



The Career Paths of Doctorate Holders





The Career Paths of Doctorate Holders

The Careers Paths of Doctorate Holders
Original title: Karierne poti doktoric in doktorjev znanosti
Authors Urška Arsenjuk, Darja Vidmar
Translated by Boris Panič

The publication is available at www.stat.si/eng

Information: Information Centre

phone: +386 1 241 64 04

e-mail: info.stat@gov.si

 @StatSlovenia

CIP - Kataložni zapis o publikaciji
Narodna in univerzitetna knjižnica, Ljubljana

331.108.4:001-051(0.034.2)

ARSENJUK, Urška

The career paths of doctorate holders [Elektronski vir] / [authors Urška Arsenjuk, Darja Vidmar ; translated by Boris Panič]. - El. knjiga. - Ljubljana : Statistical Office of the Republic of Slovenia, 2015. - (Collection Brochures)

Prevod dela: Karierne poti doktoric in doktorjev znanosti

ISBN 978-961-239-330-4 (pdf)

1. Gl. stv. nasl. 2. Vidmar, Darja, 1979-
279186432

FOREWORD

Striving to achieve sustainable growth, modern societies are becoming increasingly dependent on modern science, technology and innovation that have direct economic and social impact on the development of our society.


A series of indicators on science, technology and innovation show the declining position of Europe in the world. To strengthen their economies and preserve the competitive edge, European countries – Slovenia included – are faced with many challenges; therefore, they set ambitious goals to promote research and innovation.

As highly-qualified individuals with scientific and technological knowledge and skills, doctorate holders are of key importance in achieving these goals. Countries should fully exploit their potential and talents since they increase diversity, enrich human knowledge and improve understanding.

To better understand the characteristics of doctorate holders and to obtain key answers to questions related to this population – e.g. on their jobs, how their knowledge obtained through years of education is exploited on the labour market, on knowledge transfer – a few years ago the international statistical survey on the careers of doctorate holders started to be conducted. The Statistical Office of the Republic of Slovenia conducted this survey for the second time in 2013.

The purpose of this publication is to inform the general public about the key findings on the population of doctorate holders obtained with the mentioned statistical survey. They are presented with short comments, charts, tables and infographics and divided into five chapters (demographic and educational characteristics, labour market, research activity and international mobility).

We hope you will find new and interesting data and information in this brochure and we kindly invite you to read it.



Genovefa Ružić
Director-General

CONTENTS

WHAT DO STATISTICAL DATA ON DOCTORATE HOLDERS REVEAL? 7

1 DEMOGRAPHIC CHARACTERISTICS 9

2 EDUCATIONAL CHARACTERISTICS 15

3 LABOUR MARKET 21

4 DOCTORATE HOLDERS AS RESEARCHERS 31

5 INTERNATIONAL MOBILITY 37

KEY FINDINGS ON DOCTORATE HOLDERS 41

DEFINITIONS OF SOME CONCEPTS USED 42

PRECISION OF ESTIMATES 43

STATISTICAL SIGN 43

ABBREVIATIONS 43

UNITS OF MEASUREMENT 43

COUNTRY ABBREVIATIONS 43

SOURCES AND LITERATURE 44

What do statistical data on doctorate holders reveal?

Demographic characteristics

- How is the number of this population changing?
- What is the gender structure of this population?
- What is the age structure of this population?

...

International mobility

- To what extent were doctorate holders internationally mobile?
- To which regions and countries do they move the most?
- What are the most frequent reasons for temporary migration abroad?

...

Educational characteristics

- What are the sciences they received doctorates in?
- Do the genders differ in selecting fields of science or fields of education?
- How did they assess their knowledge, attributes and behaviours at the end of doctoral studies?
- On average, how long did their doctoral studies last?

...

Researchers

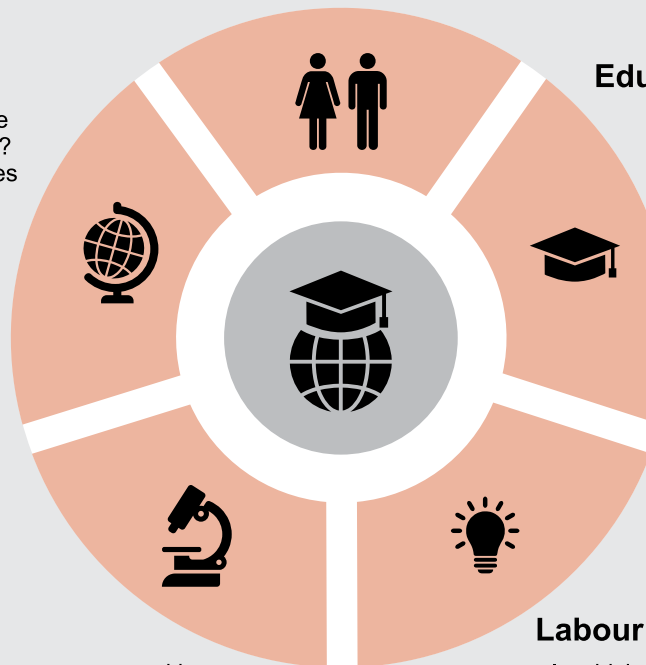
- In their work, how many of them are engaged in research?
- What are their main reasons for working as researchers?
- Are doctorate holders working as researchers more satisfied with their principal jobs than doctorate holders not working as researchers?
- Which sector is the main employer of researchers?

...

Labour market

- In which sectors are they employed?
- Are genders represented equally at high and the highest positions?
- What are their average gross annual earnings?
- To what extent does their work combine “intellectual” and “economic” advantages?
- Are they in general satisfied with their jobs and work?
- How important are their knowledge, attributes and behaviours for their jobs and work?

...





1 DEMOGRAPHIC
CHARACTERISTICS

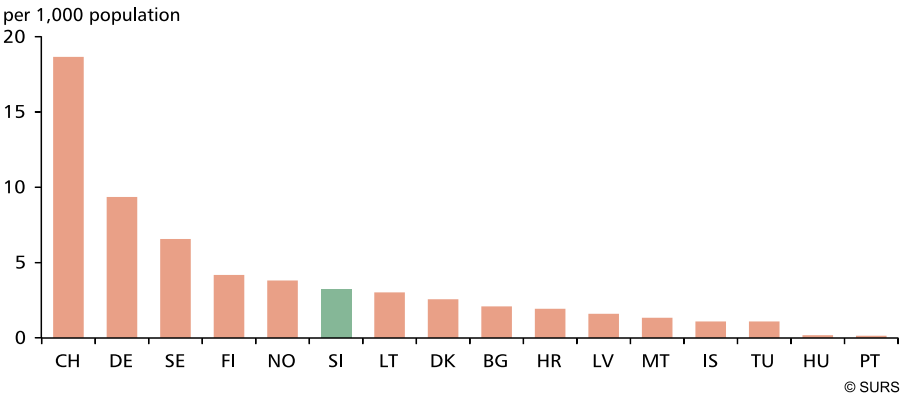
At the end of 2012 around 7,800 doctorate holders in Slovenia

At the end of 2012, 7,779 residents of Slovenia aged up to 69 years were doctorate holders. The figure takes into account men and women who received their doctoral degrees in Slovenia or abroad, are up to 69 years old and have permanent or temporary residence in Slovenia.

Doctorate holders represent a relatively small share of the total population but as highly-qualified individuals they are key actors behind the creation of innovation and knowledge-based economic growth¹. In 2012, they represented about a percent of the total population aged 15-69 in Slovenia, i.e. 5.2 doctorate holders per 1,000 population.

The international comparison for 2009 shows that in most countries for which the data are available there are fewer than 5 doctorate holders per 1,000 population. Switzerland, Germany and Sweden stood out with 18.4, 9.4 and 6.5 doctorate holders per 1,000 population, respectively.

Chart 1: Doctorate holders per 1,000 population by countries, 2009



Source: Eurostat (<http://ec.europa.eu/eurostat>, 16. 10. 2014)

More male than female doctorate holders

In 2012 (latest available data), there were more male than female doctorate holders in Slovenia: 4,620 male doctorate holders or 59% vs 3,159 female doctorate holders or 41%.

Infographic 1: Doctorate holders by gender, Slovenia, 2012



Source: SURS

¹ Auriol, Schaaper, Felix, 2012, p. 12.

The prevalence of male doctorate holders is characteristic of most of the European countries for which the data are available. In 2009, Portugal was the only country in which female doctorate holders (54%) outnumbered their male colleagues. In other countries the share of female doctorate holders was between 49% (in Latvia) and 22% (in Malta).

Chart 2: Doctorate holders by countries, 2009



Source: Eurostat (<http://ec.europa.eu/eurostat>, 16. 10. 2014)

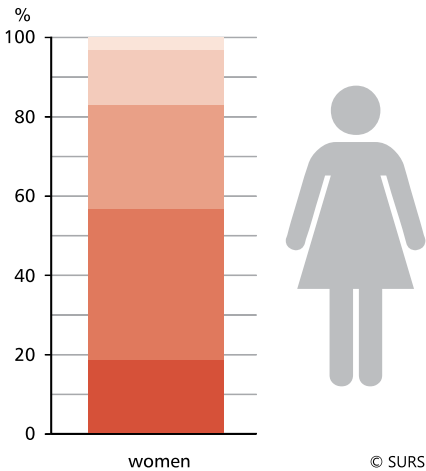
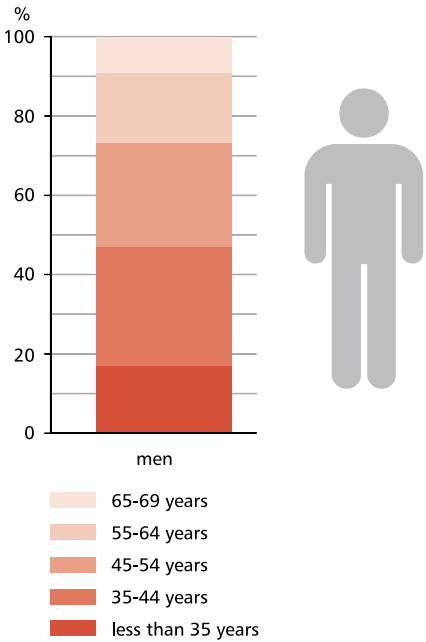
A large majority of doctorate holders in Slovenia are citizens of Slovenia

As regards citizenship, as expected in 2012 a large majority of doctorate holders in Slovenia were citizens of Slovenia (99%).

Most doctorate holders are 35-54 years old

In 2012 most of the doctorate holders (59%) were 35-54 years old, 18% of doctorate holders were less than 35 years old and the fewest (7%) were 65-69 years old. The reason for this is that in previous decades fewer persons participated in doctoral studies, particularly women. Among all female doctorate holders, the share of 65-69-year-old female doctorate holders was 3%², while among all doctorate holders the share of 65-69-year-old doctorate holders was 9%.

Chart 3: Doctorate holders by age groups, Slovenia, 2012



Source: SURS

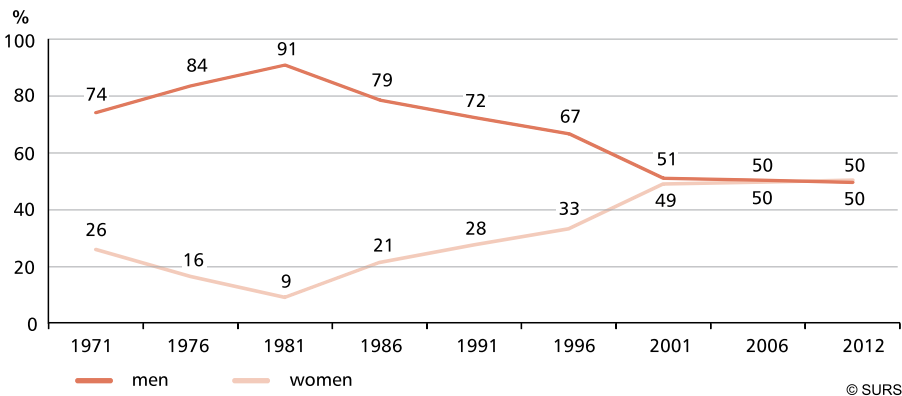
² Less accurate estimate – use with caution.

The population of doctoral students is constantly increasing; women are catching up with men

In the recent decades the number of tertiary education graduates, particularly doctoral graduates, has been constantly increasing. In 1971, 58 people graduated from doctoral studies, ten years later (in 1981) 78, in 1991 149, and in 2012 as many as 569. In the observed period the number of doctoral graduates thus jumped by 8.8 times.

A decade ago male doctoral graduates greatly outnumbered their female colleagues, but as the data show in recent years women have started to catch up with men; in 1971 they represented 26% of doctoral graduates, ten years later (in 1981) 9%, in 1991 28%, in 2001 49% and in 2006 and in 2012 a half.

Chart 4: Gender structure of doctoral graduates, Slovenia

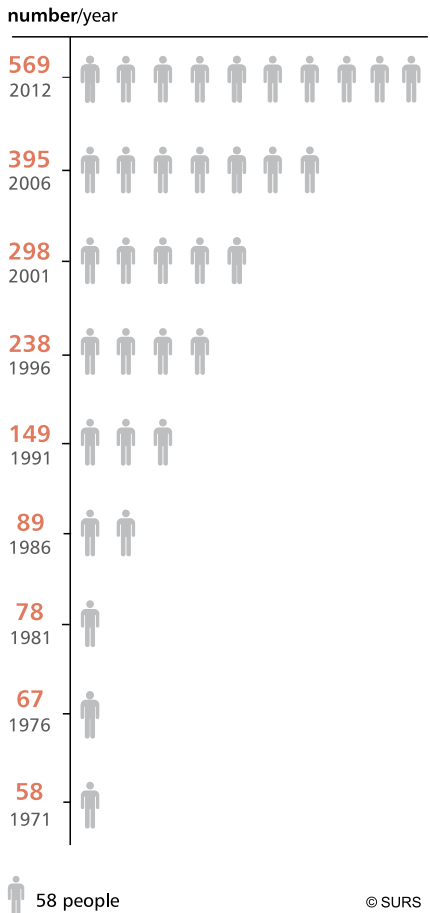


Source: SURS

The ratio between men and women, which was 3 to 1 in 1971, was declining until 2001 and then it levelled.

The international comparison for 2012 shows that in EU27 Member States women represented on average 47% of doctoral graduates; the share was between 41% (in the Czech Republic) and 60% (in Latvia).³

Infographic 2: Growth of the number of doctoral graduates, Slovenia¹⁾



1) Data are rounded.
Source: SURS

³ Source: Eurostat (<http://ec.europa.eu/eurostat>, 16. 10. 2014)

Because doctoral graduates are potential scientific and research personnel, for a society in which research and innovation are the drivers of economic development it is important that doctoral studies include both genders equally.

In the EU27 the compound annual growth rate of female doctoral graduates exceeds the growth rate of their male colleagues

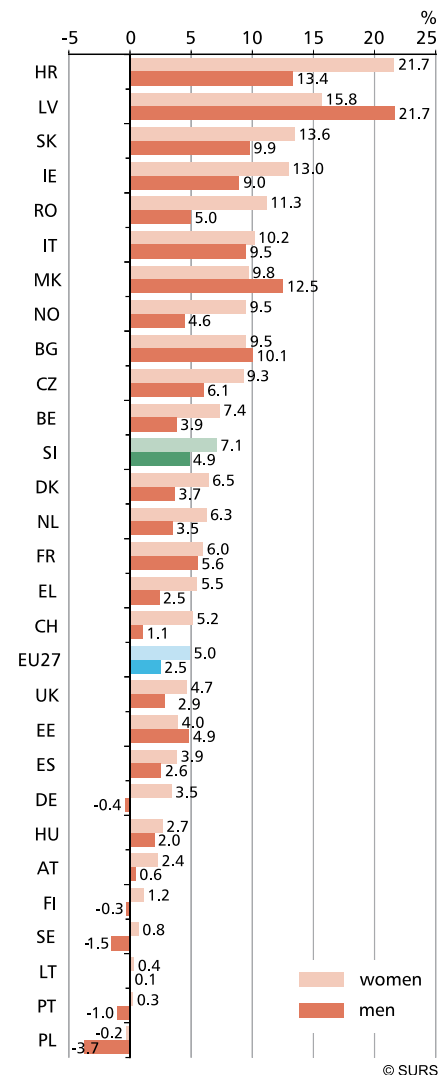
Statistical data on doctoral graduates show that recently their number has been increasing in most of the European countries. This is confirmed by the compound annual growth rate of doctoral graduates for both genders.

Examining the growth rate for each gender separately, one can see that in most of the European countries the annual growth rate for women was higher than the annual growth rate for men. In the 2002-2012 period the number of female doctoral graduates in the EU27 was growing on average by 5% per year and the number of their male colleagues by an average annual rate of 2.5%.

In Slovenia the compound annual growth rate of the number of female doctoral graduates was 7.1% and of their male colleagues 4.9%, i.e. 2.2 p.p. lower.

Negative compound annual growth rates of the number of doctoral graduates were recorded in Germany (-0.4%), Finland (-0.3%), Sweden (-1.5%) and Portugal (-1.0%); however, in these countries the annual growth rate of the number of female doctoral graduates was positive. Poland was the only country with a negative total annual growth rate of the number of both male (-3.7%) and female (-0.2%) doctoral graduates.

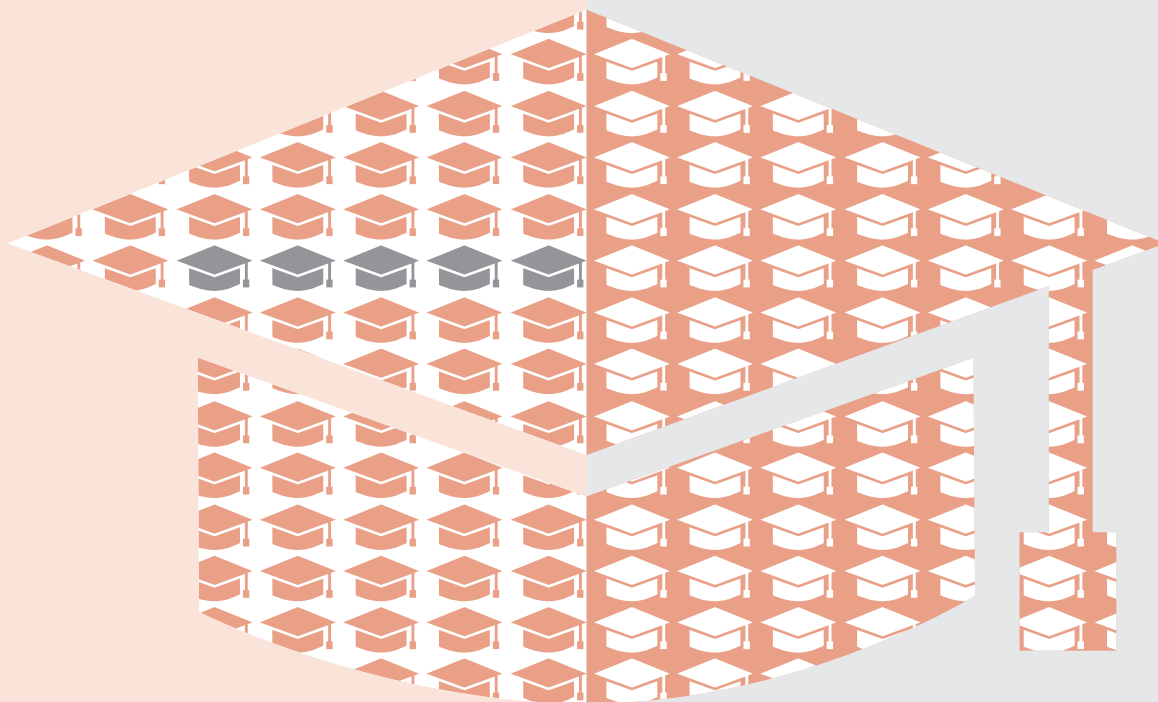
Chart 5: Compound annual growth rate of the number of doctoral graduates, by countries¹⁾, 2002-2012²⁾



1) EU27: estimate.

2) Reference years: EE: 2007-2010; EL: 2004-2012; FR: 2003-2011; RO, HR: 2003-2012.

Source: Eurostat (<http://ec.europa.eu/eurostat>, 16. 10. 2014)



2 EDUCATIONAL
CHARACTERISTICS

Education focused on striving for progress

In contemporary societies the educational characteristics of doctorate holders are highly regarded, since research is the essence of their work. They strive for progress, creation and diffusion of new knowledge, and creation of new technologies.⁴

Around 10% of doctorates received abroad

Of all doctoral holders with permanent or temporary residence in Slovenia in 2012, 91% or 7,085 doctorate holders received their degrees in Slovenia and 9% or 694 doctorate holders received their degrees abroad.

Most of the doctorate holders have degrees in natural sciences

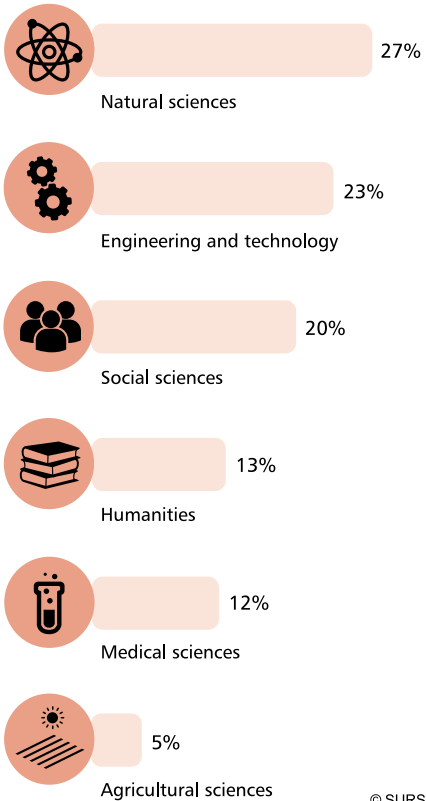
At the end of 2012, most of the doctorate holders in Slovenia had degrees in natural sciences (27%); they were followed by those who received degrees in engineering and technology (23%), social sciences (20%), humanities (13%) and medical sciences (12%). The fewest doctorate holders had degrees in agricultural sciences (5%).

Most of the recent doctorate recipients, i.e. those who received their doctoral degrees in 2011 and 2012, received their degrees in social sciences (28%); they were followed by those who received their degrees in natural sciences (22%), while the fewest received their degrees in agricultural sciences.

Unequal gender distribution among fields of science

The gender structure of doctorate holders shows a slightly unequal distribution among fields of science (shown by the international classification of fields of science and technology), which indicates the presence of horizontal segregation that reflects in higher shares of women in the so-called female sciences. The lowest share of female doctorate holders received their degrees in engineering and technology, which are supposed to be “male sciences”; women represented 17% of all doctorate holders with degrees in these sciences. More women than men received their doctoral degrees in medical sciences and humanities.

Infographic 3: Doctorate holders by fields of science, Slovenia, 2012



Source: SURS

© SURS

4 Auriol et al., 2012, p. 12.

Unequal gender distribution of doctoral graduates is also shown by the data on doctoral graduates by fields of education according to the International Standard Classification of Education (ISCED 97). In 2012, women outnumbered men also in all fields that are typical “female studies”, while men outnumbered women in all fields that are typical “male studies” (natural sciences and engineering). Among all doctoral graduates in 2012 who received degrees in science, mathematics and computing, 39% were women; among all doctoral graduates who received degrees in engineering, manufacturing and construction, 28% were women.

Unequal distribution of doctoral graduates by fields of education is also characteristic of other EU Member States. On average, the lowest share of female doctoral graduates was recorded in engineering, manufacturing and construction (on average 28%). The highest share of female doctoral graduates was recorded in education (on average 64%).

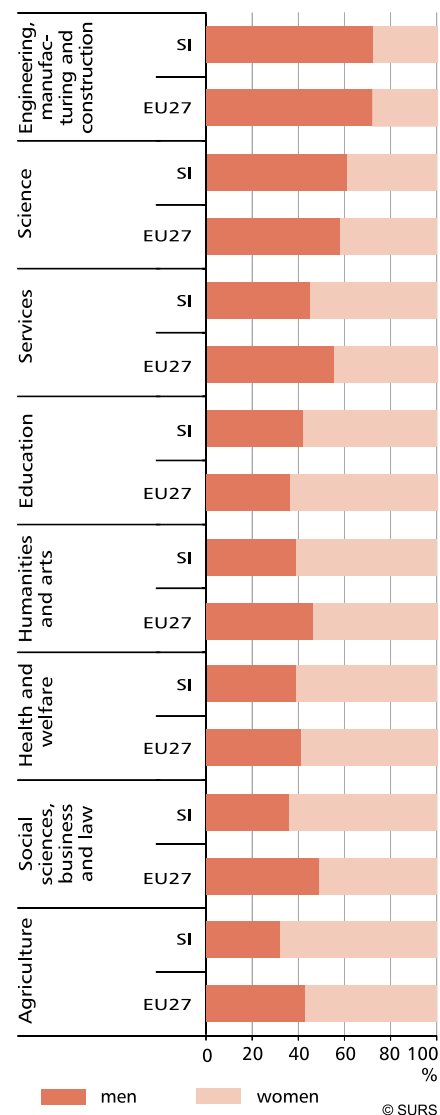
Mean age at receiving a doctorate is declining

The mean age of all doctorate holders was 35.6 years; of recent doctorate recipients 35.5 years. The median age of recent doctorate recipients was 33 years, which means that half of them were more than 33 and half were less than 33 years old when they received their degrees.

The mean age at receiving a doctorate has declined; recent doctorate recipients in Slovenia were on average 0.1 of a year younger than all doctorate recipients. The only exception was recent doctorate recipients who received their doctorates in agricultural sciences and social sciences; they were on average 1.6 and 1.8 years older than the total population of doctorate holders who received their degrees in 2011 and 2012.

The largest drop in the mean age at receiving a doctorate was recorded in medical sciences; doctorate holders who received their degrees in medical sciences in 2011 and 2012 were on average 35 years old, i.e. 2.4 years younger than all recipients of doctorate in medical sciences, who were on average 37.4 years old when they received their degrees.

Chart 6: Doctoral graduates by fields of education, Slovenia and EU27¹⁾, 2012



1) EU27: estimate.

Source: Eurostat (<http://ec.europa.eu/eurostat>, 16. 10. 2014)

Average duration of study is increasing

Doctoral studies of all doctorate holders lasted on average 4.1 years and of recent doctorate recipients 4.5 years. The median value for recent doctorate recipients was 5 years, which means that half of recent doctorate recipients studied more than 5 years and half less than 5 years.

Average duration of study of recent doctorate recipients (who received their doctorates in 2011 and 2012) was on average 0.4 years longer than average duration of study of all doctorate recipients. The largest increase was recorded in agricultural sciences, where recent doctorate recipients on average studied 1.3 years longer than all doctorate recipients (4.1 years).

Table 1: Doctorate holders by fields of science, Slovenia, 2012

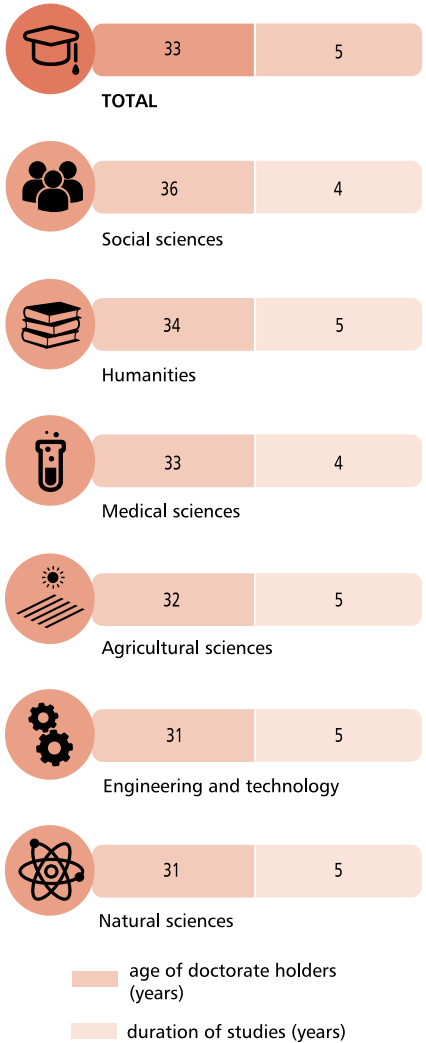
	Number		Mean age at receiving a doctorate (years)		Average duration of study (years)	
	total	recent	total	recent	total	recent
TOTAL	7,779	1,027	35.6	35.5	4.1	4.5
Natural sciences	2,110	231	33.5	32.0	4.1	4.7
Engineering and technology	1,812	202	34.3	33.6	4.3	4.5
Medical sciences	954	173	37.4	35.0	4.3	4.8
Agricultural sciences	373	30 ^M	36.6	38.2	4.1	5.4
Social sciences	1,528	287	37.7	39.5	3.5	4.0
Humanities	1,002	104 ^M	37.5	35.7	4.4	4.8

M less accurate estimate – use with caution
Source: SURS

Working as assistants and/or researchers is the primary source of financing doctoral studies

For 63% of doctorate holders the primary source of financing their doctoral studies was working as assistants and/or researchers. The other important sources of financing were work in another occupation (10%) and scholarships from Slovenia (7%).

Infographic 4: Median age of recent doctorate recipients at receiving the doctorate and median duration of studies by fields of science, Slovenia, 2012



Source: SURS

Self-assessment of knowledge, attributes and behaviours at the end of doctoral studies: mostly good or very good

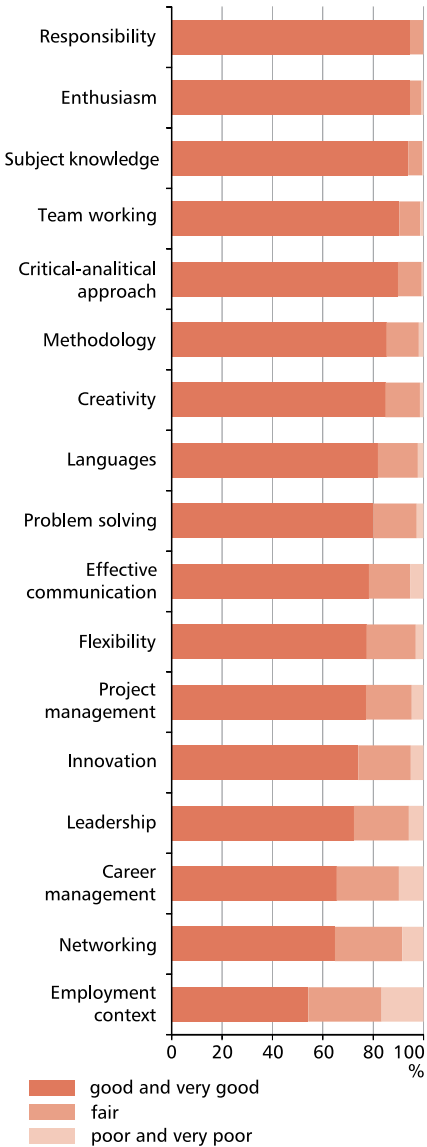
More than half of doctorate holders who in 2012 assessed their knowledge, attributes and behaviours at the end of doctoral studies by individual categories selected good or very good in all categories.

At the end of their doctoral studies more than 80% of doctorate holders who assessed their knowledge, attributes and behaviours thought that they had good or very good practical knowledge of their subject and the wider research context (subject knowledge), were “thinking outside the box” and developing new knowledge (creativity), were very well qualified for critical analysis and assessment of findings and results (critical-analytical approach), knew very well how to use the research methodology, tools and techniques (methodology), were very proficient in foreign languages (languages), knew very well how to cooperate with colleagues constructively (team working), and were very independent and responsible (responsibility) as well as committed to their tasks (enthusiasm).

Lower self-assessment regarding networking, career management and understanding how organisations operate

Even though doctorate holders thought that they were generally well qualified at the end of doctoral studies, there were some deficiencies in networking (developing, maintaining and using networks), career management (active management of own professional development) and employment context (understanding how organisations work), since about a third of doctorate holders assessed these categories as fair, poor or very poor.

Chart 7: Self-assessment of knowledge, attributes and behaviours at the end of doctoral studies, Slovenia, 2012



© SURS

Source: SURS



3 LABOUR MARKET

EU 2020 Strategy and the Union of innovations

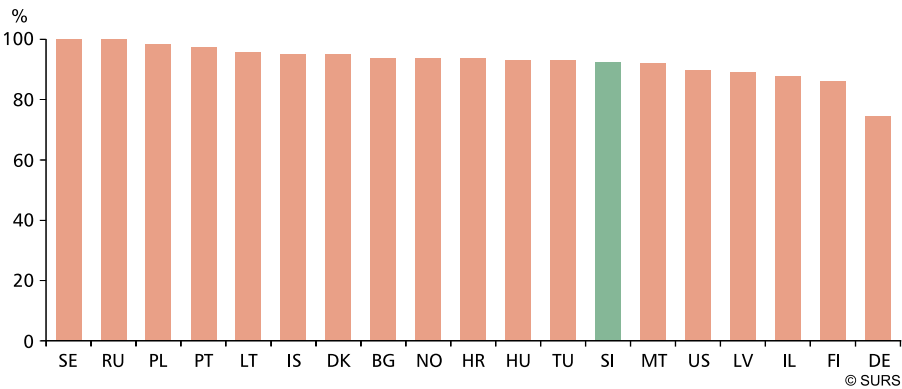
A number of science, technology and innovation indicators show the declining position of Europe in the world. By adopting the EU 2020 Strategy and its ambitious policy of promoting research and innovation, the EU set ambitious goals. To achieve them, it is important that countries – Slovenia included – fully use the potential and talent of doctorate holders.

Employment rate of doctorate holders higher than that of other higher education graduates

At the end of 2012, most doctorate holders in Slovenia were employed, i.e. 7,107 or 92%; 2%⁵ of doctorate holders were self-employed, 6% were inactive and 2%⁶ were unemployed.

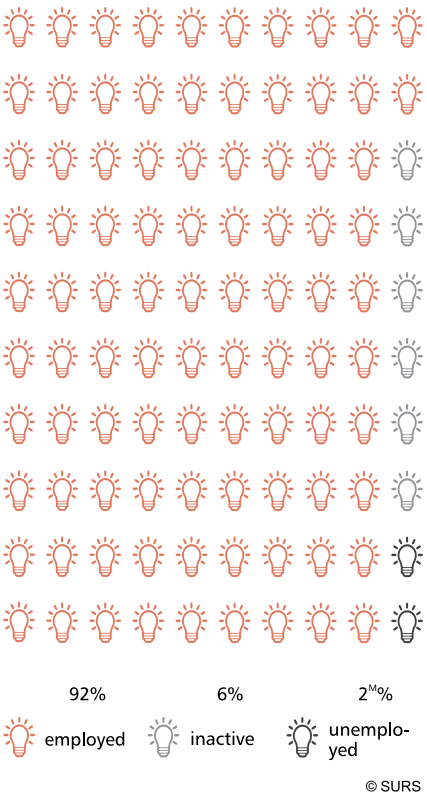
The international comparison for 2009 shows that doctorate holders had higher employment rates than all other higher education graduates of the same age.⁷ In the observed countries the employment rate of doctorate holders was between 75% (in Germany) and 100% (in Sweden and Russia).

Chart 8: Employed doctorate holders as % of all doctorate holders by countries, 2009



Source: Eurostat (<http://ec.europa.eu/eurostat>, 16. 10. 2014)

Infographic 5: Doctorate holders by employment characteristics, Slovenia, 2012



M less accurate estimate – use with caution
Source: SURS

5, 6 Less accurate estimate – use with caution.
7 Auriol, Misu & Freeman, 2013, p. 12.

Most of the employed doctorate holders have degrees in natural sciences

The structure of doctorate holders by fields of science reflects on the labour market. At the end of 2012, most of the employed doctorate holders had degrees in natural sciences (27%), followed by those with degrees in engineering and technology (24%), while the fewest had degrees in agricultural sciences (5%).

The higher education sector is the major employer of doctorate holders

In general, doctorate holders prefer to remain at universities. At the end of 2012 almost half of doctorate holders in Slovenia (3,462 or 49%) worked in the higher education sector; most of them had degrees in social sciences (23%), followed by those who had degrees in engineering and technology (22%) and those who had degrees in natural sciences (21%). 1,723 or 24% of doctorate holders worked in the business enterprise sector; most of them (38%) had degrees in natural sciences, followed by those who had degrees in engineering and technology (36%). 1,611 or 23% of doctorate holders worked in the government sector; most of them had degrees in natural sciences (31%). The remaining doctorate holders worked in the other education sector and the private non-profit sector.

The higher education sector was also the major sector of employment of doctorate holders in other countries for which the data for 2009 are available. In the Netherlands, Denmark and Belgium the share was around a third and in Poland and Portugal almost 80%. A third of doctorate holders were employed in the business enterprise sector in Belgium, Denmark and the United States.⁸

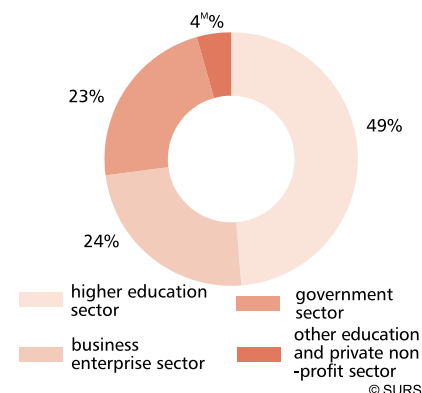
One in four doctorate holders temporarily employed

At the end of 2012, 5,367 or three quarters of doctorate holders in Slovenia were in permanent employment and 1,740 or a quarter in temporary employment; women prevailed.

The share of doctorate holders in temporary employment, which was the highest among doctorate holders aged up to 35 years (over a half), is falling with age. Younger doctorate holders are thus in a worse position on the labour market than their older colleagues.

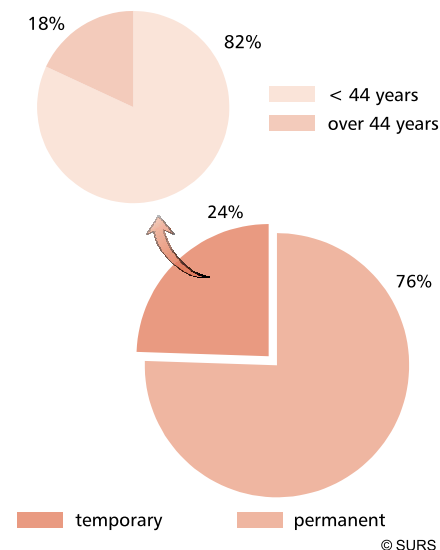
This is also characteristic of other observed countries. The international comparison for 2009 shows that doctoral graduates who received their degrees within the past five years or less had a higher share of temporary contracts (except in Malta) than those who received their degrees more than five years ago.⁹

Chart 9: Employed doctorate holders by sectors of employment, Slovenia, 2012



M less accurate estimate – use with caution
Source: SURS

Chart 10: Employed doctorate holders by age groups and type of contract, Slovenia, 2012



Source: SURS

⁸ Auriol et al., 2013, p. 19.

⁹ Auriol et al., 2013, p. 16.

Full-time employment predominates

At the end of 2012 most of the employed doctorate holders in Slovenia (92%) were in full-time employment.

Most of the doctorate holders are professionals

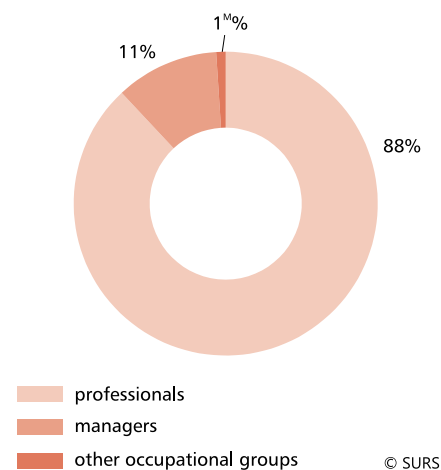
Among all doctorate holders in employment at the end of 2012, 11% or 756 were managers and 88% or 6,247 were professionals. Most of the latter were teaching professionals (45%) and science and engineering professionals (26%). Other occupational groups represented negligible shares.

High and the highest positions are occupied by fewer female doctorate holders ...

Women represented a minority of doctorate holders who worked as managers.

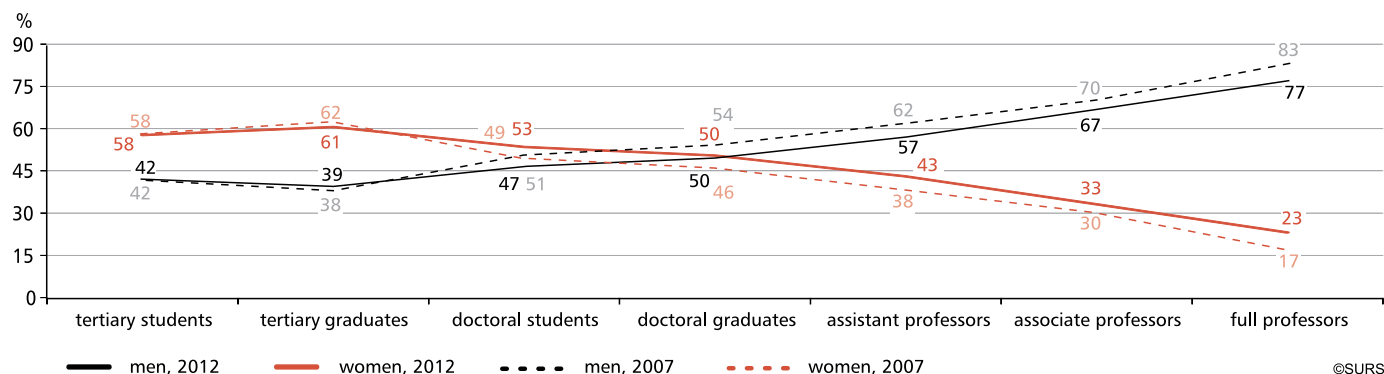
The lower number of women in high and the highest positions is also shown by the data on the teaching faculty, which indicate the so-called vertical segregation, i.e. the gender inequality in higher and more influential functions.¹⁰ The data on the teaching faculty show that in typical academic careers the share of women is falling with each higher step on the academic ladder. This inequality is shown well by the so-called scissor diagram.

Chart 12: Employed doctorate holders by occupational groups, Slovenia, 2012



M less accurate estimate – use with caution
Source: SURS

Chart 11: Women and men¹⁾ in typical academic careers, Slovenia



1) Students and tertiary education graduates do not include students and graduates of doctoral studies.

Source: SURS

¹⁰ Caprile et al., 2012, p. 15.

... even though they dominate among the student population

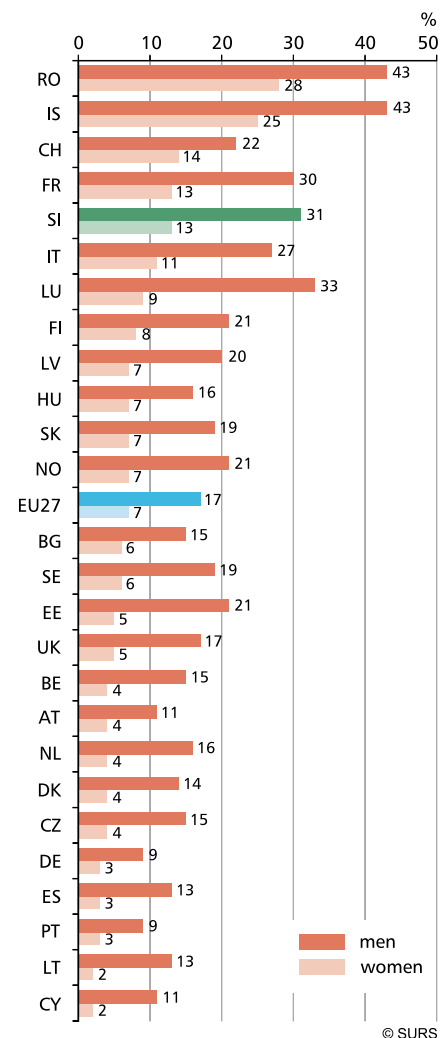
Despite the fact that women have been prevailing among the student population in Slovenia since the 1980s, in the highest academic positions they are outnumbered by their male colleagues. In 2012, women predominated among tertiary students and graduates. Their share at the doctoral level was lower than before but still higher than the share of male doctoral students; however, the share of women and men who completed their doctoral studies was roughly the same.

The doctoral degree is frequently the basis for an academic career, so the low share of women at this level has a negative effect on their relative representation at the first stage of the academic career. In 2012, half of the doctoral graduates were women and half were men. However, the share of women declines with each next step on the academic ladder: 43% of assistant professors, 33% of associate professors and only 23% of full professors were women. One of the possible explanation for women's under-representation at the highest hierarchical level could be that the generation effect is at work, meaning that women who are currently at the highest levels only accounted for a very small proportion of female students at the different study levels when they were young.¹¹ This can clearly be seen from the presented age structure of doctorate holders.

In the EU27, too, the share of male full professors higher than the share of female full professors

The scissor diagram is characteristic also of other European countries. The share of women declined with each higher step on the academic ladder; this shows vertical segregation which countries try to reduce, since the low number of women in the highest decision-making positions means waste of female potential and talent for European economies.¹² According to the data for 2010, female full professors represented 7% of total female academic staff, while male full professors represented 17% of total male academic staff at the highest academic position in EU27 Member States (a.k.a. grade A academic staff). In all observed countries the share of male full professors was much higher than the share of female full professors, which ranged between 2% (in Cyprus and Lithuania) and 28% (in Romania).

Chart 13: Full professors¹⁾ as % of total academic staff by countries, 2010²⁾



1) In most countries grade A academic staff includes full professors.

2) Reference years: CZ: 2008, DK, FR, CY, AT, PT, RO, SE: 2009, EE: 2004, UK: 2006, SK: 2001; EU27: estimate.

Source: She Figures 2012

¹¹ European Commission, 2013, p. 97.

¹² European Commission, 2012, p. 13.

More than half of doctorate holders teach in their work

In the employment that they had at the end of 2012, 57% of doctorate holders were teaching; 30% of them were teaching for more than 75% of their working time and 33% for less than 25% of their working time.

30% of doctorate holders had at least one second job

At the end of 2012, 30% of employed doctorate holders had at least one second job in addition to their principal jobs. More than half of them were men. Second jobs reflected in higher average gross annual earnings.

Highest average gross annual earnings received by doctorate holders in the business enterprise sector

In 2012, average gross annual earnings of doctorate holders in Slovenia amounted to EUR 45,164. The median value was EUR 40,231, which means that half of doctorate holders had higher and half had lower earnings than the stated amount.

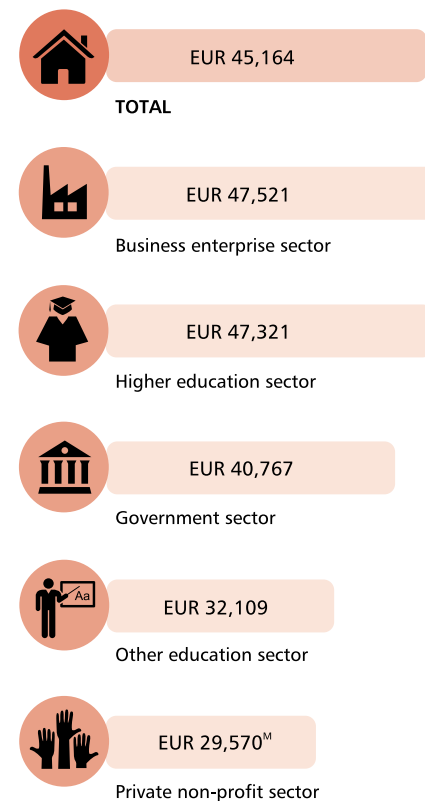
The highest gross annual earnings were received by doctorate holders working in the business enterprise sector (EUR 47,521), followed by those working in the higher education sector (EUR 47,321), the government sector (EUR 40,767) and the other education sector (EUR 32,109). The lowest gross annual earnings were paid in the private non-profit sector.

Income gap between female and male doctorate holders

It is characteristic of the labour market in general that there is a gender income gap, which is also true of doctorate holders. In 2012, average gross annual earnings of male doctorate holders amounted to EUR 47,777 (median EUR 41,873) and of their female colleagues to EUR 41,342 (median EUR 37,410). Gross annual earnings of female doctorate holders were 87% of gross annual earnings of their male colleagues. In absolute value they were on average more than EUR 6,000 lower. The greatest gender income gap was recorded in the higher education sector and the private non-profit sector, where earnings of female doctorate holders were on average EUR 10,000 lower than earnings of their male colleagues.

The international comparison for 2009 also shows the existence of the gender income gap in other European countries. Female doctorate holders had lower median gross annual earnings than their male colleagues in all countries for which data are available. In addition to possible inequalities, the differences may be explained by different factors such as younger average age of women and consequently lower seniority, as well as the fact that women are more frequently working part-time.¹³

Infographic 6: Average gross annual earnings of doctorate holders by sectors of employment, Slovenia, 2012



© SURS

M less accurate estimate – use with caution
Source: SURS

¹³ Auriol et al., 2013, p. 20.

Highest average gross annual earnings received by doctorate holders with degrees in medical sciences

In 2012, doctorate holders with degrees in medical sciences had the highest average gross annual earnings, EUR 65,187. Average gross annual earnings of male medical doctors amounted to EUR 78,030 and were 63% higher than average gross annual earnings of all male doctorate holders, while average gross annual earnings of female medical doctors amounted to EUR 52,438 and were 27% higher than average gross annual earnings of all female doctorate holders.

The lowest average gross annual earnings were received by doctorate holders with degrees in agricultural sciences; they amounted to EUR 35,801 and were 21% lower than average gross annual earnings of all doctorate holders.

As expected, lowest average gross annual earnings received by doctorate holders aged up to 35 years

Average gross annual earnings of doctorate holders aged up to 35 years amounted to EUR 28,315 in 2012, which was 63% of the average gross annual earnings of all doctorate holders in Slovenia. The median earnings for this age group amounted to EUR 26,717, which means than half of doctorate holders in this age group received higher and half lower gross annual earnings than the stated amount.

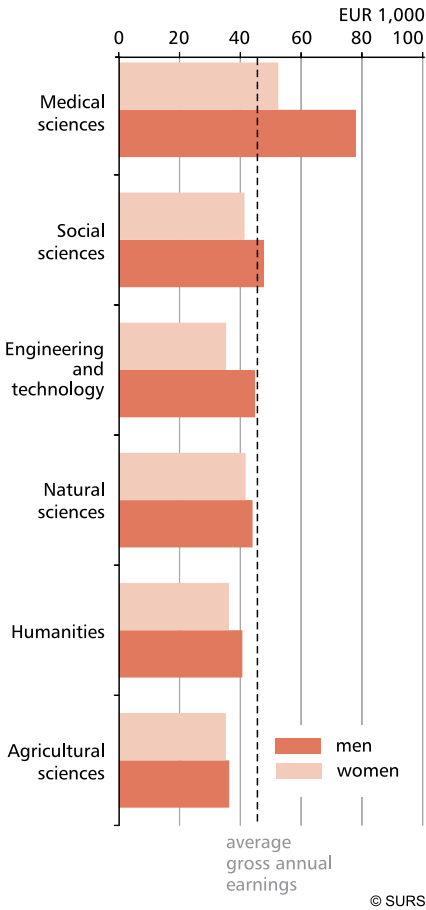
Table 2: Average gross annual earnings of doctorate holders by age groups, Slovenia, 2012

	EUR					
	Total		Men		Women	
	average	median	average	median	average	median
TOTAL	45,164	40,231	47,777	41,873	41,342	37,410
less than 35 years	28,315	26,717	29,954	28,828	25,877	25,302
35-44 years	40,923	36,262	45,773	39,348	35,277	32,886
45-54 years	51,664	45,734	50,987	45,734	52,637	45,080
55-64 years	59,308	51,587	61,294	52,152	55,341	49,452
65-69 years	63,076	55,111	62,717 ^M	55,111	65,497	67,352

M less accurate estimate – use with caution

Source: SURS

Chart 14: Average gross annual earnings of doctorate holders by fields of science Slovenia, 2012



Source: SURS

Average gross annual earnings of doctorate holders grew with each age group. As expected, on average the highest average gross annual earnings, EUR 63,076, were received by doctorate holders aged 65-69 years. Their median earnings amounted to EUR 55,111, which means than half of them received higher and half lower gross annual earnings.

Work of almost three out of four doctorate holders closely related to their qualification, i.e. doctorate

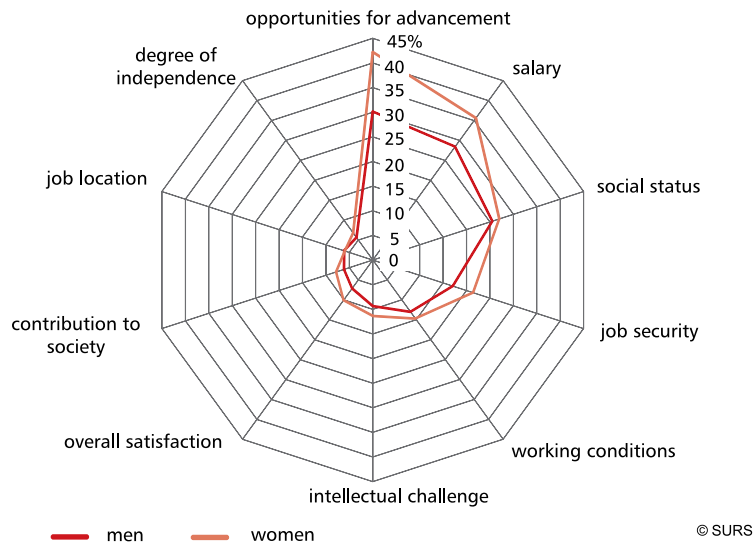
At the end of 2012, the principal job of 70% of employed doctorate holders in Slovenia was closely related to their qualification, i.e. doctorate. For 22% of doctorate holders their principal job was partly related to the doctoral degree and for 8% not at all related to the doctoral degree.

As regards doctorate holders with degrees in humanities, for three quarters their work was closely related to their doctorate. As regards doctorate holders with degrees in agricultural sciences, the share was two thirds.

In general satisfied with their principal jobs

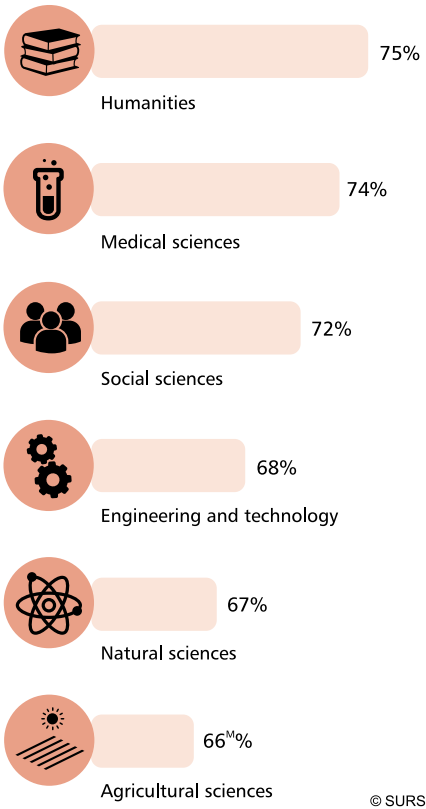
At the end of 2012, 92% of doctorate holders in Slovenia were generally satisfied or very satisfied with their jobs. The satisfaction rate was the highest regarding the degree of independence, intellectual challenge, job location and contribution to society, and the lowest regarding the opportunities for advancement and salary; female doctorate holders were slightly more dissatisfied with the latter two categories.

Chart 15: Doctorate holders aged up to 35 years who expressed dissatisfaction with individual job-related categories, by sex, Slovenia, 2012



Source: SURS

Infographic 7: Opinion of doctorate holders regarding the job relation to the doctoral degree, Slovenia, 2012

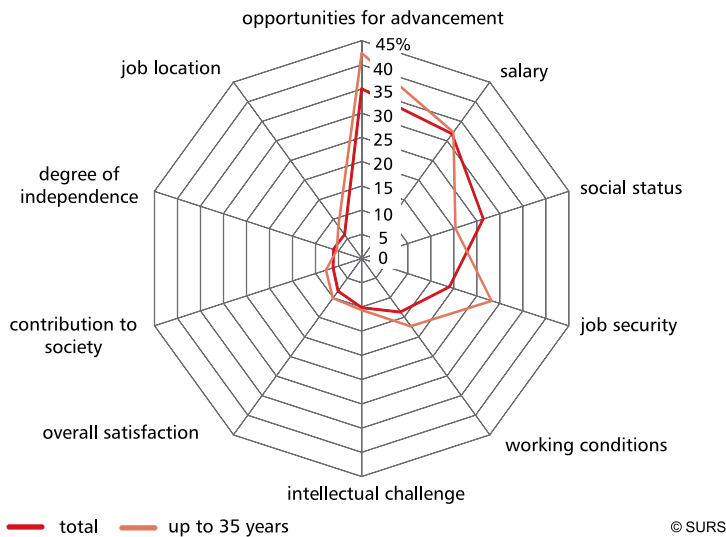


M less accurate estimate – use with caution
Source: SURS

A comparison of the categories intellectual challenge, degree of independence and contribution to society, which represent “intellectual advantages”, with the categories salary and opportunities for advancement, which represent “economic advantages”, shows that the jobs of doctorate holders do not necessarily combine satisfaction with intellectual and economic advantages, which is particularly true of female doctorate holders.

Compared to all doctorate holders in Slovenia, in 2012 doctorate holders aged up to 35 were generally less satisfied with individual job-related categories. The only exception was the social status category, where young doctorate holders expressed slightly more satisfaction. 42% of doctorate holders aged up to 35 were much less satisfied (compared to all doctorate holders) with opportunities for advancement, job security and working conditions. Higher dissatisfaction with these categories is the result of the mentioned worse labour market situation of young doctorate holders.

Chart 16: Doctorate holders who expressed dissatisfaction with individual job-related categories, Slovenia, 2012

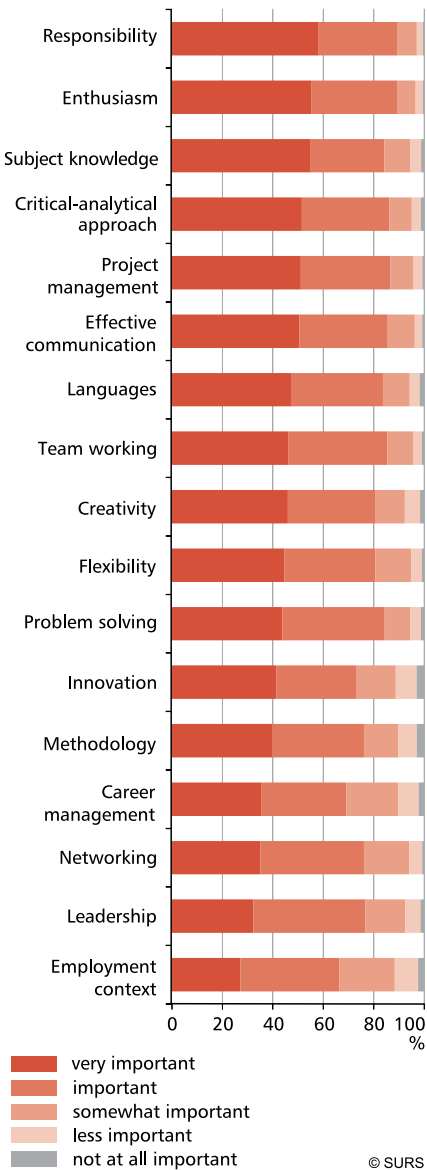


Source: SURS

Jobs performed by doctorate holders mostly require high qualification

Doctorate holders assessed to what extent their knowledge, attributes and behaviours are important for their work. Jobs of doctorate holders require effective and self-confident communication with different people, effective planning,

Chart 17: Knowledge, attributes and behaviours by level of importance for work/job, Slovenia, 2012



Source: SURS

leadership and timely implementation of projects (project management), critical analysis and assessment of findings and results (critical-analytical approach), dedication to fulfilling their tasks (enthusiasm), independence and responsibility, appropriate usage of research methodology, creativity, rapid adjustment to changes and new circumstances, effective communication in foreign languages, theoretical and practical understanding of their subjects, team working, and introducing appropriate solutions for problems and challenges. Three out of four doctorate holders who assessed the mentioned categories thought that these knowledge, attributes and behaviours were very important or important in their work, which shows that the talent of doctorate holders on the Slovene labour market was well exploited in 2012.

One in three doctorate holders changed their principal jobs in Slovenia at least once in the past decade

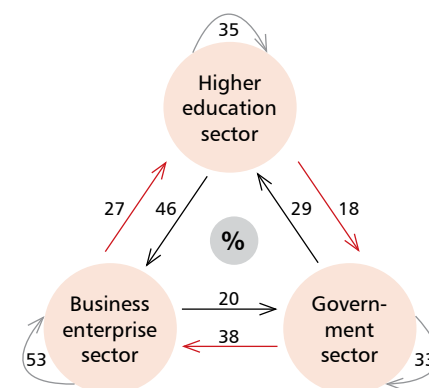
In modern societies in which knowledge is the key value, the exchange and transfer of knowledge are the most important factors of progress. One of the methods of knowledge transfer is mobility of people between various research organisations and sectors of the economy. In Slovenia one in three doctorate holders (2,280 people) employed at the end of 2012 changed their principal jobs in the past ten years, i.e. between 1 January 2003 and 31 December 2012. According to a less accurate estimate, around 1,920 doctorate holders changed their principal jobs within the three main institutional sectors: the higher education sector, the government sector and the business enterprise sector.

612 of them used to work in the business enterprise sector; 53% of them remained in the business enterprise sector, 27% found jobs in the higher education sector and 20% in the government sector.

611 of them used to work in the government sector; a third of them remained in the government sector, 38% found jobs in the business enterprise sector and 29% in the higher education sector.

700 of them used to work in the higher education sector; 35% of them remained in the higher education sector, almost half of them found jobs in the business enterprise sector and 18% in the government sector.

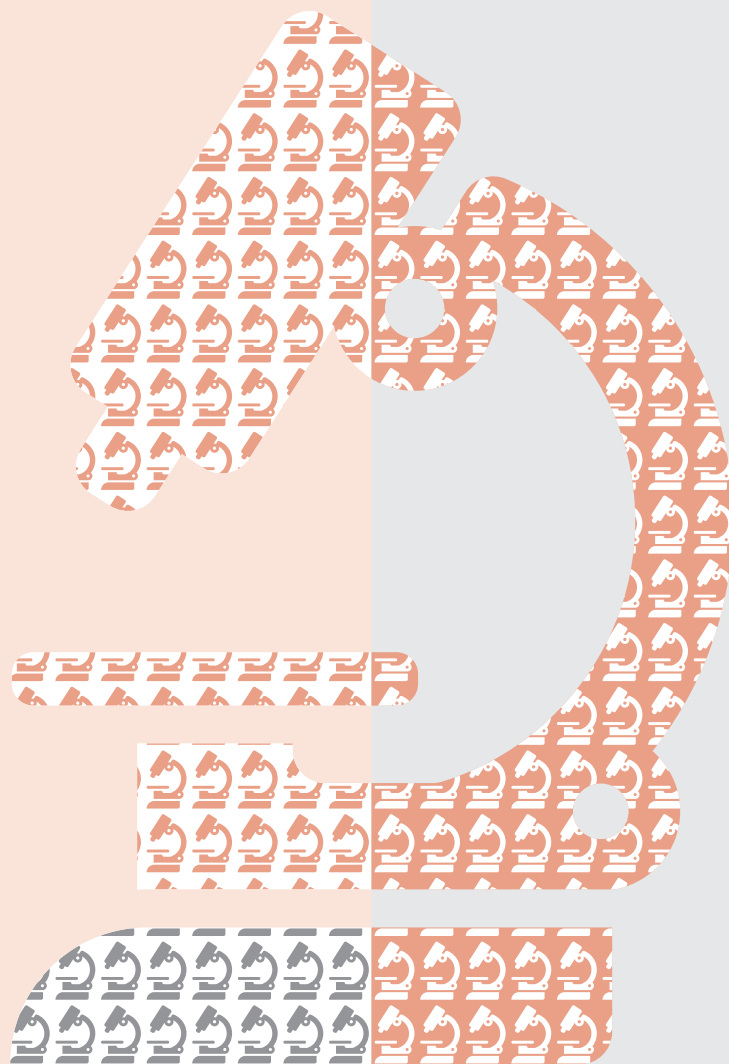
Chart 18: Doctorate holders who changed their jobs in the past ten years within or between sectors¹⁾, Slovenia, 2012²⁾



1) The calculation does not take into account the other education sector and the private non-profit sector.

2) M less accurate estimate – use with caution.

Source: SURS



4 DOCTORATE HOLDERS
AS RESEARCHERS

In general, research is the focus of work of doctorate holders. In rapidly changing and knowledge-based economies, highly qualified, creative and dynamic researchers are necessary to build and maintain a competitive economy.¹⁴

Most of the doctorate holders engaged in research

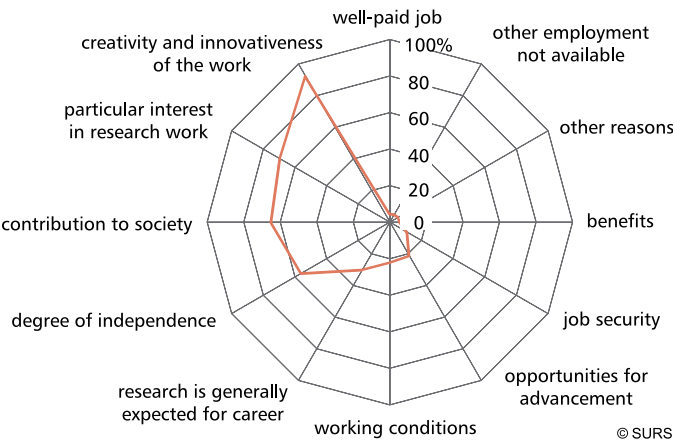
Research is demanding and full of challenges, which come both from the environment and from the internal desire to discover something new and seek truth. On one hand, researchers are stimulated by the desire to contribute new knowledge to the global community, while on the other hand they are forced to do that by the needs of the society, solving of its problems and accelerating its development.¹⁵

6,029 or 85% of doctorate holders employed in Slovenia in 2012 were engaged in research and/or experimental work, i.e. creating new knowledge, products, procedures, methods or systems, or leading such projects. Of these, 2,359 female doctorate holders and 3,670 male doctorate holders worked as researchers.

Creativity of work the most frequent reason for working as a researcher

For doctorate holders the most frequent reason for working as a researcher was creativity of research work (92%), followed by particular interest in research work, contribution to society and degree of independence. These data also show that doctorate holders value intellectual advantages more than economic advantages.

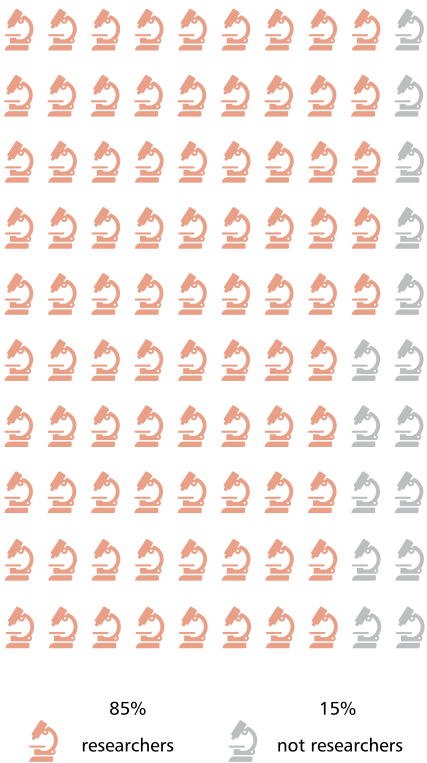
Chart 19: Reasons for having chosen a research career, Slovenia, 2012



Source: SURS

14 Auriol et al., 2013, p. 7.
15 Svetlik, 2013, p. 7.

Infographic 8: Employed doctorate holders by whether or not they worked as researchers, Slovenia, 2012



© SURS
Source: SURS

Higher education sector the main employer of researchers

Of all doctorate holders employed in 2012 in the higher education sector 93% were engaged in research. In the government sector the share was 82%, in the business enterprise sector – which invests the most in research and development – 76%, in the private non-profit sector 64%¹⁶ and in the other education sector 46%¹⁷.

The fewest researchers received doctoral degrees in agricultural sciences

The share of researchers was the highest among doctorate holders who received degrees in engineering and technology (89%), followed by those who received degrees in medical sciences (87%); it was the lowest among doctorate holders who received degrees in agricultural sciences (65%)¹⁸.

In other countries, too, researchers are mostly employed in the higher education sector

The international comparison for 2009 shows that in most of the observed countries the higher education sector was the main sector of employment for doctorate holders working as researchers. Only Belgium, the United States and the Netherlands had higher shares of doctorate holders as researchers in the business enterprise sector. Traditionally, doctorate holders pursue an academic research career, but the growing number of doctorate holders employed as researchers in the business enterprise sector – which is the largest R&D sector in OECD countries – reflects greater demand for highly skilled personnel outside the academia and/or less available opportunities in the higher education sector.¹⁹

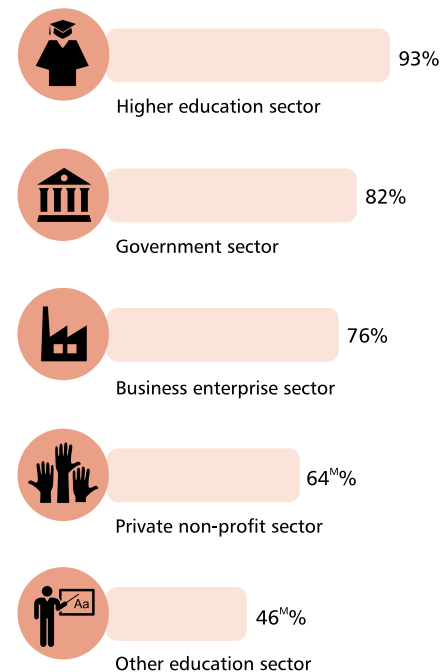
Researchers in Slovenia earn on average more than their colleagues who are not engaged in research

In 2012, average gross annual earnings of researchers amounted to EUR 46,080; for female researchers EUR 42,137 and for male researchers EUR 48,615. Average gross annual earnings of male doctorate holders were higher than those of their female colleagues, irrespective of whether they were engaged in research or not.

Average gross annual earnings of doctorate holders working as researchers were 15% higher than average gross annual earnings of doctorate holders not engaged in research.

Doctorate holders working as researchers earned more than doctorate holders not engaged in research in all sectors of employment; the difference was the smallest in the business enterprise sector.

Infographic 9: Researchers by sectors of employment, Slovenia, 2012



© SURS

M less accurate estimate – use with caution
Source: SURS

¹⁶, ¹⁷, ¹⁸ Less accurate estimate – use with caution.

¹⁹ Auriol et al., 2013, p. 24.

Doctorates in medical sciences bring the highest average gross annual earnings

As is true of the entire population of doctorate holders in Slovenia, in 2012 researchers with doctorates in medical sciences had the highest average gross annual earnings, EUR 67,613. Their average gross annual earnings were 47% higher than average gross annual earnings of all doctorate holders working as researchers, while compared to doctorate holders with doctorates in medical sciences who did not work as researchers their earnings were 38% or more than EUR 18,000 higher. As regards average gross annual earnings, researchers with doctorates in social sciences followed with EUR 44,706.

On average satisfied with their principal jobs in Slovenia

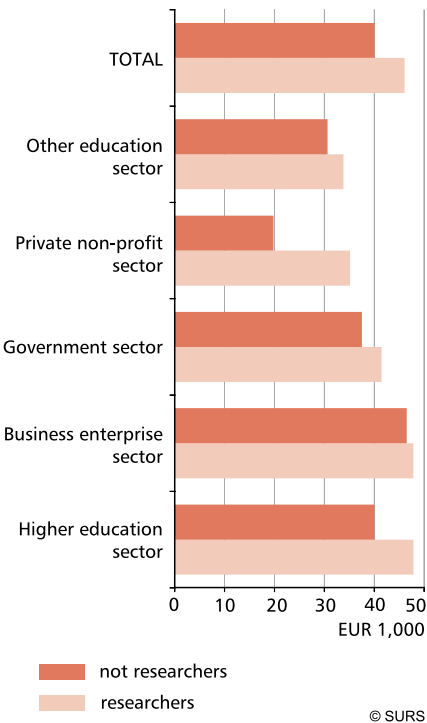
The data for 2012 show that doctorate holders working as researchers were in general satisfied with their principal jobs. In most of the categories they were at least as satisfied as doctorate holders not working as researchers. Researchers expressed greater dissatisfaction with job security, while in all other categories doctorate holders not working as researchers were more dissatisfied, especially with the opportunities for advancement and intellectual challenges. 32% of doctorate holders working as researchers were dissatisfied with opportunities for advancement, while the share for doctorate holders not working as researchers was 51%. The shares of doctorate holders dissatisfied with intellectual challenges were 7% for those working as researchers and 27% for those not working as researchers.

Chart 20: Doctorate holders who are dissatisfied with the possibilities offered by employment, Slovenia, 2012



Source: SURS

Chart 21: Average gross annual earnings of doctorate holders by sector of employment, Slovenia, 2012



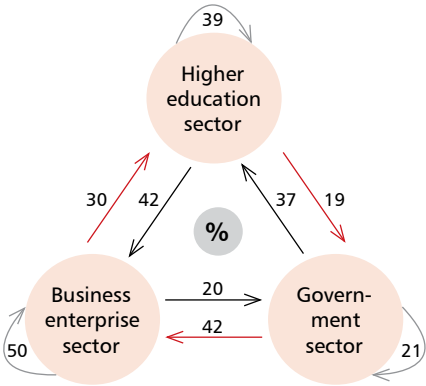
Source: SURS

Researchers change their jobs less frequently

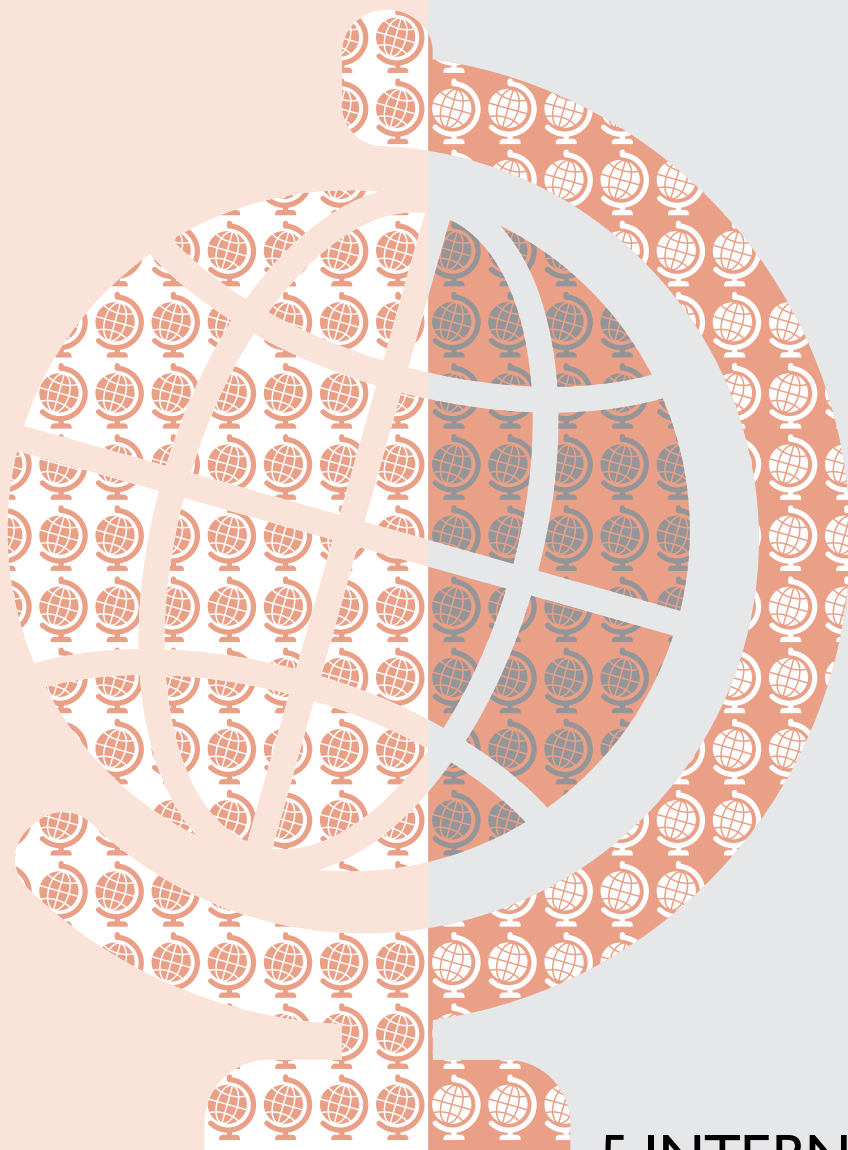
In the past ten years (between 1 January 2003 and 31 December 2012), doctorate holders working as researchers changed their jobs less frequently than doctorate holders not working as researchers. Fewer changes in employment of doctorate holders working as researchers than of doctorate holders not working as researchers can be explained by the fact that the former were in general more satisfied with their principal jobs than the latter.

According to data for 2012, which should be taken into account as less accurate estimates, 1,807 doctorate holders working as researchers changed their jobs in the past ten years; 1,566 of them changed their jobs within the three main institutional sectors (business enterprise sector, government sector, higher education sector): 501 of them used to be employed in the business enterprise sector (half of them remained in the sector), 460 in the government sector (42% changed to the business enterprise sector) and 605 in the higher education sector (42% of them found new jobs in the business enterprise sector). This shows that the number of doctorate holders working as researchers in the higher education sector and the government sector declined, and that in the business enterprise increased. This can indicate the growing needs of the business enterprise sector to employ doctorate holders as researchers.

Chart 22: Researchers who changed their jobs in the past ten years within or between sectors, Slovenia, 2012¹⁾



1) M Less accurate estimate – use with caution.
Source: SURS



**5 INTERNATIONAL
MOBILITY**

Scientific and technological cooperation in Europe and the world

As other European countries, Slovenia, too, faces a number of challenges, including the ones arising from the growing globalisation. Without increased scientific and technological cooperation in Europe and the rest of the world countries cannot effectively respond to global challenges. For developing and spreading knowledge in the world, international cooperation, mobility of researchers and “brain circulation” are very important.²⁰

International mobility not yet widespread

Internationally mobile are those doctorate holders who studied for a doctorate and/or who after having received a doctorate worked or were engaged in research/experimental work abroad for more than 3 months in the past ten years (between 1 January 2003 and 31 December 2012).

Statistical data show that doctorate holders in Slovenia are not very internationally mobile. In the past ten years 15% of them were internationally mobile. More than half of internationally mobile doctorate holders were men.

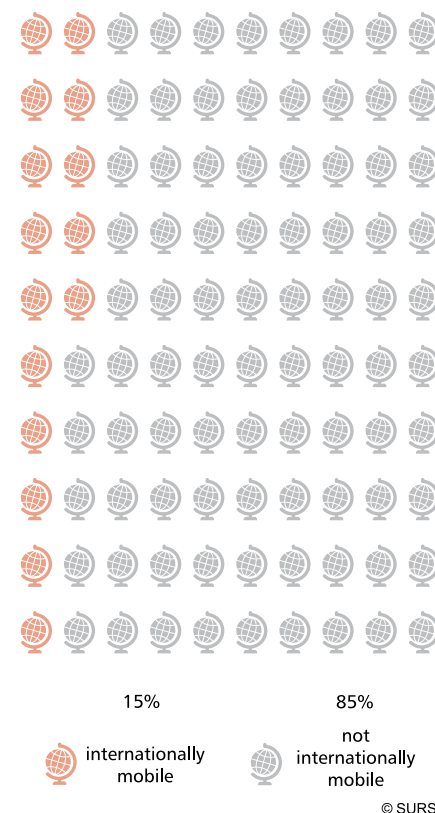
The international comparison for 2009 shows that low international mobility was recorded also in other countries for which the data are available. On average, only 14% of national citizens with a doctorate were internationally mobile in the previous ten years. A number of barriers, including economic and personal costs, language differences and lack of incentives may also explain this apparently low mobility rate.²¹

Most of the doctorate holders go to European countries

In the past decade 74% of internationally mobile doctorate holders from Slovenia went to European countries, followed by North America (Canada, Mexico and the United States) with 18%²². The most popular European countries were Italy, Germany and Austria.

The international comparison for 2009 shows that Europe was the main target region for internationally mobile doctorate holders. The United States was among the first three destination countries, while the three largest European countries (France, Germany and the United Kingdom) appeared among the favourite destinations as well as those countries that have strong historical, cultural or linguistic links with the reporting country.²³

Infographic 10: Internationally mobile doctorate holders, Slovenia, 2003-2012



Source: SURS

²⁰ Ministry of Higher Education, Science and Technology, 2011, p. 110.

²¹ Auriol et al., 2013, p. 37.

²² Less accurate estimate – use with caution.

²³ Auriol et al., 2013, p. 37.

Most of the so-called internationally mobile doctorate holders only once abroad in the past ten years

In the past decade 76% of all internationally mobile doctorate holders with Slovene citizenship were internationally mobile once and 55% of them stayed abroad for less than a year.

The most frequent reason to go abroad is academic

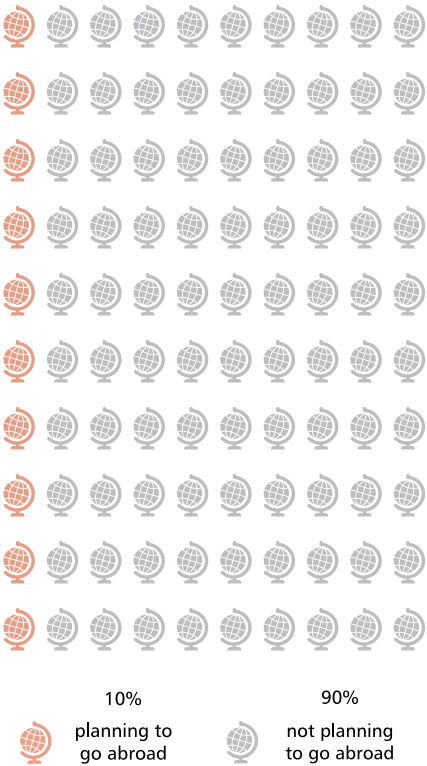
In the 2003-2012 period the most frequent reason for going abroad was academic, followed by obtaining the highest tertiary qualification and by job related or economic factors.

One in ten doctorate holders in Slovenia planned to go abroad

In 2012, 10% of doctorate holders planned to leave Slovenia within the next 12 months. The most frequent reason was academic, followed by job related or economic factors.

The international comparison for 2009 shows that in all (eleven) observed countries for national citizens with a doctorate academic reasons played an important role in deciding to go abroad (43.9%), followed by job-related or economic factors (30.9%) and family or personal reasons (15%). The latter were the main reasons for returning to the home country.²⁴

Infographic 11: Doctorate holders planning to go abroad in the next 12 months, Slovenia, 2012



© SURS

Source: SURS

²⁴ Auriol et al., 2013, p. 40.

Key findings on doctorate holders

Demographic characteristics

- There are more male than female doctorate holders.
- In recent decades the number of doctorate holders in Slovenia has been constantly increasing.
- The average annual growth in the number of female doctorate holders exceeded that of their male colleagues.

International mobility

- On average, in the past ten years one in seven doctorate holders spent some time abroad due to academic reasons, i.e. was internationally mobile.
- Most of the so-called mobile doctorate holders moved to European countries.
- One in ten doctorate holders planned to emigrate from Slovenia in the next 12 months.

Researchers

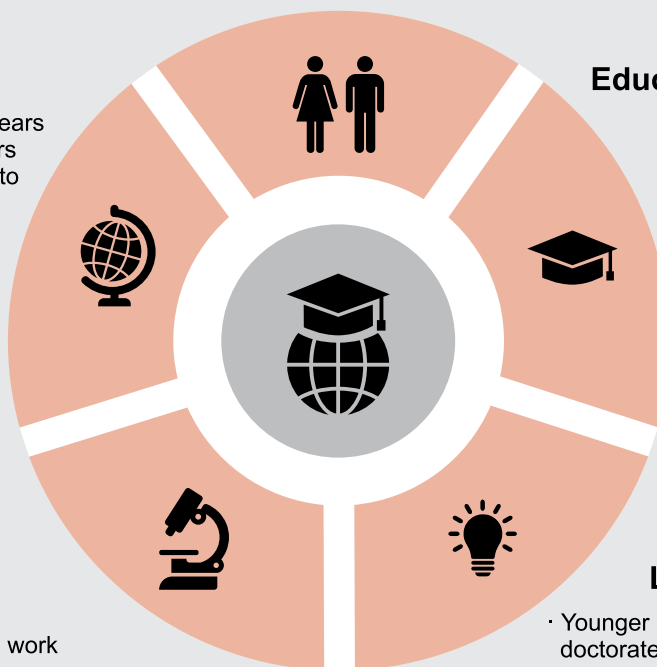
- Most of the doctorate holders work as researchers.
- Most of the doctorate holders are employed in the higher education sector.
- The share of doctorate holders working as researchers is the lowest among those who received their degrees in agricultural sciences.
- Creativity of work is the most frequent reason for working as a researcher.

Educational characteristics

- Most of the doctorate holders in Slovenia received their degrees in natural sciences.
- There is horizontal segregation of doctorate holders, which reflects in the unequal gender distribution of doctorate holders by fields of science and fields of education.
- The mean age of doctorate holders at receiving the doctoral degree is declining, while the average duration of study is increasing.

Labour market

- Younger doctorate holders – female doctorate holders in particular – are in a worse position on the labour market than their older colleagues.
- The higher education sector is the major sector of employment of doctorate holders.
- There is vertical segregation of doctorate holders on the labour market.
- There is an income gap between female and male doctorate holders.
- Work of doctorate holders does not necessarily combine “intellectual advantages” with “economic advantages”.
- In their work, most of the doctorate holders are engaged in research.



DEFINITIONS OF SOME CONCEPTS USED

Doctorate holder is a person who finished the doctoral studies and after the end of the study obtained the academic title of doctor of science.

The Survey on the Careers of Doctorate Holders takes into account doctorate holders aged up to 69 years who have permanent or temporary residence in Slovenia, irrespective of whether they received their doctorates in Slovenia or abroad.

Principal job is a job that the doctorate holder had on 31 December 2012.

Second job is a job that the doctorate holder had on 31 December 2012 in addition to his or her principal job.

Researcher is a person who at the job he or she had on 31 December 2012 – irrespective of whether it was a principal or second job – was engaged in research and/or experimental work, i.e. conception or creation of new knowledge, products, procedures, methods or systems, and managed such projects.

Recent doctorate recipients are those who received their doctoral degrees in 2011 or 2012.

Internationally mobile doctorate holder is a person who in the period from 1 January 2003 to 31 December 2012 studied for a doctorate and/or after having received a doctorate worked or was engaged in research/experimental work abroad for more than 3 months.

Sectors of employment. Enterprises and organisations in which doctorate holders were employed or worked are divided into five sectors:

1. Business enterprise sector includes enterprises whose primary activity is the market production of goods or services for sale to the general public at an economically significant price.
2. Government sector includes non-financial corporations under public control and other central government units, other local government units and direct budgetary users.
3. Higher education sector covers universities and other institutions in which post-secondary education takes place, irrespective of the source of finance and legal status. Also included are research institutes, experimental units and clinics under the direct supervision of public higher education institutions.
4. Private non-profit sector covers private non-profit institutions serving private persons and households. The institutions are financed by the founder in the form of gifts in kind, with part of the funds contributed by enterprises and the government.
5. Other education sector comprises all institutions carrying out pre-school, primary or secondary education, whatever their source of finance and legal status.

PRECISION OF ESTIMATES

Because the survey does not include all units of the target population but only a selected random sample, sampling errors appear in estimates. The sampling plan, the sample size and the variability of data determine how big a sampling error is. Therefore, the precision of estimates can vary. The Statistical Office of the Republic of Slovenia draws attention to less precise estimates by equipping them with a special mark ^(M) or by not publishing them at all (N).

STATISTICAL SIGN

M less accurate estimate – use with caution

ABBREVIATIONS

EUR	euro
EUROSTAT	Statistical Office of the European Union
ISCED 97	International Standard Classification of Education
OECD	Organisation for Economic Development and Cooperation
R&D	Research and Development
SURS	Statistical Office of the Republic of Slovenia
UNESCO	United Nations Educational, Scientific and Cultural Organisation

UNITS OF MEASUREMENT

%	percent
p.p.	percentage point

COUNTRY ABBREVIATIONS

EU27	27 EU Member States		
AT	Austria	NL	Netherlands
BE	Belgium	PL	Poland
BG	Bulgaria	PT	Portugal
CY	Cyprus	RO	Romania
CZ	Czech Republic	SE	Sweden
DK	Denmark	SI	Slovenia
DE	Germany	SK	Slovakia
EE	Estonia	UK	United Kingdom
EL	Greece		
ES	Spain	HR	Croatia
FI	Finland	IS	Iceland
FR	France	IL	Israel
HU	Hungary	JP	Japan
IE	Ireland	MK	Macedonia
IT	Italy	NO	Norway
LT	Lithuania	RU	Russia
LU	Luxemburg	CH	Switzerland
LV	Latvia	TU	Turkey
MT	Malta	US	USA

SOURCES AND LITERATURE

European Commission (2012). *Structural change in research institutions: Enhancing excellence, gender equality and efficiency in research and innovation*. Luxembourg: Publications Office of the European Union, 2012

European Commission (2013). *She Figures 2012. Gender in Research and Innovation. Statistics and Indicators*. Luxembourg: Publications Office of the European Union, 2013.

Ministry of Higher Education, Science and Technology (2011). *DRZNA Slovenija: Nacionalni program visokega šolstva 2011–2020 ter Raziskovalna in inovacijska strategija Slovenije 2011–2020*. Ljubljana: Ministry of Higher Education, Science and Technology.

Auriol, L., Misu, M., & Freeman, R., 2013, *Careers of Doctorate Holders. Analysis of labour market and mobility indicators*. Retrieved on 5. 10. 2014. from the website:

<http://www.oecd-ilibrary.org/docserver/download/5k43nxgs289w.pdf?expires=1419848281&id=id&accname=guest&checksum=9305A1A9CC55F7CEE13A9E3878EF7265>

Auriol, L., Schaaper M., & Felix, B., 2012, *Mapping Careers and Mobility of Doctorate Holders: Draft guidelines*. Retrieved on 5. 10. 2014 from the website:

<http://www.uis.unesco.org/ScienceTechnology/Documents/oecd-mapping-careers-doctorate-holders-2012.pdf>

Caprile, M., Addis, E., Castaño, C., Klinge, I., Larios, M., Meulders, D., Müller, J., O' Dorchai, M., Palasik, M., Plasman, R., Roivas, S., Sagebiel, F., Schiebinger, L., Vallčs, N., Vázquez-Cupeir, S. (ur.) (2012). *Meta-analysis of gender and science research. Synthesis report*. Retrieved on 5. 10. 2014 from the website:

http://ec.europa.eu/research/science-society/document_library/pdf_06/meta-analysis-of-gender-and-science-research-synthesis-report.pdf

Svetlik, I. (2013). Predgovor. Univerza v Ljubljani (2013). V Cimperle, J. (ur.) *Doktorat znanosti in promocije doktorjev znanosti na Univerzi v Ljubljani: 1919-2012 (str. 7)*. Ljubljana: Univerza. Retrieved on 8. 11. 2014 from the website:

http://www.uni-lj.si/o_univerzi_v_ljubljani/organizacija_pravilniki_in_porocila/univerzitetni_arhiv/razstave/2013111516533351/

Demography. Population data. Population. *Eurostat database*. Luksemburg: Eurostat. Retrieved on 16. 10. 2014 from the website:

<http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-data/database>

Demography. Population data. Population. *Eurostat database*. Luksemburg: Eurostat. Retrieved on 16. 10. 2014 from the website: <http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-data/database>

Science, technology and innovation. Science and technology. Career Development of Doctorate Holders. *Eurostat database*. Luksemburg: Eurostat. Retrieved on 16. 10. 2014 from the website:

<http://ec.europa.eu/eurostat/web/education-and-training/data/database>

Demography and social statistics. Population. *SI-STAT Data Portal*. Ljubljana: Statistical Office of the Republic of Slovenia. Retrieved on 8. 10. 2014: <http://pxweb.stat.si/pxweb/Database/Demographics/Demographics.asp>

Demography and social statistics. Labour market. *SI-STAT Data Portal*. Ljubljana: Statistical Office of the Republic of Slovenia. Retrieved on 8. 10. 2014: <http://pxweb.stat.si/pxweb/Database/Demographics/Demographics.asp>

Economy. Research and Development, Science and Technology. Careers of Doctorate Holders. *SI-STAT Data Portal*. Ljubljana: Statistical Office of the Republic of Slovenia. Retrieved on 8. 10. 2014:

http://pxweb.stat.si/pxweb/Database/Economy/23_research_develop/04_Careers_Doct/04_Careers_Doct.asp

