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# The German Doctoral Candidates and Doctorate Holders Study ProFile

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## 1 Introduction and background

This paper provides an overview of the longitudinal data set of the German Doctoral Candidates and Doctorate Holders Study *ProFile* which is available for analysis to researchers interested in the topics of doctoral training and careers of doctorate holders.

ProFile was developed against the background of a lack of information with regard to the conditions of doctoral training and careers of doctorate holders in Germany and the aim to also provide decision makers from academia, science and science policy with a sound empirical basis, encourage debates and support them with data.

In Germany the focus of the discussion lies mostly on the structural weaknesses of doctoral training and its organization (Hauss et al. 2012: 12f) for instance mechanisms of quality assurance (Guth 2006; Wissenschaftsrat 1996; Wissenschaftsrat 2002; Wissenschaftsrat 2011; Hochschulrektorenkonferenz 2012; Landeshochschulkonferenz Niedersachsen 2014) and the general supervision situation of doctoral candidates and their dependence on professors which is dominated in Germany by the master-apprentice model (Berning/Falk 2005; Schmidt/Richter 2008). Another important topic is the funding and

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employment status during doctoral candidacy, their influence on time to degree and successful conferral of the PhD together with the subsequent occupational perspectives, placement and professional career (Enders/Bornmann 2001; Jaksztat/Schindler/Briedis 2010; Jaksztat/Preßler/Briedis 2012; Konsortium Bundesbericht Wissenschaftlicher Nachwuchs 2013). Furthermore, questions of adequate qualification are considered in terms of specific requirements of the academic and non-academic job market including competence acquisition and development (Schaeper/Briedis 2004; Vurgun 2016). Recently, the discussion has been shaped by the various emerging ways to the doctorate, for example as member of a structured doctoral program (SDP) and different traditional and non-traditional formats such as the research doctorate, the taught doctorate, PhD by published work, joint doctorate or new route doctorate (Green/Powell 2005; Bao/Kehm/Ma 2016) with ProFile facilitating analysis on those trending topics of international research, too.

ProFile was initiated by the Institute for Research Information and Quality Assurance (Institut für Forschungsinformation und Qualitätssicherung, iFQ) which is now part of the German Centre for Higher Education Research and Science Studies (Deutsches Zentrum für Hochschul- und Wissenschaftsforschung, DZHW).<sup>1</sup>

Since the beginning of the study in 2009 seven cohorts of doctoral candidates from selected German universities, graduate schools and scholarship providers have been surveyed on an annual basis until they completed or dropped out of their doctoral training and once after the conferral of their doctorate.

Designed as a service-oriented research project the goal pursued by the German Doctoral Candidates and Doctorate Holders Study ProFile is twofold: First, to provide a proper data base for doctoral education in Germany that can be used for a variety of research questions with regard to young scientists and second, to serve as a monitoring and evaluation tool for the participating institutions (see Table 1) based on annual reports which include benchmarks and results for institution specific questions.

In the following, ProFile's study design, the data set, the analytic potential and data access conditions will be described.

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<sup>1</sup> As of January 2016 the iFQ is part of the German Centre for Higher Education Research and Science Studies (DZHW). Here, it continues its work as Research Area 2 "Research System and Science Dynamics".

**Table 1:** Participating institutions and years with data delivery.

Type of institution	Participating institution
Universities	Humboldt-Universität zu Berlin (2009–present), University of Kassel (2010, 2014–present), Heidelberg University (2009–present), Freie Universität Berlin (2009–present), Friedrich Schiller University in Jena (2009–present), Leibniz Universität Hannover (2009–present), University of Osnabrück (2009–present), Otto von Guericke University of Magdeburg (2011–present), Goethe Graduate Academy at Goethe University Frankfurt (2012, 2014–present)
Graduate schools	Hartmut Hoffmann-Berling International Graduate School of Molecular and Cellular Biology (2009–present), International Graduate Centre for the Study of Culture (2009–2010), Graduate School for Advanced Manufacturing Engineering (2009–2010), Erlangen Graduate School in Advanced Optical Technologies (2009–2010), International Graduate School of Science and Engineering (2009–2010)
Scholarship providers	German National Academic Foundation (Studienstiftung des Deutschen Volkes, 2009–present), Heinrich Böll Foundation (2012–present), German Academic Exchange Service (Deutscher Akademischer Austauschdienst, DAAD, 2012–present)*
Research funding organization	German Research Foundation (Deutsche Forschungsgemeinschaft, DFG): Research Training Groups and Collaborative Research Centres (2009–2011)

Note: \*Scholarship holders in cooperating programs, individually funded ones intending to obtain a doctorate at a German University as well as scholarship holders funded in the program IPID (International Promovieren in Deutschland).

## 2 Study Design

### 2.1 Sampling Design

Registration procedures of doctoral candidates differ from university to university, since registration of doctoral candidates is not mandatory in Germany.<sup>2</sup> The German Federal Statistical office published two studies in 2012 and 2016 that estimate the number of doctoral students (Wolters/Schmiedel 2012; Hähnel/Schmiedel 2016). However, these estimations were not intended to function as

<sup>2</sup> The current amendment of the university statistics act (Hochschulstatistikgesetz) strives to improve the nationwide registration of doctoral candidates and thus the data base for the assessment of the total number of doctoral candidates in Germany (Bundesministerium für Bildung und Forschung 2015).

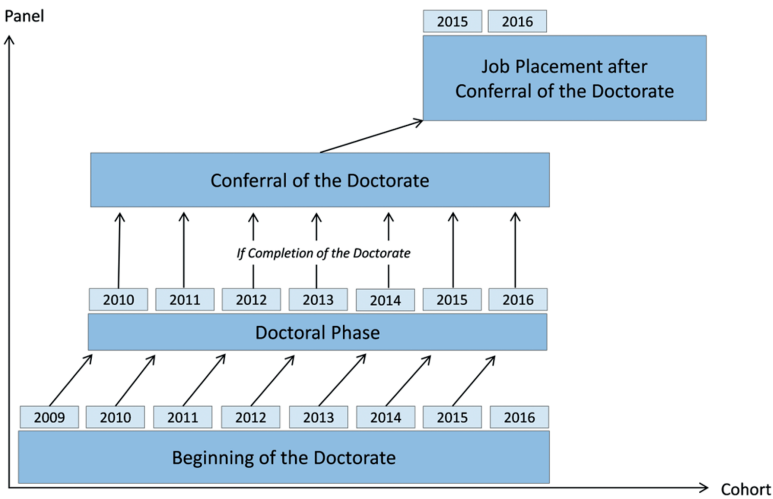
a selection frame for sampling and the underlying total population of doctoral candidates remains unknown. Thus, drawing a simple random sample is not possible (Fräßdorf/Fräßdorf 2016). Therefore, several universities, graduate schools and scholarship providers were contacted before the ProFile survey started in 2009 in order to get access to registers of doctoral candidates. The selection of participating institutions was primarily driven by the intention to reflect heterogeneity in contextual factors, respectively settings, in which a doctorate might be pursued and obtained and to yield sufficient sizes of sub-samples for comparative analysis. The sample of universities was therefore intended to vary in terms of size, composition of disciplines and geographical location (Hauss et al. 2012: 49). In addition, the selection was also influenced by the fact that the respective institution needed to be willing to participate in the project and capable of assessing and transmitting the relevant data of their doctoral candidates (Hauss et al. 2012: 51). The participating institutions annually submit contact data of their doctoral candidates (encompassing email address, name, year of birth, gender and discipline). Even though the participating institutions were not sampled randomly, the selection of participating institutions in ProFile basically follows the logic of a cluster sampling where ProFile attempts full coverage at the level of the participating institutions – the primary sampling units – listed in Table 1.

## 2.2 Survey design

The study follows a panel design in the sense that it ideally surveys a doctoral candidate at the beginning of his or her doctoral candidacy, at least one time during the doctoral candidacy, at the conferral of the doctorate and once after the conferral of the PhD as illustrated in Figure 1. Every year, a new cohort of doctoral candidates is added to the survey.

The study foresees three surveys which are conducted by the DZHW: the Initial Survey, the Evaluation Survey and the Follow-Up Survey. Participants are invited through a personalized link to the online questionnaire via a bilingual email with English and German being the available survey languages.

The Initial Survey targets doctoral candidates who participate in ProFile for the first time. Even though the Initial Survey targets doctoral candidates at the beginning of their doctoral candidacy, due to the lacking necessity of prompt registration at universities, not all persons delivered are doctoral candidates. Instead, the data also contain persons who recently completed their doctorate or persons who stopped working on their doctorate (drop outs). About 5% of the respondents in the Initial Survey are doctorate holders and less than 1% report



**Figure 1:** ProFile longitudinal design.

that they quit their PhD. The yearly Evaluation Survey focuses on persons who already participated in ProFile and stated that they are still doctoral candidates in the previous Evaluation or Initial Survey or those who completed their doctoral training in the meantime. The Follow-Up Survey targets doctorate holders who participated in ProFile at least once and completed their doctoral candidacy.<sup>3</sup>

## 2.3 Questionnaire Design

Since the status of the respondent is unknown prior to the invitation to the Initial and Evaluation Surveys, event triggered questionnaires have been implemented. Depending on the actual status of their doctoral project, which is assessed in the beginning of the Initial and Evaluation Survey, respondents are directed to varying questionnaires as depicted in Table 2. Thus, the status of the doctoral project serves as key variable for routing the participant to the correct questionnaire.

<sup>3</sup> The Follow-Up Survey in 2015 questioned doctorate holders who had indicated the completion of their doctoral candidacy in any Initial or Evaluation Survey between 2009 and 2014, meaning that the award of the doctorate can date back several years. The Follow-Up Survey in 2016 additionally questioned doctorate holders who reported their conferral of the doctorate in the Evaluation Survey 2014 or Initial Survey 2015 but had not participated in the Follow-Up Survey 2015.

**Table 2:** Overview of ProFile questionnaires implemented in the ProFile surveys.

	Initial survey	Evaluation survey	Follow-up survey
Doctoral candidate	Initial Questionnaire for Doctoral Candidates (PI)	Evaluation Questionnaire for Doctoral Candidates (PE)	
Doctorate holder	Initial Questionnaire for Doctorate Holders (PtI)	Evaluation Questionnaire for Doctorate Holders (PtE)	Follow-Up Questionnaire (FQ)
Drop out	Questionnaire for Drop Outs (A)		

The shaded cells in Table 2 display the questionnaires a ProFile participant ideally answers: The *Initial Questionnaire for Doctoral Candidates (PI)* focuses on information on the educational background, motives for a candidature, the supervision situation, the quality of courses offered, resources and questions about how doctoral candidates finance themselves during their doctoral candidacy. If the respondent’s status of the doctoral project does not change during the next year he or she receives the *Evaluation Questionnaire for Doctoral Candidates (PE)* which aims at generating more information about the (possibly changing) conditions of their doctoral training. Conceptualized as a short questionnaire between the beginning and the conferral of the doctorate, it primarily considers changes in individual funding and supervision. If respondents indicate to have completed their degree, they receive the *Evaluation Questionnaire for Doctorate Holders (PtE)* which determines the successful conferral of the doctorate as well as job-related aims and perspectives. After the doctorate is finished, the *Follow-Up Questionnaire (FQ)* focuses on job placement in and outside of academia as well as career trajectories after the conferral of the doctorate. It also aims at gaining more insight into job satisfaction, possible job strains and adequate occupation within or outside of academia. Table 3 gives a brief overview of the single topics covered in the different questionnaires.

### 3 Data Set

#### 3.1 Number of Respondents

Altogether 15,649 doctoral candidates participated at least once in an Initial Survey from 2009 to 2015. Nearly half of them could be surveyed in an Evaluation Survey afterwards, from which 3,271 were questioned about their

**Table 3:** Topics of the ProFile questionnaires.

Topics	Questionnaires
<b>Educational biography</b>	
Higher education entrance qualification	<i>PI, Ptl, A</i>
University degree	
Vocational training qualification	
Former doctoral project	
<b>Doctoral project</b>	
Name of the university of doctoral project	<i>PI, Ptl (in retrospect), A</i>
Discipline	
Thesis by publication/monograph	
Time to degree	
Candidate's motivation to start the PhD	
Difficulties encountered during doctoral project	
Type and characteristics of structured doctoral program	<i>PI, Ptl (in retrospect), A, PE</i>
Time use/time management	
Scientific output (publications, conference presentations)	
Job offers during doctoral candidature	
Supervision	
Courses offered	
Research stays in Germany and abroad	
Financing and monthly household income	
Vocational goals and aspirations	
Intention to habilitate	
Aspired occupation	
Engagement at universities	
Teaching activities	
Reasons for interruptions and duration	
<b>Drop out</b>	
Reasons for drop out	<i>A</i>
<b>Conferral of doctorate</b>	
Information on successful completion of the doctorate	<i>Ptl, PtE</i>
<b>Job placement</b>	
Professional status	<i>FQ</i>
Work field	
Job description	
Specific questions depending on professional status	
Job search	
Vocational prospects	

(continued)

Table 3: (continued)

Topics	Questionnaires
Outcome	
Honorary office	
Socio-demographics & personal information	
Skills & abilities	<i>PI, Ptl</i>
Self-efficacy	
Personality (Big Five)	
Individual risk attitude	
Demography	<i>Fixed variables (e. g. gender, year of birth) once. Children and partnership in every survey.</i>

Note: Institution specific questions are not listed in this table.

conferral of the doctorate. Up to now, 1,554 individuals were surveyed at all stages of their doctoral project (see Table 4). Since ProFile is still ongoing, this number of respondents will increase. As mentioned above, a few respondents are already doctorate holders in the Initial Survey and receive a specific questionnaire which surveys the beginning of the doctorate in retrospect and are questioned in the Follow-Up Survey, too.

Table 4: Number of respondents in surveys (2009–2015).

Initial survey		Evaluation survey		Follow-up survey	
Doctoral candidates (PI)	Doctorate holders (Ptl)	Doctoral candidates (PE)	Doctorate holders (PtE)	Doctorate holders (FQ)	Doctorate holders (FQ)
				from Evaluation survey	from Initial survey
15,649	1,352	7,082	3,271	1,554	574

Source: ProFile data, own calculations 2016.

Note: Respondents are persons, who either completed the questionnaire or dropped out of it, but answered the status question at least.

## 4.2 Sample composition

The fact that besides universities also graduate schools and scholarship providers serve as primary sampling units doctoral candidates from these types of institutions are oversampled in the ProFile data. This was anticipated in order to allow



in-depth analyses for these subgroups. Therefore, three samples need to be distinguished. Specific analyses on stipends can be run using the *stipend sample* which consists of doctoral candidates from graduate schools and scholarship providers exclusively. For analyses that are not solely focused on stipends the *uni sample* can be used. It consists of doctoral candidates at participating universities including scholarship holders from the participating graduate schools and scholarship providers, in case those doctoral candidates intend to graduate from one of the participating universities. The ones not intending to graduate from the participating universities are excluded from this sample. Both samples overlap in the parts of scholarship holders intending to graduate from participating universities. Taking into account the oversampling of stipends in the analyses, it is also possible to use the *full sample*. However, for descriptive statistics it is recommended to use the *uni sample* to avoid bias. Table 5 gives an overview of the number of respondents in the three samples for the Initial Surveys. The variation in the sample sizes results from changes in the composition of the participating institutions.

**Table 5:** Composition of respondents in uni, stipend, and full sample for the initial surveys.

	Uni sample	Stipend sample	Full sample
2009	1,081	1,551	2,463
2010	1,134	657	1,697
2011	1,137	1,028	2,050
2012	1,055	1,174	2,095
2013	1,442	725	2,085
2014	2,071	870	2,836
2015	1,527	999	2,423
Total	9,447	7,004	15,649

Source: ProFile data, own calculations 2016.

### 4.3 Data Quality

Data quality is ensured by means of data monitoring and error correction at different stages. At the stage of data delivery the whole contact data delivered by the participating institutions is checked and corrected for duplicates.<sup>4</sup> During

<sup>4</sup> Since it is theoretically possible that one and the same doctoral candidate is reported by two different participating institutions, duplicates are identified by a routine based on names, email addresses, discipline and year of birth.

field phase three reminders are sent and bounced email addresses are researched manually and invited again to increase response rates.<sup>5</sup> In addition, respondents were provided with results from the survey in order to show its value and increase panel commitment. The response rates vary between 20 % and 40 % for Initial Surveys, 30 % and 50 % for Evaluation Surveys and over 50 % for Follow-Up Surveys.<sup>6</sup> After data collection data editing includes anonymization, plausibility checking, coding of missing values and editing of central variables.

Furthermore, external validation was conducted on the level of the participating institutions and on the level of the whole sample. On the level of participating institutions the distributions of the data provided (gender, year of birth and discipline) and the data collected in the Initial Surveys are compared. On the level of the whole sample the *uni sample* of the Initial Survey 2015 can be compared with up-to-date official results of the Federal Statistical Office (Hähnel/Schmiedel 2016) which estimated the number of doctoral candidates at German universities by means of a two stage random sample where professors (as supervisors) and then doctoral candidates were asked to participate. The study concluded that there were about 196,200 doctoral students in Germany in winter semester 2014/2015. The comparison of the ProFile uni sample with the current results of the Federal Statistical Office is depicted in Table 6.<sup>7</sup>

## 4 Analytic Potential

Currently, ProFile is the only survey in Germany that covers all disciplines,<sup>8</sup> different types of doctorates (e.g. PhD by published work and taught

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**5** Response rate is the quotient of the respondents and the net subpopulation (gross subpopulation adjusted for persons without valid/undeliverable email addresses) multiplied by 100.

**6** The participating institutions differ in terms how data is transmitted to ProFile. The opt-in data procedure requires that doctoral candidates at the participating institutions give consent that their data is delivered to the DZHW. Partners with complete data submission transfer contact data of all their candidates to the DZHW without prior consent. The data collection procedure has consequences for the response rates: The opt-in procedure produces higher response rates.

**7** Comparisons with results of an earlier estimation of the Federal Statistical Office of doctoral candidates in Germany in winter semester 2010/2011 by Wolters/Schmiedel (2012) with ProFile data also displayed only small differences concerning the distribution of candidates by gender and discipline (Hauss et al. 2012: 53).

**8** Doctoral candidates from medical faculties are not included in the ProFile sample. This is in line with concerns that an unknown number of German doctoral degrees in Medicine may not

**Table 6:** Doctoral candidates in official estimation and in ProFile by discipline and gender.

	Doctoral candidates winter semester 2014/2015 estimation of Federal Statistical Office in %			Doctoral candidates ProFile participants in Initial survey 2015 in %		
	Women	Men	Total	Woman	Men	Total
Linguistics and Cultural Studies	61.0	39.0	18.0	59.9	40.1	25.0
Law, Economic and Social Sciences	43.0	57.0	17.0	48.9	51.1	14.6
Sports	/	/	/	60.0	40.0	0.3
Mathematics, Natural Sciences	41.0	59.0	30.0	47.3	52.7	43.6
Medicine/Health Sciences	58.0	42.0	10.0	64.7	35.3	1.1
Veterinary Medicine	/	/	/	72.7	27.3	2.9
Agricultural, Forestry and Nutritional Sciences	58.0	42.0	2.0	62.8	37.2	2.8
Engineering Sciences	21.0	79.0	19.0	23.6	76.4	7.0
Fine Arts, Art History	64.0	36.0	2.0	73.7	26.3	2.5
Other Discipline	/	/	/	0.0	100.0	0.1
Total	44.0	56.0	100.0	51.1	48.9	100.0

Note: Values for Sports, Veterinary Medicine and Other Discipline were not reported in Hähnel and Schmiedel 2016. Source: Hähnel/Schmiedel 2016: 25ff, ProFile data, own calculations 2016.

doctorates) and at the same time spans different universities and funding organizations.

ProFile facilitates the analysis of changes and trends over time by comparing cross-sectional data of different cohorts and also longitudinal analysis of individual doctoral candidates and doctorate holders.<sup>9</sup> Due to the longitudinal survey design of ProFile the candidates' progress can be ideally traced from the

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be equivalent to an ISCED-8 degree and instead more closely resembles an ISCED-7 degree (Wissenschaftsrat 2002: 11). However, neighboring disciplines to Medicine are included in the ProFile sample (e. g. Human Biology, Health Sciences). The discipline contained in the data is based on an open answer in the survey. In case someone indicates to work on a medicine related topic this person receives the respective coding for Medicine.

<sup>9</sup> Due to the very low number the ProFile data are not suitable for the analysis of drop outs. It is known that the number of drop outs in surveys is not representative. Estimates assume that 50 % of doctoral candidates do not finish their doctoral training (Burkhardt 2008: 176ff).

start of the doctoral candidacy to job placement after the conferral of the doctorate on an individual level. This long term monitoring makes it possible to detect changes over time whilst taking into account and controlling for individual factors as well as structural determinants that shape doctoral training and subsequent (research) careers.

To exploit the longitudinal data in particular, sequence and cluster analyses can be run, for example to reconstruct typical financing patterns, occupational transitions or mobility. In addition, event history analysis (e. g. to assess the time to degree) or multi-level analysis using information on discipline and university are possible. The ProFile data can also be linked with information from the European Tertiary Education Register (ETER) or the Leiden Ranking facilitating more in-depth analysis.<sup>10</sup>

Using the ProFile data, different topics concerning doctoral candidates and doctorate holders were explored during recent years. An extensive overview of results based on the diverse topics covered by the ProFile Study can be found in Hauss et al. (2012). Furthermore, the ProFile data were used to investigate the role and identity cultures of doctoral candidates in Germany (Kaulisch/Hauss 2012), the quality of doctoral candidacy (Hornbostel/Tesch 2014), the financing and employment situations of doctoral candidates (Fräßdorf/Kaulisch/Hornbostel 2012), the intention to enter an academic career (Hauss/Kaulisch/Tesch 2015), the specific situation of the doctoral candidacy in law (Tesch 2015) and the potentials of an empirical foundation of counselling services for future doctoral candidates (Fräßdorf/Hornbostel 2012). With a view to structured doctoral programs inherent expectations (Hauss/Zinnbauer 2011), the supervision situation (Hauss/Kaulisch 2012; Briedis et al. 2013) and the promotion of equal opportunities (Kaulisch 2011) were analyzed.

## 5 Data access

The ProFile data have been processed with funding from RISIS<sup>11</sup> in order to make it available to the scientific community. As a European data and

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<sup>10</sup> The purpose of ETER is to build a register of Higher Education Institutions (HEIs) in Europe, providing data on the number of students, graduates, international doctorates, staff, fields of education, income and expenditure as well as descriptive information on their characteristics. Currently, aggregated information are available for 2254 HEIs (<http://risis.eu/data/eter-dataset/>). The Leiden Ranking offers insights into the performance and scientific collaboration of 800 major universities worldwide based on bibliometric information and indicators (<http://www.leidenranking.com/>).

<sup>11</sup> Research Infrastructure for Research and Innovation Policy Studies (<http://risis.eu/to>)

networking initiative, whose central objective is to combine and ensure access to different data sets, RISIS aims at building up a distributed infrastructure on data relevant for research, innovation dynamics and policies.

Interested researchers can apply for an on-site visit at DZHW in Berlin via the respective RISIS platform<sup>12</sup> to get access to the ProFile data in the form of individualized Scientific Use Files (SUFs) that will be generated based on their specific interests and request. For this, they will have to undertake a two-step process: first, they have to register and sign the charter of good practice (accreditation) and then pass a review and selection process for their proposed project which is executed by the dataset producers and the RISIS project review board. Successful applicants from universities or research institutions outside of Germany may also apply for travel and accommodation funding through RISIS. The RISIS platform also contains relevant information on the ProFile data (e.g. data documentation, questionnaires). More information on the ProFile Study can also be found on the respective project homepage (<http://www.forschungsinform.de/profile/start.html>). Direct contact persons for further questions regarding the data set and conditions for guest researcher stays are Janine Lange ([lange@dzhw.eu](mailto:lange@dzhw.eu)) and Jakob Tesch ([tesch@dzhw.eu](mailto:tesch@dzhw.eu)).

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<sup>12</sup> <http://datasets.risis.eu/>

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