



DG Research and Innovation

Monitor human resources policies and practices in research
(LOT 1 Part 1)

The Researchers Report 2012

Scorecards



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Introduction

The multi-coloured scorecards allow for quick visualisation of the countries' individual progress between two different dates for a number of key indicators. The indicators were selected on the basis of their a) relevance for the issue to be monitored, b) comparability between dates (availability of data) and c) robustness of the data set. The scorecards presented in the scope of this report reflect progress (or the lack thereof) between two dates for each of the indicators. Scorecards serve as a means of monitoring progress (or the lack thereof) between different dates by showing if the value of an indicator has increased, decreased or remained stable. The indicators are presented for the following 'monitoring categories':

- The stock of researchers in Europe;
- Women in the research profession;
- Open, transparent and merit-based recruitment;
- Education and training;
- Mobility and international attractiveness.

The table below presents an overview of the indicators, the data sources used and the respective year(s) of reference for each of the monitoring categories.

Table 1: Scorecards - indicators, the Researchers Report 2012

Indicators	Data source(s)	Year(s) of reference
The stock of researchers in Europe		
Researchers (Full Time Equivalent) per thousand active labour force, Europe, US, China, Japan, 2000 and 2009	Eurostat	2000, 2009
Women in the research profession		
Women Grade A academic staff, Europe, 2004 and 2007 (%)	WiS database/ SHE figures	2004, 2007
Open, transparent and merit-based recruitment		
Researcher posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector, Europe, January to August 2010 and 2011	EURAXESS JOBS	2010 and 2011 (January to August)
Education and training		
New doctoral graduates (ISCED 6) per thousand population aged 25-34, Europe, US and Japan, 2008 and 2009	UNESCO OECD Eurostat education survey	2008, 2009
International scientific co-publications per million population, Europe, US, Japan and China, 2009 and 2010	Science Metrix / Scopus	2009, 2010
Scientific publications in the top 10% most-cited publications worldwide as a percentage of total scientific publications, Europe, US, Japan and China, 2006 and 2007	Science Metrix / Scopus	2006, 2007
Mobility and international attractiveness		
Non-EU doctoral students as a percentage of all doctoral students, Europe, 2008 and 2009 (%)	Innovation Union Scoreboard database (2011)	2008, 2009
Doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State, EU-27, 2006 and 2007 (%)	EUROSTAT OECD UNESCO survey	2006, 2007

Source: Deloitte

Each Scorecard refers to two dimensions:

1. **Score:** Value of the indicator for the latest year available is summarised in 5 value ranges (from 5 to 1) represented by different colours, from 5 (green) to 1 (red);
2. **Progress:** Value of the indicator against its value from the previous year (or latest year available). This makes it possible to monitor progress (or lack of) by showing if the value of the indicator has increased (↑), decreased (↓) or remained stable (↔).

Progress between two years of reference for each country as well as for the EU-27 (and in some cases for the United States, Japan and China) is calculated in the following way:

Table 2: Scorecards - Methodology

Category	Calculation
Green (5)	Figure is at least E
Light Green (4)	Figure is between D and E
Yellow (3)	Figure is between C and D
Orange (2)	Figure is between B and C
Red (1)	Figure is less than B

Source: Deloitte

X: Highest figure from the sample for the latest year available

Y: Lowest figure from the sample for the latest year available

A: $(X-Y) / 5$ (where five stands for the number of categories)

B: $Y + A$

C: $B + A$

D: $C + A$

E: $D + A$

The table below presents a summary of the countries' performance for all indicators, showing the monitoring category, the name of the indicator(s) and a summary of the respective score(s).

Table 3: Scorecards –overview of the results

	The stock of researchers in Europe	Women in the research profession	Open, transparent and merit-based recruitment	Education and training			Mobility and international attractiveness	
	Researchers (Full Time Equivalent) per thousand active labour force, Europe, 2000 and 2009	Women Grade A academic staff, Europe, 2007 (%)	Research posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector, Europe, January to August 2011	New doctoral graduates (ISCED 6) per thousand population aged 25-34, Europe, 2009	International scientific co-publications per million population, Europe, US, Japan and China, 2010	Scientific publications in the top 10% most-cited publications worldwide as a percentage of total scientific publications, Europe, US, Japan and China, 2007	Doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State, EU-27, 2007 (%)	Non-EU doctoral students as a percentage of all doctoral students, Europe, 2009 (%)
Green (5)	2	3	1	3	2	4	2	1
Light Green (4)	2	3	2	3	2	9	1	3
Yellow (3)	7	8	2	6	7	9	4	2
Orange (2)	11	6	6	8	9	4	5	5
Red (1)	10	9	20	13	14	8	10	18
Total # of countries	32	29	31	33	34	34	22	29

Source: Deloitte

1. Researchers (Full Time Equivalent) per thousand active labour force, EU-27, US, China, Japan, 2000 and 2009

Table 4: Value ranges – Researchers (FTE) per thousand active labour force, EU-27, US, China, Japan, 2008 and 2009

Green (5)	The number of researchers (Full Time Equivalent) is at least 13.3 per thousand active labour force
Light Green (4)	The number of researchers (Full Time Equivalent) is between 10.5 and 13.2 per thousand active labour force
Yellow (3)	The number of researchers (Full Time Equivalent) is between 7.7 and 10.4 per thousand active labour force
Orange (2)	The number of researchers (Full Time Equivalent) is between 4.7 and 7.6 per thousand active labour force
Red (1)	The number of researchers (Full Time Equivalent) is less than 4.7 per thousand active labour force

Source: Deloitte

Data: Eurostat

Key findings

The EU is lagging behind its main competitors in the share of researchers in the total labour force. In 2009, this stood at 6.63 per 1000, compared to 9.4 in the US and 10.32 in Japan. The Nordic countries and France do relatively better.

The labour force population (referring to the total labour force, which includes both employed and unemployed persons) was about 239 million in the EU-27 in 2009, compared to 155 million in the United States, 66 million in Japan and 780 million in China.

Between 2000 and 2009, the number of researchers (FTE) in relation to the active labour force increased by from 5.04 to 6.63 in the EU-27. The respective increase in the United States was from 9.0 to 9.4. In Japan, the number of FTE researchers per thousand active labour force increased from 9.57 to 10.32 while China reported an increase from 0.94 to 2.01.

Between 2008 and 2009, the number of researchers (FTE) per 1 000 labour force has increased in Europe and Japan by 4%, more than in the US (1%) and has remained relatively stable in China.

Table 5: Scorecard: Researchers (FTE) per thousand labour force, EU-27, US, China, Japan, 2008 and 2009

Region	2008	2009	Progress /2008 (%)	
<i>European Union 27</i>	6.4	6.6	↑	4
<i>United States</i>	9.3	9.4	↑	1
<i>China (except Hong Kong)</i>	2.0	2.0	↔	0
<i>Japan</i>	9.9	10.3	↑	4

Source: Deloitte

Data: Eurostat

Sweden, France and Norway have a higher share of researchers (FTE) per thousand active labour force than the US. Denmark and Finland rank highest with more than ten researchers per thousand active labour force - higher than the US and Japan.

In 2009, the share of researchers per thousand active labour force was highest in the Nordic countries (Finland and Denmark) and lowest in a number of the Eastern European countries such as

Romania, Bulgaria and Poland. In 2009, Iceland reported the highest penetration of researchers in the workforce with 16 researchers. Other Scandinavian countries (Finland, Denmark and Norway with around 10 researchers per thousand active labour force) rank among the top five countries together with and France. Romania and Bulgaria as well as the Mediterranean islands report the lowest numbers with three or less researchers per thousand active labour force.

Between 2008 and 2009, out of the 32¹ European countries, 17 reported a positive growth in the number of researchers (FTE) per thousand labour force, 2 showed no progress and 13 countries reported a decrease in their numbers. The table below shows the countries' individual performance in increasing the number of researchers (FTE) per thousand labour force between 2008 and 2009.

Table 6: Scorecard: Researchers (FTE) per thousand labour force, Europe, 2008 and 2009

Country	2008	2009	Progress /2008 (%)	
<i>Iceland</i>	12.7	16.0	↑	21
<i>Finland</i>	15.1	15.3	↑	1
<i>Denmark</i>	12.1	12.0	↓	-1
<i>Luxembourg</i>	10.7	10.5	↓	-2
<i>Norway</i>	10.1	10.3	↑	2
<i>France</i>	8.1	10.2	↑	20
<i>Sweden</i>	9.8	9.5	↓	-3
<i>Portugal</i>	7.1	8.1	↑	12
<i>Austria</i>	8.1	8.1	↓	-1
<i>United Kingdom</i>	8.1	7.8	↓	-4
<i>Belgium</i>	7.8	7.8	↓	-1
<i>Germany</i>	7.3	7.5	↑	3
<i>Slovenia</i>	6.7	7.1	↑	6
<i>Ireland</i>	6.5	6.8	↑	5
<i>Estonia</i>	5.7	6.2	↑	8
<i>Spain</i>	5.7	5.8	↑	1
<i>Czech Republic</i>	5.7	5.4	↓	-5
<i>Switzerland</i>	5.4	5.3	↓	-2
<i>Netherlands</i>	5.7	5.2	↓	-9
<i>Lithuania</i>	5.2	5.2	↓	-1
<i>Slovakia</i>	4.7	4.9	↑	5
<i>Hungary</i>	4.4	4.8	↑	8
<i>Greece</i>	4.3	4.6	↑	6
<i>Italy</i>	3.9	4.1	↑	6
<i>Croatia</i>	3.5	3.6	↑	4
<i>Poland</i>	3.6	3.5	↓	-3
<i>Bulgaria</i>	3.2	3.4	↑	7
<i>Latvia</i>	3.6	3.1	↓	-18
<i>Malta</i>	3.2	2.8	↓	-14

¹ Data are not available for IL.

Country	2008	2009	Progress /2008 (%)	
<i>Turkey</i>	2.3	2.4	↑	5
<i>Cyprus</i>	2.0	2.0	↔	0
<i>Romania</i>	2.0	1.9	↔	0

Source: Deloitte

Data: Eurostat

2. Women Grade A² academic staff, Europe, 2004 and 2007

Table 7: Value ranges – Women Grade A academic staff, Europe, 2004 and 2007

Green (5)	The percentage of women Grade A academic staff is at least 27.3
Light Green (4)	The percentage of women Grade A academic staff is between 22.8 and 27.2
Yellow (3)	The percentage of women Grade A academic staff is between 18.3 and 22.7
Orange (2)	The percentage of women Grade A academic staff is between 13.7 and 18.2
Red (1)	The percentage of women Grade A academic staff is less than 13.7

Source: Deloitte
Data: Eurostat

Key findings

The ratio of women in top-level positions in research between 2004 and 2007 rose in every country at a different pace. The probability of women of reaching a top-level (Grade A) position in research is highest in Romania, Latvia, Turkey and Croatia and lowest in Ireland, Cyprus, Malta and Luxembourg.

The under-representation of women at the higher levels of the academic hierarchy is reflected in the share of women in Grade A academic positions. The culmination of a research career is reaching a top-level position. In 2007, the EU-27 average of the share of women among Grade A academic was 18.7%. The proportion of women in top research positions was highest (>25%) in Romania (31.7%), followed by Latvia (29.1%), Turkey (27.8%) and Croatia (26.2%). Malta (2.3%), Luxembourg (9.3%), Cyprus (9.5%) and Ireland (9.6%) reported the lowest (<10%) figures for women in top-level academic positions.

Between 2004 and 2007, the average percentage of women academic Grade A staff in the EU-27 increased from by two percentage points from 17% to 19%, and all countries in the scope of this report reported an increase in the ratio of women in high-ranking academic positions. Data are unavailable for the United States and Japan.

Table 8: Scorecard: Women Grade A academic staff, EU-27, 2004 and 2007

Region	2004	2007	Progress 2004 (%)	
European Union 27	17	19	↑	10

Source: Deloitte
Data: She Figures 2009

² Grade A: The single highest grade/post at which research is normally conducted.

The table below shows the countries' individual performance in increasing the percentage of women Grade A academic staff between 2004 and 2007.

Table 9: Scorecard: Women Grade A academic staff, Europe, 2004 and 2007

Country	2004	2007	Progress /2004 (%)	
Romania	29.1	31.7	↑	8.2
Latvia	26.5	29.1	↑	9.1
Turkey	26.9	27.8	↑	3.4
Croatia	-	26.2	-	-
Bulgaria	18.0	23.5	↑	23.3
Finland	21.2	23.4	↑	9.5
Switzerland	16.5	21.7	↑	23.8
Poland	19.5	20.3	↑	3.8
Slovakia	13.5	20.1	↑	32.9
France	17.9	18.9	↑	5.0
Hungary	15.4	18.8	↑	17.9
Iceland	15.1	18.6	↑	19.1
Italy	16.4	18.5	↑	11.5
Spain	17.6	18.4	↑	4.6
Norway	15.7	18.1	↑	13.3
Sweden	16.1	18.1	↑	11.0
United Kingdom	15.9	17.5	↑	9.0
Slovenia	12.9	16.6	↑	22.3
Lithuania	12.1	14.4	↑	16.1
Austria	11.9	14.3	↑	17.3
Czech Republic	10.3	12.7	↑	19.2
Israel	10.6	12.7	↑	16.8
Denmark	10.9	11.9	↑	8.3
Germany	9.2	11.9	↑	22.7
Netherlands	9.0	11.1	↑	18.5
Belgium	9.0	10.7	↑	15.9
Ireland	-	9.6	-	-
Cyprus	9.3	9.5	↑	2.8
Luxembourg	-	9.3	-	-
Portugal	20.9	-	-	-
Malta	2.3	-	-	-
Greece	11.3	-	-	-
Estonia	17.2	-	-	-

Source: Deloitte
Data: She Figures 2009.

3. Researcher posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector, Europe, January-August 2010 and 2011

Table 10: Value ranges – Researcher posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector, Europe, January-August 2010 and 2011

Green (5)	The Number of researchers posts advertised through EURAXESS Jobs portal is at least 90.0 per thousand researchers in the public sector
Light Green (4)	The Number of researchers posts advertised through EURAXESS Jobs portal is between 64.6-85.9 per thousand researchers in the public sector
Yellow (3)	The Number of researchers posts advertised through EURAXESS Jobs portal is between 43.1-64.5 per thousand researchers in the public sector
Orange (2)	The Number of researchers posts advertised through EURAXESS Jobs portal is between 21.7-43.0 per thousand researchers in the public sector
Red (1)	The Number of researchers posts advertised through EURAXESS Jobs portal is less than 21.7 per thousand researchers in the public sector

Source: Deloitte
Data: Eurostat

Key findings

The number of research posts advertised on the EURAXESS Jobs portal per thousand researchers in the public sector serves as a rough indication for assessing the openness and transparency of national public recruitment systems in the EU. The United Kingdom, the Netherlands, Ireland and Norway have among the highest shares of jobs posted on the EURAXESS Jobs portal.

Between January and August 2011, the average number of job postings on the EURAXESS Jobs portal per thousand researchers in the public sector for the EU-27 was 24, with a range from 107 in Cyprus to five or fewer in several countries. The number of jobs advertised via the online platform was high notably in the United Kingdom, the Netherlands, Ireland and Norway. Thus, researchers across Europe benefit from a more open and transparent access to research-related jobs in these countries.

We observe a low share of researchers posts advertised on the EURAXESS Jobs portal per thousand researchers in the public sector in countries such as such as Slovakia, Lithuania, Romania, Bulgaria, Hungary and Poland. Germany, Spain, Portugal and Denmark also report relatively low (<10) numbers of job postings on EURAXESS per thousand researchers in the public sector. Generally speaking, if job positions are not advertised publicly and widely, the chances of recruiting the best possible talent are more limited.

This indicator should however be treated with caution. Countries such as Germany, which report a relatively low number of research posts advertised on the EURAXESS Jobs portal per thousand researchers in the public sector, have set up national systems to advertise national postings. The indicator provides a general trend of a certain level of openness of recruitment practices in European countries. However, it is not possible to calculate with precision the level of openness in each country due to its (methodological) limitations. The publication of job vacancies on relevant European-wide online platforms such as EURAXESS Jobs is only one of many indications of an open,

transparent and merit-based recruitment system (see the definition of an open, transparent and merit-based recruitment system in chapter 3 of the *Researchers Report*).

Between 2010 and 2011, the average number of research posts advertised via the EURAXESS Jobs portal per thousand researchers in the public sector in the EU-27 increased from 4.8 to 24.4 (+80%), and the vast majority of countries reported an increase in the number of research posts advertised on the portal.

Table 11: Scorecard: Researchers posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector, EU-27, January-August, January-August 2010 and 2011³

Region	2010	2011	Progress /2010 (%)	
<i>European Union 27</i>	4.8	24.4	↑	80

Source: Deloitte

Data: Euraxess Jobs Portal

The table below presents the countries' individual performance in increasing the number of researchers posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector between 2010 and 2011 (both years referring to the periods January-August).

Table 12: Scorecard - Researcher posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector, Europe, January-August 2010 and 2011

Country	2010	2011	Progress /2010 (%)	
<i>Cyprus</i>	12.8	107.3	↑	88
<i>Luxembourg</i>	129.3	83.5	↓	-55
<i>United Kingdom</i>	2.0	77.6	↑	97
<i>Netherlands</i>	29.1	51.4	↑	43
<i>Ireland</i>	30.9	48.5	↑	36
<i>Norway</i>	32.4	38.8	↑	16
<i>Croatia</i>	5.9	37.3	↑	84
<i>Austria</i>	23.8	33.8	↑	30
<i>Greece</i>	9.4	32.5	↑	71
<i>France</i>	2.5	25.1	↑	90
<i>Belgium</i>	10.5	21.9	↑	52
<i>Sweden</i>	4.6	16.3	↑	72
<i>Switzerland</i>	4.0	15.4	↑	74
<i>Estonia</i>	4.9	15.1	↑	68
<i>Czech Republic</i>	4.3	10.5	↑	59
<i>Iceland</i>	4.4	10.2	↑	56
<i>Italy</i>	3.6	9.9	↑	63
<i>Malta</i>	0.0	8.2	↑	100
<i>Finland</i>	1.9	7.1	↑	74
<i>Slovenia</i>	2.3	5.1	↑	55
<i>Portugal</i>	3.9	4.3	↑	8
<i>Denmark</i>	3.3	4.2	↑	21

³ For 8 months: January to August, both in 2010 and 2011 to be comparable.

Country	2010	2011	Progress /2010 (%)	
<i>Spain</i>	7.7	3.9	↓	-95
<i>Germany</i>	2.3	2.9	↑	19
<i>Poland</i>	1.5	2.5	↑	41
<i>Hungary</i>	0.6	1.2	↑	52
<i>Bulgaria</i>	0.1	1.1	↑	91
<i>Romania</i>	0.5	0.9	↑	50
<i>Lithuania</i>	1.9	0.8	↓	-136
<i>Slovakia</i>	0.0	0.4	↑	100
<i>Turkey</i>	0.5	0.2	↓	-138
<i>Latvia</i>	0.5	-	-	-

Source: Deloitte

Data: Euraxess Jobs Portal

4. New doctoral graduates (ISCED 6) per thousand population aged 25-34, 2008 and 2009

Table 13: Value ranges – New doctoral graduates (ISCED 6) per thousand population aged 25-34, 2008 and 2009

Green (5)	The number of new doctoral graduates (ISCED 6) is at least 3.0 per thousand population aged 25-34
Light Green (4)	The number of new doctoral graduates (ISCED 6) is between 2.3-2.9 per thousand population aged 25-34
Yellow (3)	The number of new doctoral graduates (ISCED 6) is between 1.7-2.2 per thousand population aged 25-34
Orange (2)	The number of new doctoral graduates (ISCED 6) is between 0.9-1.6 per thousand population aged 25-34
Red (1)	The number of new doctoral graduates (ISCED 6) is less than 0.9 per thousand population aged 25-34

Source: Deloitte
Data: Eurostat

Key findings

The number of new doctoral graduates in the EU-27 has risen significantly in the past decade, increasing from 83 000 in 2001 to around 115 000 in 2010.

The number of new doctoral graduates in the EU-27 increased from 82 705 (in 2001) to around 115 000⁴ (in 2010). The increase for the US was from 44 904 in 2001 to 69 570 in 2010. In Japan, the number of new doctoral graduates increased from 13 179 in 2001 to 15 867 in 2010.

The number of new doctoral graduates (ISCED 6) per thousand population aged 25-34 in the EU-27 increased from 1.1 in 2000 to 1.6 in 2010⁵. The increase in the United States was from 1.1 in 2000 to 1.6 in 2009, while in Japan, it went from 0.7 in 2000 to 1.0 in 2009.

Table 14: Scorecard: New doctoral graduates (ISCED 6) per thousand population aged 25-34, EU-27, US, Japan, 2008 and 2009

Region	2008	2009	Progress /2008 (%)	
<i>European Union 27</i>	1.6	1.6	↔	0
<i>United States</i>	1.6	1.6	↔	0
<i>Japan</i>	0.9	1	↑	10

Source: Deloitte
Data: Eurostat

In 2009, the highest number of new doctoral graduates per thousand population aged 25-34 in Europe in 2001 was in Switzerland. The leading EU-27 countries were Sweden and Finland.

In 2009, the average number of new doctoral graduates per thousand population aged 25-34 for the EU-27 was 1.5, with a range from 3.6 in Switzerland to 0.5 or less in several European countries. The countries can be grouped into three clusters: those countries with a number of new ISCED 6

⁴ European Commission estimate based on some provisional figures

⁵ While an estimate for the EU is available for 2010, the latest available data by Member State, the US and Japan are for 2009.

graduates between 2.1 and 3.6 per thousand population, those with a range of 1.0-1.7 and those at below 1.0.

The table below shows the countries' individual performance in increasing the number of new doctoral graduates (ISCED 6) per thousand population aged 25-34 between 2008 and 2009.

Table 15: Scorecard: New doctoral graduates (ISCED 6) per thousand population aged 25-34, Europe, 2008 and 2009

Country	2008	2009	Progress /2008 (%)	
<i>Switzerland</i>	3.4	3.6	↑	6
<i>Liechtenstein</i>	0.8 ⁶	3.3	↑	76
<i>Sweden</i>	3.2	3.1	↓	-3
<i>Finland</i>	3.0	2.9	↓	-3
<i>Portugal</i>	3.0	2.7	↓	-11
<i>Germany</i>	2.6	2.6	↔	0
<i>United Kingdom</i>	2.1	2.2	↑	5
<i>Slovakia</i>	1.8	2.1	↑	14
<i>Austria</i>	2.0	2.1	↑	5
<i>Netherlands</i>	1.6	1.7	↑	6
<i>Denmark</i>	1.6	1.7	↑	6
<i>Norway</i>	2.0	1.7	↓	-18
<i>Italy</i>	1.6	1.6	↔	0
<i>Slovenia</i>	1.3	1.5	↑	13
<i>Ireland</i>	1.4	1.5	↑	7
<i>France</i>	1.4	1.5	↑	7
<i>Czech Republic</i>	1.4	1.4	↔	0
<i>Belgium</i>	1.4	1.4	↔	0
<i>Romania</i>	0.9	1.3	↑	31
<i>Spain</i>	0.9	1.0	↑	10
<i>Hungary</i>	0.7	0.9	↑	22
<i>Lithuania</i>	0.8	0.9	↑	11
<i>Croatia</i>	0.8	0.9	↑	11
<i>Greece</i>	0.8	0.8	↔	0
<i>Estonia</i>	0.8	0.8	↔	0
<i>Poland</i>	0.9	0.8	↓	-13
<i>Iceland</i>	0.5	0.7	↑	29
<i>Bulgaria</i>	0.5	0.6	↑	17
<i>Latvia</i>	0.4	0.5	↑	20
<i>Macedonia (FYR)</i>	0.3	0.4	↑	25
<i>Malta</i>	0.2	0.3	↑	33
<i>Turkey</i>	0.3	0.3	↔	0
<i>Cyprus</i>	0.2	0.2	↔	0

Source: Deloitte
Data: Eurostat

⁶ For Liechtenstein, the most recent data available is for 2007.

5. International scientific co-publications per million population, 2009 and 2010

Table 16: Value ranges - International scientific co-publications per million population, 2009 and 2010

Green (5)	The Number of International scientific co-publications is at least 1864 per million population
Light Green (4)	The Number of International scientific co-publications is between 1414-1863 per million population
Yellow (3)	The Number of International scientific co-publications is between 965-1413 per million population
Orange (2)	The Number of International scientific co-publications is between 515-964 per million population
Red (1)	The Number of International scientific co-publications is less than 515 per million population

Source: Deloitte
Data: Eurostat

Key findings

In 2010, the EU-27 was the runner-up in the production of international scientific co-publications behind the United States.

In 2010, the EU-27 lagged behind the United States in terms of international scientific co-publications per million population⁷. The EU-27 average was around 300 co-publications per million population in comparison with around 430 in the United States, 200 in Japan and 37 in China. The EU average is relatively low as here only co-publications with non-EU countries are included.

Iceland and Switzerland have very high levels, of more than 2 000 co-publications per million population followed by a number of Nordic countries such as Denmark, Sweden, Norway and Finland (in descending order) with more than 1 000 co-publications per million population. The lowest number (<500) of co-publications per million population was in a number of new Member States such as Czech Republic, Hungary, Slovakia, Lithuania, Bulgaria, Poland and Romania (in descending order).

Table 17: Scorecard: International scientific co-publications per million population, EU-27, US, China, Japan, 2009 and 2010

Region	2009	2010	Progress /2009 (%)	
<i>European Union 27</i>	290	304	↑	5
<i>United States</i>	410	432	↑	5
<i>China</i>	33	37	↑	11
<i>Japan</i>	197	200	↑	1

Source: Deloitte
Data : Science Metrix/Scopus

The table below shows the countries' individual performance in increasing the number of international scientific co-publications per million population between 2009 and 2010.

⁷ International scientific co-publications are a proxy for the quality of scientific research as collaboration increases scientific productivity. The numerator refers to the number of scientific publications with at least one co-author based abroad (where abroad is non-EU for the EU-27).

Table 18: Scorecard: International scientific co-publications per million population, Europe, 2009 and 2010

Country	2006	2007	Progress /2009 (%)	
<i>Iceland</i>	2 009	2 313	↑	13
<i>Switzerland</i>	2 182	2 297	↑	5
<i>Denmark</i>	1 413	1 530	↑	8
<i>Sweden</i>	1 405	1 479	↑	5
<i>Norway</i>	1 311	1 378	↑	5
<i>Finland</i>	1 172	1 247	↑	6
<i>Netherlands</i>	1 157	1 244	↑	7
<i>Luxembourg</i>	1 025	1 212	↑	15
<i>Belgium</i>	1 099	1 166	↑	6
<i>Ireland</i>	984	1 062	↑	7
<i>Austria</i>	978	1 049	↑	7
<i>United Kingdom</i>	888	925	↑	4
<i>Israel</i>	804	842	↑	4
<i>Slovenia</i>	788	824	↑	4
<i>Cyprus</i>	619	713	↑	13
<i>Germany</i>	635	669	↑	5
<i>Estonia</i>	528	661	↑	20
<i>France</i>	624	644	↑	3
<i>Portugal</i>	523	581	↑	10
<i>Spain</i>	486	533	↑	9
<i>Czech Republic</i>	459	497	↑	8
<i>Greece</i>	496	495	↔	0
<i>Italy</i>	441	464	↑	5
<i>Hungary</i>	347	352	↑	1
<i>Slovakia</i>	341	347	↑	2
<i>Croatia</i>	288	324	↑	11
<i>Malta</i>	201	266	↑	25
<i>Lithuania</i>	220	214	↓	-3
<i>Bulgaria</i>	217	207	↓	-5
<i>Poland</i>	199	198	↔	0
<i>Romania</i>	130	140	↑	7
<i>Latvia</i>	131	130	↓	-1
<i>Macedonia (FYR)</i>	97	117	↑	17
<i>Turkey</i>	61	64	↑	5

Source: Deloitte
Data: Science Metrix/Scopus

6. Scientific publications in the top 10% most-cited publications worldwide as a percentage of total scientific publications, Europe, US, Japan and China, 2006 and 2007

Table 19: Value ranges - Scientific publications in the top 10% most-cited publications worldwide as a percentage of total scientific publications, Europe, US, Japan and China, 2006 and 2007

Green (5)	The Number of Scientific publications amounting to the top ten percent most-cited publications worldwide is at least 13.0 per cent of total scientific publications of the country
Light Green (4)	The Number of Scientific publications amounting to the top ten percent most-cited publications worldwide is between 10.3-12.9 per cent of total scientific publications of the country
Yellow (3)	The Number of Scientific publications amounting to the top ten percent most-cited publications worldwide is between 7.6-10.2 per cent of total scientific publications of the country
Orange (2)	The Number of Scientific publications amounting to the top ten per cent most-cited publications worldwide is between 4.9-7.5 per cent of total scientific publications of the country
Red (1)	The Number of Scientific publications amounting to the top ten per cent most-cited publications worldwide is less than 4.9 per cent of total scientific publications of the country

Source: Deloitte
Data: Eurostat

Key findings

In 2007, the EU-27 lagged behind the US in terms of scientific publications in the top 10% most-cited publications worldwide. The indicator is a proxy for the excellence of the research system as highly cited publications are assumed to be of higher quality.

When it comes to the scientific quality of research worldwide, an indicator even more important than the sheer number of scientific co-publications is the capacity to produce scientific publications with high international impact. The number of citations that a scientific publication generates is an indication of its excellence and its chance of generating further scientific results. On average, a country is expected to have 10% of its publications among the top 10% most cited worldwide. A value higher than 10% means that the country tends to produce highly cited publications more often than the average.

In 2007, the ratio of EU's contribution to the 10% most cited scientific publications was 1.16, lagging behind the United States with a ratio of 1.53, although well above the ratios of Japan and China. The EU-27 produced 10.73 scientific publications in the top 10% most-cited publications worldwide in comparison with 14.31 scientific publications produced in the United States.

Individually, the best performance (>10%) in the EU-27 was shown (in descending order) by Netherlands, Denmark, Belgium, UK, Sweden, Finland, Austria, Germany, Ireland and France. Countries like France and Germany, where researchers publish relatively more in their own language, are more likely to underperform on this indicator as compared to their real academic excellence. Performance in Latvia is poor, and to a lesser extent in Croatia, Bulgaria, Poland, Slovakia and Romania.

Table 20: Scorecard: Scientific publications in the top 10% most-cited publications worldwide as a percentage of total scientific publications, EU-27, US, Japan and China, 2006 and 2007

Region	2006	2007	Progress /2009 (%)	
<i>European Union 27</i>	10.6	10.7	↑	1
<i>United States</i>	14.4	14.3	↓	-1
<i>Japan</i>	7.0	7.1	↑	1
<i>China</i>	6.1	6.6	↑	8

Source: Deloitte
Data: Science Metrix/Scopus

The table below presents the countries' individual performance in increasing the share of scientific publications in the top 10% most-cited publications worldwide as a percentage of total scientific publications between 2006 and 2009⁸.

Table 21: Scorecard: Scientific publications in the top 10% most-cited publications worldwide as a percentage of total scientific publications, Europe, 2006 and 2007⁹

Country	2006	2007	Progress /2009 (%)	
<i>Switzerland</i>	15.7	15.6	↓	-1
<i>Netherlands</i>	14.4	14.9	↑	4
<i>Denmark</i>	14.4	14.8	↑	3
<i>Belgium</i>	13.0	13.4	↑	3
<i>United Kingdom</i>	12.9	12.8	↔	0
<i>Sweden</i>	12.4	12.2	↓	-2
<i>Iceland</i>	11.4	11.9	↑	4
<i>Finland</i>	11.2	11.7	↑	4
<i>Austria</i>	10.9	11.4	↑	5
<i>Germany</i>	11.6	11.4	↓	-1
<i>Ireland</i>	10.8	11.3	↑	5
<i>Norway</i>	11.7	11.0	↓	-6
<i>Israel</i>	10.8	10.9	↑	1
<i>France</i>	10.0	10.1	↑	1
<i>Italy</i>	9.5	9.8	↑	3
<i>Spain</i>	9.5	9.5	↑	1
<i>Greece</i>	8.1	9.3	↑	13
<i>Luxembourg</i>	7.7	9.3	↑	17
<i>Portugal</i>	8.8	9.3	↑	5
<i>Cyprus</i>	8.0	8.6	↑	8
<i>Estonia</i>	7.5	7.6	↑	2
<i>Slovenia</i>	6.4	7.6	↑	16
<i>Turkey</i>	5.4	6.5	↑	17
<i>Lithuania</i>	5.5	5.8	↑	5
<i>Hungary</i>	5.1	5.4	↑	5

⁸ Citation windows 2006-2009 and 2007-2010

⁹ Citation windows 2006-2009 and 2007-2010

Country	2006	2007	Progress /2009 (%)	
<i>Czech Republic</i>	5.4	4.9	↓	-12
<i>Malta</i>	8.2	4.7	↓	-76
<i>Romania</i>	4.1	4.2	↑	2
<i>Slovakia</i>	3.4	3.8	↑	9
<i>Poland</i>	3.5	3.7	↑	4
<i>Bulgaria</i>	5.0	3.6	↓	-40
<i>Croatia</i>	3.0	3.1	↑	2
<i>Macedonia</i>	4.8	2.8	↓	-70
<i>Latvia</i>	3.4	2.1	↓	-66

Source: Deloitte

Data: Science Metrix/Scopus

7. Non-EU doctoral candidates as a percentage of all doctoral candidates, Europe, 2008 and 2009

Table 22: Value ranges - Non-EU doctoral candidates as a percentage of all doctoral candidates, Europe, 2008 and 2009

Green (5)	The Number of Non-EU doctorate candidates is at least 37.7 per cent of all doctorate candidates
Light Green (4)	The Number of Non-EU doctorate candidates is between 28.4-37.7 per cent of all doctorate candidates
Yellow (3)	The Number of Non-EU doctorate candidates is between 19.1-28.4 per cent of all doctorate candidates
Orange (2)	The Number of Non-EU doctorate candidates is between 9.3-19.1 per cent of all doctorate candidates
Red (1)	The Number of Non-EU doctorate candidates is less than 9.3 per cent of all doctorate candidates

Source: Deloitte
Data: Eurostat

Key findings

The share of non-EU doctoral candidates¹⁰ as a percentage of all doctoral candidates serves as an indication of the mobility of candidates as an effective way of diffusing knowledge. The average share for the EU-27 is around 20%. Those above the EU average are Belgium (19.3%), the UK (31.6%) and France (34.3%).

The share of non-doctoral candidates reflects the mobility of candidates as an effective way of diffusing knowledge. The average share of non-EU doctoral candidates is almost 20%. In France and the UK, the share is between 30% and 35%. A relatively high share (<20% and >10%) of non-EU doctoral candidates is to be found in a number of the old Member States, e.g. Belgium (19.3%) and Spain (17.1%) while the lowest share of non-EU doctoral candidates as a percentage of all doctoral candidates (<5%) is in a number of the new Member States, ranging from 3.9% in Bulgaria and 0.5% in Latvia. In Switzerland, almost one in two doctoral candidates is not Swiss.

Table 23: Scorecard: Non-EU doctoral candidates as a percentage of all doctoral candidates, EU-27, 2008 and 2009

Region	2008	2009	Progress /2008 (%)	
<i>European Union 27</i>	18.8	19.2	↑	2

Source: Deloitte
Data: Eurostat

The table below shows the countries' individual performance in increasing the share of non-EU doctoral candidates as a percentage of all doctoral candidates between 2008 and 2009.

Table 24: Scorecard: Non-EU doctorate candidates as a percentage of all doctorate candidates, 2008 and 2009

Country	2008	2009	Progress /2008 (%)	
<i>Switzerland</i>	45.9	47.0	↑	2
<i>France</i>	33.1	34.3	↑	3
<i>United Kingdom</i>	31.1	31.6	↑	2
<i>Norway</i>	25.0	29.1	↑	14

¹⁰ "Non-EU doctoral candidates" refers to foreign doctoral candidates in case of non-EU countries.

Country	2008	2009	Progress /2008 (%)	
<i>Iceland</i>	17.4	23.0	↑	24
<i>Belgium</i>	19.0	19.3	↑	2
<i>Sweden</i>	16.2	18.3	↑	11
<i>Spain</i>	19.0	17.1	↓	-11
<i>Austria</i>	10.5	11.1	↑	5
<i>Denmark</i>	8.9	10.5	↑	15
<i>Portugal</i>	9.1	10.0	↑	9
<i>Slovenia</i>	5.8	6.6	↑	12
<i>Italy</i>	5.0	6.2	↑	19
<i>Finland</i>	4.5	5.1	↑	12
<i>Serbia</i>	8.5	4.1	↓	-107
<i>Malta</i>	4.5	4.1	↓	-10
<i>Bulgaria</i>	3.5	3.9	↑	10
<i>Czech Republic</i>	3.7	3.7	↔	0
<i>Estonia</i>	2.4	3.0	↑	20
<i>Turkey</i>	2.7	2.8	↑	4
<i>Hungary</i>	3.4	2.8	↓	-21
<i>Croatia</i>	2.5	2.5	↔	0
<i>Romania</i>	1.7	2.1	↑	19
<i>Poland</i>	2.2	2.0	↓	-10
<i>Cyprus</i>	1.1	1.8	↑	39
<i>Slovakia</i>	1.3	1.4	↑	7
<i>Macedonia (FYR)</i>	--	1.3	--	-
<i>Lithuania</i>	0.8	0.6	↓	-33
<i>Latvia</i>	0.3	0.5	↑	40
<i>Greece</i>	--	--	--	--

Source: Deloitte

Data: Eurostat

8. Doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State, EU-27, 2006 and 2007 (%)

Table 25: Value ranges - Doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State, EU-27, 2006 and 2007 (%)

Green (5)	The percentage of doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State is at least 12.4
Light Green (4)	The percentage of doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State is between 9.4-12.3
Yellow (3)	The percentage of doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State is between 6.3-9.3
Orange (2)	The percentage of doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State is between 3.3-6.2
Red (1)	The percentage of doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State is less than 3.3

Source: Deloitte
Data: Eurostat

Key findings

Around 40 000 (or 7% of all doctoral candidates) are EU nationals studying in another EU country. Compared to the EU average (7%), the UK (15%) is the EU country most likely to be chosen by other Europeans to do their doctorate in, followed by Austria (13%) and Belgium (12%). Member States with the lowest inflows of other EU doctoral candidates are the new Member States, Italy and Portugal.

The highest level of doctoral candidates with citizenship of another EU-27 Member State (>10%) was in a number of the old Member States, e.g. the UK (15%), Austria (13%) and Belgium (12%). Conversely, the lowest share (<5%) was in a number of the new Member States, ranging from 3% in Slovenia to 0% in Lithuania.

Table 26: Scorecard: Doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State, EU-27, 2006 and 2007 (%)

Region	2006	2007	Progress /2008 (%)	
<i>European Union 27</i>	6.7	7.3	↑	8.9

Source: Deloitte
Data: Eurostat

The table below presents the countries individual performance in increasing the level of doctoral candidates with a citizenship of another EU-27 Member State between 2006 and 2007.

Table 27: Scorecard: Doctoral candidates (ISCED 6) with a citizenship of another EU-27 Member State, EU-27, 2006 and 2007 (%)

Country	2006	2007	Progress /2008 (%)	
<i>United Kingdom</i>	14.2	15.4	↑	7.7
<i>Austria</i>	12.7	13.0	↑	2.3
<i>Belgium</i>	11.2	11.7	↑	4.6
<i>Cyprus</i>	7.0	7.4	↑	6.1
<i>Denmark</i>	7.1	7.4	↑	3.7

Country	2006	2007	Progress /2008 (%)	
<i>Sweden</i>	6.8	6.9	↑	2.4
<i>France</i>	6.6	6.7	↑	1.3
<i>Czech Republic</i>	4.9	5.8	↑	14.7
<i>Spain</i>	4.2	5.1	↑	17.1
<i>Hungary</i>	4.9	4.5	↓	-8.0
<i>Finland</i>	3.5	3.7	↑	6.4
<i>Slovenia</i>	1.3	3.3	↑	59.6
<i>Malta</i>	1.6	2.8	↑	43.8
<i>Estonia</i>	2.2	2.2	↑	0.6
<i>Bulgaria</i>	2.5	2.1	↓	-22.2
<i>Portugal</i>	1.6	1.8	↑	12.4
<i>Italy</i>	1.6	1.8	↑	9.4
<i>Romania</i>	1.1	1.1	↑	0.9
<i>Poland</i>	0.5	0.5	↓	-6.9
<i>Latvia</i>	0.2	0.5	↑	55.9
<i>Slovakia</i>	0.2	0.2	↑	14.9
<i>Lithuania</i>	0.2	0.1	↓	-51.0
<i>Greece</i>	0.8	-	-	-

Source: Deloitte
Data: Eurostat