

# Careers of Doctorate Holders in the Netherlands, 2014

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# 1. Introduction

## 1.1 Doctorate holders

Doctorate holders (PhDs) are the highest educated group and are therefore considered to be very important in the advancement of knowledge-based activities and innovative practices. As this makes them important players on the labour market, it is important to collect data on their characteristics and career trajectories [1].

## 1.2 CDH-Project

The Careers of Doctorate Holders (CDH) project was initiated by the Organisation for Economic Co-operation and Development (OECD) in collaboration with Unesco's Institute for Statistics (UIS), and the statistical office of the European Union (Eurostat). The project aims to develop internationally comparable indicators on the careers and mobility of doctorate holders.

In order to be able to compare data from various participating countries, the project partners have set guidelines to be used in the various national surveys [1].

## 1.3 The 2014 survey

Statistics Netherlands carried out the Dutch CDH survey in February and March 2014. The Dutch CDH survey is a dedicated survey, based on the model questionnaire provided. The contact person for CDH statistics in the Netherlands is Francis van der Mooren (f.vandermooren@cbs.nl).

# 2. Methodology

## 2.1 Survey frame

In 2010 a frame was compiled based on PhD records provided to Statistics Netherlands by Dutch universities. This frame was supplemented with information from doctorate holders who received their degree after 2010 and also from two Dutch universities not involved in the 2010 survey. As the data provided in 2010 varied substantially, this time a uniform format was used to streamline the information.

The following data were available for most of the doctorate holders:

1. Given name(s)
2. Last name
3. First name
4. Date of birth
5. Sex
6. Year of doctorate degree

The target population of the CDH survey consists of doctorate holders who

- were awarded their degree by a Dutch university in the academic year 1990/'91 or later,
- are younger than 70 years,
- are resident in the Netherlands, and
- were registered in the Municipal Population Register on 1 December 2013.

## 2.2 Reference date

The reference date is 1 December 2013.

## 2.3 Classifications and definitions

Statistics Netherlands used the guidelines and model questionnaire provided by the three collaborative organisations, so the Dutch results can be compared with those from other countries. The main variable definitions and classifications used are:

### Doctorate holder

A doctorate holder is defined as a person with an advanced research qualification, in possession of an ISCED 2011 level 8 degree.

In the Dutch survey only persons who have followed programme focusing on scientific research (ISCED 2011 code 844) and those who have obtained their doctorate at a Dutch university are included. Information about doctorate holders who received their degree in a foreign country is not available.

### Employed

People resident in the Netherlands who have a paid job.

### Employee

A person who has a contract with an economic unit to carry out work in return for financial remuneration.

### Full-time/part-time

Persons usually working for less than 30 hours a week are considered to work part-time.

### Inactive

People not included in the labour force.

The labour force includes:

- persons who work;
- persons who have accepted a paid job but not yet started work;
- persons willing to work, who are available to work and are actively seeking work.

The employed labour force includes all persons who work. The unemployed labour force includes all persons unemployed.

### Gross annual earnings

Gross annual earnings include remuneration in cash and in kind during the year, before tax and social-security deductions.

### **Gross time to completion of doctorate**

Number of months from the start of the advanced research qualification and the award of the degree.

### **Permanent job**

A job based on a contract between an employer and an employee for an indefinite period of time.

### **Post-doc**

A person employed as a researcher with a temporary contract, in his/her first job after receiving his doctorate degree. Completion of this advanced research qualification is no longer than ten years previously.

### **Researcher**

A professional engaged in the conception or creation of new knowledge, products, processes, methods and systems and also in the management of the projects concerned. The numbers presented here differ from those in previous Dutch studies as a result of methodological differences related to the LFS. In the current survey, respondents were asked whether they were employed as a researcher as defined above. In the previous surveys, respondents were not explicitly asked whether they were researchers. Instead, research occupations were identified on the basis of Statistics Netherlands' standard classification of occupations.

### **Resident status**

Formal situation regarding the residency of a non-Dutch person in the Netherlands.

### **Self-employed**

Someone who works in their own company or practice, or in the company or practice of their partner or parents.

### **Temporary job**

A job based on a contract between an employer and an employee for a specified limited period of time.

### **Unemployed**

A person without work, who is actively looking for paid work and is directly available to work.

## **2.4 Data collection**

The CDH methodological guidelines present a number of potential data collection methods, but do not express a preference for one particular one. Statistics Netherlands decided to use online accessible web-questionnaires (CAWI). Although CAWI response is generally not as high as response in CAPI or CATI surveys, as all the respondents in this survey are highly educated and used to working with computers Statistics Netherlands assumed that they would have no difficulty completing a web-questionnaire.

Data collection took place from 3 February to 17 March 2014. The target population received a written invitation to take part in the survey and a link to the website on which they could access it. Two written reminder letters were sent to increase the response rate.

Dutch universities shared their PhD records with Statistics Netherlands and transferred

personal data of 65 thousand doctorate holders. This is the number before selection of the target population. These data were used to acquire the current addresses of doctorate holders from the Dutch municipal population register, resulting in a total of over 31 thousand doctorate holders being invited to participate in the survey. Over 16 thousand of them responded and were included in the target population. Figure 2.4.1 shows this breakdown.

### 2.4.1 Response breakdown

	<b>Total</b>
Number of doctorate holders for whom data were received from Dutch universities	64 766
Number of doctorate holders with PhD award date within survey period	55 047
Number of doctorate holders for whom name, date of birth and place of birth were retrieved from the Dutch municipal population register	37 209
Number of persons belonging to the target population	32 506
Number of persons invited to take part in survey	31 952
Non-response	15 483
Respondents	16 463
Respondents not in target population	37
Respondents in target population	16 426

## 2.5 Weighting process

In principle, everyone in the target population was invited to take part in the survey. In practice not everyone could be approached because of problems with the sampling frame: 32,506 records matched the municipal population register of which 31,952 could be approached, and of these 16,463 people responded.

A two-step weighting process was applied to generate estimates for the entire population. The first step corrected for possible selectivity caused by non-response and the 554 persons who were not approached. Population register variables could be used for this step. The weighting model included the following variables:

- university
- sex
- personal income
- academic year of doctorate degree
- age on reference date
- marital status
- ethnicity
- region

The full weighting model is as follows:

University x {sex + personal income + academic year of doctorate degree + age + marital status + ethnicity + region}

Crossing all weighting terms with university assures that the corresponding weighting terms are correct at university level. This means, for instance, that not only the number of men and women in the weighted sample corresponds with the population, but this is also true for each university. After this step the weights sum up to 32,506.

The second step in the weighting process corrected for the part of the target population which could not be approached because of unsuccessful matches in the population register. As only variables supplied by the universities can be used for this step, the weighting model is simpler:

University x {sex + academic year of doctorate degree}.

After this step the weights sum up to 44,665.

In 2014 more detailed information about population register matches was available than in 2010. A lot of effort was put into constructing a sampling frame for the weighting process. In particular, estimations were made for the part of the sampling frame with no matches to the population register. It turned out that relatively fewer persons in this group belonged to the target population than in the part that did match. In 2010, the assumption was made that the percentage of the doctorate holders who had left the Netherlands or died was similar in both the matching and non-matching parts. This is not the case, and in retrospect the estimated number of doctorate holders in 2010 was a little too high.

## 2.6 Use of register-based information

Because of their objective nature and for reasons of efficiency, registers are the preferred source of information. Therefore, for this study, we used information from the Dutch longitudinal municipal population register (MPR-L, in Dutch *Gemeentelijke Basisadministratie* or GBA), registers of the Dutch tax authority and the Business Register.

### Longitudinal municipal population register

Only doctorate holders recorded in this register were included in the target population. Data from this register, such as sex, date, and country of birth, are objective and official. In divergence from the 2010 study, the current CDH survey used the following variables from the MPR-L to pool information on doctorate holders' background: sex, age class, country of birth, and citizenship. Additional variables from the MPR-L incorporated in the survey results were number of children in the household and age of youngest child in the family.

### Tax authority registers

Under the Statistics Netherlands' Act, Statistics Netherlands has full access to all sorts of registrations. Just as in the previous CDH survey therefore, income data – in this case concerning gross median and average annual income of doctorate holders – were not collected from respondents, but from the Dutch tax authority.

### Employee Insurance Agency's policy administration

Information about sectors of industry in which doctorate holders were employed was retrieved from the UWV policy administration (in Dutch *polisadministratie*). The Employee Insurance Agency (*UWV*) makes this register available to Statistics Netherlands. As these registers do not contain information about self-employed persons and employees working outside the Netherlands, Statistics Netherlands included a question in the CDH survey about sector of employment for these doctorate holders.

## 2.7 Previous CDH data

The 2006 CDH survey was based on the Labour Force Survey (LFS) frame, while the 2010 and 2014 CDH surveys were carried out independently.

The Labour Force Survey (LFS) includes information about previous and present education, employment situation and household characteristics. All other information requested for the tables was taken from registrations. As the LFS has proven to be insufficient to provide

all the required data, from reference year 2009 onwards the CDH survey was carried out as a dedicated survey, with some methodological modifications and resulting differences in the number of doctorate holders (see Table 2.7.1. for an overview).

Compared to the 2010 survey, two extra universities were included this year. However, because of the new weighting process, the weighted number of doctorate holders is almost the same in both surveys (see section 2.5).

### 2.7.1 CDH Surveys in the Netherlands

Survey name	CDH 2006	CDH 2010	CDH 2014
Reference year	Average of 2004, 2005 and 2006	2009	2013
Data sources	Dutch Labour Force Survey (LFS) and registrations	CDH survey and registrations	CDH survey and registrations
Survey mode	CAPI	CAWI	CAWI
Questionnaire	LFS questionnaire	CDH questionnaire	CDH questionnaire
Target population	All doctorate holders younger than 70 living in the Netherlands in 2005, excluding institutional population	All doctorate holders younger than 70 with a PhD from a Dutch university in 1990 or later, living in the Netherlands on 1 August 2010	All doctorate holders younger than 70 with a PhD from a Dutch university in 1990 or later, living in the Netherlands on 1 December 2013
Universities covered	All universities	All Dutch universities, except Tilburg University and University of Amsterdam	All Dutch universities
Identification of doctorate holders	Sample survey	Dutch universities' registrations	Dutch universities' registrations
Number of doctorate holders in survey (unweighted)	1 760	10 326	16 426
Number of doctorate holders in survey (weighted)	72 000	43 100	44 324
Doctorate holders with foreign PhD	Included	Not included	Not included
Data delivery to OECD, Eurostat, Unesco	Project Careers of doctorate holders 2006	Project Careers of doctorate holders 2010	Project Careers of doctorate holders 2014

## 2.8 Modifications in CDH 2014 compared with CDH 2010

The model questionnaire was used for CDH 2014, with adjustments to some questions for the Dutch context, or modifications as a result of a pre-test carried out prior to the official study [2].

This pre-test revealed that respondents found some questions in the model questionnaire incomprehensible and discouraging in terms of completing the questionnaire, such as EDU.2 the choice of field of science (they did not recognise their own field of science from the Frascati list), EDU.4 category of advanced research qualification (what is a fundamental problem?), and CAR.3. not working as a researcher (too direct and negative answer categories). For this reason, compared to CDH 2010, Statistics Netherlands changed the formulation of some of the questions slightly, changed the sequence of the modules, and included some additional subjective questions to give respondents the opportunity to clarify personal PhD experiences.

Furthermore, for efficiency reasons, CDH 2014 was enriched with register-based information on doctorate holders' demographic status, income situation, and sector of employment. Lastly, the LFS questionnaire modules about employment status, occupation and enterprise were integrated in CDH 2014. As a result, not only are the results from both surveys comparable, but Statistics Netherlands could also use the same software for the automatic coding in CASCOT.

## 3. Results

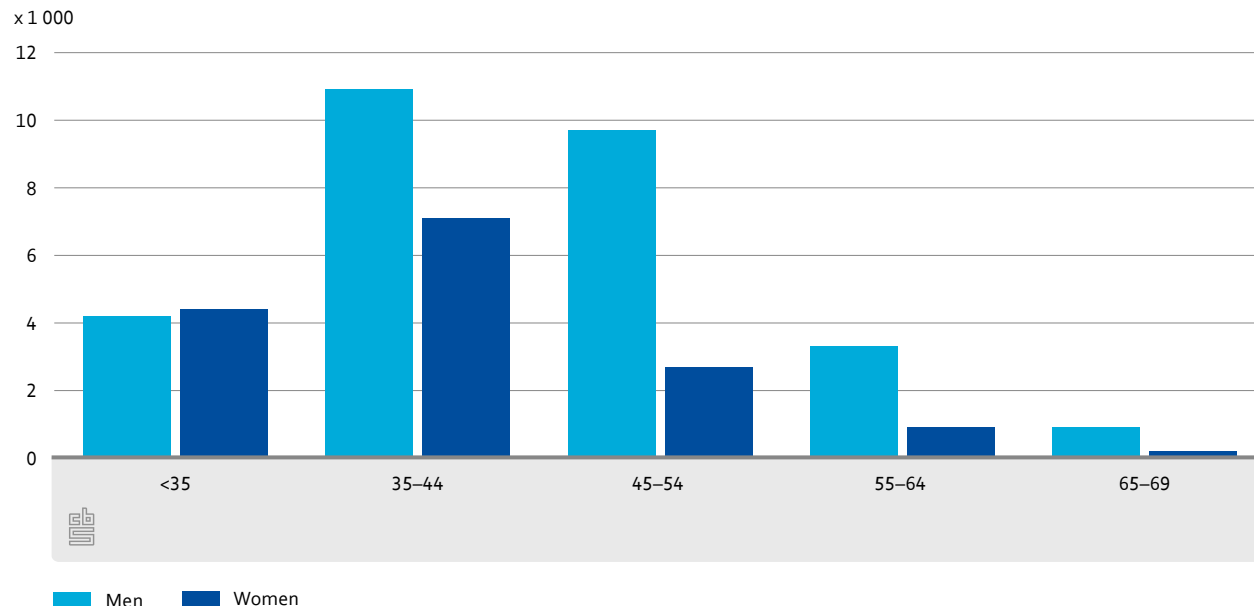
Overall the results indicated that the background characteristics of doctorate holders are quite similar to those shown by the previous CDH survey. However, the CDH 2014 survey included more foreign-born doctorate holders than the 2010 sample, especially in the older cohorts. This may be the result of better matching of country-of-birth information from the municipal population register in 2014. But it may also be the result of the improved weighting model.

The outcomes of the Dutch CDH survey are subject to a margin of error, and because of the considerable relative inaccuracy, figures under a certain threshold will not be published. In principle, the minimum is set at 1,000 for totals and 50 for cells.

### 3.1 Age class and sex

Just over 44 thousand people younger than 70 years resident in the Netherlands and registered in the municipal population register on 1 December 2013, had been awarded a PhD from by Dutch university in 1990 or later. Two-thirds (i.e. 65 per cent) of doctorate holders are men. In each age class there are more men than women doctorate holders, except for ages younger than 35 years; in this age group there are slightly more women than men with a PhD.

#### 3.1.1 Doctorate holders by age class and sex



### 3.2 Citizenship

Most doctorate holders, 94 percent, are Dutch citizens. Two-thirds of foreign citizens with a doctorate come from EU countries, particularly Germany, Belgium and Italy. These foreign PhD holders citizens are relatively young: 38 percent of them belong to the age class younger than 35 years, compared with 18 percent of Dutch doctorate holders in this age class.

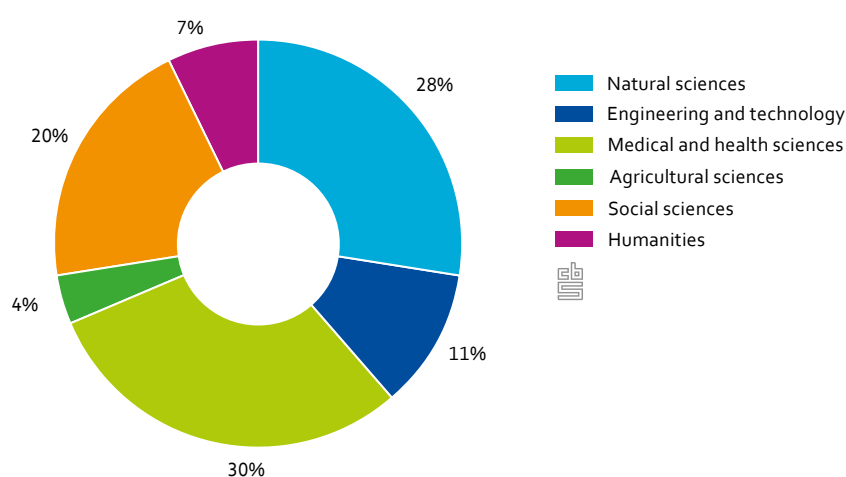


### 3.3 Field of doctorate

Medical and health sciences are the most popular field for doctorates (30 percent), followed by the natural sciences (28 percent). The latter include, mathematics, computer and information sciences and biological sciences. A fifth of doctorate holders (20 percent) got their degree in social sciences, with psychology and economics and business the most popular disciplines.

The fields differ between foreign and Dutch doctorate holders: for foreign citizens, natural sciences and engineering and technology are the most popular fields, while most Dutch doctorate holders received their degree in medical and health sciences and natural sciences. The mean age of doctorate holders at the moment they received their degree is 33. Those with a PhD in humanities (e.g. history and archaeology, languages, arts) are 38 years old on average when they receive their PhD. The average age in other fields of science varies between 31 and 35 years, with men showing higher ages at doctorate completion than women, in all fields.

#### 3.3.1 Field of doctorate degree



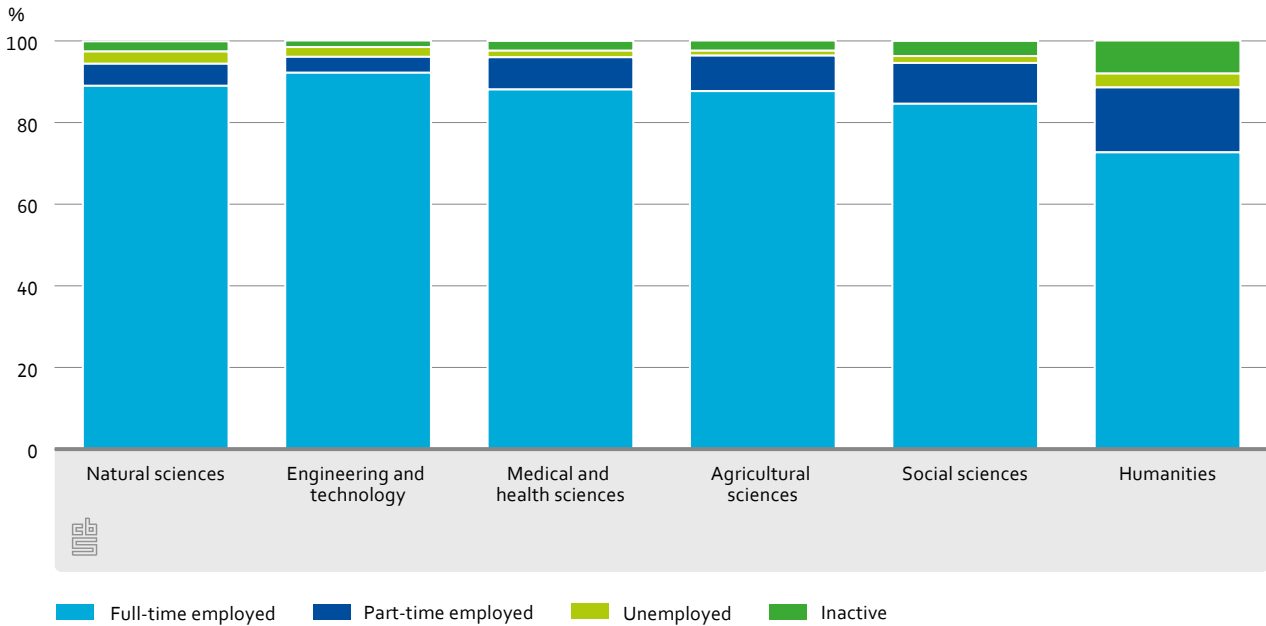
### 3.4 Employment status

A large majority of doctorate holders (95 percent) were employed in 2013, and most of them worked full-time (i.e. 30 or more hours per week). Workers with a PhD in humanities are most likely to work part-time: about 18 percent, four times as many as workers with a PhD in engineering and technology.

Eighty percent of all employed doctorate holders are (still) working as a researcher. This is least common for workers with a PhD in medical and health sciences: over a quarter do not work as a researcher.

Only 977 of the 44 thousand doctorate holders were unemployed, and around 1.3 thousand were not working and not looking for work.

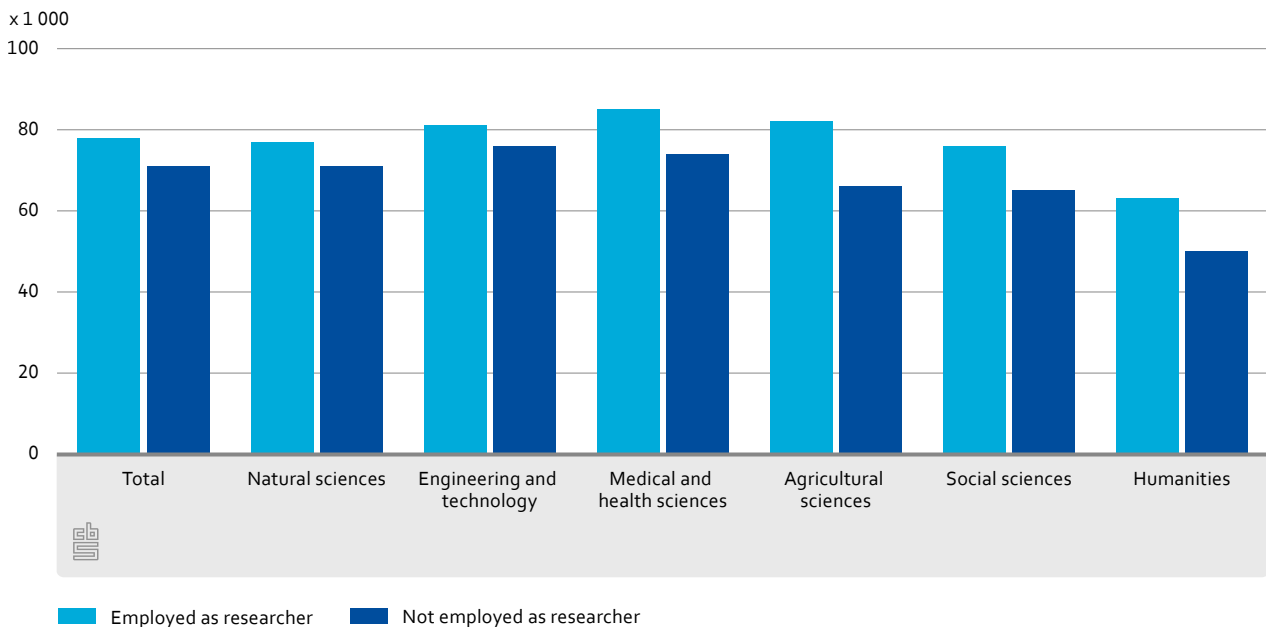
### 3.4.1 Employment status



### 3.5 Gross annual earnings

Median gross annual earnings<sup>1)</sup> differ between researchers and doctorate holders with other work: 78 versus 71 thousand euros in 2013. Apparently, a subsequent career as a researcher pays off financially for doctorate holders. For post-docs, who are in their early stages of their research career, the median gross annual earnings are much lower, with 49 thousand euros per year in 2013.

#### 3.5.1 Gross annual earnings



<sup>1)</sup> Annual earnings consist of personal primary income. This is the sum of an individual's income from labour and from own enterprise. Income from labour consists of wages and salary including pension and social security contributions. Income from own enterprise includes profits.

Researchers with a PhD in medical and health sciences have the highest incomes: their median gross annual earnings amount to 85 thousand euros. Doctorate holders with humanities degree earn least: 60 thousand euros a year. The share of part-time workers with a PhD in medical sciences is much smaller than in humanities, which might explain part of this annual income difference.

Incomes differ substantially between men and women. Men receive a median annual wage of 86 thousand euros, while women earn 65 thousand euros a year. Naturally, the relatively large share of part-time workers among women compared to men might contribute to this income difference.

Almost 80 percent of employed doctorate holders indicated they were fairly or very satisfied with their salary. This percentage is about equal for researchers and those working in other fields.

### 3.6 Mobility

Almost a quarter of all doctorate holders have studied, worked or conducted research abroad in the last ten years. This is slightly higher for women than for men doctorate holders, and more common in the younger age group: early half of the under-35s with a PhD had taken such an opportunity.

The United States is the most popular destination for itinerant doctorate holders: 23 percent of had spent a period there. The United Kingdom (12 percent) and Germany (11 percent) were also popular destinations. Only few doctorate holders had concrete plans to leave the Netherlands (again).

## 4. Tables

The following set of tables have been completed for the CDH 2014 survey and are available on request:

### Personal characteristics

1. Doctorate holders by sex and age class
2. Doctorate holders by type of Citizenship, resident status and place of birth
3. Doctorate holders by citizenship and resident status
4. Doctorate holders by sex and country of citizenship
5. Doctorate holders by citizenship/resident status and age class
6. Doctorate holders by citizenship and field of doctorate
7. Doctorate holders by sex and country of birth
8. Doctorate holders by place of birth/resident status and age class
9. Doctorate holders by place of birth and field of doctorate degree

### Education characteristics

10. Doctorate holders by citizenship/resident status and region of doctorate award
11. Doctorate holders by place of birth/resident status and region of doctorate award
12. Doctorate holders by country of doctorate award and of prior education

13. Recent doctorate recipients: age at doctorate and time to completion by main field of doctorate
14. Doctorate holders by main field of doctorate and primary source of funding during completion of doctorate

### **Employment situations and perceptions**

15. Doctorate holders by employment status and year of doctorate
16. Doctorate holders by employment status and field of doctorate
17. Doctorate holders by employment status and age class
18. Doctorate holders by employment status and citizenship/resident status
19. Recent doctorate recipients by employment status and primary source of funding during completion of doctorate
20. Employed doctorate holders by field of doctorate and occupation
21. Employed doctorate holders by sector of employment, field of doctorate and sex
22. Employed doctorate holders: median gross annual earnings
23. Employed doctorate holders: average gross annual earnings
24. Employed recent doctorate recipients: gross annual earnings by primary source of funding during completion of doctorate
25. Employed doctorate holders: job mobility in last 10 years by sector of employment
26. Employed doctorate holders by industry and sex
27. Employed doctorate holders: perception of job qualification by sex and year of doctorate
28. Employed doctorate holders: perception of job qualification by sex and field of doctorate
29. Employed doctorate holders: satisfaction with employment situation by sex and criteria of satisfaction
30. Employed doctorate holders: satisfaction with employment situation by research status and criteria of satisfaction

### **International mobility: inward and outward**

31. Doctorate holders by type of international mobility in last ten years and citizenship
32. Internationally mobile doctorate holders: previous country of stay in last ten years by citizenship
33. Internationally mobile doctorate holders: reasons for moving into the country in the last 10 years by citizenship
34. Internationally mobile doctorate holders: frequency and length of mobility by citizenship
35. Mobility intentions in the next year by country of intended destination
36. Reasons for mobility intentions in the next year

### **Scientific output**

37. Outputs of doctorate Holders working as researchers in the last three years by field of doctorate
- Outputs of doctorate holders working as researchers in the last three years by age class and sex

# References

[1] Auriol, L., M. Schaaper and B. Felix (2012), 'Mapping Careers and Mobility of Doctorate Holders: Draft Guidelines, Model Questionnaire and Indicators – Third Edition', OECD Science, Technology and Industry Working Papers, 2012/07, OECD.

[2] Arends, J. and Morren, M. (2013). Report on the pre-test of the careers of doctorate holders survey 2014

## Explanation of symbols

.	Data not available
*	Provisional figure
**	Revised provisional figure (but not definite)
x	Publication prohibited (confidential figure)
–	Nil
–	(Between two figures) inclusive
0 (0.0)	Less than half of unit concerned
empty cell	Not applicable
2013–2014	2013 to 2014 inclusive
2013/2014	Average for 2013 to 2014 inclusive
2013/'14	Crop year, financial year, school year, etc., beginning in 2013 and ending in 2014
2011/'12–2013/'14	Crop year, financial year, etc., 2011/'12 to 2013/'14 inclusive

Due to rounding, some totals may not correspond to the sum of the separate figures.

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