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Foreign doctoral graduates most likely to work in higher education

Foreign doctoral students are increasing in number at Swedish higher education institutions (HEIs). While experience tells us that many will leave the country after graduation, new statistics show that a larger percentage of the most recent cohort followed up chose to remain in Sweden. Most of those who stayed found employment, most commonly in the higher education sector.

This study is a collaboration with Statistics Sweden (SCB). It is part of the UKÄ project *Fokus forskarutbildning* [Focus on Third-cycle Education]. The purpose of the study is to contribute knowledge to the discussion of whether the scope of third-cycle courses and programmes offered at Swedish HEIs reflects society's need for graduates with a third-cycle education.

Within the framework of the project, we have previously demonstrated that a large percentage of foreign doctoral students leave Sweden after graduating.¹ But what about those who stay; what do they do? To what extent do they enter the labour market and what jobs do they take? This study follows up foreign doctoral students who were awarded a Degree of Doctor in Sweden between 1998 and 2017.

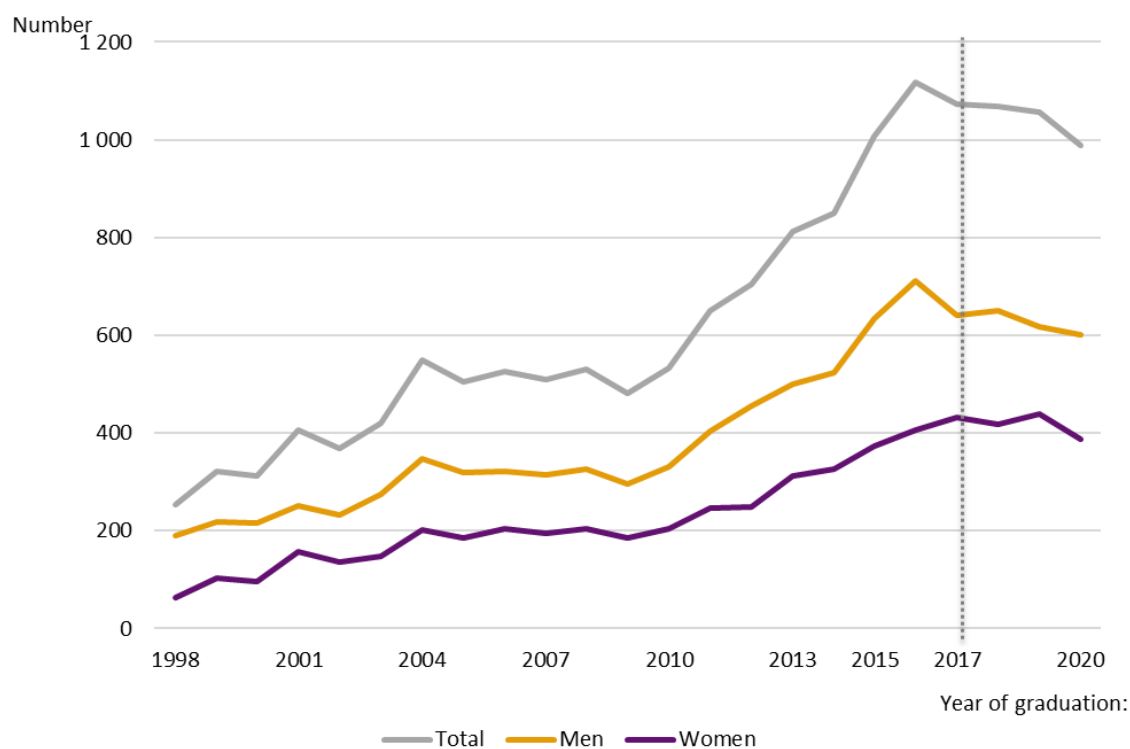
For our purposes, the term *foreign doctoral student* refers to someone from another country admitted to third-cycle studies at a Swedish higher education institution, who has either been granted a residence permit for studies in higher education, or who otherwise migrated to Sweden less than two years before commencing third-cycle studies.

The number of foreign doctoral students awarded a Degree of Doctor in Sweden has increased significantly (see Figure 1). In 1998, they numbered 250, or 13 per cent of all doctoral students who were awarded a Degree of Doctor that year.

¹ Many foreign doctoral students leave Sweden after graduating. UKÄ 2019.

By 2017, the last year followed up in this study, their number had risen to 1,070, or 38 per cent of all doctoral students who awarded a Degree of Doctor.

Figure 1. The number of foreign doctoral students awarded a Degree of Doctor in Sweden, 1998–2020.
The dotted line indicates the cut-off point for the survey population (1998–2017).



A total of 11,930 foreign doctoral students were awarded a Degree of Doctor in Sweden between 1998 and 2017 and are therefore included in the survey. Men outnumbered women significantly, accounting for 63 per cent of foreign doctoral students during the period compared to 37 per cent women.

In the study we have followed up their situations one, three, five and eight years after graduating. For obvious reasons, the length of time we could follow a cohort decreased over time; we could only follow up those who were awarded a Degree of Doctor in 2017 one year after graduation, while those who graduated between 1998 and 2010 could be followed for the full eight years. In our assessment, three years after graduation is a reasonable follow-up interval and we therefore focus on those who defended their thesis between 1998 and 2015 in most sections of the study. For further information, please refer to the appendix *Method and population*.

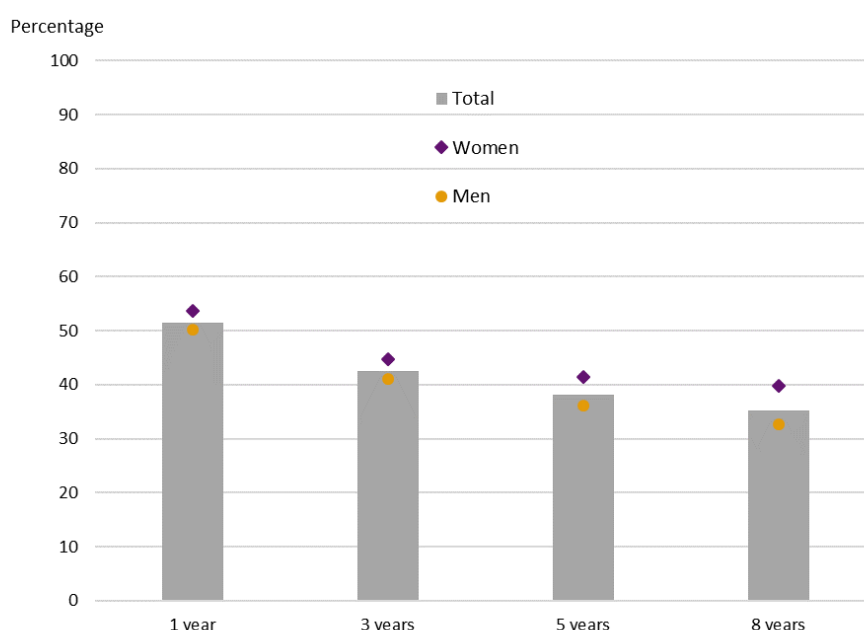
How many foreign doctoral students stay in Sweden?

Our estimate of how many foreign doctoral students choose to stay in or leave Sweden after defending their thesis is based on data from various administrative registers. However, one should bear in mind that this is a highly mobile group and some may have left Sweden without this being noted in any registers. The data should therefore be interpreted with a certain amount of caution.

A higher percentage of women stay

The percentage of foreign doctoral graduates who remain in Sweden varies at each follow-up interval (see Figure 2). Just over half remained one year after graduation, decreasing successively at each interval: by the third year, 42 per cent were still in Sweden; at five years, 38 per cent; and at eight years, 35 per cent. The sharpest decline in the number remaining is between one and three years.

Figure 2. The percentage of foreign doctoral students choosing to remain in Sweden 1, 3, 5 and 8 years after being awarded a Degree of Doctor. Graduated 1998–2017.



A larger percentage of women than men remained in Sweden at all follow-up points. After one year, 54 per cent of women and 50 per cent of men were still in the country. Eight years after graduation, the percentage of women remaining had declined to 40 per cent and men to 33 per cent.

Even if many foreign doctoral students leave Sweden after being awarded a third-cycle qualification, a considerable number remain. In total, over 4,000 people stayed for at least three years, 3,000 for at least five years and 2,000 for at least eight years (see Table 1).

Table 1. Number of foreign doctoral students still in Sweden 1, 3, 5 and 8 years after being awarded a Degree of Doctor. Graduated 1998–2017

	1 year	3 years	5 years	8 years
Women	2,370	1,610	1,200	830
Men	3,770	2,530	1,810	1,190
Total	6,140	4,140	3,000	2,010

The percentage who choose to remain is increasing

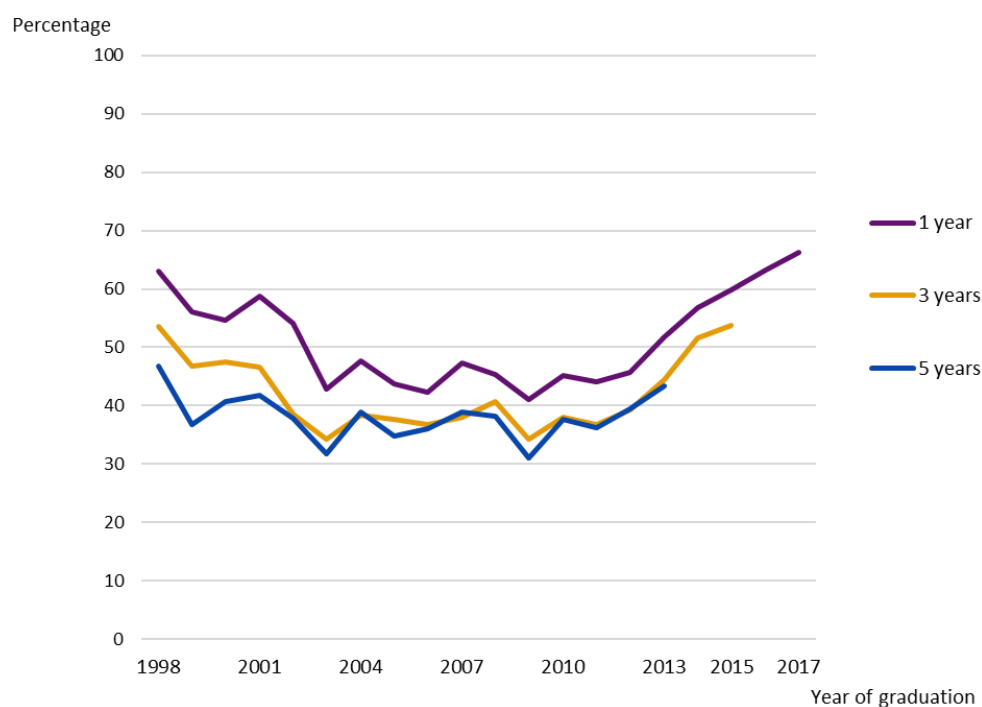
The year in which doctoral students were awarded a third-cycle qualification appears to affect the likelihood of remaining in Sweden. The percentage of foreign doctoral students still in Sweden one,

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three and five years after graduating varies from one cohort to the next (see Figure 3). At the start of the period, the percentage remaining declined successively; for example, 54 per cent of those who graduated in 1998 remained after three years compared to only 34 per cent of the 2003 cohort. From then on, the percentage remained relatively stable at around or just under 40 per cent until 2013. The percentage then began to increase and by 2015 it had returned to 54 per cent, the same as the first cohort we followed. The same pattern is visible one and five years after graduation. So, the trend thus far appears to be for more foreign doctoral students to stay in Sweden.

Figure 3. Percentage of foreign doctoral students still in Sweden 1, 3 and 5 years after being awarded a Degree of Doctor. By year of graduation. Graduated 1998–2017



At the start of the period, a lower percentage of foreign doctoral students remained five years after graduating than at three years. From 2010 onwards, however, there was no decline between these two follow-up points. This may indicate that those who stay for three years are likely to remain in the longer term.

The increasing inclination to remain in Sweden may be associated with the increasing demand for third-cycle qualifications on the Swedish labour market, as demonstrated by UKÄ in a previous analysis. The number of people with a third-cycle qualification working in Sweden has increased significantly, from 48,000 in 2007 to 68,000 in 2018.² We have also seen an increased demand for third-cycle qualifications in job advertisements. The percentage of job advertisements seeking this level of expertise doubled between 2012 and 2020.³

² Forskarutbildade på en föränderlig arbetsmarknad - analys av forskarutbildade på svensk arbetsmarknad 2007–2018. UKÄ statistical analysis 2020.

³ Highest demand for third-cycle qualifications is in healthcare and higher education. UKÄ 2021.

It is also likely that the rules for obtaining a residence permit and work permit in any given year of

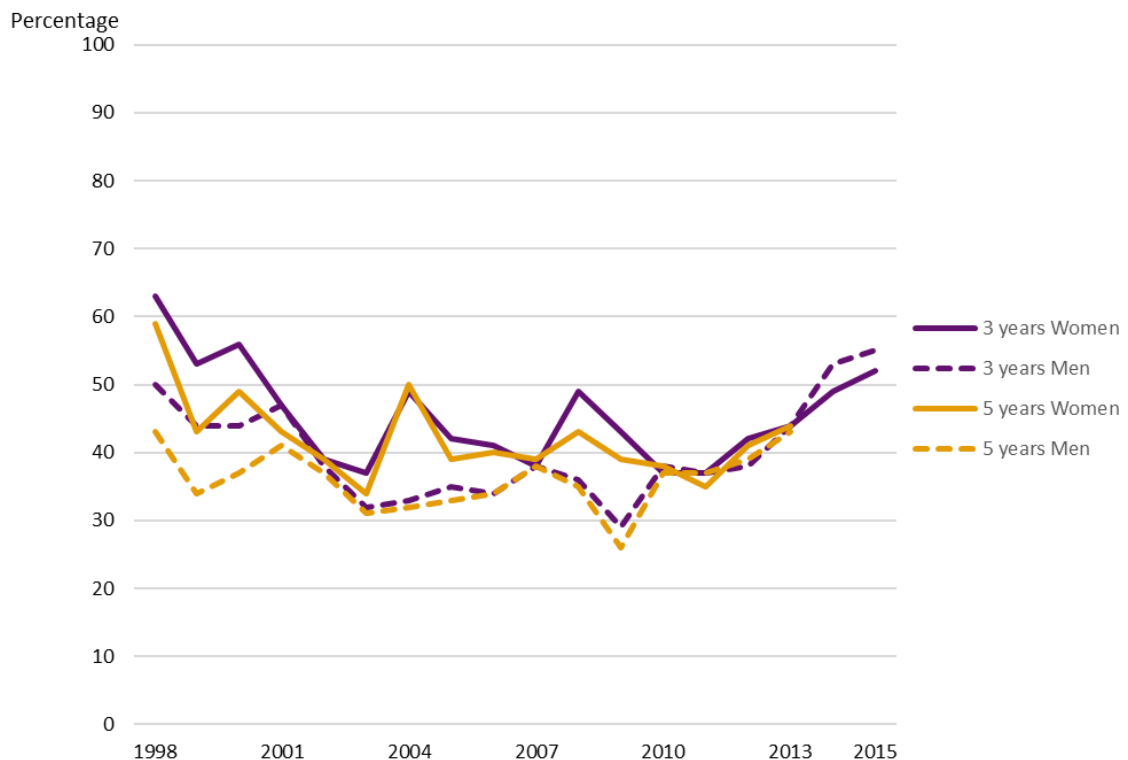
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graduation have a significant impact. A change to the rules in 2014, for example, meant that a foreign doctoral student's third-cycle study period could be counted towards qualification for a permanent residence permit, and indeed we can see that the percentage of foreign doctoral graduates remaining in Sweden three years after graduation increased after 2014. A legislative amendment in 2021 that introduced stricter rules on employment for obtaining a permanent residence permit may have an impact on the possibility of current doctoral students remaining in Sweden.⁴ However, in this study we have not had the opportunity to analyse the effects of the regulatory framework on the likelihood of remaining in Sweden in any great detail.

There are certain difference between the sexes with regard to inclination to remain in Sweden after being awarded a Degree of Doctor. In most of the cohorts studied, a higher percentage of women than men remained both three and five years after graduation (see Figure 4). Although Figure 4 may give the impressions that there are major difference between individual years, these may be the result of there being a relatively low number of graduates in certain cohorts.

Figure 4. Percentage of women and men among foreign doctoral students still in Sweden 3 and 5 years after being awarded a Degree of Doctor. By year of graduation. Graduated 1998–2015.



The 2009 cohort stands out, with the lowest percentage of men still in Sweden both three and five years after graduation (29 and 26% respectively). This pattern is not repeated among women, even if the figures for the 2009 cohort were slightly lower compared to 2008. Later in the study, from 2014 onwards, more men than women remained in Sweden.

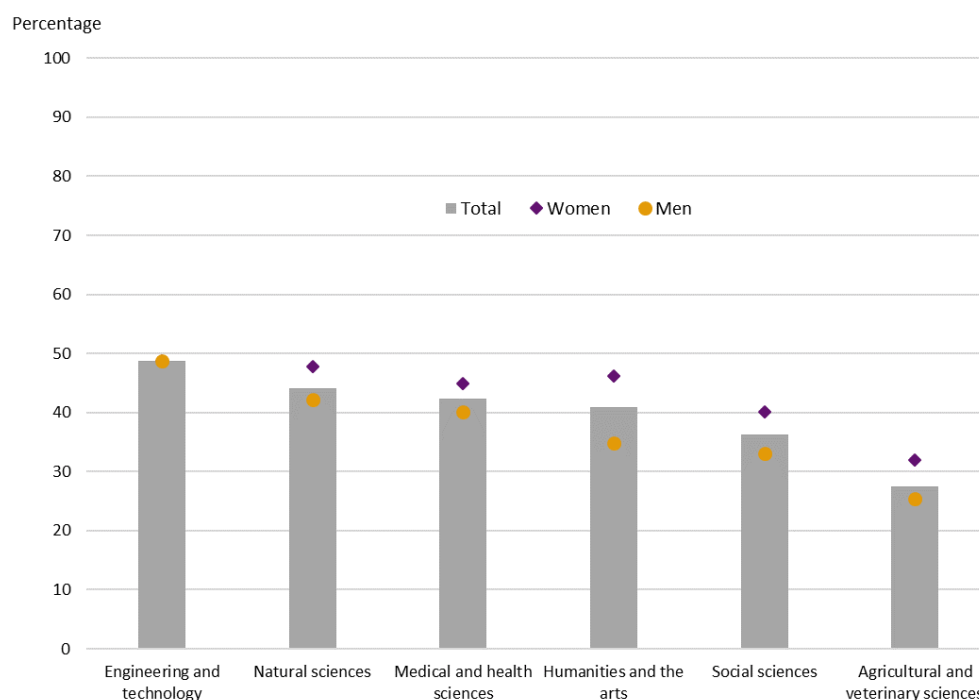
⁴ Swedish Aliens Act (SFS 2005:716)

Engineering and technology is the field with the highest percentage of foreign doctoral students who stay in Sweden

On average, 42 per cent of foreign doctoral students are still in Sweden three years after being awarded a third-cycle qualification, although there is significant variation between fields of research and development (see Figure 5). The highest average is among those awarded a qualification in the field of engineering and technology, 49 per cent of whom remained three years after graduation. The corresponding figure for the field of natural sciences was 44 per cent. The field with the lowest percentage was agricultural and veterinary sciences, with 28 per cent. This is largely due to the fact that many of the foreign doctoral students in this field are funded by the Swedish International Development Cooperation Agency (Sida), with the express intention that they will return to develop research capacity in their homelands. At 36 per cent, the percentage of doctoral students who choose to remain is also low in social sciences, another field in which Sida finances a number of foreign doctoral students.

More female than male doctoral students remained in Sweden after graduating in every field except engineering and technology. The greatest gender disparity, 11 percentage points, was found in humanities and the arts.

Figure 5. Percentage of foreign doctoral students still in Sweden 3 years after being awarded a Degree of Doctor. By field of research and development and sex. Graduated 1998–2015.



The highest numbers of doctoral students choosing to remain in Sweden were found in the fields of natural sciences, medical and health sciences, and engineering and technology (see Table 2). The highest number of women were awarded qualifications in medical and health sciences (600) and the highest number of men in engineering and technology (850).

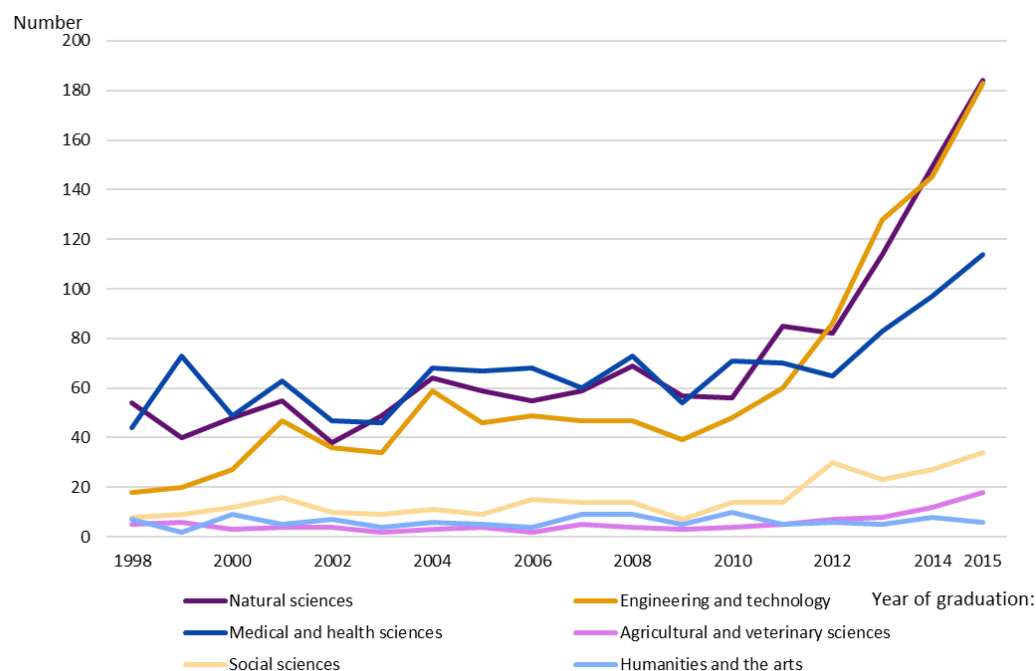
Table 2. Number of foreign doctoral students still in Sweden 3 years after being awarded a Degree of Doctor. By field of research and development and sex. Graduated 1998–2015.

	Women	Men	Total
Natural sciences	500	820	1,320
Medical and health sciences	600	610	1,210
Engineering and technology	270	850	1,120
Social sciences	140	140	280
Humanities and the arts	70	50	110
Agricultural and veterinary sciences	40	60	100
Total	1,600	2,530	4,140

Largest increases in engineering and technology and natural sciences

If we divide the 4,140 foreign doctoral students who stayed in Sweden for three years after graduating by field of research and development and year of graduation, we can see a clear development (see Figure 6). While there was no dramatic change in the numbers staying among those awarded a Degree of Doctor between 1998 and 2010, from 2012 onwards numbers increased sharply in the three largest fields of research and development, more than doubling in natural sciences and engineering and technology and increasing somewhat more modestly in medical and health sciences. This development is in line with the increase in the number of foreign graduates during the early 2010s (see Figure 1). The trend was the same for women and men within all fields of research and development.

Figure 6. Number of foreign doctoral students still in Sweden 3 years after being awarded a Degree of Doctor. By field of research and development and year of graduation. Graduated 1998–2015.



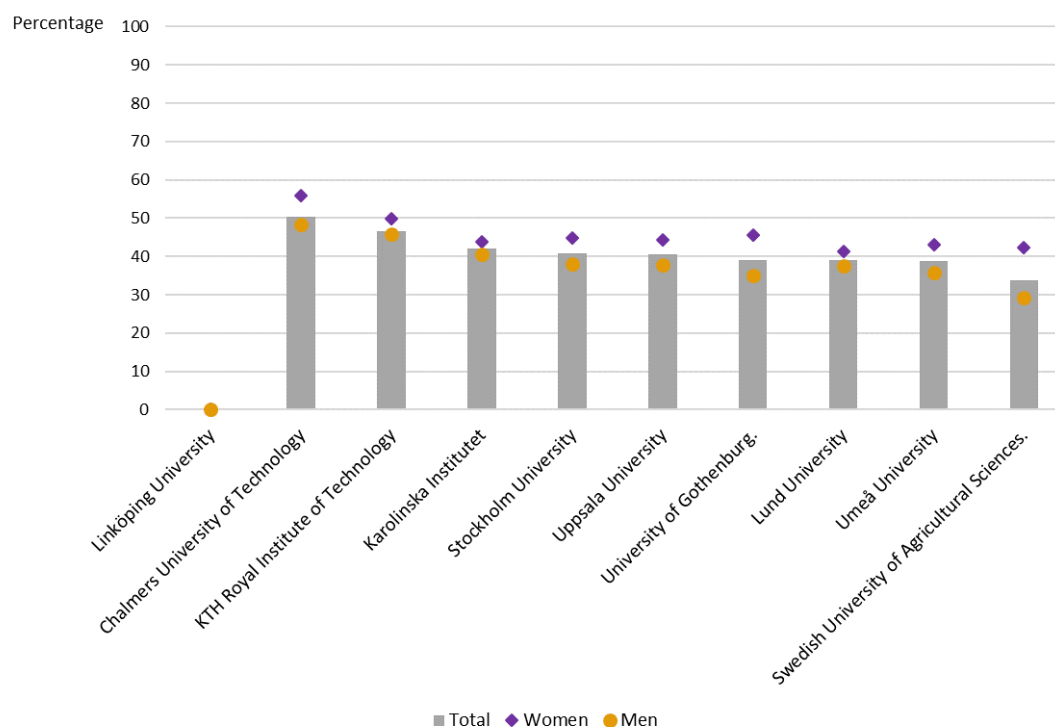
We also see a distinct increase in the number of foreign doctoral students in the three largest fields of research and development who choose to remain in Sweden.

A high percentage of graduates from technical universities choose to remain

The percentage of foreign doctoral students choosing to remain in Sweden after graduation also differs between HEIs (see Figure 7). Among the major universities, it was technical universities that had the highest percentages, with around half of doctoral graduates from Linköping University and Chalmers University of Technology and 47 per cent from KTH Royal Institute of Technology choosing to remain. Only 24 per cent of foreign doctoral students graduating from Stockholm School of Economics chose to remain, the lowest percentage of any Swedish HEI.

Figure 7. Percentage of foreign doctoral students still in Sweden 3 years after being awarded a Degree of Doctor. By HEI. Graduated 1998–2015.

Only the 10 Swedish HEIs with the most foreign doctoral students are included.



At all 10 of the largest HEIs, women were more likely to remain in Sweden after graduating than men. The gender imbalance was largest at the Swedish University of Agricultural Sciences, where 42 per cent of women were still in Sweden three years after graduating compared to only 29 per cent of men. Karolinska Institutet and Lund University had the most even gender balance.

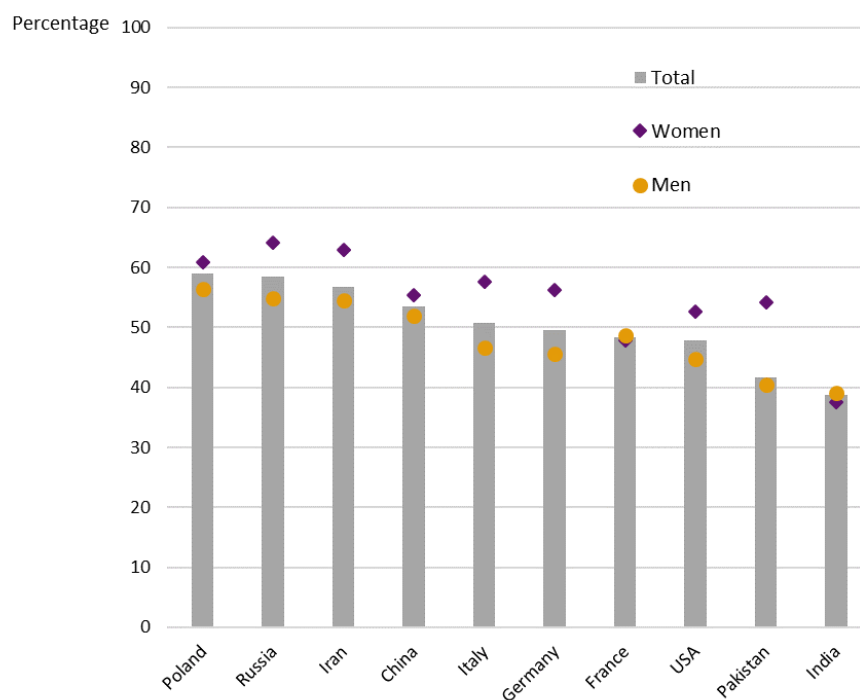
Polish and Russian doctoral students most likely to remain

Of the top ten countries of origin for foreign doctoral students awarded a third-cycle qualification by a Swedish HEI between 1998 and 2015, Poland, Russia and Iran were the three with the highest percentages of doctoral students choosing to remain (see Figure 8). India and Pakistan had the

lowest percentages. Female doctoral students from all countries apart from India and France were more likely to remain than their male counterparts. One important caveat is that we have no information about the country of origin of a significant percentage of foreign doctoral students. This data is missing for 1,190 people in the cohorts graduating between 1998 and 2015, probably because they were from a Nordic country or EU Member State and were not subject to the same stringent residence permit requirements as those from a country outside the EU and Nordic region. It is therefore likely that the number of foreign doctoral students from these regions is underestimated.

Figure 8. Percentage of foreign doctoral students still in Sweden 3 years after being awarded a Degree of Doctor. By country of origin and sex. Graduated 1998–2015.

Only the 10 countries with the most foreign doctoral students are included.



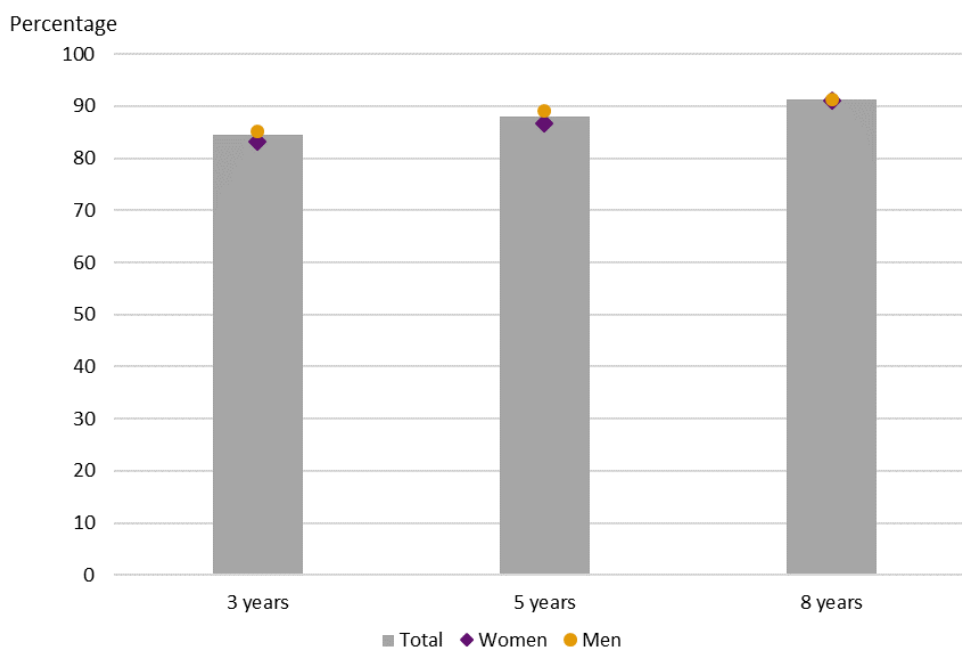
What do foreign doctoral graduates do in Sweden?

A majority enter the labour market

Most foreign doctoral students choosing to remain in Sweden have gainful employment: 84 per cent of all of those awarded a Degree of Doctor in the period 1998–2015 were in work three years later (see Figure 9). The percentage increases over time; after five years it was 88 per cent and after eight years 91 per cent.

For the purposes of this study, we define *in work* as having gainful employment at some point during the year in question. This is a relatively generous definition, but we are interested in how many respondents have participated in the labour market during the year in question, rather than how many are employed at a given point in time. Our usual metric for following up labour market participation is establishment. This is stricter in that it describes the extent to which the foreign doctoral graduates have established a good position for themselves on the labour market. By way of comparison, 68 per cent of all of those awarded a Degree of Doctor during the period studied were established three years later, while 84 per cent were in work according to our definition. For further information on the establishment of foreign doctoral students, please refer to the report *Doktorsexaminerades etablering på arbetsmarknaden Examinerade 1998–2017*. [The Establishment of Doctoral Graduates on the Labour Market 1998–2017] UKÄ 2021.

Figure 9. The percentage of foreign doctoral graduates in work 3, 5 and 8 years after being awarded a Degree of Doctor. Graduated 1998–2015.



While the gap between women and men was minor, the percentage of men in work was two percentage points higher both three and five years after graduation. By eight years, this gender gap had closed.

There is a risk that the percentage of foreign doctoral graduates in work may be underestimated. Recent graduates can apply for a postdoctoral scholarship as a career-development position. Such scholarships may be tax-free, in which case no data on income appears in Statistics Sweden's register and these postdoctoral fellows will not be counted as participating in the labour market in our study. It is also possible that foreign doctoral students have left Sweden without being registered in the statistics. They will then be counted as being outside the labour market, even though they may well be working in another country.

In total, 3,500 foreign doctoral students were in work three years after being awarded a third-cycle qualification (see Table 3), 38 per cent of whom were women and 62 per cent men.

Table 3. Number of foreign doctoral students in work 3, 5 and 8 years after being awarded a Degree of Doctor. Graduated 1998–2015.

	Total	Women	Men
3 years	3,490	1,330	2,160
5 years	2,650	1,040	1,610
8 years	1,840	750	1,080

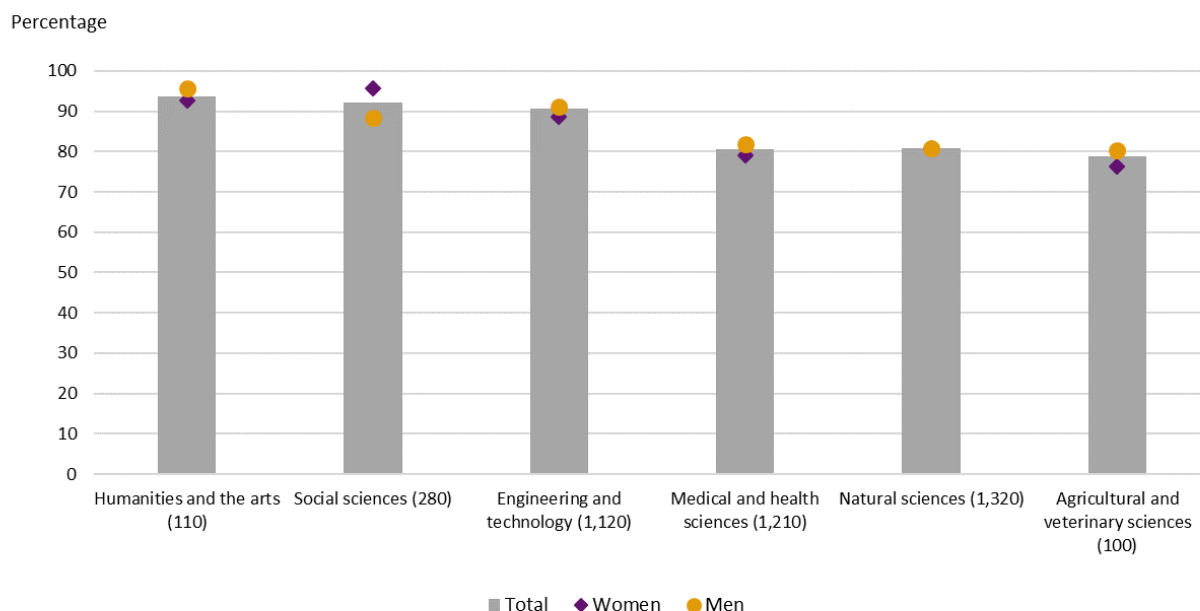
The thousands of foreign doctoral students who remain in Sweden to participate in the labour market represent a significant addition of highly skilled labour.

Humanities and the arts have the highest percentage in work

The percentage of foreign doctoral students in work three years after graduating differs from one field of research and development to another. The highest percentage (94%) was among graduates in humanities and the arts (see Figure 10), closely followed by social sciences (92%) and engineering and technology (91%). There was then a considerable gap to the fields of medical and health sciences and natural science, with 81 per cent in work. At 79 per cent, agricultural and veterinary sciences had the lowest percentage of doctoral graduates in work. This was also the smallest field in terms of numbers, with only 100 foreign doctoral students choosing to remain in Sweden after being awarded a Degree of Doctor.

Figure 10. The percentage of foreign doctoral students in work 3 years after being awarded a Degree of Doctor. By field of research and development. Graduated 1998–2015.

Number remaining three years after graduating in brackets.



Only in social services was there a significant gender gap: 96 per cent of women were in work three years after graduation compared to 88 per cent of men.

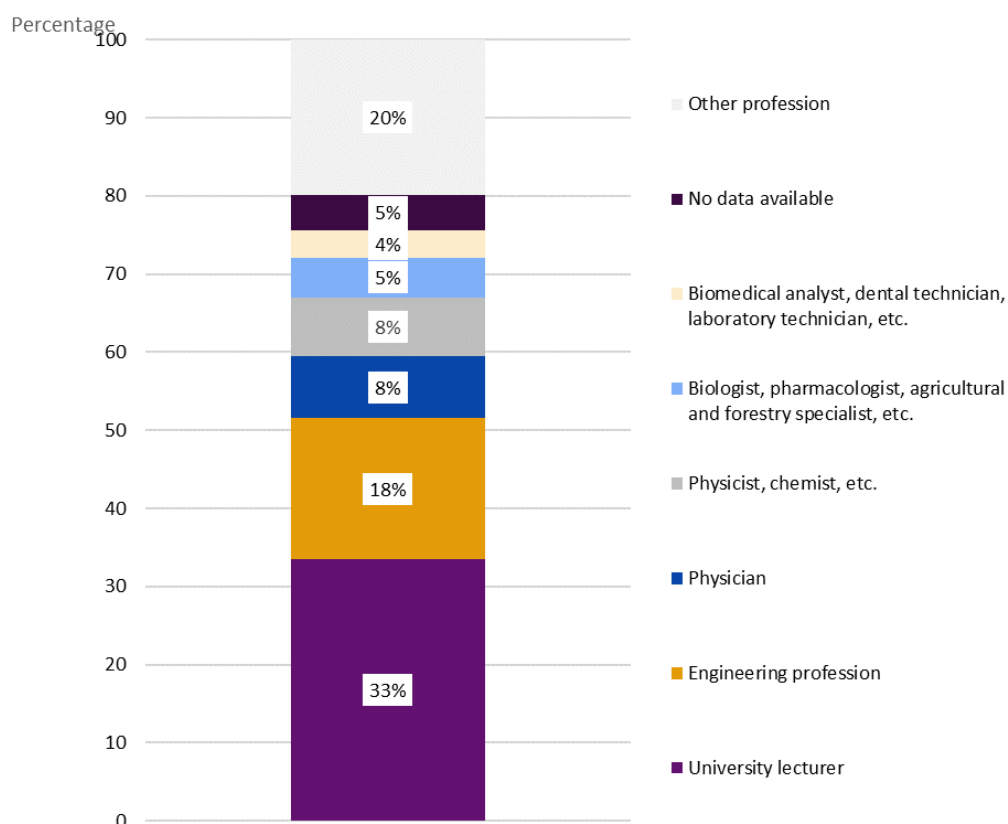
The most common profession is lecturer

Foreign doctoral students participate in the Swedish labour market in a wide range of professions. This section looks at the professions of those graduating in the period 2011–2015. Data for 1998–2010 is not reported due to changes in the Swedish Standard Classification of Occupations introduced in 2012.⁵

Many foreign doctoral students continue to work in higher education (see Figure 11). One third of foreign doctoral graduates who were in work were employed as university lecturers, which was by far the most common profession for foreign doctoral students awarded a Degree of Doctor in Sweden, followed by engineer, physician, physicist and chemist. The six most common professions accounted for 76 per cent of the foreign doctoral students who remained in Sweden after graduation.

⁵ The Swedish Standard Classification of Occupations 2012 (SSYK 2012) contains relatively major changes compared to its predecessor, SSYK96.

Figure 11. The most common professions for foreign doctoral students in work 3 years after being awarded a Degree of Doctor. Graduated 2011–2015. SSYK 2012, 3-digit level.



University lecturer was the most common profession for both women and men. The division of women and men was roughly the same in all of the most common professions with the exception of engineering, which had the largest gender gap, accounting for 21 per cent of men and 13 per cent of women.

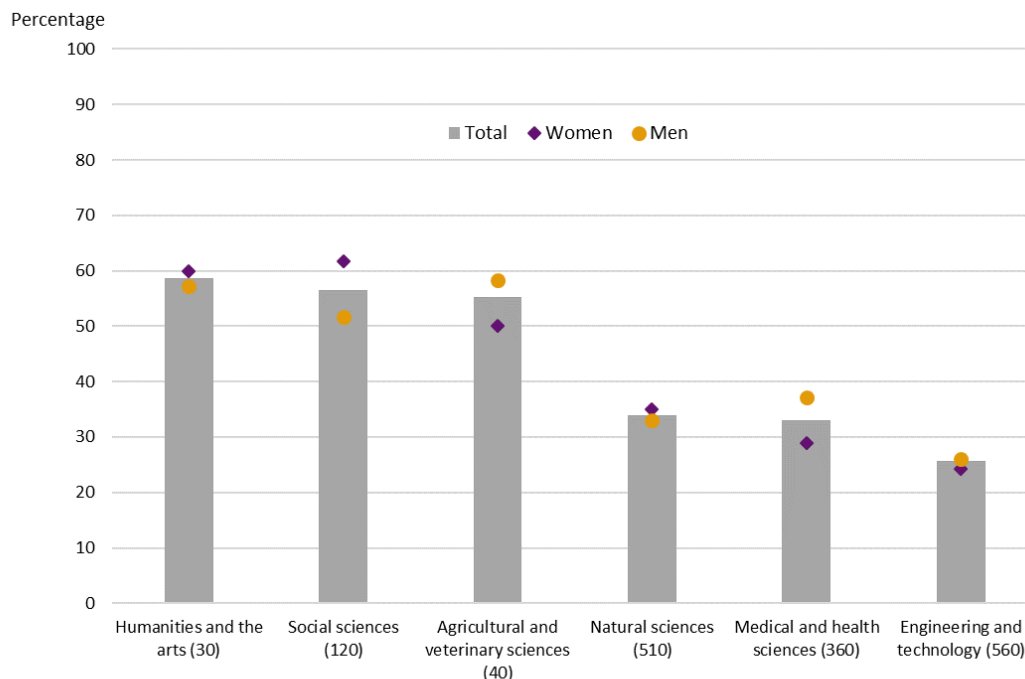
What all of the most common professions that attract foreign doctoral students have in common is that they are highly skilled and demand a higher education.

Humanities and the arts have the highest percentage working as lecturers

The percentage of foreign doctoral graduates employed as university lecturers varies from one field of research and development to the next (see Figure 12). At 59 per cent, graduates in humanities and the arts were most likely to be working as lecturers. That said, this is the field of research and development for which we have occupational data on fewest doctoral graduates (approximately 30 individuals). Relatively high percentages of graduates in social sciences and agricultural and veterinary sciences also worked as lecturers. Graduates in the field of engineering and technology were least likely to work as lecturers: 26 per cent were employed as lecturers while 39 per cent were employed as engineers. At 34 per cent, physician was the most common profession among doctoral graduates in the field of medical and health sciences.

Figure 12. Percentage of foreign doctoral students in work 3 years after being awarded a Degree of Doctor employed as a university lecturer. By field of research and development. Graduated 2011–2015. SSYK 2012.

Total number of graduates in work for whom occupational data is available in brackets.



In two fields – agricultural and veterinary sciences and medical and health sciences – a higher percentage of men than women were employed as university lecturers. The opposite was true of social sciences. There was no significant gender gap in the other fields of research and development.

A career-development position at an HEI the most common form of employment

We have seen that a large percentage of foreign doctoral graduates who are in work are employed as university lecturers. So, in which employment category do we find them? ⁶ And does their employment category change over time after they graduate?

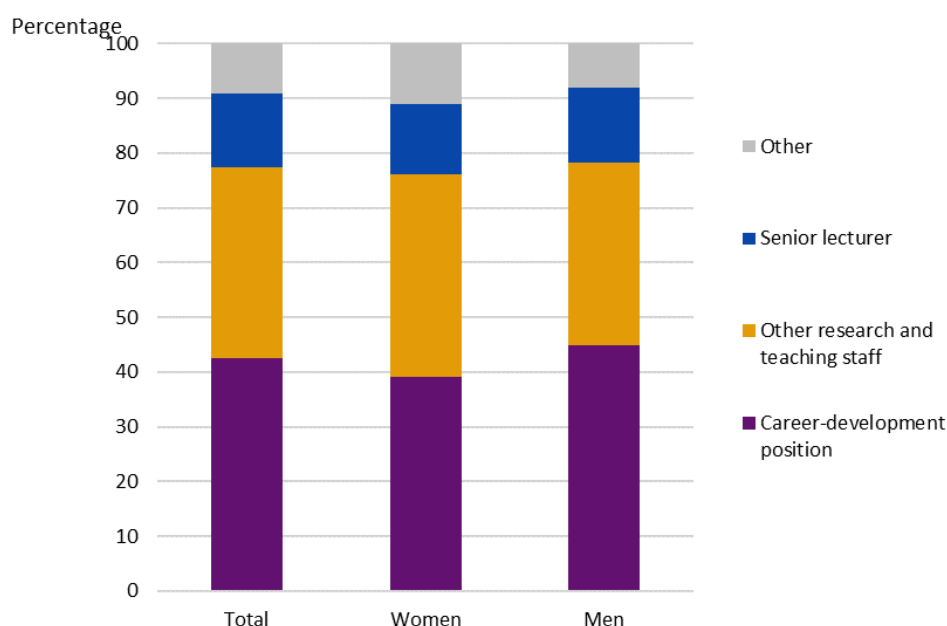
The most common form of employment (43%) for those working in higher education three years after the award of a Degree of Doctor was a *career-development position* (see Figure 13). This category mainly consists of postdoctoral fellows, research assistants and associate senior lecturers. These are fixed-term appointments offering the opportunity to acquire further qualifications for a continued academic career.

⁶ For statistical purposes, staff at HEIs are divided into a number of employment categories based on their job title, learn more in Statistics Sweden's publication *Higher education: Employees in higher education 2020*.

The employment category *other research and teaching staff* contained 35 per cent of foreign doctoral graduates. This category includes researchers, research technicians and research assistants.

Only 13 per cent of foreign doctoral graduates were in the employment category *senior lecturer*. The gender gaps within employment categories were relatively small.

Figure 13. Employment categories of foreign doctoral students working at Swedish HEIs 3 years after being awarded a Degree of Doctor. Graduated 1998–2015.



As time goes, so the percentage employed as senior lecturers increases: five years after graduation, 21 per cent of our foreign doctoral students were employed as a senior lecturer at a Swedish HEI; after eight years, this had risen to 30 per cent. Over the same period, the percentage with a *career-development position* declined from 33 per cent five years after graduation to 17 per cent eight years after graduation.

The majority of foreign doctoral students who went on to work in higher education were employed at the same HEI that awarded their third-cycle qualification. Of the foreign doctoral students who were working at a Swedish HEI three years after graduating, 67 per cent were employed at the same HEI that awarded their third-cycle qualification. While men were slightly more likely to be employed by the same HEI than women, the gender gap was small.

Afterword

There are doubtless many reasons why foreign doctoral students choose to remain in, or indeed leave, Sweden after the award of a third-cycle qualification. Many will have had no intention of staying, while others who would have liked to have remained may have had difficulty obtaining a residence permit or finding a job in Sweden. Opportunities to secure a career-development position at a Swedish HEI may have varied over time, and other countries may have offered more attractive working conditions and career paths. Nor does this study shed any light on the prospects of future foreign doctoral students. Amendments to the Swedish Aliens Act in summer 2021 imposed stricter requirements for remaining in Sweden after third-cycle studies, something that may well affect both the possibility and inclination to remain. This in turn may have a negative impact on skills provision.

Appendix: Methodology and population

We have used data from Statistics Sweden's longitudinal integrated database for health insurance and labour market studies (LISA). The database includes data on all individuals in the Swedish Population Register in each year, including region of birth, employment, income and occupation.

Our estimate of how many foreign doctoral students choose to stay in or leave Sweden after graduating is based on information from various administrative registers. If an individual is not included in any registers, they are assumed to have left the country. Although all registered residents of Sweden are required to notify the Swedish Tax Agency if they move abroad, this rule is not always observed, meaning that there may be some over-coverage in the population register (cf. *Övertäckning i Registret över totalbefolkningen – en registerstudie* [Over-coverage in the Total Population Register: A Register Study], SCB 2015:1.

We have also assumed that foreign doctoral students issued with a coordination number (a temporary identity number applied for by the student's HEI and issued by the Swedish Tax Agency), who therefore do not appear in Statistics Sweden's register, left Sweden after completing their studies.

During the period 1998–2017, 52,620 people were awarded a Degree of Doctor by a Swedish HEI, 11,930 (23%) of whom were foreign doctoral students. The majority (63%) of foreign doctoral students awarded a Degree of Doctor were men. Figures have been rounded up to the nearest ten.

Table 1. Number of foreign doctoral students awarded a third-cycle qualification 1998–2017 who were followed up, by year of graduation.

	Women	Men	Total
1998	60	190	250
1999	100	220	320
2000	100	220	310
2001	160	250	410
2002	140	230	370
2003	150	270	420
2004	200	350	550
2005	190	320	510
2006	200	320	530
2007	200	320	510
2008	200	330	530
2009	190	300	480
2010	200	330	530
2011	250	400	650
2012	250	460	700
2013	310	500	810
2014	330	520	850
2015	370	630	1,010
2016	410	710	1,120
2017	430	640	1,070
Total	4,430	7,510	11,930

Of the 11,930 foreign doctoral students awarded a Degree of Doctor between 1998 and 2017, 4,350 were from Asia. The next largest contingent came from the EU28 outside the Nordic region, with 3,280. These two regions accounted for 64 per cent of all foreign doctoral students. Men were in the majority regardless of region of origin. The largest gender gap was found among foreign doctoral students from Africa, 78 per cent of whom were men and 22 per cent women.

There is no information concerning the country of origin of a significant percentage of foreign doctoral students. This data is missing for 1,370 people in the cohorts graduating between 1998 and 2017, probably because they were from a Nordic country or EU Member State and were not subject to the same stringent residence permit requirements as those from a country outside the EU and Nordic region. It is therefore likely that the number of foreign doctoral students from these regions is underestimated.

China was the country of origin of most foreign doctoral students during the period 1998–2017, accounting for 1,820 doctoral students, or 15 per cent of the total number. Germany was next with 870, followed by Iran with 730.