ROTTERDAM SCHOOL OF MANAGEMENT ERASMUS UNIVERSITY

RESEARCH REPORT – EUROPEAN INNOVATION SCOREBOARD

Innovativeness of the Netherlands relative to EU countries

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Table of Contents

Executive Summary	
Methodology	5
Summary Innovation Index	6
New doctorate graduates	7
Population with tertiary education	8
Youth with at least upper secondary education	9
International scientific co-publications	10
Top 10% most cited scientific publications	11
Non-EU doctorate students	12
R&D expenditure in the public sector	
Venture capital investments	14
R&D expenditure in the business sector	15
Non-R&D innovation expenditure	16
SMEs innovating in-house	17
Innovative SMEs collaborating with others	
Public-private co-publications	19
PCT patent applications	20
PCT patent application in societal challenges	21
Community trademarks	22
Community designs	23
SMEs with product or process innovations	24
SMEs with marketing or organisational innovations	25
Employment in knowledge-intensive activities	
Medium and high-tech product exports	27
Knowledge-intensive services exports	28
Sales of new-to-market and new-to-firm innovations	29
License and patent revenues from abroad	30
Appendix. Overview of indicators: EU measurement framework	31

Executive Summary

The report compares the Netherlands scores on indicators of innovativeness from the European Innovation Scoreboard with the EU average scores over the period 2005-2016. We analyzed systematic out- and underperformance of the Netherlands, and trends.

The conclusion is that over the whole period the Netherlands has been strong in enablers for innovation, particularly in knowledge production and public support, and in research collaboration between public research institutes and the private sector. The country outperforms the EU average by far on highly cited publications and on international scientific co-publications. In this period, the Netherlands has further strengthened public support in R&D, and has improved the availability of venture capital relative to the EU.

A relative weakness of the Netherlands has always been the conversion of knowledge into successful innovations in the market, but it now appears that the Netherlands is doing better in this area than previously concluded. Particularly, more small and medium-sized enterprises (SMEs) indicate to be engaged in innovation. As a result of improvements, the overall score of the Netherlands has improved relative to the EU over the period 2005-2016.

The results mentioned above involve that firms in the Netherlands show better innovation management, converting knowledge inputs more effectively into innovation outputs than reported in the past. Since the Netherlands remains weak on some output indicators, further improvement in innovation management is required.

Summary of indicators

A significant positive trend of the Netherlands compared to the EU average is seen in:

- Overall: Summary Innovation Index
- Enablers
 - Non-EU doctorate students¹;
 - R&D expenditures in the public sector;
 - Venture capital investments;
- Firm activities
 - SMEs innovating in-house;
- Outputs
 - SMEs with product and process innovations;

¹ Due to the lack of data the trend should be interpreted cautiously.

RESEARCH REPORT – EUROPEAN INNOVATION SCOREBOARD

• SMEs with marketing or organisational innovations;

A significant negative trend is seen in:

- Firm activities
 - Public-private co-publications;
 - Community designs;

Systematic outperformance of the Netherlands compared to the EU average is seen in:

- Overall: Summary Innovation Index
- Enablers
 - New doctorate graduates;
 - Tertiary education;
 - International scientific co-publications;
 - Top 10% most cited scientific publications;
 - R&D expenditure in the public sector;
- Firm activities
 - Innovative SMEs collaborating with others;
 - Public-private co-publications;
 - PCT patent applications;
 - PCT patent applications in societal challenges;
 - Community trademarks;
- Outputs
 - o Employment in knowledge intensive activities;
 - License and patent revenues from abroad;

On the other hand, systematic underperformance is seen in:

- Enablers
 - Youth with at least upper secondary education;
- Firm activities:
 - R&D expenditures in the business sector;
- Outputs
 - o SMEs with marketing or organizational innovations
 - Medium high-tech product exports;
 - Sales of new to market and new to firm innovations.

Methodology

We used data from the European Innovation Scoreboard from the Netherlands and the EU average of the period 2005-2016. We attained the relative score of the Netherlands on an indicator by dividing the score of the Netherlands by the EU average score. Systematic outperformance and underperformance of the Netherlands compared to EU was concluded from comparison of the data over the studied period. Using regression analyses we computed trendlines per indicator for the Netherlands and for the EU, and the trends for the Netherlands relative to the EU. In view of the low number of observations (years), we used p < 0,10 as criterion for significance.

The trends on the indicators of firm activities and outputs relative to the EU should be interpreted with caution because of a change from hardcopy to online surveying in the underlying Community Innovation Survey by the CBS, which becomes evident in the figures for 2013 onwards. Due to the lay-out of the former hardcopy questionnaire, underscoring of certain questions seems plausible². As a consequence of response-based structuring of the online survey, the accuracy of the figures is improved since the scoreboard of 2013. The data of the Summary Innovation Index are from the European Innovation Scoreboard of 2015.

Reading guide: The years in the charts are the publication dates of the European Innovation Scoreboard reports. The underlying data are usually from the previous year and for some indicators from 2-3 years before the publication dates.

For this report, data were used from the European Innovation Scoreboard, European Commission, prepared by Merit, Maastricht, the Netherlands. We thank Hugo Hollanders from Merit for his kind co-operation.

² CBS, CIS 2008-2010.

Summary Innovation Index

The Summary Innovation Index summarizes the range of different indicators of innovation and measures the innovation performance. The summary innovation index of the Netherlands was higher than the EU average over the whole period. In 2005 it was 14% higher than EU average; however, in 2009 it was higher only by 3% than EU average. After 2009, the score of the Netherlands on the index increased systematically and in 2015 it was 17% higher than the EU average.

The trends for both the Netherlands and the EU are positive and significant. The score of the Netherlands increases 3.7% on average per year, while the score of the EU increases 2.5% on average per year. The increase of the score of the Netherlands relative to the EU is positive and significant (p-value 0.04).



New doctorate graduates

The indicator presents new doctorate graduates per 1000 population aged 25-34. The score of the indicator for the Netherlands has been increasing during the years and always remained higher than the EU average. In 2010 it was 1.6 which was 14% higher than the EU score and in 2016 the indicator score was 2.2, which was 20% higher than EU score.

The trends for both the Netherlands and the EU are positive and significant. The score of the Netherlands increases 4.9% on average per year, while the score of the EU increases 4.6% on average per year. There is no significant increase or decrease of the score of the Netherlands relative to the EU.



Population with tertiary education

Tertiary education refers to the percentage of the population aged 25-64 (for years 2005-2009) or 30-34 (for years 2010-2015) having completed tertiary education. The population with tertiary education in the Netherlands has always been higher than the EU average. In 2005 the score of the indicator was 27.55 and it was 26 % higher that the EU average. From 2009 onwards the tertiary education remained higher than the EU average but has been decreasing constantly during the years (in 2009 and 2015 it was higher than the EU average by 32% and 17% respectively). In 2016 the score of indicator is 46.40, which is 21% higher than the EU average.

The trends for both the Netherlands and the EU are positive and significant. The score of the Netherlands increases 4.7% on average per year, while the score of the EU increases 4.9% on average per year. There is no significant increase or decrease of the score of the Netherlands relative to the EU.



Youth with at least upper secondary education

The percentage of population aged 20-24 which have attained at least upper secondary education. Youth education attainment level of the Netherlands has been lower than the EU average by 2-3% (apart from 2006 when it was equal) during the years. In 2016 the score is 79.8 and it is 3% lower than the EU average.

The trends for both the Netherlands and the EU are positive and significant. The score of the Netherlands increases 0.6% on average per year, while the score of the EU increases 0.7% on average per year. There is no significant increase or decrease of the score of the Netherlands relative to the EU.



International scientific co-publications

The indicator is a proxy for quality of scientific research and is measured by the international scientific copublications per million population. During the 5 year period, the score of the indicator for the Netherlands has been increasing steadily. In 2010 the score was 1059 and in 2015 it was 1524. Also, the international scientific co-publications score has always been higher for the Netherlands compared to the EU average. The score was 4 and 4.2 times higher than the EU average in 2010 and 2015 respectively. However, in 2016 the score has decresed to 1449 but still remains 3.2 times higher than the EU average.

The trends for both the Netherlands and the EU are positive and significant. The score of the Netherlands increases 5.3% on average per year, while the score of the EU increases 7.6% on average per year. There is no significant increase or decrease of the score of the Netherlands relative to the EU.



Top 10% most cited scientific publications

The indicator captures the scientific publications among the top 10% most cited publications worldwide as percentage of total scientific publications of the country. The indicator's score for the Netherlands has been higher than the EU average by approximately 40% from 2011 to 2016.

There are no significant trends for either the Netherlands or the EU, nor is there a significant increase or decrease of the score of the Netherlands relative to the EU.



Non-EU doctorate students

The indicator represents Non-EU doctorate students as a percentage of all doctorate students. The Netherlands' score was lower than the EU average in 2014 and 2015. In 2014 it accounted for 86% and in 2015 to 96% of EU average. In 2016, the score exceeds the EU average by 9%.

There are no significant trends for either the Netherlands or the EU. Nevertheless is the score of the Netherlands relative to the EU is positive and significant (p-value 0.03). However, the number of observations is low and there was a change in data source in 2016; therefore this result should be interpreted cautiously.



R&D expenditure in the public sector

R&D expenditures in the public sector measured as a percentage of GDP of the Netherlands have always been higher than the EU average. The score remained stable during the period between 2010 and 2013. The expenditures exceeded The EU average by 28% during these years. The slight drop of the score was seen the following two years. However, in 2016 the score of the indicator is 0.87, which is 21% higher than the EU average.

The trends for the Netherlands is positive. The score of the Netherlands increases 2,2% on average per year. There is no significant trend for the score of the EU. The increase of the score of the Netherlands relative to the EU is positive and significant (p-value 0.04).



Venture capital investments

Venture capital investment represents early stage and expansion and replacement capital for firms. The Netherlands accounted for 69% of the EU average for venture capital investments in 2008. Due to the steady growth of the score the EU average was reached in 2010. From 2010 the score has been steadily rising and exceeded the EU average venture capital investment by 10% in 2015. In 2016 the score has increased from 0.07 to 0.1, leading to outperformance of the EU average by 53%.

The trends for both the Netherlands and the EU are negative and significant. The score of the Netherlands decreases 3.8% on average per year, while the score of the EU decreases 11.2% on average per year. The score of the Netherlands decreases significantly less than the score of the EU (p-value 0.003).



R&D expenditure in the business sector

R&D expenditure in the business sector represents the creation of new knowledge within firms. For the Netherlands, it has always been lower than the EU average. In 2005 the score of the indicator accounted for 80% of the EU average. During the period from 2009 to 2013 it represented 70-74% of the EU average. After the sudden increase, the score has been slightly decreasing from 1.22 to 1.11 in 2014 and 2016 respectively. In 2016 the score accounts for 85% of The EU average.

There is no significant trend for the Netherlands, while the score of the EU increases 1.3% on average per year. There is no significant increase of decrease of the score of the Netherlands relative to the EU.



Non-R&D innovation expenditure

Non-R&D innovation expenditure is measured as a percentage of total turnovers. Examples of such expenditure are an investment in equipment and machinery and the acquisition of patents and licenses. The gradual increase in non-R&D innovation expenditure in the Netherlands has been seen in the period from 2008 to 2013. In 2008 and 2010 it accounted for only 28% and 73% of the EU average, and in 2013 it exceeded the EU average by 9%. However, the score of indicator dropped suddenly to 26% of the European average in 2015.

There is no significant trend for the Netherlands, while the score of the EU decreases 5.9% on average per year. There is no significant increase or decrease of the score of the Netherlands relative to the EU.



SMEs innovating in-house

This indicator measures the degree to which SMEs that have introduced any new or significantly improved products or production processes have innovated in-house. The score of the indicator for the Netherlands had been below the EU average from 2007 to 2010. However, it was increasing gradually. In 2013 it exceeded the EU average by 23%. Later, the EU average was exceeded by 36% in 2015.

The trends for the Netherlands is positive and significant. The score of the Netherlands increases 6.0% on average per year. There is no significant trend for the EU. The score of the Netherlands increases significantly relative to the EU (p-value 0.003).



Innovative SMEs collaborating with others

The indicator of innovative SMEs collaborating with others represents the degree to which SMEs are cooperating with others in order to innovate. It measures the flow of knowledge between public research institutions and firms and between firms and other firms. The Netherlands has been exceeding the EU average of innovative SMEs collaborating with others during the past years. In 2008 and 2013 it exceeded the EU average by 30%, whereas in 2015 it surpassed the EU average by 40%.

The trends for the Netherlands is positive and significant. The score of the Netherlands increases 2.4% on average per year. There is no significant trend for the EU. The score of the Netherlands does not increase or decrease significantly relative to the EU.



Public-private co-publications

The public-private co-publications represent the active collaboration activities and cooperating research between business sector researchers and public sector researchers leading to academic publications. It is remarkable that the Netherlands' score for public and private co-publications has always been exceeding the EU average by at least 2.4 times. It was 2.66 and 2.38 times higher than the EU average in 2008 and 2015 respectively.

There are no significant trends for either the Netherlands or the EU, nor does the score of the Netherlands increase or decrease significantly relative to the EU.



PCT patent applications

The indicator presents PCT patent applications per billion GDP. The score of PCT patent applications for the Netherlands has been always exceeding the EU average by 60% (with an exception for the year 2014, when the score was 40% higher than the EU average).

The trends for the Netherlands is negative and significant. The score of the Netherlands decreases 2.5% on average per year. There is no significant trend for the EU, nor does the score of the Netherlands increase or decrease significantly relative to the EU.



PCT patent application in societal challenges

The indicator represents PCT patent applications in health technology and environment-related technologies. It is measured as PCT applications in societal challenges per billion GDP. The Netherlands' score for this indicator has always been higher than the EU average during the years. In 2010 it was 1.11 which was 72% higher than the EU score. From 2011 to 2013, the score was increasing from 1.05 to 1.22 and outperformed the EU average by approximately 24%. From 2014 to 2015 the score rose dramatically from 1.17 to 1.73 and slightly decreased to 1.68 in 2016, the latter exceeded the EU average by 67%.

The trends for both the Netherlands and the EU are positive and significant. The score of the Netherlands increases 8.0% on average per year, while the score of the EU increases 6.8% on average per year. There is no significant increase of decrease of the score of the Netherlands relative to the EU.



Community trademarks

The indicator represents the community trademarks per billion GDP. The Netherlands indicator's score has always been exceeding the EU average. During the period of 3 years (2007-2010), the steady growth of the score led to the outperformance of the EU average from 59% to 61%. From 2010 till 2016 the score has been decreasing gradually and in 2016 it is 1.14 which is 16% higher than the EU average.

Since in 2010 the score was redefined, we present two different graphs. For the same reasons, we did not calculate separate trends. There was no significant increase of the score of the Netherlands relative to the EU.





Community designs

The indicator of community designs represents community designs per billion GDP. A glimpse into the past provides an insight that the score for the indicator has been increasing from 2005 to 2009 with a small drop in the score in 2008. The score remained above the EU average during the years and in 2009 the score exceeded the EU average by 32%. However, from 2010 to 2016 the score of the indicator decreased and stayed below EU average (with an exception of 2015). In 2016 the score accounts for 77% of the EU average score (4.44). Because of a redefinition of the score in 2010 we present two graphs.



Because of the redefinition of the score, we only computed the score of the Netherlands relative to the EU, which is negative and significant (p=0.06).



SMEs with product or process innovations

The indicator presents SMEs introducing product or process innovations. The Netherlands' score for the indicator has been lower than the EU average by 2%-8% till 2010. In 2013 the score exceeded the EU average by 20% and in 2015 the score was 34% higher than the EU average.

There are no significant trends for the Netherlands or the EU. The score of the Netherlands increases significantly relative to the EU (p-value 0.08).



SMEs with marketing or organisational innovations

The indicator presents SMEs applying marketing or organizational innovations. The score of the indicator has been lower than the EU average for the last 8 years. However, the relative score has been increasing steadily and the gap between the EU average and the Netherlands has been reduced. In 2008 the score represented only 72%, whereas in 2015 it was 97% of the EU average.

There are no significant trends for the Netherlands or the EU. The score of the Netherlands increases significantly relative to the EU (p-value 0.04).



Employment in knowledge-intensive activities

The indicator represents the employment in knowledge intensive activities measured as a percentage of total employment. The score for employment in knowledge-intensive activities of the Netherlands has been exceeding the EU average for the last 6 years. From 2010 to 2014 the score fluctuated only slightly (between 14.8 and 15.2) and it exceeded the EU average by 9% in 2014. In 2015 the score of indicator has increased sharply (17.10) and it has remained at this level till 2016, when it exceeded the EU average by 24%.

The trends for both the Netherlands and the EU are positive and significant. The score of the Netherlands increases 2.5% on average per year, while the score of the EU increases 1.0% on average per year. There is no significant increase of decrease of the score of the Netherlands relative to the EU.



Medium and high-tech product exports

The indicator of medium high-tech product exports represents the exports of medium and high-technology products as a share of total product export. The medium high-tech exports score of the Netherlands has kept its position below the EU average over time. From 2009 to 2016 the score accounted for 80% - 85% of the EU average.

There is no significant trend for the Netherlands. The trend for the EU is positive and significant. The score of the EU increases 2.0% on average per year. There is no significant increase of decrease of the score of the Netherlands relative to the EU.



Knowledge-intensive services exports

The indicator measures the competitiveness of the knowledge -intensive service sector. The knowledgeintensive service exports of the Netherlands has been below the EU average over time. During the 5 year period 2008-2013 the score of the Netherlands was decreasing steadily from 39.91 to 26.31. In 2013 it accounted for 58% of The EU average. In 2014 and 2015 the score was increasing gradually and it accounted for approximately 60% of the EU average in 2015. In 2016 the score was redefined, which explain the apparent increase of the score in that year.

There are no significant trends in either the score for the Netherlands or the EU, nor does the score for the Netherlands increase or decrease significantly relative to the EU.



Sales of new-to-market and new-to-firm innovations

The indicator presents sales of new-to-market and new-to-firm innovations as a percentage of turnover. The score of the indicator has been lower than the EU average during the years; however it has been steadily increasing. It accounted for 70% of the EU average in 2010 and 2013. In 2015 it increased slightly but it was enough to improve the relative position and account for 95% of the EU average.

The trends for the Netherlands is positive and significant. The score of the Netherlands increases 5.8% on average per year. There is no significant trend for the EU, nor is there a significant increase of decrease of the score of the Netherlands relative to the EU.



License and patent revenues from abroad

The indicator presents license and patent revenues from abroad as a percentage of GDP. The score of this indicator for the Netherlands remained higher than the EU average from 2010 to 2016. In 2010 the score was 0.67 which was 3 times higher than the EU average. A drop in the score (from 1.3 to 0.8) was seen in 2014, but it still remained 5% higher than the EU average. A sudden increase in score (from 0.8 to 3.75) was seen in 2015. During this year the Netherlands' score was almost 6 times higher than the EU score. In 2016 the score has decreased slightly and it is 4.2 times higher than the EU average.

There are no significant trends in either the score for the Netherlands or the EU, nor does the score for the Netherlands increase or decrease significantly relative to the EU.



RESEARCH REPORT – EUROPEAN INNOVATION SCOREBOARD

Appendix. Overview of indicators: EU measurement framework

Source: Innovation Union Scoreboard 2015



Contact details

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