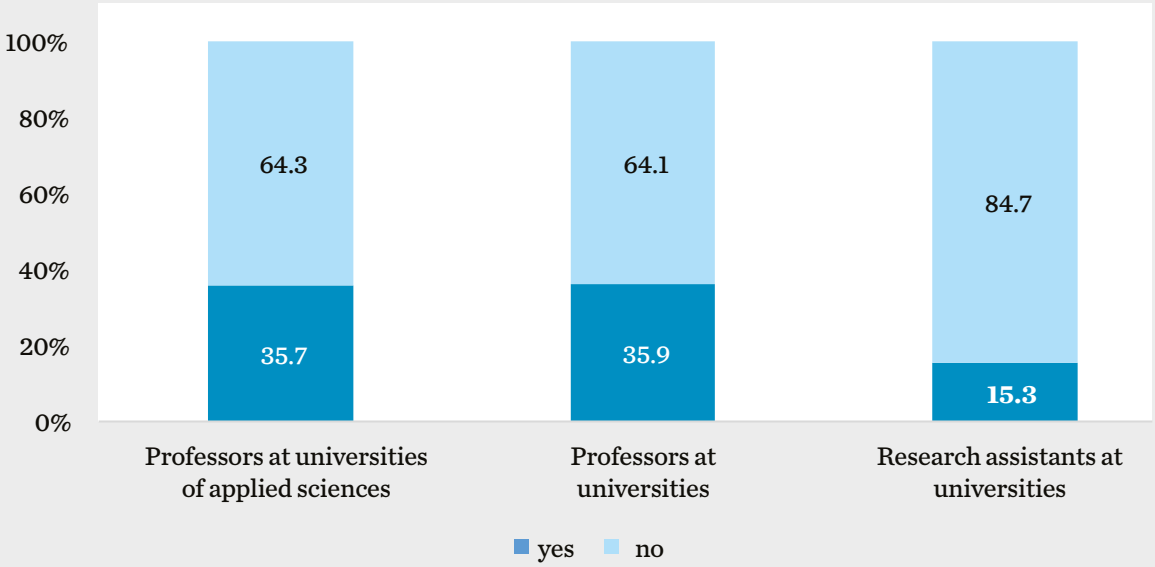
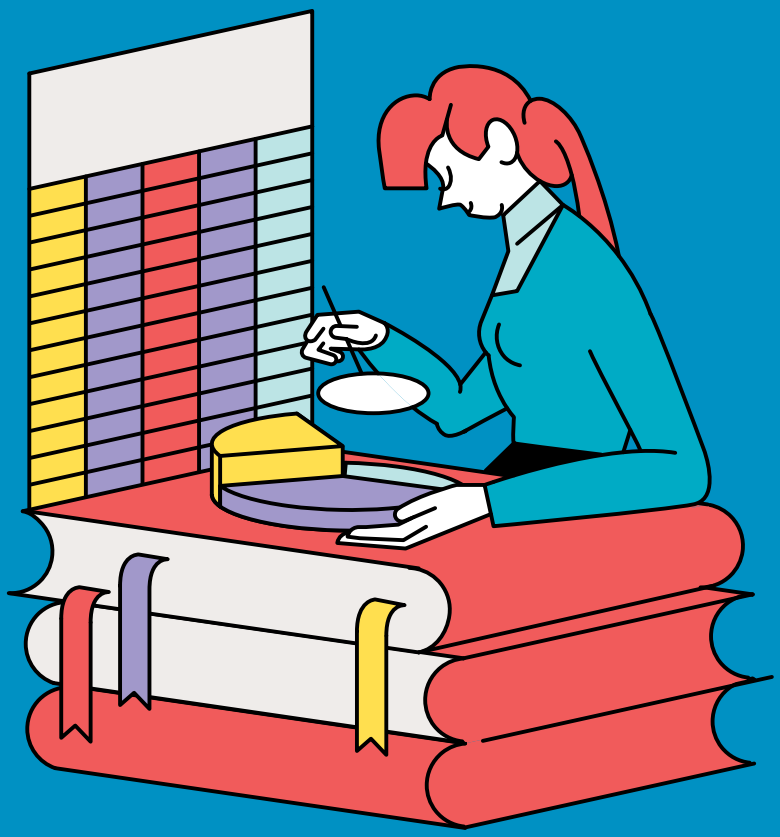


Fig. 21 *Use of the option of secondary publication among persons who are aware of the right, by status group and institution, n=112*



6. Barriers and incentives of Open Science

In the context of the increasing globalisation and digitalisation of science, there is a clear trend towards opening up scientific processes and results. Open Science, as a guiding principle for transparent, accessible and collaborative research, is at the centre of this change. This chapter of the study report analyses the various barriers and incentives associated with the implementation and promotion of Open Science from the perspective of researchers in the economic sciences. This analysis is intended to provide valuable information for fully realising the potential of Open Science and supporting the scientific community on the path to greater openness and inclusivity.

**Methodological note: The scale used in the questionnaire for the questions on barriers and incentives (from 1 as highest agreement to 5 as lowest agreement) was reversed in the presentation of results for reasons of easier readability. The values shown below are mean values (M) in relation to agreement with the items surveyed. High values indicate high agreement. Low values signalise low agreement.*

6.1. Barriers to the use of Open Science

The study analysed barriers to the use of Open Science practices (see Fig. 22) among 310 respondents. The results show that legal barriers, such as copyright and data protection, represent the greatest barrier with a mean score of 3.5 (on a scale of 1 to 5). This indicates concerns about compliance and the security of sensitive information. On a par with a mean score of 3.5 are financial restrictions that hinder Open Access publishing, for example. The costs of Open Access publications, i.e. the so-called article publication charges (APCs), are presumably the main reason for this (see also section 5.2).

Lack of time to familiarise oneself with Open Science practices is rated with a mean value of 3.1 and reflects the challenge of learning additional methods alongside everyday research. The lack of recognition of Open Science practices in the scientific community was also given a mean score of 3.1, indicating a cultural barrier within the research community.

What reasons prevent you from applying Open Science?

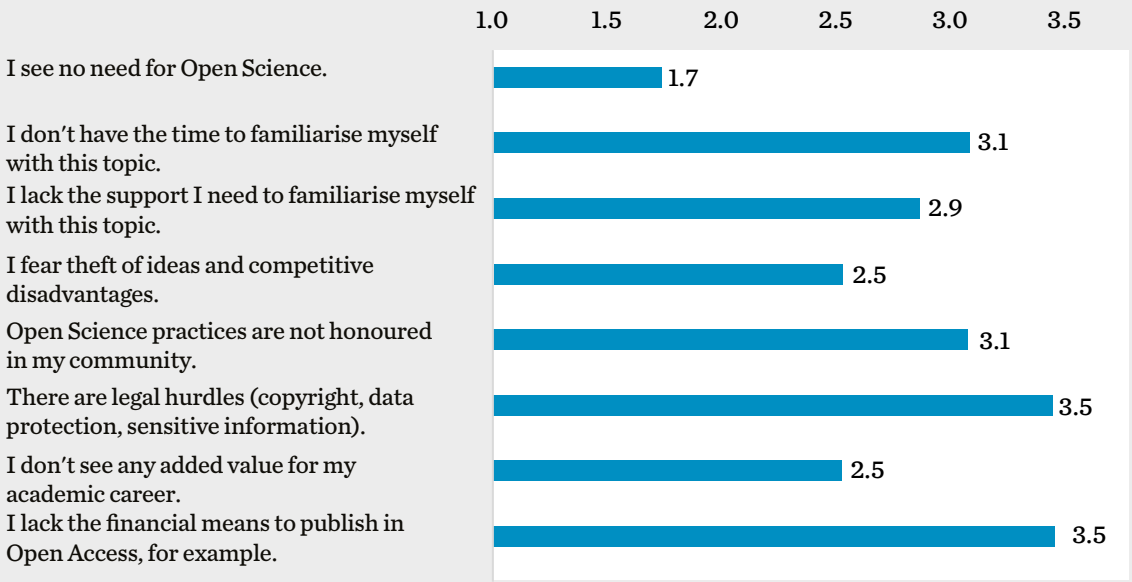


Fig. 22 *Barriers to Open Science, n= 310, multiple answers possible*

The lack of support for familiarising oneself with Open Science results in a mean value of 2.9, which indicates a lack of resources or assistance. The fear of idea theft and competitive disadvantages as well as the lack of perceived added value for the scientific career (each with M = 2.5) are further factors that limit the use of Open Science practices.

The lowest mean value of 1.7 was for the statement that there is no need for Open Science. This indicates that the basic concept and benefits of Open Science are recognised by most respondents.

In summary, the study shows that legal and financial hurdles, lack of time, lack of recognition in the community, lack of support and concerns about idea clauses and career benefits are perceived as barriers to the implementation of Open Science practices. These findings could be crucial for the development of targeted strategies to promote Open Science.

The **free text responses** on other barriers to the use of Open Science practices confirm the legal concerns and financial hurdles. However, institutional reasons are predominantly mentioned, which are sometimes at an individual level, such as "doctoral supervisor sees no benefit", but often affect the entire research landscape.

Here are some examples of voices:
- *"The university's infrastructure is often lacking. There would need to be separate positions for the follow-up of data or the writing of policy reports or press releases."*
- *"Overall university culture, university management, orientation of the university towards teaching"*
- *"no OA/OS strategy of the university"*
- *"The journal doesn't allow it."*
- *"I can only get a professorship by publishing in top journals. Open Science doesn't help me to get X A+ papers. Unfortunately."*
- *"Unfortunately, people are currently acting as if publishing (highly ranked) research papers is the ultimate in scientific output. As researchers, we - very stupidly - make ourselves dependent on publishers, self-imposed rankings and blind peer reviews, some of which are completely misguided (nothing against peer reviews per se, rather the sometimes nasty practices involved). As researchers, we are then judged by this or sometimes simply have to publish something in order to fulfil our quotas. Publishing takes centre stage, not research."*

6.1.1. Differences between the specialist disciplines

With regard to the disciplines of economics, business studies and general economics , there were no major deviations in the 268 surveys (see Fig. 23). The barrier "I see no need for Open Science" is slightly more pronounced in General Economics (M = 1.9) than in Economics (M = 1.7) and Business Studies (M = 1.6). The lack of support is perceived somewhat more strongly as a barrier in economics (M = 3.0) and business studies (M = 2.9) than in general economics (M = 2.7). The lack of financial resources for publishing in Open Access is a somewhat greater barrier in business studies (M = 3.7) than in general economics (M = 3.5) and in economics (M = 3.4).

6.1.2. Gender differences

The available data show significant differences between the genders of 292 respondents with regard to three specific perceived barriers to the implementation of Open Science practices (see Fig. 24): For female participants, lack of time (M = 3.5) is a significantly greater barrier than for male participants (M = 2.9). This could indicate a higher workload or more varied obligations for women. There are also greater differences in the lack of support, with a mean value of 3.4 for female respondents and 2.7 for male respondents. This suggests a discrepancy in the availability or perception of support structures or resources. A lack of financial resources as a barrier is also rated statistically significantly higher by women than by men (M = 3.4), with a mean value of 3.7.

6.1.3. Differences between the defined academic subgroups

The comparative analysis of the three academic subgroups analysed (professors at universities of applied sciences, professors at universities and academic staff at universities, n = 235) on the perceived barriers to the implementation of Open Science shows some statistically significant differences (see Fig. 25):

With a mean value of 1.5, academic staff at universities rate the barrier of not seeing a need for Open Science significantly lower than professors at universities (M = 1.9) and professors at universities of applied sciences (M = 2.0). This could indicate a greater awareness or openness towards Open Science among academic staff. The lack

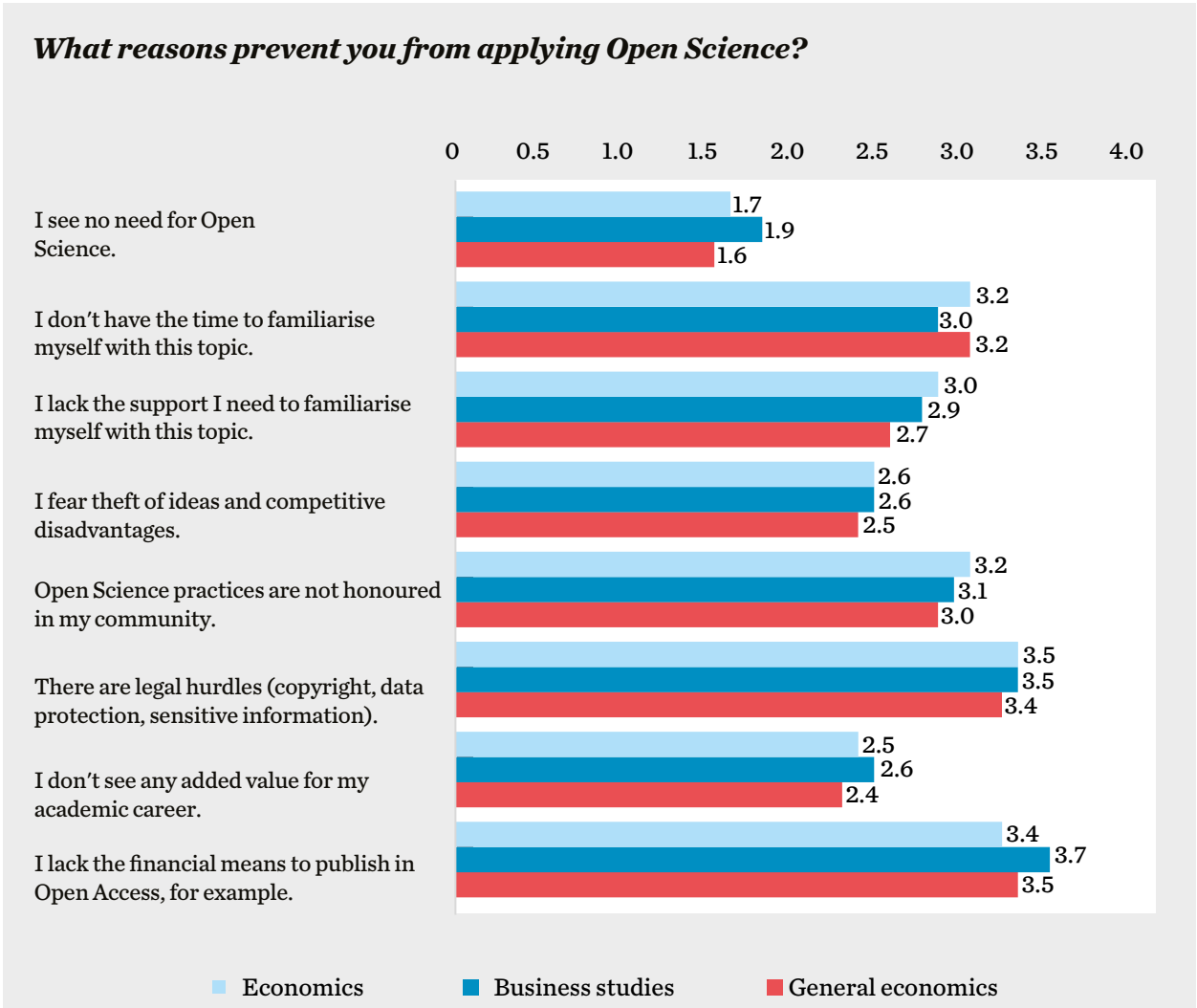


Fig. 23 *Barriers to Open Science by subject discipline; n= 268, multiple answers possible*

of time factor is rated slightly higher by academic staff at universities with a mean value of 3.2 than by professors at universities (M = 2.9) and universities of applied sciences (M = 3.0). This may indicate a possibly greater workload or lower resource allocation in this area. A lack of support is rated slightly higher by academic staff at universities with a mean value of 3.1 than by professors at universities of applied sciences and universities (both M = 2.7). Fears regarding the theft of ideas and competitive disadvantages are slightly more pronounced among academic staff at universities (M = 2.7) than among professors (both with M = 2.4). The lack of recognition of Open Science practices is rated slightly higher by academic staff at universities with a mean value of 3.2 than by professors at universities of applied sciences and universities (both M = 2.9). Legal hurdles are rated significantly higher by professors at universities (M = 3.7) than by professors at universities of applied sciences (M = 2.8) and also higher than by research assistants (M = 3.5). Professors at universities (M = 2.4) and academic staff at universities (M = 2.5) rated the barrier of not seeing any perceived added value for their academic career slightly lower than professors at universities of applied sciences (M = 2.9). A lack of financial resources is a slightly greater barrier for professors at universities of applied sciences and academic staff (both with M = 3.7) than for professors at universities (M = 3.3).

Overall, the results for the three academic subgroups analysed indicate that research assistants at universities experience greater barriers in terms of time, support and recognition, while professors at universities primarily have legal concerns. Financial constraints are a significant barrier across all academic subgroups.

6.2. Incentives for the use of Open Science

In addition to the barriers described above, the present study also investigated which offers and incentives would favour the use of Open Science practices among the respondents (see Fig. 26).

Barriers to Open Science by gender

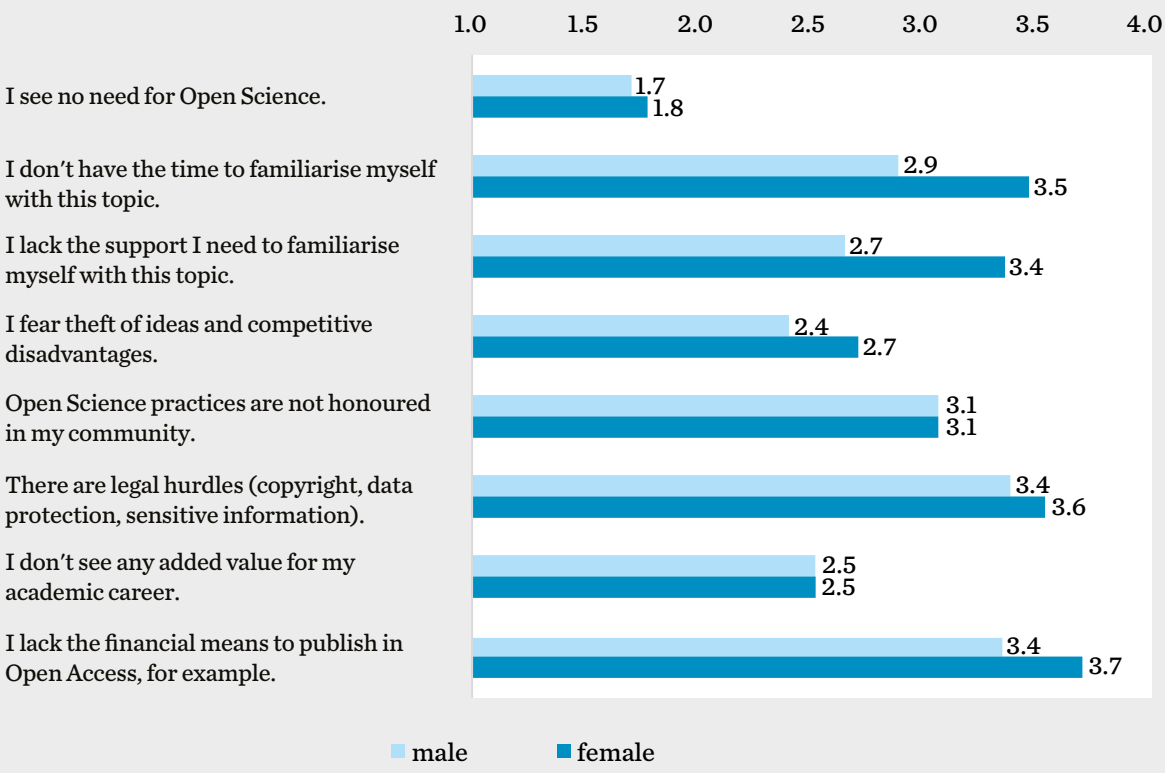


Fig. 24 *Barriers to Open Science by gender, n= 292, multiple answers possible*

The frontrunner with a mean value of 4.1 is the prospect that the citation frequency of their own publications could increase as a result of Open Science. This emphasises the value researchers place on the visibility and recognition of their work. With a mean value of 4.0, the opportunity to tap into additional sources of funding and the recognition of Open Science practices for scientific careers also represent a high incentive. Both factors point to the importance of structural and career-promoting incentives.

Practical support from Open Science experts is rated with a mean score of 3.5, which indicates the need for tangible help and advice. With a similar rating of 3.4 on average, respondents would like more information on the concrete application of Open Science practices. Other important aspects are the recognition of one's own work outside the scientific community and the citation and recognition of published data and codes (each with M = 3.8). Better access to open research data appears to be just as important (M = 3.8).

Overall, these results suggest that both structural support and the expansion of recognition and financial opportunities are key drivers for the adoption of Open Science practices. Researchers are open to Open Science if it improves their visibility and career opportunities and if they receive the necessary support.

6.2.1 Differences between the specialist disciplines

The results on the incentives of Open Science in relation to differences between the three major subject areas of economics, business studies and general economics are presented below (see Fig. 27).

Respondents from the general economics (M = 3.6) would like information on the concrete application of Open Science practices somewhat more than those from economics and business studies (both with M = 3.3). Attention to the work is also slightly more relevant for general economics (M = 3.9) than for economics (M = 3.8) and business studies (M = 3.7). More citations is a slightly stronger factor in economics (M = 4.3) and general economics (M = 4.2) than in business studies (M = 3.9). The possibility of accessing openly accessible research data is slightly more relevant in general economics (M = 4.0) than in economics and business studies (both with M = 3.7). The

Barriers to Open Science in relation to qualification and institution

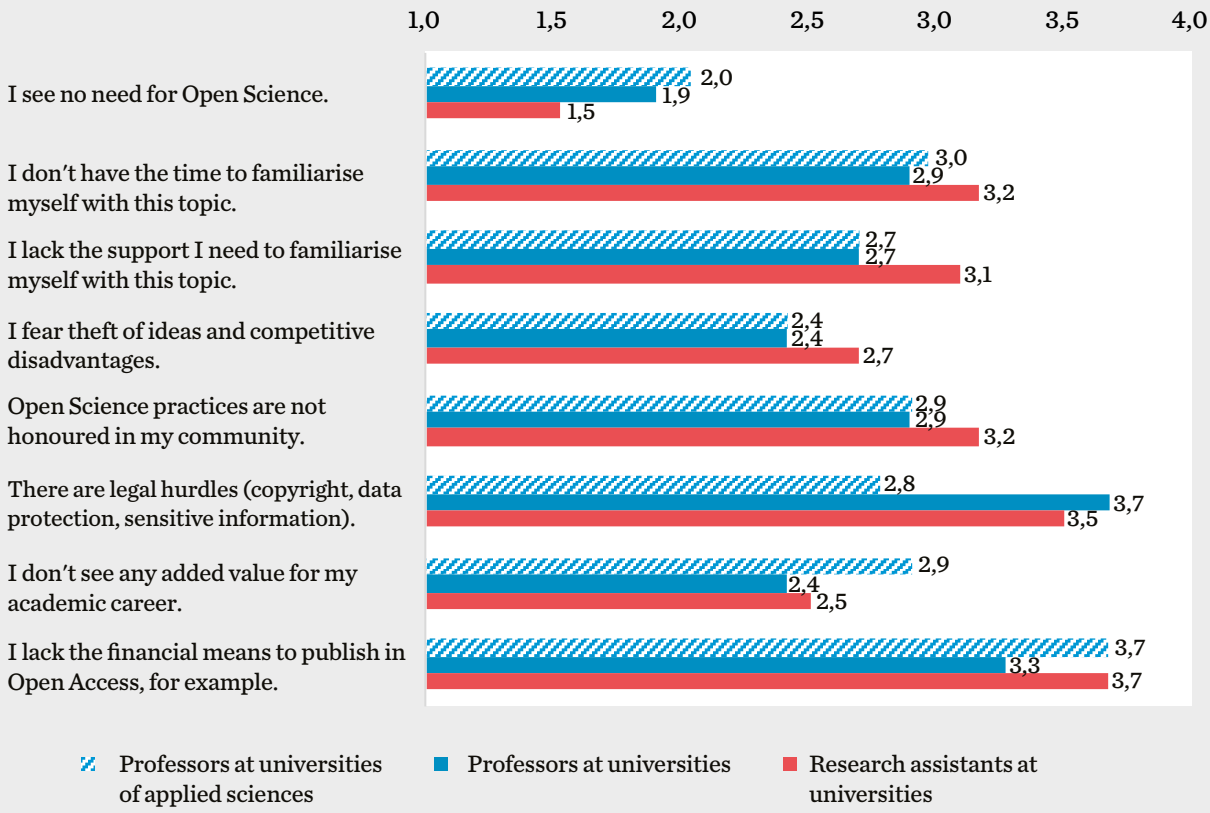


Fig. 25 *Barriers to Open Science in relation to qualification and institution, n= 235, multiple answers possible*

recognition of Open Science practices for academic careers is slightly more pronounced in economics (M = 4.1) and business studies (M = 4.0) than in general economics (M = 3.8).

To summarise, although there are slight differences in the assessment of incentives for Open Science between the three major subject areas of economics, business studies and general economics, these are not significantly pronounced. However, it can be seen that economics researchers place a slightly higher value on the citations of their publications and the recognition of Open Science practices for their careers, while researchers in general economics place more value on attention for their work outside academia and on access to research data. Overall, business studies researchers gave slightly lower ratings for the various incentives.

In conclusion, it can be stated that in order to promote the use of Open Science practices for all three major subject areas, the recognition of scientific work through citations and the consideration of Open Science in scientific careers are considered particularly important. Sources of funding and access to research data also play a significant role. Less critical, but still important, are practical support and information provided.

6.2.2. Gender differences

When analysing the incentives for Open Science, there are some significant differences between female and male researchers (see Fig. 28): Female respondents (M = 3.9) want practical support from Open Science experts more than male respondents (M = 3.3). In addition, female respondents (M = 3.9) would like more information on Open Science practices to a greater extent than male respondents (M = 3.1). When it comes to better access to openly accessible research data, female respondents show a strong interest with a mean value of 4.2, which is also significantly higher than that of male respondents (M = 3.7). The incentive "Recognition of Open Science practices for career advancement" was also rated significantly higher by female respondents with a mean value of 4.2 than by male respondents (3.9).

Which offers or incentives would encourage you to adopt Open Science practices?

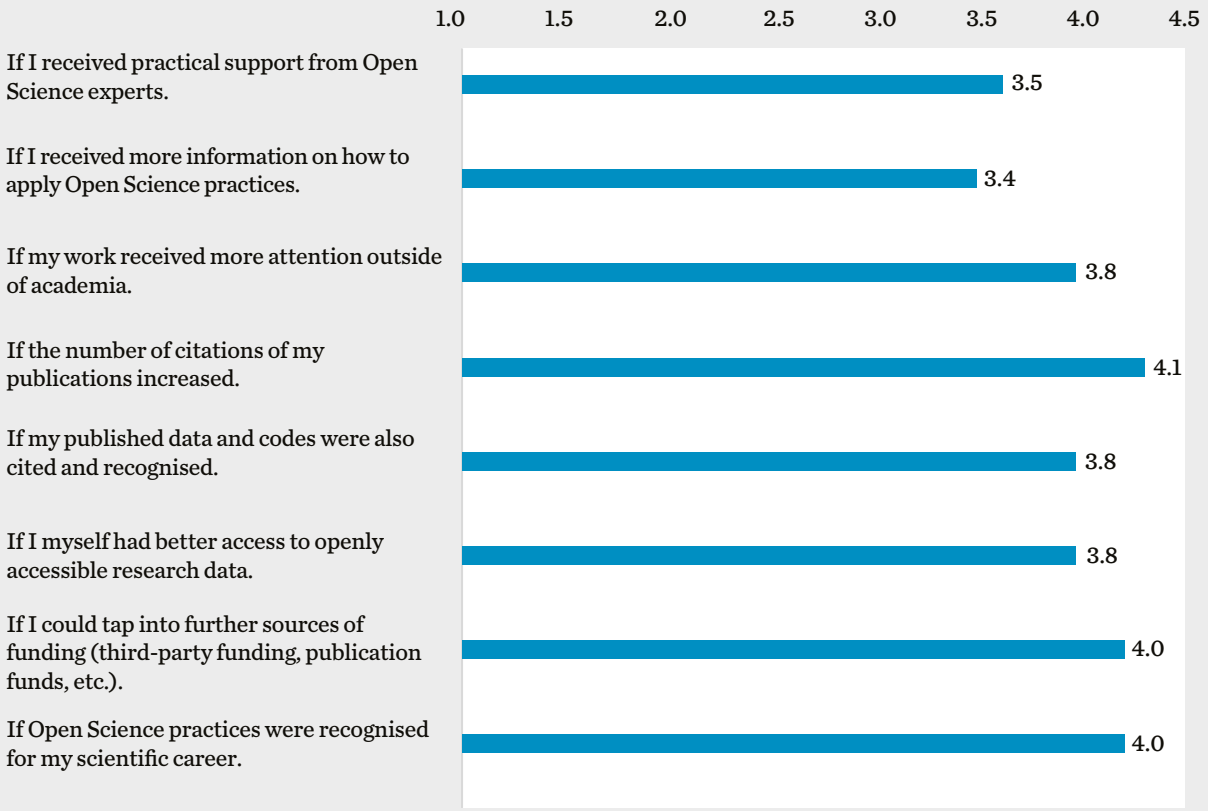


Fig. 26 *Incentives for Open Science, n= 310, multiple answers possible*

Overall, the results indicate that female respondents have different experiences or needs with regard to Open Science in scientific practice in terms of the incentives mentioned.

6.2.3. Differences between the defined academic subgroups

The results of the comparative analysis of the three academic subgroups (professors at universities of applied sciences, professors at universities and academic staff at universities) with regard to the various incentives for the use of Open Science practices are presented below (see Fig. 29).

A recognisable difference can be seen in the practical support provided by Open Science experts, where academic staff at universities (M = 3.8) rate this incentive significantly higher than professors at universities of applied sciences (M = 3.3) and at universities (M = 3.1). With regard to the need for more information about Open Science practices, academic staff at universities (M = 3.7) rate this incentive significantly higher than professors at universities (M = 2.8) and also higher than professors at universities of applied sciences (M = 3.2), which indicates a greater need for information in this subgroup. The desire for their own work to receive more attention outside academia is slightly more pronounced among academic staff at universities (M = 4.0) than among professors, regardless of the type of university where they are employed (both with M = 3.8). An increasing number of citations of their own publications through Open Science is rated by academic staff and professors at universities (both with M = 4.2) as slightly more relevant compared to UAS professors (M = 3.8). In addition, access to openly accessible research data is rated as significantly more important by academic staff at universities (M = 4.1) than by UAS professors (M = 3.3) and also slightly higher than by university professors (M = 3.7). Research staff at universities (M = 4.2) rated the development of additional sources of funding slightly more important compared to UAS professors and university professors (M = 3.9 each). Research assistants (M = 4.3) rate the recognition of Open Science practices for their career higher than professors at universities (M = 4.0) and significantly higher than UAS professors (M = 3.5).

Which offers or incentives would encourage you to adopt Open Science practices?

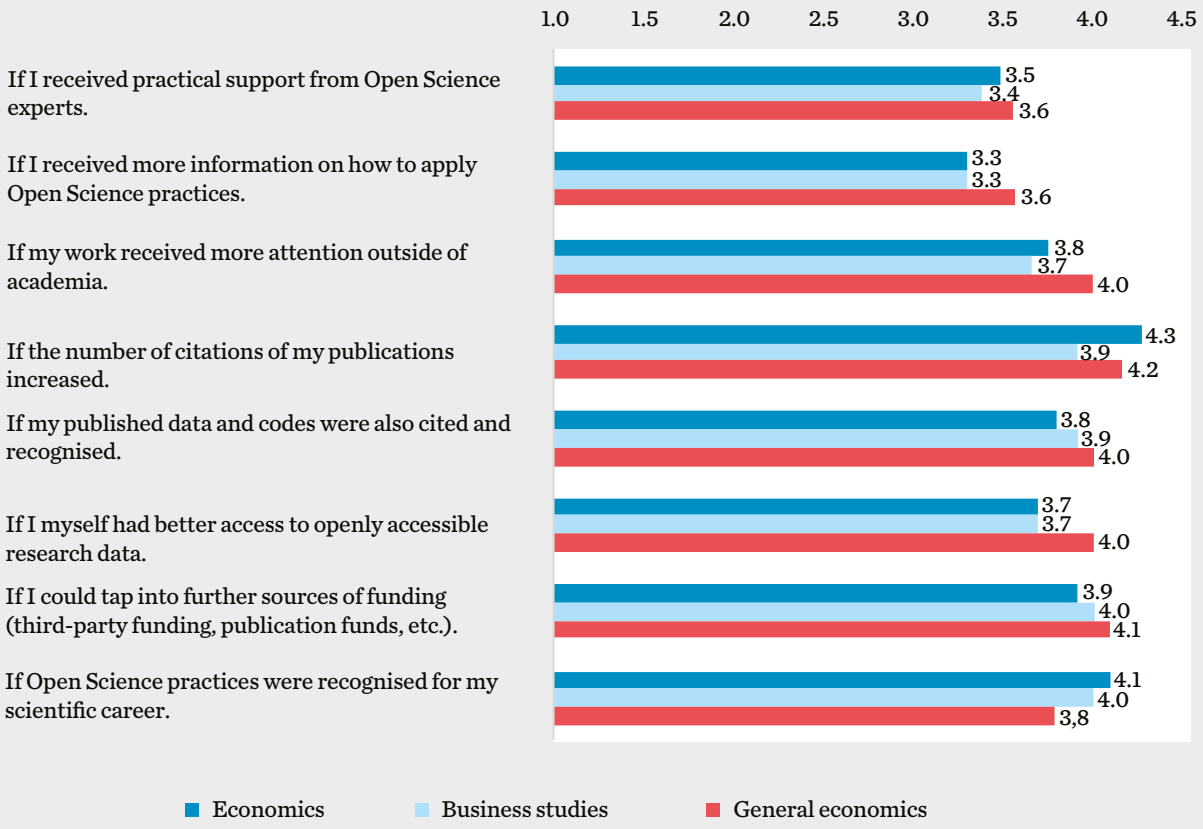


Fig. 27 *Incentives for Open Science by subject discipline, n=268, multiple answers possible*

In summary, the data from the three subgroups indicate that academic staff at universities generally have a greater need for support, information and recognition in the context of Open Science than professors, regardless of the type of university. These differences could be due to the different career phases and roles of the respondents, who each have different requirements and expectations of academic work and Open Science.

Which offers or incentives would encourage you to adopt Open Science practices?

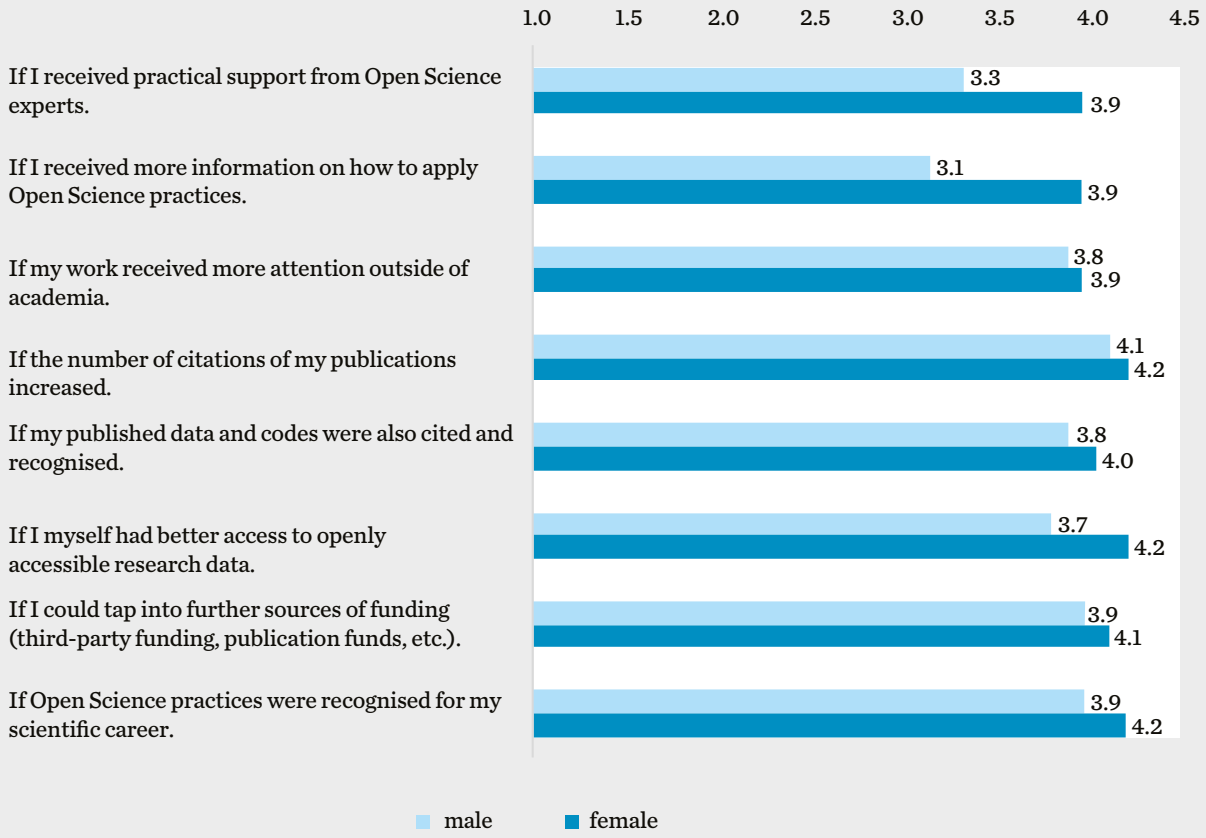


Fig. 28 *Incentives for Open Science by gender, n=293, multiple answers possible*

Which offers or incentives would encourage you to adopt Open Science practices?

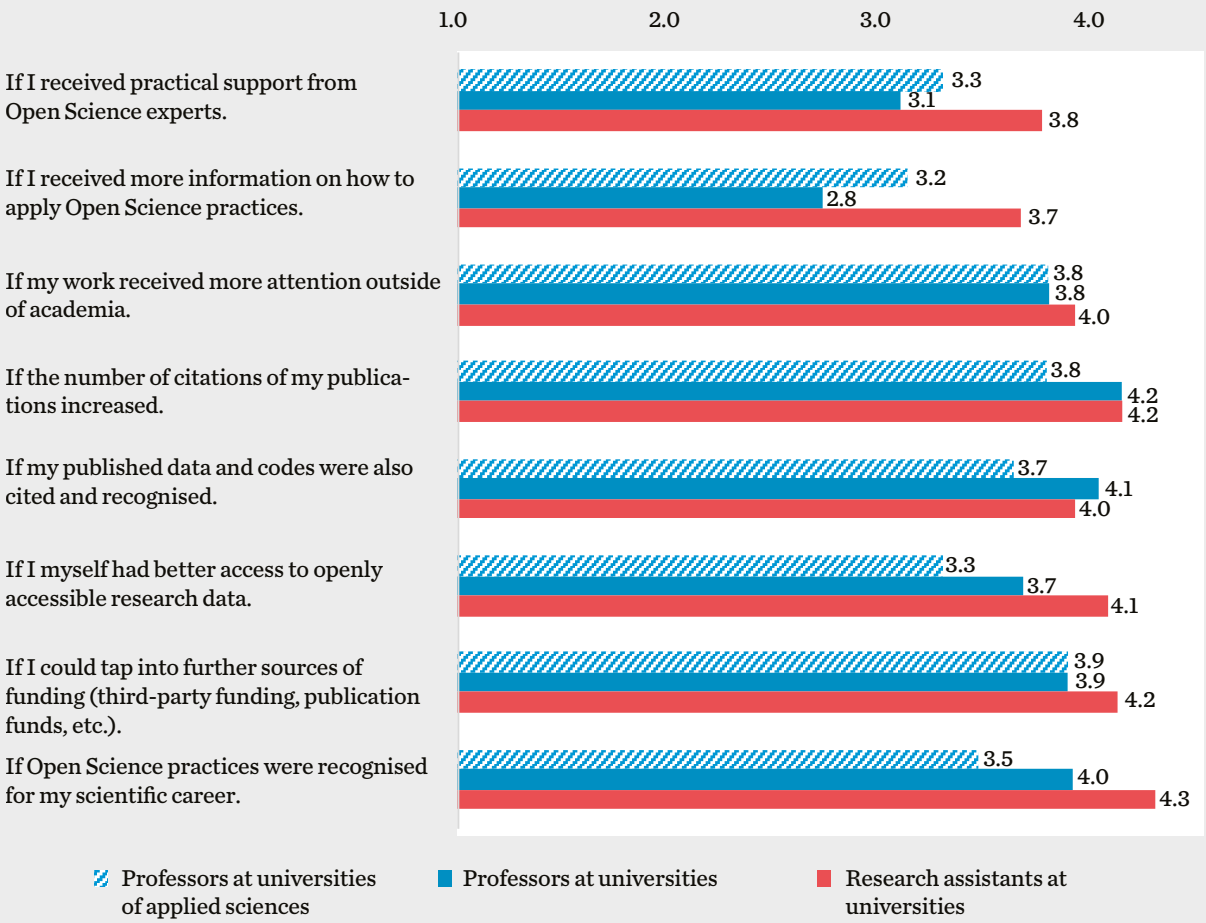
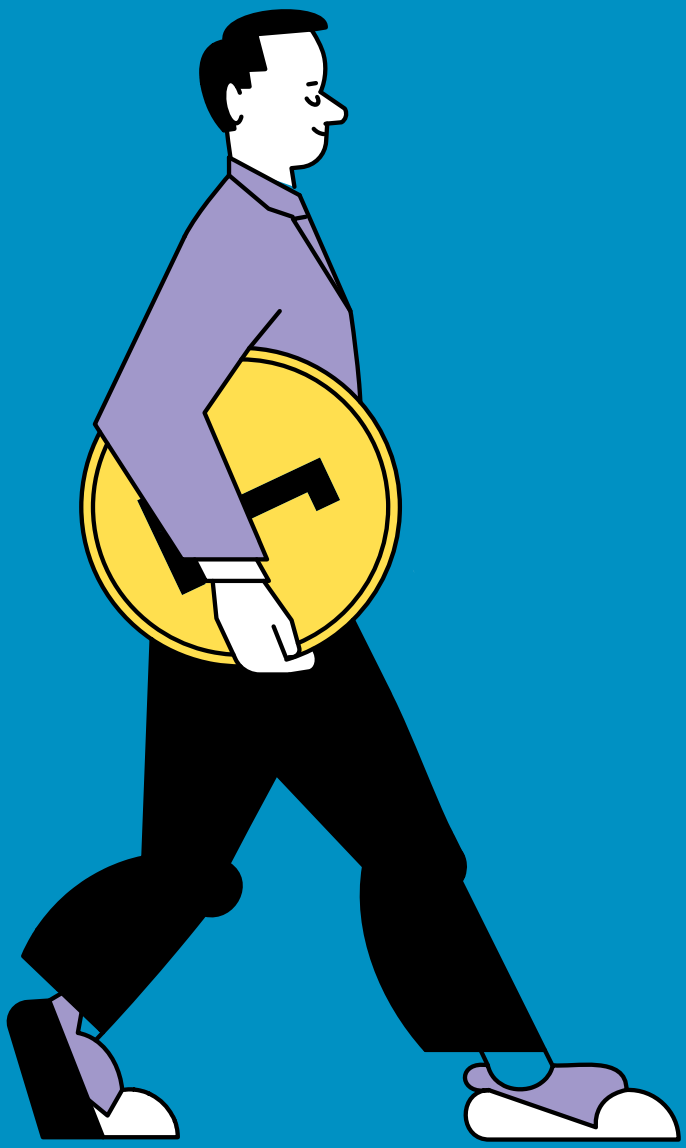


Fig. 29 *Incentives for Open Science by academic qualification and type of university, n=235, multiple answers possible*



7. Conclusion and discussion

The results presented paint an overall optimistic picture of the current status of Open Science in economics. Although there are still a number of challenges and barriers, there are nevertheless signs of a positive development.

7.1. Comparison of 2019 and 2023

The ZBW already conducted a comprehensive Open Science study in 2019 (cf. Scherp, Siegfried, Biesenbender, Breuer: 2020). The data from the 2019 study are not directly comparable for various methodological reasons: The questions and also the response formats (scales and data level) were different, meaning that a quantitative inferential statistical comparison with the data from the current 2023 survey presented is not possible. The comparisons made below should therefore be seen as a purely interpretative, qualitative comparison in order to better categorise the development between 2019 and 2023.

The following picture emerges from a comparison of the two studies:

Use of Open Access literature
A clear change is emerging in the use of Open Access literature. In 2019, only just over a third of respondents stated that they specifically searched for Open Access literature. By 2023, this figure had risen to a clear majority of almost two thirds. It should be noted that in 2023 respondents were asked about "freely accessible versions" and in 2019 about "Open Access literature". Even though not all respondents probably made a direct link between freely accessible versions and Open Access, this increase is likely to illustrate an increasing prioritisation and appreciation of freely accessible research resources within the academic community.

A significant increase in targeted searches for Open Access publications can be observed among professors in particular. A similar trend can also be seen among doctoral students and private lecturers. Only among junior professors do fewer than half continue to search specifically for Open Access, although there has also been an increase in this subgroup. This development reflects a general change within the academic landscape, which is increasingly prioritising free and Open Access to scientific knowledge.

Development within the economic disciplines
Another interesting aspect is the development within the various economic disciplines. In 2019, there were still clear differences between business studies and economics with regard to the search for Open Access literature. By 2023, these differences appear to have levelled out, as no significant subject differences can be reported. This could indicate a general harmonisation of practices and an increasing acceptance of Open Access across disciplines.

Appreciation of open research data
The appreciation of open research data has also developed positively. An increased appreciation of Open Data can be observed between 2019 and 2023. Although a considerable proportion of researchers were already working with research data in 2019, the use of Open Data portals and the prioritisation of Open Data was less pronounced. By 2023, awareness of the importance of Open Data has increased, as evidenced by a slight increase in researchers prioritising Open Access to data. This change is particularly notable as it indicates a growing recognition of the benefits that Open Data offers for the reproducibility and transparency of research.

Provision of research data and codes
A comparison of the two studies suggests that awareness of the provision of research data and codes hardly increased in the economic sciences between 2019 and 2023. As before, only just over a third of respondents ensure that data or codes are made available for their publications. This stagnating trend indicates that despite the ongoing discussions and initiatives to promote Open Science, the economic community has remained largely unchanged in its practice. The continued high number of those who do not attach importance to this aspect emphasises that considerable efforts are still needed to embed the importance of Open Science practices throughout the research community.

Use of analytics software
A comparison of the survey results from 2019 and 2023 primarily shows constants with regard to the use of software for data analyses. A consistent preference for the use of free or open source software, especially R, is evident throughout both years, which indicates a continued appreciation of independence from commercial providers and the promotion of the reproducibility of research results. Sharing research data and code also remains a key aspect of the scientific community, with platforms such as GitHub or specialised repositories underlining the commitment to transparency and collaboration.

Motivation for publishing in Open Access
Recognition of the importance of Open Access as a means of disseminating one's own scientific findings is consistently strong, with an even greater awareness of and commitment to Open Access in the scientific community evident in 2023. In both 2019 and 2023, there are differences in Open Access behaviour between different academic positions and types of institutions, with professors at universities tending to have a higher level of participation in Open Access publications. To summarise, the data indicates an increase in the advocacy and implementation of Open Access publications, with a stronger emphasis on personal conviction and external requirements as motivations.

Barriers and incentives for Open Science
The analysis of barriers and incentives for Open Science shows both constants and changes between 2019 and 2023. The lack of time to engage with Open Science practices was highlighted as a key barrier in both 2019 and 2023. In both years, a third of respondents stated that time constraints were a serious hurdle. This consistency emphasises that structural changes are necessary to facilitate the implementation of Open Science.

In terms of financial resources, there was a shift in perception between the years. While in 2019 around a minority of respondents saw additional costs as a barrier, in 2023 this appears to be a greater obstacle, particularly in business studies at specialized higher education institutions, which is underpinned by the highest mean value given for financial constraints. This shift could indicate increased publication costs or changing financial conditions that require specific support and funding solutions.

Legal hurdles, which were previously only considered a problem by a small minority of respondents, are in the spotlight in 2023 and are now seen as the biggest obstacle to the implementation of Open Science. This change indicates that legal concerns may have increased or that their impact is now more noticeable. This could indicate an increasing complexity of the legal framework or an increased sensitisation to legal issues. It could also be that more researchers are now using data for which the legal conditions for making it available are complex.

Fears of theft of ideas and competitive disadvantages have remained at a consistently low level over the years. This shows that, despite progress in the openness of scientific practice, concerns about the protection of intellectual property remain.

The incentives for Open Science have hardly changed over time. Recognition continues to be the main motivator, which takes different forms depending on the status group. This suggests that more multidimensional recognition systems need to be developed in order to address the different needs and motivations of researchers.

7.2. Conclusions

This study on the application of Open Science practices in economic sciences offers several profound implications for the further development of the discipline.

Firstly, the growing importance of empirical research emphasises the need to improve access to data and software. The study shows that the majority of respondents work with data, but less than half of respondents value the free accessibility of this data. This is in line with the findings of Ambrasat and Heger (2020), who also found a discrepancy between support for Open Data and the actual active provision of data. Institutions and funding organisations should therefore create even more incentives than before to support the collection and provision of research data. This could be done by promoting data infrastructures and providing resources for data preparation and analysis, as recommended by the European Commission (2021) and already being prepared in the NFDI consortia.

Secondly, the high value placed on credibility and transparency in research shows that open scientific practices are increasingly regarded as standard. In addition, the present results indicate that the reproducibility of research, especially at universities, is an important A for researchers to implement open practices. The publication of data and codes should therefore be systematically encouraged by institutions setting clear guidelines and incentives, as currently promoted by COARA. This could be done by integrating Open Science criteria into evaluation and promotion systems and by providing financial support for Open Access publications.

Thirdly, the increased use of Open Access literature emphasises the importance of free and comprehensive access to scientific knowledge. The study shows that many economic researchers are specifically looking for freely accessible literature, which is a positive development. The Open Access share of journal publications is around one third. The main reasons given for not publishing in Open Access are that the chosen journal is not Open Access and that no funds are available for APC fees. A general rejection of Open Access could not be established. Politicians and the scientific communities should continue to work together to reduce the financial barrier to Open Access publications. This could be achieved through the increased establishment of publication funds and the intensified negotiation of Open Access agreements with publishers, as proposed by Kaier and Ginther (2017) and the Federal Ministry of Education and Research's Open Access strategy (2016) and as has been promoted by the ZBW for many years in the context of Open Access transformation agreements and consortium negotiations.

It also shows that legal and financial barriers continue to be significant obstacles, even more so at universities of applied sciences than at universities. The study confirms that legal hurdles (such as copyright and data protection) and financial restrictions (such as APCs) are the biggest barriers. This is in line with the findings of the European Commission (2021), which identify similar barriers. Increased efforts are needed to overcome these barriers by clarifying and harmonising legal frameworks and providing financial support for Open Science initiatives. The development of clear and understandable guidelines for dealing with copyright and data protection in research, especially in the context of AI applications, is essential.

Furthermore, the incentives for researchers to practise Open Science must be emphasised more strongly in communication than the barriers. A comparison of the response behaviour with regard to barriers and incentives shows that existing barriers are rated less relevant than a lack of incentives. The prospect of increased citation frequency, additional sources of funding and the recognition of these practices for academic careers are key motivating factors. In order to promote a broader acceptance and implementation of Open Science practices, the benefits, positive experience reports and added value for scientific careers should be specifically emphasised in communicative practice.

Finally, the study shows that there is a recognisable need for practical support and further training, especially among young researchers. For example, only half of economic researchers are aware of the principle of secondary publication, of which only around a third have already utilised it. The provision of training and advisory services by Open Science experts can support researchers in acquiring the necessary skills and knowledge to effectively implement Open Science practices.

To summarise, economic sciences is on a positive path towards greater transparency and openness. However, the further promotion and integration of Open Science practices requires targeted measures to overcome existing barriers and create a supportive environment that can fully realise the benefits of Open Science.

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9. Appendix

Questionnaire

Invitation mail

Subject: Study on Open Science in the economic sciences

Kiel, XX.XX.2023

Dear Mrs ...,
Dear Mr ....,

We at the ZBW - Leibniz Information Centre for Economics have been working intensively on the **Open Science transformation** in economic sciences for years.

We are currently very specifically interested in how **widespread Open Science practices** are **in your day-to-day research when** it comes to researching and accessing scientific literature or research data.

In this context, we would like to ask you to take part in **our empirical study.**

The survey is conducted online. Answering our predominantly closed questions takes around **10 minutes** in total. The survey runs until 28 April 2023 and every completed questionnaire helps us.

To access the survey, please click on the following link: zbw-survey.limesurvey.net/396952?lang=en

If you have any questions, please do not hesitate to contact us at zbw-umfrage@zbw.eu.
Thank you very much for your co-operation!

With best regards
Prof. Dr Klaus Tochtermann
Prof. Dr Marianne Saam

Intro

We would like to find out from you what role Open Science and Open Science practices play in your personal day-to-day work. Your answers will help us to expand our services in the context of Open Science and to better align them with your needs. We therefore ask you to take around 10 minutes to answer the following questions.

1) Application of open practices

Firstly, we would like to find out to what extent you have already used open practices in your day-to-day work.

RANDOMISE THE ANSWER OPTIONS FOR MULTIPLE ANSWERS

A1) Research & access to scientific literature and sources

A1a: Do you search specifically for freely accessible versions of publications that interest you?

Yes	No

If yes

Where do you look for these freely accessible versions? Text field

A1b: In publications (e.g. journals), do you specifically check whether data and code are available in addition to the article?

Yes	No

A1c: Do you use scientific blogs to find out about current topics in economic research?

Yes	No

A2) Research data

A2a: Do you work with data in your research?

Yes	No
Continue with A2.1	***continue with A3***

A2.1) Research & access

A2.1a) When selecting data for your research, do you ensure that it is freely accessible?

Yes	No

If yes

What are the reasons? (multiple answers possible)

- Because dealing with freely accessible data is easier.
- Because I don't have the funds for paid data.
- Because my organisation does not have access to chargeable data.
- So that my research can be reproduced by others.
- Further reasons: Text field

A2.2) Analysis & publication

A2.2a: Which software do you use for data analysis?

Please tick all that apply! (multiple answers possible)

- R
- STATA
- SPSS
- EXCEL
- Matlab
- More: Text field

A2.2b: Why do you use free / open source software?

Please tick all that apply! (multiple answers possible)

- I don't use free software.
- Because I don't have the funds for paid software.
- Because my organisation does not have access to paid software.

- Because it makes me independent.
- Because it facilitates the reproducibility of my research results.
- Because it's standard in my community.
- Further reasons: Text field

A2.2c: Do you publish your data and codes (as far as legally possible)?

Yes	No

A2.2d: Why would you publish your data and codes (as far as legally possible)?

Please tick all that apply! (multiple answers possible)

- Because my chosen magazine demands it.
- Because my third-party funder requires it.
- Because I want to make my research results more widely accessible.
- Because it increases the credibility of my research.
- Further reasons: Text field

A2.2e: Why would you <u>not</u> publish your data and codes (as far as legally possible)?

Please tick all that apply! (multiple answers possible)

- Because it is not required by my chosen journal.
- Because the effort is too great for me.
- Because I fear a competitive disadvantage.
- Because I don't see any added value in it.
- Because I don't see any added value for my academic career.
- Further reasons: Text field

A3) Publishing

A3a: Have you published articles in peer-reviewed journals?

Yes	No

If yes

- How many: Number
- How many of these are directly available with the publication in Open Access: Number

A3b: Have you published any articles in an edited volume/ book?

Yes	No

If yes

- How many: Number
- How many of these are directly available with the publication in Open Access: Number

A3c: Have you published any working papers so far?

Yes	No

If yes

- How many: Number

A3d: Why would you publish in Open Access?

Please tick all that apply! (multiple answers possible)

- Because my chosen journal publishes in Open Access.
- Because my third-party funder requires it.
- Because my organisation dictates it.
- Because I want to make my research results more widely accessible.
- Because publicly funded research should be publicly accessible.
- Further reasons: Text field

A3e: Why would you <u>not</u> publish in Open Access?

Please tick all that apply! (multiple answers possible)

- Because my chosen journal does not publish in Open Access.
- Because I have no funds for the author fees (APC).
- Because the results are already freely available as a working paper.
- Because I doubt the quality of Open Access journals.
- Because I don't see any added value in it.
- Because I don't see any added value for my academic career.
- Further reasons: Text field

A3f: Are you familiar with the concept of making publications freely accessible after an embargo period?

Yes	No

If yes

Have you already used this secondary publication option to make your own publications available?

Yes	No

If yes
Where do you make these secondary publications available? (multiple answers possible)

- Repository of my institution
- Repository in my discipline
- Social networks
- Own website
- More: Text field

A3g: How often have you already published articles in scientific blogs?

0	1-2	3-5	...

2) Barriers & incentives

B1: To what extent would the following reasons prevent you from using Open Science practices?

Likert scale (randomise answers)

- applies (1)
- rather true (2)
- undecided (3)
- rather not applicable (4)
- does not apply (5)

- I see no need for Open Science.
- I don't have the time to familiarise myself with this topic.
- I lack the support I need to familiarise myself with this topic.
- I fear theft of ideas and competitive disadvantages.
- Open Science practices are not honoured in my community.
- There are legal hurdles (copyright, data protection, sensitive information).
- I don't see any added value for my academic career.
- I lack the financial means to publish in Open Access, for example.

Further reasons: Text field

B2: To what extent would the following offers or incentives promote the use of Open Science practices in your organisation?

Likert scale (randomise answers)

- applies (1)
- rather true (2)
- undecided (3)
- rather not applicable (4)
- does not apply (5)

- If I could get practical support from Open Science experts.
- If I could get more information on the concrete application of Open Science practices.
- If my work received more attention outside of academia.
- If the number of citations of my publications would increase.
- If my published data and codes were also quoted and recognised.
- If I had better access to openly accessible research data myself.
- If I could tap into other sources of funding (third-party funds, publication funds, ...).
- If Open Science practices were recognised for my scientific career.

Further offers or incentives: Text field

3) Socio-demographic questions:

Finally, a few questions for the statistics.

S1: In which speciality do you work? (Only 1 answer possible)

- ECONOMICS
- BUSINESS STUDIES
- General Economics
- Other, namely: Text field
- not specified

S2: Where are you currently employed? (Only 1 answer possible)

- University
- University of Applied Sciences

- Private university
- Research Institute of the Leibniz Association
- Research institute outside the Leibniz Association
- Other, namely: Text field
- not specified

S3: What is your current academic qualification? (Only 1 answer possible)

- Professor
- Junior professor
- Private lecturer
- Postdoc
- Doctoral candidate
- Other, namely: Text field
- not specified

S4: How old are you? (Only 1 answer possible)

- under 25
- 25 - 30
- 31 - 35
- 36 - 40
- 41 - 45
- 46 - 50
- 51 - 55
- 56 and older
- not specified

S5: Which gender do you feel you belong to? (Only 1 answer possible)

- Male
- Female
- diverse
- not specified

4) Conclusion

E1: Can the ZBW support you even more with Open Science?

Yes, namely: Text field

No

Thank you very much!

We at the ZBW thank you very much for your contribution.

We expect to publish the findings from this study in 2023. Are you interested in the study report? Please contact us at zbw-umfrage@zbw.eu. We will be happy to send you the study report by e-mail.

I wish you another successful day.

Yours sincerely from Kiel and Hamburg
Dr Martina Grunow, Dr Doreen Siegfried and Dr Guido Scherp

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