Factsheet science and innovation

Innovation Attaché Network – Berlin

Kingdom of the Netherlands

Federal Republic of Germany

Facts and figures on science and innovation in the Netherlands and Germany

IA Berlin – 2014

Table of Contents

Introduction

Measuring the success of such policies or the innovation capacity of a country is not an easy task. A multitude of indicators can be used to measure the amount of 'innovation' in a country: the amount of start-ups, the quality of the educational system and the ease of doing business for instance all partly reveal the stance of the innovation environment.

The Dutch Innovation Attaches in Berlin collected a variety of indices and indicators on innovation for both Germany and the Netherlands. This information is presented in this document, that seeks to compare science and innovation in both countries. An initial overview is given in the table below. Starting from page 3 this report then further elaborates on these and other values and focusses on the strengths and weaknesses of the innovation environment in both countries.

Overview international comparison rankings Germany and the Netherlands

	Germany	Netherlands
Global Competitiveness Index[1]	4	8
Europe 2020 Competitiveness Report[2]	5	3
Innovation Union[3]	3	5
Global Innovation Index[4]	15	4
Networked Readiness Index[5]	12	4
Citation score[6]	1.22	1.52
R&D expenditure (% GDP)[7]	2.9	2.2
Knowledge Economy Index[8]	8	4
Ease of Doing Business Index[9]	21	28
Global Connectedness Index[10]	10	1
GDP per working hour[11]	60.4	61.5
GDP in USD (PPP per capita)[12]	39.500	43.300

[1] World Economic Forum "Global Competitiveness Index 2013 – 2014"
[2] World Economic Forum ''The Europe 2020 Competitiveness Report: Building a More Competitive Europe''
[3] European Union ''Innovation Union Scoreboard 2014''
[4] Cornell University, INSEAD, and the World Intellectual Property Organization(WIPO) ''Global Innovation Index 2014''
[5] World Economic Forum ''The Global Information Technology Report 2014''
[6] Wetenschaps-, Technologie en Innovatie-indicatoren http://wti2.nl/
[7] OECD
[8] World Bank ''Knowledge Economy Index 2012''
[9] World Bank ''Easy of Doing Business Index 2014''
[10] DHL ''Global Connectedness Index 2012''
[11] OECD
[12] CIA World Factbook 2014

Facts and figures on science and innovation in the Netherlands and Germany

Global Competitiveness Index

On the 2013-2014 Global Competitiveness Report of the World Economic Forum the Netherlands takes a 8th position. Germany ranks 4th on this index. The Netherlands has been in a top 10 position since 2009.

Strengths of the Netherlands according to the report:

- Efficient institutions and government
- Strong infrastructure, especially the ports
- Competitive markets with effective anti-cartel measures
- Advanced digital infrastructure with high broadband penetration
- Advanced health- and educational system
- High innovation capacity

Strengths of Germany according to the report:

- Strong infrastructure
- High innovation capacity, high R&D-spending, close collaboration between industry, knowledge institutions and the presence of advanced research institutes
- Size of the German market
- Streamlined, modern business management

Europe 2020 Competitiveness Report

On the 2014 Europe 2020 Competitiveness Report of the World Economic Forum the Netherlands takes a 3th position. Germany scores a 5th position on this index.

Strengths of the Netherlands according to the report:

- Smart, inclusive society with low inequality
- Efficient pro-business operating environment
- Outstanding ICT use
- Well-performing educational system

Strengths of Germany according to the report:

- High R&D spending, highly innovative companies
- Strong digital agenda to increase productivity
- Strong environmental sustainability policies

Innovation Union

On the 2014 Innovation Union Scoreboard of the European Commission the Netherlands takes a 5th position and is an 'innovation follower'. Germany ranks 3th and is an 'innovation leader'.

The Netherlands scored 14% above the EU-average on the 2014 innovation index. Strengths of the Netherlands according to the report:

- ‘Open, excellent and attractive research systems’ (indicators that measure the quality of scientific output)
- ‘Linkages & entrepreneurship’ (amount of innovative SME’s, amount of innovative SME collaborations, amount of public/private co-publications in science)

Compared to the EU-average Germany scored 28% higher. Germany performs very well on almost all indicators. Some particular strengths of Germany according to the report:

- ‘Intellectual assets’ (indicators that measure the amount of patents)
- ‘Innovators’ (indicators that measure the amount of start-ups and rapidly growing SME’s)
- ‘Firm investments’ (R&D-expenses and other innovation related expenses)

Global Innovation Index

The Global Innovation Index is co-published by Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO, an agency of the United Nations, UN). On the 2013 index the Netherlands scores a 4th position. Germany holds a 15th position on this index.

The core of the GII Report consists of a ranking of world economies’ innovation capabilities and results. In 2013, the ranking covered 142 economies, accounting for 94.9% of the world’s population and 98.7% of the world’s Gross Domestic Product (in US dollars). The GII has established itself as the reference among innovation indices, and has evolved into a valuable benchmarking tool to facilitate public-private dialogue, whereby policymakers, business leaders and other stakeholders can evaluate progress on a continual basis.

Source: http://www.globalinnovationindex.org/

Entrepreneurialism

Governments tend to promote start-ups because they create economic vitality and innovation. Moreover, new firms challenges existing firms and give them the incentive to adapt and continue to innovate. Entrepreneurialism and high levels of early-stage entrepreneurial activity therefore indicate a vibrant, dynamic economy.

	Established Business Ownership Rate (% in 2013)[1]	Total early-stage Entrepreneurial Activity (TEA) (% in 2013)[2]
Germany	5.1	5.0
The Netherlands	8.7	9.3

[1] Established Business Ownership Rate: percentage of 18-64 population who are currently owner-manager of an established business, i.e., owning and managing a running business that has paid salaries, wages, or any other payments to the owners for more than 42 months.

[2] Total early-stage Entrepreneurial Activity (TEA): percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business.

Nascent entrepreneur, i.e., actively involved in setting up a business they will own or co own; this business has not paid salaries, wages, or any other payments to the owners for more than three months.

Owner-manager of a new business, i.e., owning and managing a running business that has paid salaries, wages, or any other payments to the owners for more than three months, but

not more than 42 months.
Source: Global Entrepreneurship Monitor

IT

On the 2014 Networked Readiness Index of the World Economic Forum the Netherlands takes a 4th position. Germany ranks 12th on this index.

WEF-research into network readiness awarded the Netherlands an excellent score: 4th place in a list of 144 countries. The WEF-Networked Readiness Index is one of the most comprehensive and authoritative assessments of the impact of ICT on competitiveness of nations and the well-being of their citizens. To measure this, this index assesses the preparedness of an economy to fully leverage ICT in terms of: (1) ICT infrastructure, cost of access and the presence of the necessary skills to ensure an optimal use; (2) Uptake and use of ICT among governments, business and individuals; (3) Business and innovation environment, and the political and regulatory framework; and (4) Economic and social impacts accruing from ICT. Furthermore, according to the ITU the Netherlands ranks 6th among the world's most advanced ICT economies. ITU's ICT Development Index ranks 155 countries according to their level of ICT access, use and skills.

Source: Holland Compared / World Economic Forum, 2013

Times Higher Education World University Ranking

On the 2013 Times Higher Education overall ranking Dutch universities score well. Thirteen universities made it into a top 250 position. After the US and UK, the Netherlands is the country with most universities in the top 200. Twelve Dutch universities are listed in the top 200, eight of which score a top 100 position. The performance of the Dutch universities on the Times Higher Education World University Ranking and on other ranking indices is a testimony of the strong Dutch research sector. The best performing Dutch university is Leiden University, scoring a 67th place. Other universities listed on the top 100 are the universities of Delft, Rotterdam, Utrecht, Wageningen, Amsterdam, Groningen and Maastricht. The top 50 mainly comprises US and English private universities that have a focus on postgraduate education and research. These universities generally have access to large budgets.

On the 2013 Times Higher Educations Ranking ten German universities score a top 200 position. The highest scoring university is the Ludwig-Maximilians-Universität in München (58th position). Other German universities featured in the top 100 are the universities of Göttingen, Heidelberg, Berlin (Free University and Humboldt University) and the Technical University Munich. The top 250 contains nineteen German universities.

Position Dutch universities	
THE world top 400 (2013)	
Leiden University	67
Delft University of Technology	69
Erasmus University Rotterdam	73
Utrecht University	74
Wageningen University	77
University of Amsterdam	83
University of Groningen	98
Maastricht University	98
Eindhoven University of Technology	106
Radboud University Nijmegen	131
VU University Amsterdam	144
University of Twente	170
Tilburg University	226-250

Source: VSNU

Students abroad

The Netherlands is a popular destination for students that want to study abroad, especially amongst Germans. In 2012, most foreign students enrolled at Dutch universities came from Germany (26.050). China and Belgium follow at distance with 5.700 and 2.900 students respectively. Amongst the German students that study abroad only Austria (22,9%) is a more popular destination than the Netherlands (18,7%). 87,2% of the Germans studying in the Netherlands are enrolled for graduate education (bachelor), the remaining 12,8% is taking courses at postgraduate level (master). About half of these students study law, economics or social sciences. Medicine is also a popular field of studies (10,5%). Furthermore, a lot of students participate in the ERASMUS-program of the EU.

In 2012 2.250 Dutch students studied in Germany. Amongst Dutch students destinations such as the U.K. (6.600) and Belgium (5.450) are more popular. The *Duitsland Instituut Amsterdam* (Germany Institute Amsterdam) launched a website to stimulate Dutch students to study in Germany: www.studereninduitsland.nl

Source: Statistisches Bundesamt and Nuffic

Citation score

The Dutch citation score amounted to 1.52 for the period 2009-2012. This indicates qualified and internationally oriented scientists. The German citation score for that period amounted to 1.22.

The citation impact score is a key indicator of scientific quality. The score refers to the number of times a scientist is cited by other scientists. These citations indicate how much they value each other's work. The global average citation impact score is '1'. Dutch scientists are cited above the global average and claim third place in the world. Furthermore, Dutch scientists score highly for joint publications, which indicated the international significance of research taking place in the Netherlands.

Source: OCW Trends in beeld / http://www.wti2.nl/

Publication productivity

In 2013 2.25 publications per 1000 inhabitants were released in the Netherlands. That number amounted to 1.25 publications per 1000 inhabitants in Germany in 2013. Like in other smaller countries like Switzerland, Australia and the Nordic countries the Dutch publication productivity is relatively high.

A comparable impression emerges if productivity is measured by expenditure. The amount of publications per million euro spent on R&D in 2013 in the Netherlands was 5.9. German researchers produced 3.3 publications per million euro spent in that year.

Source: http://www.wti2.nl/

International scientific cooperation

As is the case for many countries, the US is the most important partner for the Netherlands when it comes to scientific co-publications (13.4%). The US is followed by the countries neighboring the Netherlands: the UK (10.7%), Germany (10.5%), France (6.1%) and Belgium (5.4%). Dutch scientists publish with scientists from over 100 different countries, yet fifteen countries account for three quarters of all scientific co-publications.

Source: OCW Trends in beeld

	Int. co-authorship	Int. co-inventions
Germany	43,3	16,8
Netherlands	49,0	19,3

International co-authorship of scientific publications is based on the share of articles with authors affiliated with foreign institutions in total articles produced by domestic institutions.
International co-inventions are measured as the share of patent applications with at least one co-inventor located abroad in total patens invented domestically.

Source: OECD Science, Technology and Industry Scoreboard 2013: Innovation for Growth.

Private-public scientific partnerships

The table below shows the share of industry funding of total university research. Germany, Belgium and the Netherlands respectively take a 1st, 2nd and 3rd place on this list. This is an indicator of high university-industry interaction.

Share of industry funding of university research (percentages)			
	2001	2007	2011
Germany	12.2	15.5	14.0
Netherlands	5.2	7.5	8.2
EU28	6.4	6.9	6.6

Source: OECD (2014), Main Science and Technology Indicators.

Another measure of valorization activities is the level of university-industry co-publications (expressed as a percentage of the publications linked to a specific university within the country where at least one address referred to is a firm). The Dutch score of 7.2% is surpassed only by Sweden and Denmark. In Germany 4.9% of all Web of Science-indexed research publications for 2008-11 were co-authored with industry. In the Netherlands less than half of these publications were co-authored with domestic firms, a level that is lower than in comparable countries. According to the OECD the relatively low share of co-publications with domestic firms signals the high research quality of Dutch research universities and their attractiveness as partners to international firms.

Share of university-industry co-publications (2008-11)		
	Papers co-authored with industry, %	Share of domestic industry, %
Germany	4.9	--
Netherlands	7.2	44

Source: OECD (2014), Reviews of Innovation Policy; Netherlands

Participation in the EU Framework Programs

Both the Netherlands and Germany participate extensively in projects that are (partly) funded by the EU. Since 1990 at least one German research partner has been involved in approximately 36% of all EU funded programs. That percentage is 19.6 for the Netherlands. These percentages make Germany and the Netherlands respectively the 2nd and 6th most active participants in the Framework Programs.

Key participating countries:	**# of projects participated in:**	**As percentage of total # projects**
1. United Kingdom	38.855	39,5
2. Germany	**36.046**	**36,6**
3. France	32.974	33,5
4. Italy	25.723	26,1
5. Spain	21.041	21,4
6. Netherlands	**19.272**	**19,6**
7. Belgium	14.891	15,1
8. Greece	10.742	10,9
9. Sweden	10.541	10,7
10. Denmark	8.853	9,0

EU Framework Programs can have participants from a large variety of countries. Each project however has only one coordinating country. Since 1990 Germany has been coordinating country in 14.4% of all EU funded projects, making it the 3rd most active coordinating country. The Netherlands coordinated 7.0% of all projects and scored a 5th position.

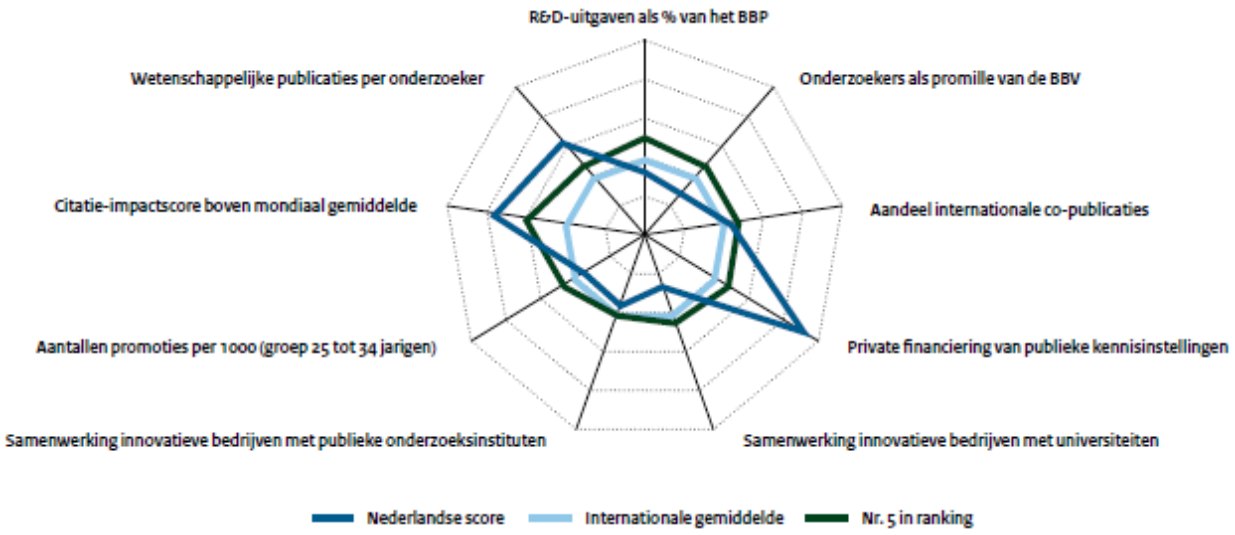
Key coordinating countries:	# of coordinated projects	As percentage of total # projects
1. United Kingdom	18.895	19,2
2. France	14.245	14,5
3. Germany	**14.190**	**14,4**
4. Italy	9.001	9,1
5. Netherlands	**6.919**	**7,0**
6. Spain	6.686	6,8
7. Belgium	5.105	5,2
8. Greece	2.993	3,0
9. Denmark	2.533	2,6
10. Sweden	2.255	2,3
Sum top 10	82.822	84,2
Remaining	15.591	15,8
Sum total	98.413	100

Source: http://cordis.europa.eu/

Top five ambition in science

The government of the Netherlands has the ambition to score a top five worldwide position when it comes to education and science. The ministry of Education, Culture and Science monitors this ambition, using a total of nine indicators.

These indicators are mentioned in the image below. Starting at the top moving clockwise these read: 1)R&D-expenditures as % of the GDP 2)researchers as per mille of the working population 3)share of international co-publications 4) private funding of public knowledge institutions 5)cooperation innovative companies with universities 6)cooperation innovative companies with public research institutes 7)amount of promotions per 1000 (group 25 to 34 year olds) 8)citation impact score above global average 9)scientific publications per researcher.



Source: Trends in Beeld 2013, OCW.

R&D expenditure

	Total R&D expenditures as % GDP	Private R&D expenditures as % GDP	Public R&D expenditures as % GDP
Germany	2,9	2,0	0,9
Netherlands	2,2	1,2	1,0

Source: OECD Main Science & Technology Indicators over 2012

Top 3 regions with highest R&D expenditure as % of local GDP:

Germany (2009)	Total R&D expenditures as % GDP
Baden-Württemberg	4.8%
Bavaria	3.1%
Hesse	3.0%

Source: Destatis, Statistisches Bundesamt

Netherlands (2009)	Total R&D expenditures as % GDP
Brabant	2.4%
Gelderland	2.1%
Utrecht	2.0%

Source: CBS, Statistics Netherlands