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Research and Innovation Observatory Country Report 2016 The Netherlands
The 2016 series of the RIO Country Report analyses and assesses the development and performance of the national research and innovation system of the EU-28 Member States and related policies. It aims at monitoring and evaluating the EU policy implementation as well as facilitating policy learning in the Member States.

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Foreword

This report offers an analysis of the R&I system in The Netherlands for 2016, including relevant policies and funding, with a particular focus on topics of critical importance for EU policies. The report identifies the main challenges of the Dutch research and innovation system and assesses the policy responses implemented. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports and online publications. The quantitative data are, whenever possible, comparable across all EU Member State reports. Unless specifically referenced, all data used in this report are based on Eurostat statistics available in January 2017. The report contents are partly based on the RIO Country Report 2015 (Janssen, Den Hertog and Jonkers, 2016).

A more detailed analysis underpinning this report and more information on policy responses is available in the Background Expert Report on R&I Policies in 2016 (Van den Broek & Deuten, 2017).

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HIGHLIGHTS

- The economic recovery of the Dutch economy proceeds into 2016. In 2015, economic growth accelerated to 2.0% of GDP, following 1.0% in 2014.
- Labour productivity is high and the Netherlands is among OECD countries with the highest skilled labour force
- In 2016 the Netherlands became one of the 'innovation leaders' of the European Innovation Scoreboard
- Public expenditures on R&D have not been subject to fiscal consolidation pressure
- Appropriations for direct funding of R&D are stabilising but will drop as % of GDP in 2016-2018.
- The R&D tax allowances comprised about 87% percent of total government support to private sector R&D (not including the Innovation Box)
- The Netherlands has as strong position in international and European rankings on e-government and public sector innovation
- The GERD of 2.0 % and 2.01 of GDP measured in 2014 and 2015 respectively is similar to the EU28 average, but well below the national target of 2.5%.

MAIN R&I POLICY CHALLENGES

- **Improve low level of public support for R&D** Government expenditure on R&D is low in comparison to other advanced economies. It increased between 2014 and 2015 from € 4.4 to € 4.5 b. Appropriations for public funding increased between 2014 and 2015, but are projected to decrease again until 2017.
- **Increase intensity of private R&I** The business sector as a whole invests less in R&D and in knowledge-based capital than is the case in other advanced innovation systems. Indirect (fiscal) support measures have come to dominate the Dutch enterprise and innovation policy mix. In 2016 the platform NLGroeit (Netherlands Grows) was launched to enhance the number of fast growing (innovative) companies. For 2015 the CBS reports that the number of fast growing companies increased again by 10%, though not all these firms are innovation intensive.
- **Address (future) skill shortages** The Netherlands has a strong and highly educated workforce for innovation, but has faced challenges responding to emerging labour market needs. This situation may deteriorate in the face of an ageing population, digitisation and other specific societal challenges. The Human Capital Agendas of the top sectors and the Technology Pact are intended to address the shortage of skilled workers.

MAIN R&I POLICY DEVELOPMENTS IN 2016

- Reorganisation of the Research Council NWO
- Launch of the platform NLGroeit (Netherlands Grows)
- StartUp Delta initiative funded for another 4.5 years (until 2020)
- The Technology Pact 2020 has been updated for the 2016-2020 period in April 2016.
- Merger of two of the main tax incentives for R&D, the WBSO and the RDA

1. Main R&I policy developments in 2016

Reorganisation of the Research Council NWO	• Plans for the reorganisation of the Research Council NWO were presented in March 2016. Changes will come into effect on the 1st of January 2017
NLGroeit	• 2016 saw the launch of the platform NLGroeit (Netherlands Grows) which aims to enhance the number of fast growing companies.
StartUp Delta initiative	• The StartUp Delta initiative will be funded for another 4.5 years (until 2020). (Ministry of Economic Affairs, 2016)
Technology Pact 2020	• The Technology Pact 2020 has been updated for the 2016-2020 period in April 2016. Together with the Human Capital Agendas of the top sectors, the Technology Pact is intended to address the shortage of skilled workers
Merger of WBSO and RDA	• 2016 saw the merger of two of the main tax incentives for R&D, the WBSO and the RDA
Top Consortia for Knowledge (TKI) have been streamlined	• From 2016 onwards the number of Top Consortia for Knowledge (TKI) have been consolidated to 12 to make them more effective[1].
SME Innovation support for Topsectors	• The SME Innovation support for Topsectors (MIT) scheme is continued in 2016 and slightly enlarged with € 5 million to a total of € 55 million.
National icons	• The Ministry of EA appointed three 'national icons'. These are innovative projects which contribute to societal challenges and can promote the Netherlands as an innovative country.
Ethical aspects	• From 2016 onwards there will be an annual overview of the activities on ethical aspects of innovation policy from the Ministry of EA.
Digital Agenda	• The Ministry of EA presented a new Digital Agenda in July 2016.
Agile and futureproof regulation	• The government has taken several initiatives on agile and futureproof regulation. This covers for example new developments around fintech, big data, private rental (AirBnB) and the taxi market (Uber).
Big data in the field of ECS	• In June 2016 the Ministry of ECS published a letter on the impact of 'big data' on the field of education, culture and science

[1] This should be read as a rationalisation of the top sector policy rather than diminishing importance of the top sector policy.

Startimpuls NWA	• The Ministry of ECS has committed € 20 million to three themes of the National Science Agenda. The themes are resilient societies, digitisation and the contribution of natural sciences to innovation.
National Roadmap Large-Scale Research Infrastructures	• The permanent committee on large-scale research infrastructures has presented her roadmap of infrastructures that will have major importance for science and society.

1.1 Focus on National and Regional Smart Specialisation Strategies

Description and timing:

Innovation is prominent in the provincial and regional policy agendas. There is broad acceptance of the need for triple/quadruple helix stakeholder involvement. Noord-Nederland (Friesland, Groningen, Drenthe), Oost-Nederland (Gelderland and Overijssel), Zuid-Nederland (Zeeland, Noord-Brabant and Limburg) and West-Nederland (Noord-Holland, Flevoland, Utrecht and Zuid-Holland) have each developed a regional innovation strategy for smart specialisation (RIS3). An important trigger for the development of these RIS3 was the requirements to have strategic frameworks in order to be able to invest European Regional Development Funds in the regions. Except for North-Netherlands, the strategies are strongly aligned to the Topsector approach thus connecting them to national R&I policies and available research infrastructures. The RIS3 are predominantly strategic in nature, they do not have a publicly available detailed financial plan.

New developments

Policymaking continues and almost all regions have seen new initiatives on innovation policy over the last years which fit into the RIS3 policy framework and reflect the idea of policymaking as a constant process. The regions Noord and Zuid have made the RIS3 strategies the dominant framework for their regional innovation policy. For example: Noord-Nederland has built a new governance system around the RIS3 strategy and the subsequent Noordelijke Innovatie Agenda. Based on one of the recommendations from this agenda an innovation board was set up in 2016. This region has also established a strategic collaboration agreement with the Romanian Nord Est region within the RIS3 framework.

2. Economic Context[2]

The economic recovery of the Dutch economy proceeds into 2016. In 2015, economic growth accelerated to 2.0% of GDP, following 1.0% in 2014. Whereas earlier recovery was export driven, domestic demand picked up markedly in 2015. This also applies to investment activity which increased considerably. Real GDP is forecasted to experience annual growth of 1 ¾ % between 2016 and 2018 respectively, leading to a neutral output gap in 2017, following strong growth of domestic demand on the back of robust labour market conditions, low prices and fiscal stimulus measures. However, the CPB Netherlands Bureau for Economic Policy Analysis has recently reduced this economic growth forecasts for 2017 to 1.7% in the light of the expected effects of the Brexit and a further reduction of natural gas revenues (CPB, 2016). The deficit in 2016 is set to decline to -0.8 % of GDP, from -1.9% in 2015. Tax cuts worth € 5 b (0.7% of GDP) and lower natural gas revenues are more than offset by increasing tax revenues – especially from corporate taxes. The budget balance is projected to be -0.3 in 2017 and -0.1 in 2018. The debt-to-GDP ratio, which declined to 65.1% in 2015, is projected to further decrease to 63% of GDP in 2016 to 59.3% of GDP in 2018. (ECFIN, 2016b) The economic crisis has affected the productivity of the Dutch economy. In the pre-crisis period (2002-2008) labour productivity grew at a pace of 1.3% per year, after the crisis this slowed down to 1.0% per year after a shrinking of 2% in 2009. Multifactor productivity has declined sharply in 2009, increased in 2010 and then declined again until 2012. From 2013 onwards the multifactor productivity shows improvement. . This places the Netherlands on the lower ranks of OECD comparisons in terms of productivity growth. Productivity, however, is relatively high in comparison to other OECD countries.

2.1 Structure of the economy

The Netherlands has an open economy with a high level of international trade. Due to increasing domestic demand, the current account surplus is declining from 10% in 2012, to 8.5% in 2015 and 7.7 % in 2018. The Dutch economic structure has a strong specialisation in services (77% of total GVA) – of which more than half are knowledge intensive services (47% of total GVA). More than 99% of firms in the Netherlands are SMEs, responsible for 71% of employment and 62% of GDP(Statistics Netherlands, 2016a). The strong growth in micro-entrepreneurship was a point of concern in the Country Specific Recommendations 2016. 16,000 Dutch scale ups, employing 330,000 people contribute almost the same to Dutch GDP as all 716.000 self-employed without personnel together (Statistics Netherlands, 2016a).

2.2 Business environment

The Netherlands scores well on indicators of the Global Entrepreneurship Monitor (GEM, 2015). However, it has dropped three places on the World Bank Doing Business rank to 28th position. It became easier to start a business, but getting credit became more difficult and employment taxes increased. The Netherlands holds a (shared) first position on trading across borders (World Bank, 2016). The Netherlands ranks 2nd after Denmark in terms of the digitalisation of the economy and its score, unlike that of Denmark, grew faster than the EU over the last year (EC, 2016c).

2.3 Supply of human resources

Unemployment has decreased to 6.9% in 2015 and is expected to decrease to 6.1 in 2016. This trend is expected to continue as the vacancy rate indicates strong labour demand (Statistics Netherlands, 2016b; EC, 2016b). Labour productivity in the

[2] The introductory context section is heavily based on EC (2016a; 2016b)

Netherlands is high,[3] ranking among the highest of OECD countries. Dutch adults are among the most highly skilled of OECD countries with high levels of tertiary education and proficiency in literacy and numeracy (OECD, 2016a). With regard to STEM studies, there are still concerns regarding the inflow and outflow of students (NCGTP, 2016a) (see challenge 3). The number of vacancies for ICT and engineering is rising and the share of such vacancies that is filled with great difficulty was 41% in 2015 (NCGTP, 2016b).

3. Main R&I actors

The R&D&I structure in the Netherlands is mainly centralised at the national level. The central government remains the main financing body, but policy choices and focus areas are gradually becoming more regionalised. Direct support to business R&I is also increasingly provided at the regional level. The main policy actors in R&I are the Ministries of Economic Affairs (EA) and Education, Culture and Science (ECS). EA and ECS share the responsibility for enterprise policy, which includes innovation policy. ECS is responsible for science and education policies and the allocation of institutional funding to the universities. The main R&I policy implementation bodies are the Netherlands Organisation for Scientific Research (NWO), the Technology Foundation STW and the Taskforce for Applied Research SIA (both part of NWO), the Royal Netherlands Academy of Arts and Sciences (KNAW), and the Netherlands Enterprise Agency (RVO). Non-profit organisations and foundations do not play a large role in R&I funding in the Netherlands.[4]

Amongst the most prominent research performers in the Netherlands, we find 13 research universities, which do well in international rankings, as well as 37 universities of applied sciences, which are more focused on technical and vocational training. Research is also being conducted in academic hospitals that are part of the universities. The six Applied Research Organisations which receive public funding, recently formed the TO2 federation. The largest is the Netherlands Organisation for Applied Scientific Research (TNO). As part of Dutch enterprise policy, nine 'top sectors' with strategic importance for the Netherlands were identified. A main objective is to improve public-private collaboration in R&I through so-called Top Consortia for Knowledge and Innovation (TKIs). In the course of 2012, the parties collaborating in the top sectors established 19 TKIs - consolidated into 12 TKIs from 2016 onwards. Together the nine Topsectors which are central to the enterprise policy represent 89% of R&D-intensive firms. [5]

The Netherlands is home to over 220 clusters, "valleys", and platforms which in some way promote innovation and strive to be an international innovation hotspot [6]. Public-private partnership within these regional hotspots is in general strong. However, their critical mass is limited from a European or global perspective (Deuten, 2015). This has led some to criticism of the numerous initiatives and calls for a more integrated approach.[7] A relevant initiative in this respect is Startup Delta which has the goal to promote and strengthen the Dutch start-up ecosystem and in which most regions collaborate.

[4] A recent study by the Advisory council for science, technology and innovation (AWTI) estimated that charitable organisations, especially in the health field, was 3.3% of GERD - similar to shares found in other European countries. (AWTI 2014).
[5] These top sectors are Agri & Food; Horticulture; Chemical industry; Creative Industry; Energy; High Tech Systems & Materials; Life Sciences & Health; Logistics; and Water. (Statistics Netherlands, 2015). Top Sector Monitor 2015. In Dutch.
[6] FD (8 mei 2016) Innovatiehotspots buitelen over elkaar heen.
[7] Romme, S. & Stam E., "Naar één metropolis NL", Trouw, 15 juli, pagina 19

4. R&I trends

In 2016 the Netherlands became one of the 'innovation leaders' of the European Innovation Scoreboard (previously Innovation Union Scoreboard) (EC, 2016f). A key strength of the Dutch innovation systems is the quality of its science base. Business expenditures in R&D remain relatively low in comparison to other countries in the innovation leader's group.

GERD increased from € 12.7 b to € 13.6 b between 2013 and 2015. Although presented as signs of progress in the Dutch NRP 2015, expenditures on Research and Development (GERD) as a share of GDP have been increasing only gradually over the past few years. The 2.01% of GDP measured in 2015 is similar to the EU28 average, but well below the national target of 2.5%.

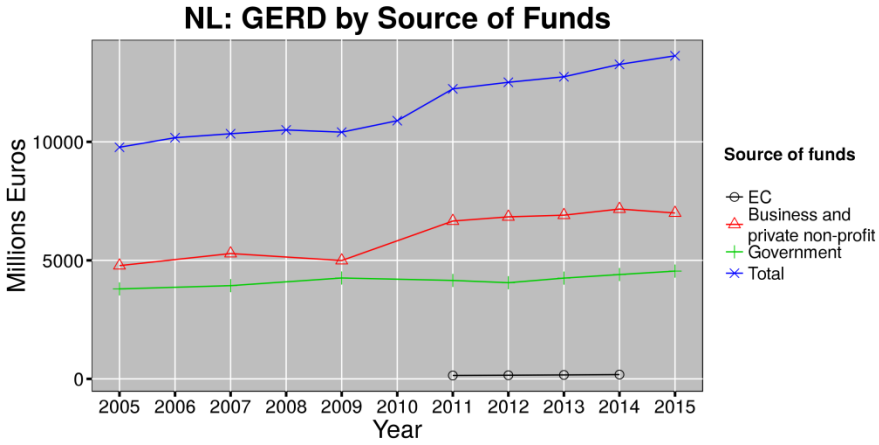

Figure 1 Development of government funding in total GERD.
Data source: Eurostat, November 2016.

4.1 Public allocation of R&D and R&D expenditure

In the years following the crisis, **public expenditures on R&D** have been **relatively safeguarded**. During the crisis and the post-crisis period, direct public funding to R&D, expressed as GERD funded by the government, has not fallen back to the pre-crisis levels, neither in terms of budget appropriations nor as effective expenditures. Dutch direct public funding of R&D per GDP is around the EU28 average but considerably below similar economies such as the Nordic Countries and Germany.[8] It increased between 2013 and 2015 from € 4.25 b to € 4.55 b. The inflow of FP funding has increased over the past years and is expected to continue doing so from around € 700-800 million per year in 2015.[9]

Appropriations for direct public R&D funding increased between 2014 and 2015, then are projected to decline until 2017 and stabilise in the years thereafter (Vennekens & Van Steen, 2016). The total foreseen budget for direct R&D funding for 2016 is € 5 b. Appropriations for direct funding of innovation (not R&D) increased sharply between 2014 and 2015, followed by a strong decline. The increase in 2015 is mainly due to the funding of energy related innovation and the supply of capital to Regional Development Organisations (ROMs) (Vennekens & Van Steen, 2016).

[8] Eurostat accessed 23/08/2016
[9] Estimate by Vennekens and Van Steen (2016)

With the introduction of the **Enterprise Policy** in 2011, the ministry of EA now mainly supports firms to participate in **public-private research collaborations**[10] or allows them to deduct costs related to engaging in R&D.

R&D tax incentives are important compared to direct government funding of business enterprise expenditures on R&D (BERD). The R&D tax allowances comprised about 87% percent of total government support to private sector R&D, not including the Innovation Box (OECD, 2016b). The share of tax incentives in total public R&D support increased from 9 to 24% between 1999 and 2016. The two main Dutch R&D tax incentives (WBSO and RDA) have been merged in 2016. This was done to improve both the effectiveness and the efficiency of the RDA. With the merger there is one taxation base for R&D incentives, which covers all R&D costs. Previously the RDA was based on firm profits which led to uncertainty about the amount of fiscal advantage and could lead to liquidity problems. Moreover, the merger should simplify the regulation for both firms and the taxation agency (Ministry of Economic Affairs, 2015). A third form of R&D&I related tax incentives, the 'Innovation Box'[11], does not feature in the national budgets and is therefore not included in the above figures. For 2015, € 625 m was budgeted for the innovation box (an internal guideline rather than a cap).(Ministry of Finance, 2015) For 2016 and 2017 the expected expenditure is to be € 1,3b.[12] Changes in the innovation box are expected ultimately in September 2016 (Ministry of Finance, 2016) as a result of the OECD BEPS (Base Erosion and Profit Shifting) project. The BEPS project intends to prohibit multinationals to move profits between countries in order to avoid taxes. Any changes to the innovation box are thus expected to be primarily focused on restrictions for multinationals.

4.2 Private R&D expenditure

The biggest funder of business R&D is business itself at 86% of BERD in 2015. Direct government support for business R&D peaked in 2010 at 6%, but decreased since to 2.0% in 2014 (see section 4.1 on tax incentives). Another major source of funding is FDI. Private R&D funding from abroad is 9-10 times as high as the government contribution. This stands in contrast with the European average ratio of 2:3. However, a recent report showed that R&D centres account for less than 10% of all incoming FDI projects (Technopolis, 2016; Deuten, 2015). BERD dropped both in absolute and relative terms (% of GDP) in the wake of the crisis followed by a sharp increase in 2011. Especially BERD in the service sector increased significantly. As a result the share of the service sectors increased from 24 to 36% of BERD between 2008 and 2013. This rise may be partially due to government efforts, including R&D tax incentives and incidental additional support for business R&D by the government. Another potential and plausible reason is a revision of statistical methodology in 2011, due to which companies with less than 10 employees are included. As a result, the reported R&D expenditure of small companies grew from 10% of total R&D expenditures in 2010 to 21% in 2012 (Dialogic, 2014). Still only 1% of small enterprises has its own R&D activities. Innovation in SMEs mostly comes from medium-sized enterprises, of which one quarter carries out own R&D activities. Together SMEs account for 45% of Dutch private innovation expenditures in

[10] The budget for the TKI surcharge is € 75 m in 2016 up from € 51 m in 2015. The MIT, for supporting innovation in SMEs in top sectors has a budget of € 34 m in 2016, down from € 46 m in 2015. (Public Budget 2016:XIII Economic Affairs, 2016).

[11] The Innovation box is a kind of patent box but intellectual assets are more broadly defined than patent alone. The innovation box also gives the favourable 5% taxation rate on profits generated from immaterial assets for which an R&D declaration has been received. It e.g. also includes profits generated from breeders rights. (Belastingdienst, 2016) http://www.belastingdienst.nl/wps/wcm/connect/bldcontentnl/belastingdienst/zakelijk/winst/vennootschapsbelasting/innovatiebox/. For a recent comparative analysis of the impact of patentboxes see Alstadsaedter et al (2015).

[12] Miljoenennota 2017 annex 6

2012. The remaining 55% of business innovation expenditures was made by large firms (Statistics Netherlands, 2016).

The manufacturing sectors still account for the largest share of BERD and absolute levels of BERD in these sectors have also increased since 2010. "Manufacture of machinery and equipment" (C28) and "Manufacture of computer, electronic and optical products" (C26) are the most important manufacturing sectors in terms of BERD. This reflects the activities of some of the larger companies such as Philips, ASML, and NXP as well as the surrounding suppliers and other SME companies. These MNCs are ranked 24st, 35th and 56th respectively on the European Industrial Innovation Scoreboard.[13] Some other high ranking scoreboard companies including STMI electronics (ranked 34th in the scoreboard) have their administrative headquarters in the Netherlands, but appear to do relatively little R&D here. Unilever, a leading food and consumer good firm, ranked 39th and does deploy significant R&D activities in the Netherlands. The sectors c28 and C26 show rising BERD levels since 2009. In the case of C28, the "manufacture of machinery and equipment", BERD levels increased steeply with over € 200 m, between 2013 and 2014. The decline in BERD in the chemical sector (C20) may be due to the cyclical nature of that industry. In services the "professional, scientific and technical activities" (M) has relatively high levels of BERD in part because of the presence of large (engineering) consultancy firms. Information and communication services (J) also display a relatively high level of BERD, followed by wholesale and retail trade (G).

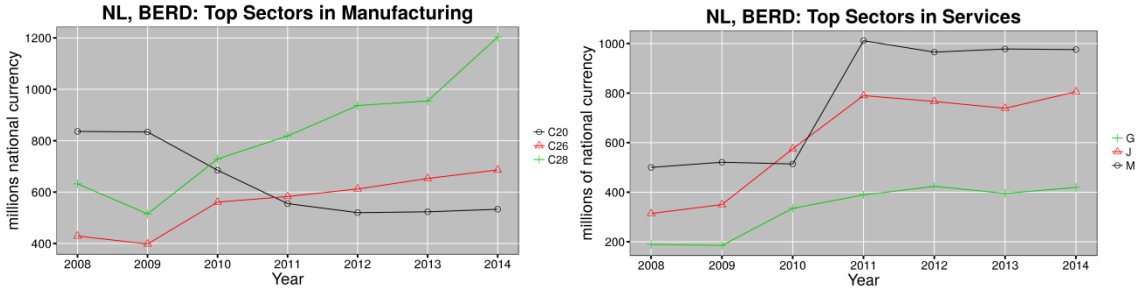

Figure 2 Top manufacturing and service sectors by BERD

Top sectors in manufacturing by BERD are ("Manufacture of machinery and equipment" (C28), "Manufacture of computer, electronic and optical products" (C26) Manufacture of chemicals and chemical products (C20). The top service sectors by BERD are: "professional, scientific and technical activities" (M); Information and communication services (J) and wholesale and retail trade (G).

4.3 Public sector innovation and civil society engagement

The Netherlands ranks 7th in the UN's e-government development index and 4th in the DESI sub-indicator on digital public services. According to the COCOPS survey on public innovation, decentralisation has made Dutch public executives more prone to take risks than public sector officials in other surveyed countries (Jilke et.al., 2013). A recent example of public sector co-creation for innovation are the 'City Deals' (Agenda Stad, 2016). By 2017, firms and citizens will have the legal right to digitally communicate with all levels of government (Ministry of Internal Affairs, 2016). A 'digicommissioner' coordinates the construction of a generic digital infrastructure (GDI) for all levels of

[13] The Innovation Scoreboard data is not compatible with BERD data as it is not restricted to intramural R&D expenditure data in a specific country but expenditures are assigned to the (country in which the) headquarters of the firm is based.

government(EC, 2016e), though cross-border interoperability is only addressed on an ad hoc basis (Bureau Digi-commissioner, 2016). The government aims to actively distribute all government data that are suited for open access and use (Ministry of IA, 2016) The National Open Data Agenda (NODA) 2016 included a government wide inventory of suitable data. This led to a 36% increase of data sets on the national governments open databank (data.overheid.nl) by June 2016. In 2016 another 26 'high value' data sets will be added to this databank.

In the development of the latest Dutch Science strategy 2025 and the National Science Agenda citizens played an important role. Inventories find almost 100 Medialabs, Fablabs and Hackerspaces in the Netherlands (Virtueelplatform, 2012), there are also several 3D printing hubs and almost every larger city has co-working spaces and hubs were people meet, work and exchange knowledge and ideas.

5. Innovation challenges

5.1 Challenge 1 Relatively low levels of public R&D expenditures

Description

The strong education system and science base of the Netherlands provide a sound basis for boosting innovation and growth via education and R&D activities. Government expenditure on R&D, however, is low in comparison to other advanced economies. In its CSR of 2015 and 2016, the European Commission therefore recommended that the Netherlands shift public expenditure towards supporting investment in R&D (EC, 2016d). In the coming years budgets for Public Research Institutes (PROs) are set to fall and will be increasingly tied to the Top Sectors. Universities are increasingly relying on competitive funding (Rathenau Institute, 2016) and are moving into the types of research traditionally carried out by PROs. This leads to the risk of erosion of the more applied part of the public research infrastructure. Direct government support for business R&D&I has become very low. This is partially compensated by R&D tax incentives, but as argued in the next challenge, more direct support would also be welcome.

Policy response

The Strategic Agenda on Higher Education and Research (2011), the Science Vision 2025 (2014) and the Science Agenda (2015) include policy measures that aim to improve the governance and funding of the higher education and research system, even if in budgetary terms, changes are limited. These policy measures attempt, inter alia, to foster profiling, concentration and a number of other policy aims, by tying funding allocation to performance. Each year € 275 m of the research council NWO is earmarked for research connected to the Top Sector agenda's. NWO is currently being reorganised to focus more on thematic, cross-disciplinary research. As a follow-up of the National Science Agenda firms and scientists have joined forces in the 'Knowledge Coalition'[14] which requested additional public funding of RDI of € 1b per year to be invested following the priorities outlined in the National Science Agenda , thereby addressing grand societal challenges (Knowledge Coalition, 2016).

Policy Assessment

Government expenditures on R&D increased between 2014 and 2015 from € 4.4 b to € 4.5 b. Appropriations for direct public R&D funding increased between 2014 and 2015. (Vennekens and Van Steen, 2016) Since changes in the governance regime have been implemented recently, it is too early to give an assessment of impact. However, GDP growth is expected to outpace the stabilising GBAORD thus reducing the public R&D intensity of the Netherlands. Considering the already high levels of competitive allocation of research funding (institutional and project funding) and the high degree of efficiency characterising the Dutch system, there may be little additional scope for increasing the quality of the science output with the current levels of input. Sufficiently sustainable levels of public R&D funding are required to ensure the quality of the long term output of the Dutch fundamental and especially also the applied research system. While changes in the public funding regime are improving links between the public research system and industry, they also carry risks: universities and PROs require core funding to maintain a healthy knowledge base and to perform their primary roles in the provision of skills and of public goods. Sufficient room for curiosity driven research is important in an advanced R&I system such as the Dutch (OECD, 2014).

[14] The knowledge coalition consists of: VSNU, Vereniging Hogescholen, Universitair Medische Centra (NFU), KNAW, NWO, VNO-NCW, MKB-Nederland and TO2-federation.

5.2 Challenge 2 Increasing private RDI expenditure and economic restructuring

Description

The business sector as a whole invests less in R&D than is the case in other advanced innovation systems: it ranks 10th among EU MS in terms of the BERD as % of GDP. At 1.11% it did show a modest improvement in relative performance, with a growth rate of 3% and a rise of two places in the ranking of EU MS (EC, 2016f). The relatively low performance on this indicator can partially be explained by the Dutch economic structure which has a strong specialisation in services and some other sectors which have a relatively low formal R&D component. Some of these sectors (e.g. food and agriculture) are, however, internationally very competitive and in comparison to other countries also very R&D intensive. However, although Dutch industry ranks top 3 worldwide in terms of productivity, R&D intensity and investments are relatively low and have not risen in the 2000-2010 period (Van der Wiel & Wijnstok, 2016). Young and entrepreneurial firms account for most of net job growth in the Netherlands and are an important source of radical innovation (Statistics Netherlands, 2016a). However, the number of fast-growing companies has almost halved between 2010 and 2014 (NL Groeit, 2016). But for 2015 the CBS reports that the number of fast growing companies increased again by 10%, another sign that the recession has been overcome (Statistics Netherlands, 2016b). Also the number of scale-ups, which forms a part of the number of fast-growing companies, increased for the first time in seven years according to the ScaleUp dashboard of the Erasmus University Rotterdam (ECE, 2016).

Policy response

Indirect (fiscal) support measures have come to dominate the Dutch enterprise and innovation policy mix since 2011. With the relative lack of national direct R&I support for firms, regional governments and the Regional Development Organisations are increasingly important sources of direct support for growing firms. A broad waiver of policy instruments has been implemented to improve the access to finance of start-ups and fast growing innovative SMEs (HGIE). Additional policy efforts partially focus on improving framework conditions. In 2016 the platform NLGroeit (Netherlands Grows) was launched to enhance the number of fast growing companies. Also the StartUp Delta initiative was further institutionalized and will be funded for another 4.5 years (until 2020) with the goal of empowering the Dutch Startup ecosystem (Ministry of Economic Affairs, 2016d).

Policy Assessment

The current system of R&D tax credits, is well-designed, but does not serve all of the varying needs of the business sector. According to the OECD (2014), rebalancing the system with a sufficient focus on competitive, well-designed direct support instruments could be more effective in stimulating innovation in first time innovators who tend to be more in need of upfront small scale support. The climate for start-ups and HGIE, including their access to finance, has improved markedly over the past years. Foreign investors also increasingly find their way to the Dutch Start up Delta. Next to stimulating R&I investments in established firms and investing in start-ups, a third way of increasing private R&I expenditure can be FDI on R&I. R&D activities only make up 10% of FDI attraction (Technopolis, 2016). Since 2007 firms in the Netherlands outsource more R&D to foreign parties than that they receive in terms of R&D funded from abroad (Deuten, 2016; Technopolis, 2016).

5.3 Challenge 3 Maintaining and improving the Human Capital Base for R&I

Description

The Netherlands has a strong and highly educated workforce for innovation, but has faced challenges responding to emerging labour market needs. The main challenge lies in the lack of science and engineering students to meet prospective labour demand (NCGTP, 2016a). The number of vacancies in engineering and ICT was approximately 29,700 at the end of 2015. The number of vacancies is especially pressing in ICT, with 3,000 more vacancies in 2015 than in 2011. It is estimated that for every starting ICT student 13 vacancies are open (Sterksen, 2016). This situation may deteriorate in the face of an ageing population (OECD, 2014). The Innovation Union Survey (IUS) 2016 indicator for the Dutch population aged 30-34 with a tertiary education was high (46.4%), in comparison to the EU average (38.5%), and improving with an annual growth rate of 2%. However, while the EU2020 target of 40% for graduation success rates in higher education has been surpassed, the Netherlands scores somewhat lower on this indicator in comparison to peer countries such as Sweden, Norway or the UK (EC, 2016f).

Policy response

The Technology Pact 2020, which targets all levels of education, has been updated for the 2016-2020 period in April 2016. The management group of the Pact has set five central themes for the next period on which actions will be taken: establishing continuous curricula and sufficient inflow, competent teachers, a stronger connection with ICT (digitalization and programming skills), more public-private partnerships in vocational education, cross-sectoral mobility and life-long learning (NCGTP, 2016b). Together with the Human Capital Agendas of the top sectors, this Technology Pact is intended to address the shortage of skilled workers. The government will invest the money from the discontinued student grant directly into the enhancement of the quality of higher education. This amount, € 620m in 2016, increases to a maximum of €1bn per year. Another initiative to strengthen quality and relevance of education was the establishment of approximately 40 Centres of Excellence and Centres of Craftsmanship. These centres, drawing upon intensive involvement of (local) enterprises, aim to contribute to the transition of vocational training, to innovation projects, and to the development of life-long-learning programs (Platform BetaTechniek, 2016). Policies directed at attracting highly skilled migrants are limited. Although there is an arrangement making it possible for firms to attract 'knowledge migrants' on attractive conditions, the Netherlands scores low on attracting knowledge migrants (PBL, 2015).

Policy Assessment

Co-ordination in the Human Capital Agendas of the top sectors and the Technology Pact can help improve responsiveness to (changing) labour market demands. The technology Pact monitor indicates that the number of university students choosing a study in Science or Engineering has increased in the past ten years, possibly as a result of the greater private costs of education or initiatives from the Technology Pact (NCGTP, 2016a). The share of technical students in Universities of Applied Sciences (UAS) and in secondary education has also increased markedly. However, this has not yet led to an increased number of STEM graduates, which is still relatively low with only 14.7% of graduates in STEM fields in 2014. The share of female science and technology students is also gradually increasing according to the Technology Pact monitor, but is still low compared to the EU average (25.2% female STEM graduates in the Netherlands versus 33.5% in the EU-28 in 2014). Labour shortages, though diminishing, remain.[15] Existing initiatives to encourage profiling and specialisation of university teaching and research

[15] See for instance the websites of Technology Pact and Platform BetaTechniek.

activities, e.g. the performance agreements between the Ministry of ECS and the universities, could enhance efficiency of the higher education system.

6. Focus on creating and stimulating markets

This section aims at describing and assessing national level efforts to introduce demand-side innovation policies to stimulate the uptake of innovation or act on their diffusion, including public procurement and regulations supporting innovation. It also analyses policy measures aimed at internationalisation of companies with the aim of increasing the innovativeness of the economy.

In the Netherlands specific attention for procurement of innovative solutions started in 2004 with the growing awareness that public procurement of innovative products and services could contribute to the solution of important societal problems and innovation policy objectives. The Dutch government procures around € 60b worth of work, services and supplies every year.[16] The largest share of these expenditures is not made by the central government (Ministry of Economic Affairs, 2011). The Dutch government aims to spend at minimum 2.5% of the purchasing budget on public procurement for innovation (PPI) and pre-commercial procurement (PCP).[17] Based on survey results it is estimated that in 2012, 6% of the number of public procurements was directed at finding innovative solutions. However, it cannot be estimated whether the goal of 2.5% of the total procurement budget has been reached as the survey had a limited scope and there were no details about the size of the contracts (Ministry of Economic Affairs, 2013).

PIANOo, the Netherlands knowledge network for government procurers, creates connections between public procurers to exchange best practices and knowledge. In consultation with the employer organisations, the responsible ministries (Infrastructure and Environment, Economic Affairs) have agreed to bring together trajectories that lead to sustainable innovations and the development of several public procurement instruments in the programme "Inkoop Innovation Urgent", (Urgent: Public Procurement of Innovation). The government also stimulates innovations by tendering R&D subsidies to SMEs (Small Business Innovation Research, SBIR) to come up with innovative solutions to societal problems and helping them to bring these to the market. To ensure a uniform process all SBIRs are executed by RVO. The use of SBIR instruments is ad hoc and differs per year[18], on average three SBIR procurements are done each year (Ministry of Economic Affairs, 2013). In over 30% of these pre-commercial procurements the government is the expected customer (Van Putten, 2015). In July 2016 a new procurement law was introduced which makes it easier for governments to develop innovations together with SMEs via procurement, the so-called innovation partnership, and after the development to buy the developed innovations without a new procurement.[19]

Another policy example focused on creating markets are the **Green Deals**. Mid 2016 there are more than 200 green deals with over 1,200 players. These are projects in which authorities make an agreement with societal stakeholders (businesses, civilians, local government, etc.) to take away bottlenecks when it comes to boosting sustainable growth. The role of the government in these Deals is not financial (as in funding projects), but involves improvement of regulations, support in innovative procurement, and certification. The Green Deals have been started between 2011 and 2014 with 1,090 participants from companies and sector organisations (70%, SMEs constituted 40% of the participants), local governments (14%), NGOs (8%), research organisations (6%)

[16] https://www.pianoo.nl/public-procurement-in-the-netherlands
[17] For comparison, Finland sets a more ambitious target of 5%.
[18] They are all executed by RVO.nl through a uniform process
[19] https://www.rijksoverheid.nl/actueel/nieuws/2016/07/20/gewijzigde-aanbestedingswet-biedt-mkb-meer-kansen

and financial organisations (2%) (Van der Werff, 2015). A recent (June 2016) evaluation of the PBL on the green deals directed at the circular economy shows that the green deal approach has added value, but due to the limited scope and duration each deal only affects part of the innovation process. Accompanying policy measures therefore remain necessary(PBL, 2016). Also the green deals do not necessarily lead to environmental benefits because the claims of the green deals remain vague and insufficiently backed-up by evidence. Another recent broader evaluation of the green deals (Kwink Groep, 2016), was rather positive about the results of the green deals. It highlighted the learning curve of constant improvements in the way green deals are closed. The Ministry has decided to continue the Green Deal policy.

"**Ruimte in regels**" is an interdepartmental programme of the Ministries of Economic Affairs and Infrastructure and Environment. It identifies regulatory barriers for companies that want to invest in innovation, especially in relation to green growth. Mid 2016 more than 200 obstacles were identified of which a little over 100 have been tackled.[20] In the **Top Sector Policy,** the topsectors are given an active role to contribute to remove regulatory barriers to innovation and to make regulation more innovation friendly. They can identify concrete situations in which existing regulations hinder innovation. Moreover, a law is being prepared which would give municipalities the possibility to experiment with alternative regulations to stimulate innovation and technological progress.

With regard to attracting FDI the challenge is to attract more R&D activities. Although the Netherlands ranks well on attracting FDI, R&D activities only make up 10% of FDI (Technopolis, 2016). Also, since 2007 firms in the Netherlands outsource more R&D to foreign parties than that they receive in terms of R&D funded from abroad (Deuten, 2015). FDI attraction in the Netherlands is coordinated by the Netherlands Foreign Investment Agency (NFIA) which is part of the Netherlands Enterprise Agency (RVO) of the Ministry of Economic Affairs and works closely together with the regional development agencies and the network of scientific and technological attaches (Ecorys, 2016).

[20] www.ruimteinregels.nl

References

Agenda Stad (2016) City deals. http://agendastad.nl/city-deals/ Accessed on: August 2016

Alstadsæter, A., Barrios, S., Nicodeme, G., Skonieczna AM, Vezzani, A., 2015, Patent Boxes Design, Patents Location and Local R&D, JRC Technical Reporthttp://iri.jrc.ec.europa.eu/documents/10180/424355/PatentBoxesDesign_PatentsLocation_and_LocalRD.pdf

AWTI (2014). The role of science foundations in the Netherlands. ATWI, The Hague. https://www.awti.nl/documenten/rapporten/2014/9/2/de-rol-van-fondsen-voor-de-wetenschap-in-nederland

Bureau digi-commissioner (2016) Digiprogram 2016/2017. Bureau digi-commissioner, The Hague. https://www.digicommissaris.nl/page/893/digiprogramma-2016-2017

Statistics Netherlands (2015) Top Sector Monitor 2015. CBS, Heerlen. https://www.cbs.nl/nl-nl/achtergrond/2015/41/monitor-topsectoren-2015

Statistics Netherlands (2016) Business cycle clock. CBS, Heerlen. https://www.cbs.nl/nl-nl/nieuws/2016/29/economisch-beeld-al-een-paar-maanden-stabiel

Statistics Netherlands (2016) The state of SMEs. CBS, Heerlen. http://www.destaatvanhetmkb.nl accessed on: August 2016

Statistics Netherlands (2016) The number of fast-growing companies increases. CBS, Heerlen. https://www.cbs.nl/nl-nl/nieuws/2016/30/aantal-snelgroeiende-bedrijven-neemt-weer-toe

CPB (2016) Concept Table Main Economic Indicators 2014-2017. CPB Netherlands Bureau for Economic Policy Analysis, The Hague. http://www.cpb.nl/persbericht/brexit-remt-groei-nederlandse-economie

Deuten, J., (2015) R&D goes global: Policy implications for the Netherlands as a knowledge region in a global perspective. Rathenau Instituut, The Hague. https://www.rathenau.nl/nl/publicatie/rd-goes-global-policy-implications-netherlands-knowledge-region-global-perspective-0

Dialogic (2014) Science, technology and innovation indicators: Resume, WTI2. Dialogic, Utrecht. http://dialogic.nl/documents/other/wti2_resume.pdf

EC (2013) Public sector innovation scoreboard. European Commission, Brussels. http://ec.europa.eu/growth/industry/innovation/policy/public-sector_nl

EC (2016a) Spring Economic Forecast. European Commission, Brussels http://ec.europa.eu/economy_finance/eu/forecasts/2016_spring/nl_en.pdf;

EC (2016b) Autumn Economic Forecast, European Commission, Brussels http://ec.europa.eu/economy_finance/eu/forecasts/2016_autumn/nl_en.pdf

EC (2016c) The Digital Economy & Society Index (DESI), European Commission, Brussels, https://ec.europa.eu/digital-single-market/en/desi

EC (2016d) Country specific recommendations 2016 The Netherlands. European Commission, Brussels. http://ec.europa.eu/europe2020/pdf/csr2016/csr2016_netherlands_en.pdf

EC (2016e) EU eGovernment Action Plan 2016-2020. European Commission, Brussels. https://ec.europa.eu/digital-single-market/en/european-egovernment-action-plan-2016-2020

EC (2016f) European Innovation Scoreboard 2016. European Commission, Brussels. http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_nl

Ecorys (2016) Final report evaluation RDAs 2010-2015. Ecorys, Rotterdam. https://www.rijksoverheid.nl/documenten/rapporten/2016/06/08/eindrapport-evaluatie-van-de-regionale-ontwikkelingsmaatschappijen-2010-2015

Erasmus Centre for Entrepreneurship (2016) ScaleUp Dashboard 2016. ECE, Rotterdam. http://ece.nl/what-we-do/scale-up-research/

GEM (2015) Global Entrepreneurship Monitor 2015. Gem Consortium, London. http://www.gemconsortium.org/report

Janssen, M., Den Hertog, P., Jonkers, K., (2016) RIO Country Report The Netherlands 2015, https://rio.jrc.ec.europa.eu/en/library/rio-country-report-netherlands-2015

Jilke, S.R, Van de Walle, S.G.J, & van Delft, R. (2013). Public Sector Reform in the Netherlands – Views and Experiences from Senior Executives: COCOPS National Report for The Netherlands. COCOPS - (COordinating for COhesion in the Public Sector of the Future). http://hdl.handle.net/1765/78040

Knowledge Coalition (2015) Science Agenda. Knowledge Coalition, The Hague. http://www.wetenschapsagenda.nl/

Ministry of Internal Affairs (2016) Current state of affairs implementation National Open Data Agenda (NODA) 2016. Ministry of Internal Affairs, The Hague. https://www.rijksoverheid.nl/documenten/kamerstukken/2016/06/22/kamerbrief-over-uitvoering-nationale-open-data-agenda-2016

Ministry of Economic Affairs (2013) Progress report PPI. Ministry of Economic Affairs, The Hague. https://www.rijksoverheid.nl/documenten/rapporten/2013/10/02/voortgangsrapportage-innovatiegericht-inkopen

Ministry of Economic Affairs (2015) Integration of fiscal incentives WBSO and RDA. Ministry of Economic Affairs, The Hague.https://www.rijksoverheid.nl/documenten/kamerstukken/2015/07/07/kamerbrief-over-integratie-wbso-en-rda

Ministry of Economic Affairs (2016a) Changes in procurement law. Ministry of Economic Affairs, The Hague. https://www.rijksoverheid.nl/actueel/nieuws/2016/07/20/gewijzigde-aanbestedingswet-biedt-mkb-meer-kansen

Ministry of Economic Affairs (2016b) Policy response AWTI advice on regional innovation hotspots. Ministry of Economic Affaris, The Hague. https://www.awti.nl/documenten/adviezen/2014/11/10/aanbieding-beleidsreactie-op-awti-advies-over-regionale-hotspots

Ministry of Economic Affairs (2016c) SME Collaboration Agenda 2016-2017. Ministry of Economic Affairs, The Hague. https://www.rijksoverheid.nl/documenten/rapporten/2016/06/08/mkb-samenwerkingsagenda-2016-2017

Ministry of Economic Affairs (2016d) Start-up Delta 2020. Ministry of Economic Affairs, The Hague. https://www.rijksoverheid.nl/documenten/kamerstukken/2016/05/24/kamerbrief-over-startupdelta2020

Ministry of Education, Culture and Science (2015) Science Vision 2025. Ministry of Education, Culture and Science, The Hague. https://www.rijksoverheid.nl/documenten/rapporten/2014/11/25/wetenschapsvisie-2025-keuzes-voor-de-toekomst

Ministry of Education, Culture and Science (2015) Strategic Agenda on Higher Education, Research and Science. Ministry of Education, Culture and Science, The Hague https://www.rijksoverheid.nl/documenten/kamerstukken/2015/07/07/aanbieding-strategische-agenda-hoger-onderwijs-en-onderzoek

Ministry of Finance (2015) Changes in tax regulations. Ministry of Finance, The Hague. https://zoek.officielebekendmakingen.nl/dossier/34002/kst-34002-83?resultIndex=51&sorttype=1&sortorder=4

Ministry of Finance (2016) Evaluation of the innovation box. Ministry of Finance, The Hague. https://www.rijksoverheid.nl/documenten/kamerstukken/2016/02/19/kamerbrief-betreffende-kabinetsreactie-evaluatie-innovatiebox

Ministry of Internal Affairs and Kingdom Relations (2015) Progress report digital 2017. Ministry of Internal Affairs and Kingdom Relations, The Hague. https://www.digitaleoverheid.nl/actueel/nieuwsberichten/intItem/voortgangsrapportage-digitaal-2017/2898

Ministry of Internal Affairs (2016) Current state of affairs implementation National Open Data Agenda (NODA) 2016. Ministry of Internal Affairs and Kingdom relations, The Hague. https://www.rijksoverheid.nl/documenten/kamerstukken/2016/06/22/kamerbrief-over-uitvoering-nationale-open-data-agenda-2016

National Coordination Group Technology Pact (NCGT) (2016a) Monitor Technology Pact 2016. National Coordination Group Technology Pact, The Hague. http://www.techniekpact.nl/monitor/landelijk

National Coordination Group Technology Pact (NCGT) (2016b) National Technology Pact 2020: focus 2016-2020. National Coordination Group Technology Pact, The Hague http://www.techniekpact.nl/cdi/files/a0c764fda4945d2814f713e0e1c033f9edac9374.pdf

NFIA (2015) Monitor Business Climate. Ministry of Economic Affairs, The Hague. https://www.rijksoverheid.nl/documenten/kamerstukken/2016/01/08/kamerbrief-over-1e-monitor-vestigingsklimaat

NL Groeit (2016) The wavering growth engine of small firms. NLGroeit, Amsterdam. https://www.nlgroeit.nl/artikel/de-haperende-groeimotor-van-het-nederlands-kleinbedrijf

OECD (2014) - Reviews of Innovation Policy: Netherlands 2014. OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264213159-en

OECD (2016) Economic survey of the Netherlands 2016. OECD Publishing, Paris. http://www.oecd.org/eco/surveys/economic-survey-netherlands.htm

OECD (2016) R&D Tax Incentive Indicators. OECD Publishing, Paris. http://www.oecd.org/sti/rd-tax-incentive-indicators.htm

PBL (2015) Foreign knowledge workers in the Netherlands. PBL, The Hague. http://agendastad.nl/wp-content/uploads/2015/02/PBL_2014_Buitenlandse-kenniswerkers-in-Nederland_684.pdf

Platform Betatechniek (2015) Website platform BetaTechniek. Access date: August 2016 https://www.platformbetatechniek.nl/home

Platform BetaTechniek (2016) Website Public Private Collaboration in Centres of Excellence and Centres of Craftsmanship. http://www.publiekprivaatsamenwerken.nl/home Accessed on 2-4-2016.

Rathenau Institute (2016) Chinese plates: financial streams and priority policy in Dutch universities.. https://www.rathenau.nl/nl/nieuws/publicatie-nederlandse-onderzoeksfinanciering-veel-competitiever-dan-offici%C3%ABle-cijfers-tonen

SER (2015) Worker deployment and labour productivity key to increasing public prosperity . Social and Economic Council, the Hague/ https://www.ser.nl/~/media/files/internet/publicaties/overige/2010_2019/2015/maatschap-welvaart/verhogen-maatschappelijke-welvaart-3.ashx

Study Group Sustainable Growth (2016) Choosing Sustainable Growth. Rijksoverheid, The Hague. https://www.rijksoverheid.nl/documenten/rapporten/2016/07/06/advies-studiegroep-duurzame-groei

Technopolis (2016) R&D Attraction Networks: A report on stakeholder co-operation and STI diplomacy to attract investments in R&D. Technopolis Group, Amsterdam. http://www.awti.nl/actueel/nieuws/2016/08/25/achtergrondstudie-rd-attraction-networks

UN (2014) E-Government Development Index. United Nations, New York. https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2014

Van den Broek, J., Deuten, J., (2017), RIO Background report 2016

Van der Werff , V., (2015), Green Deals, Presentation by Vincent Van Der Werff from the Sustainability Directorate Ministry of Infrastructure and the Environment – The Netherlands

Van der Wiel & Wijnstok (2016) Direct importance of industry in the Netherlands. Ministry of Economic Affairs, The Hague. https://www.vno-ncw.nl/sites/default/files/Directe%20belang%20van%20industrie%20-%20Ministerie%20van%20Economische%20Zaken_0.pdf

Van Putten, M., (2015), SBIR/PCP and Public Procurement of Innovation, presentation by Marieke van Putten, Ministry of Economic Affairs – The Netherlands

Van Steen, J., Total investment in research and innovation (TWIN) 2013-2019, facts & figures 14 Den Haag, Rathenau Instituut. https://www.rathenau.nl/nl/publicatie/total-investment-research-and-innovation-twin-2013-2019

Vennekens, A. en J. van Steen, (2016) Total investment in research and innovation (TWIN) 2014-2020. Rathenau Institute, The Hague. https://www.rathenau.nl/nl/publicatie/totale-investeringen-wetenschap-en-innovatie-2014-2020

Virtueelplatform (2012) Nederland Labland. Virtueel Platform, Rotterdam. http://virtueelplatform.nl/activiteiten/nederland-labland/

World Bank (2016) Doing Business 2017. World Bank Group, Washington. http://www.doingbusiness.org/data/exploreeconomies/netherlands/

Abbreviations

AWTI	Advisory Council for Science, Technology and Innovation
BERD	Business Expenditures on Research and Development
CBS	Statistics Netherlands
CIS	Community Innovation Survey
CSR	Country Specific Recommendations
CPB	Netherlands Bureau for Economic Policy Analysis
DESI	Digital Economy and Society Index
EA	Ministry of Economic Affairs
EC	European Commission
ERA	European Research Area
ERC	European Research Council
ESC	Ministry of Education, Science and Culture
ESIF	European Structural and Investment Funds
EU	European Union
EU-28	European Union including 28 Member States
FDI	Foreign Direct Investment
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditures on R&D
GOV	Government
GVA	Gross Value Added
GVC	Global Value Chain
HEI	Higher Education Institute, including universities and polytechnics
HGIE	High Growth Innovative Enterprises
IA	Internal Affairs
ICT	Information and Communication Technology
KNAW	Royal Netherlands Academy of Science
NGO	Non-governmental Organization
NL	The Netherlands
N.W.O.	Dutch Research Council

OECD	Organisation for Economic Cooperation and Development
PBL	Netherlands Environmental Assessment Agency
PCP	Pre-commercial Procurement
PCT	Patent Co-operation Treaty
PIANOo	Dutch Public Procurement Expertise Centre
PNP	Private non-profit sector
PPI	Public Procurement for Innovation
PRO	Public Research Organisation
R&D	Research and development
R&I	Research and innovation
RDA	R&D deduction (R&D tax incentive)
ROM	Regional Development Organisations
RVO	Netherlands Enterprise Agency
SBIR	Small Business Innovation Research
SIA	Taskforce for Applied Research – part of N.W.O.
SME	Small and Medium-sized Enterprise
STEM	*Science, Technology, Engineering and Mathematics*
STW	Technology Foundation part of the Dutch Research Council
TFP	Total Factor Productivity
TKI	Top Consortia for Knowledge and Innovation
TNO	Netherlands Organisation for Applied Scientific
TWIN	Overzicht Totale investeringen in Wetenschap en Innovatie (Rathenau publication)
UAS	University of Applied Science
WBSO	R&D tax credit

Factsheet

	2009	2010	2011	2012	2013	2014	2015	2016
GDP per capita (euro per capita)	37400	38000	38500	38500	38900	39300	40000	
Value added of services as share of the total value added (% of total)	75.54	75.96	75.94	76.1	76.67	77.65	78.17	
Value added of manufacturing as share of the total value added (%)	11.74	11.81	12.07	11.83	11.33	11.38	11.7	
Employment in manufacturing as share of total employment (%)	9.3	9.1	8.95	8.86	8.81	8.78	8.72	
Employment in services as share of total employment (%)	81.47	81.9	82.15	82.4	82.73	82.94	83.12	
Share of Foreign controlled enterprises in the total nb of enterprises (%)	0.97	0.97	1.12	1.11	1.17			
Labour productivity (Index, 2010=100)	97.9	100	100.7	100.5	101.2	102.1	103.6	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34			1.58	1.69	1.82	1.89		
Summary Innovation Index (rank)	12	11	10	11	7	6	6	
Innovative enterprises as a share of total number of enterprises (CIS data) (%)				51.4		55.3		
Innovation output indicator (Rank, Intra-EU Comparison)			9	9	9	9		
Turnover from innovation as % of total turnover (Eurostat)		10.4		11.8				
Country position in Doing Business (Ease of doing business index WB)(1=most business-friendly regulations)						25	28	28
Ease of getting credit (WB GII) (Rank)						65	69	
Venture capital investment as % of GDP (seed, start-up and later stage)	0.028	0.026	0.029	0.026	0.024	0.029	0.032	
EC Digital Economy & Society Index (DESI) (Rank)						3	4	2
E-Government Development Index Rank		5				5		7
Online availability of public services – Percentage of individuals having interactions with public authorities via Internet (last 12 months)	61	64	62	67	79	75	75	76
GERD (as % of GDP)	1.69	1.72	1.9	1.94	1.95	2	2.01	
GBAORD (as % of GDP)	0.79	0.77	0.77	0.72	0.73	0.74	0.74	
R&D funded by GOV (% of GDP)	0.69		0.65	0.63	0.65	0.66	0.67	
BERD (% of GDP)	0.79	0.83	1.08	1.1	1.09	1.12	1.12	
Research excellence composite indicator (Rank)				3				
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country		14.94	14.86	14.79	14.5			
Public-private co-publications per million population	87.29	101.84	110.23	93.84	90.47	85.62		
World Share of PCT applications	2.32	2.01	1.62	1.84	1.77	1.86		

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