Research and Innovation Report

Research and Innovation Policy

Sustainable Governance Indicators 2016

SGI Sustainable Governance Indicators

BertelsmannStiftung

Indicator

R&I Policy

Question

To what extent does research and innovation policy support technological innovations that foster the creation and introduction of new products?

41 OECD and EU countries are sorted according to their performance on a scale from 10 (best) to 1 (lowest). This scale is tied to four qualitative evaluation levels.

10-9 = Research and innovation policy effectively supports innovations that foster the creation of new products and enhance productivity.
8-6 = Research and innovation policy largely supports innovations that foster the creation of new products and enhance productivity.
5-3 = Research and innovation policy partly supports innovations that foster the creation of new products and enhance productivity.
2-1 = Research and innovation policy has largely failed to support innovations that foster the creation of new products and enhance productivity.

Germany

Score 9

Germany's performance in the area of research and development remains positive. According to the World Economic Forum, Germany's capacity for innovation ranks among the world's top performers. In the Global Competitiveness Report 2015 – 2016 (p.179), Germany ranked 5 out of 140 countries, just 0.3 points behind Israel with 5.9 points, in the area of technological development, and product and process innovation. Furthermore, Germany ranked 6 out of 140 countries for patent applications per inhabitant.

Regarding funding, the German government continues to raise budgets on research and development. Its spending remains above the European average. The budget of the Ministry of Education and Research was increased to €14.1 billion in 2014 and, to a record, €16 billion in 2015.

In contrast to numerous other European countries, Germany does not offer general R&D tax incentives, but rather concentrates on targeted funding of specific programs. Companies' expenditures on R&D are strong, but public-private partnerships and collaboration between universities and industry leave room for improvement. The government has continued to pursue its so-called excellence initiative within the tertiary education sector. The federal government and states have agreed to resume the Joint Initiative for Research and Innovation, and intend to increase the program's budget by 5% every year. Over the past years, as Germany increased the Research and Education Budget and pursued its excellence initiative within the tertiary education sector, the quality of its scientific research institutions improved slightly. In the Global Competitiveness Report 2015 – 2016 (p.179), Germany ranked 8 out of 144 countries in 2014 and 9 out of 144 in 2015 overall,

with a score of 5.8, competing with countries such as Japan (5.8 points) and the Netherlands (6.0 points).

Citation:
Schwab, Klaus (ed.) (2015): Global Competitiveness Report 2015-2016. World Economic Forum: Geneva.

Israel

Score 9

Israel's R&D sector is based on three pillars: scientific research performed primarily in academia, research conducted in government institutes, and research conducted by civil-industrial partnerships led by the Ministry of Finance. Israel's R&D is private-sector oriented and is becoming more so over time. In 2000, government funds accounted for 24% of total spending on civil-industrial R&D development. In 2006, they accounted for only 15.9%, and in 2009 further reductions brought public investment down to 14.5%, far below the European median of 37.3%. In contrast, in 2006 private-sector investments were above the European median by more than 20%. Consequently, although government funding has declined over the years, total R&D investment as a percentage of GDP is high in comparison to many European countries. 42% of non-governmental funding for R&D is attributed to foreign investment – the highest rate among OECD countries.

In 2013 the Ministry of Science and Technology submitted a report urging the government to allocate more public funds to R&D, arguing that private funding dominance prevents long-term and high-risk exploration. The report also pointed to the continued erosion in funding of R&D at universities. This decline is exhibited both in the declining share of contributions by universities to R&D activity over the years as well as in the reduced number of scientific publications per person compared to the 1990s. In 2014, the social-economic cabinet approved the establishment of an authority aimed to encourage technological innovation.

Still, in various EU and OECD surveys, Israel demonstrates high performance in the field of R&D. Israel is mentioned as having increased "its EPO (European Patent Office) patenting activity between 2000 and 2007, to reach the highest share of EPO patent applications per billion GDP." It was also singled out as one of the leading start-up and information exporters. Other evaluations acknowledge these accomplishments while criticizing the overly complex and burdensome bureaucracy in the field. These issues are being reevaluated and studied in current policy debates.

A large portion of Israeli R&D policy is directed toward international cooperation. In 2011, Israel was engaged in 30 different international cooperative research ventures with a variety of European countries and organizations. These resulted in 250 grant applications and projects with a total budget of €250 million. The Ministry of Science and Technology secured 14 bilateral agreements with various countries including Russia, Germany and France. Israel is also a signatory to some 29 bilateral R&D agreements and is involved in five EU programs, including Eureka, Eurostars,

the Competitive and Innovation Program – Enterprise Europe Network (CIP-EEN), Galileo, and Sesar. In terms of both policy and budgets, the most significant international involvement is in the Framework Programs, such as Horizon 2020, which are managed by the Israel-Europe R&D Directorate (ISERD).

Citation:
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Levi, Anat and Goldshmit, Roi, "Analyzing the budget of the office of the chief scientist in the Ministry of the Economy," Knesset Research Institute, Jerusalem, 26.5.2013: http://www.knesset.gov.il/mmm/data/pdf/m02763.pdf (Hebrew).

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The Ministry of Science Spokesperson, "The Minister of Science, Technology and Space submitted a report to the prime minister that calls to prepare a national five years plan for R&D," Technology and Space Ministry press release 25.4.2013: http://most.gov.il/Information/PostsSpokenman/Pages/report-perry.aspx (Hebrew).

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Schwab, Klaus, "World Economic Forum: The global Competitiveness Report 2014-2015," World Economic Forum, Geneva ,2014:
http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf (English).

http://www.oecd.org/eco/surveys/Isr ael-Overview-OECD-Economic-Survey-2 016.pdf

Sweden

Score 9

Sweden ranks among the top five advanced industrialized democracies in terms of research and development (R&D) spending per capita. This high level of investment in R&D has existed for considerable time. As an economy with high labor costs, Sweden's competitive edge lies not in large-scale manufacturing but in knowledge-intensive sectors. R&D spending thus directly sustains that competitive edge.

Governments – center-right as well as Social Democratic-Green – rarely miss an opportunity to reinforce the argument that public spending on higher education, research institutions, and research and development in general is integral to future prosperity and wealth. There is nothing suggesting that the commitment among all major political players to R&D spending is about to change.

While R&D spending has a long history, converting research and development

concepts into valuable products has been far more challenging for Sweden. The "Swedish paradox," as it is called, is precisely the inability to convert research findings into commercially viable products. However, as recent data show, Sweden now ranks first with regard to patent applications and license fees for intellectual property. This is a valid indicator that R&D is bearing fruit, as securing intellectual ownership of emerging products is a critical stage in the process from the research facility to the market. Public policy has targeted this very issue lately and the data suggest that R&D is now increasingly paying off.

Citation:
Digitaliseringskommissionen (2015): Digitalisering, främjande och framtid. En utredning kring behov av digitaliseringsfrämjande insatser (Stockholm) (https://digitaliseringskommissionen.se/wp-content/uploads/2015/02/Digitalisering-fr%C3%A4mjande-och-framtid-Slutlig-februari-2015_korrigerad.pdf).

Edquist, C. and L. Hommen (eds) (2008), Small Country Innovation Systems (Cheltenham: Edward Elgar).

Switzerland

Score 9

Switzerland's achievement in terms of innovation is considerable. It spends 3% of its GNP on research. A total of 75% of research spending is corporate spending with the direct aim of economic innovation, an important factor in the country's strong overall competitiveness. With a share of about 25%, public research funding plays a lesser role, and depends on five main actors: the cantonal universities, the two federal institutes of technology, the National Science Foundation, the Federal Commission for Technology and Innovation, and the academies of sciences. These actors are independent of each other, but cooperate on the basis of complementarity and (although limited) competition. The various institutions are highly autonomous, and research policies and processes are driven by bottom-up operations. Thus, Swiss research policy is not centralized, but rather relies on a concept of decentralized innovation with periodic intervention by the federal government.

The output of the research system is impressive. The Federal Institute of Technology Zurich (Eidgenössische Technische Hochschule Zürich) is one of the top-ranked universities in the world and the universities of Basel, Bern, Geneva, and Zurich regularly appearo on the list of the 200 best universities worldwide.

Some deficits persist, however, such as the coordination of universities and the new universities of applied sciences or the weakness in social science and humanities research relative to that conducted in the natural sciences or technological field.

Denmark

Score 8

Denmark used to score quite well in international comparisons on competitiveness. Denmark ranked third in the World Economic Forum's Competitiveness Index in 2008, but fell several places in subsequent reports. In the 2014-2015 report, Denmark was ranked 13th, which was an improvement of two places compared with the 2013-

2014 assessment. The main factor behind the falling competitiveness was the serious deterioration of wage competitiveness and falling productivity. At the moment, however, wage competitiveness is improving in comparison with neighboring countries due to moderate growth in unit labor costs.

The 2014-2015 report mentions the following factors as explanations of recent improvements: institutions and financial markets as well as macroeconomic conditions. Denmark continues to score reasonably well on its higher education and training system (10th) and labor market flexibility (12th).

In the latest 2015-2016 Global Competitiveness Index, Denmark has moved up to 12th place. Measured in terms of productivity growth, Denmark is about the OECD average.

Public R&D spending relative to GDP puts Denmark in seventh position among OECD countries. If we look at the total number of researchers in relation to population Denmark is number three among the OECD countries (after Israel and Finland). Finally, if we look at patent applications Denmark comes in at a seventh place (after Sweden, Switzerland, Finland, Japan, Israel and Germany). These factors suggest that Denmark may improve its competitiveness in the future if it can deal with the current problems, including relatively high labor unit costs.

The target for R&D investments is 3% of GDP. This figure was actually reached in 2009, with 1.02% public and 2.1% private research investments. Since Danish businesses are less innovative than foreign competitors, the Social Democratic-led government took various initiatives, including the creation of a Business Innovation Fund as well as a Globalization Fund.

The new Liberal government (since June 2015) has set a target of 1% of GDP for publicly funded research.

Citation:
World Economic Forum, The Global Competitiveness Report 2014-2015, http://www.weforum.org/issues/global-competitiveness (accessed 17 October 2014)
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Produktivitetskommissionen: www.produktivitetskommissionen.dk

Finland

Score 8

Finland has for some time been a forerunner in research and development (R&D) spending as well as in its number of researchers and patent applications. Its lead in computer technology and Internet access has been somewhat less. Finland had the

EU's highest R&D intensity in 2013, followed by Sweden and Denmark; indeed, in Finland, R&D expenditure totaled 3.3% of GDP. However, this position has declined in recent years, and the innovation system's low level of internationalization is a particular weaknesses. Moreover, the focus of R&D has been on applied research, with basic research at universities and other institutes benefiting little. This aspect has become more accentuated in recent years, and at the time of writing, the Sipilä government had announced dramatic new cuts in government spending for education and higher learning. In the long run, given the dependence of applied research on basic-research developments, the heavy bias in favor of applied research will have negative consequences for product development and productivity. More broadly, the system of technology transfer from universities to the private sector is also comparatively weak, and academic entrepreneurship is not well developed.

Citation:
"Research and Innovation Policy Guidelines for 2010-2015". The Research and Innovation Council of Finland, 2010. http://www.minedu.fi/export/sites/default/OPM/Tiede/tutkimus-_ja_innovaationeuvosto/julkaisut/liitteet/Review2011-2015.pdf
Also: http://www.research.fi/en/key-statistics

Netherlands

Score 8

The Netherlands retained its eighth-place showing in the World Economic Forum's 2015 Global Competitiveness Report, an achievement accounted for by improvements in the country's innovation-climate, education and health systems, reductions in the regulatory burdens imposed on foreign business, and a growth in patents. On the specific issue of sustainable competitiveness, the Netherlands was given sixth place. The European Union's Innovation Union Scoreboard 2015 ranked the Netherlands as the best (overtaking Luxemburg) "innovation follower" among a group of EU countries (i.e., Belgium, UK, Austria and France). The Netherlands scores above average in terms of open, excellent and attractive research systems, as well as in scientific-publication output, finances and support, and intellectual aspects such as number of patents. It is unclear whether his national R&D performance is due to government policies (coordinated by the Ministry of Economic Affairs). The country's policymakers aim to secure the Netherlands a place as one of the top five global knowledge economies, and to increase public and non-public R&D investments to 2.5% of GDP (€650 billion). However, the most recent figures, compiled by the Rathenau Institute, forecast a decrease in total government R&D expenditures to €5.5 billion, a decline of 7.7%, by 2019. Part of the budget for R&D in the Netherlands is shifting to the EU level, especially through the Horizon 2020 program.

Dutch policies used to focus on the reduction of coordination costs in creating public/private partnerships. In addition, there were substantial amounts of money in innovation credits for start-up companies and R&D-intensive SMEs – four to five times as much as for larger companies. SMEs struggle with obtaining access to bank

credits and navigating their way through a maze of regulatory details in obtaining state funds for innovation. Since 2011, national R&D has focused on nine economic sectors identified as a top priority. A special innovation fund for SMEs remains in place.

Citation:
Rathenau Instituut, Totale investeringen in Wetenschap en Innovatie, www.RATHENAU, 2015

European Commission, Innovation Union Scoreboard 2015 (ec.europa.eu/enterprise/policies/innovation/files/ius-2015_en.pdf)

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D. Lanser en H. van der Wiel (2011), Innovatiebeleid in Nederland: de (on)mogelijkheden van effectmeting, CPB Achtergronddocument (www.cpb.nl/sites/default/files/publicaties/download/cpb-achtergronddocumenten)

South Korea

Score 8

The South Korean government invests heavily in research and design (R&D), particularly in fields which can be directly commercialized. Public spending on research has substantially increased in recent years, totaling almost 1% of GDP in 2013 – the second-highest such level in the OECD. The green-growth policy is a good example of the government's willingness to support domestic industry's R&D of new products or production techniques. A further example is Park Geun-hye's Creative Economy initiative. The newly formed Ministry of Science, ICT and Future Planning will spend a total of KRW 8.5 trillion (.1 billion) over the next five years to promote R&D in the information- and communications-technology (ICT) sector, a key target sector for the creative economy.

The ever-increasing dominance of large business conglomerates ("chaebol") impedes the rise of SMEs and start-ups, which are often the source of new innovations (as opposed to incremental ones). Other weaknesses include a lack of high-quality basic research, which is difficult to commercialize in the short run but might facilitate scientific breakthroughs in the long run. In response, the government started funding a new Institute of Basic Science in 2012. South Korea has experienced a steady increase in the number of published scientific articles and patents, although the catching-up process remains slow.

In recent years, there has been an increasing focus on (applied) natural sciences, while social sciences that are crucial for innovations in governance and business systems have received less attention. Despite the very substantial government expenditure on R&D, Korea has a long way to go with regard to nurturing a sustainable, voluntary and innovative technology and business ecosystem.

Citation:
OECD, OECD Review of Innovation Policies Korea 2009
Institute of Basic Science, http://www.ibs.re.kr

United Kingdom

Score 8

The United Kingdom's tradition of being an active player in research and innovation dates back to the Industrial Revolution. The country's clusters of pre-eminent universities have for a long time played an important role in linking cutting-edge academic research with industries such as biotechnology or information and communications technology (ICT). Performance has been weaker in terms of overall R&D spending, which continues to fall well short of EU targets, as well as in the conversion of innovation into sustainable, large-scale production, which holds the potential for long-term profitability. However, it is important to emphasize that the UK economy does not have the industrial base to support a large-scale R&D effort, so it is necessary to look at other indicators, such as ICT spending (which matters more for service industries), to better understand trends in innovation in the UK.

Over the decades, attempts have been made by successive governments to improve this situation, for example, by targeting weaknesses in technical education on various levels. Recent government initiatives have focused on extending tax credits for R&D, setting up regional Technology and Innovation Centres (TICs), investing in digital infrastructure and new university research facilities, as well as establishing Innovate UK to promote economic growth through science and technology. There is also a current debate about the degree to which the United Kingdom should seek to attract highly skilled immigrants, which has been muddied by a broader attempt to curb immigration that is having some effect on the willingness of foreign students to come to the United Kingdom.

While the optimism expressed in the Innovation and Research Strategy, launched in 2011, and the sums involved are considerable, a long-term perspective and indifferent results from previous initiatives necessitate caution.

United States

Score 8

The United States has traditionally invested heavily in research and development, but the recession and the country's problematic budget politics have compromised this support. U.S. innovative capacity is a product of funding from a mix of private and public institutions. Certain public institutions stand out, particularly the National Science Foundation, the several federal laboratories, the National Institute of Health, and research institutions attached to federal agencies. In addition, there is a vast array of federally supported military research, which often has spillover benefits. In recent years, total U.S. R&D stood at roughly $400 billion, or 2.75% of GDP, of which about one-third (.3 billion) was direct federal R&D funding. President Obama set a goal of raising total R&D spending to 3% of GDP. But these ambitious plans have

fallen by the wayside. The recent demands for spending cuts and the across-the-board sequester cuts have resulted in stagnating federal R&D spending, including in the area of basic science. U.S. government R&D spending has declined as a share of GDP and in comparison both to spending by other countries and by the private sector. Critics have particularly noted the modesty of government funding for energy research, which is critical to the goal of reducing carbon emissions. As of November 2015, Congress had made significant progress in efforts to pass an Innovation Act designed to prevent "patent trolls" from extracting economically unwarranted payments from innovative companies.

Canada

Score 7

Overall, Canada's economic conditions and general policy environment are conducive to innovation and investments in productivity growth. The country benefits from stable macroeconomic policies, well-developed regulations that ensure competition, largely open trade in goods and capital, and an educated population.

At the same time, a 2015 report from the federal government's Science, Technology and Innovation (STI) Council found that the country continues to tread water as a mid-level performer in STI. Generous fiscal-incentive programs for business expenditures on R&D (BERD) are available in Canada both at the national and provincial level, but the country's BERD has been falling steadily and is well below the OECD median. Low research intensity and poor productivity performance are believed to represent a failure on the part of the business sector rather than inadequate public policy. Nevertheless, there are a number of contentious issues in innovation policy, including the effectiveness of the federal government's Scientific Research & Experimental Development (SR&ED) tax program in increasing business-sector R&D (the program has never been formally evaluated) and the impact of cuts to the budgets of government R&D labs. Critique has likewise been levied on the inadequacy of government programs to facilitate technology transfers, and persuade small and medium-sized businesses to adopt best practices. Finally, increased rates of higher education participation have failed to yield increased business sector R&D and productivity.

Public policy in Canada appears to have encouraged a strong research capacity in the academic sector. In September 2012, the Council of Canadian Academies released an assessment of science and technology in Canada, based on a survey of over 5,000 leading international scientists, that found the country's scientific research enterprise to be ranked fourth-highest in the world, after that of the United States, the United Kingdom and Germany.

Citation:
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Council of Canadian Academies (2012) Expert Panel Report on the State of Science and Technology in Canada, September, http://www.scienceadvice.ca/uploads /eng/assessments%20and%20publications%20and%20news%20releases/sandt_ii /stateofst2012_fullreporten.pdf

Estonia

Score 7

Research, development and innovation (RDI) have been national-development priorities, reflected in a relatively sophisticated set of policy instruments and in steady increases in RDI expenditure, which has reached the EU average level. However, recent evaluations (e.g., the Okk Report, requested of the Research and Development Council by the national government) also point to some weaknesses. The growth in public RDI expenditure has been almost wholly based on EU structural funds, while the volume of domestic revenues applied for this purpose has remained comparatively static. The majority of RDI resources are invested in producing research infrastructure without clear accompanying strategic plans for how to sustain the efficient use of buildings and equipment, or how to assess the potential impact of R&D projects on the country's socioeconomic development.

Policy measures have been much more successful in developing scientific research, as indicated by an increased number of highly ranked international publications. Advances in the development of patents, high-tech products and services are noticeable but less prominent. One problem is that RDI measures have been focused on the top end of the economy, and the innovation system is consequently quite detached from the broad remainder of the country's economy. As a result, RDI output has not made a significant contribution to structural reforms of the economy. The second major problem is that RDI is treated as an objective in itself, and therefore remains only vaguely linked to the country's economic and social goals. R&D contracts with enterprises compose only 4% of the annual volume of universities' RDI budgets.

Citation:
Okk, G. (2015)Eesti ülikoolide, teadusasutuste ja rakenduskõrgkoolide võrgu ja tegevussuundade raport. https://riigikantselei.ee/sites/default/files/riigikantselei/strateegiaburoo/eutarkvt_loppraport.pdf (accessed 30.10.2015)

France

Score 7

Having improved since 2007, France performs well in research and development policy. According to the EU Innovation Scoreboard 2015, France is ranked tenth (among 28 EU countries) with respect to innovation capacity; in the report's global innovation index, France performs slightly above the EU average but is ranked in the group of "innovation followers," behind the group of "innovation leaders." Overall

spending on research and development represents 2.23% of GDP, below the OECD average and far from the EU target of 3%. Whereas public spending is comparable to the best-performing countries, private spending is low but growing thanks to the fiscal incentives put in place by the Sarkozy government and maintained by the Hollande administration. France's main relative weaknesses are its low private investment, a less than innovative corporate environment, especially with small- and medium-sized businesses, and weak cooperation between the private and public sectors.

The government has recently taken several measures to facilitate and promote innovation. Fiscal rebates for companies and citizens have been introduced; a public bank (Banque Publique d'Investissement) has been created to finance innovative small and medium firms; major projects have been financed; private funds have been mobilized through the creation of foundations; a €30 billion public loan was offered to support "innovative" ventures; the creation of start-up companies has been facilitated through various legal and tax incentives and capital risk channeled toward these innovative sectors; regional clusters have been supported by local and state authorities and cooperation between universities and companies has been encouraged. Infrastructure investment has also been made.

However, there are still no tangible results from all these efforts. Some barriers to innovation still exist. Cooperation between academic institutions and businesses is still restricted by cultural traditions, such as a lack of investment by small- and medium-sized companies and the reluctance of researchers to invest in policy-relevant or applied research. Productivity and the status of public research in international rankings could also be improved. Other issues include the growth of start-up companies that are unable to raise proper funds and are then forced to sell assets to bigger companies.

In general, the mediocre profitability of French companies is an obstacle toward more research and development spending. Existing fiscal and regulatory rules with "threshold effects" (sharply rising charges when the number of employees reaches the threshold) create barriers to the growth of small firms. Uncertainty over legal and fiscal rules is also a major problem, as shown by the company revolt in the wake of the proposal of the Socialist-led government under President Hollande to raise taxes on profits resulting from the sale of young companies.

A more positive note results from the dynamism of new start-ups supported not only by public research money but also by large private companies, which encourage and fund incubators. The key issue remains the capacity of these young companies to develop and grow in an environment which is insufficiently friendly and supportive.

Ireland

Score 7

While government policy is supportive of research and innovation by indigenous firms, the most striking success of Irish industrial policy has been in attracting foreign-owned firms in high-tech sectors to Ireland. This trend continued during the economic crisis. Indeed, the inflow of foreign direct investment in the IT and pharmaceutical sectors contributed significantly to the economy's strong recovery. The location of these firms in Ireland has created opportunities for innovative small Irish firms to develop technological inputs to supply them.

Ireland's overall information and communication technology (ICT) readiness continues to lag behind most other northern and western European countries as well as Israel. Nonetheless, the World Economic Forum's Competitiveness Report for 2014 ranked Ireland 12th worldwide in terms of "technological readiness," a rise from 17th place in 2012. This rank was maintained in the latest (2015) report.

The so-called double Irish tax facility, which provided significant tax incentives for multinational companies to attribute intellectual property income (wherever its origin) to their Irish subsidiaries, was abolished in the 2015 budget in order to avert EU penalties over illegal state aid to industry. In the 2016 budget, the minister for finance announced some details of a new "knowledge box" scheme that will partially replace this facility. This will provide a 6.25% corporate tax rate on profits arising from "certain patents and copyrighted software which are the result of qualifying R&D carried out in Ireland." It is clear that the Irish government intends to remain in the forefront in the competition to attract R&D-intensive investment.

Japan

Score 7

In the second half of the 20th century, Japan developed into one of the world's leading nations in terms of research and development (R&D). Even during the past two so-called "lost decades," science, technology and innovation (STI) received considerable attention and government funding. Current policies are based on the Fourth Science and Technology Basic Plan (2011 – 2016). The emphasis has shifted away from a supply-side orientation fostering specific technologies such as nanomaterials to a demand-pull approach cognizant of current economic and social challenges. In 2015, plans were underway for the Fifth Basic Plan. According to an interim report released in January 2015, concrete proposals in this package would include a reform of the career system for young researchers, an increase in (international) mobility, measures supporting the development of a cyber society, and – as has been usual – the promotion of critical technologies, including those considered indispensable for Japan's independence and autonomy.

In institutional terms, basic research and innovation policy has been overseen by the Council for Science and Technology Policy (CSTP) since 2001. This body is

currently headed by the prime minister, signaling the high status accorded to STI issues. In previous years, the council lacked concrete powers and clout. The LDP-led government has changed that, with the CSTP installed as a think tank above the ministries, and provided with budgetary power and increased personnel. Program directors are appointed to oversee various measures. While the recent, somewhat bewildering, variety of measures introduced has made this move plausible, it remains to be seen whether the addition of a new bureaucratic layer above the ministries will ultimately increase efficiency.

Strengthening the institutional structure remains a priority. The former Japan Aerospace Exploration Agency (JAXA) has been renamed as the National Research and Development Agency Japan, and is slated to take on broader responsibilities according to the draft Fifth Basic Plan.

Citation:
MEXT, Japan's STI Policies looking beyond Mid-long Term –Toward the 5th Science and Technology Basic Plan –, Tentative translation, January 2015

Lithuania

Score 7

Lithuania's economy is characterized by a low level of innovation. As assessed by the EU Innovation Scorecard, the country performs below the EU average, falling into the country group called "moderate innovators." Lithuania was ranked 38th out of 141 countries assessed in the 2015 Global Innovation Index. The country has set an ambitious target of spending 1.9% of GDP on R&D by the 2020; however, this level has hovered around 0.8 – 0.9% of GDP in recent years (reaching 1.0% in 2013). Moreover, the share of this sum spent by the business sector was very low, totaling just 0.24% of GDP in 2013. Within the country's innovation system, research is oriented only weakly to the market, research products are not supported with sufficient marketing or commercialization efforts, investment is fragmented, funding levels are not competitive with other European states, and enterprises do not participate in international markets to any significant degree, although there are some exceptions demonstrating good practices in the biotechnology and laser industries.

Lithuanian authorities have used EU structural funds to improve the country's R&D infrastructure. So-called science valleys have been developed, integrating higher-education institutions, research centers and businesses areas that work within specific scientific or technological areas. This was a high priority for European Regional Development Fund support in the 2007 – 2013 period whose investments contributed to increasing Lithuania's R&D intensity. However, using this new research infrastructure efficiently remains a major challenge, and cooperation between industry and research organizations remains rather weak. The government has also supported the sector through financial incentives (in particular, an R&D tax credit for enterprises) and regulatory measures. Demand-side measures encouraging innovation are less developed. Excessively bureaucratic procedures are cited by the

science and business communities as among the main obstacles to research and innovation in Lithuania. The government recently developed a new smart-specialization strategy intended to focus resources on science and technology areas in which Lithuania can be internationally competitive, although it has been criticized for investing too heavily in the construction of new buildings and renovation of low-ranking universities' campuses.

Citation:
The EU Innovation Scoreboard is available at http://ec.europa.eu/enterprise/policies/innovation/facts-figures-analysis/innovation-scoreboard/
COMMISSION STAFF WORKING DOCUMENT, country report Lithuania 2015: http://ec.europa.eu/europe2020/pdf/csr2015/cr2015_lithuania_en.pdf.
See Global Innovation Index 2015 at file:///C:/Users/Vitalis/Downloads/gii-full-report-2015-v6.pdf.

Luxembourg

Score 7

In its Europe 2020 Strategy, the Luxembourgish government set a goal of raising public expenditure on research and innovation to between 2.3% and 2.6% of GDP, with 0.7 to 0.8 percentage points of this earmarked for public use (starting from 0.62% in 2013) and 1.5 to 1.9 percentage points earmarked for private research. The overall European goal is 3% of GDP. In 2014, the Société Nationale de Crédit et d'Investissement (SNCI) set up a new research fund. Small and medium-sized companies (SME) are provided with financial incentives designed to support R&D business projects in Luxembourg. To encourage SME investments in research and innovation, the fund provides grants of €150 million over five years. Furthermore, the Chair on Social Business and Social Management of the University of Luxembourg will promote social enterprises and help stimulate start-ups, seeking to enhance economic sustainability and build links to public research and innovation projects. Broadband infrastructure has been expanded to reach 93% of households in 2014.

With 59.6% of the workforce deemed high-skilled, Luxembourg has the highest such share in the WEF's 2015 rankings. More than 40% of the working-age population holds tertiary education degrees and/or is employed in the science and technology sector. This potential should help to create synergies between public research and industry. Luxembourg is ranked 9th among143 countries in the Global Innovation Index.

Improvements in research policy over the past 20 years have included the launch of a national funding program (Fonds National de la Recherche) in 1999, the foundation of the University of Luxembourg in 2003 and the creation of a general public scholarship scheme that replaced the child-benefits program in 2010. Luxembourg's university has steadily expanded, with a move into the new Campus City of Science in Esch-Belval promising an enhanced research focus.

The new Belval campus, designed for 7,000 students, 3,000 researchers and 6,000 inhabitants, is one of the largest urban-conversion projects in Europe. In 2015, more than 830 employees and 2,000 students moved to the new location. At the House of Innovation alone more than 500 scientists, researchers and international specialists

from CRP-Henri Tudor, Luxinnovation and the Dr. Widong Center carry out applied research. Furthermore two interdisciplinary hubs (in the areas of biomedicine and IT security) work on fundamental research and strategic business partnerships.

The University of Luxembourg was ranked 193rd in a recent global university ranking (World University Rankings 2015 – 2016), and 98th among Europe's top 100.

Prime Minister Xavier Bettel introduced the "Digital Lëtzebuerg" initiative in October 2014, with the aim of strengthening ICT capacities over the long term, both for citizens and in the economy as a whole. Public spending on research and development must increase strongly to sustainable achieve these goals. In addition, public research funding must be evaluated more carefully on the basis of impact and efficiency. According to a recent OECD follow-up innovation report, the research and innovation landscape in Luxembourg has shown promising development, with the National Research Institutes already acting as important research support instruments. The report recommends better impact control and further investments in Belval campus. R&D and cluster policies must be further evaluated on the basis of economic impact and effectiveness.

In May 2013, the former government commissioned a team of researchers to clarify the role of the Luxembourgish public administration during the Second World War. In a study published in February 2015, the historians came to the conclusion that the occupation government was partly responsible for the deportation of Jewish citizens. After the release of the report, the government publicly apologized as a symbolic act to the Jewish community.

Citation:
http://www.cedies.public.lu/fr/publications/guides-pratiques/faq-uni-lu/luxembourg/guidance-booklet-for-faq-and-concerns.pdf
http://www.gouvernement.lu/4103901/20-digital-letzebuerg
http://www.gouvernement.lu/5380237/27-wef
http://www.heritage.org/index/country/luxembourg
http://www.innovation.public.lu/fr/brochures-rapports/o/ocde-luxembourg-innovation-2015/ocde-luxembourg-innovation-2015.pdf
http://chd.lu/wps/portal/public/RoleEtendu?action=doDocpaDetails&backto=/wps/portal/public&id=6283#
https://www.timeshighereducation.com/world-university-rankings/2016/world-ranking#!/page/0/length/25http://
http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/lu/
http://www.uel.lu/images/stories/Documents_public/Annuaire_de_la_competitivite_2015_-_UEL.PDF
http://www.odc.public.lu/publications/pnr/2015_PNR_Luxembourg_2020_avril_2015.pdf
http://www.odc.public.lu/indicateurs/tableau_de_bord/index.html
http://www.snci.lu/files/62261.pdf
http://www3.weforum.org/docs/gcr/2015-2016/Global_Competitiveness_Report_2015-2016.pdf
http://www.innovation.public.lu/fr/brochures-rapports/o/ocde-luxembourg-innovation-2015/ocde-luxembourg-innovation-2015.pdf
http://www.wort.lu/de/politik/streitgespraech-die-debatte-um-den-artuso-bericht-566e9cd90da165c55dc4f8a4

New Zealand

Score 7

New Zealand policy regarding research and development strategies and expenditure (R&D), high-technology employment and patent indicators is deficient, a situation criticized by the OECD. The OECD strongly recommends a coherent policy that

makes more use of incentives for enterprises to invest in research and development and that steers and funds public infrastructure with regard to basic and applied research institutions. The problem does not seem to result from cumbersome bureaucratic procedures, but mainly has to do with New Zealand's size and the geographical isolation, as well as the lack of large companies operating at an international level. In response, the National-led government introduced a new business R&D support scheme including targeted grants and vouchers, and it restructured key innovation agencies into a single Ministry of Science and Innovation. In 2012, the ministry was absorbed by the Ministry of Business, Innovation and Employment. Major initiatives in research and innovation policy include the development of sector investment plans outlining priorities for the contestable science investment round (a program which provides financial resources for science and innovation research projects); input into the recovery and rebuilding of Christchurch following the 2010 earthquakes; the Green Growth Agenda; and the establishment of a new institute in February 2013 called Callaghan Innovation, to help commercialize innovation in the high-tech manufacturing and services sectors. While the government has increased spending on tertiary training in the fields of engineering and science, domestic expenditures on research and development as a percentage of GDP (0.59% in 2011/2012) places New Zealand well down the list of OECD countries, including its closest economic partner, Australia. In September 2014, before the general election, the National government promised, if elected, to invest $20 million a year more in business R&D co-funding through Callaghan Innovation, in order to achieve a total increase of R&D spending of 1% of GDP by 2018. In addition, funds have been provided for the establishment of privately led regional research institutes, agricultural and biological research partnerships, and natural-hazards projects. Despite these initiatives, government spending on research and development falls far short of that found in many other Western economies.

Citation:
Annual Report 2011-2012 (Wellington: Ministry of Science and Innovation 2012).
Annual Report 2014-2015 (Wellington: Ministry of Business, Innovation & Employment 2015).
Callaghan Innovation: http://www.callaghaninnovation.govt.nz/ (accessed November 30, 2015).
"m a year more for business R&D," National, 15 September 2014. https://www.national.org.nz/news/news/media-releases/detail/2014/09/14/m-a-year-more-for-business-r-d

Belgium

Score 6

R&D policy is shared between the central government, which can offer tax incentives, and the subnational (regional and community) governments, which are responsible for managing European subsidies and supporting university R&D and related projects. This increases subnational accountability but hurts coordination and limits economies of scale. According to the KPMG consultancy, Belgium has "increased its attractiveness as a prime location for companies involved in research and development activities and in the exploitation of patents." The country's location, transportation facilities and infrastructure offer much for potential investors, KPMG says.

According to the Europe Commission too, Belgium is improving its R&D performance. It spent 2.28% of its GDP on R&D in 2013, and currently uses all available tax incentives to promote R&D. In spite of this, the share of basic research in business enterprise R&D (BERD) has dropped from 9.5% in 2005 to 7.0% in 2007.

Despite these improved fiscal incentives, Belgium remains technologically considerably behind other European countries of a similar size such as Denmark and the Netherlands. While some indicators such as patent registration and monetary returns may be improving, the technological content of the country's exports is progressively eroding. Universities are chronically underfunded, despite the assistance provided by the regions to help them monetize their discoveries in the form of spin-offs and improved links with businesses. This should not overshadow important exceptions; a highly skilled work force is present, and fiscal incentives have attracted some research-intensive firms in the chemical, pharmaceutical, and more recently computer-science sectors (such as Google, in the latter category).

Citation:
EC 2015: http://ec.europa.eu/economy_finance/publications/eeip/pdf/ip008_en.pdf

Europe 2020 indicators: http://ec.europa.eu/eurostat/statistics-explained/index.php/Europe_2020_indicators_-_research_and_development

Biatour and Kegels 2015: http://www.plan.be/admin/uploaded/201510021314080.WP_1506_11090.pdf

Iceland

Score 6

Combined public and private research and development (R&D) expenditure in Iceland totaled 3% of GDP in 2006, one of the highest levels in the OECD group. About 40% of this expenditure was provided by the government. This high level of R&D investment reflects the ongoing transformation from an economic focus on agriculture and fisheries toward manufacturing and services. In particular, this has included the creation of new private firms in biotechnology, pharmaceuticals, and high-tech manufacturing.

The government fosters research and innovation in the fields of geothermal energy, hydropower, and genetics and information technology. Public R&D expenditure, which peaked in 2008 and 2009, was cut by about 10% in 2011 and remained at 2011 levels through 2012. Between 2012 and 2013, public R&D expenditure increased by almost 7% from 2012 to 2013 and by 5% from 2013 to 2014. In 2012, total R&D expenditure had fallen to 2.6% of GDP, compared with 3% in 2006 when it was at its peak.

Citation:
Research, Development and Innovation in Iceland - 2014 edition. RANNIS - The Icelandic Center for Research
https://www.rannis.is/media/utgafur-og-skyrslur/Research,-Development-and-Innovation—2014-edition-(2).pdf

Poland

Score 6

The Polish system for research and development (R&D) has been significantly restructured since 2010. Science and higher-education reforms in 2010 and 2011 have spurred significant changes, including a move toward more competitive funding, the creation of two R&D agencies respectively for applied and basic research, and efforts to tackle fragmentation by focusing funding on the best-performing institutions. In July 2012, the first six national leading scientific centers (KNOW) were selected. These efforts have gradually shown their results. However, Poland continues to score poorly in the EU's Innovation Union Scoreboard rankings, and there is still some way to go if Poland is to meet its overall R&D spending target of 1.7% of GDP by 2020. In order to help achieve this goal, Poland once again applied for a loan of €940 million from the European Investment Bank to sponsor Polish activities in R&I as of 2015.

Citation:
Gorzelak G. (ed.), (2015), 'Growth-Innovation-Competitiveness: Fostering Cohesion in Central and Eastern Europe', GRINCOH Project Final Report, Contr. Nr. 290657

Austria

Score 5

Public research in Austria is mainly university centered. However, this is a challenging environment, as universities are overburdened by huge numbers of students, while researchers in some disciplines are overwhelmed by teaching obligations. The Austrian Academy of Sciences is in a critical situation, plagued by insufficient funding. The Austrian Science Fund (Fonds zur Förderung der wissenschaftlichen Forschung) is tasked with coordinating academic research, but has shown only partial success in this task. Research funded by private corporations has little tradition in Austria, and at least in the near future, offers little hope of improving this situation. The deficiencies in public-funded research cannot be counterbalanced by privately funded operations. The whole sector is in acute need of more funding, but the budgetary situation and the growing shift of public funds from the young toward older generations, a trend driven by demographic change, make the outlook quite dire.

This does not prevent excellent research from being conducted in some fields. Important and significant innovations in disciplines such as biological science and medical research are still possible in Austria.

More broadly, links between industry and science are sound, and a high share of public research is funded by industry. In contrast to basic research, industry-sponsored research is mostly aimed at the applied sciences and does not necessarily affect universities. Integration within international networks is strong, and a high share of the labor force is occupied in science and technology-related occupations.

Business R&D is particularly strong in niche markets, often performed by specialized small and medium-sized enterprises (SMEs). Other pillars of Austrian business research include large companies, affiliates of foreign corporations, and the medium- to low-tech manufacturing sector. Although Austria does not feature any of the world's top 500 corporate R&D investors, there are – according to OECD data – some dynamic startups on the Austrian market. These startups, however, are not a direct result of Austrian research policy.

Chile

Score 5

R&D expenditure as a share of GDP is very low in Chile compared to other OECD countries, and most of this expenditure is undertaken by the government rather than the private sector. But Chile has shown that it is aware of shortcomings regarding the necessities of technological innovations, especially for its future economic and thus social development. Significant reforms have been put in place to raise R&D funding, including earmarked taxation (a royalty tax on mining), higher government expenditure, and the improvement of tax incentives for private R&D. Although results have to date been disappointing – in large part because of bureaucratic hurdles to the approval of private and public projects – Chilean institutions show good results at least in the area of basic research. But the steps necessary to transform this good basic research into applied research are almost never taken. Universities are often not prepared to support research that operates at the interface between basic research and industrial development. This is reflected in the comparatively low number of patents registered per year on a per capita basis, whereas the number of scientific publications is relatively high. In general, access to the limited public funds available for research tends to be quite difficult due to high bureaucratic barriers. Despite these facts, a slight improvement regarding innovation policy and scientific cooperation can be observed. According to the latest version of the Global Innovation Index (2015), Chile was ranked at 42nd place out of 141 countries, up from 88th place in 2013.

Citation:
http://www.expansiva.cl/media/en_foco/documentos/17032010150429.pdf
http://www.scidev.net/america-latina/innovacion/noticias/tres-paises-lideran-innovacion-en-latinoamerica.html
https://www.globalinnovationindex.org/

Czech Republic

Score 5

Overall, R&D expenditures are growing and approaching the EU average in terms of spending as a share of GDP. European structural funds are the main driver of this growth. The majority of the public R&D funding is allocated to public universities and research institutions and focuses mostly on natural, technical and medical sciences. There is also indirect support for R&D in private sector in form of tax credits. The newest available data (2013) show that the volume of tax credits

amounted to CZK 2.3 billion (€85 million), and most of these are used by large corporations (70%). The government support for start-up companies remains weak. The main means of transferring scientific discoveries into products and enhanced productivity is inward investment by multinational companies, bringing innovations to the Czech Republic that were developed elsewhere, or in-house innovation focusing on product improvement.

Citation:
Analýza stavu výzkumu, vývoje a inovací v České republice a jejich srovnání se zahraničím v roce 2014 [Analysis of the state of Reserach, Development and Innovation in the Czech Republic and their international comparison in 2014]. Published on 31.9.2015 by the Office of the Government of The Czech Republic, ISBN: 978-80-7440-140-4 Available online http://vyzkum.cz/FrontClanek.aspx?idsekce=759405 (last visited 6.11.2015).

Malta

Score 5

Business research and innovation (R&D) have gained in importance in recent years. Nonetheless, the business R&D sector in Malta requires substantial development. For instance, the National Strategic Plan for Research and Innovation 2011 – 2020 highlights the importance of placing R&D activities at the center of economic policymaking.

It also highlights the challenges that hinder growth in this area, mainly the relatively low percentage of science and technology graduates. Moreover, the National Research and Innovation Strategy 2020, published in 2014, and the 2013 Innovation Union Scoreboard stress the lack of domestic R&D intensive companies. Reasons cited were the orientation of small and medium-sized businesses toward local markets with only 7% of small businesses offering differentiated products. The Chamber of Enterprise, Commerce and Industry also highlighted the need to address the fragmentation of the R&D sector.

Although the 2014 Innovation Union Scoreboard described Malta as a moderate innovator and ranked Malta below the EU average, Malta climbed four places overall in its 2015 scoreboard with improvements across most innovation indicators.

Furthermore, efforts are being made to improve the R&D through various programs. In 2013, the government budget allocated €32 million to R&D and innovation activities, and is developing a life sciences center, a national interactive science center and an ICT innovation accelerator with the aim of creating the pre-conditions for growth in this area.

Citation:
National Strategic Plan for Research and Innovation 2011-2020 (Draft for Public Consultation - 2011) p.9, p.12, p.13
Innovation Union Scoreboard 2013 p.44
Research and Development in Malta NSO August 2012
Private Sector Interaction in the Decision Making Processes of Public Research Policies Country Profile: Malta European Commission ec.europa.eu/invest-in-research/pdf /…en/psi_countryprofile_malta.pdf
Times of Malta, MCA award for start-ups, 26/10/2014.
Times of Malta, First Tenants confirmed for Life Sciences Park, 23/10/2014.
Innovation Union Scoreboard 2014
National Research and Innovation Strategy 2020 p. 7
Innovation Union Scoreboard 2015 p. 62
National Reform Programme 2015 p. 15
RDTI Committee The Malta chamber of commerce enterprise and industry 2014

Norway

Score 5

Despite its high GDP per capita, Norway spends comparatively little on research and development (R&D), even compared to its Nordic neighbors. However, this spending has increased slightly in recent years. Research policy is nonpluralistic, government-led, and is not strongly oriented toward enterprise or innovation. The country's strength lies in applied economic and social research rather than in basic and hard science research. Research funds are mainly public, distributed through a single research council, and are politically directed from above. Recent reforms have not been very successful, and the government is frequently criticized for insufficient investment in research. The country's private sector also engages in comparatively little research funding. This low aggregate investment level is reflected in the relatively low number of patents that are granted. It is also interesting to note that the share of degrees granted in science and technology is low, and that Norwegian children have fared especially poorly in scientific knowledge, at least in relative terms, in the OECD's Program for International Student Assessment (PISA) study. However, the international rankings of some of the country's most important universities have improved in recent years. The country would certainly benefit from a higher absolute level of investment in R&D. However, the research council's centralized allocation of funds and state subsidies, with only limited participation by private donors, has also been criticized as a model. The council's selection of priorities has often been narrow. There is thus ample scope for increasing investment in academic and basic research, as well for promoting more involvement by private- and public-sector actors.

Portugal

Score 5

Research and innovation policy partly supports innovations that foster the creation of new products and enhances productivity. There is a policy to support research and innovation – backed by the European Union and the Portuguese government – that functions in universities and in businesses, and in some research centers which are linked to businesses and (in most cases public) universities.

The European Union's 2015 Innovation Union Scoreboard classifies Portugal as a "moderate innovator," the second-lowest category (out of four). However, it also notes that Portugal's research and innovation performance has improved in the 2007 – 2014 period, including its relative performance in comparison to the EU average.

However, this average over the last seven years masks a recent decline in R&D investment. The bailout period's austerity measures impacted adversely on public funding, the main source of investment in R&D, while the economic recession has

also curtailed private investment in R&D. While Portugal's Innovation Index score for 2014 rose somewhat when compared to the previous year (0.403 in 2014; 0.400 in 2013), it still remains considerably below the pre-bailout level (0.426 in 2010). Overall, Portugal has diverged from the EU average since 2011, although in 2014 it saw the distance to the EU average fall marginally for the first time since 2010.

The government has sought to increase R&I outputs by adopting the Strategic Program for Entrepreneurship and Innovation (+e+i), which was approved in December 2011. However, the results of this program have yet to translate fully into new products and greater productivity, even if the program's existence demonstrates an awareness of the need to harness R&I for this purpose.

Citation:
http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/files/ius-2015_en.pdf

Turkey

Score 5

The government continued to strengthen the country's research and innovation capacity during the review period. The Scientific and Technological Research Council of Turkey (TUBITAK) is the leading agency for management, funding and conduct of research in Turkey.

According to the Turkish Statistical Institute, the government's provision for R&D increased from $2.5 billion in 2012 to $3.1 billion in 2013. Total R&D spending by the public and private sectors as a fraction of GDP in 2013 was 0.95%. Commercial enterprises account for the largest share of R&D expenditures, at 47.5%. While universities accounted for 42.1% of spending on R&D, public institutions' share was 10.4%. In terms of financial contributions to R&D projects, commercial enterprises have the largest share with 49.3%, followed by public institutions with 26.8%, universities with 20.6%, and other sources 3.3% of R&D. In terms of full-time employment, 196,321 people worked in the R&D sector in 2013, an increase of 6.5% compared with the previous year. 35.2% of R&D personnel were employed by commercial enterprises, while 57.8% worked at universities, and public institutions employed 7.1% of R&D personnel.

In 2013, Turkey adopted the Tenth Development Plan, covering the period 2014-18, aiming to improve science, technology and innovation, as one of the building blocks for innovative production and steady growth. In Turkey, the Supreme Council for Science and Technology (SCST) is the highest ranking science and technology policymaking body in Turkey. In the last few SCST meetings, emphasis was placed on intensifying R&D efforts in the energy, health and biotechnology sectors, and providing subsidies to R&D laboratories of multinational enterprises that would be established in Turkey.

Citation:
Ministry of Development (2014)'Pre-Accession Economic Program 2014-2016", Ankara.

Australia

Score 4

Successive governments have sought to introduce policies at various times to encourage innovation and to increase investment in business and industry. The 2008 report, "Venturous Australia – Building Strength in Innovation," recommended measures to increase human capital, enhance intellectual-property rights and increase innovation in government. It also advocated the introduction of more comprehensive tax incentives to encourage greater investment in innovation. The Australian government responded to the report in May 2009 with "Powering Ideas: an Innovation Agenda for the 21st Century," in which it committed itself to a 10-year plan to build a stronger national innovation system.

However, changes to the policy environment following this report were minimal under the previous Labor government, and since the election of the Abbott government in September 2013, government support for research and innovation has been reduced considerably. Australia continues to provide significant public financial support for research and development, but the results continue to be quite disappointing. The Abbott government cut funding to the Australian Research Council scheme, which funds non-medical university research, and abolished the Australian Renewable Energy agency, which acted to support renewable energy projects in their start-up and early stages. Also telling was the fact that there was no science minister under the Abbott government, for the first time since 1931. However, with the replacement of Abbott with Malcolm Turnbull as prime minister in September 2015, a new cabinet was formed that included a science minister. Moreover, in his early speeches, the new prime minister has emphasized the need to foster innovation.

Citation:
Australian Government, 'Powering Ideas: An Innovation Agenda for the 21st Century', 12 May 2009: http://www.innovation.gov.au/innovation/policy/pages/PoweringIdeas.asp x

Australian Government Department of Industry, Innovation, Science, Research and Tertiary Education, 'Australian Innovation system Report 2012': http://www.innovation.gov.au/Innovation/Policy/AustralianInnovationSystemReport/AISR2012/index.html

OECD, Economic Survey Australia 2014, Paris: OECD, 16 December 2014.

Cyprus

Score 4

Cyprus research and development programs mainly started with the creation of the country's first university in 1992, along with other tertiary-education institutions. These institutions receive EU funds. The share of R&D expenditure performed by higher education (49.6%) remains larger than that performed by businesses or state-owned research centers, in contrast to the higher business-funded share EU-wide.

With regard to output and innovation, a substantial share of Cypriot companies have introduced innovations, with proportionally more enterprises receiving public funding for innovation-oriented activities than the EU average. However, the country's scores on indicators such as R&D spending, number of research personnel and quality of Internet access are among the EU's lowest. Generally, the country's private sector, which includes many small companies, provides little opportunity and limited funding for R&D activities.

Project funding was negatively affected by the economic crisis in the period under review. A recent European Commission report (2013) stated that businesses had limited demand for R&D and little propensity to innovate. Cyprus' R&D budget target for 2020 of 0.5% of GDP is the same as the present rate. Meeting only this target, the lowest in EU, would imply stagnation.

Citation:
1. Eurostat, Research and Innovation Challenges, http://ec.europa.eu/europe2020/pdf/themes/2015/research_and_innovation.pdf

Hungary

Score 4

Hungary's research and innovation (R&I) sector is fairly advanced but chronically underfinanced. Under the Fidesz governments, the situation has worsened further, since public funding for universities and research has been drastically cut. With 1.4% of GDP, public spending on R&I in 2015 was below both the Hungarian (1.8%) and the EU target (3.0%). The Hungarian Academy of Sciences still suffers from the effects of a radical and politically motivated reorganization performed under the second Orbán government. The European Institute of Technology and Innovation (EIT), which was established by the European Union in Budapest in March 2008, has not had much effect on R&D in Hungary to date, largely due to a lack of resources on the Hungarian side. The third Orbán government has transformed the National Innovation Office (Nemzeti Innovációs Hivatal, NIH) into a more comprehensive National Research, Development and Innovation Office (Nemzeti Kutatási, Fejlesztési és Innovációs Hivatal, NKFIH) under the direct control of a former Fidesz minister József Pálinkás.

Italy

Score 4

In recent years, Italian governments' research and innovation policies have been weak, underfunded and not strategically coordinated. The Renzi government has not been able to make much headway in this regard given the tight budgetary context. Funds for R&D have not increased, but some new measures have been introduced to foster start-up companies. As a result, there has been growing awareness of the

strategic importance of R&D across society, in the media and among some politicians. There have been some attempts to link university funding to the quality of research outputs. This policy is intended to incentivize universities to generate more quality research.

Romania

Score 4

Years of mismanagement and underinvestment in the sciences and industries which drive research development have resulted in a brain-drain of innovators, educators and entrepreneurs. For the 2014-2020 programming period only 15% of the EU funds available to Romania are allocated to R&I. The Ponta government sought to reverse this trend by launching the National Research-Development and Innovation Plan 2015-2020. The plan aims at increasing spending on R&D to 1% of GDP by 2020 and calls for new national and international projects. The plan concentrates on industries and areas of expertise likely to attract investment from domestic and international sources. It aspires to attract 2% of GDP worth of investment by 2020 which, in turn, could lead to a GDP growth of 3%. Worth noting are two key projects which have elevated Romania's R&I status internationally in the hope of attracting investment and professionals seeking to conduct research. The first is the Magurele scientific laser project, a fundamental research project under the umbrella of the budding national nuclear physics research sector. The second project to have garnered international attention is Romania's commitment to participate in the European Space Agency's (ESA) development of the International Space Station (ISS) and the Ariane 6 rocket program.

Spain

Score 4

Research and technology policy remained a weak point during the period under review, as evidenced by the low number of patents registered, the relatively poor international ranking of universities and the decreasing level of spending on R&D. Indeed, in 2014, just 1.20% of GDP went to research and development, compared with an EU average of more than 2% (which was the Spanish target for 2010). While the crisis is certainly responsible for the decline, the draconian cuts implemented in recent years have exacerbated a situation already needing attention. It is clear that the government's post-housing-bubble pledge to promote a new model of economic growth based on brainpower rather than construction has not been reflected in the budget. All indicators of public or private support for innovation in Spain are far below those in the advanced-economy leaders; for example, the country is ranked 19th among the 28 member states in the EU Innovation Scoreboard.

The Spanish National Research Council (CSIC), which is the largest Spanish scientific institution, with 6,000 scientists and more than a hundred institutes, warned

in 2013 that its research centers were headed for “catastrophe” if no extra money was found. Its budget had fallen by 30% from 2008 levels, and many promising young scientific researchers were going abroad, producing a brain drain the country could ill afford. At the end of 2015, the Popular Party government finally made good on its promise to establish a national science-funding agency. However, this policy was not slated to include new money, as it the new entity would simply take over existing research budgets. A rise in the median age of the scholarly workforce, the increasing obsolescence of existing lab instruments and an excessive bureaucracy are other troublesome factors.

Nevertheless, according to the Cotec Report on Technology and Innovation, some positive signs regarding R&D investment were evident in 2015, largely thanks to European Commission funding and private investment (which accounts for more than half of Spain’s total R&D spending). Spain also came out relatively well in the latest Nature Index (published in June 2015) , which tracks the affiliations of high-quality scientific articles published in 68 science journals; in this, Spain was the 10th most prolific country worldwide.

Citation:
William Chislett. 2016. A New Course for Spain: Beyond the Crisis. Madrid: Elcano Institute

COTEC. 2015. Informe 2016 sobre Tecnología e Innovación en España. www.cotec.es/pdfs/COTEC-informe-2016.pdf

European Commission, Innovation Union Scoreboard 2015
http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/index_en.htm

Bulgaria

Score 3

Traditionally, Bulgaria numbers among the lowest spenders on research, development and innovation in the European Union. Successive governments have concentrated on other issues and have largely relied on foreign direct investment and European Union funds to generate economic growth. Public outlays for research and development have decreased significantly from 2009 to 2011, and have stagnated since. Subsidies for innovative start-up enterprises are available almost exclusively through European Union structural funds. Technological innovations are also stifled by cumbersome patent and copyright protection procedures.

Croatia

Score 3

Croatia does not have a mature innovation system, and has fallen further behind in the field of research and innovation (R&I) policy. The country lacks a coherent and integrated policy framework, companies have low technological capacity to support innovation, and technology-transfer mechanisms are inadequate. While budget outlays for R&D reach about the same proportion of GDP as the EU-28, the results

in terms of overall expenditure on R&D are far weaker in Croatia. In 2014, overall spending on R&D was 0.79% of GDP in Croatia, compared to 2.03% in the EU-28. This suggests that the business sector is over-reliant on the government to fund R&D. The Milanović government has done little to use the newly available EU structural funds for modernizing and developing the innovation system. However, the government has played a role in the development of a relatively comprehensive Strategy for Education, Science and Technology. Drafted by more than 100 people, including R&I specialists, the 180-page document was unveiled in September 2013. However, the government has been slow to endorse the strategy and to commence implementation.

Greece

Score 3

Even though spending on research and development increased somewhat during the period spanning 2004 to 2013, Greece has never made research and development a priority policy sector. Greece ranks 29th among 41 advanced economies in terms of public R&D spending and even lower in terms of private R&D spending. This is a factor of overall economic activity, institutional weaknesses, and cultural resistance to public-private collaboration.

In the period under review, as in the past, most research was conducted at state universities and state research institutions. However, universities and research centers saw their funding (based on the state budget) decline in 2015, as the new coalition government of Syriza and ANEL scrambled to withhold budget outlays for the seven-month long period that it negotiated with Greece's creditors over a new bailout program. Despite economic adversity, there are clear "islands" of excellence at these universities in areas such as biology, IT and computer science, economics, various branches of engineering, archaeology, and history.

A law which had been passed by the previous government (New Democracy-PASOK coalition) in October 2014 has not actually been implemented because of the change of government in January 2015. The law was supposed to accord larger decision-making powers to general managers of research institutions and render researchers' labor contracts less secure. The same bill downgraded the national council of research and technology (ESET) from an agency which advised the minister of education to an appendage of the general secretariat of research and technology (GGET).

Notably, Greek researchers who seek EU funding are often disproportionately successful in securing it. For instance, the National Technical University of Athens actively participates in international projects, as does the Heraklion-based Institute for Technology and Research.

At the same time, institutional and cultural barriers have undermined R&D collaboration between state bodies and the private sector, as has been evident in the

very low take-up of EU-funded schemes to support such partnerships.

Under “Europe 2020,” Greece is committed to an unusually low target for research funding as a percentage of GDP (1.2% as opposed to the EU mean of 3%) and the five-year plan for R&D developed by the previous ESET has not been implemented. The current trajectory is thus very concerning.

In summary, Greek research and innovation policy during the review period has definitely proved suboptimal.

Citation:
Data on expenditure on research and development are on tables provided by SGI on this platform.

Latvia

Score 3

Research and development (R&D) expenditure in Latvia was equal to 0.66% of GDP in 2013, an increase on previous years driven by an increase in EU funding. Latvia is the only EU member state where more than half of all investment into R&D comes from non-domestic sources. Between 2009 and 2013, private-sector investment into scientific research was equal to 0.2% of GDP, significantly below the average EU-27 rate of 1.2% of GDP. Furthermore, public-sector investment into R&D was the lowest of any EU member state. The Ministry of Education identified the lack of public funding as a major impediment to the development of science, technology and innovation in Latvia.

Public funding for research institutions fluctuates year to year. This creates an environment of uncertainty that discourages young people from entering the fields of science, technology and innovation, or encourages these young people to look for opportunities abroad. There are few links between industry and research institutions, a fact that further hampers the growth of the R&D sector. Furthermore, there is a persistent lack of public funding for the development of international research networks and collaborative projects.

The Union Innovation Scoreboard 2014 ranks Latvia 26th out of 27 EU countries in terms of innovation. However, Latvia has a strong record of improvement, placing the country among the top three in the EU.

National industrial policy guidelines for the period 2013 to 2020, adopted in 2012, established a framework for public support of innovation. The Ministry of Economy and the Latvian Investment and Development Agency (Latvijas Investīciju un attīstības aģentūra, LIAA) initiated a range of innovation-support projects in 2013 to promote high value added business activity. The aim of these projects is to support new product design and technology development as well as to promote cooperation between the research and business sectors. A new framework document for science, technology and innovation support was adopted in 2013 for the period 2014 to 2020.

The new framework aims to rebalance investment flows by increasing the share of domestic public and private investment.

Citation:
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2. European Commision (2014), Union Innovation Score board 2014, Available at: http://ec.europa.eu/enterprise/policies/innovation/files/ius/ius-2014_en.pdf, Last assessed: 01.11.2014.

3. Ministry of Economy, Guidelines on National Industrial Policy, Available at (in Latvian): http://www.em.gov.lv/em/2nd/?cat=30765, Last assessed: 21.05.2013

4. Ministry of Education and Science, Framework document on Science, Technology Development and Innovation 2014 - 2020 (in Latvian). Adopted 28.12.2013. Available at: http://polsis.mk.gov.lv/view.do?id=4608, Last assessed: 31.10.2014

Mexico

Score 3

National spending on research and development (R&D) continues to be very low in comparison with other OECD countries. According to World Bank estimates, in 2011 Mexico spent only 0.4% of its GDP on R&D, roughly the same percentage as in developing countries like Botswana and Uganda. One consequence of Mexico's reliance on large companies has been severe polarization, in which a very large number of "micro" firms have little or no institutionalized access to state R&D spending, while large and efficient firms undertake their own research and development spending. There is growing awareness of this problem within Mexico itself, but Mexico still ranks below most OECD member countries on indices relating to R&D. The OECD has stated that R&D spending in Mexico is quantitatively and qualitatively inadequate.

Slovakia

Score 3

Slovakia has a weak and underdeveloped research and innovation policy. R&D intensity, public expenditure on R&D, the number of patent applications and levels of employment in knowledge-intensive activities are below the EU average. A basic problem lies in the fact that the Slovak economy is dominated by multinational companies that are not linked to the country's universities and research institutes. In January 2015, a new law entered into force providing tax advantages for companies investing in research and development (R&D). Based on the new legislation, companies investing in R&D can reduce their tax bases by an additional 25% of their real R&D expenditures, 25% of their wage costs for R&D employees, whom they recruited as graduates of secondary schools and universities, and 25% of the year-on-year increase in R&D expenditures.

Slovenia

Score 3

Slovenia's R&I activities have long been of both low quality and quantity. The Cerar government several times promised to prioritize R&I, but in reality placed little emphasis on it. It has failed to increase national funds available for R&I and to raise the share of EU funds devoted to the support of research and development. In some areas of research, EU funds have even declined, as Slovenia has experienced serious administrative difficulties in absorbing funds for R&I. To delevop an effective policy response to the R&I, the "2011 Research and Innovation Strategy" needs to be implemented as quickly as possible.

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